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THE PRESIDENT'S PAGE

Probably the most widely read part of *The Wilson Bulletin* is the section headed "General Notes." Because the subject matter is varied, we are almost certain to find contributions which interest us in one way or another.

Unfortunately our Editor does not receive for this section, in sufficient quantity, the type of material most greatly desired. The majority of manuscripts submitted are anecdotal or pertain to distributional records, often too local to be either of much ornithological significance or of much reader interest. Greatly needed are concise, factual manuscripts which will serve to augment our knowledge of the biology of birds.

Last year (vol. 61, p. 131) I pointed out several gaps in our knowledge of birdlife, namely, length of incubation periods, length of nestling life, daily activity rhythms, clutch size, location of roosting sites, and water requirements. Observations on these aspects of birdlife are admirably suited to "General Notes." In addition, observations on the following problems are equally well suited.

Predation upon birds. Our ornithological literature contains abundant suppositions as to the kinds of predators that destroy nests and adult birds, but relatively few observations of the "predator in the act."

Nest-building. In the case of many of our commonest birds, we do not know the actual mechanics of the process, the role of the sexes, and the length of time involved.

Mating displays. The mating displays of most small birds, especially passerine birds, have been ignored. Because the mating display of a bird such as the Blue Jay is not as showy as that of a peafowl, no attention has been paid to it.

Parental defense. Although an extraordinary number of observations have been made on the "injury-feigning" of parent birds, we have few published descriptions of threat-displays, direct attacks, and warning sounds.

Multiple-broodedness. We need to know which species regularly rear two or more broods in a season. Determinations should be based on birds which have been marked (*e.g.*, color-banded) so as to be individually recognized.

More "General Notes" based on the type of information suggested above will serve the dual purpose of contributing to knowledge and increasing reader interest.

Olin Sewall Pettingill, Jr.

A HYBRID BETWEEN THE SCARLET AND THE WESTERN TANAGER

Piranga olivacea × *Piranga ludoviciana*

From a water color by Robert M. Mengel, based on a specimen taken in Anoka County, Minnesota, August 17, 1949.

A HYBRID TANAGER FROM MINNESOTA

Harrison B. Tordoff

Museum of Zoology, Ann Arbor, Michigan

On August 17, 1949, Dwain W. Warner, Dana Struthers, and I collected an oddly plumaged tanager (*Piranga*) 5 miles northwest of Wyoming, Anoka County, in east-central Minnesota. The specimen proved to be a male with a completely ossified skull. It weighed 32.0 grams and had some fat. Its testes measured about 2.00 x 0.75 mm. It was molting, the longest tail feathers extending scarcely a half inch beyond the tips of the fully developed upper tail coverts.

The accompanying plate illustrates the peculiar plumage, perhaps more effectively than a written description. The crown of the specimen is mottled with black-tipped greenish-yellow feathers and orange-red feathers. The rest of the head, hind neck, upper back, throat, and upper breast are less intense orange-red, with scattered yellow feathers. The middle of the back is mottled with yellowish-green, black, and orange-red. The rump, lower breast, and belly are largely yellow, with a few orange-red feathers interspersed. The flanks are greenish-yellow, and the tail coverts are reddish-orange. The feathers of the crural tract are black, tipped with greenish-yellow. The tail and wings are black, with greenish-yellow edges on some of the middle and greater secondary wing coverts.

At first sight, the bird appears to be an adult male Scarlet Tanager (*Piranga olivacea*) in postnuptial molt; however, it resembles the Western Tanager (*Piranga ludoviciana*) in several respects. First, the orange-red of the feathers is much closer to that on the throat and chin of the male Western Tanager than it is to the red of the normal male Scarlet Tanager. Exceptionally, however, the head and body plumage of the breeding male Scarlet Tanager is orange-red rather than scarlet. The scattering of red feathers over the body indicates the Scarlet Tanager since in the Western, the red occurs only on the head and (occasionally) some of the breast feathers. Second, in the Minnesota specimen, the well-defined greenish-yellow tips of three of the middle coverts form a single short wing-bar on either side. The Western Tanager has 2 conspicuous yellow wing-bars, while the Scarlet has them only very rarely. Third, the newly replaced outermost tertial of the specimen has a white tip (1.5 mm. wide). The Scarlet Tanager occasionally has a narrow, light edging on the inner secondaries, while the Western customarily has fairly broad edgings in fresh plumage which are about 1 to 2 mm. wide. In fresh plumage, the tail of the Western is white-tipped (always?), while this tipping is lacking in the Scarlet and in the specimen figured. Fourth, the middle of the back of the

Minnesota specimen is mottled with black. This black involves parts of some scapulars and interscapulars. On some of the interscapulars, there are two distinct black bars, separated by a band of orange-red or green. The entire middle of the back is black in both plumages of adult male Western Tanagers, and either red or green in the two plumages of adult male Scarlets, although a male Scarlet in the P. W. Shufeldt Collection, taken October 9, 1932, at Belize, British Honduras, has slight traces of black on some of the back feathers. A fifth point, more difficult to account for, is the black mottling on the crown of the Minnesota bird. In this regard, I can only point out that an adult male Western Tanager in the P. W. Shufeldt Collection from Mora County, New Mexico, September 24, 1939, has definitely black-tipped feathers on the crown, throat, and upper breast. Lastly, the bill of the Western Tanager tends to be slightly less swollen than that of the Scarlet Tanager. Ridgway (Birds of North and Middle America. Part 2. *U. S. Nat. Mus. Bull.* No. 50, 1902, pp. 89 and 93) gives the range of bill depth at base for 14 adult male Scarlet Tanagers as 8.9 to 9.7 mm. (average 9.4), and for 12 adult male Western Tanagers, 7.9 to 8.6 mm. (average 8.1). The bill depth of the Minnesota specimen is 8.1 mm.

I examined the red feathers of the head under a magnification of 18 × to determine whether any of them belong to the incoming plumage, since the male Western Tanager retains some red on the head in winter, while the male Scarlet ordinarily loses all of the red feathers in the postnuptial molt. The new feathers on the specimen can readily be distinguished from the old on the basis of wear. As far as I can tell, all of the red feathers are badly worn, whereas all of the yellow head feathers and many of the yellow body feathers are fresh and unworn. This indicates that in full winter plumage this individual would have shown very little or no red. However, the presence of many badly worn yellow feathers on the body indicates that in full breeding plumage, this individual must have had a wholly red head, with a yellow- and red-mottled body.

A consideration of all the factors involved has led me to conclude that the Minnesota bird is a hybrid between the Western and Scarlet Tanager– the first known as far as I have been able to ascertain. Hybrids have been recorded between several other east-west allopatric species in North America. These hybrids provide additional evidence of the close relationship existing between their parent species.

Roberts (The Birds of Minnesota, Vol. 2. Second Edition. Minneapolis, 1936, p. 329) lists two May sight records for the Western Tanager at Minneapolis, about 35 miles southwest of the Anoka County locality of the specimen figured. He gives the status of the Scarlet Tanager in Minnesota as "summer resident, breeding throughout the state" (loc. cit.). The specimen discussed above is now in the collection of the Minnesota Museum of Natural History, University of Minnesota.

BAROMETRIC PRESSURE-PATTERNS AND SPRING BIRD MIGRATION

A. M. Bagg, *72 Fairfield Avenue, Holyoke, Mass.*

W. W. H. Gunn, *Dept. of Zoology, University of Toronto, Toronto, Ont.*

D. S. Miller, *Fish & Wildlife Division, Ont. Dept. of Lands & Forests, Toronto, Ont.*

J. T. Nichols, *American Museum of Natural History, New York City, N. Y.*

Winnifred Smith, *Winghaven, Route # 1, Two Rivers, Wisc.*

F. P. Wolfarth, *133 High St., Nutley, N. J.*

As PREPARATORY background for studies of the relation between barometric pressure-patterns and spring migration in North America east of the Rocky Mountains, this paper reviews the relevant literature and outlines current studies of the correlation and its practical applications. In setting the Rocky Mountains as a western boundary for the region under discussion, the authors recognize the distinction between migration phenomena east and west of a line approximated by the 100th meridian, as emphasized by Peterson (1948: 165–6, 233). The southern and eastern boundaries can be defined as the Gulf states and the Atlantic coast, respectively; but the northern boundary must at present be left in vague outline, roughly represented by Lat. 50° N., due to lack of pertinent data.

The authors wish to acknowledge valuable assistance generously given by the following persons: Margaret M. Nice, James L. Peters, and Wendell Taber, who offered helpful criticism of the manuscript; W. B. Alexander, James L. Baillie, Roland Clement, Samuel A. Eliot, Jr., Joseph J. Hickey, and R. M. Saunders who made available certain references and field records; and R. E. Lautzenheiser, meteorologist, of the U. S. Weather Bureau, Chicago, who was consulted in regard to the section on meteorological definitions.

Introduction

The basic concepts of modern meteorology are treated in Haynes (1947) and government or newspaper weather maps provide accompanying definitions of the terms and symbols used thereon. As a ready reference for readers unfamiliar with meteorological terms, the following greatly simplified synopsis is presented:

The modern analysis of weather is based on the concept of large moving air masses which are labelled according to their source and the type of surface from which they have derived their characteristics of temperature and humidity: *Tropical* or *Polar*, *Continental* or *Maritime.* Within itself, an air mass retains its individual character, although it will tend to be modified, in the lower levels, by the region over which it is passing. When 2 masses of different properties (such as a warm, moist Maritime Tropical air mass and a cold, dry Continental Polar air mass) adjoin one another, they produce a boundary in which the cold air tends to push in a shallow wedge under the warm air, and the warm air rises over the cold air. A "wave" appears in the boundary and the 2 air masses tend to whirl together. This disturbance takes on a roughly circular form and creates a *depression* or *low pressure area.*

The boundary between the 2 air masses will now be represented by 2 marked surfaces of discontinuity of temperature and wind direction, radiating from a point at or near the center of the Low. Where these surfaces of discontinuity touch the earth's surface, they are called surface *fronts.* Where cold air is replacing warm air, the front is termed a *cold front* and is indicated on weather maps by a line bearing triangular points showing the direction of movement. Where warm air is replacing cold air, the front is termed a *warm front*, indicated by half-circles on the frontal line. The pronounced sector of the low pressure area lying between the cold front and the warm front is termed the *warm sector.* A frontal line with alternate triangular points and half-circles represents a *quasi-stationary front*, where the leading edge of the cold air mass is relatively stationary.

Air tends to flow towards a low pressure area (cyclone) from a high pressure area (anticyclone) but, due to the rotation of the earth, this flow occurs spirally rather than directly. In the northern hemisphere, winds blow in a clockwise direction around centers of high pressure and counterclockwise around centers of low pressure.

Several early examples might be cited to show that, for many years, ornithologists have been interested in the relation between weather conditions and spring bird migration in our temperate latitudes. For example, in discussing migrating birds, Nuttall (1832: 22–23) stated: "It is possible that at times they may be directed principally by atmospheric phenomena alone. . . . The currents of the air, in those which make extensive voyages, are sedulously employed; and hence, at certain seasons, when they are usually in motion, we find their arrival or departure accelerated by a favorable direction of the winds." Also, Thoreau (1881: 159–161) wrote in his (Concord, Mass.) Journal, under date of March 17, 1858: "A remarkably warm and pleasant day with a south or southwest wind. . . . Thus these four species of birds [Bluebird, Flicker, Robin, and Redwing] all come in one day, no doubt, to almost all parts of the town."

However, in order to understand the correlation of weather and migration it is first of all necessary to distinguish between 2 types of migration "waves" regularly observed in the region under discussion. These are superficially somewhat similar, but actually stem from divergent meteorological conditions: (1) the *arrested wave*, checked by adverse weather, and (2) the *onrushing wave*, impelled forward by favorable conditions.

The difference between the two is well illustrated by a passage from Batchelder (1882: 252), who analyzed weather's relation to the northward course of a "tidal wave" of birds observed consecutively at Washington, D. C., New York City, and Boston, Mass. He interpreted the correlation as follows: "The vast number of birds [noted at Washington] was doubtless due to the cold and rainy weather that prevailed, checking the progress of the migration beyond the latitude of Washington [arrested wave]. When the weather changed, the gradually accumulated throng was let loose, and rushed in a great [onrushing] wave towards the northern breeding grounds. In the vicinity of New York . . . after prolonged cold and wet weather a change came on the morning of May 20, and with the pleasant weather the rush of birds began. Almost all the Warblers and Thrushes were in great numbers, and continued very abundant at least throughout the following day. In the latitude of Boston birds had been unusually scarce for some days. The change to clear and warmer weather took place about noon of the 21st, and before the rain ceased the rush of birds had begun. All day long the smaller birds came in unheard of numbers, stopping awhile to feed, and then hurrying on [onrushing wave]. The next morning the host was even greater, and the trees fairly swarmed with Warblers. Before noon of that day most of the birds had passed on, but for a day or two afterward the number of loiterers was sufficient to be noticeable. . . ."

Among more recent authorities, both types of waves are implicit in statements by Cruickshank (1942: 39–40), Griscom (1945: 103) and Nichols (1948: 126, 130). A specific modification of this correlation is given by Nice (1937: 55), who writes of the Song Sparrow: "The early migration is absolutely dependent upon a warm wave the last of February or the first of March, but the main migration is only relatively dependent on a rise in temperature. Severe cold waves stop migration short."

The above analyses have emphasized significant temperature-rise and a southerly wind as the meteorological key to the onrushing wave. As a working formula, that emphasis has been most useful in anticipating occasions of noteworthy vernal movement. Generally speaking, however, ornithologists have paid very little attention to the study of the barometric pressure-patterns which produce the warm waves which, in turn, favor migratory movement in spring. Since it is this particular aspect which has been, in recent years, the subject of investigation by the authors, it consequently seems fitting to present the following references which treat the problem.

Early North American References (1888–1937)

In his "Report on Bird Migration in the Mississippi Valley in the Years 1884 and 1885", Cooke (1888: 16–25) included a section entitled "Relation of Migration to Barometric Pressure and Temperature". This section presents a detailed "record of the relation of migration to atmospheric conditions for the seven days from March 19 to 25, 1884, contrasted with a week's migration in May". Discussing the period of March 19–25, 1884, Cooke described a situation (since found to be typical, in a general way, of that season of the year) in which the center of a low pressure area is moving from "the southern Rocky Mountain region" progressively northeastward through North Platte (Nebraska), Yankton (S. Dakota), St. Paul (Minn.) and Marquette (Mich.). He describes the night of March 21 as being "a night of much migration", but one in which the movements took place "only to the east of the low pressure area; for it is a law of atmospheric circulation that the winds are attracted from the south, not directly toward the center of the low pressure area, but toward places to the east of it in the same direction that it is moving, while the winds which it attracts from the north move toward places to the west or behind it. Migration, therefore, would be looked for in vain to the south, west, or north [of the low pressure center]. . . . It is well to bear in mind that all these birds were migrating on a rapidly falling barometer, hence in the face of what is usually considered a sign of an approaching storm".

Before leaving Cooke, there are two further passages which are of importance in subsequent discussion: First: "Since it is known that low pressure is generally accompanied by clouds and rain, while areas of high pressure are cloudless, it would be naturally supposed that migration would take place during high pressure; but, as has already been stated, the area of low pressure attracts a south wind and the increased warmth more than overbalances the cloudiness. Fully 60 per cent of the spring migration of 1884 took place in cloudy weather". Second: Describing an instance in May in which there seemed "to have been a regular though not rapid advance . . . with N. and NW. wind", Cooke was led to the inference that "during the latter part of migration there is no night so unfavorable but that some migration takes place".

In reporting on the 1902 spring migration at Rochester, N. Y., Eaton (1904: 344) observed that "the greatest bird wave of the season . . . occurred on the 3rd of May . . . a perfect day, warm and sunny, following a low cyclonic center moving from the southwest and culminating in a shower during the night". Eaton added that "during the warbler season of 1903 there was no decided southwest cyclonic storm and no remarkable warbler wave". Moreover, Eaton (1910: 67) made this significant general observation: "There can be no doubt that the arrival of birds with us depends upon the temperature and probably upon the winds. With the advance of a low cyclonic center from the southwest, bringing high temperature to western New York in March, April or May, there is sure to be a bird wave which corresponds in magnitude to the warm weather wave which undoubtedly brought it. Many facts seem to show that the birds of western and northern New York are mostly immigrants from the southwest, and the warm weather as well as the prevailing winds of this region also come from that direction. The warm weather at least furnishes the favorable conditions which induce them to migrate. These are no more an agreeable temperature than an abundance of food and favoring winds to aid their arduous passage".

Smith (1917) remarked that "there seems to be ample justification for the statement that in Central Illinois there is a high degree of correlation between the flights of night migrants [in spring] and the meteorological conditions involved in the near approach from the West of an area of low barometric pressure with the accompanying rise in temperature and southerly winds". Possibly with an eye to more general application, Smith (1918) repeated this statement, but without mention of central Illinois.

For the period 1919–1937 there is surprisingly little to be found on this aspect of migration in the North American literature. The pressure-pattern relationship is given virtually no consideration, while winds, *per se*, unless exceptionally strong, are generally regarded as having little or no relation to time or direction of migration, the latter conclusion being reached chiefly on the basis of local observations rather than from a survey of the meteorological picture for the continent as a whole.

The question arises: why has the whole subject involved in these published findings been, until very recently, so largely overlooked? In the opinion of the authors, at least three factors appear to have contributed to this situation. First, numerous professional ornithologists were interested in the physiological mechanism which induced the state of unrest which, in turn, appeared to precede and accompany actual migration. Thus, experimental investigation tended toward such research as that carried out by Rowan (1929 *et seq.*) and Kendeigh (1934) on climatic factors. Second, while over 40 years ago Wood (1906: 156) remarked that "... enough study of the weather maps has been done at this Museum [University of Michigan Museum of Zoology] to show that 'bird waves' can be predicted with some certainty", the amateur field ornithologist was neither equipped with, nor educated in the use of, meteorological maps to employ the above discoveries to advantage in his avocation. Nor, as pointed out above, was he encouraged by the literature of the day to support Wood's views. Third, the science of meteorology itself is greatly advanced today in knowledge, techniques and availability over what it was during the years preceding World War II.

European References

This paper is concerned primarily with the region of North America east of the Rocky Mountains. However, it appears worthwhile to consider whether the type of pressure-pattern first outlined by Cooke favors spring migration elsewhere in the Northern Hemisphere. There is evidence from European findings, for example, to support this contention. As early as 1832, Nuttall (1832: 27) wrote interestingly of an instance of the arrested wave in the Mediterranean region in which adverse winds precipitated numbers of migrant Quail on Islands of the Archipelago, "where they wait, sometimes for weeks, the arrival of a propitious gale to terminate their journey. . . ."

Walter (1908: 365–6), in discussing a paper by Marek of Hungary, stated that Marek had compared "known migrations of the woodcock in Europe with the weather charts of the same dates and had found that, aside from minor deviations, these birds migrate from anticyclonic areas of high barometric pressure to cyclonic areas of low barometric pressure".

Eagle Clarke (1912) devoted considerable attention to "the meteorology of bird-migration", with particular reference to the British Isles and Western Europe. Due perhaps to the moderating climatic influence of warm ocean currents, migration flyways appear to be more complex there than in eastern North America, with considerable west-east spring movement in evidence as well as south-north flights. Nevertheless, Clarke showed that favorable conditions for south-north flights to and through Great Britain and neighboring regions of the Continent of Europe are such that there is a "High" to the east or southeast of these areas and a "Low" to the west or northwest of them. He used maps of barometric pressure to illustrate favorable and unfavorable conditions. He believed that the clear weather of a high pressure system prevailing in the area in which the movement has its origin is a prerequisite to the great "rushes". However, in regard to winds, he took a strong position later echoed by numerous other writers on the subject: "... Their direction, apart from the weather condition to which they are due, has no influence whatever on the [migratory] movements".

Thomson (1926), in reviewing European findings to that date, stated Clarke's views and summarized the work of 2 meteorologists, Hegyfoky and Defant. Hegyfoky found spring migration into Hungary "favored by high barometric pressure and rising temperature in the region passed through, these conditions being commonly present when there is a depression over northwestern Europe". Similarly, Defant found "a close correlation . . . between [spring] immigration into Austria and high barometric pressure over the Balkan peninsula"; but, while he recognized the attendant existence of a pressure gradient falling from east to west in the Mediterranean region, he did not emphasize the importance of the northwestern depression. After noting that the correlation with a high pressure area was similar to that found by Clarke, Thomson is then careful to say: "Defant, however, differs from Eagle Clarke in attaching direct importance also to favorable winds".

Thomson (1936), reviewing subsequent (1926–1935) findings on weather influences, quoted Schenk who, following up Marek's earlier work, investigated the spring migration of the Woodcock (*Scolopax rusticola*) into Hungary in relation to weather conditions. "He [Schenk] found that the chief movements coincide with, or quickly follow northwesterly cyclonic conditions (depression in the region of England), possibly because there is then fine weather (with warm air currents from the south) over the Mediterranean."

While further investigation was carried on in Europe, notably in Finland by Palmgren (1937), the tendency has been to deal with aspects of migration outside the immediate scope of this paper.

Recent North American References (1938–1948)

During recent years improved U. S. Weather Bureau maps became available to the North American public, and certain newspapers began printing simplified versions of such maps. Some radio stations issued not only weather forecasts, but also detailed descriptions of prevailing pressure-patterns and the various meteorological factors involved. Finally, quite a few ornithologists received meteorological training during the course of their World War II service. Thus new availabilities and techniques paved the way for the rediscovery of earlier findings and permitted their practical application. The forerunner of this trend may be said to be McMillan (1938), who brought a new and refreshing outlook to the subject. An experienced airline pilot well versed in the latest meteorological techniques of the day, he emphasized the fact that wind and temperature conditions at ground level may differ widely from those prevailing at the levels of flight; hence, conditions aloft must be considered in any true picture of migratory flight.

He further propounded "the general hypothesis that, whenever possible, migrating birds ride the wind" and that by utilizing "the spinning cyclonic and anti-cyclonic areas" (i.e., Lows and Highs) they "are riding the natural fly-ways of the world". This concept has found more recent expression in Landsberg (1948: 709), who says: "To the meteorologist, it looks as if some . . . migratory birds had developed a rather remarkable system of what is called in modern aviation 'pressure-pattern flying'. This is the system which takes advantage of the maximum possible amount of tail wind in long-distance flights. . . . If powerful modern aircraft, for reasons of economy and safety, adopt the system of pressure-pattern flying, it seems reasonable that birds, which are much more dependent upon assistance offered by these air currents, would follow the path of least resistance."

While we agree with the suggestion that many migrants avail themselves of "pressure-pattern flying", the following statement by McMillan (1938) appears to be somewhat of an over-simplification: "Spring and the birds came early in 1938. Was one the cause and the other the effect? Why not say that both are effects of the same cause—that the influx of tropical air came early this year? The birds migrate and the wind migrates. . . ." This seems to be a confusion of short-term meteorological factors with longer-term climatology. For example, similar barometric patterns may occur in the eastern United States in November and March, both of them producing an influx of warm, southwesterly air, but only in March do these patterns coincide with a northward flight of birds.

In the region of the states bordering on the Gulf of Mexico, where the influx of tropical air first makes itself evident, interesting facts came to light more or less as a by-product of the recent studies of migration routes in the region of the Gulf. Burleigh (1944: 337–8) pointed out that spring migrants were observed along the Gulf Coast of Mississippi only when grounded by inclement weather. This point was treated more fully by both Williams and Lowery. Williams (1945: 108) indicated that few or no migrants are to be seen on the Gulf Coast in fine spring weather, but the "sudden appearance of the migrants will occur (and occur invariably) *at any hour of the day when bad weather comes.*" Lowery (1945: 92) said: "During clear weather, trans-Gulf migrants that do not breed on the Gulf coast or in the lower Mississippi River valley proceed. inland several hundred miles before coming down. That stretch of coast which one might suppose to be teeming day after day during the spring with multitudes of migrants . . . is, in actuality, *during fine weather*, an 'ornithological vacuum' so far as many migrants are concerned. . . . *During inclement weather*, however, all trans-Gulf migrants are precipitated on the first available land. . . ."

That this "bad" or "inclement" weather in fact represented the arrival of a cold front from the northwest was amply demonstrated by Lowery (1946: 178) who described in careful detail the sequence of meteorological and ornithological events which take place when a cold front cuts off the influx of tropical air and grounds northbound migrants. Both Williams and Lowery are describing extreme examples of the arrested wave. It is interesting to compare these descriptions with the example quoted earlier from Nuttall (1832) regarding migrant Quail in the Mediterranean region.

In regard to the northward departure of migrants from the Gulf states, Lowery (1945: 97) stated: "Migrants which arrive on the Gulf coast are not so completely fatigued as to require long periods of rest before advancing northward. . . . Should the weather clear on the morning following the passage of a polar front, the concentrations are usually maintained throughout the first day. On the second day, however, only a few are found. . . ." This statement is of particular importance since it permits the determination of the barometric pressure-pattern characteristic of the onrushing wave at the inception of its northward movement from the Gulf states. Thus, with the eastward passage of the High, whose leading edge was represented by the cold front, the situation gradually becomes more favorable for the resumption of a northward flow of tropical air. When the High is supplemented by a Low originating over the southwestern states and moving northeastward, then the influx of tropical air over the eastern part of the United States is greatly intensified, and, as determined by observers working independently in the north-central and northeastern United States and southern Canada, it is under these conditions that bird waves may be expected in their regions.

For example, in following such movements in New Jersey, one of us (Wolfarth) observed as early as 1940 the favorable influence of a High centered off the Middle Atlantic coast. The relation between this observation and Lowery's (1946) is apparent, since they both look to a pressure-gradient falling from east to west to accompany northward movement. Similarly, on the basis of her own ornithological and meteorological observations, begun in 1946 at Two Rivers, Wisconsin, another of the present writers (Smith) deduced that noteworthy spring migration may be expected in a given area when that area is, or was during the preceding night, in the warm sector of a Low.

From his own observations in Massachusetts in 1947, coupled with migration data contributed by other observers, Bagg (1948: 147), stated that spring migration into New England and adjacent sections of the northeastern states is stimulated by a pressure-pattern in which "high pressure is moving eastward off the southeast U. S. coast, while a low pressure area is moving into the Great Lakes region after having originated in the vicinity of Kansas and Colorado", the clockwise effect of the High having set in motion a northeastward flow of tropical Gulf air, that flow being subsequently intensified by the counterclockwise effect of the Low.

Gunn (1948), studied the relation between pressure-patterns and records of migration at Point Pelee for the years 1937–1947 and found that the type of pressure-pattern favorable to New England was equally favorable to the Lake Erie region. Crocker and Gunn (MS.), studying in some detail the meteorological background of the exceedingly early arrival of a wave of insectivorous migrants observed in the Lake Erie and Western Lake Ontario region during the period April 5–7, 1947, attributed the arrival of the wave in this region to the intense cyclonic disturbance which arose in the southwestern states and whose center passed to the northwest of the region, as was first suggested by Mayfield (1947: 153–154).

One consequence of this varied, independent research has been the pooling of ideas and observations by the co-authors that made possible the joint study of spring migration in 1948 along a broad front. It also brought about a search of the literature resulting in the historical background for the subject, as outlined above. Since each and every one of the references quoted appears to represent an individual approach to the same fundamental principles regarding the relationship between barometric pressure-patterns and spring bird migration, and since these principles are supported by meteorological and ornithological data obtained during the spring of 1948, it is therefore deemed possible to draw up a working hypothesis for the analysis and prediction of spring migration flights.

Hypothesis

1. In the region under consideration, northward movement of migrants in late winter and spring will normally begin under conditions of a barometric gradient falling from east to west and of southerly winds typical of the westward portion of a high pressure area (clockwise circulation) moving off to the east or southeast.

2. When the high pressure area is supplemented by a low pressure area (counterclockwise circulation) originating in the southwest and moving northeastward, the influx of warm, moist tropical air is extended and intensified; concurrently, the northward movement of migrants assumes the proportions of a pronounced onrushing wave in the warm sector of the low pressure area.

3. The intensity of the onrushing wave and the distance advanced by it are likely to be proportional to the depth of the Low and the extent of its northeastward progress.

4. Expressed in terms of "fronts", it may be said more simply: during the period of spring migration, pronounced movement will take place into or through a given region during the interval between the passage of a warm front through that region and the subsequent arrival of a cold front.

5. Cloudiness and rain are likely to be encountered by the onrushing wave as the cold front approaches from the west or northwest. If still in motion when overtaken by the cold front, the onrushing wave will be grounded and thus form an arrested wave until the meteorological cycle is complete and a further advance takes place.

6. An onrushing wave may also be grounded if it encounters a quasi-stationary front intersecting its line of flight.

7. The above relationships, while always of major significance in spring, may be less absolute in character during the later part of spring migration than during the earlier part.

Something should be said concerning the species of migratory birds to which this hypothesis directly applies. Studies so far have shown that a great many migrants do fit into this category and moreover, have failed to indicate any exceptions, although research is needed to determine the exact meteorological factors involved in the spring migrations of certain groups of birds such as: owls; pelagic birds; shore-birds that are chiefly littoral in their passage; other species, like the Evening Grosbeak (*Hesperiphona vespertina*), whose spring migration may not follow the general south-to-north trend. While recognizing the possibility of such exceptions as these, the authors believe that the above hypothesis does apply to the vast majority of spring migrants in the region considered.

While this paper has been confined to spring migration, because it is felt that autumn migration requires a separate study, the authors concur with the recent statement by Landsberg (1948) that any hypothesis of bird migration "should include a very careful analysis of . . . patterns of atmospheric currents."

To illustrate the relation between barometric pressure-patterns and spring migration in eastern North America, the authors chose one of several periods of notable migration observed in the northern states and southern Ontario during the spring of 1948: April 18–22. This particular example was selected because the favorable pattern affected in succession from west to east all regions that the authors had under personal observation. The authors would add, and emphasize, that while the following example involves only one 5-day period, neither the evolution of the barometric pressure-pattern nor the accompanying evidences of migration differ fundamentally from what the authors have found in other situations that they have studied individually. To cite one case, Bagg's faith in the above hypotheses is based on his studies of the meteorological backgrounds of the following occasions of either notable influx or diurnal migration at Holyoke, Mass: March 25, April 6, 12, 27, May 12, 1947; March 16, 22, April 20–21, May 10, 1948; March 22, 27, 1949.

The figures (1–2) represent simplified versions of the U. S. Weather Bureau 1.30 A.M. and 1.30 P.M. maps for the period of April 17–21. For the sake of clarity, the data on these figures are confined to simple indications of: (1) the positions of the High and Low centers at the particular times involved; (2) their attendant frontal systems; (3) general trend of wind direction (large arrows); (4) a few of the isobaric lines, connecting localities of equal barometric pressure, to indicate not only the positions, but also the general outlines, of the Highs and Lows; (5) the path of the Low center on April 20–21, its position at six-hour intervals being denoted by the dark squares.

April 17, P.M.: High pressure is centered over the eastern Great Lakes with northerly winds prevailing on its eastern periphery, the leading edge of cold air moving southward through Georgia. The clockwise flow of air around this High is bringing southerly winds, and a warm front, to the Prairie states.

April 18, A.M.: The High center has moved eastward to New York and southern New England, the dotted line on the figure indicating the southerly limit of freezing temperatures at 1.30 A.M., E.S.T., on this date.

April 18, P.M.: The High center is moving off the southeastern coast of New England, and the pressure gradient falls from this center along an east-west line through the eastern half of the U. S. to a shallow Low over Nebraska. A warm front is entering Wisconsin.

April 19, A.M.: The High is centered just east of New England. The Low over Nebraska has deepened, and the warm front now extends from northern Wisconsin to Lake Ontario. The warm sector, behind this front, includes the vicinity of Two Rivers, Wis., and the greater part of lower Michigan.

At Winghaven, located on the west shore of Lake Michigan, 10 miles north of Two Rivers, Wisconsin, the day of outstanding migration during April, 1948, was the 19th (Smith). Eight new species for the year were listed on this date

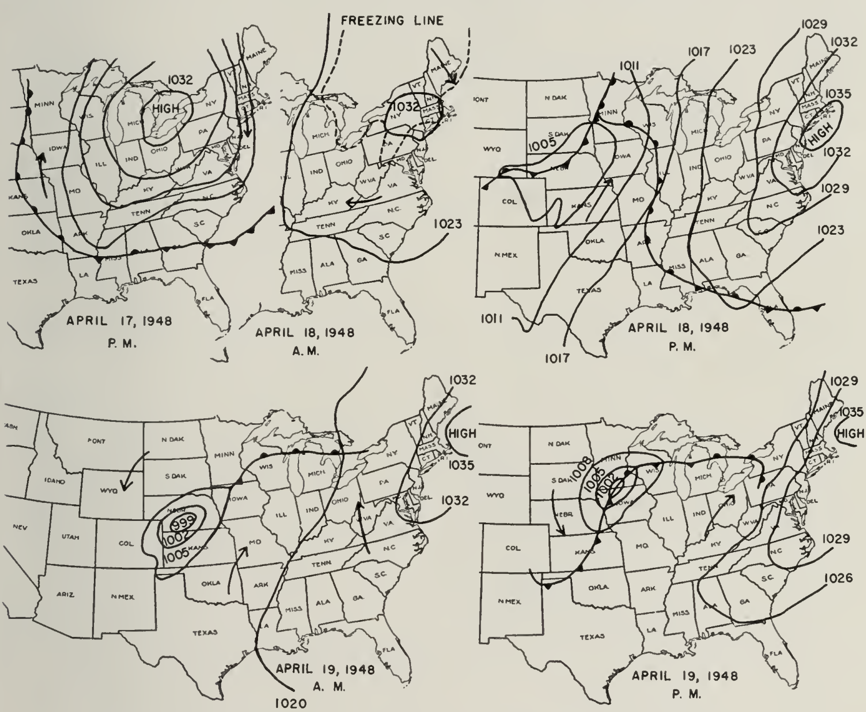

FIG. 1. Weather maps from April 17–19, 1948 (see text for explanation).

—Double-crested Cormorant (*Phalacrocorax auritus*), Shoveller (*Spatula clypeata*), Cooper's Hawk (*Accipiter cooperii*), Ring-billed Gull (*Larus delawarensis*), Bonaparte's Gull (*Larus philadelphia*), Barn Swallow (*Hirundo rustica*), White-throated Sparrow (*Zonotrichia albicollis*), Swamp Sparrow (*Melospiza georgiana*); 3 other species appeared in greater numbers—Blue-winged Teal (*Anas discors*), Redhead (*Aythya americana*), Canvas-back (*Aythya valisineria*). In Michigan, Wallace and Black (1948: 161) reported: "Over the first part of the month of April birds trickled in rather gradually, but a warm spell on the 19th and 20th speeded things up. . . ."

April 19, P.M.: The High is virtually as before. The Low center has moved to a position over the Minnesota-Iowa border, and the warm front has passed to the northeast of Toronto, placing the latter within the warm sector.

April 20, A.M.: High pressure prevails over the Atlantic seaboard, while the Low is now centered over northeastern Wisconsin. From this center, a warm front curves NE to Georgian Bay and then SE to New York City, and is about to penetrate New England.

At Toronto, the morning of the 20th produced a very pronounced influx of migrants, the best of the month (Gunn); 3 new species were noted—Upland

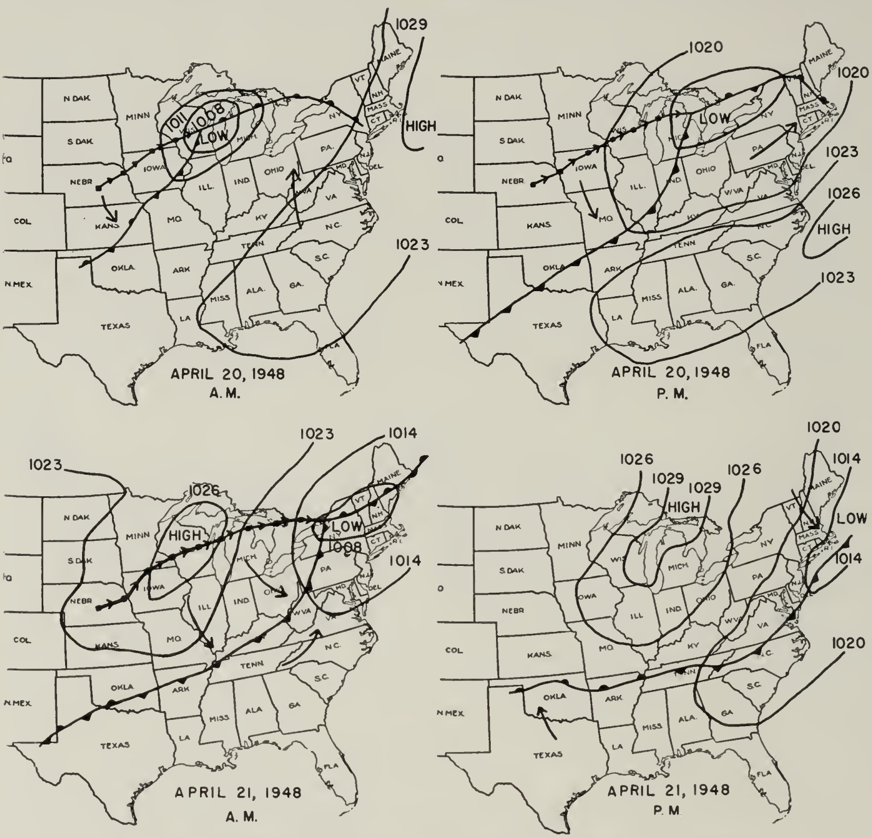

FIG. 2. Weather maps from April 20–21, 1948 (see text for explanation).

Plover (*Bartramia longicauda*), Tree Swallow (*Iridoprocne bicolor*), Brown Thrasher (*Toxostoma rufum*),—and a marked increase in Hermit Thrushes (*Hylocichla guttata*), Golden-crowned Kinglets (*Regulus satrapa*), Savannah Sparrows (*Passerculus sandwichensis*), and White-throated Sparrows. To summarize the Toronto situation, R. M. Saunders reported (*in litt.*) that, as of May 5, 1948, there had been "nothing like a wave since April 19–20". On April 20 there was a great movement, consisting of many kinds of land birds, in northern New Jersey and also at Hawk Mountain, Pa. (Wolfarth). In New York City, moreover, this day brought to Central Park the wave of greatest volume recorded up to that point in 1948, consisting mostly of White-throated Sparrows, many Hermit Thrushes, as well as a few Towhees (*Pipilo erythrophthalmus*) and a Northern Water-thrush (*Seiurus noveboracensis*) (Nichols). This same day, April 20, brought the greatest wave of the month to the Connecticut Valley in Mass., the significant features being good numbers of Myrtle Warblers (*Dendroica coronata*), Palm Warblers (*Dendroica palmarum*) and Ruby-crowned Kinglets (*Regulus calendula*), plus a good many Chipping Sparrows (*Spizella passerina*), White-throated Sparrows and Pine Warblers (*Dendroica pinus*) (Bagg).

April 20, P.M.: The High is now centered east of the Middle Atlantic seaboard, approximating the quasi-permanent "Bermuda high" of summer, while the Low center has moved to Lake Huron. The warm front extends from northern Vermont to Boston, while the cold front extends southwestward from the Low center.

April 21, A.M.: The Low center has moved to northern New York. A new High, moving down from the Northwest, is centered over Wisconsin. Warm, southwesterly conditions continue within the sector formed by the quasi-stationary front extending from the eastern end of Lake Ontario to the Bay of Fundy and the cold front curving southwestward from the Low center.

In the early morning of April 21 there was migration in New Jersey and Pennsylvania (Wolfarth); in New York City, White-throated Sparrows and Towhees reached their maxima for this wave, but the Hermit Thrush had fallen off in numbers (Nichols). At Talcott Mt., Conn., and Mt. Tom, Mass., the best hawk flights of the month occurred in the final 2 hours of the warm sector, which ended there with the arrival of the cold front in the late forenoon (Bagg). On April 21, moreover, eastern Massachusetts experienced a wave, including 125 Hermit Thrushes listed at Nahant (Alexander et al., 1948).

April 21, P.M.: The Low is now centered east of New England, and its attendant cold front extends from the Atlantic Ocean through Virginia, North Carolina and Tennessee. The new High prevails over the Great Lakes region, while a new warm front is moving northward through Oklahoma and Arkansas. The cycle which began on April 17 is now complete.

The 250 Palm Warblers and 1500 White-throated Sparrows which were observed in 2 eastern Massachusetts localities, Wayland and Nahant, on April 22, (Alexander et al., 1948) appear to represent migrants which entered Massachusetts during the favorable period of April 20–21, were grounded by the cold front on April 21, and then proceeded to concentrate in such areas as Wayland and Nahant, presumably remaining until the next period favorable for further migration (Bagg).

Summary

This paper studies barometric pressure-pattern factors which particularly stimulate spring migration in North America east of Long. 100° W. and south of Lat. 50° N. A distinction is made between an onrushing wave of birds actively migrating and an arrested wave of grounded migrants.

Early North American references (prior to 1938), together with European findings of the same period, are cited to show what was written regarding the relation of barometric pressure-patterns to spring migration before meteorologists recognized the roles of air masses and frontal systems. These early investigations indicated that northward migration occurs in certain regions in the Northern Hemisphere when the pressure gradient falls from east to west.

Recent North American investigations (1938–1948) are described. The basic agreement prevailing among all investigations, both early and recent, leads the authors to propose several hypotheses. The most fundamental of these states that, during the period of spring migration, pronounced movement will take place into or through a given region during the interval between the passage of a warm front through that region and the subsequent arrival of a cold front.

To illustrate the mechanics of this basic hypothesis, the typical period of April 17–22, 1948, is analyzed meteorologically and ornithologically. A notable influx of migrants, which became apparent progressively eastward from Wisconsin to Massachusetts, is directly correlated with the advance and frontal development of a Low center which moved from Nebraska to the New England coast.

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LIFE MEMBER

Dr. Clayton G. Rudd, a successful dentist of Minneapolis, has long been deeply interested in nature photography and conservation. During his early boyhood in the unspoiled prairies of western Canada he had unforgettable experiences with migrating and nesting waterfowl—among them Whooping Cranes. After graduating in dentistry at the University of Minnesota he moved to Minneapolis; but since 1932 the Teton wilderness of Wyoming has continued to lure him summer after summer, and in 1948 he finished a home near the village of Moose, in Jackson's Hole. His colored motion and still pictures, many of which are notable for their beauty, are principally of Wyoming birds, mammals, plants and scenery.

THE WING MOLT OF THE BOB-WHITE

Donald R. Thompson and Cyril Kabat

Wisconsin Conservation Department, Madison, Wis.

CONSIDERABLE interest has recently developed in the determination of age in juvenile gallinaceous birds by the measurement of the length of the growing replacement-primaries during the postjuvenal molt. Knowing the age at the time of collection or observation, then events in the nesting phenology can be dated (Thompson and Taber, 1948; Thompson and Kabat, 1949). Such facts provide a basis for comparing nesting seasons between years and between areas, they facilitate productivity analysis, and they may reveal relationships with other characteristics of the population (such as density and sex and age ratios) and with other environmental conditions.

Since the accuracy of the wing-molt technique of aging depends on the uniformity of the postjuvenal wing molt, there would seem to be a need for further analysis of this uniformity in wild birds. This paper attempts to present such an analysis and a discussion of the irregularities that may be encountered for the juvenile Bob-white (*Colinus virginianus*), and, further, it supplies a discussion of the parallel molt of primaries occurring in the adult during the postnuptial molt.

Normally the juvenile Bob-white commences the postjuvenal primary molt at 28 days of age (Petrides and Nestler, 1943). At this time the juvenal primaries have all developed except the outer 2, IX and X, which are still growing. The process of shedding and replacing these juvenal primaries progresses from the innermost primary (I) distally through primary VIII which completes its growth at 150 days of age. Juvenal primaries IX and X, which have completed their growth at 63 and 65 days of age, respectively, are retained until the postnuptial molt of the following year. This retention was first described by Dwight (1900). The constancy of the rate of this wing molt, according to Petrides and Nestler (1943), who have given the above description, provides the most accurate method available at present for determination of the age of juvenile Bob-whites up to 150 days of age. Their table (p. 779) gives the lengths of the various developing primaries for each day of age from 24 to 150 days.

Little has been written about the molt of quail that are over one year old. Bent (1932) implies that a primary molt occurs in adults by referring to the postnuptial molt as "complete". He also refers to the time of the molt in the statement: "The first postnuptial molt, the following summer and fall, chiefly in September, is complete and produces the adult winter plumage. Adults then continue to have similar molts each year, a very limited head molt in the spring and a complete postnuptial molt from August to October" (p. 17).

This study was supported in part by a grant-in-aid from the Wisconsin Alumni Research Foundation (initially made to the junior author at the Univ. of Wis.) and by Wisconsin Pittman-Robertson Projects 2-R, 14-R and 9-R (which subsequently carried the bulk of the project to completion). The writers are indebted to Dr. Rudolph Bennitt for making available supplementary quail wings taken in Missouri. Acknowledgement is expressed to Dr. J. J. Hickey for his careful examination of the manuscript.

Materials and Methods

Bob-white have been collected periodically in Wisconsin since 1943 with mass collections being made in the autumns of 1947 and 1948. Some additional material was obtained by soliciting quail hunters for wings from shot birds. All materials thus assembled were obtained during the period October 1 to December 10 of each year. Winter trapping of quail provided supplementary material which is described later in the paper. An examination was also made of 97 wings selected from a group furnished by the Missouri Cooperative Wildlife Research Unit.

In the course of the Wisconsin collections, data were recorded on covey size and location, and weight, sex, and age data were taken on individual birds. On each wing the length of each of the developing primaries was measured in millimeters from the point of insertion of the primary in the manus out along the vane of the feather to the tip. This was considered to be a more accurate and more easily replicable method of measurement than that used by Petrides and Nestler (1943) who made their measurements from the leading edge of the wing. To equate our measurements with theirs a correction of 12 mm. was added to ours to compensate for the width of the manus. Thus a measurement of 52 mm. from the point of insertion to the tip of the feather corresponds to a length of 64 mm. when measured from the leading edge (cf. primary II, Fig. 1).

Uniformity of the Postjuvenal Primary Molt

Petrides and Nestler (1943), in deriving their table showing ages corresponding to various lengths of developing primaries, made daily measurements on a pair of quail raised in captivity. These were supplemented and modified by periodic measurements on 7 groups of birds which were raised in captivity and whose ages were known. These 7 groups each contained 10 to 35 birds, whose age at the time of measurement varied from 45 to 128 days. One to 3 developing primaries were measured on each individual. (Thus in Fig. 1 two postjuvenal, or first winter, primaries are in a developmental state, II and III. Primary I has completed its growth.) The mean lengths of the various developing primaries for each of the 7 groups thus provided check points for the table and enabled modification of the daily measurements on the pair to be made.

Errors in age determination were evaluated from the groups by comparing the lengths of primaries on all the individuals with the modified measurements on the pair of birds. Thus a bird in the 70-day group may have had a sixth primary replacement whose length was 24 mm., rather than the 41 mm. length which is the average length of the sixth primary in the 70-day group. Since 24 mm. correspond to a length characteristic of birds 66 days old, according to the modified measurements on the pair of birds, the error in age determination would be 4 days if age determination were based on the length of the sixth

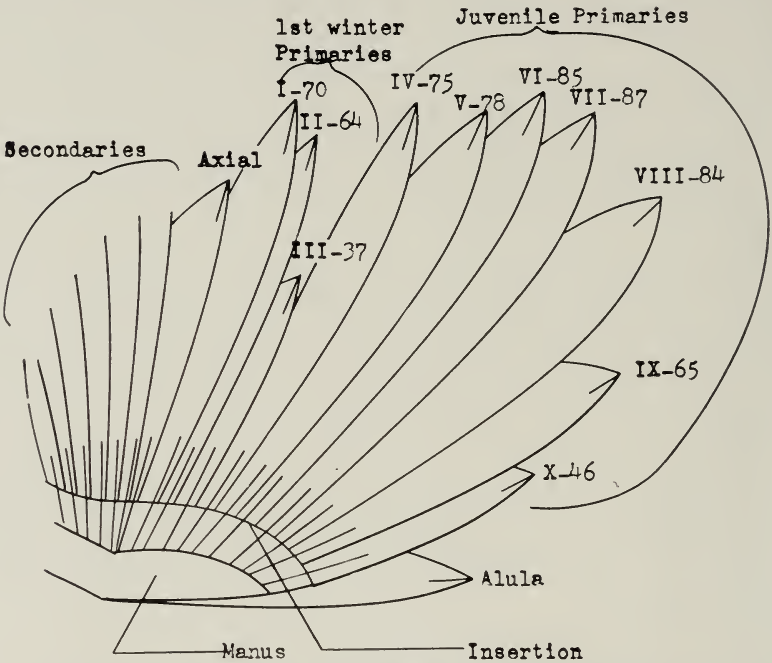

FIG. 1. Postjuvenal primary molt in the Bob-white. Juvenal primaries I, II, and III have been replaced by first-winter primaries. The length of II indicates the quail to be 51 days of age, while the length of III indicates 48 days of age. Numbers are the lengths of the primaries in millimeters found on an actual wing.

primary. The largest error which they found by this method was 13 days, though in some of the groups the maximum individual error was as little as 4 days. The older birds tended to have a larger range of variation between the indicated and the known age than did the younger birds.

These errors led Petrides and Nestler to believe that this method of age determination was limited in its accuracy. Unfortunately they did not give standard deviations of the errors which they found, but these would be considerably smaller than the maximum errors reported.

Inasmuch as the birds used by Petrides and Nestler were 5 or more generations removed from the wild and were reared under uniform conditions in captivity, the essential uniformity which they exhibited would not necessarily be characteristic of wild birds. Hence, it was felt necessary to evaluate the uniformity of the postjuvenal primary molt as it occurs in wild birds. Because it is difficult to obtain wild birds of known age in large numbers, other approaches must be used for this evaluation. Two alternative methods were employed by us, one based on variation of indicated ages in the same individual, and the other on variation of indicated age within family groups. These do not in a strict sense define the true error in age determination; however, they do provide a valuable delimitation of the uniformity of the primary molt.

The method based on the variation of indicated ages in the same individual can be applied because the age indicated by one growing primary does not necessarily agree with the age estimate from another growing primary on the same wing which is in a developmental state at the same time. This is due to a deviation of the length of one or more of the developing primaries from the lengths listed as characteristic for each day of age by Petrides and Nestler. For each individual wing examined for this study the ages of the quail indicated by each of the growing primaries present were determined from Petrides and Nestler's table. Only birds under approximately 124 days of age were examined, since all primaries except VIII have completed their growth by this age, and hence 2 primaries simultaneously in development cannot be found for comparison of indicated ages.

The difference in the 2 or more age readings for each wing is termed "discrepancy" (Fig. 2), and it is obtained by subtracting algebraically the age indicated by the more distal primary replacement from the age indicated by the more proximal developing primary. An example of this is shown in Figure 1. Here the first-winter primary III has reached a length of 37 mm. The indicated age from this more distal developing primary is 48 days. Primary II, on the other hand, indicates the age to be 51 days, as it is 64 mm. long. Hence the algebraic difference or "discrepancy" is (+) 3 days. It is felt that "discrepancy" is a better term than "error" for the present use inasmuch as the true age is unknown and hence cannot be used as a reference point. The true age in most cases will lie between the 2 indicated ages, especially if the discrepancy is large. Hence the discrepancies are larger than the actual error that would be incurred in aging birds.

The discrepancies arising from each pair of measurements were assigned to an "age class" on the basis of the age indicated by the more distal replacement. The magnitude of these discrepancies in days and the frequency with which they were found in the various age classes are given in Figure 2. An examination of the standard deviations accompanying each age class indicates that up to 75 days of age these discrepancies are small with only 1 case out of 121 showing a discrepancy as great as 6 days. Beyond 75 days of age the discrepancies increase in magnitude, with 14 days being the maximum discrepancy

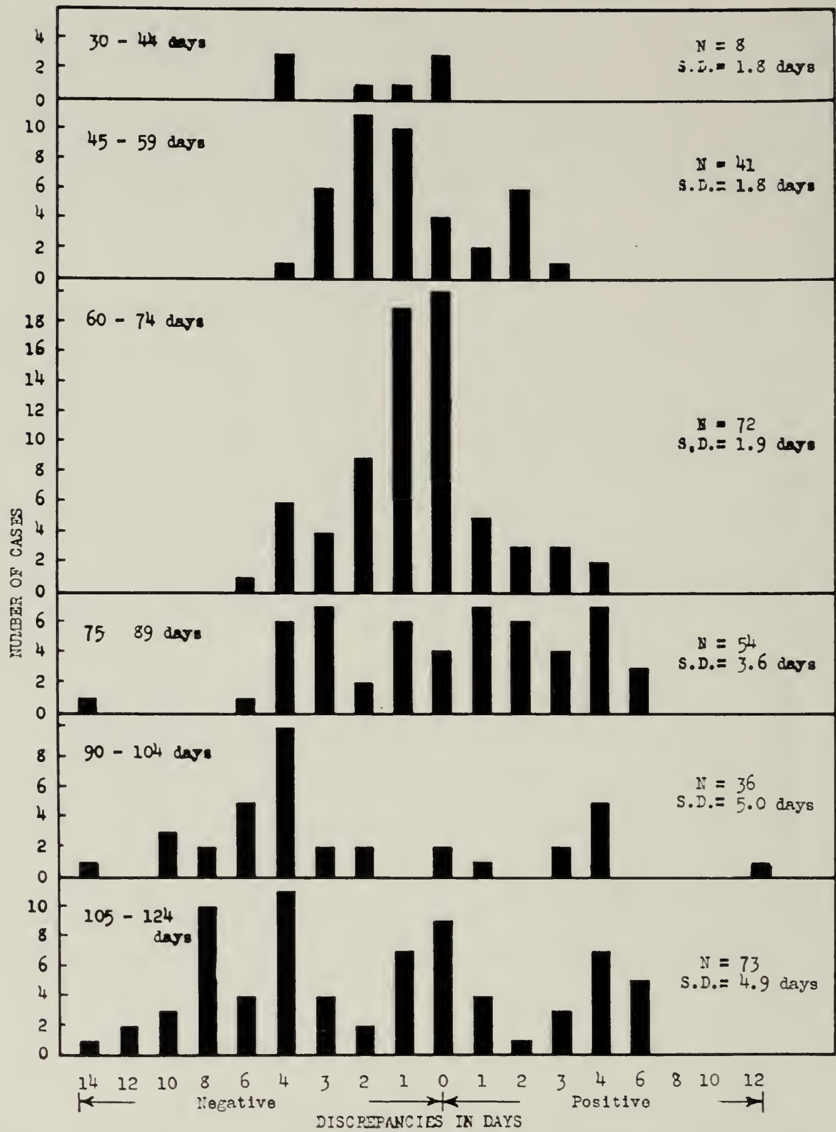

FIG. 2. Distribution of frequencies of discrepancies in age indication on individual wings of quail in various age classes. N = no. of specimens; S.D. = standard deviation.

in any age class. For the entire group of 284 pairs of age estimations here analyzed the number and magnitude of the discrepancies are as follows:

Discrepancies	Negative										Positive							
in days....	14	12	10	8	6	4	3	2	1	0	1	2	3	4	6	8	10	12
No. of cases	3	2	6	12	11	37	23	27	43	42	19	16	13	21	8	0	0	1

The standard deviation for the entire group is 3.8 days. However, as indicated above the younger birds show lesser discrepancies, and in practice the age estimate is the average of the estimate from the 2 or more developing primaries. Thus a bird with a discrepancy of 14 days would be assigned an age that is only 7 days from either extreme. For example, if primary VIII indicated 116 days of age and primary VII, 102 days of age, the final age assigned would be 109 days. Even in this case of an extreme discrepancy the final age estimate is almost certain to be within 7 days of the true age. When interpreting the meaning of the standard deviations of the discrepancies, the observer should thus keep in mind the fact that the error in age determination will only seldom be over one-half of the value of large discrepancies. On the other hand, when the discrepancy is small, the error would tend to be more than one-half the discrepancy.

Thus the finding of a small discrepancy does not necessarily indicate greater precision in age determination than does the occurrence of a large discrepancy. The logic of this becomes apparent when it is considered that a small discrepancy is likely to arise through the occurrence of 2 measurements that err in the same direction from the average lengths for the true age, while large discrepancies would be more likely to arise from measurements that err in opposite directions from the average lengths for the true age. Thus an exact value cannot be arrived at, by this means of analysis, for the error in age determination. But it seems justifiable to consider the standard deviation of "errors" would be one-half of the standard deviation of "discrepancies" (3.9) or 2.0 days.

The second method used by us in testing the uniformity of the postjuvenal primary molt was to compare the indicated ages of all juveniles collected from the same covey of quail, and to note the discrepancies between the indicated ages of these juveniles. In general the indicated ages of individual juveniles in a covey fall naturally into one or more groups of ages, because there are 1 or more different-aged broods composing the covey. Thus in a small covey, which may consist of only 1 brood, the indicated ages will usually fall into a single group, whereas in a larger covey, which may consist of 2 or more broods, 2 or more natural groupings of ages may be discernible.

In all the collections and materials gathered for this study 78 of these groupings were apparent, and the total number of birds included in these groupings was 233. Material had to be discarded in some cases where overlapping of indicated ages was possible, as in a covey composed of 2 broods of closely similar age. In such cases it was impossible to assign the intermediate ages to the proper group. It is possible that among some of the groups used in the compilation the extreme discrepancies have been eliminated, since the presence of only one extreme in a group leads to a suspicion that it is a sole representative of a different-aged brood, and hence it was not included. These facts lead to an artificial bias in the data which would tend to reduce the magnitude of the discrepancies. This may be partially compensated for by some of the groupings

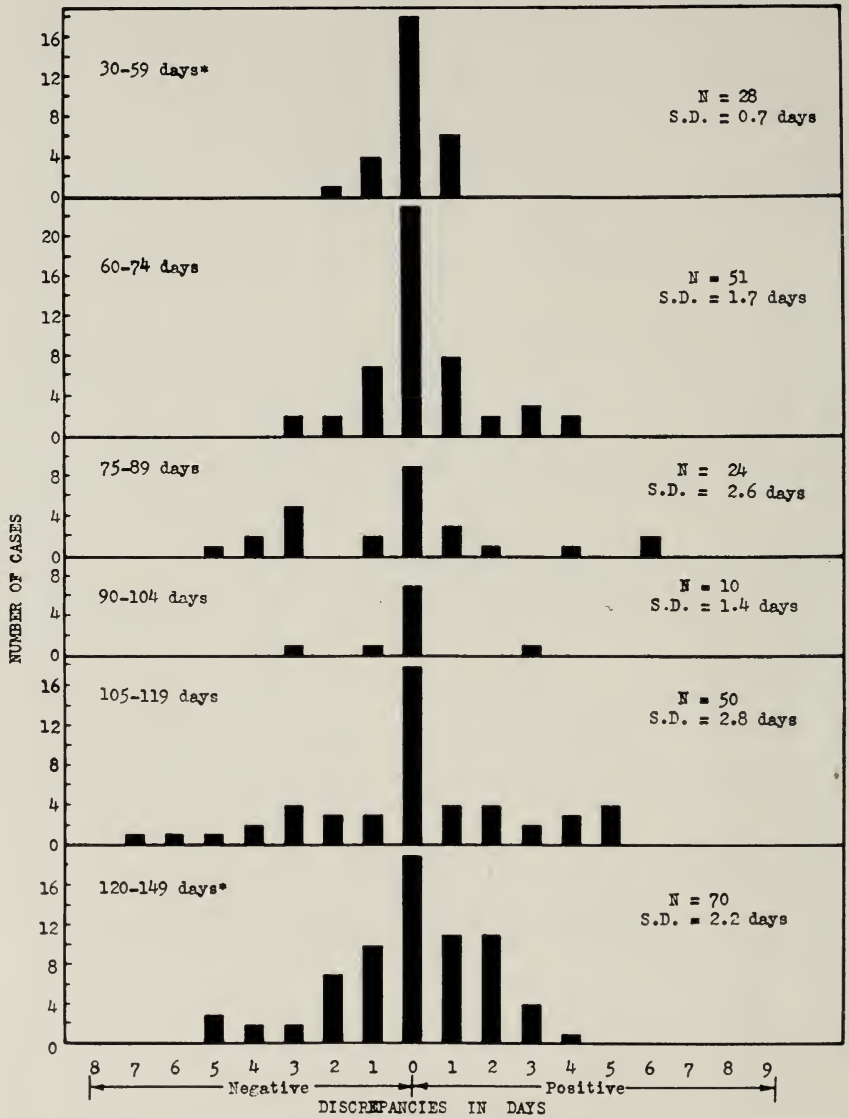

FIG. 3. Distribution of frequencies of discrepancies in age indication between juveniles collected from family groups of various age classes. N = no. of specimens; S.D. = standard deviation. * Note that these 2 age classes have twice the span of the others.

unknowingly including more than one true age of young leading to discrepancies of greater magnitude than actually exist.

Usually only the outermost developing primary was considered in deriving the indicated age of the individual from the table of Petrides and Nestler, though in some cases the average age as indicated by more than one developing primary was used. In compiling the data the mean indicated age was calculated for each of the groups. The departure of the individual indicated ages of birds within each group from this mean were tabulated, and these are termed "discrepancies" as in the previous method. It should be noted that this method differs from the previous in that discrepancies are taken from a midpoint rather than between extremes. Hence the value of the discrepancies are considerably smaller than in the other method. Each group of birds was then assigned to an "age class" according to the mean indicated age of the group, and frequency distributions of the individual discrepancies which were found are given in Figure 3. Again the younger age classes tend to have a smaller standard deviation. The combined data of all age classes embodying 233 birds is as follows:

	Negative								Positive					
Discrepancies in days	7	6	5	4	3	2	1	0	1	2	3	4	5	6
No. of cases	1	1	5	6	14	13	27	93	32	18	10	7	4	2

The standard deviation of this distribution is 2.1 days, and this corresponds very closely with the standard deviation of "errors" (2.0 days) derived by the first method of analysis. Both imply that the maximum error in age determination using the postjuvenal primary molt is probably about 4 days at the 95% level of confidence.

These treatments indicate a relatively high uniformity of the postjuvenal primary molt in the wild Bob-white, and this uniformity is as great or greater than that reported by Petrides and Nestler (1943) for captive birds. Thompson and Kabat (1949) used one-week intervals in plotting hatching dates of Bob-white, and this degree of refinement in age estimation seems well justified by the above considerations.

Irregularities in the Postjuvenal Molt

While the juvenile Bob-white normally molts through primary VIII in the postjuvenal molt, a number of cases have been found where this was not true. During the course of winter trapping of quail, 32 birds were given a special examination in March of 1948. Of the juvenile birds 9 were found to have had an arrested molt. Replacement of only 7 of the juvenal primaries had occurred. The retention of the outer 3 juvenal primaries was evident from the distinctly brownish coloration of these which is a result of fading of the original pearly gray color. The replacement, that is, the first-winter, primaries are relatively unfaded at this time, and under moderately good daylight illumination the contrast with the unreplaced juvenal primaries, which are more faded, is readily apparent. Recognition of the more pointed nature of juvenal primaries (Stoddard, 1931), is not sufficiently reliable for positively detecting the presence of juvenal primaries.

A different line of evidence for an arrested molt was obtained on 15 juveniles trapped alive in early December of 1947. The seventh replacement primaries on these birds were 74 to 98 mm. in length, and the eighth juvenal primaries had not been dropped and were not loose.

According to the table of Petrides and Nestler (1943) the eighth primary should have been dropped when primary VII was 72 mm. long. Confirmation of the arrested condition was later obtained on 5 of these 15 juveniles by retrapping in February. On these 5 birds primary VIII had not been replaced, and the length of primary VII in early December on these 5 had been 74 to 98 mm. This strongly suggests that the other 10 birds which were not retrapped also had an arrested molt, since the lengths of their seventh primaries in early December were of the same order as those on which the arrested molt was confirmed.

On the other hand an examination of 87 juvenile birds trapped during the winter of 1946–47 revealed only 1 bird which had failed to complete the postjuvenal primary molt. This bird had also stopped with dropping and replacement of the seventh primary. Possibly this difference between the 2 years is explicable by 2 considerations. The first of these is that while inconclusive evidence is at hand for the 1946 hatching season, many birds were hatched late in the season in 1947 compared with other years (Thompson, 1949). The other consideration is that the onset of winter was much earlier in 1947 compared with 1946, and this might have induced premature cessation of molting. The birds on which arrested molt was found in 1947 were about 15 to 18 weeks old when trapped in December and hence had hatched in early August.

As could be surmised on finding cases of arrested molt, cases of extension of the molt beyond its normal limits might also be expected to occur. This has been noted for the postjuvenal primary molt in 2 instances: one bird was taken on Nov. 16, 1947 on which the ninth juvenal primary had been shed and the replacement primary was 62 millimeters in length; the other was taken November 6, 1948 with the ninth replacement primary measuring 52 mm. The eighth postjuvenal primaries were completely developed in these two cases. The identity of these birds as juveniles was established by the presence of buff tips on the greater upper primary coverts (Van Rossem, 1925; A. S. Leopold, 1939), and by the unresorbed bursa of Fabricius. Inasmuch as primary VIII completes its growth at about 150 days of age the first of these birds must have hatched before June 9 and the other before June 19.

The frequency with which these irregularities occur is possibly influenced by a number of factors, but as suggested above, a strongly presumptive one is the date of hatching of the juvenile bird. The hatching period of the Bob-white in Wisconsin covers a long span of time, extending from late May to early October. Since primary VIII is normally shed at 101 days of age, this stage may be reached anytime between early September and mid-January. In the case of birds hatching late the onset of winter may terminate the molt before this stage is reached and result in an arrested molt, whereas early-hatched birds may be induced to continue the molt beyond the normal limit by favorable weather. A. S. Leopold (1943) found hybrid and domestic turkeys to be quite variable in the extent of the molt, though no variation was observed among 5 wild turkeys. While he concluded that heterozygosity of the genotype was responsible for this variation, he cites the review by Salomonsen (1939) which strongly suggests that environmental temperatures, by action through the thyroid on the feather follicle, control both the initiation of the molt and its extent. Genetic and environmental mechanisms are not necessarily at odds, of course, as the one may set the stage for the operation of the other.

The Postnuptial Wing Molt in the Adult

The sequence of the wing molt in the adult is very similar to that of the juvenile Bob-white except that it is complete, the primaries being shed and replaced distally commencing with the innermost primary. Inasmuch as the outer 2 juvenal primaries, IX and X, have been retained by the bird through its first year of life, the first postnuptial molt replaces 8 postjuvenal primaries (I through VIII) and 2 juvenal primaries (IX and X).

In the course of obtaining the collections it seemed apparent that a relationship existed between the stage of the postnuptial molt of the adult birds associated with the juveniles and the molt stage of these juveniles. This correlation is difficult to establish with wild birds because of uncertainties in establishing the adult as the true parent of the juvenile. Mere consort is not proof of parentage, since more than one brood may be present in the covey, and non-breeding adults may also be present. The similarity of the progress of wing molts between adults and juveniles from the same covey arose often enough, however, to lead to further inspection.

A more effective, though less specific, line of approach was adopted to establish this relationship. This entailed a comparison of the wing-molt stages of the adults obtained during the collection period in 1947 with those obtained in 1948. If a correlation exists between the progress of the adult and juvenile wing molt, then the molt stage attained in the adults in 1947 should show a retardation over those in 1948, since the progress of the wing molt of the juveniles in 1947 lagged greatly behind that of juveniles in 1948.

TABLE 1

Distribution of primary molt stages of adult quail

Year	Sex	Latest primary dropped						
		V	VI	VII	VIII	IX	X	Total
1947	Female	1	1	5		1	2	10
	Male			4	6	7	2	19
	All	1	1	9	6	8	4	29
1948	Female					2	4	6
	Male				2		9	11
	All				2	2	13	17

The lag in the juveniles was due to the lateness of the hatch in 1947 as compared with 1948. In 1947 the median hatching date fell in the first week in August, whereas in 1948 the median hatching date was in early July (Thompson, 1949). Hence many of the adults were occupied with breeding activities until later in the season in 1947. This might be presumed to delay the onset of the molt in the adults and give rise to a correlation of the progress of the adult molt with that of the juveniles. This has been observed in pheasants (Kabat, Thompson, and Kozlik, in press).

Table 1 shows that such a delay occurred in the molt of the adults in 1947 compared with 1948. Of 29 adults in 1947 the median bird had dropped only 8 primaries, while in 1948 most of the adults in the group of 17 birds were regrowing the tenth primary. The table also suggests that the adult males were somewhat in advance of the females in the molt, although the 1948 data are too scant to show this.

In the discussion on irregularities in the postjuvenal molt it was mentioned that unmolted juvenal primaries are distinguishable from the replacement primaries by their faded color. This fading is far more apparent in adult birds that have not completed their molt, since the old primaries have been exposed to fading for a considerably longer time. The fading produces a cocoa-brown coloration which gives an extreme contrast with the pearly gray color of the new primaries. This characteristic of itself may be used as an indicator of adult condition if the molt has not been completed, for once seen it cannot easily be mistaken.

Three cases have been found in which the postnuptial molt definitely did not go to completion. The first of these was a male trapped in early January of 1947. Primary IX was fully regrown, but the old X was retained. On December 13, 1947 a female was trapped and was retrapped on March 10, 1948. In December the ninth primary was 17 mm. in length but was fully grown in March. The cocoa-colored tenth primary remained. In the final case a male trapped on January 7, 1948 had 9 characteristically new, fully developed primaries and a brown tenth primary. In all these cases both wings displayed the same condition, so that the aberrancy was not due to an accident to a feather follicle. These incompletions parallel the incomplete molts discussed previously for juvenile birds, and probably the same factors that terminate molt in the juveniles are operative in the adults.

While successive postnuptial molts, to our knowledge, are essentially the same, the fact that the first postnuptial molt occurs when the quail is a yearling provides an interesting method of distinguishing yearlings and older birds in the adult category. During the first postnuptial molt, in the yearling, the greater upper primary coverts of the juvenile-type are replaced by ones of the adult-type, and the more pointed outer 2 juvenal primaries (which were retained through the postjuvenal molt) are replaced by the more rounded adult type of primary. The adult type of covert is distinguishable by the lack of the buff or mottled tip and also by its tendency to be flatly rounded rather than pointed. In the case of the adult beyond the yearling class the postnuptial molt results in replacement of adult-type coverts and rounded outer primaries. In other words, 2 types of coverts and primaries are present in yearling birds during the course of the postnuptial molt, whereas in older birds only 1 type is present. Since there are only 9 greater upper primary coverts, and the shedding of these precedes that of the primaries by 1 stage, the last one is dropped about the time the eighth primary is shed. Inasmuch as the outer 2 coverts are often more faded and worn and are less buffy than the other juvenile-type coverts, this criterion of yearling condition is almost impossible to apply after the loss of the seventh covert at about the time of dropping of the sixth primary.

One further remark needs to be made regarding the adult-type greater upper primary covert. Typically, it is readily distinguishable from the juvenile-type covert when comparing adult and juvenile birds in the fall and winter. Without a background of experience, however, there is a possibility of confusing juvenile and adult quail in winter in some cases if the buffness of the tip of the covert is given sole consideration. Out of 22 adult wings given a close examination the coverts of three had a noticeable buffness of tip and seven had a very slight buffness. These might possibly lead an observer to believe that the birds were juveniles. However this tipping of buff on the adult-type covert differs from that on the juvenile type by being of darker hue and by its tendency to be largely marginal rather than "running" down the midrib.

Summary

An analysis of the uniformity of the postjuvenal molt of primaries in wild juvenile Bob-white by 2 independent procedures indicates that the standard deviation of the error of age determination is about 2.0 days. Cases have been found in which the postjuvenal molt of primaries both proceeded beyond the eighth juvenal primary or was arrested with the seventh primary. Adults have also been found with an arrested primary molt. A positive correlation was found between late postnuptial molt in adults and late postjuvenal molt in juveniles. This can probably be ascribed to late completion of breeding activities which delays the onset of the molt in the adults. A method is described for detecting unmolted primaries in both juvenile and adult quail on the basis of the fading of the gray color to brown, and another description enables a distinction to be made between yearling quail and older adults during the postnuptial molt.

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BIRD TRANSECTS ON THE NORTH ATLANTIC

Robert L. Grayce

Massachusetts Audubon Society, Boston, Mass.

A TRIP across the temperate North Atlantic or along its coasts offers the opportunity for a type of bird watching known as a pelagic belt transect. Such bird counts serve to increase our knowledge of the spatial fluctuations of avian populations, the normal and exceptional distribution of species, the routes and shifts of range during seasonal periodic migrations, and localizations due to factors of weather, food supply, and current direction.

Four neritic and 2 oceanic belt transects, covering approximately a one-eighth mile swath from the stern or from the bridge deck of a steamer traveling generally at 14 knots, were made between latitudes 44°N and 59°N during August and November 1948. These observations illustrate especially the populations present and the complex of activities during the breeding, post-breeding, early autumnal migration and winter resident periods of the Nova Scotia-Newfoundland coasts, the northwestern and the southeastern Irish coasts, and the North Atlantic between Newfoundland and Ireland. Observations, never interrupted by bad weather, were made at dawn and dusk and through most of the day with time off for breakfast, lunch, tea, and dinner.

Several observations on the neritic transects (table 1) deserve comment. The birds seen in the American coastal zone were migrants, residents, and winter visitants. The coastal birds of Ireland were probably resident there or from Scotland. Fulmars, so evident on the Irish side, were near breeding grounds. Though typically oceanic, they enter the American cool north temperate neritic biochore, where they do not breed, particularly in winter at the Grand Banks, although this is not too evident in the number of individuals recorded in transect 4. One "blue" phase Fulmar was seen off Nova Scotia on November 26 in company with 2 dark phase birds and 15 light phases. Among the diving ducks the Barrow's Golden-eyes and the King Eiders were noteworthy. The location of observation, 2 miles off the point south of St. Johns, Newfoundland, may well be a wintering station for these birds. The absence of reports of diving ducks on the European side was because the ship avoided the bays and estuaries. Although gulls live almost exclusively in coastal areas in winter, a count of 10 species during the November transects is exceptional and probably not to be duplicated anywhere else in an area of comparable extent. With the Iceland and Glaucous Gulls was one gull which followed the ship for about 2 hours after leaving St. Johns and showed light gray wing markings and suggestions of "mirrors"—a Kumlien's Gull I am certain, having previously observed wintering birds so identified on the New

England coast. The observation of so many Brünnich's Murres off Cabot Strait on the northern end of the Grand Banks was a notable sight. Most of them,

TABLE 1

North Atlantic Neritic Transects, 1948

	1	2	3	4
Common Loon—*Gavia immer*				1
Greater Shearwater—*Puffinus gravis*	3			
Atlantic Fulmar—*Fulmarus glacialis*	1	45		18
Leach's Petrel—*Oceanodroma leucorhoa*	39			
Gannet—*Morus bassanus*	3	8	12	
European Cormorant—*Phalacrocorax carbo*		1		
American Golden-Eye—*Bucephala clangula*				70
Barrow's Golden-Eye—*Bucephala islandica*				3
Old-Squaw—*Clangula hyemalis*				8
Eider—*Somateria mollissima*				3
King Eider—*Somateria spectabilis*				4
White-Winged Scoter—*Melanitta deglandi*				5
Surf Scoter—*Melanitta perspicillata*				7
American Scoter—*Oidemia nigra*				30
Oyster-Catcher—*Haematopus ostralegus*		1		
Golden Plover—*Pluvialis dominica*	200			
Ruddy Turnstone—*Arenaria interpres*	28			
Northern Phalarope—*Lobipes lobatus*	50			
Northern Skua—*Catharacta skua*		3		
Glaucous Gull—*Larus hyperboreus*				4
Iceland Gull—*Larus l. leucopterus*				4
Kumlien's Gull—*Larus leucopterus kumlieni*				1
Great Black-Backed Gull—*Larus marinus*	7	4		23
Lesser Black-Backed Gull—*Larus fuscus*			1	
Herring Gull—*Larus argentatus*	2	4	23	66
Mew Gull—*Larus canus*			19	
European Black-Headed Gull—*Larus ridibundus*			3	
Little Gull—*Larus minutus*			1	
Atlantic Kittiwake—*Rissa tridactyla*			10	333
Arctic Tern—*Sterna paradisaea*		1		
Atlantic Murre—*Uria aalge*		1	2	6
Brünnich's Murre—*Uria lomvia*				2500
Dovekie—*Plautus alle*				95
Black Guillemot—*Cepphus grylle*			1	
Atlantic Puffin—*Fratercula arctica*	7			20
Passerine Bird—*Dendroica striata*?	1			

Transect 1. was from Halifax, N. S. to St. Johns, Newfoundland via the most direct route. August 29–30, 1948.

Transect 2. was the northwestern Irish coast from the Vidal Banks to Rathlin Islands. September 4, 1948.

Transect 3. was in the shipping lanes along the southeastern Irish coast in the Irish Sea. November 18, 1948.

Transect 4. was from St. Johns, Newfoundland to Halifax, N. S., the reverse of transect 1. November 25–26, 1948.

being glutted with food, just pattered over the water or "belly-bumped" the surface whenever they tried to fly. The absence of any Razor-billed Auks (*Alca torda*) or of Black Guillemots on the American side is unusual.

The oceanic transects (table 2), detailing the birds seen while traveling over and back across almost the same 1800 mile route between Newfoundland and Ireland, merit interpretation. Although Atlantic Fulmars are distributed across the ocean in the fiftieth latitude, counts indicate that they prefer the colder waters of the Labrador Current. In the November transect 4 individuals of the birds observed were in the "blue" phase, 1 in the white phase, and upwards of 10% in the dark phase, these latter being all on the American side. The Greater Shearwaters seen in September were in groups of about 20 birds traveling toward the northeast. They were obviously making their journey toward the eastern side of the Atlantic, the western side being vacated by

TABLE 2

North Atlantic Oceanic Transects, 1948

Atlantic Fulmar	384	41	64	52	2	28	60	2000	500
Sooty Shearwater—*Puffinus griseus*	2								
Audubon's Shearwater—*Puffinus lherminieri*								1	
Greater Shearwater	635	227	4			3			
Leach's Petrel	129								
Gannet	1				1				
Ruddy Turnstone			2						
Northern Skua		2			1	2	1		
Pomarine Jaeger—*Stercorarius pomarinus*	1								
Parasitic Jaeger—*Stercorarius parasiticus*	7								
Atlantic Kittiwake	1				51	54	20	7	60
Arctic Tern		6	210	1					
Atlantic Puffin							11	2	2
Date	Aug. 31	Sept. 1	Sept. 2	Sept. 3	Nov. 19	Nov. 20	Nov. 21	Nov. 22	Nov. 23
North Latitude	48° 59′	51° 37′	53° 53′	55° 09′	51° 28′	51° 40′	51° 48′	50° 46′	49° 25′
West Longitude	49° 14′	40° 45′	31° 13′	20° 52′	15° 04′	21° 18′	31° 22′	41° 44′	48° 02′
Temperature (F)	56	57	52	56	51	51	52	48	42
Wind	NW	N	N	N	S	SW	E	NW	NW

October. The 3 individuals recorded on November 20 represent a late departure. The Audubon's Shearwater observed on November 22 at 50°46′N40′W in company with hundreds of Fulmars was unusual, since the closest breeding ground is Bermuda. The Northern Skuas, usually solitary, were twice seen in pairs. The single Pomarine Jaeger, easily distinguishable as to species by size alone, was observed in a close flock with 3 Parasitic Jaegers moving southeasterly. During the gale in November one Kittiwake, overturned by an extra gust of wind, flew upside down for five seconds before turning right side up. The Arctic Terns, sometimes calling as they flew along, were for the most part trending in an easterly direction. The Atlantic Puffins, easily overlooked at sea, were over 800 miles from land.

Summary

Observations of the birds of the temperate North Atlantic were made by belt transects during stated periods of a day and month over an arc of sea approximately one-eighth mile from the after-deck or the bridge deck of a ship traveling an average of 14 knots of speed over a known course. The records show 36 neritic species and recognizable subspecies and 13 oceanic species in the late summer and fall of 1948.

THE WILSON ORNITHOLOGICAL CLUB LIBRARY

The following gifts have been recently received. From:
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Fr. Haverschmidt— 1 reprint, 1 book
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WILSON ORNITHOLOGICAL CLUB NEWS

The editors of *Audubon Magazine* have long believed that professional and amateur ornithologists should write popularized accounts of their researches and of conservation problems to arouse greater interest and understanding among people outside the biological field. To stimulate more popular ornithological writing, *Audubon Magazine* is now paying from $15.00 to $75.00 for all accepted articles ranging from 1,500 to 2,500 words, although shorter or longer material may be acceptable. Articles on bird ecology, migration, behavior and food habits, personal experiences in attracting birds, birds and other wildlife of a region, and local wildlife conservation projects are particularly desirable.

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Wilson Ornithological Club Annual Meeting

The 31st Annual Meeting of the Wilson Ornithological Club will be held at Jackson's Mill, West Virginia, April 28–29, as announced in the December *Bulletin*.

If you are planning to attend, please write immediately to Maurice Brooks, West Virginia University, Morgantown, West Virginia, so that he can make arrangements for your accommodations. Please state the approximate time of your arrival and departure, and the names of the persons in your party.

Although Jackson's Mill provides a picturesque, rural setting for this meeting, its accommodations are excellent. The cottages are of substantial, dwelling-house type and every room is heated. This whole establishment is a detached part of the campus of West Virginia University. It is an ideal place for the children of those who wish to bring their families.

GENERAL NOTES

BLACK VULTURES IN WESTERN PENNSYLVANIA

Since W. E. Clyde Todd, in his "Birds of Western Pennsylvania", lists no record of the Black Vulture (*Coragyps atratus*) within his area, and since no subsequent report is on file in the records of the U. S. Fish and Wildlife Service, the following observations are evidence of the further northward spread of this species.

On September 17, 1949, while observing hawk migration from the Cross Mountain fire tower in southwestern Franklin County, my attention was drawn to a bird which had just arrived from the east at a height of 150 feet. The conspicuous white wing patches, short square tail, dark head, and characteristic flight identified it immediately as a Black Vulture. It flew to a dead tree one quarter of a mile south of the tower, and alighted. Six minutes later a second Black Vulture arrived from the east, passed 500 feet overhead, then turned south, and losing altitude in 3 wide circles, alighted in the same tree with the first individual. One then flew to a nearby tree, and both remained perched in full sight for nearly 2 hours. During this time Turkey Vultures (*Cathartes aura*) were constantly in sight, flying, or perched in trees near the Black Vultures; one rested for more than half an hour in the same tree with one of the latter, showing the distinct difference in size between the two. In the afternoon, when Seth H. Low and I were driving through Blair Valley, just across the state line in Maryland, we saw 1 Black Vulture in a roost of more than 50 Turkey Vultures on the west slope of Rickard Mountain, 3 miles east-southeast of Cross Mountain summit.

On the same day, 8 Black Vultures were seen circling over the south slope of Fairview Mountain, Maryland, 6 miles south of Cross Mountain, by Orville W. Crowder and party. Although members of the Maryland Ornithological Society were observing hawks on 9 other ridges between Hagerstown and Grantsville that day, no other Black Vultures were identified.—Chandler S. Robbins, United States Fish and Wildlife Service, Patuxent Research Refuge, Laurel, Maryland.

LARK BUNTING IN CENTRAL OKLAHOMA IN WINTER

During late January and early February of 1949 a series of severe wind, snow and sleet storms swept across Oklahoma from the west. In the wake of one of these a somber little bird appeared at our banding station on the morning of February 5. Although completely out of its normal winter range (Mexico), it was unmistakably a female Lark Bunting (*Calamospiza melanocorys*). The identification was later verified by Dr. W. P. Taylor, leader of the Wildlife Unit at A. and M. College, and O. S. Pettingill of Carleton College, Minnesota.

To our surprise the bunting repeated the same afternoon, again on February 7, 16, 19, 20, 22, several times a day through March 15, 17, 25, 27, 31, April 1, 2, 3, and was back for the last time on April 9. These dates coincide with the repeat records of a flock of Harris's Sparrows (*Zonotrichia querula*) with which the Lark Bunting was seen several times in the fields west of the station; the flock disappeared about the same date as the bunting's final appearance.

Although very similar to the Harris's Sparrows in coloring, the bunting could always be distinguished from a distance by its characteristic behavior. At our approach to the trap the Harris's Sparrows usually flew *up*, flitting from side to side. The bunting always dove *down* into the farthest corner, and continued to push and flutter in one spot until released.

Weights were taken from time to time with a scale accurate to 1/100th of a gram.

Feb. 5	36.72	Mar. 5	38.35	April 2	38.35
Feb. 19	39.32	Mar. 31	35.75	April 3	37.37
Feb. 23	36.40	April 1	37.37	April 9	42.25

Frederick M. and A. Marguerite Baumgartner, Stillwater, Oklahoma.

SMITH'S LONGSPUR IN OHIO

On April 18, 1949, G. Ronald Austing, Worth Randle, and I collected 4 Smith's Longspurs (*Calcarius pictus*) from a flock of about 25 longspurs at the Oxford airport, Butler County, Ohio, about 30 miles north of Cincinnati. The flock from which the 4 individuals were collected consisted of about 25 birds, some of which may have been Lapland Longspurs (*Calcarius lapponicus*) since it was not possible positively to identify each bird.

The flock was first seen April 9, 1949, by Austing, Victor Sloane, and me. The birds were wild and at that time were identified only as longspurs. Every effort was made to collect specimens since Lapland Longspurs are very rare in Southern Ohio (there being only 3 records: one collected during the winter of 1869–70 by Dury; one December 11, 1877; and 4 seen December 15, 1946 by Victor Sloane and me). On April 16, Austing, Randle, and I again attempted to collect specimens but with no success. At this time the unstreaked ochraceous-buff breasts of some of the birds were first noticed and these birds were tentatively identified as Smith's Longspurs. On April 18, Austing, Randle, and I again located the flock. Since the birds were reluctant to fly in the face of a 25 to 30 mile per hour wind accompanied by sleet and snow we were able to come within range.

Four specimens, all males, were collected; 3 are in the collection of the Department of Zoology, University of Cincinnati and one in the Ohio State Museum at Columbus. The specimens all show the buff breast first noticed in the field, being in nearly full breeding plumage.

Smith's Longspur has been definitely recorded in Ohio only once previously: On January 29, 1888, when Clark P. Streator collected 2 specimens from a large flock which were feeding on ragweed near Garrettsville, Portage County, Ohio (see *Ornithologist and Oologist*, 1888, **13:** 95; and *Wilson Bull.*, 1904, **16:** 85). Where these specimens are I do not know. They are not in the Cleveland Museum of Natural History nor in the Ohio State Museum at Columbus. Streator's record was inadvertently omitted by both Lynds Jones and William Dawson from their publications on Ohio birds.—EMERSON KEMSIES AND G. RONALD AUSTING, University of Cincinnati, Cincinnati, Ohio.

INJURY FEIGNING BY WILLOW PTARMIGAN

During the summer of 1941, at Churchill, Manitoba, I frequently encountered broods of young Willow Ptarmigan (*Lagopus lagopus*) with their parents on the tundra. The excited calls of the parents, or the "broken wing" act if the observer happened to be close, usually indicated that young were concealed somewhere nearby. When the family group was taken by surprise and the parents exhibited this type of behavior, the chicks crouched in the grass or took cover under the nearest object. Whenever broods were encountered, a search for the chicks was made so that they might be banded. The parents, with the female leading and showing the most anxiety, attempted to draw attention away from the chicks, by feigning injury until the searchers had found them. When discovered, the chicks scampered or flew off in several directions, protected by a barrage of flying attacks on the prospective bird bander by one or both parents. Seldom did the adult bird actually strike, but the confusion that accompanied its attack and the scattering of the chicks was so complete that by the time one could collect his wits and stop ducking, the chicks had disappeared from view and were in safe hiding at some distance from the spot. Chicks became such strong fliers after being out of the nest for about a week that once they had flushed, tracking them down was nearly impossible. Even chicks a few days old could fly several yards and then disappear in the tundra growth. To the best of the writer's knowledge injury feigning by this species has not been previously reported.—OSCAR HAWKSLEY, Laboratory of Ornithology, Cornell University, Ithaca, New York.

DIVERSIONARY BEHAVIOR OF RED-COCKADED WOODPECKER

On April 26, 1948, Lucien Harris, Jr., John W. Burch, and I found 2 occupied nest holes of Red-cockaded Woodpeckers (*Dendrocopos borealis*) in longleaf pines about 50 yards apart. One of these holes, only 5.5 feet from the ground, is the lowest yet recorded for the species to the best of my knowledge. The young had left both nests by June 13, 1948. On May 29, 1949, I again visited this spot with J. B. McCall, Jr., hoping to have him photograph the birds which occupied the lower nest site. When we had approached within 5 feet of the nest a female carrying food approached; upon seeing us she flew with somewhat impeded flight, stopping at several intervening trees, to the second nest hole 50 yards distant, entered the hole still carrying the food, emerged without the food, and flew away. McCall and I satisfied ourselves that the second nest hole was unoccupied. The visit of the female to the unoccupied hole served effectively to divert our attention from the occupied nest. I left, but McCall remained and was successful in taking excellent color movies of the female feeding the young from a distance of 20 feet within the next half hour. These observations occurred near Kings land, Camden Co., Ga.—Frederick V. Hebard, 1500 Walnut Street Building, Philadelphia 2, Pennsylvania.

BEHAVIOR OF SPARROW HAWKS

On March 22, 1949 at about 1 p.m., 3 Sparrow Hawks (*Falco sparverius*) were seen flying above and around the roof of the 7-story Department of Justice Building, Washington, D. C., directly across the street from our observation window on the fifth floor of the Internal Revenue Building. One alighted on a chimney on the Justice Building, another about 100 feet distant from the first on a wire attached to the same roof; the third hawk alighted near the bird perched on the chimney. After a few moments the third bird mounted the perching bird, and the two birds apparently copulated; the upper bird was clearly smaller than the other. Within a few minutes both flew away, the larger bird out of sight and the smaller bird directly to a position near the bird perched on the wire. The smaller hawk soon mounted the bird perched on the wire and the 2 birds apparently copulated; again the upper bird was clearly smaller than the other bird. After the second apparent copulation, the smaller bird flew away and out of sight; the larger bird remained perched in the same place. Only 3 birds were involved in the behavior described. About 5 minutes later a smaller sparrow hawk flew to, and mounted, this same perching bird, and the 2 birds apparently copulated. The total elapsed time for all of these observations was approximately 20 minutes.—Arthur H. Fast and Lewis H. Barnes, Internal Revenue Building, Washington, D. C.

SPARROW HAWK BAFFLED BY ROOFLESS COURT

The skill of the sparrow hawk in flight would seem to assure its ready escape from a roofless enclosure approximately 85 feet high and with an area of 115 x 195 feet. Such an enclosure seemed to offer an insoluble problem, however, for a female sparrow hawk (*Falco sparverius*) which died of starvation and thirst in a court of the U. S. Department of Commerce building in Washington, D. C. This court has no side exits, but is entirely open to the sky.

There was no indication that the sparrow hawk was incapacitated in any way when first observed in the court on July 21, 1949. It flew many times with no difficulty at all from one side of the court to the other, and on at least one occasion ascended to a cornice just one floor below the top of the building. As the hot July days progressed, however, it became less alert and permitted observers at windows to approach within a few feet. On July 27 it was offered a chunk of liver which it accepted and tore with its beak, without eating more than a few shreds if it ate any at all. The next day it disappeared, and the day thereafter, 8 days after it was first seen, it was found dead on the cement floor of a sunken alleyway adjoining the court. It is my belief, shared by others who saw the hawk, that it somehow became bewildered and unable to recognize that freedom was easily accessible if it flew upward.—FRANK C. CROSS, 9413 Second Avenue, Silver Spring, Maryland.

SHRIKE ATTACKED BY BARN SWALLOWS

The Barn Swallow (*Hirundo rustica erythrogaster*), though normally a peaceable bird, appears to lack no courage in attacking its enemies. Bent (1942, *U. S. Nat. Mus. Bull.* 179: 452) reported that he once saw a pair of Barn Swallows attacking and chasing a Sharp-shinned Hawk which had approached their nest too closely.

On August 2, 1949, I saw 5 Barn Swallows attack a Migrant Shrike (*Lanius ludovicianus*) near Colesville, Maryland. They harrassed the shrike, which was perched on a telephone wire, until they forced it to take wing and flee across a field with its tormentors in hot pursuit. This attack seemed to be entirely unprovoked; the date was well past the period when Barn Swallows are known to nest in the vicinity. Apparently, they merely recognized the shrike as an enemy and set upon it for no other reason.

Recognition of the shrike as an enemy is evidently not universal among small North American birds. About one month earlier, near Osborne, Kansas, I had seen a Meadowlark (*Sturnella neglecta*) and a Redwing (*Agelaius phoeniceus*) calmly sharing a stretch of telegraph wire less than 6 feet long with another shrike. These 2 species are not listed by Miller (1931, *Univ. of Calif. Pub. in Zool.* 38–2: 198, 200) among the victims of shrikes, but he lists other birds, including the Mourning Dove, Cardinal, Robin, and quail, which are as large or larger. —FRANK C. CROSS, 9413 Second Avenue, Silver Spring, Maryland.

PECULIAR BEHAVIOUR AT THE NEST OF *FLUVICOLA PICA*

The small white and black tyrant (*Fluvicola pica*), known in Surinam as the Cotton Bird frequents banks of ditches and watercourses and is quite common in the coastal area. It builds its domed nest with a side entrance in branches overhanging the water. At a nest found on July 24, 1946 near Nieuw Nickerie I observed a peculiar behavior of one of the parent birds. The nest was lined with white feathers and contained one egg and one newly hatched chick. The parent birds were not present. I was much surprised to see suddenly one of the parent birds hopping nervously on the branches near the nest with a large white feather in its bill, but it did not actually enter the nest. At this stage of the breeding cycle the lining of the nest seemed quite out of place. So I attribute this behavior as the outcome of nervous agitation caused by my presence, when the bird returned to its nest. It seems to me to be a typical example of a "displacement activity", a behavior so common among birds. Armstrong (Bird Display and Behaviour. 1947) mentions many examples of fidgeting with nest material by birds in a great variety of situations and my observation of *Fluvicola pica* seems to be another example.—FR. HAVERSCHMIDT, Paramaribo, Surinam, Dutch Guiana.

RED-WINGS FEEDING ON WHITE ASH

A review of the literature shows few examples of Red-wings (*Agelaius phoeniceus*) feeding on seeds of trees. Beal (1900, *U. S. Biol. Surv. Bull.* 13: 41) lists "fruits of the wild cherry", beechnuts, and gives a personal account of Red-wings extracting seeds from pine cones, which he considers a case of necessity.

On October 15, 1949, I observed 2 male Red-wings (second year birds) feeding on the seeds of a White Ash (*Fraxinus americanus* L.) near a marsh at Lake Waubesa, Madison, Wisconsin. Both birds remained in the tree for half an hour, during which time they continually seized, manipulated, and dropped ash fruits. At first it appeared that the birds were simply picking off the fruits in play, so quickly did they handle them, but closer examination showed that they were crushing the fruits in order to obtain the seeds, and immediately dropping those fruits which were not easily opened.

The method by which they removed the seed from the fruit seems interesting enough to be described. The birds seized the fruit with their beaks, pinching the edges of the blade near the distal end of the enclosed seed in such a manner that the fruit split open. Though they generally picked at the fruits from stretched positions, they sometimes carried one to a branch and held it with their claws. It is possible that this method of feeding is a habit of general occurrence. Wetmore (1919. *Auk*. **36:** 190–197) records an equally unusual food-securing technique in the Bronzed Grackle, whereby the shells of acorns were split in two by repeated impressions around the shells from the keel on the palate.—Robert Nero, University of Wisconsin, Madison, Wis.

MORTALITY IN MEADOWLARKS AS A RESULT OF SEVERE WINTER WEATHER

In January and February of 1949, in the vicinity of Lawrence, Douglas County, Kansas, there was prolonged sub-zero weather accompanied by sleet and snow. Storms occurred frequently, and the ground surface, particularly in open areas, remained covered with ice which prevented birds from reaching food on the ground. Beginning 3 miles east of Lawrence, birds were observed on a 3.5 mile stretch of highway bordered by cultivated fields and meadows. The observer made a round trip over the highway each day on his way to and from Lawrence. There is an open deciduous forest adjoining the eastern and southern margin of the fields and meadows. There are brush covered hills to the west and fallow fields to the north. In the area studied the Meadowlark (*Sturnella magna*) was the most consipcuous species. In early January several species of fringillids, in company with the Meadowlarks, foraged at the margins of the highway. The snow plow, in clearing ice from the pavement, had left a strip 2 feet wide on the shoulder of the highway on either side of the concrete and it was on this open ground that the birds congregated. With the continued icy conditions, fewer fringillids were seen; many individuals probably retreated to the protected wooded area on the eastern margin of the field. However, the Meadowlarks remained, clinging tenaciously to the narrowly cleared strip.

In early February the Meadowlarks were noticeably weakened, and some individuals on being flushed seemed to have difficulty in flying for a distance of as much as 30 feet. As the days passed there were progressively fewer Meadowlarks along the margin of the highway, and on occasion freshly dead individuals were noted.

A brief search of forested and brushy land bordering the fields and meadows was made on February 20, 1949, but there was no indication that the Meadowlarks had sought food and shelter in these areas. Probably they remained along the roadway in spite of inadequate cover and, I suppose, with a constantly diminishing food supply, with the resulting high mortality. There was no evidence of mortality among the fringillids; these birds seemingly dispersed to more favorable areas. The Meadowlark, according to Grinnell (1928, *U. Calif. Chronicle*, XXX. 429–450), "is equipped to get its food safely and in adequate amount only from ground surface which is open-clothed with a low type of plant cover". The fact that these birds failed to use the adequate food in the adjoining, though ecologically different, habitats is testimony to the limited ecological tolerance Grinnell pointed out.—Philip H. Krutzsch, Museum of Natural History, University of Kansas, Lawrence, Kansas.

EARLY WOODCOCK NESTING FAILURE

On March 17, 1949, Aiden Ripley advised me that he had located the nest of a Woodcock (*Philohela minor*) with 2 eggs in Lexington, Mass. On March 18th it began to snow in the Boston area at about 9 A.M. and by midnight, when the temperature had dropped to approximately 10°F in the suburbs, 7 inches of snow had accumulated. On March 19th, a bright day with the temperature approximately 32°F, Ripley and I visited the nest site. There was no Woodcock at the location where Ripley had seen the eggs. However, we finally located, at the base of a 2-inch diameter birch tree, a hollow depression in the snow approximately 4 inches deep, with one egg resting on the snow in the bottom of this depression. The egg was frozen and the shell was cracked. A short way from this depression was a little channel in the snow about 12–14 inches long which indicated that the bird was restless and had left the nest momentarily, stomped around, and then returned. Apparently she had abandoned the nest just before the snow stopped falling March 18th.

Ripley immediately assured me that the 2 eggs had not previously been located at the base of this tree, but had been in a little clearing 2 or 3 feet to the left. We scraped away the snow underneath the depression where we had found the one egg and found the other 2 eggs within 4–5 inches of it, under the snow. During our scraping, one of these eggs was broken; it was not hard frozen. The other was unbroken. Ripley is absolutely certain that the Woodcock had moved the first 2 eggs to this new location, perhaps in anticipation of having to endure the storm, since there was somewhat more shelter at the base of the birch tree.—RICHARD BORDEN, 20 Spruce Street, Boston 8, Massachusetts.

NOTES ON WING-FLASHING IN THE MOCKINGBIRD

For some years before Sutton published his brief paper (*Wilson Bull.*, **58:** 206–209, 1946) on the display by the Mockingbird (*Mimus polyglottos*) which he calls "wing-flashing", this behavior had been very interesting and thought-provoking. Now, certain conclusions have been rechecked by further observation and seem valid enough to set down in writing.

Since June, 1943, it has been possible to watch Mockingbirds nearly any day all year long, at Savannah, Georgia. Some seasons or parts of seasons specific things set the adult birds apart enough so that individuals could be recognized and the sex known. One year the resident male had a lame leg. Another summer there was no male on territory for some weeks, until another bird took up residence. In spring the females arrive in clean plumage and for some time are in contrast to the males with their dirty plumage.

For some time it seemed that the males never used wing-flashing, but at least 3 undoubted instances of male indulgence have been seen; a few other times it may have been a male that displayed. The performance has been seen many hundreds, possibly thousands of times, which indicates that male indulgence is quite rare. The females come on the grass every few minutes when feeding young, and the males nearly as often.

The fact that the male rarely flashes its wings may explain why Sutton at Orlando, Florida, and Mrs. Lasky at Nashville, Tennessee, did not observe the display commonly in winter since the males remain on territory all winter, but the females appear to leave soon after the postnuptial moult in late August or in September. The male is always somewhere around in the winter, but with the gonadal influence low and little need to defend territory he sings very little until about February. In spring a female comes and accepts the territory. In 1945 the female came on April 15, in 1946 on March 31, while in 1948 one arrived on March 28, and was carrying nesting material the next day.

When a brood of young birds follows the parents on the grass, begging for food or learning to catch it themselves, some will flash the wings and others will not. One such brood of 3 which was seen daily for a week, contained 2 birds that did and one that did not display on each occasion when all were present. This is thought to indicate that the sexual differentiation in this particular appears quite early in life.

There seems no portion of the summer season when the females flash their wings any more than at any other time. In other words, there is no waxing and waning as in other behavior peculiar to the season of reproduction. The behavior was not more common when the male was present. It was not seen in any aspect when it could be thought a part of the relationship between the sexes.

The flashing is performed in many places, on the ground and off it. One female displayed several times on the ground, flew to a stake in the garden and there lifted her wings, then to the top wire of the lane fence and again lifted her wings before leaving. Another bird circled a spot and flashed her wings several times in succession before finding the insect she evidently knew was there. This looked like intentional use, yet I think it purely accidental for she ran on over the yard and caught insects here and there without showing her wings again.

In flashing the wings, the bird stands erect and holds its head high. The young, when begging for food, crouch, extend the wings out and down, quiver, hold their heads down and bills up, and in general fail completely to behave anything like either young or adult in wing-flashing. The posture of the female when ready for copulation resembles the begging of the young.

The only explanation that seems to fit, is that this is a bit of instinctive behavior which has no present use or meaning and which has no adaptive (purposive) value.

In 2 instances only, I have seen the Brown Thrasher (*Toxostoma rufum*) flash its wings in identical fashion, though there have not been as good chances to observe this species.

It is my belief that neither season, temperature, nor the frequency of the feeding trips to the nest, affect the frequency with which wing-flashing is done. It is observed in the shade, in the early spring, and at all times of day in the summer in equal frequency.

Wampole (*Wilson Bull.*, **61**: 113, 1949) tells of a bird making 4-foot vertical flights from the roof of a schoolhouse, and pausing to raise and extend the wings. It may be that this note refers to flight song of the male, a behavior which seems, in this locality, to vary greatly among individuals. In this flight song the male may flit around and do much posturing, but to me it does not seem the same performance as the deliberate wing-flashing which is the subject of this paper. Even though the performance he observed was without song, it may have been the practice of a young male, much like the instance of the very young bird I saw sitting on a fence and practicing a whisper song.

The conclusions from observations of wing-flashing are that it is done almost entirely by the females and some of the young birds; that it is done with equal frequency at all times of the year by the females when they are present; that it is not connected with mating behavior, and brings no specific response in the male; that it is very different from the begging of the young; that it is not done to startle insects into revealing their whereabouts through motion; that it has no present value to the species.—Ivan R. Tomkins, 1231 East 50th St., Savannah, Georgia.

BOOK REVIEWS

The Ruffed Grouse. Life History. Propagation. Management. by GARDINER BUMP, ROBERT W. DARROW, FRANK C. EDMINSTER, and WALTER F. CRISSEY. (New York Conservation Department, Albany, 1947.) xxxvi plus 915 pp., 4 color plates, 442 illustrations. $10.00.

This monographic treatment of the Ruffed Grouse, with particular reference to *Bonasa umbellus umbellus* as found in New York, richly deserves the award of the Wildlife Society for the best publication in the wildlife field for 1947. This publication reports upon a 13-year investigation of a single species, in all of its aspects, by a host of professional wildlife workers. It is doubted if any single wild avian species has before received such concentrated attention in North America, or elsewhere in the world. The results presented in this publication represent the largest investment ever made in the investigation of a single species of game animal. To carry out an investigation of such magnitude, with so many investigators requires an unimaginable amount of administrative perseverance and ability; it is questionable if a work of such scope will again be attempted for many, many years.

Surely, as Conservation Commissioner Perry B. Duryea states (p. vii), this report graphically points out the rapid strides which have been made in the scientific approach to the management of our wildlife resources in recent years. In addition to Bump, Darrow, Edminster and Crissey, the following individuals are listed authors for one or more sections or chapters: David E. Davis, Fred Everett, S. C. Fordham, Frans C. Goble, Earl R. Holm, John C. Jones, W. Mason Lawrence, Phillip P. Levine, William H. Long, M. E. Phillips, A. L. Romanoff, J. Victor Skiff and John E. Trainer. The color plates are from the able brush of Fred Everett and the sketches are from the pencils of Fred Everett and Clayton B. Seagers. Evidence of careful organization and editing of the entire book is abundant, including diligent cross referencing by footnotes.

The book is divided into four main sections: I—The Ruffed Grouse—Its Background, Basic Biology and Economic Importance (105 pages); II—The Factors that Affect Abundance (476 pages); III—Managing the Grouse Crop (112 pages) and IV—Appendix (192 pages). The space devoted to each of the sections is of interest in indicating the principal emphasis. It is evident that the Investigation devoted a majority of its attention to factors that affect the abundance of this species.

Bump's opening chapter on the history of the grouse gives attention to the fact that the wide variations in the abundance of this bird from year to year were recorded more than a century ago, but they were not recognized as being of a cyclic nature at that time. The periods of scarcity were blamed upon various factors, as many as thirty-six having been listed. These periods of scarcity—which are now recognized as being of a cyclic nature—resulted in directing attention to the species, first in endeavors to propagate it artificially and, beginning in 1929, with the inauguration of the New York grouse investigation. Thus, the history of the grouse is similar to that of many of our other game species; great abundance in colonial times with decreasing numbers as settlement advanced. The pronounced cycles of abundance and scarcity set this species in a category which directed attention to it somewhat earlier than to many other sporting species. So, later historians of the grouse may decree that the cycles of the grouse, although greatly complicating its management, have benefited the species in that it has directed to it some of the most concerted scientific attention received by any form of wildlife. In this manner, grouse cycles and grouse history may finally work together to the best advantage of the grouse which must live under present day conditions—to be utilized wisely or unwisely by man in the habitat which he assigns to it.

Ornithologists who are professionally concerned with our game species often are accused by sportsmen of being impractical because of their biological approach to the problems confronting them. Chapter II gives the biology, and scientific background, of the grouse and points out in many places the practical value—if not absolute necessity—of such information for the proper management of the grouse. Two examples may suffice; first, Fred Everett's close scrutiny of several hundred specimens of known sex in captivity and in the wild made it possible for him to point out a number of general characters which may be used in separating the sexes and, second, Bump's discussion of the psychology of the grouse lead him to conclude (p. 65) that the existence of a strong dominance complex among grouse, particularly among the males, may be a very important factor which limits the number of grouse that occupy any given habitat. Field usage of the information given by Everett and Bump is at once apparent to the game manager. What has been said of the practical value of the discussions by Everett and Bump applies equally as well to the Chapter II summary of the physiology, pterylology, embryology, growth and development, weights, measurements and related data. Field and experimental data which are summarized in Chapter II are presented in more detail in the appendix.

For the first time known to this reviewer, the cover requirements and the preferences for various cover types at the several seasons of the year are treated adequately for an American game species. In chapter III the results of more than 16,000 man-days afield gathering data on some 19,619 grouse flushes, 1,515 grouse broods and 1,270 nests are analyzed statistically in arriving at conclusions regarding the cover and shelter requirements of this species. Conclusions drawn from such a mass of data leave little room for argument even though these conclusions bear out some popular thoughts on these questions and run counter to other. Adequate investigation of the cover requirements of grouse of various ages and at various seasons of the year was made by the Grouse Investigation. The adaptability of the grouse to a wide variety of cover and food conditions makes it difficult to summarize with definite statements its requirements for cover, food and shelter but the treatment of these questions has been handled admirably by Bump from the mass of data at his disposal.

Ornithologists will be particularly interested in the discussions (pp. 237–241) relating to the chemical composition of some of the various foods taken by the grouse. The requirement of young grouse for a diet with a protein content of 27%, whereas the adults require only a 20% protein food, is of interest in that such protein levels are higher than for most domestic poultry to which many of our game birds often are likened. Chapter III presents data on the analysis of some 1,633 crops of grouse in which were found more than 414 species of plants and 580 different animals remains. One important fact brought out by these workers is that the grouse takes such a wide variety of both animal and plant foods, a large portion of which consists of buds. that it is usually needless for the wildlife manager to concern himself, except in very rare instances, with food production for the grouse by means of artificial plantings or artificial feeding.

Darrow's summarization of the general characteristics of the grouse, or life history, is excellently done. This analysis includes a review of the literature and a summarization of the findings of the investigation on the subject, including several very controversial matters, such as "crazy flights", the manner in which the characteristic sound heard in drumming is produced, flocking characteristics and other pertinent habits. The interpretation of the life history data is made conclusive by the opportunity which the investigators had of checking and rechecking their observations, using the grouse raised at the New York Research Center as observational specimens as well as the very extensive field data on native grouse collected by numerous field workers during the course of the 13 year Investigation. Crissey's discussion of the influence of weather upon the grouse is very thought provoking. One of the outstanding facts brought out by this discussion is that weather conditions account for but few direct losses in the grouse population. There was some relationship shown between weather conditions and periods of grouse scarcity (p. 305), but there is no evidence presented which would show that weather conditions are directly responsible for the grouse cycles of scarcity.

Predation is a controversial subject. Those who would discuss this question, would do well to review the sane discussion of this matter as given by Darrow (Chapter VII). His presentation of the theory of predation and predation control, followed by a detailed discussion of each of the large list of species known to have preyed upon the grouse at one time or another, should be read by every sportsman, game management biologist, legislator and avid protectionist. If this were done, more logic and less sentiment would be evidenced when dealing with this perennial problem in ornithology. The Grouse Investigation produced no evidence which would indicate that efforts to control completely grouse predators have resulted in a permanent increase in the numbers of grouse found on any given area (p. 350).

Seldom has it been possible to assemble sufficient data on the reproductive capacity of any wild animal to permit an intelligent evaluation of the potentialities of any given species. Edminster and Crissey had at their disposal a wealth of information on the reproductive capacity of the grouse which far exceeds that available on most other American avian species. From the data available to them (pp. 353–368), they concluded that occasionally up to 25% of the female grouse may fail to breed in some years; renesting is seldom attempted unless the first nest is destroyed during the egg laying or early incubation periods; the average life expectancy in grouse probably is about 3 years; the sex ratios vary with age and with the seasons, but seldom interfere with the breeding of the grouse; egg infertility averaged 2.6% but rose to an average of 4.3% for renesting attempts; embryo mortality was low, being only 1.9% of the fertile eggs in first nests and 3.9% in renesting attempts, and, finally, inbreeding probably does not occur to any great extent and when it does, exerts no detrimental influence on New York grouse.

The relationship of man to grouse has been roundly discussed. His place as a decimator of the species, by hunting, has been determined by the Grouse Investigation to account for about 17% of the pre-hunting season grouse population (p. 378). Further, little evidence was uncovered by the Investigation which would indicate that the hunter exerts any appreciable depressing influence by his harvest upon the grouse population (p. 380) and may at times even by his hunting "... reduce the opportunity for the agents causing periodic scarcities to become effective." As a killer of grouse predators, man's place as a grouse benefactor is questionable as is the position of the fur trapper in reducing fur bearing grouse predators. By cutting timber, cultivating the soil, rearing cattle and in many other ways man has both benefited and destroyed the grouse. Unquestionably, the future welfare of the species rests in the hands of man, more as a manipulator of the habitat than as a hunter, according to Edminster.

Levine and Goble (Chapter X) report upon parasitism and disease basing their conclusions on autopsies of some 1,119 chicks and 1,728 adults from 50 of the 55 counties outside of New York City and Long Island. In this work, which has extended over 11 years, they encountered a number of animal parasites and diseases in the grouse which they examined, but none of them could be assigned the name of "the grouse disease" so common in popular literature and discussions. No evidence was found which would indicate that parasitism or disease has resulted in the periodic fluctuations in grouse abundance. The stomach worm, *Dispharynx spiralis*, was found to be the most pathogenic parasite of wild grouse in certain sections of the Northeast. The distribution of this worm apparently does not extend into all sections of the range of the grouse, however, as other investigators have not found it in grouse specimens examined by them (p. 422). It is of interest to note that neither the blood parasite *Leucocytozoon bonasae*, which has been reported from Ontario and Michigan, nor several other reported grouse blood parasites were encountered in the New York investigations. Dispharynx appears to have caused the death of most of the grouse found dead in the field in the course of the Investigation.

Artificial propagation, in years past, has been suggested as the panacea for our difficulties in producing an inexhaustible supply of wildlife for the hunting public. In the early work with the grouse (Chapter I) artificial propagation of the grouse was attempted by many individuals and such endeavors met with almost complete failure. Bump (Chapter XI) details the systematic evolution of methods which finally resulted in overcoming the difficulties encountered by early grouse raisers. Certain difficulties, principally biological in nature, prevent the artificial production of grouse in the quantities which have been attained with quail and pheasants. Bump is careful to point out in this discussion that the artificial production of grouse, either to restock depleted coverts or to provide birds for the gun, is seldom justified, except in very rare instances. Even further advances in the mass production of grouse in captivity are unlikely to enhance greatly the value of artificial propagation of grouse as a practical wildlife management tool.

Any individual whose activities have been concerned with determining and evaluating animal populations over a period of years will be impressed with the amount of data skillfully presented by Darrow in his discussion of the factors affecting productivity and fluctuations in abundance of the grouse populations (Chapters XII and XIII). Perhaps more detailed data are presented in these two chapters on the fluctuations for the entire year, rather than for spring and fall populations only as is more often the case, than is available for any other species of bird known to this reviewer. Darrow's discussion, based on these data, of such subjects as saturation density, life equation and carrying capacity of various types of habitat is well presented. It probably represents the most complete presentation of these subjects from a factual base which has appeared in literature up to this time. Of course, the subject of cycles is discussed, but he makes no attempt to designate a single factor, or combination of factors, which may account for this phenomenon. The records presented definitely establish the fact that grouse have a more or less periodic fluctuation of abundance within a period of slightly more than 9 years. Such fluctuations do not appear to be precisely synchronized throughout the entire range of the grouse in North America nor do they exhibit this character completely even in one single state.

Part III, which deals entirely with the management of the grouse, will be of major interest to the practicing wildlife manager. In this section, Bump and Edminster have given in detail those factors which must be considered in preparing and executing a management program designed to benefit the grouse. This section of this book will be well thumbed by the wild land administrator, students of wildlife management at our colleges and universities and by the practicing game manager in the field.

The appendix, which covers almost 200 pages will be of value to ornithologists and to professional biologists as well. Detailed discussions of some of the more advanced techniques, the anatomy and pterylography of the grouse, the results of physiological studies of the grouse, grouse foods, forest-wildlife management data and various tables presenting data summarized in the text are given in the appendix. This appendix presents data which are relatively new to the field of wildlife management such as Davis' excellent presentation of the anatomy of the grouse and Long's discussion of the physiology and its relation to the management of this species.

It is no platitude to state that this publication has set a new high for the field of ornithology. True, the information given in it is treated in such detail that casual reading may indicate that it is unduly wordy; close reading will quickly dispel this thought. The completeness with which the subjects are treated and the thoroughness with which they are presented, of necessity, make the cost of this book slightly high for those individuals who would and should make the best use of the data presented. However, the intrinsic value of the publication will more than compensate for the original cost of this book; it is a fine reference tool well worth the cost. It will appear, sooner or later, on the bookshelves of a majority of the ornithologists and conservationists and in the library of many of our sportsmen and biologists. It is a striking example of the practical application of ornithological observations and reflects the results of work on many other kinds of birds.

HENRY S. MOSBY

Birds' Nests: A Field Guide. By RICHARD HEADSTROM. (Ives Washburn: New York: 1949.) 128 pp., 61 photos. $2.75.

In winter woods old bird nests are conspicuous objects sure to catch the eye and arouse curiosity as to their makers. While many ornithologists are not likely to be impressed by the importance of identifying such nests, most have probably been the target of queries concerning them at one time or another and certainly teachers and scout leaders are aware of the problem. To aid in satisfying curiosity about nests unattended by birds, this book, covering the United States east of the 100th meridian, has been produced. With it the person of limited field experience may arrive at some reasonable guess concerning the identity of an unknown nest.

Mr. Headstrom's book is essentially a key with the table of contents serving as an outline of the system. The categories are based largely on location and general form, partly on size and other considerations. As is inevitable, some parts are more definite than others; in one place 18 birds come under the same heading. Brief paragraphs help somewhat to distinguish birds grouped under a single heading, though distinctions often seem to be more a matter of vocabulary than of essential meaning. By entering the same bird in more than one place species with variable habits are adequately treated. No scientific names are given, but there is a brief statement on the breeding range of each species. The photographs, well reproduced and grouped at the back of the book in the order of the key, show a variety of nests, mostly with eggs.

HAVEN KOLB

London's Birds. By R. S. R. FITTER. (Collins: London, 1949) 256 pages, 23 illus., 2 maps. 10s. 6d.

Ornithologists have ignored the study of birds in urban habitats for the obvious reason that bird students basically are students of the fields and forests. This book, however, calls attention to the possibilities of obtaining both pleasure and ornithological information by the study of city birds. The birds of the city are described by ecological habitats: buildings, ground, trees and shrubs, marshes, the Thames, and the air.

Of the birds nesting on buildings the Rock Dove receives most attention. The swallow, house martin, and swift nested formerly in many parts of London but now are rare or absent. The explanations for the decline reveal some fascinating environmental relationships. A rapidly increasing species is the Black Redstart which invaded London before the war and utilized the nesting sites provided by the "blitz". Other species such as Wren, Robin, Pied Wagtail, and 3 kinds of tits nest on buildings or other man-made structures. The chapter on roosting contains detailed descriptions of the behavior of the Starlings, a subject sadly neglected in the United States.

Observations of migrations have been very profitable and have shown that many species migrate over the city in large numbers. Other species may be winter or summer residents. The role of predators, especially cats, rats, and gray squirrels, in destroying birds is mentioned. The book concludes with a discussion of man as an enemy and as a friend. A bibliography, list of species, and a detailed index make the texual matter readily available.

This book deserves great praise for its novel viewpoint and its splendid execution. Such a book could not be written for an American city because our ornithologists have neglected the fascinating opportunities. Perhaps this book will stimulate some observers to collect notes on urban ornithology.

DAVID E. DAVIS

Hawks Aloft—The Story of Hawk Mountain. by MAURICE BROUN. (Dodd, Mead Co. 1949) 222 pages, 11 illus. $4.00.

Hawks Aloft is the story of the Great Hawk Slaughter on Hawk Mt., and then of the building on these former shooting stands of the world's first hawk sanctuary. It is a must for all ornithologists and for all conservationists. The story—and many a story within the story—is well told and well-written. Here is a good book—a modern bird classic. It will widen the interests and broaden the outlook of the mere bird-lister. Out of the pure ornithologist it will, or at least should, make a conservationist. Of the general reader it may, or may not, make a bird zealot; but it will at least make a zealot for visiting Hawk Mountain.

In 1932 the cries of dying hawks and wounded decoys still shivered the stillness of the oak-girt cliffs. But in 1934 these same rocks were already echoing the tread of the world's first hawk warden. Shooting was stopped. By 1937 excursion trains for bird watchers—not hunters—were running from Philadelphia to Hawk Mountain for the migration. By the 1940's pictorial automobile road maps showed Hawk Mountain Sanctuary as one of the sights of Pennsylvania. Watchers on the promontory had already included visitors from the Antipodes and Japan.

This achievement is due to Rosalie Edge and to Maurice Broun. Mrs. Edge, unaided by the older orthodox conservation societies, and unfettered by lack of precedent, had plunged ahead. Her vision was to stop the killing, to save the hawks. She took an option on the mountain top, raised money and engaged Broun as curator and warden. Two years later she brought the mountain top outright and set up the Hawk Mountain Sanctuary Association.

Maurice Broun had to be as much a public relations expert as an ornithologist or warden. He braved attacks by drunken hunters and by sober local citizens. He talked softly but firmly. He explained how hawks helped, not hurt, the farmer. And he patrolled the property and protected the hawks. In two years he had converted most of the local gentry. In ten he had made Hawk Mountain known by reputation to every bird lover in North America. Now *Hawks Aloft* brings this conservation success story to the general public.

Within five weeks of its publication last September unprecedented crowds were already parking their cars along the lonely road over the mountain. Thousands of new visitors were thronging the steep trail to the summit. A friend estimated he saw $15,000 worth of field glasses on the promontory at one time on an October Sunday.

This is well. For much education is needed. One promontory saved is good. But other jutting outcrags remain unprotected in Pennsylvania, New York, Virginia and elsewhere. Broun tells about these, too. On them the slaughter goes on. And it will go on until all hawks are protected by law, and by public opinion.

Enlightenment of this public opinion is the job Broun designed for *Hawks Aloft.* It does its job well. Buy it. Read it. Give it to a friend.

HENRY H. COLLINS, JR.

Recommendations for Preparation of Manuscripts

Manuscripts should be typed on one side of white paper of good quality with title and author's name written on a separate sheet. Everything should be double-spaced and each table should be typed on a separate sheet. Figures, not words, should be used for all numbers (except at the beginning of a sentence). Sex ratios should be calculated as % males. Express data in quantitative and tabular form, wherever possible, and when giving averages, also give the standard deviation. The technical names of the A.O.U. Check List (4th edition), as corrected in the supplements, should be used. Unless specimens have actually been identified to subspecies, only the specific name should be used. Whenever possible a reference for technical names of plants should be listed. Literature should be listed at the end of the article in accordance with the style in previous issues. All articles should have a summary that gives the data in brief form. Authors should avoid footnotes, vernacular phrases, and the use of nouns as adjectives. Illustrations should have good contrast. Printing on charts and maps must be large enough to permit reduction. Cuts of figures will be destroyed unless author requests their return on the reprint order form.

To appear in future issues:

THE SONG OF THE SONG SPARROW

FAMILIAL RECOGNITION IN BIRDS

BREEDING BEHAVIOR OF GOLDFINCHES

Aj-W

June 1950

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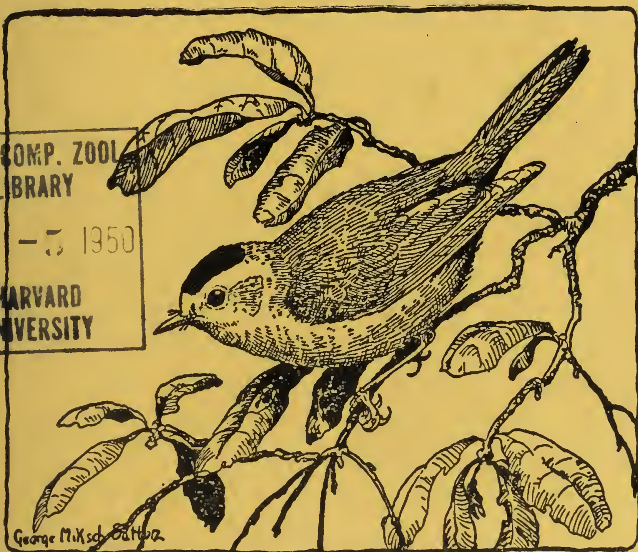

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Wilson Ornithological Club Library

The Wilson Ornithological Club Library, housed in the University of Michigan Museum of Zoology, was established in concurrence with the University of Michigan in 1930. Until 1947 the Library was maintained entirely by gifts and bequests of books, pamphlets, reprints, and ornithological magazines from members and friends of the Wilson Ornithological Club. Now 2 members have generously established a fund for the purchase of new books; members and friends are invited to maintain the fund by regular contributions, thus making available to all Club members the more important new books on ornithology and related subjects. The fund will be administered by the Library Committee, which will be glad of suggestions from members on the choice of new books to be added to the Library. George J. Wallace, Michigan State College, East Lansing, Michigan is Chairman of the Committee. The Library currently receives 65 periodicals, as gifts, and in exchange for *The Wilson Bulletin.* With the usual exception of rare books in the collection, any item in the Library may be borrowed by members of the Club and will be sent prepaid (by the University of Michigan) to any address in the United States, its possessions, or Canada. Return postage is paid by the borrower. Inquiries and requests by borrowers, as well as gifts of books, pamphlets, reprints, and magazines, should be addressed to "The Wilson Ornithological Club Library, University of Michigan Museum of Zoology, Ann Arbor, Michigan." Contributions to the New Book Fund should be sent to the Treasurer, James H. Olsen, 5465 Sharon Park Ave., Worthington, Ohio (small sums in stamps are acceptable). A preliminary index of the Library's holdings was printed in the September 1943 issue of *The Wilson Bulletin*, and each September number lists the book titles in the accessions of the current year. A brief report on the recent gifts to the Library is published in every issue of the *Bulletin.*

The Wilson Bulletin

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All articles and communications for publication, books and publications for review should be addressed to the Editor. Exchanges should be addressed to the Wilson Ornithological Club Library, Museum of Zoology, Ann Arbor, Michigan.

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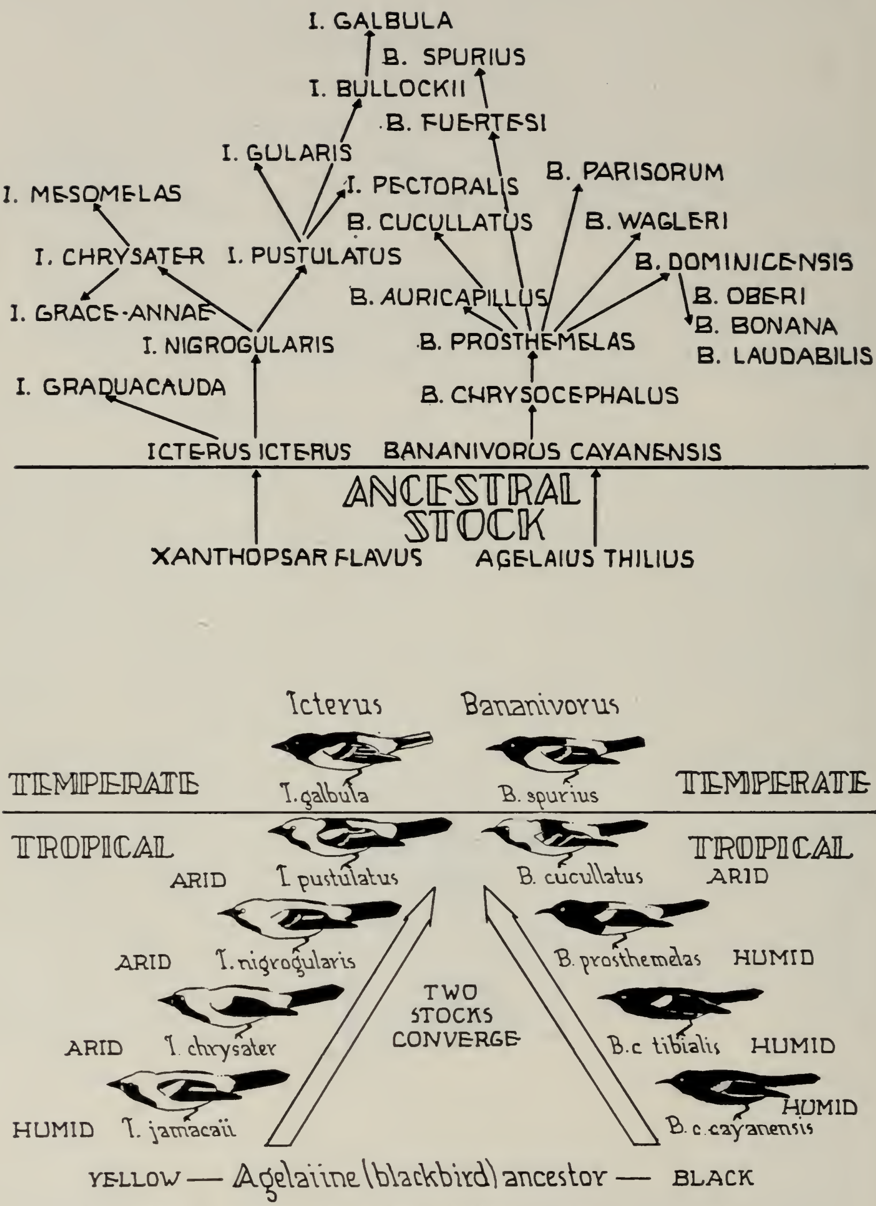

PHYLOGENETIC TREE (TOP) AND CONVERGENCE (BOTTOM) OF THE GENERA ICTERUS AND BANANIVORUS

CONVERGENT EVOLUTION IN THE AMERICAN ORIOLES

William J. Beecher

Chicago Natural History Museum, Chicago, Illinois

THE problems of adaptive convergence in bird taxonomy present many fascinating and often neglected aspects. The present paper describes the evidence for convergence of 2 genera of American orioles that are scarcely distinct but apparently arise from opposite ends of the variable blackbird genus *Agelaius*, and show hitherto unsuspected evolutionary trends toward nearly exact resemblance.

Sclater (1883), Ridgway (1902), and Hellmayr (1937) placed the orioles under a single genus (*Icterus*), and Hellmayr's nomenclature is followed here with indicated exceptions. However, evidence from functional anatomy and field study indicates that 2 phyletic lines are involved. It is proposed to retain the genus *Icterus* Brisson for the line to which the Baltimore Oriole belongs but a new name is needed for the line embracing the Orchard and Cayenne Orioles. The latter apparently arises virtually without plumage change from the black *Agelaius thilius* in the pampas region of South America. For this genus with its slender, nectar-adapted bill, the rather appropriate name *Bananivorus* Bonaparte seems to be the earliest available.

Icterus, on the other hand, appears to arise in the same region with little plumage change from *Xanthopsar*—a yellow blackbird formerly included in *Agelaius*. It is primarily a fruit-eating genus with a straight, conical bill, though the occurrence in this line of forms secondarily adapted for nectar has caused much confusion in the above reviews. Convergence comes about when northern forms of *Icterus* reduce the amount of yellow while those of *Bananivorus* reduce the black. It is the principle aim of this paper to interpret this convergence in terms of selection pressure and environmental change.

Osteological and anatomical specimens used in this investigation have been obtained from the collections of the United States National Museum, the American Museum of Natural History, the Museum of Vertebrate Zoology and, primarily, from the Chicago Natural History Museum. The bird skins used are entirely from the collection of the last museum. For use of the collections in their care, for suggestions or services, I am deeply indebted to Alexander Wetmore, Herbert Friedmann, John T. Zimmer, Ernst Mayr, Dean Amadon, Frank A. Pitelka, A. J. van Rossem, Josselyn Van Tyne, Alfred E. Emerson, Karl P. Schmidt, D. Dwight Davis, Austin L. Rand, Emmet R. Blake, Melvin A. Traylor, Jr., Robert F. Inger, Bryan Patterson, Rainer Zangerl, and Philip S. Humphrey.

The Role of Anatomy and Selection Pressure in Convergence

Natural selection may produce structural changes in birds in many different directions but most adaptive modifications producing new passerine lines have been primarily dietary. Selection pressure of this sort is ever present and is strongest upon a species which is pre-adapted for the use of a food type which is being insufficiently utilized.

Let us pursue this. Anatomically the blackbird subfamily (Icterinae) can be shown to stem from the buntings (Emberizinae), primitive South American members of which have the squamosal area of the posterior skull similarly

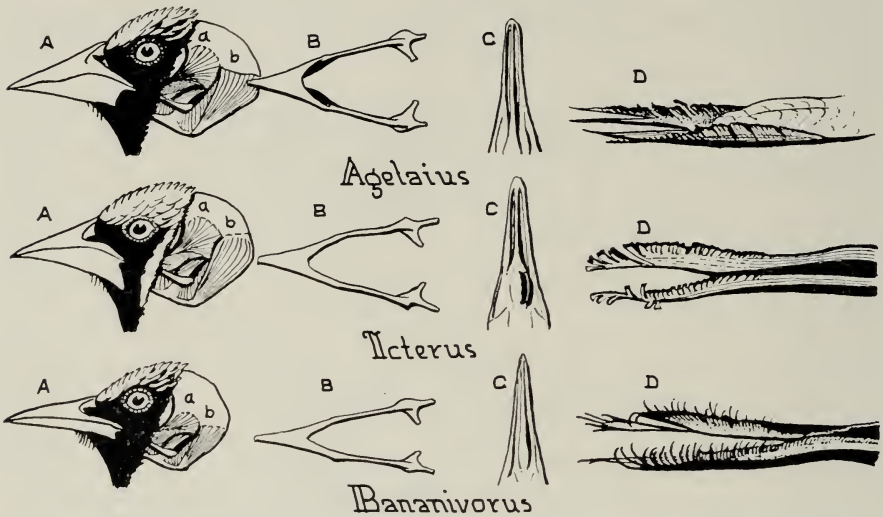

Fig. 1. Functional changes accompanying evolution of the oriole from *Agelaius*. Relation ships are shown between *Agelaius phoeniceus*, *Icterus gularis*, and *Bananivorus cayanensis* The partially skinned heads in A. show the structure of the bill with horn in place as wel as two large muscle masses: *M. adductor mandibulae* (a) and *M. depressor mandibulae* (b) B. shows the mandible in ventral aspect; C, hard palate; D, tongue.

flattened (it is inflated in advanced buntings). This pre-adaptation permitted the exploitation of many food niches besides seed-cracking simply by permitting the spread of *M. depressor mandibulae* (muscle nomenclature follows Lakjer, 1936) over the posterior region of the skull (Fig. 1).

The cowbird (*Molothrus*) is very close to this original, primitive form, having the flattened squamosal area but low development of the muscle. This ancestral form appears to have evolved three main branches—the cassiques, grackles, and marsh-blackbirds—each embracing many genera and species. *Agelaius* as the principle genus of the last branch has reached a special peak of its own with full development of this muscle, from which it has given rise to many diverging stocks including the orioles. Briefly, it is more generalized than

Molothrus with a less powerful bill capable of exploiting insect food in higher degree as well as seed food. Its outstanding features are seen in Figure 1. Under A, the partially skinned head of *Agelaius* reveals 2 large muscle masses: the anterior one is *M. adductor mandibulae* (a); the posterior one, originating on the flattened squamosal and inserting on the lever-like posterior process of the mandible, is *M. depressor mandibulae* (b). The anterior muscle serves with others not shown to adduct the mandible. The posterior one is the *only* muscle for *depressing* the mandible and the fulcrum effect of so large a muscle upon a lever-like posterior extension depresses it powerfully. This development, very unusual in birds, is linked with a habit of sometimes spreading the mandibles in foraging. In B, a ventral view of the mandible shows it to be relatively broad and expanded at the symphysis so that it is narrower dorsally than ventrally. The horny palate in C bears a rounded boss posteriorly against which seeds may be cracked but is still generalized. Finally the tongue is seen in D to be bifid and almost brushy—less finch-like than in *Molothrus*.

Each of these features of *Agelaius* is seen as a pre-adaptation for the fruit-eating modification in the oriole *Icterus*. In A, it is seen that this genus has broadened the ramus of the mandible dorso-ventrally and carried the horny sheath sharply backward in correlation with extreme development of *M. depressor mandibulae* (b). In B, the elongation of the posterior process of the mandible upon which this muscle powerfully acts is obvious, as is also the narrowing at the symphysis. In fact, the blade-like rami turn inward ventrally making the forcibly lowered mandible a functional wedge, stressed and sheathed in growing horn at the points of greatest wear just back of the symphysis. The tongue is more deeply bifid and much more brushy.

From the above it was actually possible to predict how *Icterus* must feed and see the prediction fulfilled by observation in zoos. The bill is thrust into the fruit *closed*. It is then pried opened against the resistance of the pulp, giving the brushy tongue access to the laked juice. Regardless of how many insects may be eaten when they are abundant, the primary adaptation is for powerful "gaping" inside fruit, which also permits nectar feeding when many trees are blooming in spring. Though I have figured *Icterus gularis*, the palatal knob for cracking seeds is superimposed in this species; it does not affect the fruit-eating adaptation.

Passing on to *Bananivorus* in Figure 1, we note in A that the bill is decurved and greatly reduced in mass; the ramus is weak and its horn not projected posteriorly. The reduction of *M. depressor mandibulae* and in B the shortening of the posterior process of the mandible indicate reduced gaping power. But the elongate, gently rounded form of the central palatal ridge in C and the full development of the nectarine tongue in D (see Moller, 1931) reveal high perfection of the nectar-feeding adaptation. The mandibles, figured for all 3 genera under B, clearly show the narrowing of the angle of divergence of the rami in the sequence: *Agelaius—Icterus—Bananivorus.* This lessens the resistance of fruit to gaping but also reflects the important fact that the skulls in dorsal aspect are narrower in this sequence. The nectarine warbler *Coereba* (Beecher, unpublished) has the skull narrower than normal warblers and the skulls of cassiques are similarly designed—an obvious adaptation for delving into flowers or gaping in fruit. Finally, all the foregoing forms except *Agelaius* have unusual development of the palatine salivary gland, thought to secrete the enzyme, invertase. The sucrose in nectar must be inverted to laevulose or glucose before assimilation (Pryce-Jones, 1944: 132; Wood and Osol, 1943: 1048).

We may think of *Agelaius* as being pre-adapted for gaping in soft fruit, so that *Icterus* and *Bananivorus* were evolved with relatively slight modifications.

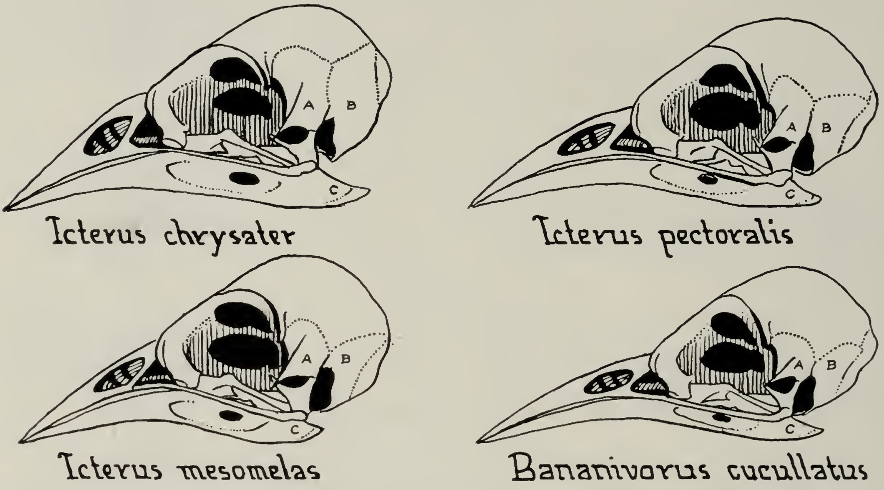

FIG. 2. Functional changes in skulls of orioles for fruit- and nectar-feeding. A shows the scar for the origin of *M. adductor mandibulae*; B, the scar for the origin of *M. depressor mandibulae*; C, its insertion on the lever-like posterior process of the mandible.

Molothrus, being hardly at all pre-adapted for this type of diet, probably responded more readily to a pressure to perfect the seed-cracking adaptation. This permits us to understand how certain members of the fruit-adapted genus *Icterus* may become secondarily nectar-adapted. A change in the direction of selection pressure occurs when the fruit-eating bill has become widely perfected —for it then becomes advantageous to take up nectar feeding to avoid competition.

The skulls in Figure 2 provide examples of this adaptive shift. *Icterus chrysater* is a highly-adapted, fruit-eating species in which A shows the fossa or scar for *M. adductor mandibulae* while B indicates the scar for the origin of *M. depressor mandibulae* and C, the scar on the mandible for its insertion. *Icterus mesomelas*, the nectar-feeding form derived from *chrysater*, has these scars much less extensive and the posterior process of the mandible much shorter. The loss of power for gaping is in direct relation to the loss of mass resulting in a more slender bill for flower probing. The same is seen in *Icterus pectoralis*, a nectar-feeding form derived from *I. pustulatus*, which achieves the greatest bill reduction in the genus. Finally, we see in the banana oriole, *Bananivorus cucullatus*, the more highly-adapted skull of a primarily modified nectar feeder.

Ecological demands due to seasonal change in the arid tropical zone imposed a still further adaptive change on the orioles invading it. Since flowering and fruiting here is seasonal, orioles nesting in this zone are obliged to migrate in the dry season, and it is easy to see how selection pressure would bear on these species to utilize seeds as food. *Icterus gularis* (and to lesser degree, *I. nigrogularis*) has evolved the palatal knob which, while not interfering with fruit eating and even some nectar feeding, permits it to remain resident the year round in this unfavorable zone.

The Role of Geological Events in Speciation

Mountains, Rain Forests, and Rain-shadow Deserts. Despite the constant presence of the selection pressures noted above, the oriole species could hardly have become distinct genetic entities without the isolating influences of Late Tertiary geological events. We are primarily concerned with the topographic and climatic effects of the Late Miocene-Pliocene uplift of the Northern Andes and Central American Highlands (Schuchert, 1935: 46). All of northern Colombia was block-faulted, the stepped graben of the Magdalena valley being 400 miles long and 15 wide with a downthrow on the eastern side of 6500 feet. Equally startling crustal movements resulted in the east-west trend of the mountains of Central America in Late Pliocene, eastern Chiapas rising over 7000 feet with many horsts and grabens passing into fold mountains northward. A major break is indicated in this highly volcanic region which, with the fault block of the Acapulco Deep off the coast of Guatemala (21,288 feet below sea level), has experienced a total crustal displacement of 32,000 feet.

These topographic changes have many indirect effects on species isolation aside from the obvious chance that populations may be split by a mountain range or lava flow. The most important source of isolation in the orioles was the climatic change accompanying uplift. When the rising Andes intercepted the deflected Southeast Trades which are the onshore winds of the Colombian west coast (Murphy, 1939: 24), the climate of the entire corridor into Central America changed. Today these onshore winds, cooled by passing over the Humboldt Current, strike the warmer coast of Peru and southern Ecuador without producing rain—hence, this area is desert. But farther north they pass over a warmer ocean surface to a cooler coast and the precipitation on the western slopes of the Andes has produced the impassable Chocó forest of northwestern Ecuador, Colombia, and eastern Panama. Berry's paleobotanical studies (1938, 1945) appear to date this Andean uplift at Lower or Middle Pliocene.

The interception of the Pacific onshore winds deprived the lowlands extending from eastern Colombia into Venezuela of all precipitation from this source. Winter drought does not permit establishment of a forest here, and nearer the coast a semi-desert occurs. In fact, only the summer rain from the Northeast Trades saves the whole region from becoming a vast rain shadow desert. This moisture supports the grasslands known as the llanos north of the Guaviare River (Pennell in Shelford, 1926: 625) and east to the Orinoco delta. These trades, intercepted by the Central American Highland farther north, provide the year-round rain responsible for the Caribbean rain forest, almost continuous along its eastern slopes.

Therefore, the period of oriole dispersal northward into Central America has seen a forest change to steppe and desert in Caribbean Colombia and Venezuela —a desert change to forest farther north on the Caribbean coast of Central America. Hence, a selective bridge has existed in Central America which has at times, allowed the passage of forest forms, at times, semi-desert forms. Range disjunctions and speciation have been the rule for orioles in this corridor, especially for arid zone forms. It is open to forest forms at present but this has apparently been so only in Recent times.

Biotic Effects of the Pleistocene Glaciation. The climatic alterations due to the Pleistocene glaciation had dramatic effects on biotic distribution in the tropics. The Pleistocene extension of Arapaho Glacier in the Colorado Front Range was nearly 4000 feet lower than its present front (personal observation). Since a similar differential existed in northern Colombia (Schuchert, 1935: 627), it may be assumed that all life zones must have been displaced downward about 4000 feet. The tropical zone was probably driven out of the Cauca valley and even south of the Amazon (cf. Tate, 1939: 154), surviving in the Caribbean areas of South and Central America only as a narrow coastal fringe.

The Pleistocene was a period that favored advanced forms. Subtropical species expanded at the expense of tropical species; the latter were thrust together in restricted areas where only the better-adapted survived to flow back into the present-day tropical zone with the climatic return to normal. A very important effect is the probable elimination of the tropical zone in the Colombia-Panama corridor. Here a lowering of the subtropical zone even 2000 feet from its present position on Serrania del Darien would have blanketed all of Panama, accounting for the present disjunctions of tropical forms. This also explains Chapman's (1917: 157) "Panama fault." He believed subsidence in Panama isolated subtropical forms in northern Central America but the post-Pleistocene return of the tropical zone to the lowlands seems more likely. Schuchert (1935: 558) shows this subsidence to be less than 400 feet.

Since virtually all water gaps were closed by Late Miocene they do not enter; only *I. graduacauda* appears to have been isolated by the Tehuantepec gap.

Dispersal and the Island Isolation of Primitive Forms. Primitive forms may be expected at the periphery of a uniform ecological habitat as a theoretical consequence of Wright's (1943; 1946) view that a favorable mutation will pass readily through the "neighborhood" populations. Since such peripheral forms are slightly less specialized for this habitat they may be better able to adapt to even small habitat changes encountered outward. Such changes may explain the fact that we normally find the most advanced forms at the periphery. Applying this, the pampas region of southwestern Brazil, Bolivia, Paraguay, Uruguay, and northern Argentina appears to be the ancestral home of the Icterinae—3 out of 4 species of cowbirds and 4 out of 8 species of marsh blackbirds overlap sympatricly here. Friedmann (1929: 343), on the basis of song, courtship, and plumage believes that the most primitive cowbird is *Molothrus badius*. It is confined to this range while the most advanced form (*M. ater*) is our North American species. I find a similar relationship among the blackbirds (*Agelaius*)—the single North American species is the most advanced. Because of parallel plumage trends in this immediate ancestor of the orioles, the probable history of *Agelaius* is briefly outlined below.

The origin of the blackbirds from the buntings was arbitrarily put at Middle Miocene because there is good reason to doubt that the finches could have evolved as a type before the grasslands came into existence in the Lower Miocene (Elias, 1942). Since Weeks (1948) has recently shown that the La Plata marine embayment of the Middle Miocene probably separated the pampas from the Brazilian shield by 300 miles of sea, the possibility of isolating the several sympatric species of *Agelaius* in the pampas today becomes apparent. In the following account these are divided into 2 groups—one black with brighter humeral patches, the other black with brighter head and breast. Both are thought to stem from *Agelaius cyanopus* (Fig. 3, *5*) of the Brazilian Highlands, whose black plumage may relate it to the ancestral cowbird. However, the suffused chestnut of its back and wing would have a strong tendency in the Icterinae not only to concentrate in the humeral area but to give way to yellow. The isolation in the pampas of *A. thilius* (number 1 in figure 3) by the maximum extension of the La Plata embayment is thought to have fixed this tendency, *thilius* being black with yellow humeral patches.

In the group lacking the humeral patch, *A. cyanopus* (*5*) appears to have evolved from *A. ruficapillus* (*6*), a form with chestnut crown and breast which may have become isolated in the pampas either by waifing across the embayment or by going around its head during a temporary recession. Imperfect isolation later permitted it to differentiate a northern race in the Brazilian Highlands from which the advanced *A. icterocephalus* (*7*) arose in the Guiana Highlands, largely by replacing the chestnut of head and breast with yellow. The specialized yellow *Xanthopsar flavus* (*8*) is believed to have arisen from *A. ruficapillus* in the pampas south of the embayment as a final phase when the Argentine fault scarps west of Sierra de Cordoba dammed off and dried up

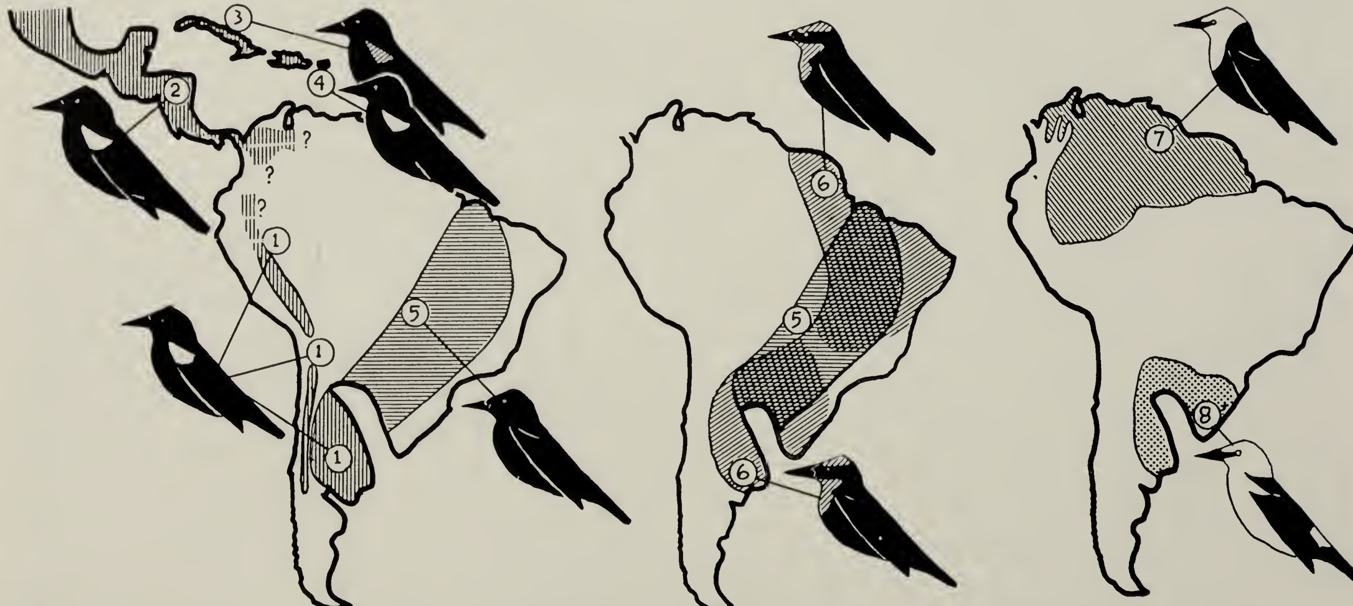

Fig. 3. Evolution in the marsh blackbirds. 1. *Agelaius thilius*; 2. *A. phoeniceus*; 3. *A. humeralis*; 4. *A. xanthomus*; 5. *A. cyanopus*; 6. *A. ruficapillus*; 7. *A. icterocephalus*; 8. *Xanthopsar flavus*.

the head of the bay. Rich (1942) considers these scarps (Sierra de Ulapes, Sierra de Guayaguas) a "fading expression" of the Central Andes (thus probably Late Miocene or Pliocene in time). Whether or not the above hypothesis as to the mode of isolating several sympatric species in an area devoid of geographic barriers today is correct in detail, it is obvious that the means for isolation existed at the right time in the La Plata embayment and in the north-south fault scarps that beheaded it.

Now taking up the group of *Agelaius* having humeral patches, we see that *A. thilius* (*1*), cut off by the embayment, could only disperse southward and northward in the marshes of the slowly rising Andes. There is no direct evidence that the species ever ranged north of eastern Bolivia where a race occurs today but *Macroagelaius* of Colombia's Eastern Andes, with its chestnut humeral patches, almost certainly stems from it. Moreover, the occurrence of forms with the humeral patch in both Central America and the Greater Antilles requires an explanation.

A curious relationship exists here. All three races of *A. thilius* (Fig. 3, *1*) have the humeral yellow patch. *A. humeralis* of Cuba (*3*) has a chestnut patch but *A. xanthomus* of Puerto Rico (*4*), certainly derived from *humeralis*, again has a yellow patch. The replacement of chestnut by yellow in more advanced forms was implied in the derivation of *thilius* from *cyanopus*. It has occurred in *Macroagelaius* where the form of the Guiana Highlands has substituted yellow for the chestnut of the Andean form—also in *Gymnostinops* and *Xanthornis* among the cassiques. But the above picture for *Agelaius* is exactly duplicated in species of *Bananivorus* where the yellow humeral patch replaces the chestnut one of earlier forms. Since *Bananivorus* is believed to stem from *Agelaius thilius*, it is noteworthy that in the latter genus of exclusive march-dwellers the Antillean forms alone are arboreal. However, the work of Taber (1934) and Palmer (1945) indicates that the vast present-day marshes of Cuba are Recent, nearly all of the island being submerged by the return of Pleistocene melt water to the sea. *A. humeralis* may have reached Cuba from the ancestral *thilius* stock of Central America as a typical marsh-dweller when it was emergent in the Early Pliocene. The Recent inundation accounts for its arboreal adaptations.

A relict marsh may have survived on the Zapata Peninsula (Barbour and Peters, 1927) but the marsh adaptations of *humeralis* did not. In it we see the first stages of such a transition as in the pampas resulted in the origin of the new genus of Cayenne Orioles, *Bananivorus*. The bill is not greatly modified but the claws are shorter and strongly decurved like those of *Bananivorus cayanensis*. *A. xanthomus* is apparently the result of a colonization of Puerto Rico by the Cuban form across the sea after the stock had become arboreal. The recent discovery of *humeralis* on Haiti (Wetmore and Swales, 1931) suggests hurricane winds as the agency. The yellow-bordered red humeral patch of *A. phoeniceus* (*2*) in Central and North America is suspected of being a further elaboration of yellow in the transition from the primitive chestnut—the deep orange of mainland orioles in contrast to the yellow of Antillean relatives suggests how red might be intensified under selection.

Cuba thus appears to be a haven for relicts in the Icterinae and the retention there of primitive plumage patterns will be seen in *Bananivorus* presently. I believe that in *Agelaius* the chestnut humeral patch of the Cuban species reflects the (elsewhere displaced) primitive condition. *Humeralis* and *xanthomus* alone in the entire genus lack plumage dimorphism. I am drawn to the possibility that the ancestral form of *A. thilius* which evolved *Bananivorus cayanensis* at the northern border of the pampas may have had chestnut humeral patches like the latter, and that in both genera these have gradually given way to yellow. Genetically, reverse evolution with yellow-shouldered *A. thilius* evolving into chestnut-shouldered *humeralis* or *B. cayanensis* is just as possible, but the color trends do not seem to support this alternative.

The evolution of the orioles from the marsh-blackbirds is therefore regarded as having occurred fairly early in the history of the latter so that the evolution of the two has been comtemporary. Once the nectar- and fruit-adaptations were made, the break with *Agelaius* was complete, and the orioles radiated rapidly into the new forest habitat with ever-increasing specialization. From this point *Agelaius* became channelized as a seed and insect feeder. The difficulty of making further adaptations of the same kind in the face of oriole competition eliminated it from the contest. True, its pre-adaptation placed it under pressure to evolve a mud-probing form with the same gaping mechanism seen in the orioles, and *Amblyramphus* (Wetmore, 1926: 389) was evolved to fill this niche. But its value to this paper has run out.

A Phylogenetic Arrangement of the Orioles

Although Mayr (1942) expresses the accepted view in stating that convenience is a major consideration in classification, he adds that it should also express evolutionary relationships so far as possible. Once again as we enter the detailed discussion of the orioles we must emphasize the failure of the old systematics in its attempt to solve this problem. Its static morphological approach did not permit us to consider such a genus as will be proposed below; the genetic basis of the new systematics does not permit us to ignore it.

I. The genus *Bananivorus* Bonaparte

Bananivorus Bonaparte, Compt. Rend. Acad. Sci. Paris, **35:** p. 834, 1853. Type by original designation, *Oriolus bonana* Linnaeus.

Diagnosis. Due to the complete convergence of this genus with *Icterus* and consequent overlap of external characters normally used in taxonomy, all attempts to characterize it have failed. No diagnostic anatomical differences have been found but none were expected in such close genera—nor did X-rays of skins with undamaged skulls covering all species reveal clear-cut distinctions. In general, members of this genus are very markedly smaller with more slender, nectar-adapted bills; but island forms such as *B. laudabilis*, *oberi* and *northropi* show the typical "island effect" by increasing the mass of the bill. Hence it is often less slender than that of *I. pectoralis* (the most slender-billed of the nectar-adapted species of *Icterus*). Some of these island outlyers even exceed temperate *Icterus* species in total size (e.g. *I. galbula*).

It is obviously unreasonable, since these are convergent genera, to expect a clear-cut diagnosis of *Bananivorus* that will exclude all forms of *Icterus*. Both reduce body bulk northward but comparisons to be valid must be made in the same area and life zone, thus eliminating specialized outlyers. This method reveals that in the deciduous forest of North America, *B. spurius* is much smaller than *I. galbula*; in California *B. cucullatus* is smaller than *I. bullockii*; in arid Central America *B. cucullatus* is smaller than *I. pustulatus*, *pectoralis*, *chrysater* or *gularis*; in arid Colombia *B. auricapillus* is smaller than *I. nigrogularis* or *icterus*. Finally, in the temperate oak-pine of El Salvador *B. maculi-alatus* is smaller than *I. chrysater*; in the Caribbean rain forest *B. prosthemelas* is smaller than *I. mesomelas*; and in the Amazonian rain forest *B. cayanensis* and *chrysocephalus* are smaller than *I. icterus*. Comparisons between island forms are invalid because the two genera never occur on the same islands and the island forms of *Bananivorus* have obviously increased in size of body and bill to take over fruit-eating functions normally belonging to *Icterus*. The reverse tendency in *Icterus* (taking over nectar feeding in the absence of *Bananivorus*) is seen in island races of *I. nigrogularis* and in *I. leucopteryx* with their longer, more slender bills. Regional comparison for convergent genera occupying the same range seems to be the only valid method and it completely separates *Bananivorus* and *Icterus* without overlap.

The bill is too responsive to adaptation to be a good character in these convergent genera. Though *Bananivorus* has its slender bill longer with respect to skull-length, *B. spurius* in temperate North America obviously does not require a long bill for the small flowers and fruits of northern trees—nor, strangely, does *B. cayanensis* in the rain forest. Its bill and gaping musculature like that of *Coereba* suggest that, like that species, it pierces through the side of a flower corolla. All remaining species of *Bananivorus* are clearly flower probers with bills longer proportionately than any species of *Icterus* except *I. icterus*, whose long bill is also an obvious specialization for probing large flowers and fruits.

The method used in separating this genus from *Icterus* has been one of tracing opposite trends or clines in each northward from the centers of origin at the northern border of the pampas where each originates independently from agelaiine stock. To designate the two phyletic lines as subgenera (cf. Simpson, 1945: 18) would be to de-emphasize their separate origin as well as the fact of convergence.

A final character, perhaps sufficient in itself, is a non-morphological one which, nevertheless, clearly expresses the underlying gene complex: a unique method of building the nest in *Bananivorus*. Small and compact, it is invariably woven of palm fibre if available and joined to the underside of a palm or banana frond by *sewing through* the living leaf and pulling its sides down about the nest. Though temperate forms depart from this habit for want of large leaves, *B. parisorum* still sews to the underside of yucca leaves. The nests of *wagleri* and *spurius* are small, compact, unlike the long, pendant nests of *Icterus*.

The Origin of Bananivorus from Agelaius thilius. Bananivorus cayanensis is believed to have evolved from an ancestral form of *Agelaius thilius* in the ecotone where the northern part of the grassland gives way to Amazonian rain forest. Since *Agelaius* today is well adapted to take both nectar and fruit occasionally, it is plausible that individuals and then populations under selection pressure invaded the low plantains or palms adjacent to their marsh habitat for this abundant food. This is thought to have occurred as discussed above through adaptive modification of the bill without much immediate pressure to alter the chestnut humeral patch of the black plumage.

FIG. 4. Evolution in the genus *Bananivorus.*

1. *Bananivorus cayanensis pyrrhopterus*
2. *Bananivorus cayanensis periporphyrus*
3. *Bananivorus cayanensis valencio-buenoi*
4. *Bananivorus cayanensis tibialis*
5. *Bananivorus cayanensis cayanensis*
6. *Bananivorus chrysocephalus*
7. *Bananivorus prosthemelas*
8. *Bananivorus dominicensis melanopsis*
9. *Bananivorus dominicensis dominicensis*
10. *Bananivorus dominicensis portoricensis*
11. *Bananivorus dominicensis northropi*
12. *Bananivorus laudabilis*
13. *Bananivorus oberi*
14. *Bananivorus bonana*
15. *Bananivorus wagleri wagleri*
16. *Bananivorus wagleri castaneopectus*
27. *Bananivorus fuertesi*

Note. The temperate zone *B. spurius* is not mapped.

Trend Toward Addition of Yellow in Humid South America. If *B. cayanensis pyrrhopterus* (Fig. 4, *1*) was under little pressure in its new habitat to alter plumage the same is true of *B. c. periporphyrus* (*2*), the next form northward. But *B. c. valencio-buenoi* (*3*) entering the Brazilian Highlands has the humeral patch distinctly more yellow-chestnut and *B. c. tibialis* (*4*) still farther north has not only the humeral patches but the tibial area yellow. In fact, just within this race a cline increasing yellow occurs northward. Meanwhile, *B. c. cayanensis* (*5*), probably forced into its present range south of the Amazon by the southward advance of the subtropical zone in the Pleistocene, has also changed its humeral patch to yellow. *B. chrysocephalus* (*6*), which has added yellow to the head and rump in addition to humeral and tibial areas, has apparently reinvaded the entire area north of the Amazon in Recent times from a Pleistocene refuge in the Caribbean coast tropical zone fringe. Its ability to do so against the competition of less-advanced *cayanensis* to the south suggests a selective advantage for increased yellow in the plumage.

Trend Toward Addition of Yellow in the Antilles. The more arid-adapted members of *Icterus* take over the winter drought range in Colombia and Venezuela along the Caribbean but we find *Bananivorus* again in the Caribbean rain forest of Central America as *B. prosthemelas.* This species is the logical culmination of the steady northward increase of yellow in the humid tropical zone, having added this color to its entire abdomen and upper breast. The abrupt increase in yellow is probably only apparent, however, due to wiping out of the intervening population by the dry-season rain shadow of northern Colombia following the uplift of the northern Andes. What this intervening population looked like and what an earlier *prosthemelas* population looked like may probably be inferred from the forms which reached the Greater Antilles from it across a partial Pliocene land bridge from Honduras. These forms most resemble *B. chrysocephalus* but lack the yellow of the head which that species probably developed subsequently.

Once again, therefore, Cuba appears to preserve a relict plumage pattern but, since this genus is younger than *Agelaius*, disjunction with mainland forms is less strong. *B. dominicensis melanopsis* of Cuba (*8*) has the tibiae and crissum barely yellow whereas *B. d. dominicensis* of Hispaniola (*9*) increases yellow on the lower abdomen and *B. d. portoricensis* of Puerto Rico (*10*) is intermediate. As often happens in island colonization, these forms may have met with relatively little competition and thus experienced little pressure to increase yellow at the mainland rate.

There are, however, peripheral forms in the Bahamas and Lesser Antilles that have added yellow almost to the extent of *prosthemelas*, though I agree with Chapman (1891: 539) and Bond (1945: 144) that *northropi* (*11*) of Andros and Abaco is an offshoot of *B. dominicensis*, not of *prosthemelas*. It was undoubtedly carried there from either Cuba or Hispaniola by hurricane winds as were the Lesser Antillean forms carried from Hispaniola by hurricane winds athwart which they lie (cf. Darlington, 1938: 283). I agree with Bond that the latter are distinct species related to *B. dominicensis* for it appears that each must have colonized the islands separately from the Greater Antilles. The southernmost form on Santa Lucia, *B. laudabilis* (*12*), shows little more yellow than the Hispaniolan bird and may not have been isolated as long as the northernmost form, *B. oberi* (*13*) of Montserrat which is almost as yellow as *northropi*. The suffusion of chestnut in the yellow of these forms culminates in the erythristic *B. bonana* (*14*) of Martinique in which the black of head and breast is replaced by chestnut grading into dusky orange ventrally. Such a color anomaly, involving possibly a simple gene change at one locus, should not obscure the fact that, toward the parent *B. dominicensis*, all three species show the same increase of yellow noted in *northropi*.

Since the Montserrat form is separated from the Martinique form by two large islands (Guadeloupe and Dominica) on which no oriole occurs, it is difficult to link them as races of a Lesser Antillean species, nor does the inclusion of all Caribbean island forms under a single polytypic species seem warranted. Nevertheless, there is little doubt of their Greater Antillean origin from *B. dominicensis* and the tendency for all Bahaman and Lesser Antillean peripheral forms to add yellow recalls the trend away from the primary center of origin in South America. Since one moves upward in time as one moves outward through all of these populations, the increase in yellow is seen to be a time trend.

Selection for Yellow as a Time Trend. The black plumage of the ancestral *Agelaius*, so advantageous for flocking marsh dwellers, seems singularly unadapted for forest-dwelling orioles. The increase in the more conspicuous yellow, during time as well as in space is therefore being selected. It may be asked why, then, the chestnut humeral patch of *B. c. pyrrhopterus* (*1*)—the oldest form at the center of origin—has not been replaced by yellow. This may be happening, just as it is thought to have happened in *Agelaius thilius*, but the process could be greatly decelerated by the following principle of diffusion:

The sparse, ever-expanding peripheral populations are probably under strong pressure to increase yellow. It would be useful in keeping contact among pioneering groups, vital to island colonizations. Each slightly different habitat encountered outward results in a more yellow population and this added yellow, being selected for, will tend to spread in all directions, even backward toward the center of origin. But on that side is met an established, less yellow population through which the change must diffuse slowly, whereas on the peripheral side no resisting population exists and yellow increase can be rapid. In a concentric distribution of populations, therefore, it appears that each more peripheral race will buffer any race lying closer to the center of origin from backward diffusion of further increments of yellow fixed in the pioneering populations. Thus, in Figure 4, *B. c. pyrrhopterus* (*1*) is buffered by *periporphyrus* (*2*) and *valenciobuenoi* (*3*) from advances in yellow made by *cayanensis* (*5*) and *tibialis* (*4*). Nevertheless, these southern populations seem to be gradually succumbing to the backward diffusion of advances in yellow made by the more northern populations. Their present plumage is non-adaptive in the sense of Robson and Richards (1936).

This may be why *B. c. pyrrhopterus* at the center of origin still has the original plumage pattern of ancestral *Agelaius thilius*. One might predict from the above that the older *Agelaius* would have had time to complete the replacement of chestnut by yellow so that only the Cuban relict, *humeralis*, reflects the former aspect. On the other hand, loss of chestnut in the Cuban *Bananivorus* indicates the probable pressure on this younger genus to increase yellow in the forest. Chestnut was probably suppressed before its expanding populations reached Central America.

Convergence in the Arid Tropical Zone of Central America. Occupying virtually the entire Caribbean rain forest, *B. prosthemelas* (*7*) appears to be the evolutionary culmination of movement toward yellow in the humid tropical zone. It has also gone as far as it can go, for it is hemmed in on all sides by the arid tropical and temperate zones. Under the resulting competition, selection pressure to adapt to new life zones would be extremely severe on peripheral populations and probably produced those arid tropical species so strangely convergent with forms of *Icterus* in the same zone. This required only the further addition of yellow to head and neck.

To the north on the arid Caribbean coasts of Mexico *prosthemelas* evolved the Hooded Oriole, *B. cucullatus* (Fig. 5, *19* to *25*) and to the south in arid northern Colombia and Venezuela, *B. auricapillus* (*26*). The essential difference between the two is that the latter lacks white in the wing as does *prosthemelas* while the former adds white in the wing but lacks the yellow humeral patch. Otherwise they are very similar as noted by Todd and Carriker (1922: 473)—and, coming from opposite ends of the *prosthemelas* population, are correctly designated separate species. At the outset in this study the relationships of all oriole species were determined on the basis of horny palate as a control upon plumage convergence. This additional line of evidence shows that the bill of *auricapillus* has diverged little from that of the parent *prosthemelas*; that of *cucullatus* has become more slender and decurved.

Concerning time relations, the isolation of *auricapillus* from *prosthemelas* could hardly have occurred before the Andean uplift produced the winter-drought area of northern Colombia and Venezuela, probably in Early Pliocene. The origin of *cucullatus* from *prosthemelas* on the north is ascribed to Late Pliocene volcanic activity which is roughly checked by the time of disjunction between *B. c. cucullatus* (*20*) on the arid Caribbean coast of Mexico and *igneus* (*22*) and *masoni* (*25*) on arid Yucatan. Since this occurrence probably dates from the origin of the Caribbean rain forest when the Late Pliocene uplift of the Central American Highlands intercepted the Northeast Trades, it follows that *B. cucullatus* antedates this geological event. This should also dispel any notions of relating this species to the convergent *Icterus pectoralis* which arose inland much later—too late to reach the arid parts of the Caribbean coast at all because the forest was already there.

It is in the arid tropical zone that convergence between the 2 genera of orioles reaches that point where plumage patterns are virtually identical (Fig. 12). The pattern is apparently being selected for and, since it represents the

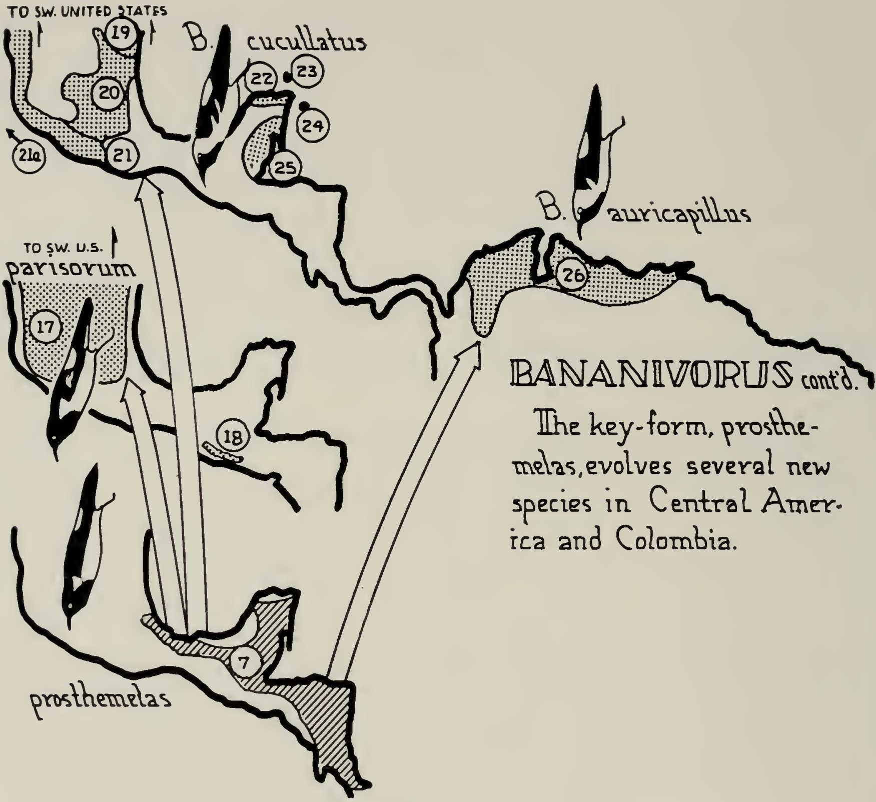

FIG. 5. Evolution in the genus *Bananivorus*.

7. *Bananivorus prosthemelas*
17. *Bananivorus parisorum*
18. *Bananivorus maculi-alatus*
19. *Bananivorus cucullatus sennetti*
20. *Bananivorus cucullatus cucullatus*
21. *Bananivorus cucullatus californicus*
21a. *Bananivorus cucullatus trochiloides*
22. *Bananivorus cucullatus igneus*
23. *Bananivorus cucullatus duplexus*
24. *Bananivorus cucullatus cozumeli*
25. *Bananivorus cucullatus masoni*
26. *Bananivorus auricapillus*

maximum addition of yellow (now supplemented by white), this varied pattern may be the most conspicuous one possible. Construction of nests in protected situations (e.g. thorn trees) may explain how such a thing can have survival value.

Convergence in the Temperate Zone of Mexico and Northward. The same environmental pressure which produced the arid tropical species just treated caused *B. prosthemelas* to adapt to other life zones. Above its Caribbean lowlands between 3000 and 6000 feet it evolved *B. wagleri wagleri* (Fig. 4, *15*) as a highland subtropical species which, with its race *castaneopectus* (*16*), ranges south to Nicaragua. Northward, it evolved temperate Scott's oriole, *B. parisorum* (Fig. 5, *17*)—possibly conspecific with the relict *maculi-alatus* (*18*)—which ranges into southwestern United States. But the selection trend has changed in these more temperate forms. True, *parisorum* in temperature semi-desert has added white wing-bars in partial approach to arid *cucullatus* but *wagleri* has actually added black to the crissum in probable response to a temperate zone trend toward reduced conspicuousness.

A volcanic area extends across all of Mexico from Jalapa, Vera Cruz to Cape Corrientes on the Pacific coast which will be seen to disrupt the range of every oriole species in this area. It apparently cut off the important species *B. fuertesi* from *prosthemelas*. This rare form of the Caribbean coastal forest to the north of the Volcanic Province has slightly decreased the black area of the upper breast and is simply an ochraceous version of the Orchard Oriole, *B. spurius*, which replaces it in eastern North America. The atavistic replacement of yellow by chestnut in this familiar species, already evident in *fuertesi*, marks a reversal of selection pressure. A similar though less advanced reduction of yellow in the Baltimore Oriole, *Icterus galbula*, suggests a general selection against conspicuousness in the temperate zone. This with the simultaneous occurrence of sexual dimorphism giving protective coloration to females may be correlated with the dying out northward of thorn trees and protecting wasp colonies utilized by orioles in their tropical range. *B. fuertesi* may be only a race of *spurius* (Wetmore, 1943: 323).

Nectar-feeding in Bananivorus. Although the primary modification of the bill for nectar-feeding in this genus was first suspected on anatomical grounds, the literature provided ample basis from field observations. Dickey and van Rossem (1938: 534) report hundreds of *B. spurius* in migration feeding on nectar in a flowering ceiba. Bailey (1928: 651) found *B. parisorum* feeding on nectar and insects at flowers of agave and yucca and notes that Grinnell found *B. cucullatus californicus* feeding with hummingbirds at "a profusely blooming ironwood;" the fruit eaten was negligible. Wetmore (1926: 383) found that *B. cayanensis pyrrhopterus* fed on "blossoms of such trees as the lepacho (*Tecoma obtusata*) and at all seasons were partial to vines and creepers," often swinging head-down in their efforts. Wetmore and Swales (1931: 409) also report seeing *B. d. dominicensis* congregated in flocks about flowers especially of agave and orange with honey-creepers, hummingbirds, and woodpeckers. The race *portoricensis* Wetmore found (1916: 115) "fond of the sweet flower juices of plants . . . the bucare (*Erythrina sp.*) being visited frequently in blossom" as well as the banana. Although I have seen *Icterus galbula* feeding on flowers in spring (e.g.

horse chestnut), this is incidental. Except for the forms of this genus secondarily modified for nectar-feeding, *Icterus* is fruit-adapted. That both genera eat many insects at times should not be surprising. Few birds are complete specialists as to food type.

Nesting in Bananivorus. The need of this genus for broad-leaved plants—banana or palm—to which to sew the compact nest of palm fibres doubtless stems from its humid tropical origin. Naumburg (1930: 397) reports the habit for *B. cayanensis pyrrhopterus* in Matto Grosso, and Beebe (1917: 243), for *B. chrysocephalus* in Venezuela. It is typical also for *B. d. dominicensis* in Hispaniola (Wetmore and Swales, 1931: 409) for *laudabilis* on Santa Lucia (Semper, 1872: 649) and *bonana* on Martinque (Taylor, 1864; Lawrence, 1879). *B. oberi* was first reported by Grisdale (1882: 487) in mountain palms on Montserrat in which Bond (1939: 194) has since found it nesting—while *northropi* (Allen, 1890) was found only in the coastal palms of Andros in the Bahamas. In Central America, Richmond (1893), Salvin and Godman (1904: 467), and Griscom (1932: 392) report *B. prosthemelas* nesting the same way.

But even species of the arid tropics cling to the trait. Todd and Carriker (1922: 473) report it for *B. auricapillus*, and Bailey (1910: 35) reports that 40 out of 52 nests of *cucullatus* were in fan palms. Ewan (1944), Huey (1944), and Grinnell (1944), carry on an interesting discussion of it in California. In more arid areas *cucullatus* and *parisorum* nest under the overhanging leaf of the yucca, using the fibres of the same plant and sewing through the leaf (Bailey, 1928). The transition away from broad leaves, which had to be made if the genus was ever to enter the humid temperate zone, is suggested by *cucullatus* nests I have seen from a sycamore (*Platanus*) taken in Arizona, and a thorn tree (*Randia*), in Yucatan. In both, the nest fibres pass through holes in the leaves. Pettingill (1942: 89) even reports the species threading fibres through pierced holes in his tent blind.

But eventually the transition must be made. *B. wagleri* in the oak-pine has a nest compactly woven of grass (Salvin, 1859: 468) as is that of *spurius* in the eastern deciduous forest. But the fondness of the Orchard Oriole for the bushes and reeds of the Louisiana marshes (Oberholser, 1938: 591) links it by way of *fuertesi* to the primitive members of the genus in the Amazonian forest borders.

II. The genus *Icterus* Brisson

Icterus Brisson, Orn., 1760, I, 30; II, 85. Type, by tautonymy, *Icterus* Brisson—*Oriolus icterus* Linnaeus.

Diagnosis. Convergence with *Bananivorus* renders clear-cut characterization impossible. *Icterus* is always larger under regional comparison, however, and the nest is typically long and pendant; not even the shorter nests of temperate forms equal the tight, round nests of *Bananivorus* (see Diagnosis).

The Origin of Icterus from Xanthopsar flavus. In the phylogeny of the blackbirds (Fig. 3), *Agelaius* was seen to produce a *thilius* group and a *cyanopus* group. Whereas *thilius* clearly evolves the black banana orioles, *Bananivorus*, the *cyanopus* group produces a largely yellow form, *Xanthopsar flavus*, considered the most likely ancestor of the genus *Icterus*. *Gymnomystax* with its agelaiine horny palate could be considered for this position but in all other respects it is already an oriole. *Xanthopsar*, therefore, probably evolved both *Gymnomystax* and *Icterus*. Their larger size and longer bills are humid tropical adaptations to large fruits, seen also in the evolution of large oropendolas from small cowbirds. The peculiar nectar-feeding habits of *Bananivorus* called for no such size increase.

The derivation of *Icterus* is necessarily speculative, however, and all we know is that it stems from an agelaiine blackbird that was probably largely yellow. *Gymnomystax*, ranging from Amazon to Caribbean, could have evolved the oldest *Icterus* species (*jamacaii* and *icterus*) but the bare mandibular and ocular areas (probably a selective result of sticky fruit juices fouling plumage) are more specialized in *Gymnomystax* than in these supposed derived forms. The lanceolate breast feathers of the latter and the long first primary of *Xanthopsar* indicate that specializations have occurred since the splitting off that will always cloud exact ancestry.

Trend Toward Addition of Black in Humid South America. The most significant generalization about *Icterus* is that, from a mainly yellow ancestral condition at the center of origin in the southern part of the Amazonian forest, the plumage tends to add black peripherally. This is seen to be a northward trend precisely opposite that observed in *Bananivorus* and may reflect the gradual shift from humid to arid tropical zones. At any rate it is clearly a movement in the direction of that exact pattern apparently being selected for by both genera in the arid tropical zone.

The troupials—*Icterus jamacaii* (Fig. 6, *1*, *2*, *3*) and *I. icterus* (*4*, *5*)—seem to be conspecific as suggested by Hellmayr (1937), the forms replacing each other geographically. They illustrate the above plumage trend. *I. icterus strictifrons* (*1*) and *croconotus* (*2*) in the ancestral Paraguayan and Amazonian lowlands respectively, are the forms with most yellow and least black. Radiating outward from these, the form of the Brazialian Highlands, *jamacaii* (*3*) and the forms of semi-arid Colombia and Venezuela, *ridgwayi* (*4*) and *icterus* (*5*), add black on head and back, and increase a white wing patch which mainly involves the secondaries and elongates the lanceolate breast feathers. The latter two northern forms also increase the bare postocular area and bill length in possible adaptation to the fruit and nectar of the giant cactus (see Todd and Carriker, 1922: 475). A habitat shift seems to occur northward also; the bamboo nesting site on the Amazon gives way on the semi-arid Caribbean coast to sites in scrubby second growth. In this group Brodkorb's (1937) race *paraguayae* is regarded as a variation of *strictifrons*.

I. graduacauda graduacauda (*6*) and *auduboni* (*7*) are thought to represent a relict population of the early, forest-dwelling *I. icterus*, cut off by the

Tehuantepec water gap since late Miocene and now found largely in temperate forest from the Mexican Highlands to the Rio Grande valley. The relatively short bill and yellow back suggest the probable aspect of the ancestral *I. icterus* before specialization (Fig. 6). Dull color and solitary habits permit survival in the north, though competition and climatic change have prevented its southward spread since the Lower Pliocene closing of the gap. Two new forms of this species have been described by van Rossem (1938: 137)—*dickeyae* in the Sierra

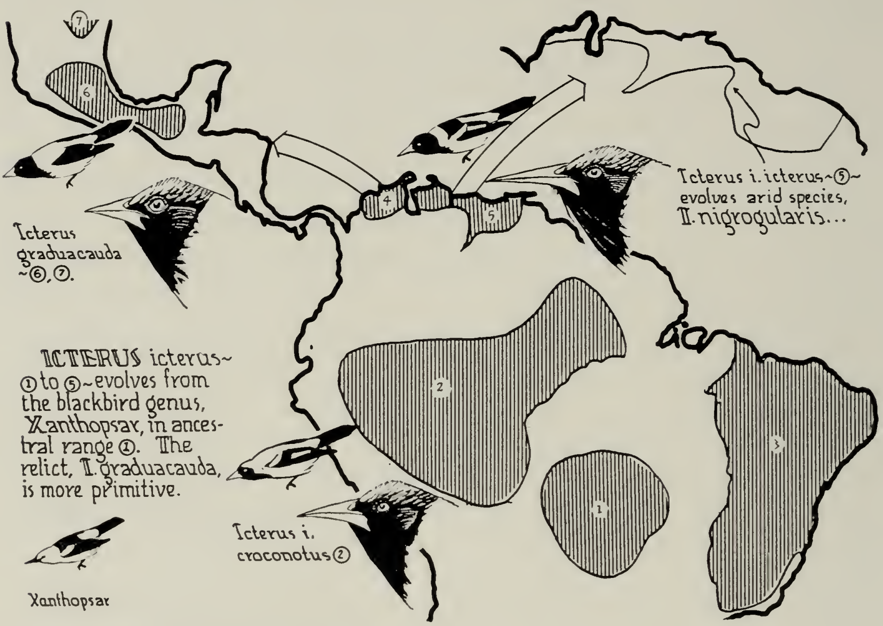

FIG. 6. Evolution in the genus *Icterus.*

1. *Icterus icterus strictifrons*
2. *Icterus icterus croconotus*
3. *Icterus icterus jamacaii*
4. *Icterus icterus ridgwayi*
5. *Icterus icterus icterus*
6. *Icterus graduacauda graduacauda*
7. *Icterus graduacauda auduboni*

Madre of Guerrero and *nayaritensis* from Tepic. Sclater (1939: 141) described another, *richardsoni*, from Tehuantepec, Oaxaca.

The creation of semi-desert in Caribbean Colombia and Venezuela by the uplift of the Northern Andes probably resulted in the evolution of arid zone *Icterus nigrogularis* from an ancestral, unspecialized *I. icterus* (Fig. 6). This is suggested by the yellow back of *nigrogularis* (Fig. 7, 8), like that of *graduacauda*. The island forms of *nigrogularis*—*trinitatis* (*9*) on Trinidad and Monos, *helioeides* (*10*) on Margarita and *curasoensis* (*11*) on Curacao, Bonaire and Aruba—increase bill-size and wing-length.

Trend Toward Addition of Black and Diet Specialization in the Arid Tropical Zone. The key form *nigrogularis* appears to have reached a position similar to that of *B. prosthemelas* with unusual opportunities for invading new niches. Wetmore (1919: 195) noted that this species of arid Colombia and Venezuela

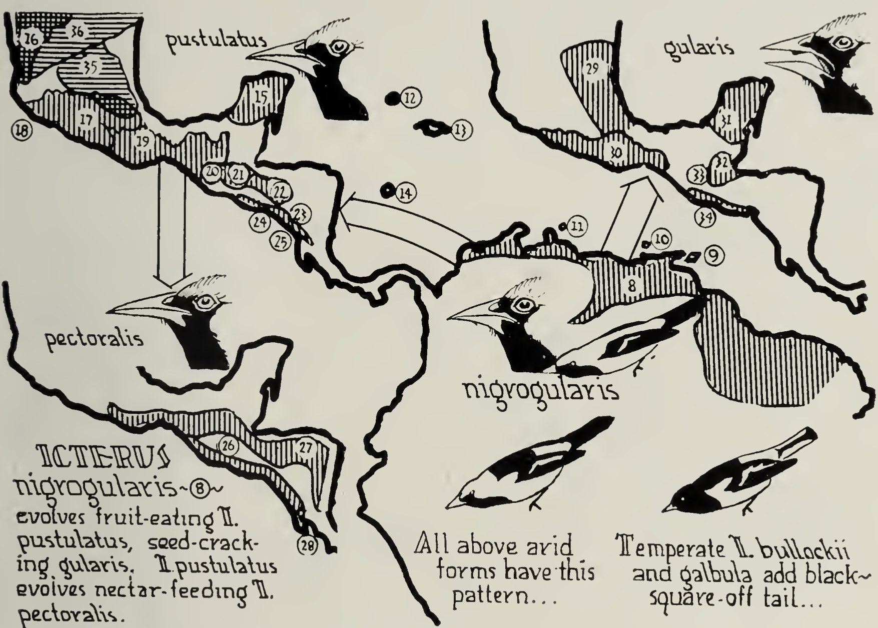

FIG. 7. Evolution in the genus *Icterus*.

8. *Icterus nigrogularis nigrogularis*
9. *Icterus nigrogularis trinitatis*
10. *Icterus nigrogularis helioeides*
11. *Icterus nigrogularis curasoensis*
12. *Icterus leucopteryx bairdi*
13. *Icterus leucopteryx leucopteryx*
14. *Icterus leucopteryx lawrencii*
15. *Icterus pustulatus auratus*
16. *Icterus pustulatus microstictus*
17. *Icterus pustulatus pustulatus*
18. *Icterus pustulatus graysonii*
19. *Icterus pustulatus formosus*
20. *Icterus pustulatus maximus*
21. *Icterus pustulatus alticola*
22. *Icterus pustulatus flammulatus*
23. *Icterus pustulatus pustuloides*
24. *Icterus pustulatus connectens*
25. *Icterus pustulatus sclateri*
26. *Icterus pectoralis pectoralis*
27. *Icterus pectoralis anthonyi*
28. *Icterus pectoralis espinachi*
29. *Icterus gularis tamaulipensis*
30. *Icterus gularis gularis*
31. *Icterus gularis yucatanensis*
32. *Icterus gularis xerophilus*
33. *Icterus gularis gigas*
34. *Icterus gularis troglodytes*
35. *Icterus bullockii abeillei*
36. *Icterus bullockii bullockii*

Note. The temperate zone *I. galbula* is not mapped.

has a palatal knob such as he described for Central American *I. gularis*. Examination of many examples of *nigrogularis* shows, however, that some individuals lack the knob entirely. It seems to exist as an allele that adaptively segregates under isolation in *gularis*.

A more extensive range must be assumed for *nigrogularis* in the early Pliocene for two distinct groups spring from it to follow largely parallel evolutionary trends. The first stems from *I. chrysater* (Fig. 8), a yellow-backed subtropical offshoot of *nigrogularis* in northern Colombia and Venezuela. This black-tailed, black-winged species which has the variable wing white of *nigrogularis* completely suppressed, gives rise to a nectar-feeding derivative, *I. mesomelas*. Peripheral forms of each in Ecuador and Central America add black and white as an evolutionary advance.

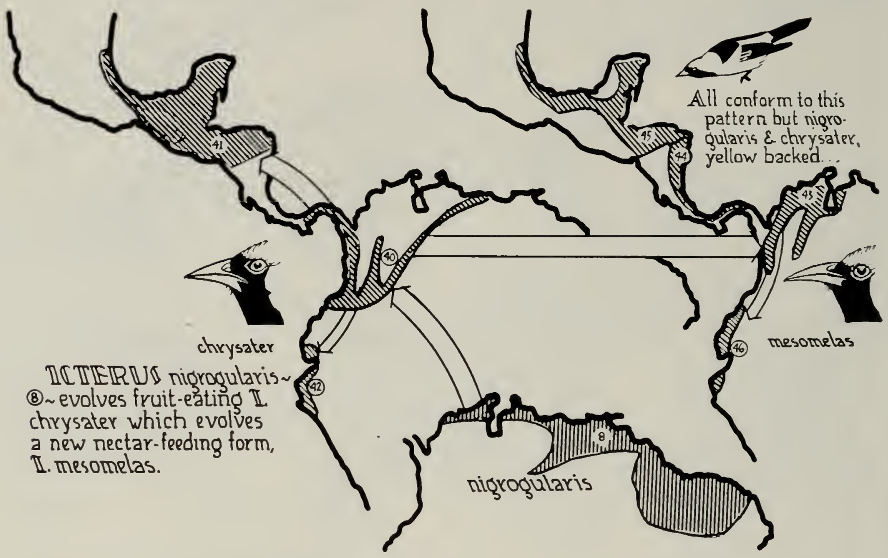

FIG. 8. Evolution in the genus *Icterus.*

8. *Icterus nigrogularis nigrogularis*
40. *Icterus chrysater giraudii*
41. *Icterus chrysater chrysater*
42. *Icterus grace-annae*
43. *Icterus mesomelas carrikeri*
44. *Icterus mesomelas salvinii*
45. *Icterus mesomelas mesomelas*
46. *Icterus mesomelas taczanowskii*

The second group (Fig. 7) has the wing white of *nigrogularis* in all forms and likewise progressively adds black to the back. More important, it shows the segregation of the palatal knob in *I. gularis* as a seed-cracking adaptation. A fruit-adapted counterpart, *I. pustulatus*, lacks it entirely, even evolving the nectar-adapted species *pectoralis*—and all three occupy the same Central American range, from which they have evidently displaced the parent *nigrogularis*. All have roughly the same plumage pattern—one which is virtually identical with that of convergent *Bananivorus cucullatus*.

The chrysater-mesomelas Group. Taking up the first group in detail, *Icterus chrysater* (Fig. 8, *40* to *42*) is believed to be a subtropical offshoot of *nigrogularis* (*8*) in northern Colombia and Venezuela. It is yellow-backed like *nigrogularis* but completely lacks wing white in the ancestral range occupied by *I. c. giraudi* (*40*)—under which Miller (1947) has synonymized *I. hondae* Chapman. The fruit-adapted *grace-annae* (*42*), cut off from *giraudi* in the subtropical zone of West Ecuador by the early Pliocene origin of the Chocó forest, has added black to the back and introduced some white in wing and tail. The Ecuadorean form of the associated nectar-feeder—*I. mesomelas taczanowskii* (*46*)—also adds white to these parts. Examining the representatives isolated in Central America, however, we find that *I. chrysater chrysater* (*41*) is little different from the Colombian parent form, *giraudi*. In fact the range disjunction is probably post-Pleistocene. But the same Pleistocene lowering of life zones resulting in the subtropical bridge linking them from Colombia to northern Nicaragua is believed to have eliminated the tropical zone from Panama. Hence, the range disjunction between *I. mesomelas carrikeri* (*43*) in Colombia and *salvini* (*44*) in western Panama is of Pleistocene origin. Whereas these forms are correspondingly similar, *I. mesomelas mesomelas* (*45*) in the northern part of the Caribbean rain forest shows longer isolation from *carrikeri*, and introduces white in the wing as did *taczanowskii* (*46*) in Ecuador. All forms of *mesomelas* differ from *chrysater* in having yellow outer tail feathers, a character which may be specially selected for in the humid forest.

That the advance in these peripheral forms to black back and wing white represents a trend upward in time as well as outward in space from the center of origin can be supported readily. *I. mesomelas*, as a nectar-adapted form derived from *I. chrysater*, is later in time, and wherever forms of the two occur in the same region *mesomelas* is more advanced in these characters.

The pustulatus-pectoralis-gularis Group. There seems to be little doubt that a population of *nigrogularis* (Fig. 7, *8*) became isolated in Central America when the northern part of the Chocó forest cut this arid region off from arid northern Colombia. This population probably evolved the island species *I. leucopteryx* in the Caribbean: *I. leucopteryx bairdi* (*12*) may have ventured out on the partial Cuban bridge after *Bananivorus* and, finding the ridge from Cuba's Sierra Maestra faulted out, remained on Grand Cayman; *leucopteryx* (*13*) may have used another incomplete birdge to Jamica; *lawrencei* (*14*) could have reached St. Andrews by a short hop from the same bridge. But it was probably in volcanic Guatemala that *nigrogularis* broke down into the three modern species which have adaptively segrated its bill characters.

The *nigrogularis* population evidently occupied all of arid Central America and one might easily take *auratus* of Yucatan (*15*) to be a form of the ancestral species. It is, however, more likely a form of the modern Central American descendant of *nigrogularis*, i.e. *Icterus pustulatus* (*15* to *25*), from which it has become separated by the late Pliocene origin of the Caribbean rain forest. *I. pustulatus auratus* (*15*) may thus be seen to grade into the races formerly known under *I. sclateri* (*19* to *25*) but which Dickey and van Rossem (1938: 522) have shown to be conspecific with *I. pustulatus* (*15* to *18*). Hence, *Icterus pustulatus* as here recognized includes forms *15* to *25* in figure 7.

There is a significant plumage gradient in this species outward from arid Guatemala where the black-backed *alticola* (*21*) is considered the most advanced form. Those races formerly under *sclateri* which occur on both sides of this form—*formosus* (*19*), *maximus* (*20*), and *flammulatus* (*22*)—have the black of the back broken up into streaks or spots with alternate yellow. The south-ranging races of the former *sclateri*—viz. *pustuloides* (*23*), *connectens* (*24*), and *sclateri* (*25*)—seem to be retarded peripheral forms in which black is even less developed. Similarly, the north-ranging races—*pustulatus* (*17*), *microstictus* (*16*), and *graysonii* on Tres Marias islands (*18*)—show less black in that order. The last form often has the back completely yellow. This is also the case with Yucatan-isolated *auratus* (*15*) and marks all these peripheral forms as static representatives of *pustulatus* in relatively stable environment—thus little advanced beyond ancestral *nigrogularis*. Conversely, the increase in black on the backs of forms isolated in the strike-faulted, volcanic Guatemalan area (Fig. 9) is evidently the result of repeated population disjunctions. Indeed, the position of any form on the gradient toward the plumage pattern under selection in the arid tropical zone seems to be a function of the number of distinct population isolations in its phylogenetic history.

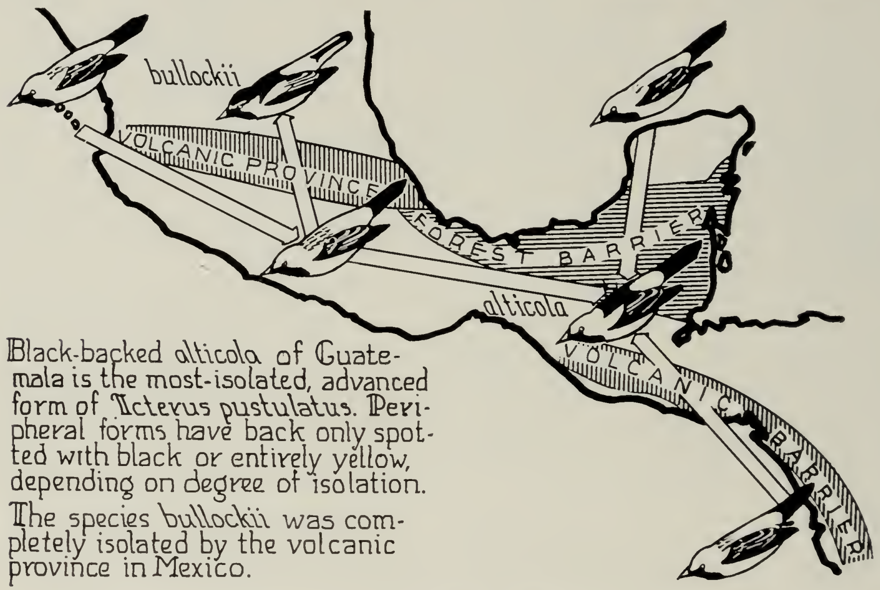

FIG. 9. Plumage gradient in the forms of *Icterus pustulatus* and origin of *Icterus bullockii.*

It is significant that *nigrogularis* appears to have evolved the 3 modern forms which segregate its bill characters in Guatemala. The variable palatal knob, an allele that may be present or absent in *nigrogularis*, has become fixed in *gularis* but completely lost in *pustulatus* which otherwise closely resembles that species. Variable bill length in *nigrogularis* has been further segregated in *pustulatus* to evolve the slender, decurved bill of nectar-feeding *pectoralis*. A single species has become 3, largely as a result of diet adaptations.

Griscom (1930: 16) has pointed out that *Icterus pustulatus*, *pectoralis* and *gularis* vary in a parallel manner. He observes (1932: 399) that "The variations of all three species are exactly alike, wherever they occur together, provided they do vary." All uniformly decrease in size peripherally throughout the arid tropical zone; show overlapping habitat preference; and, as Dickey and van Rossem observe (1938: 520), all three may nest in the same mimosa tree. Gause (1934: 20) and Lack (1944: 274) have shown that such an occurrence would be possible only when the diet is different in each species. Although field observations are lacking to show that this is so, the anatomical picture is unmistakable. *Icterus pustulatus* with its strong mandibular ramus and posterior extension of the mandible—a lever to be acted upon by the over-developed *M. depressor mandibulae*—clearly eats fruit by gaping. The palatal knob and heavier bill and adductor musculature of *I. gularis* permits it to crack seeds as well as eat fruit. The slender, decurved bill of *I. pectoralis*, with its weakened ramus and *M. depressor mandibulae*, does not prevent it from eating fruit but is obviously better adapted for probing flowers. Curiously, its only potential oriole competitor, the convergent *B. cucullatus*, does not occur in its range (Figures 5, 7) though it overlaps completely with *gularis* and *pustulatus*. Biotic pressure between these two nectar-adapted forms has apparently resulted in mutally exclusive ranges.

The conclusion seems warranted that, while all 3 species may be able to feed on fruit, nectar, and insects, each gets out of competition with the others in a hard pinch by going off into its special feeding niche. Only *I. gularis* is permanently resident where it breeds (Dickey and van Rossem, 1938: 526); *pustulatus* and *pectoralis* migrate during the dry season. This species probably eats seeds at such times, but what is needed here is a thorough ecological study of the 3 species.

We may append some information about time relations. *Icterus gularis* (Fig. 7, *29* to *34*) apparently arose before *pectoralis* since the forms of the arid *gularis*—viz., *tamaulipensis* (*29*) and *yucatanensis* (*31*)—have been separated by the Caribbean rain forest. As in the case of *Bananivorus cucullatus*, this dates *gularis* as earlier than the late Pliocene uplift which set up the conditions for this forest. On the other hand, since *pectoralis* (*26* to *28*) does not occur on the Yucatan Peninsula at all and is prevented from getting there today by the forest, the latter was already there when this species arose. Finally, if *pustulatus* arose by segregation of the palatal knob, it is the same age as *gularis* by inference.

Trend Toward Further Addition of Black in Temperate North America.

Further addition of black to the arid zone pattern could only reduce conspicuousness, and the black head and neck of the Baltimore Oriole in eastern North America seems to have precisely this purpose. This species, *I. galbula*, evolving from *pustulatus* through the intermediate Bullock's Oriole, *bullockii*, has followed a parallel trend to become convergent with the Orchard Oriole, *Bananivorus spurius* (frontispiece). Convergence, then, explains the many dissimilarities between these familiar species of the humid temperate zone.

Icterus bullockii bulockii (*35*) and its race *abeillei* (*36*) are clearly more northerly derivatives of *I. pustulatus*. Juvenal specimens of *bullockii* occur which are strikingly like the most advanced, black-backed forms of *pustulatus* in interior Guatemala. Some of these have the head nearly yellow and the black of the head in adults is always underlain by yellow. It is believed, however, that *bullockii* arose from the form *I. p. pustulatus* (*17*) farther north in the *volcanic province* of the Mexican Plateau (Fig. 7, 9). Although this form does not have a completely black back like *bullockii*, we have seen abundant indication that this feature is being selected for with each new isolation.

The present area of overlap between *pustulatus* and *bullockii* is the most likely scene of the original isolation producing the latter; it is in fact a great physiographic province. Hill (1908) describes the Mexican Plateau as a peneplain elevated in the Pliocene and dipping northward beneath the scarp of the Colorado Plateau. Near its southern face, on an axis between Cape Corrientes on the west and Jalapa on the east, the folding becomes abruptly east-west instead of the northwest-southeast prevailing northward. A major fracture is indicated in this area which Thayer (1916) has called the *volcanic province* (see Fig. 9). Volcanic peaks rise 5000 to 10,000 feet above the plateau and lava and other volcanics in filling the extensive lakes have caused them to overflow into adjacent drainage patterns. The barrier (see Pleistocene deposits on Map 13 in Sanchez, 1942) was virtually complete.

Since this barrier is late Pliocene-Pleistocene in age and completely separated populations to north and south except on the extreme Pacific side, virtually all the orioles in this area show range disjunctions. In fig. 6 the range of *I. graduacauda graduacauda* (*6*) is disjunct from the ranges of *auduboni* (*7*) and the new forms farther north, though *graduacauda* has partially re-occupied the devastated area. In Figure 7 the ranges of *I. p. pustulatus* (*17*) and *I. bullockii abeillei* (*35*) are disjunct with an expected degree of recent confluence; so are the ranges of the *gularis* races, *tamaulipensis* (*29*) and *gularis* (*30*). In Figure 5 *B. parisorum* (*17*) may owe its original disjunction from *maculi-alatus* (*18*) to this barrier. The latter then gradually succumbs to competition with *wagleri* (see Griscom, 1932: 391). *B. cucullatus cucullatus* (*20*) is disjunct from *californicus* (*21*) here, though the latter apparently did not have its range completely severed along the Pacific coast. *B. wagleri* appears not to conform, the break between *wagleri* (*15*) and *castaneopectus* (*16*) coming too far north. This seems to be a taxonomic error, however; Griscom (1932: 393) shows that specimens from Tepic, Jalisco, and Colima on the Pacific side (where the range would be less broken by volcanism) are as large as any *castaneopectus* examples. Finally, Dickey and van Rossem (1938: 530) remark a gradual blending of the two forms inland (to be expected after volcanism subsided there), and further note that the southern boundary of *castaneopectus* cannot yet be fixed.

Returning now to *Icterus bullockii*, we see in this species the first sign of increasing black in the head which will bring the derived Baltimore Oriole into convergence with the Orchard Oriole in eastern North America. Following its isolation north of the *volcanic province*, *bullockii* could range through all the arid country west of the Rocky Mountains in North America—even entering the westernmost tongue of the oak-hickory forest in southern Texas by early Pleistocene. Since variants increasing black in the head and decreasing wing white were probably under selection here, a physiographic-climatic barrier isolating this population in the more humid oak-hickory could have resulted in *I. galbula*.

Such a barrier in southern Texas can hardly be visualized before the Pleistocene. Recent studies of Pleistocene pollen profiles in peat bogs indicate that the northern spruce-fir forest reached as far as Florida on the east (Davis, 1946) and Austin, Texas, on the west (Potzger and Tharp, 1947)—at least as outlying bogs. Stenzel (personal communication to Potzger and Tharp) believes the Austin forest came from the Rocky Mountains via the Edwards Plateau. It would thus have interposed a wedge between the pinyon-juniper to the west and the oak-hickory to the east—contiguous today—blocking the eastward spread of *bullockii*. The latter could only enter the oak-hickory where it meets the desert scrub on the Texas coastal plain below the Balcones Escarpment—the south face of the plateau. If this corridor were blocked by a wedge of marsh cutting north to the escarpment from the Rio Grande embayment or delta (Schuchert, 1935; Barton, 1930), the population evolving into *I. galbula* could have been isolated in the oak-hickory—its black head and neck becoming fixed under selection.

The isolation resulting in the Baltimore Oriole was probably of short duration. Sutton's discovery of a narrow hybrid zone in Oklahoma (1938) suggests that subsequent withdrawal of the spruce-fir from the Edwards Plateau permitted *bullockii* to re-enter the oak-hickory to the north. A complete series of intergrades with *galbula* occurred here. The occurrence in the same part of Oklahoma of the hybrid zone for the xeric Lazuli Bunting (*Passerina amoena*) and the Indigo Bunting (*P. cyanea*) of the oak-hickory suggests the isolation of other species in the deciduous forest with *galbula*. Kinsey's gall wasps (1930), especially *Cynips mellea* and *villosa*, suggest a spruce-fir barrier on Edwards Plateau. Disjunctions between grackles and jays in Florida and Texas (Chapman, 1939; Amadon, 1944a and b) suggest that the deciduous forest may have been largely forced back to these points in the Pleistocene (cf. Braun, 1947).

Hybrid zones imply a temporary barrier recently removed—a condition most readily met by glaciation and volcanism. Hybridization in the Pacific Northwest is probably due to Quaternary volcanism (see Lobeck, 1941); the Mexican hybrid towhees reported by Blake and Hanson (1942) and worked out by Sibley (in press) may be due to Pleistocene volcanism. Since hybrids are less well-adapted than either parent form (Dobzhansky, 1941: 288), they probably tend to be resorbed rather promptly.

A slightly different situation resulted in the isolation of the Orchard Oriole (*B. spurius*) from *fuertesi*. In the Pleistocene the latter could probably range into Texas in shrubby borders of the coastal marsh (Thayer, 1916: 83) and could have isolated *spurius* in the oak-hickory when the plain pinched out against the scarp. The present range of *fuertesi* in southern Tamaulipas is the result of subsequent obliteration of the coastal plain in the intervening area. At any rate the Louisiana marsh habitat of *spurius* described by Oberholser (1938: 591) is strangely like that noted for *fuertesi* along the Tamesi river by Chapman (1911).

Principles and Trends Noted in the Orioles

It has not been possible to make valid comparison between the present phylogenetic scheme of the orioles (frontispiece) and the listings of previous reviewers because their works did not emphasize relationships, except as they might be inferred by position in a linear series. It is evident that their methods were in strictest adherence to the taxonomic procedure of inferring degree of relationship from degree of morphological (really external) resemblance. Adaptive modification of bills obscuring the relationship of close forms on the one hand and plumage convergence falsely indicating relationship in more distant forms on the other, could not be dealt with under a static approach.

Evolution is a process of movement and change. The 2 genera, 26 species and 76 forms of orioles here recognized are the result of intense selection in a constantly changing environment. In fact, so large a number of forms can only be accounted for by the wide latitudinal range of the group, broken up by physiographic and climatic barriers throughout its developmental history.

Geographical Isolation. The salient fact is that the area of greatest geological activity (northern South America and Central America) has produced the most forms. Moreover, the repeated close agreement of relative date of geological event with that required by the observed speciation in both genera (and of duration of isolation with degree of difference) is far too consistent to be of chance occurrence. Although we may see in the Amazonian races of *Bananivorus cayanensis* examples of Wright's (1943, 1946) "isolation by distance," the isolation of all other species and even races has been traced to some geological event. This is strong support for the view that all vertebrate species, including sympatric species, result from geographical isolation (Mayr, 1942, 1947).

My most striking case of sympatric species is that of the closely related

Icterus pustulatus, *pectoralis*, and *gularis* (Fig. 7) which not only occupy the same range in Central America but frequently nest in the same mimosa tree. There is every reason to believe that their initial isolation occurred in Guatemala as a result of the late Pliocene crustal movement and volcanism that has produced the present physiography there (Powers, 1918). With the uplift of the Sierra de las Minas, *I. pustulatus* of the Motagua valley (Fig. 10 A) could have pinched off the population which to northward in the Negro-Chixoy valley evolved as *gularis* (B). To the southward *pustulatus* is believed to have evolved *I. pectoralis* (C) in the Pacific Lowlands as a result of the extreme volcanic activity in the more recent Pacific Cordillera. Since the latter shows considerable

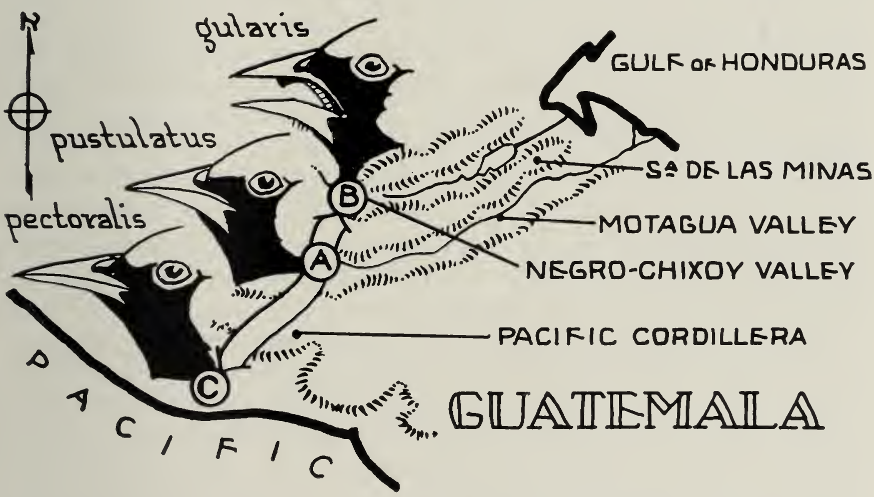

FIG. 10. Sympatric speciation in *Icterus pustulatus*, *pectoralis*, and *gularis*. *Icterus pustulatus* in the Motagua valley of Guatemala (A) isolates gularis in the Negro-Chixoy valley (B) by the uplift of Sierra de las Minas. *I. pectoralis* becomes isolated from *pustulatus* in the Pacific lowlands (C) by the volcanism in the Pacific Cordillera. Subsidence of volcanism and revegetation permits all three species to range throughout arid tropical zone of Central America.

black spotting on the breast not found in the other two, we should expect southern races of *pustulatus* to have individuals with this character. Dickey and van Rossem (1938: 524) report this in specimens of *I. pustulatus alticola* and *pustuloides*. Since *pectoralis* also has a curved, nectar-adapted bill, it is interesting to note that southern races of *pustulatus*—e.g. *sclateri* and *microstictus*—show greater indication of curvature in the culmen than northern races.

Thus, a combination of block-faulting and volcanism in the east-west mountains of Central America, trending athwart northward dispersal from South America, has provided opportunities for isolation unexampled elsewhere. No oriole range has crossed the Mexican Volcanic Province (Fig. 9) without breaking up and Guatemala has presented a similar barrier. The strike-faulted transverse valleys—arid inland but blocked by forest on the east coast and by volcanism headward—could have initially isolated these sympatric species, subsequent revegetation upon volcanic subsidence permitting their ranges to flow together. Increased post-Pleistocene aridity doubtless helped.

It may be argued that these two genera illustrate divergence southward instead of convergence northward. The objections to northern origin of the orioles are many and I will give only a few. The sympatric overlap of most of the species of *Molothrus* and *Agelaius* in the pampas region of South America, whereas only one form of each occurs in North America, strongly argues southern origin for the orioles evolving from the latter genus. An abrupt origin from *Agelaius phoeniceus* in the north of brightly colored orioles which then southward subdue their color until it is almost black in the Amazonian forest would lack an explanation in terms of selection pressure—to say nothing of the unlikelihood of so disjunct an origin from *A. phoeniceus* at the outset. Moreover, the geological events causing speciation in the orioles from northern Colombia to southwestern United States succeed each other in the time scale northward so that the northernmost forms are the most recent; it does not "work" backward. Finally, the replacement in northern South America of the three sympatric Central American species by a single variable species, *nigrogularis*, which would perpetuate their adaptive bill characters as variants, can have no known evolutionary mechanism.

Adaptive Plumage Trends. One could predict that oriole speciation, northward in latitude, upward in altitude and often in new life zones, would lend itself to the following of trends. This is obviously true, since the convergent movement of the two genera out of the humid tropics into the arid tropics and finally into the temperate zone is as clearly a progression upward in time as outward in space from center of origin. As such it furnishes a picture of response to selection pressures infinitely more valuable—since these birds are all living—than a mediocre fossil record. The convergence of *B. cucullatus* and *auricapillus* toward the identical plumage pattern found in the three sympatric species of *Icterus* suggests a perfection of this pattern for the arid tropical zone. Since the female is as bright as the male protection is apparently not a factor, being assured by the trait of nesting in thorn trees or trees with wasp nests—noted also in the colonial cassique (*Cacicus cela*) by Cherrie (1916: 204). Nests of *I. gularis* on telephone wires (Sutton and Pettingill, 1943: 130) may be associated with thorn-protected ones by predators and left alone.

There is, however, a gradual tendency northward for orioles entering the temperate zone of North America to evolve sexual dimorphism with duller females and to select hidden nest sites. Dickey and van Rossem (1938: 138) cite this in the northern races of *I. pustulatus* and suspect it in *graduacauda* while I have found it in northern races of *B. cucullatus*. All orioles reaching the United States are dimorphic besides generally reducing yellow in favor of black in the plumage, though the woodland forms of *Icterus* introduce yellow flash-markings in the tail, as does *B. parisorum*. This general trend toward inconspicuousness extends to habit also and may be due to the dropping out of thorn trees and wasp nests in the north. The "abrupt" reappearance of chestnut in *B. spurius* in this trend is only apparent, the color having only been suppressed in earlier forms. It is still evident in specimens of *B. cayanensis* and *chrysocephalus*, and is only partly displaced by yellow in *prosthemelas*. The latter will be recalled as evolving *fuertesi* which is transitional to *spurius* in the revival of chestnut. The color also persists in Caribbean forms of *Bananivorus*.

The question may arise as to the amount of compliance in these trends to Gloger's (or Allen's) rule. As stated in Hesse, Allee and Schmidt (1937: 395), mammals and birds inhabiting humid regions are supposed to have more melanin pigmentation and those of arid regions, more phaeomelanin (yellow and reddish-brown) pigmentation. The opposite trends of *Bananivorus* and *Icterus* within the humid tropical zone indicate little agreement with the principle and it is thought that it may not be applicable to species obviously developing ruptive patterns. On the other hand, the tendency to add black as both genera enter the humid temperate zone suggests compliance.

Within a given life zone we have seen that the plumage pattern tends to remain static while new species arise with bill adaptations to different diet; with changing life zones the plumage pattern tends to change while the bill adaptation for a particular diet remains static. Whatever the combination in a given species it appears to be highly adapted for the niche it occupies. Aside from the possible exception of *B. cayanensis* which still bears the blackbird plumage pattern at the center of origin, I cannot point to a single non-adaptive feature in orioles. It seems likely that in a highly competitive group they are eliminated. From the Pleistocene and Recent fossils described by Wetmore, Miller and others, it is clear that the number of poorly-adapted forms extinguished even in so young a group as the Icterinae may be startling.

Evolution and Systematic Categories. Evolution in the orioles, despite extinctions, is smooth. Species and even the genera arise without strong disjunction and it is generally unnecessary to invent hypothetical ancestors because the parent forms still exist. The derivation of orioles from blackbirds may suggest that the borders of the higher categories are unreal but the disjunctions in bill, diet, and habitat can, under selection pressure, only diverge still more. Against this, it may be seen from races and hybrids that the species is not as real at the borders as many workers at this level like to believe; it is real but its chief merit lies in its position as a definable, fundamental unit. However, even as the species tends to stabilize itself with time, so does the higher category based on diet and habitat adaptations, draw away from other higher categories.

I am unable, therefore, to follow Kinsey (1936) in his contention that there are no higher categories and no centers of origin. Every vertebrate species must have a center of origin by virtue of its initially complete isolation from a parent species. Nor are the higher categories unreal; they are branches on a phylogenetic tree, each in adaptive response to selection pressure in a particular direction. The same is evident at the species level in the orioles and genetic drift (Dobzhansky, 1941: 332; Wright, 1940) seems to have been ineffective against selection here. The opposite plumage clines, occurring as convergent time trends in two distinct phyletic lines, strongly suggest the elimination of variants from the pattern under selection.

Summary

An attempt is made to explain in evolutionary terms the apparent convergence of two phyletic lines (genera) in the orioles. It is shown that selection of new lines of birds usually hinges on dietary modification of the bill and jaw musculature and that the two lines have arisen from opposite ends of the blackbird genus *Agelaius* by specializing its pre-adaptations. The fruit-adapted *Icterus*, including the Baltimore Oriole, increases the gaping power of the mandibles; the nectar-adapted *Bananivorus*, including the Orchard Oriole, reduces the mass of bill and skull. The segregation of the genera and species results from the isolating influence of geological events which have often operated indirectly through associated climatic change.

The replacement of chestnut by yellow in the plumage of *Agelaius* is regarded as a time trend; the chestnut humeral patches of the relict *A. humeralis* on Cuba reflect the ancestral condition of *A. thilius* at the time it evolved the oriole *Bananivorus* in the pampas region of South America. No clear-cut characters separate the latter from *Icterus* because of the convergence but comparison of the two in the same region and life zone shows *Bananivorus* to be always smaller. It evolves from *A. thilius* north of the pampas without plumage change, simply by adapting to nectar and soft fruit, but adds yellow northward under obvious selection pressure to increase conspicuousness in its new forest habitat. The same trend is noted in the Caribbean where peripheral Bahaman and Lesser Antillean forms derived from *B. dominicensis* of the Greater Antilles increase yellow, and this is seen as a trend upward in time as well as outward in space from center of origin. *B. prosthemelas* of the Caribbean rain forest evolves arid zone forms which increase yellow still more to achieve the pattern convergent with that of *Icterus* forms in the same zone. Northward in the temperate zone, under apparent shift in selection, it evolves less conspicuous forms also convergent with *Icterus* forms there.

The fruit-adapted *Icterus* arises in the pampas region from the yellow agelaiine *Xanthopsar*, its forms showing an opposite trend northward to reduce yellow which results in the arid zone convergence with forms of *Bananivorus*. Two lines branch from the key species *nigrogularis*—a humid-adapted *chrysater* group with a derived nectar-feeding form and the arid zone *pustulatus* group of

Central America. The latter segregates among three species bill adaptations for fruit, seeds, and nectar existing as variants in the parent *nigrogularis*. Evolving from this group northward, *bullockii* splits off the Baltimore Oriole in the oak-hickory forest where it is convergent with the Orchard Oriole, evolved by *B. prosthemelas* via intermediate *fuertesi*.

Certain trends and principles are illustrated by both genera. The importance of geographical isolation is emphasized, the splitting off of virtually each form being assigned a geological or climatic event. The convergence toward identical plumage in Central America suggests selection for conspicuous pattern; that northward suggests selection shift favoring inconspicuous pattern as the protection of thorn trees and wasp nests dies out. Although evolution of species from species is smooth the evidence of geographical isolation in the orioles does not support Kinsey's view that there are no centers of origin and no higher categories. The suggestion is made that numerous other cases of inter-generic convergence and especially parallelism may occur in passerine birds.

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Several occurrences of the Evening Grosbeak (*Hesperiphona vespertina*) in eastern Ohio were recorded in the winter of 1949–50:

(1) Along Mill Creek, near Youngstown—8 on December 26;

(2) Five miles northwest of Salem—11 on January 1;

(3) Near Londonville—66 on January 2.

Stimulated by these records, I am making a survey of this invasion into Ohio and adjacent areas. Will persons please send me records of Evening Grosbeaks for this survey?

Raymond O. Marshall
RFD #2, Columbiana, Ohio

Ornithologists are urged to collect data on the timing of bird songs because this aspect has been neglected. To record the data merely write position of second hand at first notes of successive phrases during continuous song. Example: Towhee, June 24, '49, 10 A.M., 77°F, Palmyra, N. J.; 14-20-28-34-39-45-52-5-11-16. For fast singers such as the Red-eyed Vireo, record the number of phrases in 60 seconds. I shall be glad to correspond with anyone desiring to collect records.—George B. Reynard, 728 Parry Ave., Palmyra, New Jersey.

GENERAL NOTES

DEVELOPMENT OF A REDWING (*AGELAIUS PHOENICEUS*)

In 1938 I had the privilege of raising 2 families of young birds under the guidance of Dr. Konrad Lorenz in Altenberg, Austria, and since then, have raised over a dozen birds of 4 species in this country. I found that all these passerines followed the same general pattern of development, yet with clear, specific differences. Hand-rearing of birds, combined with careful, continuous observation, gives the student a knowledge of much of the instinctive equipment of a species, as well as information on the learning process. It gives an insight into the character of a species which can be gained in no other way.

Two female Redwings, each removed from its nest at an age of 9–10 days, were hand-raised to study their behavior. Comparing their development with the schedule shown in Nice (1943:15, 34, 57) these 2 Redwings had attained essentially all the motor coordinations of the first 3 stages by the time they left the nest. The most striking of these are as follows: Stage 1, coordinations mainly concerned with nutrition—gaping; Stage 2, first appearance of new motor coordinations—preening, stretching legs up, screaming, cowering; Stage 3, rapid acquisition of motor coordinations—stretching wings up, stretching sidewise, scratching head, shaking self, location call. In the short interval between the time I took F and the time she left the nest, I did not see any fanning or fluttering of the wings.

Comparison of Development of 3 Species

In Table 1 a comparison is given of activities of Stages 4 and 5 as they appeared in the Redwings, in Song Sparrows (*Melospiza melodia*), and in a Cowbird (*Molothrus ater*) that I watched to the age of 25 days (Nice 1939). (From their appearance, when found on July 6, from their spontaneous leaving of their nests on July 8 and 9, and from their attainment of skillful flight on July 15 and 16, the Redwings are assumed to have hatched June 29 and 30. The sex of the birds was known by their comparatively small size, their tarsi measuring 28 mm. on July 8. The older bird, W, was raised by Mrs. Winifred Smith, Two Creeks, Wisconsin.)

Stage 4 in these 3 species is characterized by leaving the nest, establishment of locomotion, and first appearance of independent feeding coordinations. Stage 5 is characterized by attainment of flight and of gradual independence in feeding and social behavior. With some passerines, Stage 4 is passed in the nest. This is true of species nesting in protected places—Group II in Table V (Nice 1943:70): Sittidae, Cinclidae, Sturnidae, Laniidae, Hirundinidae, Regulidae; and Group III: Paridae, Certhiidae, Ploceidae, Troglodytidae, Sialia in the Turdidae, Muscicapidae, Motacilla in the Motacillidae, and also Carduelinae on the Fringillidae. Others leave the nest before they can fly, spending Stage 4 in the open—Group IV: Sylviidae, most of the Turdidae, Anthus in the Motacillidae; and Group V: Alaudidae, Icteridae, Mimidae, Parulidae, and Fringillidae except the Carduelinae. (These observations are based on birds in the North Temperate Zone.)

With the Song Sparrow, Stage 4 means a week of retirement in which the fledgling hides in the undergrowth, calling to its parents with the location note; the bird is independent of nest and siblings, but strictly dependent on its parents for food.

The first 4 instinctive activities in Table 1 appear on the first day. Walking came a few days later with the 2 Icterids. The next 4 activities, concerned with food getting, are largely experimental and might be considered premature manifestations. As to bathing, if by accident a 13- to 15-day old bird blunders into a dish of water and responds with bathing movements, it often does not know how to dry itself.

Stage 5 begins with the attainment of skillful flight and lasts until the independence of the young bird. The little Song Sparrow comes out of retirement, pursues its parents for food, meets its siblings again and quarrels with them, and gradually, through maturation and trial and error, becomes able to feed itself entirely.

The Redwing's development closely paralleled that of the Song Sparrow, the chief difference lying in the fact that the former is less of a ground bird than the latter. Instead of hopping over the floor as did the Song Sparrows, she stepped, hopped, walked, and flew. She also showed more of a tendency to climb than they, something also noted by Mrs. Laskey (personal communication) with her hand-raised Redwing. She walked much less than did the Cowbird, but was far more active and skillful in movement than that individual. Another marked contrast lay in the begging behavior of the 2 birds: the Cowbird persistently begged from all the Song Sparrows, young and adult, as long as we had it; the Redwing begged from our adult hand-raised Meadowlark, *Sturnella magna*, the first time they met, but never again, and never from the young Nighthawk, *Chordeiles virginianus*.

TABLE 1

Maturation of Some Instinctive Activities in Three Species

	AGE IN DAYS		
	Redwing	Song Sparrow	Cowbird
Stage 4			
Leaving nest	10	10	11
Hopping	10	10	11
Flying	10	10	11
Sleeping in adult position	10	10	11
Walking	12	10	13, 15
Exploratory pecking	13	12, 13	14
Watching prey	13	12, 13	
Drinking	13	13–16	16*
Picking up food	14	12–14	
Bathing	13	13–15	16*
Stage 5			
Flying well	17	17	
Frolicking	16	17, 18	
Antagonism note	14	17	21
Threatening	17	19	
Fighting	20	19, 20	
Alternate wing motion in bathing	25	20–25	16*
Prying with bill	21		
Shelling seed	30	26	
Adult notes	37	28	
Sunning	39	29–34	
Nest molding	39	35, 52	

* First opportunity

Innate and Learned Behavior

All the activities in Table 1 are examples of innate modes of behavior. Learning is concerned with the object of the instinctive reaction. This means—in flying, suitable landing places; in feeding, that which is or is not edible; in social relations, distinguishing between social companions and enemies.

Motor Coordinations. It was not until F left the nest that she slept with her bill in her scapulars, as W had done the previous night. On July 10 F flew 2.5 feet and climbed a philodendron plant and the window screen. She appeared to have no difficulty in landing. On the 11th I first noted the juvenile behavior of stretching legs up and wings down at the same time; this was occasionally seen until July 19. W had done it July 9. During the first 4 days out of the nest F walked and hopped and took her first bath, thoroughly soaking herself; she shook herself vigorously, but made no attempt to dry herself by preening.

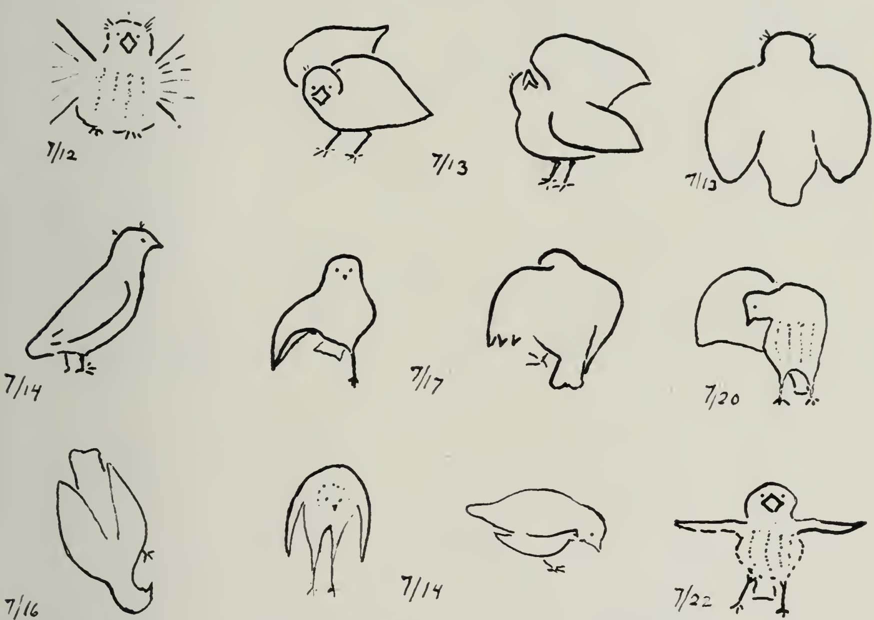

FIG. 1. Instinctive Movements of Young Redwing
Top row: begging, climbing on screen.
Middle row: stretching sidewise, preening.
Bottom row: climbing on screen, stretching legs up and wings down, scratching over wing, begging.

Stage 5 was ushered in on the 15th by "frolicking"; she gave wild hops hither and yon with the aid of her wings. After 4 weeks of age she frolicked entirely on the wing, flying madly back and forth in her cage. On the 16th she flew to the top of the sunporch; she circled about and tried to alight on the wall. (W was released on July 15; she flew well and was adopted by adult Redwings.) On the 17th F walked most of the time, occasionally hopping; at 5 weeks hopping was no longer seen. On July 20 she started to pry with her beak like a Meadowlark, Bronzed Grackle, *Quiscalus quiscula* (Laskey 1940), or Starling, *Sturnus vulgaris;* this became one of her favorite occupations, prying apart the leaves of books or newspapers when held by one of us, and probing under other objects. On Aug. 7 as she lay on my apron, she opened her wings and went through motions of nest molding, picking up the flounce of my dress and tucking it under her. She was a very active, alert bird, constantly busy, examining the objects in her environment, tweaking, pecking, and probing them.

FIG. 2. Development of Redwing

July 8: F crouching in improvised nest; F taken out of nest.

Feeding Behavior. On July 9 I first noted F fluttering her wings when begging. About every 50 minutes she began to call with a single location note. She crouched low to beg. The next day her food call was double and, when she was fed, it became triple. On the 13th she started giving this triple note nearly every time she flew, keeping this up for the next 3 weeks.

The first intimations of independent feeding reactions appeared on July 12; up till now the Redwing had sat motionless between her hourly meals, but now she began to explore her environment with her bill. She pecked at all sorts of things, including a dropping. The next day she picked up food, but dropped it again. On the 14th she tried to catch an ant; on the 15th she picked up and ate a small green insect. On the 18th she readily picked up and ate meal-

FIG. 3. Social Behavior of Redwing

Above: Redwing begging from Meadowlark as latter cautiously approaches the young birds. (July 12.)

Below: Social bond between Redwing and Nighthawk, antagonism between these two and the Meadowlark. (July 22.)

worms, as well as miscellanious small insects crawling out of the net with which we had swept the grass. Four days later she ate a yellow and black beetle about 6 x 2.5 mm. in size.

Her responses to lady beetles showed some confusion. On the 15th she tried to catch one, then suddenly began to beg loudly *chick-chick-chick-chick-chick* with fluttering wings, her open mouth directed towards the beetle on an upright grass stem! Later she saw the beetle again and approached it begging. The next day she went through the same performance before a bit of cottage cheese hanging from the Nighthawk's breast feathers. On July 22 she again gave the food call to a lady beetle, but did not flutter her wings. She finally took it in her bill but dropped it.

She learned to avoid one insect. On the 18th she took a brown stink bug in her bill; she dropped it, and jumped away, frantically trying to scratch her bill with one foot while getting away from the vicinity of the obnoxious creature. She never touched a brown stink bug again, but a few days later sampled a green one. (Curiously enough, the Meadowlark readily ate stink bugs.)

On July 31 she ate small ants, but did not "ant." She caught and ate a small wasp with no ill effects. She knew very well where the mealworms were kept; she flew to their boxes and gathered up stray individuals.

Social Behavior. The Redwing's social companions were people, the Nighthawk and the Meadowlark. The 2 young birds were at first free on a table on the sunporch, but after July 16 spent most of their time in a cage 60 x 80 x 45 cm, while the Meadowlark lived in a larger cage in the same room.

There was a strong and continuing bond to human beings as parent companions and later as social companions (Lorenz 1937). Till the age of 5 weeks she greeted every person entering the sunporch with her food call, and she begged vigorously whenever food was offered. At 4 weeks it was no longer possible to pick her up at will, but she came to us of her own accord, alighting on our heads or hands and on newspapers and magazines we tried to read. She often lay down on my dress and seemed to enjoy gentle stroking. The hand-raised Song Sparrows had lost the social bond to people at the age of 3 to 4 weeks.

A social bond developed between the Redwing and Nighthawk, despite their very different modes of life. The Nighthawk sat motionless most of the time in contrast to the great activity of the smaller bird. Occasionally F pulled at her companion's feathers or toes, and from July 17 to 23 frequently jumped on her back. (This behavior would seem to correspond to that of the 3 week old Song Sparrow's often landing on their fathers.) The Nighthawk never seemed to resent any of these attentions from the Redwing, although she was markedly antagonistic to the Meadowlark after being rather severely pecked by the latter during their first encounter on July 12. From the time F was 3 weeks old, the 2 young birds often lay side by side. It was a surprise to find that the Redwing enjoyed bodily contact with the Nighthawk and our stroking even at the age of 7 weeks.

On July 12 when I introduced the Meadowlark to the young birds, the Redwing gaped and gave the food call as he approached. The next encounter was on July 16 when F had reached Stage 5. I put the Meadowlark on the windowsill near the Redwing; although she had had no unpleasant experiences with him, she opened her bill, held out her wings and gave her antagonism note, a kind of snarl. The same thing happened the following day, while on the 19th, she and the larger bird started pecking at each other; when he gave her a hard peck, she screeched and I removed him. On Aug. 1 she snatched a grasshopper from his bill. Two days later she entered his cage; he threatened her with open bill and she left. Later she stayed in for some time. Sometimes she alighted beside his cage and a sparring match ensued.

In 1940 I did not succeed in making a social companion out of a Cedar Waxwing (*Bombycilla cedrorum*), apparently because a hand-raised Song Sparrow met the specifications far better than I did; the 2 birds ate together, sunned together, preened at the same time, followed each other in flight, and roosted together. The Nighthawk, on the other hand, shared so few of the Redwing's activities that she did not adequately fulfill the place of a social companion, and the social bond remained strong towards the far more active human beings.

Summary

The development of a hand-raised Redwing from the age of 9 to 42 days closely paralleled that of Song Sparrows, the chief difference being that she was less of a ground bird than they and she did not lose the social bond to human beings after becoming independent.

A table is given showing the ages at which 21 instinctive activities appeared in this bird, in

Song Sparrows, and a Cowbird; these activities belong to Stages 4 and 5 in the development of passerines. The Redwing hopped at 10 days and walked at 12; at 4 weeks she walked exclusively. Exploratory pecking appeared at 13 days; 5 days later she was catching insects. A social bond existed between her and a young Nighthawk, and between her and human beings, but her reactions to a year old Meadowlark were largely hostile.

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MARGARET MORSE NICE, 5725 Harper Ave., Chicago 37, Illinois

A LARGE SANDPIPER CLUTCH

In his "Comments on Recent Literature" relating to clutch size in birds, Amadon remarks that sandpipers "lay 4 large eggs; apparently this is the maximum number that can be covered by the parent" (*Wilson Bull.*, **61(2):** 117. 1949.) In view of this statement it may be of interest to record a nest with 5 eggs of the spotted sandpiper (*Actitis macularia*) that I found in early July, 1948, on the border of Mamagekel River, north of Nictau, New Brunswick. By July 7 the eggs had hatched, but the 5 young were still in the nest. Of the many nests of this species that I have examined from Maine to Maryland none has contained more than 4 eggs. Virginia Orr reports finding 5 newly hatched young "in a marshy bit of tundra" in Newfoundland Labrador on July 8, 1946 (*Auk*, **65(2):** 222. 1948.)

Possibly clutches of 5 eggs of the spotted sandpiper are more frequent in eastern Canada than in the eastern United States. It is worth noting that among plovers the average clutch in North America is 4, in the Antilles 3, and in northern South America (e.g., Trinidad) apparently only 2.—JAMES BOND, Academy of Natural Sciences, Philadelphia, Penna.

SWAINSON'S WARBLER ON COASTAL PLAIN OF MARYLAND

Investigations of remote areas in the eastern United States are continually extending the known breeding range of Swainson's Warbler (*Limnothlypis swainsonii*) northward (e.g., southern Illinois, central West Virginia, and recently into southern Delaware and the portion of Maryland east of Chesapeake Bay).

The "Eastern Shore" records, dating back to Cadbury's sight record in 1942 near Willards, and Stewart's specimen in 1946 at Pocomoke City (Stewart and Robbins, *Auk*, 64: 272, 1947), do not indicate recent invasion of the more northern part of the Atlantic Coastal Plain. Conditions in the Pocomoke Swamp, where this warbler occurs, seem to have been ideal since time immemorial, and there are many records of its occurrence in nearby Dismal Swamp, Virginia, dating back to the latter part of the last century. The occurrence of this species can be correlated with the southern element prevailing in the swamp.

Pocomoke Swamp, which appears to be the northernmost of the true southern swamps on the Atlantic Coastal Plain, extends along the Pocomoke River from lower Sussex County, Delaware, to within a mile or so of Virginia. The plant geographer may think of the Pocomoke as a disjunct (area of discontinuous distribution), since this swamp is separated from similar areas. The long sandy peninsula of the "Eastern Shore" of Virginia and the mouth of the Chesapeake Bay separate the Pocomoke from the Dismal Swamp, while the bay lies between the Pocomoke Swamp and the bottomlands of "Tidewater" Virginia.

Principal known nesting areas of Swainson's Warbler in the Pocomoke are (1) near Willards, Maryland, and Selbyville, Delaware, 0.25 miles south of the Delaware line; (2) five miles south of Pocomoke City near the Virginia line. These areas are almost identical in character, and lie on the upland side of the swamp, about a half mile east of the river.

The preferred nesting habitat is the sweet pepperbush (*Clethra alnifolia*) thicket, which is constantly boggy or inundated, where the swamp is in a stage of secondary succession after being cut over to the extent that only second growth forest remains.

The dominant species of the forest community are sweet gum (*Liquidambar styraciflua*), black gum (*Nyssa biflora*), red maple (*Acer rubrum*), magnolia (*Magnolia virginiana*), water oak (*Quercus nigra*), and horse sugar (*Symplocos tinctoria*). Cypress (*Taxodium distichum*) while forming the dominant type along the river, is of secondary importance in the sweet pepperbush swamp. Principal understory plants in addition to *Clethra*, are *Vaccinium* sp., *Smilax* sp., *Woodwardia virginiana*, *Itea virginica*, and *Ilex glabra*.

In drier portions of the swamp, near the Delaware line, a heavy undergrowth of laurel (*Kalmia*) is found in which an occasional Swainson's Warbler is heard singing; near the Virginia line, an extensive Southern White Cedar (*Chamaecyparis thyoides*) stand adjacent to the pepperbush habitat was devoid of this species. This warbler may breed in other localities not yet located.

Robert Stewart and the writer noted the first spring arrival in the Pocomoke Swamp on April 21 (1948). Departure data are incomplete. I have a record for August 30, 1948, but none for September. However, the bird probably lingers a few weeks later. Austin H. Clark (*Raven*, 10; 1, 1939) observed two in a *Baccharis* thicket on Tangier Island, Virginia, in the middle of Chesapeake Bay, just over the Maryland-Virginia line, and almost at the mouth of Pocomoke Sound, September 17–19, 1939. These were probably Pocomoke birds migrating.

It is the latest warbler to arrive on the nesting ground, and is the latest nester. On May 30, 1949, all of the resident warblers were feeding young except this species. The writer observed newly hatched young on June 13, 1948.

In a survey of the 2 known breeding areas in the Pocomoke on May 30, 1949, 6 singing males were observed in the lower (southern) area, and 2 near the Delaware line (a single singing male noted in the Delaware extension of the swamp was also noted on this date). These 2 small breeding populations are only a sample of the potential carrying capacity of the swamp, as the entire Pocomoke has many areas of the same type of ecological communities favorable to this species that have not been investigated during the breeding season by ornithologists.—BROOKE MEANLEY, 4513 College Avenue, College Park, Maryland.

THE APPETITE OF A BLACK AND WHITE WARBLER

On Sept. 19, 1949, at about 2:00 P.M., a neighbor, noticing a female Black and White Warbler (*Mniotilta varia*) on the porch with her head under her wing, brought the bird in and warmed her in her hands. The bird would take nothing but a little water, and was not able to fly, but by mid-morning the next day she started to hop over the floor. At 5:00 P.M. on the 20th she came into our hands, and after her fast of at least 27 hours at once took mealworms from us. She was fearless, hopping indifferently over the floor, the furniture, or us.

Insects were the only food she would accept, although we offered her tiny pieces of canned dog food (the staple nourishment of our hand-raised Meadowlark, [*Sturnella magna*]) rolled into larvae-like shapes. Different kinds of berries were also refused. A grasshopper 2 inches long was ignored, as well as a full-grown cricket, small ants, a yellow and black striped beetle, and a red mite. Most of the insects caught by sweeping the grass were eagerly taken, even squashed and battered specimens at the bottom of the net. Small moths, leaf-hoppers and tree-hoppers, a small stink bug, a black beetle 0.05 inch long, small crickets, and grasshoppers up to an inch long suited her.

Presented with a sizable grasshopper, she seized it by the head, pinched and shook it vigorously until the body was shaken loose. She ate the head, then picked up the insect by a hind leg and shook until the body fell off. She discarded that leg and got rid of the second in the same manner, sometimes she would also get rid of the small legs. She then took hold of the wings and shook them loose and, finally, with an effort, swallowed the body. With smaller grasshoppers she often ate the body with the wings and some of the legs.

On Sept. 27 and 28 we measured and counted all the food items. In one day she ate 11 grasshoppers measuring from 0.6 to 1.0 inches, 1 meal beetle, and 21 mealworms, averaging an inch. Only once during this day did she seem fed to repletion and cease her tireless hopping back and forth in her cage. (She was not trying to get out, for she much preferred her cage with its many perches to any other place on the porch.) In 5 hours she deposited 50 droppings. Twice during the other test day she was thoroughly filled; at 10:45 A.M. after 13 grasshoppers she preened herself and ignored food for a time. After 16 more she even napped a bit at 5:20 P.M. Her total was 32 grasshoppers, averaging 0.9 inches (23 mm.); each day she had eaten over 2 feet of insects.

On Oct. 17 we gave the Meadowlark only grasshoppers, although he was able to find some scattered puppy meal in his cage; he ate 32, ranging from 0.5 to 1.2 inches, averaging 0.9 inches, and he ate the legs in every case. The Meadowlark weighed 105 grams, nearly 10 times the probable weight of the Black and White Warbler. (Dr. J. Van Tyne gave me 4 weights of fall females of this species; they ranged from 10.5 to 11.5 grams, averaging 11.0.) Three feeding tests in early November showed that he ate about 18% of his weight (of dog food, puppy meal, and insects), whereas the Warbler probably ate about 80% of her weight each day—some 9 grams of grasshoppers. As a rule, the smaller the bird, the more proportionally it eats. Moreover, the Warbler was very active, the Meadowlark inactive. When we consider the small size of most of the insects taken in nature by Warblers, it is no wonder that these little birds must be ever on the move seeking nourishment.—MARGARET AND CONSTANCE NICE, 5725 Harper Avenue, Chicago 37, Illinois.

ON THE NAMING OF BIRDS

Recently we have read a good deal about the common or English names of birds. Some writers emphasize the need of giving each species an English name invented—where necessary—according to certain "simple and logical guiding principles" (Eisenmann and Poor, 1946, Wilson Bull., **58**: 210–215). Others contend that English names are of minor importance; that those already existing, even where manifestly unsatisfactory, are good enough for the slight purposes they serve; and that we can do no better than to agree to conserve those already in use (Griscom, 1947, Wilson Bull., **59**: 131–138).

First, why must we have English names? Are not the Latinized binomials or trinomials all we need in studying birds? There seems to be a widespread belief that vernacular names are easier to remember than Latinized names, that their use makes bird study simpler and more attractive to amateurs. My own experience is that in some instances the English name, in others the Latin binomial, sticks the more tenaciously in my mind. Although Blackburnian Warbler is admittedly a not particularly appropriate name, I still find it easier to remember than *Dendroica fusca*—doubtless because a bird so glowing as the adult male can not properly be called 'fuscous', whereas the 2 words that compose the proper name 'Blackburn' are suggestive of the warbler's vivid plumage. But I find that *Terenotriccus erythrurus* comes more readily to mind than the book-name Fulvous-throated Flycatcher, because the ruddy tail which gives its specific name to this little bird of tropical America is far more prominent than its fulvous throat. Each man's memory forms its own associations, and no two of us remember in precisely the same way. But if the Latin names were not changed with such disconcerting frequency that they are far less stable than the English names, I should say that the latter were not so much easier to remember that we should be justified in taking great pains to invent them. After all, their existence merely increases the burden on our memory, for every earnest student of birds learns the Latin as well as the English nomenclature of his local avifauna.

There are other and deeper reasons why our birds should have names in the living language we speak and write. Ornithology consists of far more than classification and the making of faunal lists—for this the technical terminology would be adequate. Our experiences with birds are manifold and complex, factual and emotional. We are impelled to speak and write of them in our mother tongue; to do so with ease, grace and grammatical correctness, it is indispensable that we have names for them in our own language. English and Latin differ so profoundly in word order and mode of pluralization that we can hardly write a sentence containing a Latin binomial without either making a clumsy circumlocution or committing a grammatical error. "I saw two Summer Tanagers" is a sentence at once simple, natural and correct. How would we state this fact if we lacked an English name for the bird? "I saw two *Pirangae rubrae*" would be decried as pedantry; but "I saw two *Piranga rubras*" is an intolerable solecism. "I saw two individuals of *Piranga rubra*" is formally correct but clumsily long. Most of us would probably evade the issue by saying "I saw two *Piranga rubra*"; but this is doubtfully admissible. The Latin name of a species should probably be considered either as a collective noun or an abstract noun, designating not a particular individual but a concept, a 'universal'. I believe that it is as incorrect to say that "I saw a *Piranga rubra*" as to say "I saw a mankind" when referring to a particular man, or "I saw a vegetation" when designating an individual plant. At all events, the grammar of both the English and the Latin languages forbids us, except in rare instances, to use nouns in both singular and plural without change of termination.

Another grave difficulty in the use of scientific names is that we are not sure how to pronounce them. Theoretically they should be pronounced as Romans of the classic period would have spoken them; but although there are systems for the pronunciation of Latin words, these are at variance, and without actual phonographic records we can only surmise the values which a people long extinct gave to the words and syllables preserved for us in written documents. Having lived long in Spanish-speaking countries, I tend to accent the scientific names of birds according to the rules for pronouncing Spanish, which is perhaps as close to classic Latin as any living tongue. But when occasionally I meet my colleagues, they do not always understand my pronunciation of Latin binomials; and I often have difficulty in following them when they use names perfectly familiar to me in print.

Admitting the desirability of having names for the birds in our mother tongue, there still remains the question of how we should go about selecting or creating them. Should they be, as some have suggested, made to order, standardized by committees, and established by fiat, as the Latin names are? So far as we know, no living language nor any important part of any language has been created in this fashion. If our names for birds are to become a true and vital part of our mother tongue, they must be subject to the same laws of genesis, survival and decay as the other words which make up the language.

Inexactness and lack of logicality does not trouble us in names once they have become so thoroughly familiar that we have forgotten the misconception in which they originated. We do not today hesitate to use 'turkey', 'Muscovy' duck, 'Irish' potato, or 'guinea pig' because these organisms of New World origin have, like so many others, been wrongly attributed to the Old World. Often a name appropriate to one member of a group of birds is no longer descriptive when applied to related species. Although the original redstart is a thrush and not a wood warbler, I do not believe that anyone would wish to change the designation of our American Redstart, which like the European bird of that name bears a color approaching red on its tail: the word is etymologically if not taxonomically appropriate. Yet when *Setophaga picta*, by virtue of its relationship to *Setophaga ruticilla* is likewise called a redstart, the name ceases to be descriptive of its black and white tail; and when extended to members of the related Neotropical genus *Myioborus*, it is still wider of the mark. We should rebel against giving the name 'red-tail' to warblers with black and white tails, but since the meaning of the equivalent 'redstart' is not so obvious to us, we apply it with no feeling of impropriety. Likewise 'nightingale-thrush', very aptly applied to the brownish, semi-terrestrial *Catharus melpomene*, is far less appropriate for the blackish, spotted-breasted members of this genus. Again I would let the nomenclature stand as it is. I have never known any man called Smith or Tanner to change his surname because he no longer follows the ancestral occupation. When a name becomes just a name—a sound of forgotten primary meaning associated with an object or an idea—it has reached the ultimate stage in the formation of language.

The vocabulary of ornithology, like that of other sections of our language, should be free to grow and change. Who are the people to be responsible for this growth? The people who pay attention to birds—professional and amateur ornithologists, bird-lovers of all degrees—have made and are making the language of ornithology; they must be free to modify and improve it by the natural processes involved in the development and change of language. The English names of our birds are almost universally admitted to be unsatisfactory in many instances. To those most intimately associated with any bird, a new designation will now and then be more or less spontaneously suggested, whether by voice, or habits, or some feature of coloration or structure. The originator of such a name should by all means use it, in the beginning perhaps in conversation with friends of kindred interests, later in published writings, where first it must march timidly, shielded by quotation marks, although soon it may be strong enough to stand boldly among its compeers without apologies. The editors of ornithological publications must use their judgment in admitting a new name to their pages, just as the editors of literary magazines must employ discretion in allowing the use of words not yet included in the standard dictionaries. If the bird's new name is better than the one already in general use—if it is easier to remember, more 'natural', more descriptive—it will almost surely in the ordinary course of events supplant the older term; just as 'bobolink' has replaced 'ortolan' as the common name of *Dolichonyx oryzivorous*. Perhaps a new name based upon behavior or habitat will not be strictly applicable to the species in all portions of an extended range, but I do not believe that it should for this reason be rejected if otherwise good. A bird's English name consists of at most three or four words, and we must not expect so small a number of adjectives and substantives to tell the whole story of its appearance, habits and range!

If we accept the contention that the 'common' names of birds should be as far as possible of spontaneous origin and free, untrammeled growth, like the other departments of a living language, what should be the function of a 'committee on nomenclature' in regard to them? I believe that such a committee should treat the English names of birds as the makers of dictionaries deal with the language as a whole. The dictionary-maker does not attempt to create the language; his job is to discover and record the generally accepted usage in writing and speech. Yet it is inevitable that the judgments passed by the editors of a widely used dictionary strongly influence subsequent usage. So the 'committee on nomenclature' should list the most generally used name of each of the birds within the area it treats. If several names are in common use, I see no reason why it should not record them all, perhaps indicating preference for that most generally employed or otherwise most suitable, but not neglecting to include others which hold a place in the common speech of ornithologists, and may at last outlive the one currently preferred. If no English name is available for a certain bird, the space for it may well be left blank, as a challenge to some alert ornithologist to become so thoroughly familiar with the bird that a name spontaneously springs up in his mind. By such procedures the names of birds would be treated as living, plastic language, rather than an aggregation of book names fixed by fiat. In countries like England and most of the United States where men have long taken a pointed interest in birds, their names even if free to change would probably do so slowly, at about the same rate as the English language as a whole changes. But if English-speaking ornithologists should turn their attention in numbers to a region like Amazonia or the high Andes, we should expect a host of new names to appear, just as happens in any science or art which is rapidly expanding or changing.

To expect a 'committee on nomenclature' to do more than list the English names currently available and express an opinion as to the best usage, is to ask too much. The most conspicuous result of past attempts to manufacture names in large quantities is a score of clumsy and inept designations. Robert Ridgway, who in preparing his great work on 'The Birds of North and Middle America' tried to invent English names for every species and subspecies not already so-named—that is, for a large part of the vast avifauna of México, Central America and the Antilles—complained of the difficulty of the task and the virtual impossibility of devising satisfactory appelations for a long array of slightly differing objects. Many of his names, especially those derived from distinguishing features of coloration or form, are felicitous and will probably endure; but perhaps the majority are forced creations which await only some more apt combination of words or letters to supersede them. A very large proportion of the 'English' names originated by Ridgway contain the names of persons or political divisions, or are merely the sesquepedalian generic term preceded by an English adjective.

If faced with the problem of inventing a name for a bird, the substantive part of which must be, let us say, 'toucan' or 'swallow', it is most helpful to have before one specimens or pictures of all the known toucans or swallows, and to try to pick a character in which the species to be named differs from all the others which bear the same substantive. If only one species of swallow has a pink throat, let us by all means call it 'Pink-throated Swallow'. Unfortunately, in many groups of birds designated by the same substantive, it is impossible to find a unique character in which a given species differs from all related forms. More often related species are distinguished by different combinations of characters.

One thing which I do believe we are justified in requesting of a 'committee on nomenclature' is that it designate an English name to be used for each species, in all its races. I think that it would be fair to ask them to do this only in cases where such designation would entail no more than the selection of the most appropriate among names already in use for the subspecies—this should take care of most if not all of the birds of America north of México. To avoid forced inventions, it seems best to use the name of the nominate race as the species name wherever it lends itself to such use. When this name does not adapt itself to combinations in forming the names of subspecies, then the name of a race other than the nominate one might be selected as the species name; and in a few instances preference might be given to the present name of the most widely distributed and familiar susbspecies, even if this is not the nominate form. I think it a wise suggestion that only subspecies recognizable in the field with reasonable certainty be given English designations. Witmer Stone (1935, Auk, **52:** 31–39) advocated that in general forms readily distinguished be given specific rank; this would greatly simplify the matter of English nomenclature, but would hardly be acceptable to modern systematists.

In conclusion, I would emphasize again the fact that the Latinized binomial, or now very commonly trinomial, names of organisms are not language, do not follow the laws of the origin and evolution of language, and can never quite satisfy those who would have genuine names for the things they know, love, talk and write about. I do not imply by this statement that binomials and trinomials are not useful. They are immensely useful as a means of expressing in brief compass our notions of the relationships of organisms, and of referring each species to an original description and, where possible, to a type specimen. But precisely because they are called upon to express relationships of the former kind they are incapacitated for serving to express relationship of another kind—that is, the association of a particular sound with a definite object or idea. For it is obvious that our concepts of biological affinity may change without altering our association of sound with object. Except that it might be more difficult to remember, a system of serial numbers and letters would be as useful as the current biological nomenclature in indicating these supposed genetic relationships and in referring to published descriptions and the specimens upon which they are based. Because of constantly changing conceptions of relationship, and because of the tyrannous working of the law of priority coupled with shifting interpretations of inadequate descriptions and figures published in the infancy of ornithology, scientific names are changed with a disconcerting suddenness and abruptness which never happens in natural language. Even if the English names of birds are not fixed by fiat but permitted to change and evolve in the way of all living speech, we may expect that they will prove more stable than the scientific names of birds have been. For languages in their natural growth never perpetrate an injustice to the thousands of people who use them, and have only a limited amount of time and mental energy for learning new names, in an effort to do tardy justice to the memory of some savant long since in his grave and, we hope, beyond the petty jealousies involved in priority of publication.

SUMMARY AND RECOMMENDATIONS

It is desirable for many reasons that each species of bird bear a single name, applicable to all its subspecies, in the language which we speak and write. These names of birds should be treated as living language, which combines the fixity necessary for mutual understanding with a degree of flexibility that permits growth and change. It is often exceedingly difficult to make names to order. Most of our English names for New World birds have been so made; many are widely admitted to be unsatisfactory; and to fix these names for all time by fiat would be deplorable. Yet when one enjoys a special intimacy with a bird, a felicitous name will often spring into the mind, suggested by voice, habits, plumage or some other character. These considerations lead to the following recommendations:

1. That students and bird-lovers who have hit upon a bird name which seems to them more apt than the one currently used, feel free to try it out among their friends and colleagues, suggest it in life-history or other papers, and generally make it known to the ornithological public. But so far at least as birds included in the A. O. U. Check-List are concerned, it would seem inadvisable to use such a new name in the title of a paper, or in a formal list, until it had won its way to general acceptance as superior to the officially designated name.

2. That the A. O. U. Committee on Nomenclature take cognizance of these newly suggested names—it might even signify willingness to receive them directly from the originators—and at their discretion use the more inspired of them to supplant existing English names that seem less satisfactory. In this way, also, names could be gradually accumulated for species which now lack them, their several forms being designated by unrelated subspecific names. The alternative of asking a committee to manufacture species names in quantity is to be avoided, as these forced inventions are too often infelicitous.

3. In regard to parts of the Western Hemisphere not covered by the A. O. U. Check-List, it seems premature to undertake a general naming of the birds in English until we are far more intimate with them as living creatures. However, a committee, whether officially representing the A. O. U. or otherwise constituted, might begin to cull the more adequate names from the many scattered sources, and receive suggestions from those who enjoy opportunities to become intimate with particular species. Until this is done, those interested in the birds of tropical America seem doomed to struggle along as best they can with the conflicting and too often unsatisfactory, mass-produced English names to be found in Ridgway, Hellmayr, Chubb and Brabourne and other systematic works.—ALEXANDER F. SKUTCH, Finca 'Los Cusingos', San Isidro del General, Costa Rica.

LIFE MEMBER

Roger Tory Peterson has studied birds afield in every State of the Union. He is best known to members of the Wilson Ornithological Club for his books, *Field Guide to the Birds*, *Field Guide to Western Birds, and How to Know the Birds*. His principal ambition lies, however, in the field of bird painting, and for this he studied five years at the Art Students' League and National Academy of Design in New York City. Recently he completed series of color-plates for *South Carolina Bird Life* and *The Birds of Newfoundland*. Since 1934 he has been associated with the National Audubon Society, engaging chiefly in educational work. A collection of his writings recently appeared in book form, *Birds Over America*. He was elected a Fellow of the American Ornithologists' Union in 1948.

The Wilson Bulletin has entered into an agreement with University Microfilms, Ann Arbor, Mich., to make issues available to libraries in microfilm form. Microfilm makes it possible to produce and distribute copies of periodical literature on the basis of the entire volume in a single roll, in editions of 30 or more, at a cost approximately equal to the cost of binding the same material in a conventional library binding. Sales are restricted to those subscribing to the paper edition, and the film copy is only distributed at the end of the volume year. The microfilm is in the form of positive microfilm, and is furnished on metal reels, suitably labeled. Inquiries concerning purchase should be directed to University Microfilms, 313 N. First Street, Ann Arbor, Michigan.

THE WILSON ORNITHOLOGICAL CLUB LIBRARY

The following gifts have been recently received. From:

Aaron M. Bagg—1 reprint
H. Lewis Batts, Jr.—1 book
Hervey Brackbill—1 reprint
B. W. Cartwright—1 pamphlet
David E. Davis—2 reprints; 1 book
Harvey I. Fisher—3 reprints
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Fred M. Packard—2 pamphlets
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William H. Phelps—2 reprints; 1 book
Frank A. Pitelka—20 reprints
A. W. Schorger—1 vol. of magazine
W. E. Scott—5 pamphlets
Winnifred Smith—1 reprint
O. A. Stevens—2 pamphlets
Emerson A. Stoner—2 books; 8 reprints
Robert W. Storer—4 reprints
Harrison B. Tordoff—1 reprint
Josselyn Van Tyne—11 reprints
William C. Vaughan—3 magazines
L. H. Walkinshaw—1 book
Frances A. Ward—6 magazines
Harriet B. Woolfenden—4 reprints

BOOK REVIEWS

South Carolina Bird Life. By ALEXANDER SPRUNT, JR., and E. BURNHAM CHAMBERLAIN. (Contrib. XI Charleston Mus., University of South Carolina Press, Columbia, S. C., 1949.) xx + 585 pp., 35 colored plates, 49 photographs, 1 map. $10.00.

This is a state bird book in the grand tradition. Text, illustrations, format, and typography are all opulent. In a day of high printing and engraving costs, bird students will marvel at the richness of the volume, and may well expect to wait many a year before they again see a new book that is comparable.

Ornithological work in South Carolina is itself in the best tradition of the science. The authors of this volume point out that more species of birds have been made known to science from South Carolina than from any other state. Catesby, Bartram, Aubudon, and Bachman were pioneers of natural history study in the colonial years of Carolinian settlement, and in the period following the Declaration of Independence. Coues, Merriam, and Loomis carried on the work during the middle years of the last century. Arthur T. Wayne became the foremost resident ornithologist of the Low Country, his active work extending from 1883 to 1930. Sass, Weston, Tomkins, and others are of the present generation of bird students. Sprunt and Chamberlain, themselves in the foremost rank of American ornithologists, have, with the able editorial assistance of E. Milby Burton, had the pleasant and fruitful task of presenting in this volume the harvest of South Carolina bird lore.

So much of the state's ornithological work has centered in the Low Country, of history and tradition, that one inclines to forget the piedmont and mountain sections. The authors have not neglected these regions, although they regret the comparative scarcity of resident bird students in them. For purposes of ecological study, they divide the coastal plain area into barrier beaches, sea islands, salt marshes, swamps, ricefields, and mainland. Piedmont and mountain regions are treated as units.

After acknowledgments, and a foreword by E. Milby Burton, Director of the Charleston Museum, the volume presents a comprehensive historical survey of ornithological work in South Carolina. This is followed by a list of bird species and races whose type localities are in South Carolina. There is an ecological description of the state as it breaks down into natural regions, and an informative chapter "On Studying Birds". The body of the book is made up of descriptions and discussions of 442 species and races of birds which have been recorded from the state. Appended is a list of seventeen species which have been given hypothetical status. There is a comprehensive index.

Under each species is an English translation of the scientific name which will be welcomed by many users of the book. Local names for the species are recorded, followed by description, general range, and status in South Carolina. Discussions of species include history and notes on food habits.

Special mention must be made of the book's illustrations. Color plates, thirty-five of them, are by Francis Lee Jaques, Roger Tory Peterson, Edward von S. Dingle, and John Henry Dick. With the oil paintings of Jaques and the water colors of Peterson most bird students are familiar. They have come to expect from these artists the very finest in bird portraiture, and both are at their best in the present volume. Dingle and Dick, both local artists, are not, perhaps, so well known to the public, although their work in this book should go far toward bringing them the recognition which they deserve. They give fresh approaches to bird art, and some of their plates, particularly Dick's warblers, are as delicate and lovely as this reviewer has seen. Photographs in the volume, from many sources, are well-chosen, representative, and beautifully reproduced.

In a book of such excellence, the reviewer can find little with which to quibble. There will be those to question the inclusion of a number of species whose recorded occurrences in South

Carolina depend solely on sight identification. Most such records are of strikingly-marked birds, and the authors place their trust in the competence of the observers. Loomis's account of breeding Bush-Tits in the Carolina piedmont is an extraordinary one, and Northern observers will join their Southern brethren in resentment that his verifying specimens should have been destroyed by fire set by General Sherman's army. The authors of this volume have assigned these Bush-Tits to a definite race, the California Bush-Tit. Similarly, they have assumed that the only Burrowing Owl recorded in the state was a Western Burrowing Owl. All the weight of probability may be in their favor, but these are guesses, and in making them the authors have, or so it seems to this reviewer, laid themselves open to criticism.

Concerning the putative recent status of Carolina Paroquets in the Santee Swamp, there is room for much healthy argument. Sprunt firmly believes that these birds were present as late as 1936–38. Others who were on the ground are very doubtful. In any event, readers will enjoy the account of this bird, as well as the discussions of such other rarities as Ivory-billed Woodpecker and Bachman's Warbler.

Only a few of the southeastern states have had published definitive bird books of high scientific, literary, and artistic merit. *South Carolina Bird Life* takes its place in the front rank of such state manuals. It will bring many readers to see for themselves the mountain country around Caesar's Head, the charm of the Santee Swamp, and the sub-tropical richness of Bull's Island.

Maurice Brooks,
West Virginia University
Morgantown, West Virginia

The Sandhill Cranes. By Lawrence H. Walkinshaw. (Cranbrook Institute of Science, Bulletin No. 29, 1949.) x + 202 pages, 17 photographic plates, 5 maps and 31 tables.

In 15 years of consuming interest in the Sandhill Cranes, including field excursions that carried him from Alaska to Cuba, the author of this important book on the 4 subspecies of *Grus canadensis* has accumulated an immense amount of data, much of it entirely new. Since Blaauw's *Monograph of the Cranes* (London, 1897) there has been no comprehensive work on the Gruidae. This study is a welcome event and adds vastly to our knowledge of the Sandhill group. With its frequent comparisons with the habits and behavior of other cranes it should be a useful reference for students of the entire family.

The chapter on Molts and Plumages contains detailed comparative tables of weights and measurements. Among other things, these appear to demonstrate the presence of a "prairie intermediate" form, between the larger *G. c. tabida* and the smaller *G. c. canadensis* in size. A diagram shows the details of two partial molts in a captive bird. Other chapters discuss Voice, Crane Behavior, Food and Feeding Habits, Pairing and Territory, Nesting, the Young, the Crane from Fall to Spring and the History of North American Crane Populations. There is a wealth of data on the nests and nest sites of the various subspecies.

Detailed distribution records are listed in an appendix and summer range, nesting record and winter range maps appear elsewhere. There is no method given for relating occurrence locations in the appendix to actual locales on these maps. Nor is the interesting distribution of the different forms related to habitats, beyond brief descriptions of the character of nest sites. The migration maps are good, but their value would have been enhanced if more locations could have been plotted. They refer to the spring and fall movements of *G. c. canadensis* only. The tables giving extreme and average egg and hatching dates are of unique interest, as is that showing frequency of incubation.

Population estimates reflect much careful field work and constitute a definite contribution. It is evident that the Florida and Cuban forms are in need of strong conservation measures if they are to be preserved and it may come as a surprise to many that the Greater Sandhills are so few in number. Limiting factors are discussed briefly.

It is unfortunate that so much data had to be compressed into 147 pages of actual text. There are no summaries and the index could have been more exhaustive. Nevertheless, this book is of outstanding worth and contains excellent reference material.

ROBERT P. ALLEN

Territory in Bird Life. by ELIOT HOWARD. (Collins, London, 1948.) 224 pages, 12 plates. 10s 6d. Reprinted with an Introduction by Julian Huxley and James Fisher.

Ornithologists will be pleased to know that a reprint of this classic is now available at a reasonable price. This book has long been out of print and inaccessible to a new generation of students who are building on the firm foundations laid by this brilliant amateur. The new introduction briefly summarizes the history of the idea of territory and comments upon the essential correctness of Howard's views in the light of present day knowledge. It would be superfluous to review the contents of this well-known book. This edition is identical word for word with the original (1920); even the plates are exact copies. It seems certain that this reprinting will encourage some to refresh their memories and others to enjoy this book for the first time.

DAVID E. DAVIS

REPORT OF TREASURER FOR 1949

Balance as shown by last report, dated December 31, 1948	$ 42.40	
RECEIPTS		
Dues:		
Associate	1,473.00	
Active	2,029.00	
Sustaining	730.00	
Subscriptions to "The Wilson Bulletin"	297.20	
Sale of back issues and reprints of "The Wilson Bulletin"	163.10	
Transferred from Endowment Fund [Special Fund, interest, etc.]	475.00	
Gifts for relief of European Ornithologists	100.00	
Contributions to Library Book Fund	35.40	
Gifts; miscellaneous receipts	9.88	
Total receipts		$5,354.98
DISBURSEMENTS		
"The Wilson Bulletin"—printing, engraving, mailing	$3,874.77	
Purchase of back issues of "The Wilson Bulletin"	3.15	
President's expense—printing, postage	20.81	
Editor's expense—reprints, postage, secretarial aid	292.70	
Secretary's expense—stationery, postage, clerical aid	155.68	
Treasurer's expense—stationery, postage, clerical aid	113.97	
Membership Committee's expense—postage, printing	238.78	
Contribution to European Ornithologists Relief Fund	100.00	
Purchase of books for Library	14.86	
Dues to International Committee for Bird Preservation	5.00	
Bank charges, foreign exchange, corporation papers, bond of Treasurer, and miscellaneous expenses	14.86	
Annual Meeting expense	276.36	
Total disbursements		$5,110.94
Balance on hand in Citizens Fidelity Bank and Trust Company, Louisville, Kentucky, December 31, 1949		244.04
		$5,354.98

ENDOWMENT FUND

Cash balance in Savings Account December 31, 1948		$ 253.29
Received during year:		
Interest on U. S. Bonds and on Savings Account	$ 135.28	
Life Membership Payments	725.00	
		860.28
		$ 1,113.57
Disbursed during year:		
Transferred to checking account [Special Fund, Interest, etc.]	$ 475.00	
Bank Charge [State Tax]	.85	475.85
Balance Cash in Savings Account December 31, 1949		$ 637.72
Securities Owned:†		
U. S. Postal Savings Coupon Bonds, dated July 1, 1935	$ 780.00	
U. S. Savings Bonds, Series "G" dated September 1, 1943 [maturity value $1,000.00]	955.00	
U. S. Savings Bonds, Series "G" dated September 20, 1944 [maturity value $1,500.00]	1,423.50	
U. S. Savings Bonds, Series "G", dated June 1, 1945 [maturity value $500.00]	473.50	
U. S. Savings Bonds, Series "G" dated July 1, 1945 [maturity value $900.00]	852.30	
U. S. Savings Bonds, Series "G" dated October 1, 1945 [maturity value $1,400.00]	1,325.80	
U. S. Savings Bonds, Series "F" dated February 1, 1947 [maturity value $2,000.00]	1,508.00	
U. S. Savings Bonds, Series "F" dated April 1, 1948 [maturity value $2,000.00]	1,490.00	
U. S. Savings Bonds, Series "F" dated October 1, 1948 [maturity value $1,450.00]	1,075.90	
Total, securities owned†		9,884.00
Total Endowment Fund		$10,521.72

† Bonds carried at redeemable value December 31, 1949.

In reserve:

Louis Agassiz Fuertes Research Grant Fund [special gift]	$ 300.00
S. Morris Pell Fund [special gift]	75.00

Respectfully submitted,
BURT L. MONROE, *Treasurer*

December 31, 1949
Approved by Auditing Committee.
LEONARD C. BRECHER
FREDERICK B. HEBARD

Recommendations for Preparation of Manuscripts

Manuscripts should be typed on one side of white paper of good quality with title and author's name written on a separate sheet. Everything should be double-spaced and each table should be typed on a separate sheet. Figures, not words, should be used for all numbers (except at the beginning of a sentence). Sex ratios should be calculated as % males. Express data in quantitative and tabular form, wherever possible, and when giving averages, also give the standard deviation. The technical names of the A.O.U. Check List (4th edition), as corrected in the supplements, should be used. Unless specimens have actually been identified to subspecies, only the specific name should be used. Whenever possible a reference for technical names of plants should be listed. Literature should be listed at the end of the article in accordance with the style in previous issues. All articles should have a summary that gives the data in brief form. Authors should avoid footnotes, vernacular phrases, and the use of nouns as adjectives. Illustrations should have good contrast. Printing on charts and maps must be large enough to permit reduction. Cuts of figures will be destroyed unless author requests their return on the reprint order form.

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THE WILSON ORNITHOLOGICAL CLUB

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S. Charles Kendeigh, 1943–1945
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Olin Sewall Pettingill, Jr., 1948–1950
Maurice Brooks, 1950–

THIRTY SECOND ANNUAL MEETING

DAVENPORT, IOWA, APRIL 27–28, 1951

Complete Details in December 1950 Bulletin

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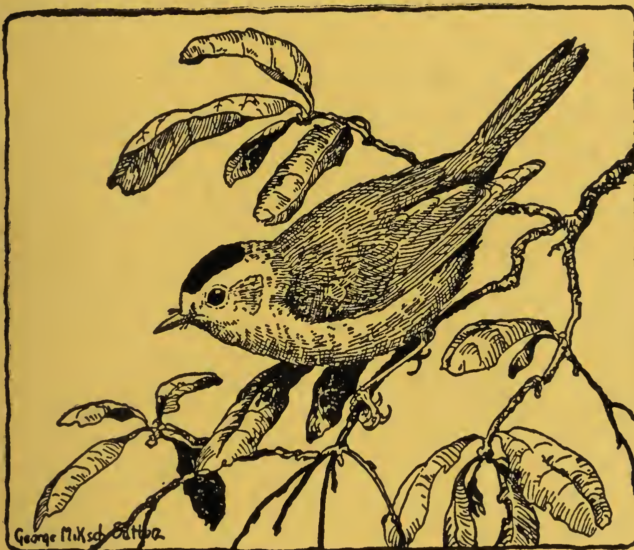
September 1950

VOL. 62, NO. 3 PAGES 105-152

The Wilson Bulletin



Published by the
Wilson Ornithological Club
at
Baltimore, Maryland

The Wilson Ornithological Club

Founded December 3, 1888

Named after Alexander Wilson, the first American ornithologist.

President—Maurice Brooks, West Virginia University, Morgantown.

First Vice-President—W. J. Breckenridge, University of Minnesota, Minneapolis.

Second Vice-President—Burt L. Monroe, Ridge Road, Anchorage, Ky.

Treasurer—James H. Olsen, Box 151, Worthington, Ohio.

Secretary—Harold F. Mayfield, 2557 Portsmouth Ave., Toledo 12, Ohio.

Membership dues per calendar year are: Sustaining, $5.00; Active, $3.00; Associate, $2.00. The Wilson Bulletin is sent to all members not in arrears for dues.

Wilson Ornithological Club Library

The Wilson Ornithological Club Library, housed in the University of Michigan Museum of Zoology, was established in concurrence with the University of Michigan in 1930. Until 1947 the Library was maintained entirely by gifts and bequests of books, pamphlets, reprints, and ornithological magazines from members and friends of the Wilson Ornithological Club. Now 2 members have generously established a fund for the purchase of new books; members and friends are invited to maintain the fund by regular contributions, thus making available to all Club members the more important new books on ornithology and related subjects. The fund will be administered by the Library Committee, which will be glad of suggestions from members on the choice of new books to be added to the Library. George J. Wallace, Michigan State College, East Lansing, Michigan is Chairman of the Committee. The Library currently receives 65 periodicals, as gifts, and in exchange for *The Wilson Bulletin*. With the usual exception of rare books in the collection, any item in the Library may be borrowed by members of the Club and will be sent prepaid (by the University of Michigan) to any address in the United States, its possessions, or Canada. Return postage is paid by the borrower. Inquiries and requests by borrowers, as well as gifts of books, pamphlets, reprints, and magazines, should be addressed to "The Wilson Ornithological Club Library, University of Michigan Museum of Zoology, Ann Arbor, Michigan." Contributions to the New Book Fund should be sent to the Treasurer, James H. Olsen, 5465 Sharon Park Ave., Worthington, Ohio (small sums in stamps are acceptable). A preliminary index of the Library's holdings was printed in the September 1943 issue of *The Wilson Bulletin*, and each September number lists the book titles in the accessions of the current year. A brief report on the recent gifts to the Library is published in every issue of the *Bulletin*.

The Wilson Bulletin

The official organ of the Wilson Ornithological club, published quarterly, in March, June, September, and December, at Baltimore, Maryland. In the United States the subscription price is $2.00 a year. Single copies 50 cents. Outside of the United States the rate is $2.25. Single copies, 60 cents. Subscriptions, changes of address and claims for undelivered copies should be sent to the Treasurer. Most back issues of the *Bulletin* are available at 50 cents each and may be ordered from the Treasurer.

All articles and communications for publication, books and publications for review should be addressed to the Editor. Exchanges should be addressed to the Wilson Ornithological Club Library, Museum of Zoology, Ann Arbor, Michigan.

Entered as second class matter at Baltimore, Md. Additional entry at Ann Arbor, Mich.

THE WILSON BULLETIN

A QUARTERLY MAGAZINE OF ORNITHOLOGY

Published by the Wilson Ornithological Club

Vol. 62, No. 3 SEPTEMBER 1950 Pages 105–152

CONTENTS

THE PRESIDENT'S PAGE

Since this marks the beginning of a new administration in Wilson Club affairs, it would seem appropriate that some accounting of the official family be given. Club members have a right to know what they may expect from their officers, and what are the policies that will be followed.

After a long and devoted period of service to the Club, Olin Sewall Pettingill, Jr. retires as one of your officers. As Secretary, as Vice-President, and as President, he has been untiring in his efforts for the welfare of the organization. Fortunately, through the wise provision of the Constitution which makes all Past-Presidents permanent members of the Executive Council, we shall continue to have the benefit of his experience and leadership.

Walter J. Breckenridge, of the University of Minnesota's Museum of Natural History, assumes the duties of First Vice-President. He has served as an elected member of the Executive Council, and, more recently, as Second Vice-President. Many members will remember the last Minneapolis meeting, for which he had the responsibility as Chairman of the Local Committee on Arrangements. For its Second Vice-President the Club has chosen Burt L. Monroe, of Anchorage, Kentucky, who retires from the Treasurership. During a period of rising costs and financial difficulties, Burt Monroe has handled the fiscal affairs of the Club with great skill and complete devotion.

The Club's Secretary continues to be Harold F. Mayfield, of Toledo, Ohio. He brings to his duties a wide business experience, a thorough training in personnel management, and a spirit of cooperativeness which make his services invaluable. As the new Treasurer, James H. Olsen, of Columbus, Ohio, has been chosen. He, too, has had wide business experience and extensive contacts. He has grown up through the Brooks Bird Club, and is now serving as its President.

David E. Davis, of Johns Hopkins University, has felt that he must retire as Editor of *The Wilson Bulletin*. During his term as Editor, he has had to deal with the perplexing problems of sky-rocketing printing costs, and he has worked untiringly and with great scientific skill. As the new Editor, George Miksch Sutton has been chosen. In addition to his long service to the Club in many capacities, he brings to his new duties an international reputation as artist and writer, and a boundless enthusiasm.

The newly-elected member of the Executive Council is Fred T. Hall, Director of the Davenport (Iowa) Public Museum. He will also serve as Chairman of the Local Committee on Arrangements for the 1951 meeting in Davenport. Members of the Council who continue in office are Richard H. Pough, of the American Museum of Natural History, New York, and William C. Vaughan, of Buffalo. Burt Monroe will continue to represent the Club on the Council of the American Ornithologists' Union, and S. Charles Kendeigh, a Past-President of the Club, will be our representative on the Council of the American Association for the Advancement of Science, of which we are an affiliate. To serve as a member of the Board of Trustees, Aaron Moore Bagg, of Holyoke, Massachusetts, has been named.

According to the retiring Treasurer, we have weathered the worst of our financial stresses, and the Club finds itself in sound fiscal condition. We shall strive to maintain our present membership rates, since members of the Council believe that our low dues are an encouragement to joining for students and other beginners in the field of ornithology.

It will be the policy of the President to bring into the active work of the Club as many as possible young and promising bird students. By tradition, ours has been a *young* organization, in which both professional ornithologists with a genuine liking for field work, and active and enthusiastic amateurs in bird study, can feel at home.

The fine spirit of Club members made manifest at the recent Jackson's Mill meeting is both a promise and a challenge. There is every reason for hoping that the organization can progress toward richer experiences for its individual members, and toward greater service for ornithology. To the realization of this hope your new President pledges his best efforts, and asks the fullest measure of your cooperation.

MAURICE BROOKS

FEMALE GOLDFINCH AT NEST. PHOTOGRAPHED IN BUTLER COUNTY, PENNSYLVANIA, IN AUGUST, 1945, BY HAL H. HARRISON. THE MANY DROPPINGS ON THE RIM ARE CHARACTERISTIC OF GOLDFINCH NESTS TOWARD THE END OF THE FLEDGING PERIOD.

BREEDING BEHAVIOR OF THE GOLDFINCH

BY ALLEN W. STOKES

THIS paper presents aspects of the breeding behavior of the American Goldfinch (*Spinus tristis*) with emphasis on pair formation, establishment of territories, and breeding success. The study was made on 24 acres of park and marshland in Madison, Wisconsin, during the summers of 1944, 1946, and 1947. The area offered the advantages of high breeding densities and nests placed so low that observation was easy.

The Goldfinch has been the subject of several good nesting studies within the past 20 years. Walkinshaw (1938, 1939) made an intensive study on a 35 acre marsh near Battle Creek, Michigan, supplemented by data collected over a period of 20 years. Drum (1939) studied aspects of territorialism during 2 summers at Douglas Lake, Michigan. Mousley (1930a, 1930b, 1932, 1935) spent entire days at a single nest in southern Quebec making excellent observations on the activities of that single pair, repeating his observations during 2 subsequent summers. The observations of Mousley and Walkinshaw on nest construction, egg-laying, incubation, and care of the young were very thorough, and I have little to add to them. The reader is referred to their studies for these aspects of the nesting cycle. I wish to express my thanks for the guidance of Dr. R. A. McCabe under whose guidance the study was carried out during the first year. This study was financed in part by a University of Wisconsin research fund established in memory of the late Charles W. Bunn and is journal paper number 18, University of Wisconsin Arboretum.

Study Area

About 16 acres of the area were part of a large peat marsh bordering Lake Wingra in Madison. During the summer, the ground was usually dry and firm. The other 8 acres consisted of lawn, shrubs, and shade trees, chiefly elm (*Ulmus* sp.), red maple (*Acer rubrum* L.), poplar (*Populus* sp.), and willow (*Salix* sp.), and was on higher ground (Figs. 1, 2). With the exception of occasional small box elders (*Acer Negundo* L.) and willows there were no trees on the peat marsh proper. Elderberry (*Sambucus canadensis* L.) was the most abundant shrub, occurring in large clumps, or else as individual plants. Next in order of abundance came red-osier dogwood (*Cornus stolonifera* Michx.), buttonbush (*Cephalanthus occidentalis* L.), and Tartarian honeysuckle (*Lonicera tatarica* L.). Common forbs included Joe-Pye weed (*Eupatorium maculatum* L.), giant sunflower (*Helianthus giganteus* L.), goldenrods (*Solidago* spp.), asters (*Aster* spp.), thistles (*Cirsium* spp.), nettle (*Urtica procera* Muhl.), jewelweed (*Impatiens biflora* Walt.), wild cucumber (*Echinocystis lobata* Michx.), smartweeds (*Polygonum* spp.), swamp milkweed (*Asclepias incarnata* L.), and dodder

(*Cuscuta Gronovii* Willd.). Grasses and sedges covered much of the marsh. All classification of plants is according to Deam (1940).

Fig. 1. Goldfinch Study Area—1947

Methods

Observations began July 1 in 1944 and 1946. I spent the spring of 1947 in Madison and was able to observe the Goldfinches from the time of their arrival. As soon as the birds came into the study area in late June, I spent many hours watching them from a high tower or several tree lookouts. The area was carefully checked for nests 4 or 5 times throughout the nesting season by searching all trees, shrubs, and suitable forbs, but with experience most nests were located by observing the behavior of the birds. Of the 240 nests found on the area during the 3 years, 161 were found before egg-laying started; 65 contained eggs; 11 contained young; and in 3 the young had already fledged. In the late fall of 1946, after all leaves had fallen, I found 6 nests I had overlooked (7% of the total). Nests were checked every 2 or 3 days to establish the progress and outcome. In a few cases the interval between observations ran as high as 10 days.

In 1944, 4 females and 1 male were marked with colored celluloid leg bands; in 1946, 16 males and 19 females; and in 1947, 9 males and 30 females, of which 6 males and 10 females were also marked with colored pigeon feathers attached to the rump with cement. Most of these birds were banded during the stages of nest construction or early incubation, and were watched closely to determine breeding behavior and the size of the breeding population. Observations continued each year until all birds had fledged. Approximately 600 hours were spent in the field during the 3 years.

Pair Formation

Goldfinches were uncommon birds during the winter in the Madison area. Spring migrants did not become conspicuous until May 10 in 1947, the only spring I was in Madison. By May 18 they were among the most common birds around Madison. Only a few days earlier dandelions (*Taraxacum officinale* Weber) had come into bloom like Cadmus' teeth, making golf courses and lawns an almost solid mass of yellow. Goldfinches were feeding in extraordinary numbers on these dandelions, suggesting that possibly their migration kept pace with the blossoming of these flowers, thus ensuring abundant food. Many of these birds were already paired.

It soon became obvious from daily observations on many birds that courtship and pair formation take place while the birds are still in flocks during May and early June, and probably earlier. Establishment of territory on the other hand occurs less than 2 weeks before nest building starts in early July. This is in contrast to most song birds where pair formation follows establishment of territory. Walkinshaw (1938) observed pair formation in Goldfinches to have taken place in late April. I have found no other mention of pair formation in the literature. Although my observations are incomplete, I will present the elements of behavior I associated with pair formation, although they may not necessarily be in their actual chronological order: (1) courtship song, (2) courtship flights, (3) song flights, (4) canary-like or true song.

(1) *Courtship Song*. When Goldfinches first arrived in 1947, I heard several males sing a "courtship song" at intervals of about 5 seconds and lasting for 2 seconds. Its first part was suggestive of the beginning of the song of the Song Sparrow (*Melospiza melodia*) and then it broke into a faster, higher-pitched portion resembling the true Goldfinch song. This courtship song was un-

doubtedly the same as that described by Nice (1939). The only time I ever heard it during the nesting season was on August 14 when a male had lost his mate. At that time it sang every 5 seconds for at least 10 minutes. Hence I think this song is used to attract a mate. It is not a territorial song, as Mrs. Nice correctly deduced, in that it is heard a month or more before territories are established. The fact that I heard it so seldom at Madison suggests that most Goldfinches were paired before arrival.

(2) *Courtship Flight.* Often while birds were feeding in flocks, paying no apparent attention to each other, a male darted out after a female and pursued her in a zig-zag flight, weaving in and out among the trees at break-neck speed and only a few inches behind her. Occasionally the female seemed to be chasing the male, but the action was so fast and the birds so close together that I could not be sure. Almost invariably other males joined the flight until there were as many as 6 males pursuing the same female. This usually ended in a song flight by the males while the female disappeared among the trees or bushes. On several occasions the male rejoined the female that he had chased, so pairing had apparently taken place. I spent about 10 hours watching various flocks at this stage and observed such chases every few minutes, yet never observed any stimulus in the form of posturing or call that might have set off this flight.

(3) *Song Flight.* The song flight is similar to that of the Brown Thrasher (*Toxostoma rufum*) and Yellow-breasted Chat (*Icteria virens*), a hovering, hesitant flight in a perfectly horizontal path, the bird seeming barely able to keep itself aloft. Although this flight is usually in a circular course during the nesting season, it more often is straight or irregular and of shorter duration in the courtship period. During this flight the male invariably sings his typical canary-like song. Just as soon as he stops his song flight, his song stops, and he resumes the typical undulating flight with its accompanying *per-chic-o-ree* note.

(4) *Canary-like Song.* This typical Goldfinch song has defied description, but closely resembles the varied warbling of a canary. It was most often heard from the treetops and only seldom from the tops of small bushes. Singing was most frequent during courtship and before nest building had started. Males sang in flocks even more than while alone. Although I do not know its true rôle, it is certainly associated more with courtship than with territorial establishment.

Records for the occurrence of first song at Madison for the past 4 years have been kept by James Zimmerman. They are: April 19, 1945; April 17, 1946; May 7, 1947; and April 17, 1948. He believes that song may be correlated with sudden availability of abundant food. His dates of first song reflect the fact that 1945, 1946, and 1948 were early years and 1947 late, as to development of vegetation. Onset of song and of nesting in these 4 years do not seem to be related, since 1947 was the earliest nesting season, yet latest for beginning of song.

Birds separated from the flock after pairing but apparently moved freely without regard to territory. During this post-pairing stage the male was intolerant to other males that approached close to the female. Defense at this time took a variety of forms. Usually the defender merely flew to the intruder's perch, forcing the latter to move off. At other times the defending male flew after the intruder in the same hesitant manner of the song flight, but without singing. More rarely the 2 males became involved in a "tumble fight". Here the males flew at each other, first one above, then the other, like cabbage butterflies but with no actual violence. It often ended with the 2 males making a song flight. These flights were often seen, but were short and related only to the position of the female at that time and not to any territory. Less often the female drove other females from her mate in the same manner as the males.

Maintenance of the Bond

Once formed, the bond is maintained chiefly by courtship feeding. This occurs from egg-laying through nestling stages. After the first egg has been laid, the female spends much of her time on the nest, getting on and off at frequent intervals. When the male flies overhead she may fly to him, but more often she will extend her head, flutter her wide-spread wings rapidly, and utter a high *chee-chee-chee-chee.* If the male approaches the nest, the female moves up on the rim with bill extended for feeding. In about half the cases the male will come in to feed her, the food consisting of anywhere up to 30 regurgitated seeds. At other times the male may perch in a nearby branch or neighboring bush, making no advances towards the female. But the female is not easily put off; she flies with quivering wings to the male and will even peck at his bill in her efforts to obtain food, at which the male may finally capitulate.

The male does his share in feeding the young. If the female happens to be brooding the young as he comes to the nest, she will again beg for food as described above and be fed. She will then usually feed the young with these same seeds. On 2 occasions I have seen a male feed his mate following nest failure.

I have observed copulation on only 3 occasions. Once the male approached the female as she was begging for food. Within a few seconds he mounted, copulation lasting for only 2 or 3 seconds, during which the female quivered her extended wings. The male then flew off without further ado. In the other 2 cases there seemed to be no prelude to copulation.

Establishment and Maintenance of Territory

During May and early June, Goldfinches remained on the lawns where food was abundant, and did not come down into the marsh until ready to establish a territory. From the middle of June until the middle of August there was a steady infiltration of birds and establishment of new territories. During July, I never noticed unmated birds in the marsh. In August I observed 3 cases of aggressive males, presumably unmated. Unmated birds may have fed in the large neutral areas of the marsh, but they certainly did not attempt to intrude on established territories. A flock of 4 unmated Goldfinches, the only ones seen outside the study area, were in an area of poor nesting habitat.

Authors disagree about territorialism of Goldfinches. Walkinshaw (1938) and Nice (1939) found no evidence of conflict between pairs and believed Goldfinches showed a definite sociability in nesting. Drum (1939), on the other hand, found definite territories that were actively defended against all males trying to settle within the territory.

Fig. 2. View of the study area looking south. The highest breeding density occurred in these loose clumps of elderberry. Photo by R. A. McCabe.

At Madison much of the territorial behavior was established by placing a mounted Goldfinch at 3 to 30 feet from the nest sites during all stages of the nesting cycle. This showed that some birds took up their territory 2 weeks before actual nest building, but usually only a day or two. Males attacked the male dummy when it was placed within 10 yards of the nest site, the reaction becoming stronger the closer the dummy was to the nest. Once a male attacked the dummy near the nest of a neighboring pair 10 yards distant. Females attacked both male and female dummies that were placed within 5 yards of the nest, and at this distance attacked more intensively than did the males.

On several occasions both male and female attacked simultaneously while I was still placing the dummy. A vigorous attack consisted of alighting on and pecking at the head of the dummy. At the other extreme the birds merely called plaintively and flew from perch to perch near the nest. Occasionally, the males made a song flight. When the dummy was left in place for more than a few minutes, the birds soon stopped attacking and perched 5 to 10 yards away. There they usually pecked at their toes, presumably a substitute mechanism. Often the males perched facing the dummy, body erect and motionless. When neither male nor female was present when I placed the dummy, I have on several occasions seen the male flying past overhead. The instant he saw the dummy he swooped down and attacked immediately without alighting. Once a male, unaware of the dummy, was feeding low in some nearby bushes. The instant he noticed it he attacked. In 1946 the dummy was attacked by 10 males and 5 females; in 1947 by 10 males and 17 females. Both males and females attacked the dummy as late as the 10th day of incubation.

Much of the above evidence might be construed as merely defense of nest site and not *prima facie* evidence of territorial defense. But many hours spent in an observation tower and other lookouts gave additional evidence. Males on the territory commonly perched quietly and motionless on top of tall shrubs, often a dead branch. Intruding males might take up a similar position within 20 feet. The 2 males would watch each other quietly, but eventually the defender would take off after the intruder, either driving him from his perch or actively taking part in a tumble fight. The male on his territory made frequent song flights. Here, the flights reached their perfection with the male making 3 or 4 complete circles, singing his jubilant song all the time.

These song flights were most frequent at the time of territorial establishment and nest building. They also depended on the proximity of other pairs and their stage of nesting. When 2 pairs were beginning to nest at the same time, there was almost constant jockeying between males. I have seen a single male make 6 song flights within 20 minutes, interspersed with much chasing of the adjoining male. Later in the nesting cycle, territorial defense consisted more of chasing than of singing or song flights, although following nest failure or the beginning of a second nesting, territorialism became stronger again.

Although adjoining males sat on their prominent perches staring at each other for minutes on end, I never saw anything resembling a defensive posture such as described in the Song Sparrow by Nice (1937) or the Snow Bunting by Tinbergen (1939). I have just 3 records of any posturing by Goldfinches. In 2 cases I had placed a female dummy within 6 feet of a partially constructed nest. In each case the female came to the nest to place material. On sighting the dummy she crouched, holding her head forward, wings quivering, and uttering a high, fast *chee-chee-chee-chee* for a few seconds before attacking. In a third case I saw 2 males 6 feet apart on a wire doing very much the same thing for a period of a minute or more before going into song flights. I believe the song flight acts as a very strong notice of territorial bounds and takes the place of other forms of display. Certainly, the area bounded by a song flight corresponds fairly closely with the actual boundaries of the area defended.

Conder (1948) observed frequent posturing in the European Goldfinch. It consisted of pivoting through 90 degrees, body extended slightly forward. It was used as a deterrent to intruding males as well as enemies. I often noticed Goldfinches pivoting on their perches, either while in the territory or while feeding, but never associated it with display. Certainly, there was no obvious relation between pivoting and the appearance of intruding males.

Males or females flying overhead across a territory were never attacked. Likewise birds feeding within a territory could often go unmolested. But the instant a male took up a prominent position he would certainly be driven off, if the defender were in sight. Female intruders were likewise driven off, usually by the females.

During 1947, I observed territorial defense at 17 nests. There were 33 cases of male chasing male; 6 of female chasing female; 1 of female chasing a male; and 1 of male chasing female. A single conflict lasted from a few seconds to a half hour. The greatest distance from the nest that a male was seen to defend his territory was 30 yards. The latest territorial defense was September 1, 1947, when both male and female were active in driving off neighboring males and females. At this time the female was incubating her second brood.

The female may take an active or leading part in the selection of territory for, of the 2 adult banded females from 1946 that returned to the study area in 1947, one nested 50 yards from its 1946 nest, the other 15 yards. In 1948 1 adult banded male returned to within 15 yards of its 1947 nest. Two other banded but unidentified females also returned to nest in 1947. Since no aluminum bands were used in 1946, other returns may have been present in 1947, but undetected because of lost celluloid bands. If the males alone selected the territory these females could scarcely have had the chance to build so close to their former nests. Davis (1941) observed that the female kingbird selects the nest site after pairing; the male subsequently defends the territory. Additional evidence for the female selecting the nest site is given later under the section Second Broods.

Requirements and Size of Territory

Type: The Goldfinch territory consists of the nest site and immediate area, but does not necessarily include food, water, or nesting material sufficient for the pair. On the study area the chief nesting material, thistle, grew mostly in several large discrete patches (Fig. 1). Nests were never found in these or in sunflower until toward the end of the season, and then usually only in the smaller patches. I doubt if a Goldfinch could defend such an economic asset against the many Goldfinches seeking its use.

There seems to be a relationship between food supply, nest sites, and population density. In 1944, when there were 36 pairs, 18 nests (35% of total) were built in composite plants, all of which are favored sources of food for Goldfinches. Eleven of these were in giant sunflower, the only year nests were built in this plant. In 1946 with 54 pairs 13% of all nests were in composites; and in 1947 with 60 pairs, only 5 nests or 5% of the total were in these plants. Hence, in years of high density Goldfinches seem to have difficulty in defending nest sites in plants the seeds of which are in so much demand.

Food, for the most part, consisted of seeds of thistle, Joe-Pye weed, and giant sunflower, all abundant on the marsh, but the birds usually had to forage outside of their territory for them. At 2 springs in the northwest corner of the area I could always count on seeing Goldfinches on a sunny afternoon, either bathing or drinking. Water may well be an essential component of high breeding densities for this species.

Although there were abundant shade trees in the western part of the area affording satisfactory nest sites, these were rarely used (a late fall census after all leaves had fallen still failed to disclose nests in them). The ideal sites were where elderberry grew abundantly and yet close to at least 1 large tree. The highest breeding density in 1947 was on 6.4 acres of marsh where there were 38 pairs. This makes an average territory of 7100 square feet, or a circle of diameter 95 feet. The territories reported by Drum (1939) extended to 1000 feet in length, hence the occurrence of territorialism does not depend on breeding density.

The Nesting Cycle

Although, in general, the Goldfinch delays nesting later than all other birds in eastern North America, there is a wide spread in nesting records. Roberts (1936) reports a record of a nest with 2 eggs found May 20, 1930 in Minnesota; at the other extreme he reports a nest containing 3 eggs about to hatch on Sept. 30, 1894. For Wisconsin, J. B. Hale of Madison told me of seeing copulation on May 27, 1947. I. O. Buss, formerly of Madison, found a freshly hatched nest on June 26, 1946. Such early nesting records are to be treated as anomalies and bear little relation to the normal sequence of nesting.

Since I was able to locate almost all nests on the study area, the curve in Figure 3 purports to show the dynamics of a nesting population. Since almost all nests were found either in process of construction or with eggs, I was able to date the beginning of the nests to within a few days. Extrapolation, where necessary, was based on nest chronology established at nests with precise records. The curves for 1944 and 1946 were very similar to that of 1947 and hence are not shown.

Nest construction generally started the first week in July, and in 2 weeks had come to a peak, with a minor peak almost an even month later. Nest building had ceased by the first week of September. The closest synchronization of nesting came in 1946 when 57% of all females were building simultaneously, compared with 40% in 1944 and 1947. Analyzing Walkinshaw's data (1939) for 14 nests started in July, 1936, I find a peak of nest building July 23, in close agreement with Madison.

Although nest building reaches a peak of activity about the middle of July, the total number of active nests (being built or containing eggs or young) continues to rise until the middle of August. This is probably due to the steady influx of new pairs to the study area up until that date. These late arrivals might be females that had started nesting elsewhere and then had come into the marsh for subsequent renesting attempts. But of the 53 banded females, the greatest observed move between nesting attempts was 150 yards, and almost all females remained within the same territory. Thus, there must be some physiologically retarded females arriving for an initial nesting attempt a full 6 weeks later than the most sexually advanced females.

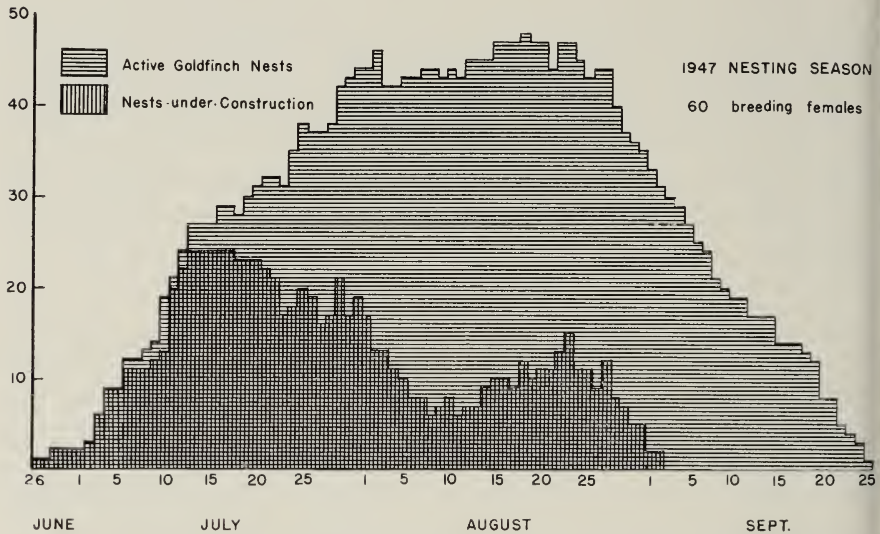


FIG. 3. Curves showing (a) rise, broad peak, and decline of entire nesting season; and (b) two distinct peaks of nest construction within this period.

The curve of total nest activity begins to drop about August 18, indicating the point at which some females stop breeding activity. Thus, the earliest nesters cease breeding at the time that the latest nesters are beginning.

Whereas the Goldfinches of the study area indicate a fairly well defined pattern of nesting, there seem to be geographical differences in the nesting cycle. On July 9, 1947, when many Goldfinches were nesting in Madison, I observed only 50 miles to the north, a flock of over 100 Goldfinches that were just beginning to break into pairs. Males were in process of chasing females in zig-zag flights a full month behind the Madison birds. Outside of this flock that was feeding on catkins of red birch (*Betula nigra* L.) along the Wisconsin River, I saw no other Goldfinches in the area.

The cause for late nesting among Goldfinches has been a subject of speculation among ornithologists, some of whom erroneously believe that these birds are dependent upon the pappus of thistle for lining the nest. There is little reason for believing this is the case, for I have found down from cattail (*Typhus* spp.), willow, and poplar in early nest linings, and in St. Paul early nests are lined with pappus from dandelions and sow thistle (*Sonchus* spp.) (Lewis, Unpub. MS.). The Goldfinch seems to have filled an ecological niche by utilizing seeds of composites as its chief food source, at least at time of nesting. Delaying nesting until July and August ensures an abundant source of food for the young.

There are few common, native composites in eastern United States that bloom early. In Wisconsin, field thistle (*Cirsium discolor*) is the first common, native composite to bloom (mid-July) hence, several centuries ago before the advent of Canada thistle (*Cirsium arvense* L.) and other European weeds, nesting could never have preceded that date by much. Goldfinches were probably much less abundant at that time, unless they were more diverse in their diet than now. At Madison the Canada thistle, the earliest common composite except dandelion, does not bloom until the last week in June and its seeds are not ripe until the first week in July (Zimmerman, Unpub. MS.), so the timetable of hatching nests is about as far advanced as would be safe.

The Nest

Site: Goldfinches will nest in a wide variety of trees, shrubs, and forbs, as long as they are growing in open sunlight. The location of 230 nests found on the area during the 3 years is given in Table 1. The preponderance of nests in

TABLE 1
THE LOCATION OF 230 NESTS ON STUDY AREA

SPECIES	RELATIVE ABUNDANCE OF PLANT	PER CENT OF NESTS
elderberry	10	68
dogwood	2	8
box elder	1	5
thistle	2	5
sunflower	2	5
aster	1	2
buttonbush	0.5	2
red maple	0.5	1
Joe-Pye weed	4	1
willow	4	1
poplar	1	0.5
cherry	0.1	0.5
wild lettuce	0.1	0.5
goldenrod	0.5	0.5

elderberry is mainly a reflection of the abundance of that shrub, but the total absence of nests from mature elm, willow, and poplar indicates that the Goldfinch has a decided preference for shrubs and forbs. Nests found outside the study area were commonly placed in red-osier dogwood and saplings of willow and poplar. Other plants included red oak (*Quercus borealis* Michx.), red pine

TABLE 2

THE HEIGHT OF 278 NESTS FOUND ON STUDY AREA

HEIGHT OF NEST ABOVE GROUND IN FEET	NO. NESTS
1	0
2	2
3	48
4	82
5	71
6	39
7	15
8	12
9	4
10–14	4
15–19	1

(*Pinus resinosa* Ait.), white cedar (*Thuja occidentalis* L.), tamarack (*Larix laricina* Koch), elm, plum (*Prunus*), hawthorn (*Crataegus* sp.), bog birch (*Betula pumila* L.), lilac (*Syringa vulgaris* L.), and nine-bark (*Physocarpus opulifolius* L.), in small numbers.

As the season advanced there was a marked increase in the use of forbs as nest sites. The Goldfinches presumably wait until these forbs have matured, but also many of the formerly favored elderberry bushes have had their crowns opened up by the weight of ripening berry clusters, thus making the nests too exposed and also affording few vertical crotches. Nests started in elderberry may drop as much as 18 inches by the time the berries become ripe, thus imperilling eggs and young in windy weather.

Where insects have attacked the main stalk of a forb, the lateral buds sprout to form an ideal rosette in which to place a nest. Almost all nests found in forbs were placed in such rosettes, and were singularly free from wind damage.

Almost all nests found in shrubs and forbs were from 3 to 6 feet off the ground; those in trees were usually from 8 to 15 feet high (Table 2). The nest is seldom well concealed for the female seeks for nest site a plant that has 2 or more nearly vertical branches forming a crotch in which to place the nest. Thus the nest is either below the leafy part of the plant as in elderberry, or else in some sparsely foliated plant as willow, poplar, or forb. This relationship of the nest to the crown of the plant is brought out by analysis of the 135 nests placed in shrubs or forbs in 1946 and 1947. Of these, 93% were located within 2 feet of the top, and 99% within 3 feet.

I believe that food supply is a more important determiner of occurrence of Goldfinches than nest site, and that when shrubs are not available these birds will select any available plant with proper branches that grows in the open. I have found no records, however, of Goldfinches nesting in any densities in trees.

Construction: In spite of the heavy drain upon the silky fibers of swamp milkweed made by the earlier nesting Alder Flycatchers (*Empidonax traillii*) and Yellow Warblers (*Dendroica petechia*), there remained enough for Goldfinches to use, at least for the first nestings. As late as August 18 females were gleaning the last bits from stalks. Following nest failure females commonly used material from the old nest or even material from a neighboring active nest. Later nesters used nettle blossoms of which the 2 inch long stalks made an excellent binder for thistle down or milkweed fiber. Other nests consisted chiefly of grasses, nettles, or outer coatings of dead forbs. Rarely, the down of cat-tail, Joe-Pye weed, willow, or poplar was also used for lining.

TABLE 3

THE TIME REQUIRED TO BUILD NEST IN RELATION TO NESTING SEASON

	PERIOD IN WHICH NEST WAS STARTED			
	July 1–15	July 16–31	August 1–15	August 16–31
Required time to build nest in days	13.0	10.8	5.8	5.6
Number of nests	17	12	4	12
Standard Deviation in days	4.6	4.4	.96	1.3

As the season advanced, the interval between beginning of nest construction and laying of the first egg decreased steadily from an average of 13.0 days in early July to 5.6 days (statistically significant) in late August (Table 3). For such a late nesting species such an economy of time must materially increase the number of renesting attempts possible.

Egg Laying: The number of eggs in a completed clutch varied from 2 to 7 (Table 4). Mean clutch size in July was 5.3 eggs, but by late August clutches averaged only 3.7 eggs (highly significant difference). The drop in clutch size with season probably depends more on the number of renestings than the lateness of the season. The decrease between each of the bimonthly intervals from July 15 to August 31 is highly significant. For 10 females where the sizes of the first and second clutches are known, the first clutch averaged 4.8 eggs (S.D. = .40), and the second 3.8 (S.D. = .87).

TABLE 4

VARIATION IN CLUTCH SIZE WITH SEASON

DATE FIRST EGG LAID	NUMBER OF NESTS BY CLUTCH SIZE						MEAN	STANDARD DEVIATION
	2	3	4	5	6	7		
July 1–15	0	0	0	2	0	0	5.0	—
July 16–31	0	0	8	34	11	1	5.3	.65
August 1–15	0	1	8	38	5	0	4.8	.57
August 16–31	3	11	17	6	0	0	3.7	.90
September 1–15	0	3	2	0	0	0	3.4	.49
Totals	3	15	35	80	16	1	4.6	

TABLE 5

THE TIME REQUIRED FOR RESUMPTION OF EGG-LAYING AFTER NEST FAILURE

DATE OF NEST FAILURE	NUMBER OF DAYS BETWEEN NEST FAILURE AND EGG-LAYING	STAGE OF NEST AT TIME OF FAILURE
July 8	12	Nest ¾ built
July 13	21	Nest complete
August 3	6	8 days incubation
August 14–17	11–14	Young 7 days old
August 16–20	4–8	8 days incubation
August 21–22	7–8	1 egg

I have only 6 records of the time required for a female to start laying following nest failure (Table 5). This time ranges from 21 days down to a possible 4 days. These records suggest that the interval before laying may depend as much on the season of the year as the stage of nesting at the time of break-up. If so, this would agree with the acceleration in nest construction mentioned above.

Although about 30 hours were spent the first year in observing the activities of the male and female during egg laying and incubation, my observations agree closely with those of Mousley (1930a, 1930b, 1932, 1935) and Walkinshaw (1938, 1939) and will not be recounted here.

Care of the Young

The young must be fed very little the day of hatching, for I saw no food in the crops until the second day. As many as 60 sticky seeds are fed by regurgitation to the young during 1 feeding. One trip by the female to the feeding grounds is sufficient for 2 or 3 feedings when the young are less than a week old. The average time between feedings at this time was about 25 minutes; it decreased as the birds became older, and finally rose again just before the birds fledged.

The young were given the same food as was eaten by the adults. Of a dozen crops examined by artificial regurgitation, only 1 contained any animal matter, a 0.75 inch long caterpillar. Both parents ate small droppings and carried off the larger ones. The nest remained clean until about the eighth day, but extensive fouling occurred within the last 2 days before fledging, the rim becoming a solid mass of excrement (frontispiece). This fouling is not a safe criterion for nesting success, since some nests remained clean right up to the end. Nests with only 1 or 2 young are not immune to fouling, suggesting that it is not the amount of work involved that results in droppings being left.

The first week of life for the young is all victualling and voiding. After that they show more interest in their surroundings. They eye ants and beetles crawling close to the nest, crouch low when danger approaches, spend much time on warm days preening their feathers or occasionally standing up and fluttering their wings. They do not react to calls of nearby Goldfinches but wait for the almost inaudible *per-chee* of the female as she prepares to feed them before raising their heads. The young fledge when 10 to 16 days old (Table 6). The

TABLE 6

AGE OF FLEDGLINGS ON LEAVING THE NEST

AGE (DAYS)	NUMBER OF NESTS
10	9
11	4
12	9
13	7
14	6
15	3
16	2
Totals	40

Mean age at fledging—12.3 days.
Standard Deviation—±1.76 days.

mean fledging age of 12.3 days agrees fairly well with the 12.88 days recorded by Walkinshaw (1939) for 25 young. My banding operations undoubtedly caused some broods to leave the nest earlier than they might normally. This probably accounts for the relatively large number fledging at 10 days.

Within 24 hours before fledging the young develop a call, *chick-kee*, very faint when still in the nest, but audible at 50 yards when once fledged. Fledglings may remain quiet for long periods of time, but seem to recognize the male parent's voice and immediately start this *chick-kee* call. As the male comes into sight they flutter their wings in effort to get to him and utter this call incessantly until fed. This same note may also be used as a collecting call in answer to the male, who takes over most of the duties following fledging. Whenever disturbed and scattered, the young become silent immediately, but after a few minutes they resume the *chick-kee* call, apparently to signal their presence. A week after leaving the nest, this call evolves into *chick-kee-dee*, very similar to the call of the Chickadee (*Parus atricapillus*) both in quality and pitch. It is given by the young as they follow the male about the marsh and has been heard well into October.

Reds, a male bird taken from the nest at 3 days and held in captivity, shed considerable light on the development of certain traits. Although he gained weight much more slowly than wild birds, his rate of feathering was about normal. At 13 days he was hopping about the floor, and 2 days later was able to fly up 10 inches. By 16 days he was hopping strongly and flying across the room. The next day he was seen pecking at food. By 19 days he was eating by himself, although he would still accept food from a stick. By 20 days he was a strong flier circling the room with ease and landing without a falter. By this time he had learned to drink from a dish. By 30 days he was shelling his own seeds.

Some of the stimuli for gaping were shown by Reds and his fellow orphans. Although the female may at times give a soft call to the young when she is ready to feed them, this is apparently not a necessary stimulus. Captive young at 3 or 4 days gaped when the edge of the nest was tapped or when their bills were touched with food. At about 7 days they gaped at the mere sight of food if hungry enough. When week-old young were put in closely placed nests they would attempt to be fed by the birds in the other nest, even moving over bodily into the other nest in their efforts. But once together in a nest again they would no longer try to be fed. Hence, sight of a bird, regardless of size outside of the nest, also acted as a stimulus to gaping.

Second Broods

It has been assumed that the Goldfinch is single-brooded because of its late nesting. Mousley (1935) gave some evidence on the basis of behavior that it might raise a second brood. Much to my surprise, in 1944 I found one definite record of a banded female starting a second nest following fledging of her first brood in August. In 1946 and 1947 with many more birds banded early in the season, I found 9 more females starting a second brood. I believe that most females that raise their first brood before August 20 start on a second brood. The lateness of the season is no deterrent to them, for birds were found in the nest as late as September 23 in most years. Brother Hubert Lewis found 2 broods fledging on October 15, 1946 in St. Paul, Minnesota, so in extreme cases a second brood might be started as late as September 15.

As the young reach fledging age, the male takes over most of the feeding, thus giving the female time to start her new nest. One female started her new nest 3 days before her first brood fledged. Therefore the stimulus for renesting must precede fledging by at least 3 days. The first egg of the second clutch was laid anywhere from 3 to 10 days, but usually 5 or 6 days, following fledging in the first nest. The time between the start of the first and second clutches is remarkably uniform. Four females required 33 days, 3 took 34 days, and 3 others took 32, 35, and 36 days. Second clutches were begun between August 10 and 27.

In only 3 cases have I had both male and female of double-brooded birds banded. In 2 cases the female kept her mate and built within 20 yards of the first nest. In the other case I strongly suspect that the female changed mates although retaining her old territory. While watching her from a blind I saw her being fed at her new nest by an unbanded male. To the many males that were flying overhead she paid no attention. But when shortly afterwards a male with 5 young settled into a clump of sunflowers close to the nest, the female got off her eggs and uttered the high *chee-chee-chee* so typical of a female expecting her mate to come to the nest. I could not see whether the male was her old mate, but the behavior of the female and the size of the fledged brood suggested this. It looked here as though the female had taken a new mate, but had not completely severed her bond with her former one. Unfortunately, the nest was destroyed that night before I could watch her further.

In 4 cases the female built her nest in an entirely new territory, as far as 150 yards from the first nest. These new territories were vigorously fought for with neighboring males. In one case the male was scarcely allowed to reach the female on the nest without being driven off by a neighboring male whose territory had been reduced by the newcomer. This looks like further evidence that the female selects the nest site, in this case having placed her nest in an almost untenable position that would scarcely have been the case if the male had free selection of territory. There remains the possibility that a second-nesting female may have to seek a new mate if her old one is no longer sexually active. But the chance of an unmated male still being sexually active at this late date would probably not be any greater than for a mated male, which after all has been stimulated by courtship feeding and territorial defense during most of the preceding nest cycle. Cessation of sexual activity is usually associated with onset of molt. In Madison the first males began to show post-nuptial molt the first week in September, so this event would signal cessation of further nesting.

How extensive is second nesting among Goldfinches? In 1947 6 out of 30 banded females raised a second brood; in addition, 3 unmarked females almost certainly raised a second brood. Hence, a probable minimum of 15% of the 60 breeding females were double-brooded. At first glance the prominent second peak in the nest construction curve (Fig. 3) with its close coincidence with second nesting suggests an extensive amount of second nesting. In 1947 there were 37 nests started after August 5, the earliest record for beginning of second nesting. These nests were built mainly by 2 categories of females: those renesting after nest failure, and those beginning a second brood. For lack of more

TABLE 7

RELATION OF NEST FAILURE AND SUCCESS WITH SEASON

PERIOD IN WHICH NEST FAILURE OR FLEDGING OCCURRED	NUMBER OF NEST FAILURES	NUMBER OF SUCCESSFUL NESTS	PER CENT OF NESTS SUCCESSFUL
July 1–10	0	0	—
July 11–20	14	0	0
July 21–30	19	0	0
July 31–August 9	14	1	7
August 10–19	22	12	35
August 20–29	34	29	46
August 30–September 8	28	19	40
September 9–18	4	17	81
September 19–28	0	16	100
September 29–October 8	0	0	—
Total	135	94	41

precise information one must assume that females in either category are equally likely to begin a new nest. A comparison of nest records during July and August shows that for each 10 day period more nests failed than were successful (Table 7). Hence, considerably more than half of the 37 nests started after August 5 must have belonged to renesting females. Therefore, the second peak in nest construction can be attributed only partially to second nesting. A total of 7 females reared second broods.

Mortality

During the 3 years, 65% of the total number of eggs laid hatched and 49% of all eggs produced fledglings (Table 8). The only certain cause for mortality I ever found was from storms. Nests built in elderberry heavy with fruit or in

TABLE 8

NESTING SUCCESS AND PRODUCTIVITY

	1944	1946	1947	TOTAL
Number pairs	36	54	60	150
Total nests	56	81	102	239
Total eggs	170	206	320	696
Eggs hatched	108	119	228	455
Young fledged	63	92	183	338
Per cent of eggs hatched	64	58	71	65
Per cent eggs producing fledglings	37	45	57	49
Av. number young per pair	1.7	1.7	3.0	2.3
Per cent of females raising fledglings	.39	.48	.75	.57

forbs were sub ject to destruction by high winds and were found tilted so far over that eggs or young had fallen out. Three or 4 deserted nests were soon covered over and inhabited by Deer Mice (*Peromyscus leucopus*). I suspect that they may eat eggs from nests that were not being incubated, for I found mouse feces in the bottom of a freshly deserted nest. Garter Snakes (*Thamnophis sirtalis*) curled up beside nests on several occasions made me suspect them. One in particular was right in the bowl of a nest subsequently deserted.

Trautman (1940) found 4 out of 16 nests at Buckeye Lake parasitized by Cowbirds (*Molothrus ater*). Since these 4 nests were all found within a period of 9 days and in the same field, he suggests that a single late Cowbird might have laid eggs in all 4 of these nests. His field notes indicate that ordinarily there is little overlap between egg-laying of Cowbirds and Goldfinches (letter). I had only 1 case of parasitism and this was in a nest in which egg-laying started July 25.

Undoubtedly some nest failure was through death of the female, although with such a high density of breeding birds, most of them unmarked, it was not possible to determine this. Indirect evidence, however, points to considerable adult mortality. During the 3 years the 150 pairs laid 696 eggs, an average of 4.6 per female. But the mean size of complete clutches laid during July and the first 2 weeks of August was 5.0 eggs. If there had been no adult mortality one would expect that each female would average somewhat more than 5 eggs laid during a season, for some were double-brooded and many others had their first nest destroyed with eggs or young in the nest. It is difficult to conceive that a female would never succeed in laying at least 1 full complement of eggs. Hence there must have been considerable female mortality to keep the ratio of eggs laid to total breeding females down to 4.6.

Productivity

In 1947, 57% of all eggs eventually produced fledglings, compared with 37% in 1944, and 45% in 1946 (Table 8). This productivity must be considered minimal, for during 1946 and 1947 some adult birds were trapped at the nest site, which probably caused desertion in some cases. However the desertion rate at unmolested nests was just as high as at nests where trapping was carried on. And the year of lowest fledging success was when no banding was done until the young were ready to fledge.

Walkinshaw (1939) found 58% fledging success from 248 eggs, and Lewis (unpub.) reports 80.3% on the basis of 608 nests located in thistle found during the years 1943 through 1946 at St. Paul, Minnesota. The difference in nesting success between St. Paul and Madison is highly significant and one must infer that there are environmental differences between the 2 areas. The St. Paul study area was in the city suburbs with presumably fewer mammalian predators.

The location of the nests in thistle may also have acted as additional protection against predation or storms.

During 1944 and 1946 each breeding female produced an average of 1.7 young; in 1947 an average of 3.0. Until much more banding has been done and mortality tables of both juveniles and adults worked out, one cannot say how many young must be raised to maintain the population. If there is any truth in the old saw "safety in numbers," Goldfinch flocks may suffer less mortality than non-flocking species, in which case relatively low brood success would suffice to maintain the population.

Summary

A 3-year nesting study with emphasis on behavior, territory, and breeding success was made on 24 acres of park and marshland in Madison, Wisconsin. The area was frequently searched for nests and their outcome determined by visits every 2 or 3 days. Seventy-nine birds were banded in the early stages of the nest cycle to facilitate behavior study and estimates of the population.

Pair formation took place in May or earlier while birds were still in flocks. Elements of pair formation included courtship song, courtship flights, song flights, and true song. After pair formation, birds left the flocks, but did not take up territory until just before nesting began. The bond was maintained by the male feeding the female, as well as by song. Territory was defended vigorously by males, either by chasing, taking up prominent perches, or by song flights. Defense was strongest at the beginning of the cycle, but occasionally lasted until young were in the nest. It appeared again with renesting and second nesting. The territory did not necessarily include food, water, or nest material. In the area of densest population territories averaged 95 feet in diameter.

Nest construction began in July and reached a peak the middle of July. New pairs continued to enter the study area until the middle of August, by which time some females had already completed nesting. Breeding densities on the area increased from 36 pairs in 1944 to 54 in 1946, and 60 in 1947. Nests in shrubs and forbs were usually from 3 to 6 feet high; those in trees 8 to 15 feet. Of 230 nests found 68% were in elderberry, the commonest shrub on the area, but 22 other species of plants were utilized to lesser degree. Nest construction took an average of 13.0 days in early July and decreased steadily to an average of 5.6 days in late August.

Clutch size of 150 nests ranged from 2 to 7 eggs. Mean clutch size in July was 5.3 eggs, but for late August was only 3.7. Six records of renesting females indicated from 4 to 21 days were required between time of nest failure and subsequent egg-laying.

A captive Goldfinch was raised to study behavior. It was eating independently at 19 days, was a strong flier at 20 days, and was shelling seeds at 30 days.

Stimuli for gaping in young birds included tapping the nest, touching the bill, and the presence of other nestlings in an adjacent nest.

Approximately 15% of Goldfinches start a second brood between August 5 and September 1. The female may change mates, but more often retains the same mate and territory. In 1 case the female started a new nest 3 days before the young in the first nest had fledged. A total of 7 females reared second broods.

During the 3 years, 65% of all eggs hatched and 49% produced fledglings. This compares with 58% and 80.3% in 2 other regions. Storms were the only definite cause for nest failure, but Deer Mice, Garter Snakes, and death of the female were probable factors. The number of young produced per pair ranged from 1.7 to 3.0.

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Department of Wildlife Management, University of Wisconsin, Madison

THE BRANT OF PRINCE PATRICK ISLAND, NORTHWEST TERRITORIES

BY CHARLES O. HANDLEY, JR.

THE systematic relationships of the small, black-headed geese of the genus *Branta* have long been a center of lively controversy. Opinion has varied as to whether they belonged to one species or two. Birds wintering in Europe are now believed to belong to a single species, *Branta bernicla* (Linnaeus), and two races of this species are considered valid—a dark-bellied one, *bernicla*, breeding in western Siberia and on islands north of the European mainland, and a light-bellied one, *hrota* (O. F. Müller), breeding in the eastern American arctic and on islands northwest of Europe (Witherby *et al.*, 1939: 215). *Hrota* winters extensively in the New World also, especially along the Atlantic coast. The distinctness of a third form, *nigricans*, breeding in eastern Siberia and the western American arctic, has never been denied. With it the problem has been one of degree of difference. Is it related to *B. bernicla* as a subspecies or as a species? G. N. Lawrence described it as a full species. For a long time it was regarded as such, but ornithologists who visited the western American arctic continued to report the presence of both *nigricans* and *hrota* there in summer. Series composed of breeding *and winter* specimens from various parts of North America could be arranged in such a way as to show almost complete intergradation between the two forms. This intergradation, which allegedly could "be traced over the circumpolar circle in northern Europe and Asia" (Taverner, 1926: 110) was accepted by taxonomists as evidence that the forms were not biologically isolated hence not specifically distinct. *Nigricans* was therefore reduced to subspecific rank in the 19th supplement to the third edition of the A.O.U. Check-List of North American Birds (1944. *Auk*, 61: 443).

The area throughout which the breeding ranges of *hrota* and *nigricans* are believed to overlap is extensive. Bent (1925: 238), on Taverner's authority, states that both forms have been taken on Melville Island, Northwest Territories. Taverner (1926: 110) states that "light and dark-bellied birds seem to meet in the islands of Franklin [i.e., the Arctic Archipelago] without interbreeding. . . ." Gavin (1947: 198) discovered separate nesting colonies of both *nigricans* and *hrota* in the Perry River district south of Queen Maud Gulf. Hanson, Scott and Queneau (1949: 226) also found both these forms at Perry River, but apparently only *nigricans* was nesting that season. The comments of Bird and Bird (1936: 606), Schiøler (1925: 497–523), and Jourdain (1936) suggest that the breeding ranges of *nigricans* and the nominate race overlap in western Siberia.

If *nigricans* and *hrota* do actually interbreed anywhere in the western American arctic, it is somewhat surprising (a) that no one has encountered mixed pairs in that vast area; and (b) that there are so few *true* intermediates in museum collections. By 'true' intermediates I mean *breeding* specimens neither dark enough below for *nigricans* nor light enough below for *hrota*, *and collected in the area of overlap*. Numerous specimens have been preserved which are intermediate in a very broad sense. Most *B. b. bernicla* of the Old World are neither dark enough below for *nigricans* nor light enough below for *hrota*, yet obviously those far removed birds are not intermediates between *nigricans* and *hrota* in a genetic sense. Moffitt (1932: 308) says: "I know of no single specimen ever having been procured in America showing indications of interbreeding."

In the course of investigations on Prince Patrick Island, Northwest Territories, in 1949, I found both *nigricans* and *hrota* common as nesting birds. *Nigricans* was the more numerous. The two forms arrived almost simultaneously, giving no hint of any difference in migration routes. This was not surprising, perhaps, in view of the lateness of the arrival date. The first birds I saw appeared to be a pair. They came in on 12 June, a dreary, foggy day. They circled back and forth low over the snow-covered river delta, the coastal hills, and unbroken ice of the bays, searching for open water or a bare spot of land on which to alight. I could not identify them except as brant. On the 15th I saw four flocks. One flock, composed of four *nigricans*, grazed on a small spot of lush grass and moss tundra which had melted clear of snow. They were reluctant to fly as I approached and returned to the same spot after I had moved away. Other flocks, proclaiming their arrival with a musical honking and croaking, were migrating up icebound Crozier Channel. A flock of eleven came in low over the ice and lit at a meltwater pool on the beach near my camping spot. They rested, drank, bathed, preened, chased each other around with extended necks as though courting, gabbled continuously, and occasionally uttered soft honking notes. Most of these birds appeared to be *nigricans*, but two were quite light and may have been *hrota*, although I could not be sure. The first undoubted *hrota* I observed on 17 June. That day I collected a pair as they grazed on a muskeg island which had just emerged from the snow of a river delta. On subsequent days brant frequently visited this same area, but the two forms almost always kept separate from each other.

As soon as the south and west slopes began to clear of snow, the brant commenced nesting. The tundra was more than eighty percent snow covered, and snowshoes were still necessary for travel, when on 22 June, on the gentle, well vegetated lower slopes of a mountain three miles inland, I located my first nests. These slopes were among the first vegetated areas to dry out sufficiently to allow nesting. I observed about a dozen pairs of brant scattered over several square miles, and found three nests. One of the nests contained four eggs, so it must have been started soon after 12 June. In addition to the nesting pairs, I saw several flocks of four to twenty individuals on the nesting area. These birds were so intent on grazing that I could not help believing that they had just arrived. This was the first date on which I observed large numbers of brant. Pairs of typical *hrota* and pairs of typical *nigricans* both nested on these same slopes, with nests as little as two or three hundred yards apart. Other nests, less than a dozen in all, and scattered widely, I found on other well vegetated dry tundra in the vicinity, but I found no colonies. With the exception of two destroyed nests on rocks near the beach, all nests that I found were at least one mile inland.

Nesting habitat of Brant on Prince Patrick Island in mid-July. The bird is a Long-tailed Jaeger (*Stercorarius longicaudus*) at its nest. Note the snowbank; the bareness of the distant slopes; and the prevalence of grass in the foreground. Photograph by Charles O. Handley, Jr.

The summering population probably totalled fewer than one hundred individuals. A large number of these apparently did not attempt to nest. It is possible that the late thaw had much to do with this. The tundra was still seventy percent snow covered by 30 June. In general, the summering flocks did not mix, although they used the same tundra and the same ponds to a large extent.

All the nests which I found were destroyed by dogs or foxes (*Alopex*), although the fox population appeared to be not unusually high. Very few goslings were found. The earliest of the season were located by S. D. MacDonald of the National Museum of Canada on a shore-lead on 23 July. I am not sure of the form to which these belonged because I did not see the parents. I found other broods, a total of five in all, on inland ponds on 29 July and 3 August. Three of these broods were *nigricans*. I am not sure that any of the young brant were able to fly by the time of the freeze-up the first week of September. The only one upon which I could keep a check was about three-fourths grown and partly fledged on 30 August.

The fall migration, which began about the first of August and continued to the end of the month, seemed to proceed in a leisurely manner. The birds apparently left the island a few at a time throughout this period, in flocks varying from four to thirty individuals. The last *nigricans* were observed on 30 August, the last *hrota* on the 31st. I was surprised on 14 August to encounter a flock of about four hundred individuals grazing in a flooded meadow along Crozier Channel. The only portion of the flock that I could see clearly appeared to be *nigricans*. Perhaps this flock was made up of birds which had summered farther to the northeastward on Prince Patrick, on the Bordens, or in Isachsen Land, all of which places are known to be inhabited by brant. I think there were few, if any, local birds in the flock.

In summary it may be stated that both the Black Brant, *nigricans*, and the American Brant or Light-bellied Brant, *hrota*, nested on Prince Patrick Island in 1949. Differences in arrival and departure dates of the two forms were slight and probably insignificant. The two forms nested in the same habitat, even on the same slopes more or less side by side, showing no ecological separation. Neither form nested in colonies. Non-breeding birds of both forms frequented the same ponds and tundra. I observed no mixed breeding pairs and only infrequently observed what I thought to be a mixed flock. Thirteen adults collected at random for the U. S. National Museum were all typical of one form or the other. Nine were *nigricans*, four were *hrota*, none was intermediate.

So-called intermediates between *nigricans* and *hrota* which have from time to time been taken in North America may not be true intermediates (i.e., intermediates in a genetic sense). They may be stray *Branta b. bernicla*. It would be hardly reasonable to suppose, however, that two such apparently closely related forms, nesting in intimate association as they did on Prince Patrick Island in 1949, would not occasionally interbreed. Since I did not actually observe any such interbreeding, and since the two forms appeared to be biologically isolated despite their geographical and physical proximity, they should, I believe, be considered specifically distinct.

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University of Michigan Museum of Zoology, Ann Arbor

NEW LIFE MEMBER

Since her childhood on a farm in Kalamazoo County, Michigan, Hazel Louise Bradley has been interested in birds. She received her bachelor's degree in agriculture from Michigan State College and her master's degree in biology from the University of Michigan, and for the past sixteen years has taught biology at the Jackson (Michigan) High School. Since 1946 she has served the Michigan Audubon Society as Recording Secretary. She is now the Secretary-Treasurer of the Jackson Audubon Club. She has been active as a bird-bander and as a County 4-H Club Leader in Upper Michigan. She has published two papers in *The Jack-Pine Warbler*—one on the Chipping Sparrow, one on the Indigo Bunting, the latter based on studies carried on at the University of Michigan Biological Station at Douglas Lake. Miss Bradley is interested in trees, flowers and mosses, counts bicycling and bowling as favorite hobbies, and is known among her friends for her swift pace as a hiker.

GENERAL NOTES

Gannet, Wood Ibis, and Gull-billed Tern along the coast of Mississippi.—From August, 1949 to late January, 1950 I was stationed at Keesler Field, Biloxi, Mississippi. The following three species of birds, which I observed there during that period, seem worthy of record. The first two are not even listed by T. D. Burleigh in his 'The Bird Life of the Gulf Coast Region of Mississippi,' and the last he reports only from islands well out from the mainland (1944. *Occ. Papers Mus. Zool.* Louisiana State Univ. No. 20, p. 382).

Morus bassanus. Gannet. On January 2, 1950, in Mississippi Sound about 8 miles offshore from Biloxi, I saw a number of Gannets. Although the day was misty, I identified ten individuals with certainty. Four of these were in mottled plumage. The birds were fishing in a loose flock.

Mycteria americana. Wood Ibis. On October 16, 1949, while observing shorebirds about six miles west of Biloxi, I saw a small flock of Wood Ibises flying eastward about five hundred yards off shore. With 8x binocular I could clearly see the dark colored heads and necks and extensive black of the wings.

Gelochelidon nilotica. Gull-billed Tern. Among a large flock of Forster's Terns, *Sterna forsteri*, sitting on some pilings along the sea wall at Biloxi, I saw four Gull-billed Terns in winter dress on August 31, 1949. This was the only occasion on which I noted the species.—Lt. Karl W. Haller, *Box 3344, Killeen Base, Killeen, Texas.*

Winter copulation of Mallards.—The disposition of the Mallard (*Anas platyrhynchos*) to engage in coition outside the normal breeding season seems to have been generally overlooked in North America. Bent's 'Life Histories of North American Wild Fowl' (1923) contains no mention of it, and no recent reference has been made to it in *The Wilson Bulletin, The Auk*, or *The Condor.* On the other hand, Boase (1931. *Brit. Birds*, 25: 17) has reported "actual pairing" in Scotland as early as December 6 on salt water, and January 1 on fresh water. In 1910 Heinroth stated that coition was common among Mallards on the European continent after September throughout the fall and winter (*Verh. d. V. Internat. Ornith.-Kong., Berlin*, p. 679) and similar statements in the Handbook of British Birds (1939, 3: 234) are based to a considerable extent on Heinroth.

At Roaches Run Waterfowl Sanctuary near Washington, D. C., on January 21, 1950, my attention was attracted by the bobbing of a male Mallard before a female. Soon the female also started bobbing, and presently she was mounted by the male. These Mallards belonged to stock which commonly migrates north about the middle of March. In recent years, however, a few birds have become permanent residents. On April 24, 1949, I observed a female with six young at the sanctuary. This female was probably one of the sedentary birds. The water is brackish.—Frank C. Cross, *9413 Second Avenue, Silver Spring, Maryland.*

Ruffed Grouse eats snake.—On September 30, 1949, near Crane Lake, Minnesota, my wife and I noticed a garter snake (*Thamnophis sirtalis*) dead in the road. It was about 12 or 13 inches long and had not been much damaged. About an hour later, as we were walking back along the road, we encountered a Ruffed Grouse (*Bonasa umbellus*) with about half of what we assumed to be the same snake hanging from its mouth. As we watched from a distance of 18–20 feet, the grouse, which appeared to be nearly full-grown, continued swallowing the snake, but it obviously was having difficulties. It seemed to be disturbed by us, and in a few minutes ran into the woods with about 5 inches of the tail of the snake hanging from its mouth.—J. S. Findley, *1201 South Center Avenue, Sioux Falls, South Dakota.*

Malay Banded Crake off the island of Mindanao in the Philippines.—At 4 o'clock on the afternoon of October 3, 1945, while the U. S. S. *Jamestown* was steaming through the Sulu Sea seven miles due west of Dohinoc, Mindanao, a rail—subsequently identified as a Malay Banded Crake, *Rallina fasciata*—collided with the ship's superstructure, stunned itself, and fell to the deck. A crew member brought the bird to me. Its legs, feet and eyes were red, the latter of a very bright shade. Wondering whence it could have come, I noticed dark storm clouds and heavy lightning over the island in the vicinity of Dohinoc. On skinning it I found it to be a male. Its testes were not enlarged.

The specimen is now No. 113,947 in the collection of the University of Michigan Museum of Zoology. It is one of 46 specimens known to be in museums of the United States at this time. The American Museum of Natural History has 24 specimens, the U. S. National Museum 11, the Chicago Natural History Museum 4, the Museum of Comparative Zoology at Harvard 3, and the Academy of Natural Sciences in Philadelphia 3.

Rallina fasciata has not previously been reported from Mindanao, although it has been found on Palawan (Lowe, *Ibis*, 1916, p. 611), Balabac (Everett, *Ibis*, 1895, p. 32), and Mindoro (McGregor, *Philippine Journ. Sci.*, 1906, p. 698) in the Philippines. It is known to inhabit India, Burma (Sharpe, *Cat. Birds Brit. Mus.*, 1894, 23: 75), Siam (Gyldenstolpe, *Ibis*, 1920, p. 763) and "the Malay Peninsula; Sumatra; Java; Borneo; Lesser Sunda Islands; . . . Pelew Islands; Moluccas (Halmahera, Batjan, and Buru)" (Peters, 1934. Check-list of Birds of the World, 2: 171). The Mindanao record does not extend the periphery of range, but it does fill the gap which has existed between Mindoro to the north and the Moluccas to the south and Palawan to the west and the Pelew Islands to the east, strongly suggesting that this little known rail may inhabit the central Philippine Islands.—KENNETH W. PRESCOTT, *University of Michigan Museum of Zoology, Ann Arbor.*

Death of a Horned Lark in territorial combat.—On March 4, 1950, my husband and I, in company with Robert A. Whiting and Kenneth Bunting of Jackson and George M. Sutton of Ann Arbor, visited various parts of Jackson County, Michigan, checking early duck arrivals. The morning was bright, the wind brisk and from the northwest, the snow several inches deep, and the temperature about 20° F. In the vicinity of Clark Lake we continued to see pairs or small flocks of Prairie Horned Larks, *Eremophila alpestris praticola*, many of them in snowless places at the very edge of the highway. Near a slough just north of Jefferson Road and west of South Woodlands Road we stopped to look at some Tree Sparrows (*Spizella arborea*) and a Song Sparrow (*Melospiza melodia*).

Having climbed the embankment near the highway and started through a young cherry orchard toward the slough, we happened to see and hear ahead of us two Horned Larks. That these birds were neither a pair nor part of a flock was soon apparent. They were males in bright plumage. As they walked and ran about on the snow they continued to twitter excitedly, occasionally singing a full song. Often they stood high, with 'horns' lifted, or crouched, 12–15 inches apart, facing each other defiantly. Occasionally they sang in duet. We soon realized that we were witnessing a territorial conflict, for the birds, despite the sweetness of their singing, were obviously opposing each other determinedly. They did not run at each other, but flew instead; and when they met, midair, they rose fluttering straight up to a height of 30 or 40 feet, pecking and clawing at each other the whole way. Their twittering never ceased, but they resumed their singing only after descending to the ground and taking positions a few yards apart. Not once, during the 15 minutes or more that we watched them, did one drive the other about. One flew at the other, the other seemed to accept the challenge without giving ground, and up they went, fighting hard. Usually they rose quite rapidly and directly, but the wind carried them away from the area in which they continued to show interest and to which they invariably returned. For a time we thought one bird was showing signs of weariness, the other of victory, but when they flew at each other and fluttered upward we found it quite impossible to be sure which was which.

Somewhat to our surprise, and almost certainly without our frightening them off, both birds flew upwind and across the highway, still twittering and bickering. We did not keep our eyes on them, but judged from the singing that they were continuing their fighting just across the highway. Turning our attention momentarily to the sparrows we had started after in the first place, we began our return to the car.

As we started to cross the highway Mr. Bunting called to our attention a 'dead bird' in the highway about 25 yards away in exactly the direction of the twittering we had last heard from the fighting Horned Larks. Using our binoculars, we instantly saw that the 'dead' bird was a male Horned Lark, and that a *living* male Horned Lark was beside it apparently pecking at its wings and tail as if trying to rouse it. Approaching, we found that the 'dead' bird was actually still alive, but it was obviously done for. As it struggled feebly, spreading its wings and tail, the other bird twittered, ran at it, gave it a peck or two, and flew off. We were only five or six yards away at that time.

Picking the doomed bird from the ground we watched it expire in our hands while the living bird twittered only a few rods away. We were greatly puzzled as to exactly what had happened. Each of us sensed that this was the very bird we had been watching and we could not help wondering whether it had died from exhaustion or been dealt a lethal blow by the other bird. One thing was certain: the bird could not have been lying there when we had crossed the highway a little more than a quarter of an hour before; it had been mortally injured within the past few minutes.

Some of our questions were answered when we made a skin of the specimen that evening. The bird was in excellent condition. It weighed 34 grams. Though not fat, there was a considerable amount of food in its gizzard. There was no evidence of fractures. The skull, however, showed moderate hematoma along the parieto-occipital suture line, and there was a mild hematoma across the upper back and left shoulder. These wounds (which had not torn the skin) suggested a blow of sufficient force to involve the central nervous system and cause death. Our conclusion was that the bird, its attention focussed primarily upon its opponent and its perceptive powers somewhat dulled by the long and strenuous combat, had struck a telephone wire while fluttering upward and thus met its tragic end. The wind had carried it, still fluttering no doubt, to the highway, where we had found it. Reviewing what we had seen of the two birds—the dying and the 'victorious', we decided that the latter probably had been just as much bewildered and surprised—in its way—as we had by the refusal of the other to continue fighting.

Pickwell (1931. *Trans. Acad. Sci. St. Louis*, 27: 56) states that "all quarrelling" between male Horned Larks defending territories "takes place in the air." He describes the "curious game of tit for tat" which the birds play, "one now chasing, next being chased. . . ." Sutton (1927. *Wilson Bulletin*, 39: 133), however, mentions "tussels on the ground" which may have been in defense of territory.

Mr. Bunting returned the following day to the scene of the above-reported observations, finding a pair of Horned Larks not far from the highway. This pair probably nested somewhere in the vicinity.—Betty Darling (Mrs. Powell) Cottrille, *6075 Brown's Lake Road, Jackson, Michigan.*

White-breasted Nuthatch and Tufted Titmouse hawking for insects.—On the evening of August 13, 1949, I watched a male and female White-breasted Nuthatch (*Sitta carolinensis*) hawking for flying insects in and about a white elm (*Ulmus americanus*) at my home. The birds frequently made flights of a few yards, generally with some abrupt turns, just inside or outside the peripheral twigs of the tree, about 30 feet above the ground. Less frequently they flew out from the tree as much as 10 yards. Once, when the male alighted after such a flight, I saw a clear-winged insect in his bill. The nuthatches hawked steadily for eight minutes. On the evening of August 30, I saw a different (banded) male nuthatch make a twisting flight, apparently hawking, from the same elm to another tree. I also saw a Tufted Titmouse (*Parus bicolor*) make a hawking flight from the tree. Winged ants were flying about the immediate vicinity on both evenings, and the birds may have been capturing them. I have not found any previous record of such feeding by either *Sitta carolinensis* or *Parus bicolor*. Bent (1948. *U. S. Natl. Mus. Bull.* 195: 27, 28, 52) cites records for the Red-breasted Nuthatch (*Sitta canadensis*) and Pygmy Nuthatch (*Sitta pygmaea*), and there are records for *Sitta europaea* (1949. *Brit. Birds*, 42: 56, 386).—HERVEY BRACKBILL, *4608 Springdale Avenue, Baltimore 7, Maryland.*

The Carolina Wren, *Thryothorus ludovicianus*, as a mimic.—Though mimicry by this species has been reported many times, some ornithologists still seem to have reservations on the subject. Bent (1948. *U. S. Natl. Mus. Bull.* 195: 212) summarizes the literature, listing 12 bird species the Carolina Wren has been thought to imitate. The name 'mocking wren' has been applied to *Thryothorus ludovicianus* in publications on the birds of Pennsylvania, the District of Columbia, Indiana, Iowa and Missouri, and 'mocker' has been applied to the bird in New Jersey.

While looking over some old notebooks recently, I found substantially this entry under date of April 30, 1903 (locality, Bloomington, Indiana): A Carolina Wren singing; the song was so like that of a Chewink (*Pipilo erythrophthalmus*) as to deceive me until I saw the performer.—W. L. MCATEE, *6200 Woodlawn Ave., Chicago 37, Illinois.*

A Black and White Warbler's Nest with Eight Cowbird Eggs.—In an oak-hickory woodland about three-quarters of a mile southeast of Half Moon Lake, Washtenaw County, Michigan, I found, on May 16, 1949, a nest of the Black and White Warbler (*Mniotilta varia*) which contained not only 2 eggs of the Warbler, but also 8 of the Cowbird (*Molothrus ater*). The nest, constructed of grasses, dried leaves, hair and shreds of inner bark, was only 80 mm. in diameter, within, and was about three-quarters roofed over. The entrance was approximately 75 mm. wide by 50 mm. high. The female bird was on the nest and flew when I approached closely.

Within the next 4 days, I visited the nest twice, finding the female Warbler present, her mate still absent. She was apparently obtaining her own food. On one occasion, she left the nest only when I came very near, and she moved quickly along the ground, trailing her outspread left wing and twice falling, as if in an effort to draw my attention from the nest. Following the Warbler, I discovered, only 40 feet from her nest, a Towhee's nest, where both parents were attending 3 nestlings.

On May 26, I found that the 2 Warbler eggs had been removed from the nest, one destroyed completely, one punctured and lying nearby. (Fortunately, the full contents of the nest had been photographically recorded, earlier.) Whether the Warbler had removed her own eggs or whether this was the work of a Cowbird that returned even at this late date is, of course, not known.

Dr. George M. Sutton and Mr. Haven Spencer accompanied me to the nest on May 30 and succeeded in photographing the Black and White Warbler atop the pile of Cowbird eggs in her nest (Figure 1). We measured the eggs and compared patterns of speckling, photographed the group together and returned them to the nest. In Figure 2, the eggs are numbered, left to right, 1 to 4 in the top row and 5 to 8 beneath. Measurements, in millimeters, were as follows:

1.—21.3 x 16.6	3.—22.3 x 15.5	5.—21.7 x 15.2	7.—23.6 x 16.4
2.—21.6 x 16.4	4.—22.5 x 15.4	6.—22.2 x 16.1	8.—22.8 x 16.3

The damaged Warbler egg measured 17.8 x 14.0 mm.

FIG. 1. Black and White Warbler incubating two eggs of her own and eight Cowbird eggs. Photographed in Washtenaw County, Michigan, May 30, 1949, by Haven H. Spencer.

FIG. 2. Eight Cowbird eggs from a Black and White Warbler nest. Photographed in Washtenaw County, Michigan, May 30, 1949, by Haven H. Spencer.

Dr. Sutton concluded, after examining the eggs, that possibly only 4 Cowbirds had parasitized this nest. Four female Cowbirds could have laid the 8 eggs in 2 days.

The situation at the nest remained unchanged during the observations on June 1 and June 3. On June 4, however, I discovered the 8 eggs destroyed and the Warbler departed, apparently due to predation by some carnivorous mammal.

Eight is apparently the greatest number of Cowbird eggs reported for any of the numerous host species of *Molothrus ater*. In a letter dated May 26, 1949, Dr. Herbert Friedmann informed me that 8 Cowbird eggs had once been reported for a Towhee nest, but that 5 was the most reported heretofore in a Black and White Warbler's nest. It is unfortunate that the commonness of parasitism of the Towhee did not come to my attention in time for me to determine the species of the 3 nestlings found near the Warbler's nest.

While this series of observations is of interest principally because of the number of Cowbirds' eggs in the Warbler's nest, it also furnishes a nesting record for a part of Michigan where the Black and White Warbler nests only infrequently; and, further, it shows an unusual perseverance by the female Warbler in incubating a remarkable number of eggs for almost twice the duration of the normal incubation time.—George W. Byers, *University of Michigan Museum of Zoology, Ann Arbor.*

Red-wings feeding on white ash.—Robert Nero's recent note under this heading (1950. *Wilson Bulletin*, 62: 39–40) reminds me of my own observations of this habit of the Red-wing (*Agelaius phoeniceus*). Every October beginning with that of 1922 this species has fed on the seeds of a large white ash (*Fraxinus americanus*) behind my house in West Roxbury, Massachusetts. My first note of this behavior, dated October 22, 1922, reads as follows: "A small flock composed of both sexes feeding in the top of our white ash. After reaching up and picking off a samara the bird held it against the twig on which it perched and evidently detached the wing, or perhaps shelled the seed, in this way. They seemed to require a solid twig to aid them in the shucking process and not to be able to cut the wing off with the bill alone as some of the finches do."

In some Octobers I have seen only male Red-wings feeding on ash seeds; in others, both sexes. My notes for October 26, 1947: "Many females among the Red-wings here today feeding in the ash trees and resting in hemlocks, etc. The females were in preponderance and flew about together." On at least one occasion (October 16, 1928) I have seen Rusty Blackbirds (*Euphagus carolinus*) similarly feeding on the ash seeds.—Francis H. Allen, *215 La Grange St., West Roxbury 32, Massachusetts.*

Unusual bathing techniques employed by birds.—Near my home in Streetsville, Ontario, I have observed three species of birds bathing in unusual ways:

Black-capped Chickadee, *Parus atricapillus*. On February 26, 1946, I watched a chickadee bathing in new, light fluffy snow under a wide-spreading shrub. It dived in and fluttered and floundered along with bathing motions of head-dipping and wing-quivering.

Tennessee Warbler, *Vermivora peregrina*. On September 30, 1949, a Tennessee Warbler bathed at a pond's shallow edge by flying down into the water from an over-hanging willow branch. It dipped in and out several times until thoroughly wet.

Slate-colored Junco, *Junco hyemalis*. On October 10, 1949, a junco took an early morning bath in dewdrops. There had been fog in the night, and everything was heavily bedewed, including a patch of thick clover in the lawn. Here the junco burrowed in under the wet leafage making the customary bathing motions of the wings, and sending the spray flying.—Margaret H. Mitchell, *Streetsville, R. R. 1, Ontario, Canada.*

EDITORIAL

Members of the Club who attended the meeting at Jackson's Mill, West Virginia in April will never forget the wonderful spirit which prevailed. Maurice Brooks and the host organizations did a masterful job of entertaining and caring for us. We were especially glad to see Harvey I. Fisher, Editor of *The Auk;* William C. Legg, erstwhile Editor of *Field Ornithology;* and John Handlan, whose story-telling was a memorable part of one of the evening gatherings. We were sorry that our two living founders, Lynds Jones and R. M. Strong, could not be there. An unexpected feature was the informal showing of bird drawings by Hugh Land, of Huntington, West Virginia, Donald Malick, of Olean, New York, and Robert Verity Clem, of Hamden, Connecticut. The papers were well worth hearing. For a time Southgate Hoyt's famous pet, Phloeo, stole the show, but for those who preferred wild Pileated Woodpeckers, the West Virginia hills had provided a pair with their nest not far away. Secretary Harold Mayfield's detailed account of the meeting appears in the final pages of this issue.

We are saddened by news of the death, on May 5, 1950, of H. Boardman Conover, for many years Research Associate of the Chicago Natural History Museum; world authority on game birds; and, with Charles B. Cory and Charles E. Hellmayr, author of the celebrated "Catalogue of Birds of the Americas and the Adjacent Islands." His private collection of game birds numbered nearly 18,000 specimens. Born in Chicago, on January 19, 1892, and educated at Yale, he was interested in birds all his life. Field studies took him to Venezuela in 1920, to Chile and Argentina in 1922, to Hooper Bay, Alaska in 1924, and to East Africa in 1926–27. He published about 38 papers, among them reports on his trips to Venezuela and Alaska. He became a member of the Wilson Ornithological Club in 1944, and a Life Member in 1947. Two of his papers, revisions of certain tinamous, remain to be published. His bird collection was willed to the Chicago Natural History Museum.

Edward L. Chalif, of Short Hills, New Jersey, announces his intention of donating two hundred dollars a year for ornithological work in Mexico. Mr. Chalif has visited Mexico himself and has become deeply interested in the birds of that country. The Edward L. Chalif Grant for Bird Work in Mexico will be awarded through the Research Committee of the Wilson Ornithological Club.

Miss Theodora Melone, of Minneapolis, Minnesota, who was active as a member of the Club's erstwhile Committee on Aid to European Ornithologists, has given twenty-five dollars to the Louis Agassiz Fuertes Grants Fund. In her letter of transmittal she says: "The extra 25 dollars is for the Fuertes Fund. It is not much, but it may help finance a research project."

President Brooks has appointed the following:

Trustee, to serve three-year term, 1950–1953. . . . . Aaron Moore Bagg

Endowment Fund Committee: Leonard C. Brecher, Chairman. Clinton S. Banks, Robert L. Edwards, Robert T. Gammell.

Louis Agassiz Fuertes Research Grant Committee: Charles G. Sibley, Chairman. John T. Emlen, Jr., Ernst Mayr, Frank A. Pitelka, George M. Sutton, Dwain W. Warner.

Membership Committee: Seth H. Low, Chairman. Ralph M. Edeburn, Assistant Chairman. Members to be announced later.

Library Committee: George J. Wallace, Chairman. H. Lewis Batts, Jr., Mrs. Herbert E. Carnes, A. W. Schorger, A. E. Staebler, Dwain W. Warner.

Illustrations Committee: Robert M. Mengel, Chairman. Allan D. Cruickshank, Hal H. Harrison, Karl H. Maslowski, Edgar M. Reilly, Jr., Robert W. Storer.

Wildlife Conservation Committee: Robert A. McCabe, Chairman. Members to be announced later.

Committee on Arrangements for the 1951 meeting in Davenport, Iowa: Fred T. Hall, Chairman. Members to be announced later.

Representative on the Council of the American Ornithologists' Union...... Burt L. Monroe

Representative on the Council of the American Association for the Advancement of Science.................................. S. Charles Kendeigh

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The editors are grateful to the following for assistance in preparing for publication the material presented in this issue of *The Wilson Bulletin:* William L. Brudon, Thomas D. Burleigh, Betty Darling Cottrille, David E. Davis, Eugene Eisenmann, Merle L. Kuns, Robert M. Mengel, Hustace Poor, Kenneth W. Prescott, Austin L. Rand, and Robert W. Storer. They are especially grateful to Elsa Hertz for the many hours she spent in re-typing manuscripts.

ORNITHOLOGICAL LITERATURE

Lista de las Aves de Venezuela con su Distribucion. Parte 2. Passeriformes. By William H. Phelps and William H. Phelps, Jr. Bulletin of the Venezuelan Society of Natural Sciences, Vol. 12, No. 75, 1950: $6\frac{3}{8} \times 9\frac{1}{4}$ in., 427 pp., with large folded map indicating the more than 350 localities mentioned. Paper. *Bs.* 10. Obtainable from La Sociedad Venezolana de Ciencias Naturales, Avenida Carabobo, Caracas, Venezuela. Send $3.00 in personal check on a U. S. bank, or an international money order.

Ornithologists interested in the taxonomy, nomenclature and distribution of Venezuelan birds have not, up to the present, had a definitive work for reference. Adolf Ernst's "Catálogo sistemático de las especies de aves que han sido observadas hasta ahora en los Estados Unidos de Venezuela," listing 315 genera and 556 species, and published in 1877, has not been easily obtainable. Such general works as "The Birds of South America," by Brabourne and Chubb, and the Chicago (Field) Museum of Natural History's "Catalogue of Birds of the Americas and the Adjacent Islands," begun in 1918 by Charles B. Cory and continued by Charles E. Hellmayr and Boardman Conover, have of course been useful, but the Venezuelan material has not been readily separable from the rest. Two papers in English, one by Alexander Wetmore (1939), "Observations on the Birds of Northern Venezuela," the other by Herbert Friedmann and Foster D. Smith, Jr. (1950), "A Contribution to the Ornithology of Northeastern Venezuela" (respectively Nos. 3073 and 3268, *Proc. U. S. Natl. Mus.* 87: 173–260 and 100: 411–538), have served to focus attention upon Venezuela, but they have not dealt with the country as a whole. In addition there have been, within the past decade or so, numerous reports in Spanish, among them "Aves de la Ribera Colombiana del Río Negro (Frontera de Colombia y Venezuela), " by Armando Dugand and William H. Phelps (1948. *Caldasia,* 5: 225–245), and "Las Aves de Perija," by William H. Phelps (1944. *Bol. Soc. Venez. Ciencias Naturales,* 56, pp. 265–338). Briefer papers, principally descriptions of new forms or annotated lists dealing with circumscribed areas such as islands off the north coast of Venezuela, have continued to appear both in English and in Spanish. Through this considerable mass of material everyone has come to realize that the Venezuelan Society of Natural Sciences, and especially William H. Phelps and his son, William H. Phelps, Jr., have been diligent in their study of Venezuelan birds.

"Lista de las Aves de Venezuela con su Distribución" is the culmination of all this effort. It represents numerous expeditions to little known parts of the country, preservation and identification of large numbers of specimens, visits to all the major museums of North America, correspondence with European ornithologists, and exhaustive study of the literature. Part 2, now before us, is admirably thoroughgoing and thoughtfully presented. As the title indicates, this part deals only with passerine birds. Part 1, covering the non-passerines, is to appear later. For each form discussed the scientific name, Spanish vernacular name, and full reference to the original description are given. A synonymy is included only when the type localities involved are Venezuelan. Statements of range are primarily geographical, though mention of zones and elevations hints of ecology. For forms which also inhabit other countries or parts of countries, brief over-all range-statements are given. Of special value is the listing in boldface type of localities represented by specimens in the Phelps Collection.

For many North American readers, the introduction will be of special interest and value. Here are listed, in tabular form, 56 species and subspecies which migrate to or through Venezuela, spending only part of the year there; 8 Colombian forms which are known to occur near the Venezuelan border and which therefore probably inhabit Venezuela also; 87 forms not previously reported from Venezuela; and 107 additional forms described as new from Venezuelan specimens in the Phelps Collection. The 56 migrants are preponderantly species and subspecies which breed in the United States and Canada, 44 of them being such familiar birds as the Kingbird (*Tyrannus tyrannus*), Purple Martin (*Progne subis*), Veery (*Hylocichla fuscescens*), Yellow-throated Vireo (*Vireo flavifrons*), Black and White Warbler (*Mniotilta varia*), Baltimore Oriole (*Icterus galbula*), Summer Tanager (*Piranga rubra*), and Rose-breasted Grosbeak (*Pheucticus ludovicianus*), to name one species from each family represented. The Scarlet Tanager (*Piranga olivacea*), surprisingly enough, is missing from the list. It has never been recorded in Venezuela. The Fork-tailed Flycatcher (*Muscivora tyrannus*), which ranges, according to the A.O.U. Check-List (p. 203) from southern Mexico to Patagonia, breeds locally in Venezuela in the tropical zone.

An important table shows that 25 passerine families, 317 passerine genera, and 689 passerine species of birds are known to inhabit Venezuela. Of these not one genus is exclusively Venezuelan, but 31 species are. This is not the place for a lengthy discussion, or even a listing, of these species, of course, but it is interesting to note (a) that they represent only eight families—the Furnariidae or Ovenbirds, the Formicariidae or Ant-Shrikes, the Cotingidae or Cotingas, the Tyrannidae or Tyrant Flycatchers, the Coerebidae or Honey Creepers, the Parulidae or Wood Warblers, the Thraupidae or Tanagers, and the Fringillidae or Finches; and (b) that only one of these eight families, the Fringillidae, is common to the New World and the Old. Considering how sedentary many wrens are, it is a little surprising that Venezuela has no endemic troglodytid. The same might be said for other families as well. If, as recent investigations indicate, the Honey Creepers actually belong to the Parulidae, then Venezuela, with its seven endemic Wood Warblers (three of the genus *Diglossa*, 3 of the genus *Myioborus*, and 1 of the genus *Basileuterus*) must be considered a speciation center for that highly interesting family.

The carefully prepared index and the map with its accompanying list of place-names are invaluable. The printing, unfortunately, is not all that could be wished for. Proof has obviously been read with great care, but some words on almost every page, especially italicized words, are hard to read because of the poor type.—George Miksch Sutton.

Fair Isle Bird Observatory First Annual Report 1949. George Waterston and Sons, Ltd., Printers, Edinburgh, Scotland, 1949: $5\frac{1}{2} \times 8\frac{1}{2}$ in., 31 pp., 19 photos, 1 map on back cover. Paper. 2*s* 6*d*.

On June 1, 1948, Mr. Kenneth Williamson made his first visit to Fair Isle, located midway between the Orkney and Shetland Islands, in order to organize and direct the work of a bird observatory. The two-fold objective was to obtain data on the migration and the breeding behaviour of birds. The energy and enthusiasm of Mr. Williamson have produced remarkable results during the short span of this endeavor. Four abandoned Royal Navy Detachment huts were reconditioned for living quarters and a laboratory and bird traps were erected during the first winter. The first observations on migration were commenced on April 14, 1949. A reading of the brief statement of the aims of the Fair Isle Bird Observatory does not prepare one for the wealth of information to be found in this excellent progress report. "The purpose of the Bird Observatory is to provide facilities for visitors to carry out scientific research on the island, not only in the sphere of ornithology, but in every aspect of Natural History."

One is impressed not only by the data on migration already obtained, but also by the scope of the projects planned for the future. The highlights of both spring and fall migration in 1949 are presented, including several noteworthy records. For example, an influx of Snipe (*Capella gallinago*), Redshanks (*Tringa erythropus*), and Redwings (*Turdus musicus*) was noted on the night of October 20–21. An analysis of trapped Redwings showed them to be of the Iceland race, *T. m. coburni* Sharpe. The first large scale invasion since 1935 of the Northern Great Spotted Woodpecker (*Dendrocopos major major*) occurred in September and October. All were birds of the year. In the first full season's work, six new species were added to the Fair Isle bird list, bringing the total to 298 forms. The six additions were: Black-browed Albatross (*Diomedea melanophrys*), Kentish Plover (*Charadrius alexandrinus*), Spotted Crake (*Porzana porzana*), Nightingale (*Luscinia megarhyncha*), Greenish Warbler (*Phylloscopus trochiloides viridanus*), and Pallas's Grasshopper-Warbler (*Locustella certhiola*).

A section on the "Behaviour of Migrants" discusses briefly certain open-country species and the Great Spotted Woodpecker. An insight into the adaptive ability of birds in unusual habitats is given in a discussion of these woodpeckers. "In the absence of trees, they hammered vigorously at the telephone poles, clothes-posts and the long lines of fencing-posts, feeding in characteristic fashion." Two birds were found in a dying condition with no recognizable food-remains in their gizzards. At least two birds, however, were still present in December and were "spending most of their time in the stack-yards where the traditional hammering action of the bill has been adapted to the task of removing the grain from its husk."

The laboratory routine for trapped birds includes weighing, plumage studies and the collection of external parasites. The weights of over 300 Rock Pipits (*Anthus spinoletta petrosus*) taken at various hours of the day from late June to November indicate a probable sexual difference in weight. "Wing-length provides an indication of sex in this species, and it has been found that those with wings over 90 mm. long are, on the average, 3 g. heavier than those with wings under 88 mm." It was found, also, that Redwings averaged 22.3 g. lighter in weight during the fall migration than in the spring migration. A careful check of trapped birds has added information on external parasites. A new tick for Britain, *Hyalomma marginatum balcanicum*, was taken from a Rose-colored Pastor (*Pastor roseus*), and two new hosts for hippoboscid flies were discovered: (1) *Ornithomyia avicularia* from a Water Rail (*Rallus aquaticus*), and (2) *O. fringillina* from a young Arctic Skua or Parasitic Jaeger (*Stercorarius parasiticus*). In hope of making precise descriptions of color differences between populations of the same species, a Lovibond-Schofield colorimeter is to be installed. If successful, the use of such an instrument will give a numerical reading for fine gradations in plumage-tints.

An enlightening section is presented on the recognition of 'rarities.' The philosophy at the Observatory concerning stragglers and accidentals differs strikingly from that of many ornithological circles: e.g., the rare warblers were not collected. In denying the necessity for such collecting at a modern field-study station, Mr. Williamson states: "It may be less satisfactory that an important record should rest on the deposition of a few observers, but against this must be set the important gain that these few observers are presented with a unique opportunity in field-work. They enjoy a few hours intensive training as a team,—hours which call for patient concentration on the job of observing and noting down details of plumage, habits and behaviour, and of analysing these for the all-important 'field-characters' (often so imperfectly known) likely to assist other observers in years to come." Photographs revealing details of wing-formula (e.g., of the Greenish Warbler, pl. 13) and other diagnostic characters were taken as permanent records of occurrence.

A progress report is given on long term studies on the breeding birds of the island, with special reference to the Arctic Skua, Great Skua (*Catharacta skua*), and Oyster-catcher (*Haematopus ostralegus*). The types of traps used and the success of each are discussed. A summary of the 1,793 birds ringed [banded] in 1949 and the fall of 1948 is included. The report is well illustrated with photographs of the island, traps and techniques employed.

The report admirably illustrates the results obtainable from concerted effort in ornithological studies. It should be a stimulus to all groups interested in the manifold problems of bird migration. Visitors are welcome at the station and accommodations are available for ten observers. Further information may be obtained by writing the Director, Fair Isle Bird Observatory Trust, 17 India Street, Edinburgh, Scotland.—Andrew J. Berger.

North American Waterfowl. By Albert M. Day. Stackpole and Heck, Inc., New York and Harrisburg, 1949: xx + 329 pp., 68 half-tones, 55 pen and ink cuts, 1 color plate. $4.75.

This book aims to solicit the wildfowler's help and interest through simple, patient explanation of the problems at hand and of the work that is being done to manage waterfowl as a harvestable resource. The book opens with a discussion of the reckless wildfowling of the past, then describes the steps taken to stem this heavy kill through protective legislation. This part of the story has been told many times over, of course; but here it is used as the required introduction to the main theme of the book: the modern program for the management of waterfowl. The precepts upon which the modern management program operates are set forth. Detailed discussions are given of the work of the law enforcement groups, the sanctuaries, the refuge program, the plan for waterfowl research, and the Pittman-Robertson program. There is a chapter on *State Activities* which we wish could have gone into more detail regarding the growing interest of the various states in the waterfowl program. The old attitude that responsibility for waterfowl management rests mainly with the federal government is gradually giving way to the modern plan wherein state and federal offices more equally share work and interest. There is one chapter on *Waterfowl Conservation in Canada*, mostly a brief historical record; and another chapter discusses *The Mexican Waterfowl Situation*, dealing at some length with first-hand observations of wildfowling in that country.

As with all "popular" books, the specialist sometimes does not have to read deeply to find a point or two he feels he might contest—not on accuracy but on the point of some incompleteness of treatment. I was disappointed in the chapter on wildlife research because it did not record some of the most important items that are now being studied. But I cast aside all doubts of the author's grasp on this topic when I came upon several sentences which are among the most important in the book. Mr. Day recognized the lag in wildlife research when he said (p. 203): "We have been slower in developing scientific techniques for the proper utilization and protection of our natural resources than we have in industrial fields." And he gives a solemn commitment for the future program when he writes: "Wildlife research must be a continuing function because conditions are ever changing as the pattern of land and water uses are altered. Answers obtained 20 years ago may not suit present-day needs" (p. 213). Those who have followed the work of the Fish and Wildlife Service during the last four years know of the great advancement in the Service's research program, particularly in the approach to waterfowl problems; and there is ample witness to the fact that the so-called "basic concept" of the 1930's is valued only as it measures up to modern observations.

The book is attractive in make-up and its value to many readers will be greatly increased by the many lively pen and ink drawings by Bob Hines. Among the many half-tones illustrating the work of the waterfowl program, there are included reproductions of all of the duck stamps since the first issue.—Albert Hochbaum.

BOOKS: List 8

Books added to the Wilson Ornithological Club Library since the publication of List 7. Lists 1 to 7 were published in the September issues of *The Wilson Bulletin*, 1943 to 1949.

Armstrong, Edward A., Bird life. 1949.
Beebe, William, Pheasant jungles. 1927.
Blanchan, Neltje, Bird neighbors. 1904.
Broun, Maurice, Hawks aloft: The story of Hawk Mountain. 1949.
Bullough, W. S., The reproductive cycles of the British and the Continental races of the Starling (*Sturnus vulgaris* L.). 1942.
Cruickshank, Allan D., Birds around New York City. 1942.
Cutright, Paul Russell, The great naturalists explore South America. 1940.
Darling, F. Fraser, Bird flocks and the breeding cycle. 1938.
David, Abbé, Abbé David's diary (translated and edited by Helen M. Fox). 1949.
Delamain, Jacques, Pourquoi les oiseaux chantent. 1928.
Forbush, Edward Howe, and John Bichard May, Natural history of the birds of eastern and central North America. 1939.
Fowler, W. Warde, Tales of the birds. 1888.
Groser, Horace G., The book of birds. 1911.
Haverschmidt, Fr., The life of the White Stork. 1949.
Hewitt, Redginal, Bird malaria. 1940.
Hoffman, Ralph, Birds of the Pacific states. 1927.
Howard, Eliot, A Waterhen's worlds. 1940.
Kirkman, F. B., Bird behaviour: A contribution based chiefly on a study of the Black-headed Gull. 1937.
Kortright, Francis H., The ducks, geese and swans of North America. 1942.
Musgrove, Jack W., and Mary R. Musgrove. Waterfowl in Iowa. 1943.
Nesbit, William, How to hunt with the camera. 1926.
Noll, Hans, Schweizer Vogelleben. 1942.
Nuttall, Thomas, A manual of the ornithology of the United States and of Canada. The water birds. 1834.
Palmer, Ralph S., A behavior study of the Common Tern (*Sterna hirundo hirundo* L.). 1941.
Phelps, William H., and William H. Phelps, Jr., Lista de las aves de Venezuela con su distribución. Parte 2, Passeriformes. 1950.
Roberts, Brian, The breeding behaviour of penguins, with special reference to *Pygoscelis papua* (Forster). 1940.
Roberts, Brian, The life cycle of Wilson's Petrel *Oceanites oceanicus* (Kuhl). 1940.
Rorimer, Irene T., A field key to our common birds. 1940.
Ryves, B. H., Bird life in Cornwall. 1948.
Sandars, Edmund, A bird book for the pocket. 1927.
Sanden, Walter von, Guja: Leben am See der Vögel. 1933.
Seeley, H. G., Dragons of the air, an account of extinct flying reptiles. 1901.
Selous, Edmund, Evolution of habit in birds. 1933.
Squire, Lorene, Wildfowling with a camera. 1938.
Stanford, J. K., The awl-birds. 1949.
Walkinshaw, Lawrence H., The Sandhill Cranes. 1949.

PROCEEDINGS OF THE THIRTY-FIRST ANNUAL MEETING

BY HAROLD MAYFIELD, SECRETARY

The Thirty-first Annual Meeting of the Wilson Ornithological Club was held on Friday and Saturday, April 28 and 29, 1950, at the State 4-H Camp, Jackson's Mill, West Virginia. It was sponsored by the Brooks Bird Club and the Huntington Bird Study Club.

There were four half-day sessions devoted to papers and motion pictures, two general business meetings, and a meeting of the Executive Council. In addition to the official sessions of the Wilson Ornithological Club, there were other events: an informal reception following the Annual Dinner on Friday evening; a tour of the Camp grounds and an informal meeting on Saturday evening, featuring motion pictures, "Wild Flowers of the Alleghenies," by H. P. Sturm, and a lecture, "Who Killed Cock Robin?" by Dr. F. W. Preston; bird walks on Friday and Saturday mornings; and field trips to the Cheat-Gaudineer region and to Holly River State Park on Sunday, April 30. An exhibit of handmade articles, products of Southern Highlands craftsmen, was displayed.

This meeting will be long remembered for the beautiful setting in which it was held. The West Virginia hills were becoming green and the early spring flowers were in bloom. Perfect weather prevailed and every stroll across the Camp grounds was a field trip. Pileated and Red-bellied Woodpeckers were nesting near the meeting hall, and the songs of the Bachman's Sparrow and Carolina Wren were daily attractions.

Meeting of the Executive Council

The meeting of the Executive Council was held in the lobby of Harrison Cottage, at 4:00 p.m., Thursday, April 27. The principal actions of the Council were as follows:

Upon invitation of the Davenport Public Museum, the Council voted to hold the Thirty-second Annual Meeting on Friday and Saturday, April 27 and 28, 1951, at Davenport, Iowa. A meeting of the Executive Council will be held on Thursday, April 26, and there will be field trips on Sunday, April 29.

David E. Davis asked to be relieved of the editorship of *The Wilson Bulletin*, but consented to continue in the post until a successor could be found. After a lengthy discussion of the matter, the Council voted that the resignation be accepted with regret.

George M. Sutton was elected Editor of *The Wilson Bulletin* beginning with the September, 1950, issue.

The Council recommended that abstracts of papers presented at annual meetings not be published henceforth in the Proceedings. The considerations in making this decision were as follows: The abstracts take up space which might better be used in publishing complete ornithological papers; the abstracts are usually not complete enough to warrant bibliographical reference; most of the papers of sufficient value are later published in full in *The Wilson Bulletin* or some other ornithological journal.

Opening Ceremonies

Dr. C. T. Neff, Jr., Vice President of West Virginia University, opened the general meeting on April 28 with an address of welcome. Dr. Olin Sewall Pettingill, Jr., President of the Wilson Ornithological Club, responded for the organization.

First Business Session

President Pettingill called to order the first business session on Friday morning. The minutes of the Thirtieth Annual Meeting, as published in *The Wilson Bulletin* for September, 1949, were approved.

The Treasurer's report was read, but action on it was deferred until after the report of the Auditing Committee at the final business session. The Treasurer's Report is published in the June, 1950, issue of the *Bulletin.*

Report of Endowment Committee

Leonard C. Brecher, Chairman, reported that six new life memberships were added during the year. A list of prospective life members is being compiled, and the committee will welcome the suggestions and help of all members. Life membership donations go into the endowment fund to provide steady income for the *Bulletin* and other activities of the club.

Report of Research Committee

John T. Emlen, Jr., reporting for Charles G. Sibley, Chairman, recommended that the Louis Agassiz Fuertes Research Grant of $100 be awarded to Arnold J. Petersen for a study, "Reproductive Cycle in the Bank Swallow." George M. Sutton announced that an extra $100 had been made available by an anonymous donor to this fund. This additional grant was divided as follows: $50 to Henry E. Childs, Jr., for "Population Dynamics and Life History of the Brown Towhee"; $25 to Harrison B. Tordoff for "Comparative Osteology of the Subfamilies of the Fringillidae"; and $25 to Byron E. Harrell for "Ecology of the Rancho Del Cielo, Tamaulipas, Mexico." There were nine applicants for grants.

Report of Membership Committee

Seth H. Low, Chairman, reported that the names of 229 prospective members enrolled since the 1949 meeting were posted for the inspection of members. These people were to come up for election to membership at the final business session. On April 30, 1950, the Club had 1543 members and 125 institutional subscriptions to the *Bulletin.*

Report of Illustrations Committee

Robert M. Mengel, Chairman, reported that this committee had consulted with the editor and had given him specific assistance as follows:

1. Advised the editor about numbering, sequence and quality of illustrations (1 paper).
2. Redrawn a number of graphs and maps (about 11 for 3 papers).
3. Provided a frontispiece in color for the March, 1950, issue of *The Wilson Bulletin.*
4. Assembled photographs for use in connection with one future paper.
5. In addition, the Chairman has reviewed two books, consisting largely of illustrative material, for *The Wilson Bulletin.*

Report of Committee on Aid to European Ornithologists

Miss Theodora G. Melone, reporting for Mrs. Frances Hamerstrom, Chairman, recommended that this committee not be reappointed for another year, in view of the fact that the condition of scientists in Europe has improved so much in the past year. Mrs. Hamerstrom, who has just returned from a visit in Europe, has brought back a first-hand account of this situation. She tells of the great appreciation of the people in Europe who have received gift parcels. Through the combined efforts of several American societies, more than 3000 packages had gone to European ornithologists about a year ago and many more have gone since that time. As an evidence of his appreciation, one scientist donated a valuable collection of bird skins from eastern Europe and Asia to the Museum of Zoology, University of Michigan.

Temporary Committees

The president appointed three temporary committees as follows:

Auditing Committee

Leonard Brecher, Chairman
Frederick V. Hebard

Resolutions Committee

James Tanner, Chairman
Aaron M. Bagg
Fred T. Hall

Nominating Committee

R. Allyn Moser, Chairman
A. W. Schorger
S. Charles Kendeigh

Second Business Meeting

The second and final business meeting was called to order at 9:00 a.m., Saturday, April 29, by President Pettingill. All candidates for membership to the club were elected.

Report of Library Committee

George J. Wallace, Chairman, reported that since the publication of the list in the March, 1949, *Bulletin* 61 books, 78 magazines and bulletins, 1104 reprints, and 6 pamphlets have been added to the library. The committee is assembling and re-listing all of the book titles that have been published in annual lists in September *Bulletins* from 1943 to 1949. It is hoped that these may be published all together in an early issue of the *Bulletin*, thus informing members about the books (not separates and journals) in the Club's library.

Report of Auditing Committee

The Auditing Committee reported that the books of the Treasurer had been examined and found to be in good condition. Special commendation was expressed to Burt L. Monroe, retiring Treasurer, for the systematic methods and meticulous accuracy of his records.

Election of Officers

A. W. Schorger, reporting for the Nominating Committee, proposed the following officers for 1950: President, Maurice Graham Brooks; First Vice President, Walter J. Breckenridge; Second Vice President, Burt L. Monroe; Secretary, Harold Mayfield; Treasurer, James H. Olsen; Elective members of Executive Council, Richard H. Pough (term expires 1951), W. C. Vaughan (term expires 1952), Fred T. Hall (term expires 1953).

The report of the Nominating Committee was accepted and the nominees were elected.

Report of Resolutions Committee

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

1. RESOLVED, That the Committee on Arrangements for the 1950 Annual Meeting at Jackson's Mill be highly commended for the excellent and imaginative planning that made this meeting a thorough success.
2. RESOLVED, That the Wilson Ornithological Club express its gratitude to the following groups or individuals whose efforts and generosity have contributed to the success of this 1950 meeting: to the Brooks Bird Club and the Huntington Bird Study Club—sponsors of the meeting; to West Virginia University for the use of the 4-H Camp at Jackson's Mill; to Mr. C. H. Hartley, Director of the West Virginia 4-H Camp; and furthermore, that the chairman of the Committee on Arrangements be requested to forward this expression of gratitude to the individuals or appropriate officials.
3. RESOLVED, That the officers of the Wilson Ornithological Club and the members of the various committees be commended for their inspiring leadership and able efforts during the past year; and further, that the Club express its gratitude to three retiring officers for their unceasing and often unrecognized efforts on behalf of this organization—to the retiring President, Olin Sewall Pettingill, Jr.; to the retiring Editor, David E. Davis; and especially to the retiring Treasurer, Burt L. Monroe, for five arduous years of service.
4. RESOLVED, That the Wilson Ornithological Club express its gratitude to the members of the Committee for the Relief of European Ornithologists for the time and effort they have volunteered in such a good cause.
5. WHEREAS the Wilson Ornithological Club has in the past sponsored the establishment of an air-space reservation in the Wilderness Area of the Superior National Forest, and WHEREAS a Presidential Proclamation has been declared establishing such an air-space reservation to become effective at a later date; and

   WHEREAS the opponents of this reservation have been active in attempting to have this proclamation withdrawn; be it

   RESOLVED, that the Wilson Ornithological Club reaffirm its support of the establishment of this air-space reservation; furthermore be it

   RESOLVED, that the Secretary of this Club be directed to send a copy of this resolution to the President of the United States.

Announcements

Among the resolutions adopted at the 1949 meeting was one urging the designation of Cranberry Glades in West Virginia as a Natural Area. The United States Forest Service has taken this action.

Groups interested in serving as hosts to the Wilson Ornithological Club at the 1952 meeting should write to the Secretary before April, 1951.

Annual Dinner

The Annual Dinner was held on Friday evening, April 28. Olin Sewall Pettingill, Jr., President of the Wilson Ornithological Club, served as toastmaster and gave the principal address.

Field Trips

On Sunday morning, April 30, members and guests visited the Cheat-Gaudineer region in the high Alleghenies and Holly River State Park.

Papers Sessions

Friday Morning, April 28

1. Henri C. Seibert, Ohio University, *Observations on the Roosting Flight of Herons* (slides, 15 minutes)
2. A. O. Ramsay, McDonogh, Maryland, *Some Conditioned Responses in Crows* (slides, 10 minutes)
3. James T. Tanner, University of Tennessee, *Black-capped and Carolina Chickadees in the Great Smoky Mountains* (slides, 15 minutes)
4. Oliver S. Owen, Cornell University, *The Vertical Zonation of Song-Perches in a Central New York Woodlot* (slides, 10 minutes)
5. James H. Jenkins, University of Georgia and Georgia State Game and Fish Commission, *A Comparison of the Food Habits of the Barn Owl in the Piedmont and Lower Coastal Plain of Georgia* (slides, 15 minutes)
6. Emerson Kemsies, University of Cincinnati, *Summary of the Changes in Ohio Bird Life Since the Publication of Lynds Jones' Catalog of Ohio Birds in 1903* (15 minutes)
7. W. J. Breckenridge, University of Minnesota, *Activities of Wintering Goldeneyes* (slides, 10 minutes)

Friday Afternoon, April 28

8. Maurice Brooks, West Virginia University, *The Unglaciated Appalachian Highland: The Region and its Characteristics* (15 minutes)
9. J. J. Murray, Lexington, Virginia, *Biotic Zonation in the Southern Appalachians* (15 minutes)
10. Eugene P. Odum, University of Georgia, *Distribution and Population Density of Birds at the Southern End of the Appalachians* (slides, 15 minutes)
11. Arthur Stupka, Gatlinburg, Tennessee, *Notes on Some Breeding Birds of the Great Smoky Mountains National Park* (15 minutes)
12. Frederick V. Hebard, Philadelphia, Pennsylvania, *The St. Mary's, Georgia, Region Seventy Years After Brewster* (motion picture, 30 minutes)
13. John T. Emlen and Robert Nero, University of Wisconsin, *Experimental Studies on Territory Relationships in the Red-winged Blackbird* (slides, 15 minutes)
14. Aretas A. Saunders, Norwalk, Connecticut, *Song in Relation to Subspecies* (15 minutes)
15. R. Wayne Bailey and Hans G. Uhlig, Conservation Commission of West Virginia, Charleston and Elkins, West Virginia, *Factors Influencing the Distribution and Abundance of the Wild Turkey in West Virginia* (12 minutes)

Saturday Morning, April 29

16. Dale A. Zimmerman, University of Michigan, *First Impressions of the Birds of Jalisco, Mexico* (slides, 20 minutes)
17. David E. Davis, Johns Hopkins University, *The Growth of Starling Populations* (slides, 15 minutes)
18. Aaron Moore Bagg, Holyoke, Massachusetts, *Meterological Accompaniments of Goose Flights in the Midwest, October 20–26, 1949* (slides, 20 minutes)
19. Stephen W. Eaton, St. Bonaventure College, *A Comparative Study of the Genus* Seiurus (slides, 20 minutes)
20. Southgate Y. Hoyt, Cornell University, *The Feeding Technique of the Pileated Woodpecker* (slides, 15 minutes)
21. Harvey I. Fisher, University of Illinois, *East-West Distribution of Birds in the Hawaiian Archipelago* (slides, 15 minutes)
22. G. Ronald Austing and Worth Randle, University of Cincinnati, *A Report on Feeding Habits of Wintering Long-eared Owls and Saw-whet Owls in Southwestern Ohio* (15 minutes)

Saturday Afternoon, April 29

23. Hal H. Harrison, Tarentum, Pennsylvania, *Natural Color Portraits of Some West Virginia Birds* (slides, 30 minutes)
24. William L. Rhein and Edward S. Frey, Harrisburg, Pennsylvania and Lemoyne, Pennsylvania, *The Northern Raven in Pennsylvania* (motion picture, 40 minutes)
25. W. Bryant Tyrrell, Tacoma Park, Maryland, *Roseate Spoonbills* (motion picture, 40 minutes)
26. George M. Sutton, University of Michigan, *Bird Life of the Far North* (motion picture taken by Henry C. Kyllingstad, 45 minutes)

ATTENDANCE

Three hundred twenty-one members and guests, representing 19 states of the United States and one province of Canada, registered at the meeting. Next to West Virginia, Michigan was the state with the largest attendance. The list of members and visitors follows:

From **Connecticut:** 7—Allison L. Kampf, *Bridgeport*; Richard A. Kampf, *Bridgeport*; Mr. and Mrs. Roy C. Kampf, *Bridgeport*; Roy C. Kampf, Jr., *Bridgeport*; Mr. and Mrs. Aretas A. Saunders, *Norwalk.*

From **Georgia:** 8—J. Fred Denton, *Augusta*; William W. Griffin, *Atlanta*; James H. Jenkins, *Athens*; David W. Johnston, *Athens*; Mrs. Charles Neal, *Demorest*; Bill Odum, *Athens*; Eugene P. Odum, *Athens*; Martha H. Odum, *Athens.*

From **Illinois:** 6—Amy G. Baldwin, *Chicago*; Karl E. Bartel, *Blue Island*; Leona Draheim, *Chicago*; Mr. and Mrs. H. I. Fisher, *Urbana*; Mrs. Ethel M. Henwood, *Urbana.*

From **Indiana:** 8—Mrs. Kenneth Campbell, *Indianapolis*; James B. Cope, *Richmond*; Mr. and Mrs. M. S. Markle, *Richmond*; Stephen W. Simon, *Richmond*; Mrs. C. S. Snow, *Richmond*; Margaret Umbach, *Fort Wayne*; J. Dan Webster, *Hanover.*

From **Iowa:** 4—C. C. Hazard, *Davenport*; Norwood C. Hazard, *Davenport*; Fred T. Hall, *Davenport*; Bud Johnson, *Davenport.*

From **Kentucky:** 8—Wm. H. Banks, Jr., *Louisville*; Leonard C. Brecher, *Louisville*; Nelson Leach, *Ashland*; Harvey B. Lovell, *Louisville*; Georga Martin, *Ashland*; Mr. and Mrs. Burt L. Monroe, *Anchorage*; Burt L. Monroe, Jr., *Anchorage.*

From **Maryland:** 23—Mr. and Mrs. Elting Arnold, *Chevy Chase*; Patricia Arnold, *Chevy Chase*; Sarah B. Arnold, *Chevy Chase*; Florence H. Burner, *Baltimore*; Orville W. Crowder, *Baltimore*; David E. Davis, *Baltimore*; Pearl Heap, *Baltimore*; Mrs. Alice S. Kaestner, *Baltimore*; Mrs. M. C. Kent, *Baltimore*; Seth H. Low, *Laurel*; William McHoul, *Baltimore*; Gilbert Miller, *Spring Gap*; Helen B. Miller, *Spring Gap*; Alfred O. Ramsay, *McDonogh*; Walter D. Ramsay, *McDonogh*; Miss T. M. Sandy, *Baltimore*; Mrs. H. P. Strack, *Baltimore*; R. Thomas Thayer, *Hagerstown*; Jane Tuttrup, *Derwood*; Mr. and Mrs. W. Bryant Tyrrell, *Tacoma Park*; W. D. Walker, Sr., *Kitzmiller.*

From **Massachusetts:** 1—Aaron M. Bagg, *Holyoke.*

From **Michigan:** 42—H. Lewis Batts, Jr., *Ann Arbor*; Hazel L. Bradley, *Jackson*; Mr. and Mrs. Edward M. Brigham, Jr., *Battle Creek*; Edward M. Brigham III, *Battle Creek*; Julie Brigham, *Battle Creek*; Robert D. Burns, *E. Lansing*; Mr. and Mrs. W. Powell Cottrille, *Jackson*; N. L. Cuthbert, *Mt. Pleasant*; Joyce Delaney, *Albion*; Clara Dixon, *Albion*; Jess Foote, *Albion*; John L. George, *Ann Arbor*; Charles O. Handley, Jr., *Ann Arbor*; G. Bryan Harry, *Ann Arbor*; Richard Hauke, *Ann Arbor*; Philip S. Humphrey, *Ann Arbor*; Dorothy Jackson, *Albion*; Bernard Johnson, *Albion*; Mrs. Reuben L. Kahn, *Ann Arbor*; Cecil C. Kersting, *Muskegon*; Agnes Kugel, *Grand Rapids*; Harry Laurie, *Albion*; Martha A. Lengemann, *Imlay City*; Mr. and Mrs. Robert M. Mengel, *Ann Arbor*; Mrs. Alice D. Miller, *Dearborn*; Mr. and Mrs. Walter P. Nickell, *Bloomfield Hills*; Philip G. Niemann, *Detroit*; William Oliver, *Mt. Pleasant*; Virginia Olmsted, *Plymouth*; Mrs. P. J. Reynolds, *Detroit*; Merle E. Stitt, *Ann*

Arbor; George M. Sutton, *Ann Arbor*; Harrison B. Tordoff, *Ann Arbor*; Elsie W. Townsend, *Detroit*; Mr. and Mrs. George J. Wallace, *E. Lansing*; Robert A. Whiting, *Jackson*; Dale A. Zimmerman, *Imlay City*.

From **Minnesota:** 8—Mr. and Mrs. W. J. Breckenridge, *Minneapolis*; Amy Chambers, *Minneapolis*; Mrs. Mary Lupient, *Minneapolis*; Theodora Melone, *Minneapolis*; Mr. and Mrs. Olin Sewall Pettingill, Jr., *Northfield*; Luther Rogers, *Northfield*.

From **New Jersey:** 6—Edward L. Chalif, *Short Hills*; Robert C. Conn, *Bound Brook*; Robert C. Frohling, *Union*; Peggy M. MacQueen, *Bergenfield*; Edward P. Manners, *Brooklawn*; Floyd P. Wolfarth, *Nutley*.

From **New York:** 15—Mr. and Mrs. Dean Amadon, *New York*; Frances L. Burnett, *Ithaca*; Marjorie Crimmings, *Ithaca*; Mr. and Mrs. Stephen W. Eaton, *St. Bonaventure*; Mr. and Mrs. J. Southgate Y. Hoyt, *Etna*; Mr. and Mrs. F. L. Jaques, *New York*; Donald Malick, *Olean*; Oliver S. Owen, *Ithaca*; Kenneth C. Parkes, *Ithaca*; James A. Walker, *Waterloo*; M. Shirley Windnagle, *Ithaca*.

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DAVENPORT, IOWA, APRIL 27–28, 1951

Complete Details in December 1950 Bulletin

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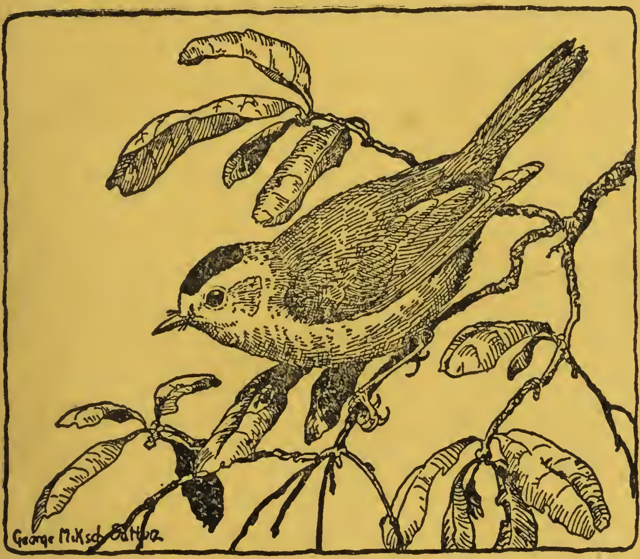

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The Wilson Bulletin

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THE PRESIDENT'S PAGE

Who should be members of the Wilson Ornithological Club? This is a question for frequent discussion at meetings of the Club's Council, and at informal gatherings of members. Perhaps we all need to consider carefully just what individuals and groups the Club is designed to serve.

Of course we welcome the professionals in the field of ornithology and its related disciplines. Staff members of museums, universities, and colleges who are working in ornithology certainly have a place in the organization. This is also true of persons in federal and state agencies which deal with wildlife management. Throughout the years *The Wilson Bulletin* has published its share of important technical papers. Its reviews have done much to mold professional opinion on outdoor writing. Its graphic material has been excellent, and, in many instances, unique. Its columns have been open to articles and notes dealing with bird protection in particular, and conservation in general.

But the vast majority of bird students are not professionals. Fortunately, the amateur in the field can, and often does, make contributions which are as accurate and scientifically significant as the work of the best professionals. It may well be that the Wilson Club makes its greatest contribution through bringing the amateur and the professional together, and in upholding standards of scientific accuracy and effective presentation toward which they both may work.

The larger portion of our membership is, and will probably continue to be, in the amateur field. Our dues have been kept lower than in most comparable organizations. This enables the student or younger worker who is at the beginning of his career to affiliate with a scientific bird group, and to grow with it.

In the Wilson Ornithological Club there are various classes of membership. The privileges of membership, however, do not differ in the slightest. The associate member has exactly the same privileges as does the life member. Persons who join the Club as members other than associate simply contribute more toward making *The Wilson Bulletin* attractive and stimulating.

Like other scientific societies, the Wilson Club is having its difficulties in this time of increasing printing costs and lowered returns on investments. Our journal is costing so much more that we have simply been forced to reduce its size. This is not pleasing to any of us, and for the situation there is only one remedy. We need new members who will maintain a loyalty to the Club throughout the years, and we need more members who will feel that they can join as other than associates. Many present associates could, perhaps, increase their contributions through membership in one of the other classes.

The Club is conducting an active membership campaign through its Membership Committee, of which Seth Low, Patuxent Research Refuge, Laurel, Md., is Chairman, and Ralph Edeburn, Marshall College, Huntington, W. Va., is Vice-Chairman. In the last analysis, however, we must depend not on this committee but on the loyalty and services of individual Club members. You can be of great assistance if you will send to any member of the Committee the names of persons who should be in our ranks. Elsewhere in this issue is published the personnel of the Membership Committee. May we count on your help?

Maurice Brooks

CRIMSON-COLLARED GROSBEAK

(Rhodothraupis celaeno)

Adult male sketched on February 25, 1938, along the Río Santa Engracia, near Victoria, Tamaulipas, México, by George Miksch Sutton. The bird has just eaten a leaf of the shrubby nightshade, *Solanum verbascifolium,* in which it is perched.

THE CRIMSON-COLLARED GROSBEAK

BY GEORGE MIKSCH SUTTON

MANY a person who has journeyed about northeastern México following the principal highways has passed through the habitat of the Crimson-collared Grosbeak (*Rhodothraupis celaeno*) without even glimpsing the bird. Finding it sometimes requires careful search in the thicket. I have never seen it near Monterrey, but it is fairly common along the Río Camacho, a few miles southwest of Linares, Nuevo León; and in the Victoria region of Tamaulipas it is almost abundant. Along the Matamoros-Victoria highway I have encountered it as far north as Jimenez. It is endemic to eastern México, having been reported only from the states of Tamaulipas, Nuevo León, San Luis Potosí, Veracruz and Puebla. It inhabits the low country chiefly, though my friend L. Irby Davis informs me that he has seen it regularly, though in small numbers, in summer among the sweet gums at an elevation of 3400 feet on the highway between Antiguo Morelos and San Luis Potosí. Along the Río Sabinas, in southern Tamaulipas, it ranges only a short way above river-level. So far as I have been able to ascertain, it is non-migratory.

It is a little heavier than the Cardinal (*Richmondena cardinalis*) and has no crest. The adult male is hardly a gorgeous bird—but the dull red of his 'collar' and under parts is of a peculiarly Mexican shade which calls to mind ripening cactus fruit, hibiscus flowers half hidden by dark foliage and shadow, or a bright serape seen in the gathering dusk. The immature male and adult female are dull black on the head and chest, and olive green otherwise, with a yellowish wash on the hind neck, lower breast, belly, and wing linings.

I first saw *Rhodothraupis* in 1938 along the Río Santa Engracia (the highway marker then called it the Corona) a few kilometers north of Victoria. In dense clumps of shrubbery which sometimes completely covered certain flat, gravelly islands, I continued to see the plump, almost dumpy looking birds—not knowing, of course, what they were, but guessing that they were fringillids because of the obvious heaviness of their bills. They all seemed to be olive-green (there happened to be no adult males in the flocks), and I was much impressed by the way in which they tore off and munched mouthfuls of leaf. They sat in the shrubbery by the hour, it seemed, chewing away, sometimes letting pieces of the leaf drop and pensively reaching out for more. So far as I could see they were subsisting wholly on the thick, soft leaves of one species of plant—a shrubby nightshade, *Solanum verbascifolium.* In my notes I referred to the birds as 'leaf eaters'. They were, I found, not fat but very tender skinned. Their stomachs held a mass of chewed up leaves, a little gravel and traces of insects, but no seeds. Some of the specimens were partly spoiled by the time I got them to the skinning table. The slipping of the throat and breast plumage was caused to some extent by the plant juice from the crop.

For some time I thought that all of these 'leaf eaters' were olive-green. I heard no song from them and their only call note seemed to be a thin, high, penetrating squeal. I heard from them no incisive *chip* like that of the Cardinal. One day I saw a black and red bird among them. When I watched this wonderful creature sitting among the nightshade, biting off chunks of leaf with its big bill, I realized that it was a 'leaf eater' too. My excitement, as I followed it about, can be imagined. Immediately after collecting it I painted its portrait (see frontispiece).

The song of *Rhodothraupis* is rich and full throated, resembling somewhat that of the Rose-breasted Grosbeak (*Pheucticus ludovicianus*), but having fewer curved or warbled notes. It is sung from the heart of a tree or thicket, rarely from the top. Seeing the singing bird requires careful slipping along the trails or waiting in the brush. The singer turns his head this way and that, usually standing straight and lifting his crown feathers. I have heard much singing from about the middle of March to early June.

The only Crimson-collared Grosbeak nest I ever saw was one found by Ernest P. Edwards on May 20, 1947. It was in a thicket not far from a trail near the Río Sabinas in southwestern Tamaulipas. It was of rather loose construction, not very deeply cupped, and thinly lined. It held three eggs. These were much like Cardinal eggs, but seemed to be larger and blunter. They were pale grayish blue in ground color, spotted all over with brown. The newly hatched young were orange-skinned with red mouth-lining and dark dorsal down (see Sutton, Lea, and Edwards, 1950. *Bird-Banding*, 21: 57). Edwards spent much time in a blind near this nest and saw the female come to it several times. He never saw the male at the nest, however.

University of Michigan Museum of Zoology, Ann Arbor

COWBIRD BEHAVIOR

BY AMELIA R. LASKEY

THE Cowbird (*Molothrus ater*) has been variously described in the literature as monogamous, polygamous, and promiscuous. As the species has been common in summer about my home in Nashville, Tennessee, I decided a few years ago to find out what I could about its territorial and mating behavior. I started color-banding in 1943, but did not undertake intensive watching until the following year. My observations were confined largely to the one and one-half acres about my home, especially to a small feeding place on the ground 25 feet from certain windows. In the breeding seasons of 1944, 1945 and 1946, I watched Cowbirds at various times of day from the arrival of the very first individual in March until the disappearance of the species in July. The birds came to the feeding place singly, in pairs, and in groups. Continuing my observations to some extent through the seasons of 1947 and 1948, I devoted several hundred hours, in all, to the study.

I attracted the Cowbirds with millet seed (the small, yellowish variety). In 1944 I confined feeding to a plot 21 by 5 feet near the house. At this gathering place, the scene of many intimidation, courtship and mating ceremonies, I gained a new understanding of the complex behavior of this highly social, parasitic species. That year my study centered in a population of 18 color-banded individuals (12 males and 6 females) and a few unmarked birds (three or more males and one or more females). In subsequent years, the population was not that large, but each year it included some birds returning from previous years. After 1944 I placed millet seed at other spots about the banding station so the activities of the birds were not concentrated at the main feeding plot.

My observations indicated monogamous mating, thus corroborating the conclusions of Herbert Friedmann, who studied unmarked Cowbirds at Ithaca, New York. He said (1929:171): ". . . if the birds are not really strictly monogamous, at least the tendency towards monogamy is very strong." However, my findings in the behavior pattern differed rather widely from his. I observed several types of behavior not heretofore described, particularly *intimidation bows* and *guarding of mates*. I found no evidence of such true territorial behavior as that discussed by Friedmann, but there was much evidence that one pair gained *dominance* in a certain area. This area, the *domain*, may be all that is left of "territory," and *guarding* all that is left of mate protection and isolation, in a social species whose breeding has become parasitical.

Songs and Call Notes

Two songs are frequently used by male Cowbirds. Friedmann (pp. 166–168) described Song 1 as the "true song . . . , the *bub ko lum tseee*, as Wetmore writes it." The *bub ko lum* part is a soft guttural gurgle, inaudible beyond 50 feet, while the *tseee* is high, shrill, and sometimes considerably prolonged. Song 2, which Friedmann regarded as one of four call notes, he called the "flight whistle," describing it as a "thin, wheezy inhaling squeak, *whssss*, [followed by a] not so wheezy, exhaling whistle, *pseeee*."

Males at my banding station used Song 1 when posturing alone on a high perch, and when displaying before males in intimidation or before females in courtship. They used it less frequently in late summer than in spring and early summer. I have an early September record of a male singing and posturing alone in a tree.

Song 2 I heard more frequently than any other vocal sound of the species, although at times it was not complete. It was used as the male started to fly and as he alighted, but males sometimes flew without singing. Usually Song 2 seemed to serve as a means of keeping in touch with other Cowbirds. When feeding alone on the ground, a male often stopped, raised his head and sang, turned and sang again as if to send the note in a different direction, then stood still as if listening for an answer. Sometimes a male flew quickly toward the sound on hearing Song 2 in the distance. Song 2 was used by members of a feeding group. I knew of the arrival of a pair near the feeding station before seeing them because the male used Song 2 and the female "rattled" or chattered. This chatter note, a common utterance of the female, appeared to be her call to the male.

Notes that may have accompanied copulation I did not hear because of extraneous sounds. Friedmann (p. 167) described the male's mating note as "high, shrill, and in a descending scale." In 1944 and 1945 (four occasions) I heard the female use the rattle or chatter note just before copulation.

I heard short notes like *tic*, *phut*, or *kek* from the female as she fed alone, but never from the male feeding alone. The male used a note of this sort following a disturbance, however. Thus if the passing of a person caused him to fly up from the feeding place he would give a low-toned but emphatic *kek*. Sometimes he repeated this single note so rapidly that it sounded like the rattle of the female. On April 12, 1944, a pair used these notes and chatter as I walked past. I interpreted the notes as scolding or alarm notes. But on other occasions there was no response as I passed. On April 29, 1944, a male flew to a shrub and gave the short note as I removed a female from a banding trap. He waited some minutes until she was released from indoors, then followed her in flight, using Song 2. On another occasion, a different male used the short note as I removed a female from a trap.

Posturing and Display

The commonest intimidation gesture used by the male Cowbird is *bill-pointing*. Friedmann (p. 175) said of this display: "They have what might be thought of as an intimidation display which may be sufficient to drive off newcomers. This consists of pointing the bill towards the zenith when near another male."

After watching hundreds of displays, most of them on the ground, I decided that certain displays had not yet been described. Elaborate "toppling-forward" bows, with wings and tail spread and bill or head touching the ground, were made in intimidation or threat. The *peck-gesture* was another sort of threat. In this display, the plumage was usually puffed, the wings spread horizontally or raised vertically, and the head thrust forward. Sometimes there were a few running steps or a flight toward the other bird. At times the display ended in actual pecking or fighting. Both of these types of intimidation display were used toward other male Cowbirds and occasionally toward a Mourning Dove (*Zenaidura macroura*), Grackle (*Quiscalus quiscula*), Brown Thrasher (*Toxostoma rufum*), or House Sparrow (*Passer domesticus*).

I saw five fights between male Cowbirds in April, 1944. During that same period, I was witness also to a peck-fight between a male Cowbird and a Brown Thrasher. The Cowbird was the aggressor. In May, 1944, I saw a male Cowbird viciously attack a House Sparrow. In April, 1945, I saw a male Cowbird strike at a female Cowbird three times within a few minutes, once while flying and twice on the ground. The attack appeared to be hostile. Nice (1937:154) mentions five instances of fights in April between male Cowbirds at Columbus, Ohio. Friedmann (1929:175) knew "of no instance of two male Cowbirds fighting."

I saw female Cowbirds intimidating other Cowbirds of both sexes through *bill-pointing*, *peck-gestures*, and (very rarely) through bowing. On June 15, 1944 and April 9, 1945, I saw fights between females. Friedmann described no female display or fighting.

Another type of behavior, indulged in mostly by the dominant male of each season, was a repetition of trips to the water pan between displays. Sometimes after running to the pan, he merely dipped his bill. Sometimes he failed to drink. All this seemed to be substitute behavior in moments of excitement.

Courtship

Bows extended in greeting or courtship by males to females were less elaborate than intimidation bows. Greeting bows of this sort varied considerably; sometimes they were only a nod, accompanied by ruffling of the neck plumage, sometimes a deep bow, involving spreading of wings and tail, sometimes a mere relaxing of the wings. Occasionally a male bowed in greeting just after stretching tall, or pranced beside the female before bowing. On April 19, 1944, when 5M was displaying to 2F, he seemed to rise as he braced himself with tail against the ground just before bowing. When displaying alone in a tree, he often terminated his bow with a bill-wiping gesture.

The dominant female of the season displayed by relaxing her wings, puffing her plumage, vibrating her tail, and quivering her wings. These displays were, I believe, connected with courtship and mating.

In pair formation ceremonies, both birds indulged in stretching, usually of a sidewise sort. This I witnessed on April 10, 1944, March 24, 1945, and March 30, 1946, the two participants being dominant.

On two occasions I saw a male toying with a dead leaf or a piece of debris while bowing to a female (April 8 and May 29, 1944).

A common type of behavior was *guarding*. In this maneuver, the male ran quickly between a female and one or more males, and attempted to remain between them while the group was feeding or otherwise engaged. While guarding, a male sometimes bowed low to another male, then turned to extend a shallow bow to the female. The dominant female occasionally guarded her mate from another female. Guarding was practiced mostly by the dominant pair of a group, but I occasionally saw a visiting male guarding the female accompanying him.

Courtship and Contentions for Social Dominance

The first Cowbird of the 1944 season, 1M, arrived March 16. (He had been banded as an adult on June 7, 1940, and had returned in March, 1942 and April, 1943.) On March 23, 1944 another male arrived. I banded him and called him 3M. I saw these two males separately, several times, feeding peaceably with Mourning Doves, Cardinals (*Richmondena cardinalis*), Red-eyed Towhees (*Pipilo erythrophthalmus*), Slate-colored Juncos (*Junco hyemalis*), House Sparrows, and Field Sparrows (*Spizella pusilla*). The Cowbirds sometimes scratched in their desultory manner. Scratching was prefaced by a slight hop which ended with the feet spread apart, one beyond the other or in a sidewise spread, as if one foot had slid backward or to the side. I heard only the flight whistle those first few days, but on March 22, 1M, perching in a tree above the feeding place, postured and used Songs 1 and 2 for several minutes. I saw no other bird anywhere in the vicinity at the time.

On March 26, a female came with 1M. The following day, at the food, he ran to her with puffed plumage and bowed each time she stood still, but she always moved away. I caught and banded this female on March 28, naming her 1F. For several days 1M and 1F followed each other and fed together, the male continuing his displays. But early on April 1, I saw 1F feeding with an unbanded male that displayed to her. Suddenly 1M swooped down and attacked this male. After a brief fight, the unbanded male moved to another feeding spot a few feet away and 1M joined the female. Once she moved toward the unbanded male, but 1M ran between them, guarding her. That day I saw 1M and 1F feeding together several times.

On April 2, other Cowbirds arrived. Near noon, 1M, 3M, and two unbanded males were feeding amicably within six inches of each other when suddenly a Brown Thrasher appeared. 1M instantly assumed a fighting posture (peck-gesture) toward this bird and the thrasher returned the gesture. They hopped at each other several times as if striking bills. As the thrasher flew off, two Cowbirds, apparently the banded ones, entangled in a fight, rolling on the ground. Then all four Cowbirds flew off.

On April 3, 1F came at 8:00 a.m. with an unbanded male which I trapped and named 4M. (This visitor did not appear again until June 14, on which date he stayed briefly.) On April 4, 1M and IF were together. Once I saw him walk completely around her. Though her wings were relaxed in courtship display, she evaded him.

Early on April 6, two strangers appeared, a transient female and a male Cowbird that remained in the area. These I banded, naming them, respectively, 3F and 5M.

On April 8 two color-banded females arrived, 2F (banded in April, 1943) and 5F (banded in September, 1942, retrapped in March, 1943). That day nine Cowbirds visited the feeding area singly and in groups—1M, 3M, 5M, three unbanded males (one with an injured foot), 1F, 2F, and 5F. There were many encounters for supremacy among the males. Some of these encounters may have resulted directly from courtship displays before the females.

At 10:25 a.m. an unbanded male, landing near 1F, threatened another unbanded male by bill-pointing, causing the latter to cower and run. At 10:30 an unbanded male landed near a banded female Mourning Dove and raised his wings as if to fight. The dove retaliated in kind, so he retreated and fed five feet away. At 10:40, 3M, accompanied by two male and two female Cowbirds, arrived and 3M displayed to 2F. At 10:50, while 5M and a dove were the only birds at the feeding plot, 1M arrived and ate amicably beside 5M until an unbanded male arrived. 1M now raised his wings and ran at the newcomer with the peck-gesture, but the newcomer merely moved a bit and 1M soon joined him. They fed briefly and the two flew off, 1M leaving first. At 11:15 I saw 3M attempting to chase 5M and an unbanded male by running at them with the peck-gesture. This did not put them to flight. 3M repeated the hostile gesture to the unbanded male, but all remained to feed. Then 1M arrived. The three other males now flew, and 1M, alone, strutted a bit with up-pointed bill. As 2F and an unbanded singing male arrived, he amicably joined them, the female feeding close to him for a brief period. At 11:30 1M and 1F arrived together. Presently 5M landed nearby. 1M ignored 5M, but twice displayed to 1F, with puffed plumage, extended wings, and Song 1.

At noon a peculiar ceremony took place betwen 1M and two unbanded males. Although feeding some distance apart, each displayed by puffing his plumage and dragging his tail. After five minutes of this behavior, they formed a triangle a few inches apart, all facing inward. They repeatedly bowed, bending forward until their bills touched the ground, meanwhile spreading their wings and tail. After a minute-long performance, one walked away, while the other continued to display to 1M. 1M moved off but rejoined the displaying one. Both then bill-pointed several times as they walked. The unbanded one bowed low to 1M, who suddenly flew at him, chasing him some feet, then the three birds flew.

During the next three hours, once an unbanded male fed amicably with 3M, and once 3M and 2F fed together while an unbanded male ran around them, 3M bowing to him until the unbanded male went to the far end to eat alone. Later 1M fed amicably with an unbanded male, but when another unbanded male arrived, he ran at the second with a peck-gesture; then all fed amicably together. 1F and 2F appeared at the food several times, each accompanied by one or two unbanded males.

At 3:22 p.m. 1F arrived, alighting in a tree near the feeding place. On previous occasions she had rattled once on arrival, but now she reiterated her call. As if in response, an unbanded male alighted in a nearby tree. Facing her, he gave two bowing displays. When she flew off, he followed her. Presently she returned to feed. An unbanded male was still following her. On being joined by 3M, the unbanded male started a display to 1F. He made a quarter turn toward her, bowing slightly, continuing to follow her as she fed, circling about her as he puffed plumage and bowed. In the course of these displays, he pecked at and picked up a piece of debris. A few seconds of feeding followed the courtship display, whereupon the males faced each other in bowing ceremonies. Each time a male moved, 1F ran a bit, avoiding any close contact with either.

At 3:40, 1F and 1M arrived, joining the sole occupant of the feeding plot, an unbanded male. A low-flying male appeared but did not alight when 1M assumed a fighting posture. When 3M arrived somewhat later, he came near 1F, and 1M guarded her as they moved about feeding.

There was more bowing and gathering in groups for the rest of the day, with 3M attending 2F, intimidating 5M with very low bows, and simultaneously guarding the female. Once when 5M and an unbanded male met, the latter retreated at 5M's bowing. Shortly after 5:00 o'clock, when four males and a female were present, another ceremony occurred. After 5M had displayed to an unbanded male, 1M bill-pointed as he walked toward them. The unbanded male bowed low to 1M in response, backing as he did so. 3M, who had been feeding several feet away with 2F, joined the other males and the four birds formed a square, facing inward. They bowed repeatedly, touching the ground in elaborate intimidation display. 3M withdrew to join the female but soon rejoined the posturing males. Presently 5M walked off a short distance, leaving the others to bow for another minute. The five birds flew off in a group.

Early the following morning, April 9, I caught the two unbanded males, naming them 6M and 2M. 6M stayed only until that evening and was not seen again. 2M became the dominant male of the season, spending more time at our place than any other Cowbird. Between April 8 and July 1, I saw him 249 times. He apparently considered himself the proprietor of the feeding plot and environs. He became the mate of 1F, displacing 1M, who had courted her and threatened the other males. On April 9 I saw neither 2M nor 1F, but 1M and 6M came to feed, sometimes amicably.

On April 10, I did not see 1M. He made his final appearance April 11 when he came for a few minutes to feed with an unidentified male.

Pair Formation, Mating, and Social Dominance of the Pair

From April 10 on, 2M guarded 1F and intimidated other males. At 4:50 p.m. on April 10, I noted the following: "3M at food, 2M and 1F arrived together, 1F rattled twice, 2M pointed bill, ran to 3M, bowed to ground twice with Song 1, female rattled, 2M again bowed very low to 3M without song, ending by touching bill twice to ground. He returned to female. At 5:06, began another series of 4 low bows to 3M, followed by a shallow bow and plumage puff to female. 5:08, standing midway between 3M and the female, 2M bowed 4 times to 3M who flew; 5:10, 2M, now feeding near the female, ran, pecking the ground. For 8 minutes they stayed together. She had wings relaxed, slightly extended from sides. When the male fed close to her, she quivered the wings briefly. Both occasionally fluffed neck plumage. Male stretched once, female stretched twice during this period. This was a sidewise stretch—wings were raised slightly, then one leg was extended backward as the corresponding wing was spread groundward. Then he approached her with a quarter turn, head lowered in the manner of a domestic cock. They flew, but she returned. She stretched again with upraised wings, then bent legs at metatarsal joints. A Brown Thrasher arrived just then; 1F assumed the peck-gesture to the other bird."

At 7:45 that evening, the pair (2M and 1F) were feeding when an unbanded male arrived. Facing the male, 2M made six or seven elaborate bows, interspersed with two shallow bows as he faced the female, guarding her. During the next several days, I saw the pair together many times. Displays which I noted included "a dancing toward her, preceding the shallow bow" and "the quarter turn side bow (facing diagonally)."

Copulation

When 2M came to the feeding place on the morning of April 16, he was alone. Alighting in a tree he used Song 1, flew to the ground to feed, sang several songs, indulged in some mild posturing, ran to the water pan, then ran back to the food. Six minutes later, he gave a shallow bow, ran again to the water pan, and flew off. At 10:18 he was back. He sang several songs on the ground, usually No. 2. At 10:23, 1F arrived with her rattle call, and alighted in a tree above him. He flew to her, alighted on a branch beside her, and bowed. She squatted, elevating her tail. He mounted briefly then hopped to a limb. She remained quietly for a few seconds before flying to the ground to feed. He followed, displaying there a few times.

Twice later that season I witnessed copulation between the pair. On April 20 at 9:00 a.m. both were in a tree above the feeding plot. He sang and she rattled just preceding the mating act, which was accompanied by considerable fluttering. The male followed her down to feed but soon flew off. Then an amusing three-minute episode occurred. He returned immediately with another female, 5F, who had been here the previous two seasons. He and 5F stopped within a few feet of his mate. The latter approached 5F with up-pointed bill and bowed fairly low to her. The male came between them. 1F walked back to her feeding spot. The male joined her but only momentarily, for he was soon back with 5F. Again 1F walked to 5F, circling slowly around her, bill-pointing. 5F started to leave, but once more 2M walked between the females. This time 5F flew, 2M after her, 1F trailing. About three-quarters of an hour later, 1F came back, followed closely by 2M, who approached her with puffed plumage. She ran at him, striking him with her bill. He moved away, but she walked after him and followed him when he flew. In about fifteen minutes, 1F was again at the food when 2F arrived. 1F bill-pointed and the other female flew.

April 28, at 9:05 a.m., 1F, who was alone at the feeding place, rattled and quivered her wings. During the four minutes following this, she turned clockwise gradually, raising her head to send the rattle in all directions, until 2M joined her. As they fed together he bowed. They flew off when a Mourning Dove arrived.

The third time I saw copulation in 1944 was shortly before 7:30 a.m. on May 12. 1F arrived in a tree and rattled repeatedly as she puffed her plumage. Her mate (2M) arrived. The two flew down to the driveway. As he walked to her, she rattled, quivering her wings. He mounted, then moved in a semicircle about her, bowing lightly and making a motion as if to mount again. She repulsed him with the peck-gesture, although quivering her wings slightly. They flew to the feeding plot where she again quivered her wings. An arriving male, greeted by 2M with a low elaborate intimidation bow, moved some distance to one side, behaved as if wary, fed briefly, and flew off.

Six times between April 23 and May 12, 1944 I saw 1F quivering her wings when 2M was with her, and the only time I saw her quiver her wings otherwise was an occasion when 2M probably was close at hand. I did not see any other male than 2M direct courtship bows toward 1F after April 8, until May 25 when an unbanded male arrived. This newcomer courted her and other females occasionally until June 23. I saw him direct six bows to her (once also guarding her from 8M, banded April 29, 1944) but in each instance she used the peck-gesture in return.

Status of Other Resident Cowbirds

During 92 observations of 2F and 16 of 5F, I never saw either respond to the courtship displays of bowing males. However, by noting the guarding behavior and intimidation displays of their male companions, I gathered some circumstantial evidence as to which males were their mates. Previous to May 4, 2F was courted by 3M and 5M. The latter attacked the domain-holder 2M on April 16 when that usually dominant male joined them. On April 25, 5M

A male Cowbird intimidating another male through bill-pointing. Photographed at Ithaca, New York, by Arthur A. Allen.

bill-pointed 2M and guarded 2F from him. But after the early part of May, 8M was almost certainly her mate. He consistently accompanied her and used intimidation display in her behalf. Of three recorded instances of intimidation, two were directed toward the dominant 2M. It is possible that 8M had associated and mated with 2F elsewhere previous to his first-observed visit to the feeding plot (April 29), or that she took him as her mate at about that time.

Much less is known about 5F. Late in the season, she was the most constant companion of a male aluminum-banded in some previous year but not retrapped for identification. The dominant 2M extended more favorable attention to her than he did to 2F. He sometimes intimidated 2F who spent much time in or near the feeding plot.

I do not know whether 3M and 5M secured mates. I think it highly improbable that 3M won any of the females I saw him courting. He spent more days in the area than any other male Cowbird except domain-holder 2M (I saw 3M on 93 occasions), yet he was under almost continuous domination and was nearly always the "extra" male among the groups.

Referring to Cowbird mating, Nice (1937:153) states: ". . . here on Interpont, with an abundance of Cowbirds, promiscuity prevails just as the older writers maintained." Although my Nashville group mingled freely in social contacts, I found no evidence of promiscuity among the females. My observations in 1945 and 1946 strengthen my belief that Cowbirds are essentially monogamous. I saw copulation only once in each of those seasons and in both instances the participants were the dominant pair of that season.

The Question of Territory: the Domain

Cowbirds have shown strong attachment to certain areas, particularly breeding areas. The remarkable homing experiments of Lyon (1935:7) and Fox (1940) prove that a deported bird will return 'home' from a distant point within a short time. Banding records show numerous returns for several years to the breeding area. Records of return for two and three seasons have been published by Laskey (1944) for four females and one male (with several additions since then). Stevens (1944), who lists returns of ten individuals, informs me by letter that five of these were males and five females, and that three of the females returned for three consecutive years. O. M. Bryens has sent me data from his banding station in Michigan showing that of 2982 Cowbirds banded, 150 were retaken, some of them for several years. Nice (1939:81) found that three females spent two years, and that two females spent three years on Interpont (Ohio). Her color-banded Cowbirds ranged within 18–20 acres usually, within 30 acres occasionally. After their disappearance in July, three of her females revisited their breeding area in September and October (1937:154).

Being unable to follow my color-banded birds in the numerous trees and thickets of our neighborhood, I did not learn how far they ranged. I do have information, however, on their territorial behavior about our house. According to Mayr, Tinbergen, Noble, and Nice (Nice, 1943:162), territory is a *defended* area. Although I saw many threats and fights, they did not seem to be in defense of territory and I witnessed no sustained effort to keep males or females out of a pre-empted area. There was much evidence of what I came to regard as sexual jealousy, however, and, particularly early in the season, of strife for dominance. There was no indication of a peck-order similar to that described by Allee for domestic chickens (Nice, 1943:92) nor of a society comparable to that of the Jackdaw (*Corvus monedula*), a society in which, according to Lorenz (1938:210) "every bird is jealous of his own position, constantly bickering with those that are his direct subordinates, but distinctly tolerant of those that range far below himself."

The ground about our home could be called a Cowbird *domain*, for it was occupied each season by a dominant male and a dominant female, his mate. They alone used this area for pair formation and mating. They did not drive other Cowbirds from food in this domain, and they tolerated Cowbirds of both sexes in social contacts, feeding and flying together with them. I believe the dominant pair showed vestigial territory behavior in intimidating others and keeping the domain for their own in pair formation and mating. This might be classed as 'Type C, mating station only' (Nice, 1943:163), modified by the fact that they did not object to others feeding there.

Friedmann (1929:175) believed that Cowbirds have definite territories. He said: "Not only has the female a definitely marked-off breeding area, but the male has a definite post, entirely comparable to the 'singing tree' that Mousley describes." He described territories of three pairs at Ithaca but stated (p. 177): "All Cowbird territories studied were not quite as definite as these three. On the west shore of Cayuga Lake the Cowbirds were found to merge the extremities of their areas into neighboring ones. . . ." He also stated (p. 177): "The Cowbirds do not make any very spirited attempts to defend their territories and consequently in regions of unusual abundance the territorial factor is much less noticeable. I have never seen Cowbirds fight and their method of defense is restricted to an intimidation display." (This was the bill-pointing gesture.) Nice (1937:154) said: "Although Cowbirds show no impulse to defend a territory, yet they appear much attached to their spring and early summer homes."

Acquiring the Domain

At Nashville during the first part of the season in 1944, 1M held the domain about the feeding plot. He was the first Cowbird to arrive that year and he had lived here three years previously. Early in 1944 he was tolerant of other feeders, showing no aversion to any bird. The first of the females to join him, 1F, he courted as they flew and fed together. He first employed intimidation when an arriving male began to display to 1F. Becoming pugnacious, he fought male Cowbirds, showed belligerence to other species, and participated in elaborate intimidation displays, guarding 1F from other males. So far as I could tell, however, she did not choose her mate until nearly two weeks after her arrival. In the meantime, she fed and flew about with various males. In the contests between 1M and other males from April 1 to 8, I was not always able to analyze the motives in their behavior. There seemed to be strife and ceremonies for dominance as well as for the favor of a certain female. There were at least two other females, but the domain-holder (2M) showed only passing interest in one of them and none at all in the other. Whether the winner acquired dominance first or the mate first is a question.

On April 8 there were triangle and quadrangle ceremonies among the males, and 1F definitely accepted 2M. I saw no further association of 1M and 1F. Although 1M came to the feeding place several times April 9–11, I did not see a female with him, nor did I see him at all after April 11. From April 10 on, 2M dominated the area. His mate, 1F, also participated in intimidation behavior, dominating the females. I recorded 85 intimidation displays by 2M to individual male Cowbirds, 7 to groups of Cowbirds, 9 to a female Cowbird (2F), and 10 to an individual Mourning Dove, Blue Jay (*Cyanocitta cristata*), Grackle, Brown Thrasher, or House Sparrow. Some 30 displays he directed solely toward 3M, who spent more time about the feeding plot than any other male except himself, and each time he displayed before a group, 3M was part of that group. Only occasionally did 3M bow low or bill-point before 2M, and when he did he was apparently attempting to gain the interest of a female. Sometimes he revealed his timidity by feeding hurriedly and warily when 2M threatened him. Usually he stolidly continued his feeding, keeping his distance when 1F was present. The other males that came regularly showed similar acceptance of 2M as a despot (a mild one) over the domain as long as he did not bow to the females with them.

Sexual Jealousy

The following incidents show, I believe, that intimidation gestures and fighting were not in defense of a piece of ground as in territorial behavior, but were purely sexual.

On April 16, when 5M and 2F were the only birds at the feeding place, and were feeding together, 2M arrived. 5M attacked him, but 2M ran to the female, and 5M came between them to guard her. She walked a few feet and the males fed together—amicably so far as I could see. When 2M moved away, 5M followed him. When 2F flew, both males followed her. Similar encounters occurred between 8M and 2M in the presence of 2F when 8M accompanied her, but these did not involve actual attack.

Strange males, when arriving, used intimidation bows to the dominant 2M at first meetings but he bowed deeply in return and they made no further attempt to intimidate him. Strange males displayed to 1F in his absence. On May 25, June 2, and June 25, unbanded males extended the courtship bow and one guarded, but 1F responded by peck-gestures. *I never saw a resident male aside from her own mate escorting her, or displaying to her, after she had mated.* On the other hand, 2M was not averse to extending the courtship bow to 5F or accompanying that female in flight.

The only female that displayed in any way on the domain in 1944 was 1F. She used the bill-pointing gesture nine times in intimidating other Cowbirds (eight times to a female, once to an unbanded male). She bowed once to a female, 5F, when her mate (2M) was showing attention to this bird. She used the peck-gesture 18 times—once to a Towhee, five times to another female Cowbird, eight times to a newly-arrived male Cowbird that bowed to her, and four times to her mate, repulsing his advances. On the day she fought with an unbanded female (June 15), she first attempted intimidation by bill-pointing. With tail elevated, she fed 6 to 12 inches away, but often stopped to bill-point. Then she ran at the intruder. At this point her mate arrived, and she guarded him from the other female by keeping between them, bill-pointing. When the intruding female approached 2M, 1F ran at her, attacking so vigorously that they rolled on the ground and one of them cried out in pain.

I observed one instance of teamwork between the dominant pair in intimidation. My notes (May 6) read: "2M, 8M feeding, 2M bill-pointing, bowing low. Then 2F arrived; she walked toward 2M as she fed, 8M joined them, guarding the female. In a few seconds 8M bowed low to 2M and ran to another feeding spot where 2F soon joined him. Then 2M bill-pointed, drank once, fed, then flew without song, returning immediately with his mate 1F; 2M and 1F pointed bills upward as they walked around the other pair, which flew."

On another occasion, June 19, as the dominant pair fed, 8M arrived, and 2M made numerous low bows as he followed the other male. 8M responded with two low bows. Then 8M's mate, 2F, arrived and 1F bill-pointed on meeting her. 2F circled on foot to join her mate. 1F followed, still bill-pointing. Then all fed walking abreast, the two males in the center, each male thus guarding his mate from the other male. A few more displays by the dominant pair put the 8M-2F pair to flight. The dominant pair followed. Presently all four birds returned, fed together for a while, and flew off again in the same order.

Drouth in 1944 caused a serious food and water shortage for wild life by the last of June, the end of the Cowbirds' breeding season. Despite the abundance of millet seed and water near my home, the Cowbirds followed their usual custom and departed. The adults began to disappear in early July and all had gone by the 15th. None reappeared at the banding station that year. I seldom see adult Cowbirds near Nashville between mid-July and flocking time in September.

The Domain Holder and Dominant Female as Mates

What I observed in 1945 seemed to indicate that the dominant male mated with the dominant female of the same area. How this came about I could not be sure. To me it appeared that the female which was successful in gaining dominance among females in an area of her own choosing accepted the dominant male of that same area as her mate. In 1945, as in 1944, the dominant male was 2M. Early that spring two females had frequented the banding station—5F, a resident of previous years, and a new arrival, 7F, banded and named on March 27. I saw 2M with both of these females from time to time but did not for some weeks observe anything indicating that he had mated with either.

On April 9 at 7:45 a.m., 2M arrived at the feeding plot with an unbanded female. This female I caught and banded, naming her 8F. As she fed, 8M directed courtship bows and Song 1 to her several times, but received no response. When 7F arrived, 8F attacked her; but when 2M flew off the two females remained to feed. About two minutes later, 2M returned. In what appeared to me to be a pugnacious manner, he attacked 7F, twice on the ground, once in the air, driving her off a short distance. Twice, during these encounters, she used the rattle. She returned immediately after each attack. When 2M left the feeding place again, 7F began bill-pointing 8F, following her over the feeding plot and into the adjoining flower bed. When 2M returned, 7F was some distance from 8F. Having directed a courtship bow to 8F, he left. Presently the two females flew off together. Later that day I saw 2M and 8F together at least twice; he bowed to her but she ignored him.

On April 10, I saw 2M and 8F again at the feeding plot. He apparently was courting her. After his departure from the plot when 7F arrived, 8F started to bill-point her. The two females used this gesture in trees and on the ground for a considerable period, apparently trying to intimidate each other; but 8F gradually became less aggressive and more wary, and later in the day I noted that *it was 7F who followed 2M in flights from the feeding plot*—a characteristic of the female of the dominant pair. I did not see 8F after that day. 7F became the dominant female, the mate of 2M. This position she held until her death on May 20. 2M had no mate after that in 1945.

In 1946, 2M was the first Cowbird to arrive. He came on March 11 and was dominant over other males until March 29. On that date 4M, a visitor of 1944 and 1945, appeared, accompanied by the first female of the season, an unbanded individual. She showed pugnacity that first day by using the peck-gesture to a male Cardinal and later, as other female Cowbirds arrived, she displayed to them with bill-points and peck-gestures. I banded her on April 1 calling her 9F. She was the mate of 4M. From that date, 2M began to lose position as head of the domain. 4M assumed the dominant place, using intimidation gestures toward 2M and other males with no retaliation from them. Although 2M remained as a resident for the season, I saw him less and less frequently and never with a mate. This seems to be further proof that holding the dominant position among males is closely linked with acquiring the dominant female as a mate.

To summarize: in 1944, the dominant position of the first arrival, 1M (a resident of previous years) was forfeited when the dominant female rejected him in favor of 2M, a male which gained dominance among males. In 1945, 2M retained the domain and acquired the dominant female, 7F, as his mate, although he apparently had preferred 8F. In 1946, 2M arrived first but lost the domain to 4M, who had been there as a visitor in the two previous years, and who had as his mate 9F, the dominant female of 1946.

Egg-laying

The first Cowbird egg that I found in 1944 was laid in a Cardinal nest on April 23. On the morning of the previous day I had noticed an excited group of Cowbirds (including 2M, 5M, and 1F) above this nest, and had seen 2M attack 5M there. The third Cardinal egg of the set had been laid April 22. On the 23rd this third Cardinal egg was missing and the Cowbird egg was in its place.

On April 26, at 9:00 a.m., I saw a female Cowbird emerge from a dense shrub border at the rear of our place, a hundred feet from the Cardinal's nest. Investigating, I found a Towhee's nest two and a half feet above the ground. In it were three eggs (one pierced), and on the ground below was another (cracked). All these eggs appeared to be Cowbird eggs. I did not see the owner of the nest. I removed the damaged eggs. At 10:30 I found the two eggs in the nest damaged —one pierced, the other broken. The following day I saw a female Cowbird there again. That day the Cardinal nest was empty, and I found a Cardinal egg (somewhat incubated) in the shrub border near the ravaged Towhee nest.

I captured 1F repeatedly in 1944, recording her weight 15 times from March 28 to June 25 (see Table 1). In general, she weighed somewhat less than 40 grams. But on April 23, April 29, April 30, May 18, and June 10 she weighed *over* 40 grams. These dates may well represent also her egg production periods. In any event, the findings tend to corroborate Nice's theory (1937:155 and 1942:89) that Cowbirds usually laid three sets of eggs per season in Ohio.

TABLE 1

Weights of Dominant Female 1F

1944	Morning	Grams	Afternoon	Grams
March 28			1:45	37.2
April 3	8:00	35.5		
12	7:00	36.7		
23			3:00	42.4
29			1:00	40.4
30	7:15	38.9	7:15	41.8
May 6	10:30	38.7		
9			2:00	38.8
18	11:45	40.1	6:30	41.9
25	7:00	37.9		
June 10	10:30	40.6		
22			2:00	38.9
25	7:00	36.7		

The weight of 6F on April 29, 1944 was 41.4 grams. Two recorded weights for her in previous years were 39.3 and 40 grams.

On the morning of May 6, 1944, 2F weighed 41 grams. She was probably in or near egg production at that time, for her average morning weight otherwise (4 records) was 39.5 grams. On May 9 and again on May 10, a Cowbird egg was laid in a White-eyed Vireo (*Vireo griseus*) nest in a shrubby border about a hundred feet east of the Towhee nest. This nest was also on 1F's domain, but I do not know which Cowbird laid the eggs. The eggs were not alike in markings and may have been laid by two females.

It is possible that, early in the season when host nests are scarce, two or more pairs of Cowbirds contend for "possession" of these nests. Most certainly there were contentions of some sort in the vicinity of the above-referred-to Cardinal and Towhee nests in 1944. When two or more female Cowbirds are ready to lay, it seems quite plausible that such rivalry should arise, that nests could be filled with Cowbird eggs, and that rival Cowbirds could destroy each other's eggs. My notes concerning the group of Cowbirds seen April 22 near the Cardinal's nest read as follows: "At least 3 males and 3 females were in great commotion in the rear section where all Cowbird eggs were found. 8:40–8:49 a.m. a pair flew to the dense growth of shrubbery and vines, some 30 feet south of the feeding place, under a large silver maple tree. This pair was followed by a male and another pair. Then a female perched for some time in another maple, some 20 feet from the first, over an exposed Mourning Dove nest (bird incubating). A few minutes later, 5M and a right-banded female perched in the first maple over an exposed Cardinal nest (set just completed). The male flew, leaving the female alone. Female 1F arrived in the tree, followed by 5F and a right-banded male: 1F landed near the end of a branch with some males crowding close, 5M nearest to her. He bowed. Then in a swift flight, a male, thought to be 2M, came and attacked the males nearest 1F. All flew to the east side of the lot, lost to sight in the dense growth. Excitement continued for the rest of the morning back there."

Through the 1944 season I put up dummy nests of several sorts, placing in them Bluebird (*Sialia sialis*) eggs from deserted nests and marked House Sparrow eggs. These eggs disappeared, but no Cowbird eggs were laid in the nests.

In 1945 I found Cowbird eggs in seven of nine Towhee nests in which eggs were laid in April and May. An early Towhee nest (eggs laid in March) was not parasitized. The earliest Cowbird eggs of that season I found April 6 (an egg in each of two nests, each egg laid April 4–6).

In mid-May of 1945 I noted much contention among the Cowbirds of the neighborhood. On May 16, I observed that the dominant 2M was limping. That morning there had been bowing ceremonies between him and two other resident males, 8M and 12M. Late that day his leg or foot trouble seemed aggravated, he sometimes lost his balance while feeding, and the plumage of his back was disarranged, the gray basal color showing as if some feathers had been lost. On May 17, an unbanded male spent considerable time at the feeding plot. He and 2M participated in bowing displays to each other at their early meetings, but by evening 2M was doing all of the bowing. At 6:48 p.m. he directed eleven bows to the stranger and, a few minutes later, ten bows while he guarded his mate, 7F. The unbanded male made no response at all.

Early in the morning on May 18 a Cowbird egg was deposited in a Towhee nest in shrubbery near the feeding plot. The domain-holder, 7F, was in egg-production at that time. Early that afternoon 7F arrived at the feeding plot with her mate and an unidentified male. She appeared to be in normal condition then, but at 7:00 p.m., as she flew to a tree near by, I saw that she was tail-less, and when she alighted her posture was that of a sick or injured bird. She remained until 7:20, flying north, probably to the usual roosting place (all Cowbirds flew in that direction at dusk). The following day she made some effort to eat, but stood or squatted idly most of the time. At 7:39 p.m., when a Blue Jay annoyed her, she made a short flight toward the north, but dropped to the ground among some plants. Apparently this was her last flight. I did not see her again, and on the following afternoon (May 20), I searched among the plants, finding her intact body. She probably had died a very short time previously for ants had not yet attacked her eyes. She was thin, weighing only 36.4 grams, a low weight for a laying Cowbird. Dissection revealed an egg in the oviduct with the yolk intact but the shell broken. On the large end of the shell was a dark brown spot, bordered with specks of light brown, but the rest of the egg was immaculate. In the ovary were three enlarged yolks of varying sizes and a mass of tiny ova. It is possible that her condition was caused by the attack of a predator or by an automobile collision, but what I had actually observed the preceding few days led me to suspect that the Cowbirds themselves were responsible. The injuries of her mate and the behavior of the other males furnished circumstantial evidence that fighting involving the 2M-7F pair had been savage.

Summary

Through the breeding seasons of 1944, 1945, and 1946, at my home in Nashville, Tennessee, I studied the mating habits and territorial behavior of the Cowbird (*Molothrus ater*). My observations were principally of 29 color-banded individuals (18 males and 11 females), some of which lived about my home for two to four seasons.

Upon their arrival in spring, male Cowbirds indulged in elaborate bowing ceremonies, intimidation gestures, pursuits and fights, striving for dominance among themselves. These activities were connected more or less directly with mating. Intimidation gestures and fights of a similar sort occurred among females also. Bows extended in courtship or greeting by males to females were of various sorts, but none was as elaborate as that given by the male in intimidating another male.

One male became dominant among males, one female among females. I ob-

served copulation one to three times a season between these two dominant individuals, and I observed no other copulation. I did not ascertain whether the male acquired his domain first and then his mate, or vice versa, or whether the dominant female first selected her domain and then accepted as her mate any male which proved to be dominant in that particular area. My observations furnish greatest support for the last-stated theory.

The dominant pair held their dominance through the same intimidation displays as those practiced among the group early in the season. Most important of these in the male were the very elaborate "toppling forward" type of bow, the peck-gesture, the pointing upward of the bill, and the guarding of the female by moving quickly between her and another male. The female maintained dominance over other females by bill-pointing, peck-gestures, bowing (rarely), and guarding her mate from another female. Female display occurred less often than male display. With both sexes, intimidation gestures occasionally ended in a fight. Sexual jealousy was evident.

All of my observations indicated that the species was monogamous, although a number of individuals of both sexes mingled freely throughout the breeding season, feeding and flying about together.

I observed no evidence of true territorial behavior: no boundary lines were defended, and no Cowbirds were excluded from any area. The area (exact size undetermined) occupied by the dominant pair I have here designated as the *domain* because it was used as a mating station by the dominant male and dominant female exclusively.

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1521 Graybar Lane, Nashville 12, Tennessee

THE NATURE AND CAUSES OF THE 'COASTAL HIATUS'

BY GEORGE G. WILLIAMS

THE object of this paper is to re-examine the nature and causes of the so-called 'coastal hiatus' in the springtime migratory birdlife of our southern states. The hiatus lies along the northern shore of the Gulf of Mexico and extends several hundred miles inland. Within it transient birds are "extremely rare, highly intermittent in their occurrence, or even wholly absent during many consecutive spring migrations" (Lowery, 1945: 119). Cooke (1904: 378; 1915: 33), Chapman (1907: 17), Lincoln (1939: 50–51), and many other ornithologists aside from Lowery and myself have recognized this hiatus, and Lowery (1945: 119) believes it exists because transients arriving from across the Gulf "do not come down immediately on reaching land but fly far inland before descending."

On the other hand, I have maintained in two articles (1945; 1947) that evidence for large-scale trans-Gulf migration is lacking, and that, on the basis of the actual evidence at hand, we must believe that the really significant migrations from south of the United States "take the coastwise routes *around* the Gulf" through Florida and Texas.

One of the just-mentioned articles (1947) suggested, but for want of space and adequate evidence did not develop, certain independent hypotheses concerning the coastal hiatus. The present paper examines those hypotheses in the light of evidence accumulated in the intervening years.

Meanwhile, however, it should be said that Lowery has modified his original views about the hiatus. He now believes (he informs me) that the hiatus is more apparent than real; that trans-Gulf migrants actually do land in numbers within the hiatus, but are dispersed so widely and thinly over a very large area that they are seldom observed. Since the very nature of this particular hypothesis makes either verification or refutation impossible, the present paper must deal with it as only a part of the overall picture. The main difficulty with it is that incontrovertible evidence of large-scale trans-Gulf migrations is still lacking.

Confession of Error

Since writing the two papers mentioned above, I have been able to make telescopic observations of night migrants. These observations have been less extensive and regular than I could have wished. But since 1947 there has hardly been a clear moonlit night in April or May that I have not spent from one to four hours (as the press of other business permitted) from early in the evening till after midnight, and on two occasions all night long, observing migrants at Houston; at a place 10 miles southwest of Houston; on Galveston Island; on Matagorda Island; and at Rockport, Texas. Erratic as these observations have been, they have amounted, all told, to many hours of work. They have convinced me that my original papers on trans-Gulf migration contained errors.

1. Both Lowery and I were impressed by the fact that spring migrants accumulate in great numbers along the Gulf coast during passage of a cold front, *no matter what hour the front strikes*. Accordingly, we agreed that spring migrations proceeded steadily and continuously (Lowery, 1945: 112; Williams, 1945: 108). Telescopic observations, however, do not confirm these conclusions. In the first place Lowery (whose telescopic work has been more extensive and consistent than mine) informs me that, normally, migration reaches a peak at certain hours of the night, and falls away sharply thereafter. And in the next place, I myself have noted that, on some nights during the spring migration along the Texas coastal plain, only 5 to 15 birds an hour will cross the moon's face; but on other nights they will pour across by the score—on one occasion (May 5, 1947) in such numbers during a two-hour period that, literally, they could not be counted.

This difference in the number of birds passing at different hours and on different nights requires that another explanation be found for the invariable accumulation of birds on the coast whenever a cold front passes.

2. Another seeming error in my original paper was its almost exclusive emphasis on coastline migration. Coastline migrations do occur. I have witnessed them repeatedly both by day and by night. The daylight migrations have involved many species and many individuals of land and water birds. Moreover, the coast undoubtedly forms a kind of sideline, as on a football field, which birds follow when unfavorable meteorological conditions make inland migration difficult.

But though the coastline migration exists, is vastly important, and must always be reckoned with, it is not exclusive. Telescopic observations have shown that, along the Texas coast, night migration may be very pronounced at least 50 miles inland.

Southern Migration Patterns

The number of individual migrants passing north along the lower Texas coastal area is simply incredible. Thus, Mrs. Conger Hagar and Fred M. Packard, in a study of birds in the Rockport-Corpus Christi area of Texas (the manuscript of which I have seen) speak of 500 Yellow-throats (*Geothlypis trichas*) counted together in a 100-foot row of young salt-cedars (*Tamarix*); 57 Bay-breasted Warblers (*Dendroica castanea*) in one tree and hundreds flocking through the adjacent area; 500 Tennessee Warblers (*Vermivora peregrina*) in a single day; waves of thousands of Baltimore Orioles (*Icterus galbula*) in a day or two; Scarlet Tanagers (*Piranga olivacea*) several dozen at a time; 50,000 Barn Swallows (*Hirundo rustica*) within two hours—and so on.

No such concentrations of birds have ever been reported in Texas outside the immediate coastal area. For example, at Austin and Dallas, regions well worked by ornithologists, the very best days in the field produce hardly one-twentieth the number of individual birds of most migrant species appearing in the Rockport area. Furthermore, at least half the 65–70 transient species recorded as regular and abundant in the Rockport area in spring are listed as "rare", "uncommon", "scarce", or "irregular" at Austin (Simmons, 1925) and at Dallas (Stillwell, 1939). The same is true of the central Oklahoma region, about 500 miles directly north of Rockport (Nice, 1931). Finally, many species (the warblers in particular) that pass through the Rockport area do not nest, and seldom appear, in the Plains region northward from Rockport to Canada. It seems obvious, therefore, that all those birds which travel along the lower Texas coastal area in such vast numbers do not continue straight northward toward Austin, Dallas, central Oklahoma, and the Great Plains. What, then, does become of them?

The answer to the question is suggested by two facts: First, a large proportion of the land species transient through the Rockport area breed largely to the northeast of Rockport, in the wooded and mountainous regions of eastern North America. Indeed, the following species, all common transients through the Rockport area, breed entirely (or with minor and casual exceptions) east of the Rockport meridian: Wood Thrush (*Hylocichla mustelina*), Worm-eating Warbler (*Helmitheros vermivorus*), Golden-winged Warbler (*Vermivora chrysoptera*), Blue-winged Warbler (*Vermivora pinus*), Parula Warbler (*Parula americana*), Cerulean Warbler (*Dendroica cerulea*), Blackburnian Warbler (*Dendroica fusca*), Hooded Warbler (*Wilsonia citrina*), Canada Warbler (*Wilsonia canadensis*) and Louisiana Water-Thrush (*Seiurus motacilla*).

Second, telescopic observations in the general region about Houston show a huge majority of night migrants flying, not north, but northeast, or north-northeast. Except when cold fronts are imminent, observation at any given hour will show that 60% to 90% of all birds seen are traveling northeast, or north-northeast. This is true of any date in April or May, or any hour of the night. All told, the average of birds traveling in this direction in any one hour is about 80% of the birds actually seen. A good typical night, in the midst of an extensive period of warm, bright weather, was May 3, 1947, when I used the telescope 2 hours and 15 minutes between 7:45 and 10:45 p.m. Birds seen were as follows: 3 going north, 2 going northwest, 5 going southwest, 47 going between east and north-northeast.

These two circumstances seem to allow of no other interpretation than that the birds passing so abundantly through the Rockport area must fan out, as they proceed, in a great triangle like that indicated in Figure 1.

But this triangle is not necessarily rigid, as it appears to be in the figure. An aggregate of hundreds of daylight observations, as well as a few nighttime observations, suggest that the triangle may waver from side to side. The push of a cold front on the northwestern edge of the triangle may compress it against the coast, where it coalesces with the regular coastwise migration. Or the flow of warm air from the south, with clear weather to the north, may swing the triangle far to the northward. Or various combinations of meteorological factors may affect it in other ways.

That this western triangle of migration exists seems certain. Whether there is a corresponding triangle extending up from Florida has never been investigated. Lowery tells me that its existence is not confirmed by the small amount of telescopic evidence now at hand. But if such a triangle exists, it must involve fewer species and fewer individuals (Williams, 1945: 103) than those of the western triangle.

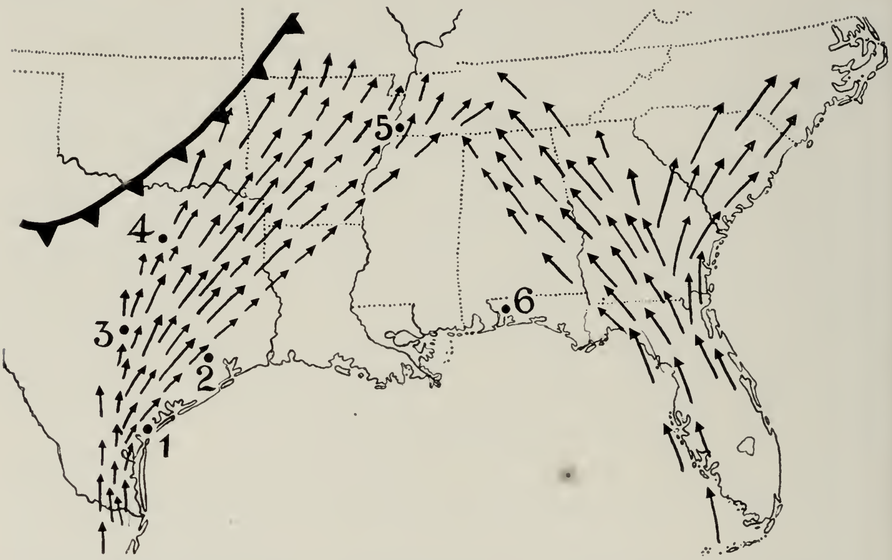

Fig. 1. Map to show spring bird migration patterns through the Southern States. The 'coastal hiatus' is obvious. The heavy barbed line across the northwest represents a typical cold front advancing toward the southeast. Places mentioned in the text: 1. Rockport; 2. Houston; 3. Austin; 4. Dallas; 5. Memphis; 6. Pensacola.

Nevertheless, when one recalls that certain species generally recognized as entering North America almost exclusively through Florida in spring breed in areas extending far to the northwest, north, or northeast of Florida, it seems probable that the eastern migration triangle exists for a few species at any rate, and perhaps for some individuals of many species. Birds in this category are the Cape May Warbler (*Dendroica tigrina*), Black-throated Blue Warbler (*Dendroica caerulescens*), and Bachman's Warbler (*Vermivora bachmanii*), and probably the Swainson's Warbler (*Limnothlypis swainsonii*), Kirtland's Warbler (*Dendroica kirtlandii*), Prairie Warbler (*Dendroica discolor*), Black-poll Warbler (*Dendroica striata*) and Bobolink (*Dolichonyx oryzivorus*). It is interesting that, according to Weston (1938: 222), the area 50–60 miles from the

Gulf inland from Pensacola has a more nearly "normal" migration than Pensacola itself. This is what we should expect if the eastern migration triangle exists. Furthermore, Weston has repeatedly remarked, in his reports from Pensacola appearing in *Audubon Field Notes*, that Swainson's, Cape May, Black-throated Blue and Black-poll Warblers, as well as the Bobolink, are rare "this far west"; yet all these birds are recorded as common spring migrants through Georgia (Greene et al., 1945). Again, this is what we should expect if the eastern migration triangle does exist.

The Coastal Hiatus

If the two migration triangles just mentioned really exist (and the western one certainly does), the coastal hiatus postulated by Cooke (1904) long ago, and described by Lowery (1945) more recently, is that land area which lies south of and between the two migration triangles.

Lowery's description (1945) outlined three characteristics of the hiatus: (a) Along the Mississippi Valley "the northern edge of the hiatus must lie to the south of Tennessee"; the southern edge iies along the coast (p. 106). (b) Many transients "are recorded consistently much earlier in Tennessee, for example, than on the coast itself" (p. 103). (c) The number of individuals and of species recorded within the hiatus "do not seem to approach those recorded slightly farther north" (p. 106); the region about Memphis, Tennessee, in particular, "throngs day after day with migrants" (p. 106).

The hypothesis of the two migration triangles fits this three-fold characterization like a glove. Specifically, (a) birds traveling along the two triangles would not enter the region of the hiatus except under the push of unfavorable weather northward from the triangles. (b) In good weather (warm and clear) they would reach Arkansas, Tennessee, Missouri, Kentucky, and northern Mississippi, northern Alabama, and northern Georgia before appearing within the hiatus. (c) The numbers of individuals and of species traveling along the triangles would be greater than the number that normally entered the hiatus.

Transients in the Hiatus

1. *Arrival Dates.*—Weston (1948) points out that during 30 years of observation at Pensacola, Florida, he has consistently "recorded 'first arrivals' here in spring on dates that afterward proved to be later than the bulk arrival date of the same species at some point much farther north." Likewise Lowery (1945) has shown that a large percentage of transient species have been recorded earlier at Memphis, Tennessee, than at Baton Rouge, Louisiana, or anywhere on the Gulf from Pensacola to western Louisiana. The traditional explanation has long been that trans-Gulf migrants during good weather "pass over the Gulf coast in the spring and proceed far inland before descending" (Lowery, 1945: 103).

This explanation might accont for the phenomenon. But it requires our believing that tiny land birds would fly at least 950 miles (the south-north distance from Yucatán to Memphis) without stopping, and 400 miles after their first landfall. Lowery suggests (1946: 205) that some of the migrants begin their flights from southern Yucatán, or "points even farther south." The non-stop flight to Memphis might thus cover about 1200–1300 miles.

Though the 500–600 mile flight across the Gulf itself is not impossible, the longer distances involved seem fabulously great for the regular migrations of small birds. The two migration triangles here described offer a much more logical and credible explanation of those good-weather discrepancies that have long been noted in arrival dates.

2. *Bird Waves.*—All along our Gulf coast the arrival of a cold front in spring is almost invariably accompanied by the appearance of hosts of migrants in the immediate coastal area. Weston in Florida, Burleigh (1944) in Mississippi, Lowery (1945) in Louisiana, and all observers on the Texas coast are familiar with this spectacular phenomenon. The traditional explanation of these bird waves is that migrants coming in from off the Gulf meet the cold front and, unable to make headway against it, accumulate on the coast and wait for it to pass.

At this point the reader's attention should be called to the fact that birds migrating in spring may retreat long distances with, or ahead of, a cold front. This phenomenon has been analyzed in some detail in a recent paper (Williams, 1950).

What seems to happen, during the passage of a cold front, to the birds migrating along the western triangle is this: they are struck on their port beam by the cold front coming, usually, out of the northwest or north-northwest. They veer off-course, and fly with the front, or ahead of it, toward the east or southeast. That is, they invade the coastal hiatus. But they do not usually stop within the hiatus itself; they press on till they see the waters of the Gulf ahead of them. Fearing to be swept out to sea, they plunge to earth and "pile up" there. Some of them may even be swept out to sea in the darkness, and return to land the next morning. Or perhaps, being crowded between the cold on the left and the sea on the right, they struggle eastward in a narrow column, hugging the coast, till the cold abates; then they turn and resume their flight directly toward their original destination. In any event, the number of individuals that appear on the coast is tremendous because the whole width of the migration triangle, with its vast numbers of migrants, has been swept clean, and the birds compressed into the narrow coastal area.

This intrepretation of the coastal concentrations is consistent with the following facts:

(*a*) The concentrations appear on the coast, no matter what hour the cold front strikes.

(*b*) The concentrations appear not merely, or even largely, in our coastal area opposite Yucatán (as would probably be the case if the birds had arrived from across the Gulf), but in the entire coastal area from Brownsville, Texas, to

Pensacola. This wide dispersal along the coast is what we should expect if the interpretation here offered is sound.

(*c*) Even when a cold front advances from almost due west, as sometimes happens, a concentration of birds will occur on the southern Texas coast. Moreover, some of the species involved—for example, the Hepatic Tanager (*Piranga flava*), Violet-green Swallow (*Tachycineta thalassina*), White-throated Swift (*Aëronautes saxatilis*), and Black-chinned Hummingbird (*Archilochus alexandri*)—have never been regarded as trans-Gulf migrants.

(*d*) Only occasionally (about once every spring) does a cold front strike the Gulf coast from the northeast. Accordingly, the characteristic birds of the eastern triangle (Cape May, Black-poll, Black-throated Blue, and Prairie Warblers, and even the Bobolink) are much more rare along the coasts of Texas, Louisiana, Mississippi, and the northwestern arm of Florida than are birds of the western triangle; and when these eastern birds do appear, they nearly always accompany one of the rare northeastern fronts. Furthermore, these birds of the eastern triangle become progressively rarer as we move westward along the coast; and conversely, characteristic birds of the western triangle become progressively more scarce as we move eastward along the coast (Williams, 1945: 103). These peculiar, but regular, diversities would not occur if the birds were coming from across the Gulf.

3. *Birds on the Gulf of Mexico.*—Vagrant land birds are seen rather commonly on all the world's seas (Williams, 1947: 229–231). I have records of Blue Jays (*Cyanocitta cristata*), Starlings (*Sturnus vulgaris*), Towhees (*Pipilo erythrophthalmus*), Brown Thrashers (*Toxostoma rufum*), and other species *not* migratory to regions south of the United States, coming aboard ships 30–150 miles out in the Gulf of Mexico, as well as a banded homing pigeon (from San Antonio, Texas) released in New Orleans on June 4, 1949, and coming aboard a ship, 50 miles south of Cameron, Louisiana, on the morning of June 6.

But I have investigated every report known to me concerning *numerous* birds on the Gulf of Mexico in spring. Invariably (and I wish to emphasize the *invariably*) a cold front had passed out over the Gulf within, at the very most, 36 hours before the time when the birds were reported.

It had long seemed to me that these birds had been swept out to sea by the cold front, and were struggling back to land when seen; that they were *not* trans-Gulf migrants. Having had no experience with birds on the Atlantic coast, I was surprised to find that Peterson (1948: 161) described the very same phenomenon on the Atlantic coast, where trans-oceanic migration is out of the question. Telling of autumn migrants at Cape May, New Jersey, Peterson described the effect of "a northwest wind blowing across the traditional lanes of travel of birds moving southward." He continued: "The birds drift southeastward in the moving mass of polar air, and if the wind is strong enough, the night migrants are carried out to sea in the darkness. At daybreak, near the Cape May Light, I have watched small birds, weak and tired, beating their way in over the surf, tacking into the stiff northwesterly breeze that had carried them offshore." Similar refugees on our Gulf coast have long been called trans-Gulf migrants. Much more probably, they are birds that cold fronts have pushed across the coastal hiatus and out to sea.

Summary

The 'coastal hiatus' of our Gulf States appears to be a lacuna south of and between two great spring migration triangles, one extending north and northeast from southern Texas, the other extending northwest, north, and northeast from Florida. In this lacuna few transient species occur during fair, warm weather.

Periodic cold fronts, with northerly winds, striking the northern sides of these migration triangles, push migrants down against the coast, where they are often seen in great numbers immediately after the passage of a cold front. Sometimes the cold fronts push birds out over the Gulf itself, where they have been mistaken for trans-Gulf migrants.

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The Rice Institute, Houston, Texas

NESTING OF THE STREAKED FLYCATCHER IN PANAMA

BY ALFRED O. GROSS

ORNITHOLOGISTS who visit the high mountains of southern Arizona in summer are apt to see and hear the Sulphur-bellied Flycatcher (*Myiodynastes luteiventris*), a noisy, quarrelsome bird which seems to prefer sycamores to other trees (Bent, 1942: 99–106). This flycatcher is the most northward-ranging form of its genus. Another species of the same genus, *Myiodynastes maculatus*, the so-called Streaked Flycatcher, is not known to range farther north than the Río Sabinas, in southwestern Tamaulipas (Sutton, Lea and Edwards, 1950: 51). It has never been recorded in the United States. It ranges southward through eastern México, Costa Rica, Panamá, Colombia, and Ecuador to northwestern Venezuela and extreme northwestern Perú—and even farther east and south if the closely allied *M. solitarius* be considered conspecific with it. The Sulphur-bellied and Streaked Flycatchers are amazingly alike in size and color. There may be differences in behavior, nesting habits and call notes between them, but these differences have never been reported adequately. Since the Streaked Flycatcher nested commonly on Barro Colorado Island in the Canal Zone during my visits there in 1925, 1927, and 1949, a report of my observations may be of interest and value.

The usual nest-site of the Streaked Flycatcher is a natural cavity or old woodpecker hole (Aldrich and Bole, 1937: 101). At Barro Colorado these are often so far above the ground or water as to be virtually inaccessible to a human being. When, during the construction of the Panama Canal, the Chagres River was dammed and Gatun Lake formed, hundreds of great trees were drowned. In 1925 and 1927 many of these trees were still standing. The soft, decaying wood had been easy to excavate, and innumerable nest-holes had been dug by woodpeckers. The abandoned woodpecker holes were used by such cavity-nesters as the Streaked Flycatcher. The only Streaked Flycatcher nests I found those two seasons were in dead trees standing in the lake. In May of 1935 Alexander Skutch observed two such nests in the lake. As the trees have rotted they have fallen. Not many of them are still standing. In 1949 so few were left that the Streaked Flycatchers were obliged to nest elsewhere. At least one pair coped with the hole-shortage by nesting on a roof. This pair I observed repeatedly from June 28, the day of my arrival, to July 27, the day of my departure.

No one knows, of course, how long that particular pair had been nesting about the buildings. Twenty-four years before, in December of 1925, Frank M. Chapman (1929: 59) had observed a pair at an old woodpecker hole high in a dead tree near the laboratory. That tree had fallen and where it had stood a house for visiting scientists had been built. In 1935 Mr. Skutch had watched a pair of Streaked Flycatchers trying to build a nest on a window-sill of that house, but the loosely piled material had continued to blow away or fall off, so he had put up a box for them. Here they had promptly built a nest, laid three eggs, and raised a brood. The partly completed nest which I found on June 28, 1949 was not the only visible evidence that Streaked Flycatchers had been nesting about the buildings. On the roof of a house not far from the one in which I lived I found the remains of a nest possibly a year old.

The new nest was on the gently sloping metal roof of a porch on the east side of the house, close against the wall and tucked in under the ample overhang of the main roof. The early morning sun reached the nest, but during most of the day it was shaded, and the overhang of the eave sheltered it from the frequent torrential downpours. When I first examined it, it was a small mass of scattered twigs—the mere beginning of the foundation. The two birds came and went together, but I noticed that I never saw both birds carrying material at the same time. The coloration and size of the male and female were exactly the same so far as I could see. Each time the carrier of material flew in, the other bird came also—but never quite to the nest. Instead it veered off, took a perch in a nearby partly-dead orange tree, and remained on guard while the other cautiously went to the nest and added the material. This accomplished, both birds flew off together. Rarely did one bird come to, or leave, the nest alone.

By July 1 the nest was a substantial mass of material. The top was horizontal but the bottom sloped with the roof, so the outer (east) side was somewhat higher than the inner. The cup was quite deep. The birds made trip after trip to a large tree growing about 75 yards from the house in a ravine. Here one bird gathered material while the other perched in the very top. The gatherer of material, assumed by me to be the female, worked at the ends of the branches, tugging at and pulling off slender curved stems, some of which may have been dry petioles. These she shifted about in her bill as the load grew. Sometimes, with mouth full, she waited a while before leaving the tree. Once more at the nest, she stood in the cup while arranging the material. Between 8 and 11 o'clock that morning material was brought to the nest once about every 15 minutes. In the middle of the day the birds took a recess. They did not resume their nest-building until late afternoon.

On July 2, work started at 7:15 a.m. In addition to coarse twigs for the walls, finer twigs and tendrils for the lining were being gathered. At 8:43 a.m. the bird I assumed to be the female alighted on the edge of the roof with 6 or 7 long fibers in her bill. Apparently scrutinizing her surroundings, she stood there for two minutes, then flew directly to the nest, alighting in the bowl itself. Here, instead of dropping her load, she moved her head from side to side, letting the dangling fibers fall between her body and the nest wall. She made no attempt, so far as I could see, to adjust their position with her bill. Now, lifting her wings and tail, she pressed the fibers into the nest with her breast. Shifting and turning, sometimes going about in a complete circle, she forced them into place. Then, with wings folded and tail stuck upward so that it touched the overhanging roof, she rested, panting hard. The heat must have been intense, for at that hour the roof was not shaded in the slightest. Five times that morning I observed this pressing into the lining of a load of fibers. The procedure was essentially the same each time. About noon nest-building stopped for the day.

Streaked Flycatcher (*Myiodynastes maculatus*) on favorite perch near nest. Photographed on Barro Colorado Island, Panama Canal Zone, in July, 1949, by Alfred O. Gross.

On July 3 the sky was cloudy and the weather cooler. Possibly as a result of this, the birds were very active. I first saw a bird at the nest at 7:46 a.m. Observing continuously from that time on, I recorded arrival with nest material at 8:15, 8:19, 8:24, 8:27, 8:34, 8:40, 8:46, 8:52, 8:59, 9:06, 9:14, 9:22, 9:30, 9:38 and 9:45. The average time-lapse between these 16 recorded visits was about 8 minutes. After 10 o'clock that morning visits were less frequent, but they continued even during a light shower. The birds did not seem to be disturbed in the least by workmen who walked in front of the house, nor did they pay much attention to a group of White-faced Monkeys (*Cebus capucinus*) which fed and frolicked in a tree not far away.

I noted no striking courtship behavior of any sort that day. While the female was coming in with nest material I did see the pair copulate, however. Thus I ascertained that the female was doing the nest-building *at that time*. I saw the male lift his crest after copulating, revealing the usually concealed bright crown-patch, but this hardly seemed to be a definite display. I failed to note any individual peculiarity through which I might hope to be able to distinguish the male from the female thereafter. Occasionally, that day, one bird arrived at the nest without an escort. I assumed this bird to be the female. Evidently ill at ease, she flitted about calling nervously until her mate appeared and took his usual position in the partly-dead orange tree.

Nest-building continued on July 4 and 5, but trips for material seemed to be less frequent. The only material now being brought was long, fine, reddish brown plant fibers. These the female (?) continued to press into place with her body (possibly to some extent with her feet), making no attempt to weave or interlace them with her bill. She turned and shifted a great deal, molding the cup to exactly the right shape. As a whole, the nest was rather flimsy. It was spread over an area about 18 by 20 inches. Its greatest actual over-all depth (not allowing for the slope) was $4\frac{1}{2}$ inches. The cup or bowl was $3\frac{1}{8}$ inches deep and $3\frac{1}{4}$ inches in diameter at the rim. The only lining materials were long, thin plant fibers. The wall and foundation materials seemed to slip out of place easily. Had the nest been in a cavity it probably would have remained more compact.

On July 6 the birds were in the trees and shrubbery about the laboratory, but I did not see either of them at or near the nest. During a heavy rain in the afternoon I saw them perched together in a blossoming *Isertia* bush with their plumage plastered down and their bills directed upward toward the falling drops. After the shower they flew up to an electric cable where, side by side, they dried and preened for 25 minutes. They paid no attention to persons passing only a few yards away. They seemed to be half-domesticated.

At 7 a.m. on July 7 the female was on the nest and the male was in a tree not far away chirping and singing. In his bill was a long fiber. He did not, however, fly with this to the nest. This was the only time I saw what I felt reasonably sure was the male carrying nest material. The female remained on the nest all morning. When I visited the nest after her departure it held one egg.

On July 8 there were two eggs in the nest at 11 a.m., and I assumed that the clutch was complete when none was added the following day. On each of my visits to the nest I made a point of waiting until the birds were out of sight, but by the time I climbed to the roof both had returned. They attacked fiercely, swooping at me and striking my head with their wings. As soon as I left the nest and got down from the roof, however, they seemed to pay no attention to me or to other persons who walked about the building.

On the morning of July 10 I was surprised to find a third egg in the nest.

The female made short visits to the nest that morning and early afternoon, but she did not seem to settle down to actual incubation until late afternoon. She was on the nest at dusk and remained there during the night.

On July 11 the female was on the nest (so far as I know) continuously until 10:30 a.m., at which time she left the nest with the male and went off to feed. The day was warm. The birds did not return until 1 p.m. The *female* went to the nest almost immediately and settled down to incubating. The *male* remained in his favorite orange tree, perching near the top and preening vigorously. At 4 o'clock the female left the nest, returning presently with several

Nest and eggs of Streaked Flycatcher. Photographed on Barro Colorado Island, Panama Canal Zone, in July, 1949, by Alfred O. Gross.

fibers in her bill. She alighted near the male and, without any courtship or display that I could see, the pair copulated. Still holding the fiber in her bill, the *female* now flew to the nest, placed the material somewhat casually on the rim, and settled upon the eggs, resuming her incubation.

At 4:45 a Ghiesbrecht's or White Hawk (*Leucopternis albicollis*) flew low across the clearing, heading for a stump just south of the laboratory. The male Streaked Flycatcher instantly left his perch in the orange tree and dashed at the hawk, causing it to change its course completely. It alighted in a cecropia tree. Here, shrieking in protest, the smaller bird continued for about twenty minutes to give battle. Finally, nagged and badgered to the edge of the clearing, the

Nesting site of Streaked Flycatcher on metal roof, Barro Colorado Island, Panama Canal Zone. Photographed in July, 1949, by Alfred O. Gross.

hawk left, and the flycatcher returned to his post in the orange tree. Despite all the commotion, the female flycatcher had remained on the nest. The male's attitude toward the hawk surprised me somewhat, for he had paid no attention to the many tanagers, honey creepers, cotingas and other birds which visited his orange tree from time to time. I had seen even a Tropical Kingbird (*Tyrannus melancholicus*) alight only a few inches from him on his favorite branch without causing an altercation.

On July 12, while I was measuring the eggs on the roof, the flycatchers attacked me more fiercely than usual. One of them dashed at my hand, striking the metal calipers so hard that a mass of feathers was dislodged. No great harm was done, however, and the attacks of both birds continued unabated. The excitement died down completely as soon as I left the roof.

On July 12 and 13 there were only three eggs in the nest, so I judged the clutch to be complete. The eggs were strikingly and beautifully marked. Their ground-color was very Pale Olive-buff[1], almost white. Over their entire surface, but especially at the larger end, they were streaked and blotched with reddish brown. The shade of most of the markings was about Van Dyke Red. At the larger end, where the ground-color was almost completely obscured, the markings varied from Hays Maroon to Diamine Brown. The eggs measured (in millimeters) and weighed (in grams) as follows:

	Longest diameter	Shortest diameter	Weight
1	23.0	19.1	4.65
2	22.8	18.9	4.59
3	24.2	19.5	4.72
Average	23.3	19.2	4.65

Skutch (1945: 19) gives the average measurements of three eggs as 27.7 × 18.6 mm. These were the eggs of Costa Rican or Panamanian birds. Three *Myiodynastes luteiventris* eggs collected along the Río Sabinas in Tamaulipas averaged 25.5 × 18.6 mm. (Sutton, Lea, and Edwards, 1950: 51).

On July 16 (the eggs had now been incubated 5 full days), the female left the nest at 1:45 p.m. and, accompanied by her mate, flew to the trees bordering the farther side of the clearing. I saw neither bird again until 5 p.m., when both returned to the partly-dead orange tree. Presently the female went to the nest. The eggs had been uncovered for over three hours, but to say that they had not been incubated at all during that time would be to disregard the heat of the day and of that particular under-the-metal-roofing nest-site.

On July 17 the female was away from the nest from 10 a.m. to 2 p.m. and again from 4:15 to 5 p.m. On July 18 she was away from the nest from 6:30

[1] Capitalized color-names used in this paper are from Ridgway's *Color Standards and Color Nomenclature* (1912).

to 9:10 a.m. and from 10:30 a.m. to 1:30 p.m. A heavy rain from 3:05 to 3:30 p.m. did not seem to disturb her in the slightest.

On July 22 (the eggs had now been incubated 11 full days) I decided to observe the nest continuously all day. I started at 6 a.m. At that time the female was on the nest. My log for the day is shown in Table 1.

During the tabulated 12 hours and 45 minutes (see Table 1) the female was on the eggs a total of 5 hours 43 minutes, off them a total of 7 hours 2 minutes, this on the 12th day of incubation. Incubation continued July 23 and 24. On both these days the female was off the nest for considerable periods, but I did not record her comings and goings. Throughout the entire 15-day incubation period she was, so far as I know, on the nest continuously each night.

TABLE 1

Attentive and Inattentive Periods at Nest, Twelfth Day of Incubation

	On Nest	Off Nest
6:00 a.m.– 6:20 a.m.	20 min.	
6:20 a.m.– 9:30 a.m.		3 hrs. 10 min.
9:30 a.m.–10:35 a.m.	1 hr. 5 min.	
10:35 a.m.–10:40 a.m.		5 min.
10:40 a.m.–10:42 a.m.	2 min.	
10:42 a.m.–11:15 a.m.		33 min.
11:15 a.m.–11:19 a.m.	4 min.	
11:19 a.m.–11:45 a.m.		26 min.
11:45 a.m.–11:57 a.m.	12 min.	
11:57 a.m.–12:22 p.m.		25 min.
12:22 p.m.–12:56 p.m.	34 min.	
12:56 p.m.– 3:00 p.m.		2 hrs. 4 min.
3:00 p.m.– 6:26 p.m.	3 hrs. 26 min.	
6:26 p.m.– 6:45 p.m.		19 min.
6:45 p.m.	returned to nest for night	

Each time I paid the nest a nighttime visit the female was there and I was surprised at her staying on the nest despite the noise, the considerable vibration of the roof, the flashlight, and the flash-bulbs used in photography.

On July 25 I went to the nest at 8 a.m., finding one egg hatched (the shells had been removed) and another pipped. The parent birds seemed to be more excited than they had been at any time during the incubation period. Until about 9 o'clock the sun struck the nest directly. During much of this early morning period the female stood on the nest-edge shading the young bird and hatching egg. At 9:23 the male brought food (presumably soft-bodied insects), fed the young one directly (i.e., without passing it first to the female) in several small installments, and returned to his orange tree, there to utter *cheer-o-wee-wee*, one of the more musical of his cries. The female now settled on the nest.

The heat was intense. As she panted I noticed the deep red color of her tongue and the yellow of her mouth-lining. Having brooded her eggs and young one a few minutes she hopped up to the nest's rim, peering at the young one and poking her bill among the eggs and young as if expecting a fecal sac to appear. At 10 o'clock both flycatchers flew off for a short time. On coming back, they took turns in feeding the young one. The male now flew to his orange tree, but the female stayed at the nest. From noon until 2 p.m., rain fell. During this time the female was on the nest, brooding closely. At 2:15 I saw her removing some egg-shells. The second egg had hatched. The male flew to the nest with food. Between feedings he uttered curious gurgling notes. These were faint, but quite distinct, and very different from his song and usual call notes. The third egg did not hatch. On examining it later, I found that no embryo had developed in it.

The down of the young birds was Blackish Slate on the top of the head, between Mouse Gray and Deep Mouse Gray on the upper part of the body, and virtually white below. I noted that there were two tufts in the middle of the crown as well as one above each eye; tufts on the nape, and scapular, humeral and femoral regions in addition to the extensive spinal tracts, and an elongate tract on each side below. The naked parts were Flesh Color, the tarsus and toes Pinkish Vinaceous, the claws Cartridge Buff and the gape Pinard Yellow. Skutch (in Bent, 1942: 102) described the natal plumage of the closely allied *Myiodynastes luteiventris*, as he had observed it in Costa Rica, as "rather copious, long, dusky down."

Unfortunately I had to leave Barro Colorado on July 27, so I could not continue my observations of the nestlings. Dr. James Zetek and his assistants continued to watch them however, ascertaining that they left the nest at 11 a.m., on August 12, when they were 18 days old. Skutch (1945: 19) gives the nestling period as "at least 21" days. The Barro Colorado birds may have left the nest somewhat prematurely.

Call notes of *Myiodynastes maculatus*

The Streaked Flycatcher has been described as a noisy bird (Todd and Carriker, 1922: 345), but what I observed on Barro Colorado did not substantiate this concept except when I climbed to the nest. Excited by my presence there, the pair uttered loud screaming notes. The usual call notes were chirps not unlike those of the Song Sparrow (*Melospiza melodia*), but louder and with a distinct metallic quality. Both the male and female gave this call note. When one gave it the other usually answered with the same note. Occasionally I heard them give a loud *witchy, witchy.*

The song, which is sometimes preceeded by 'sparrowlike chirps', and which probably is given only by the male, was so unlike what I had expected that for some time I could not believe *Myiodynastes maculatus* was giving it. It was a series of subdued, pleasing, rather high-pitched notes which I wrote down as *cheer-o-wee-wee, cheer-o-wee-wee, cheer-o-wee-wee.* I heard this song throughout the period of my observations of the roof-nest in 1949, and I heard it at various times of day. It was usually given from a high perch. Skutch, in unpublished MS notes pertaining to a song of the species he heard on Barro Colorado in July 1931, says: "the bird perched on the top of a tall tree in a clearing, and at dusk began to sing. It was a pleasing, simple melody, clearer and softer than possessed by most flycatchers: a half-whistled, sweet *Right-here-to-me, Right-here-to-me, Right-here-to-me.*" An early morning *Myiodynastes* song reported from the Río Sabinas, in Tamaulipas, and El Salto, San Luis Potosí, was four-syllabled, as were the *cheer-o-wee-wee* and *right-here-to-me* songs just described (Sutton, Lea, and Edwards, 1950: 49).

Food Habits of *Myiodynastes maculatus*

In mid-July, 1949, I noted repeatedly that the Streaked Flycatchers whose nest I was observing seemed to ignore the clouds of small brown dragonflies which were all about them. They centered their attention, apparently, on smaller, more delicate insects.

On July 24, 1949, I saw a Streaked Flycatcher kill and eat a three-inch-long lizard. Holding the struggling reptile in its beak, the bird struck first the head-end, then the tail-end of its victim against the branch on which it was perched, ran the numbed lizard rapidly through its bill, transferred it to its feet, dealt it several blows with its bill, and started swallowing it. With the lizard half-swallowed, the flycatcher rested momentarily, letting the limp tail protude. Finally, with a violent shaking of its head, it got the lizard down.

These lizards were numerous in latter July. I often saw them on the screens of the buildings. On July 25, while making observations at the nest of a Hicks' Seedeater (*Sporophila aurita*), I saw a Streaked Flycatcher alight on the ground under the nest-tree, capture a lizard, fly to a low dead branch and batter the animal to death. Killing or numbing the lizard sufficiently for ingestion required four minutes. Twenty minutes later I saw the same bird catch and eat another lizard in the same way.

Summary of Nidification Data

A Streaked Flycatcher nest, started on or about June 28, was not entirely finished on the evening of July 5, but very little work was done on it the following day and the first egg was laid July 7. Time required for building: about 8 days.

One bird seemed to do all the gathering of material and actual building and I believe this was the female. On one occasion I witnessed copulation and the female had nest-material in her bill at that time. On another occasion, however, when the supposed female was on the nest, the other bird had a fiber in its bill. The other bird did not add this fiber to the nest.

The first egg was laid July 7, the second July 8, the third July 10. Incubation apparently did not start until the afternoon of July 10, but it may have started earlier. I am not sure that a bird spent the night on the nest during the egg-laying period. On the evening of July 10, however, a bird was on the nest and it spent the night there.

On July 11 (her clutch was complete) the female added a billful of material to the nest. I believe the female did all the incubating. I never saw the incubating bird being fed at the nest by the other. I never saw two birds at the nest together during the period of nest-building, egg-laying, or incubation.

Only two of the eggs hatched. They hatched July 25. Incubation period: at least 15 days, possibly more, since it may have been the egg laid July 10 that did not hatch.

Both parent birds fed the newly hatched young directly—i.e., the food was not passed from one parent to the other before being given to the young. The young remained in the nest until August 12, being fed by both parents throughout this period. The young may have left the nest prematurely. Fledging period: at least 18 days.

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Bowdoin College, Brunswick, Maine

TERRITORY AND SONG IN THE LEAST FLYCATCHER

BY PEGGY MUIRHEAD MACQUEEN[1]

DURING the summers of 1942, 1944 and 1946, I made an intensive study of the Least Flycatcher, *Empidonax minimus*, in the vicinity of Douglas Lake, Cheboygan County, Michigan. My study covered a total of 44 nests: 19 in 1942 and 14 in 1944 on an area of 7 acres of broken aspen woods (i.e., woods in which there were several houses, roads and paths) within the Biological Station camp grounds; and 11 in 1946 on the same 7 acres plus 14 adjacent acres of unbroken aspen woods (i.e., woods without houses, roads and paths).

Techniques

The study area was systematically searched for nests, which were numbered approximately in the order found. Their position and the territorial boundaries of the nesting pairs I have indicated on maps for the three years studied (see maps).

Nests 1, 2, 3, 4, and 5 were observed for a total of 165 hours between June 20 and August 3, 1942. Nests 17 and 21 were observed for 30 hours between June 27 and July 15, 1944. Platform blinds were placed level with, and 3 to 5 feet from, these nests. Song perches and territorial boundaries of 14 pairs with nests were plotted in the field during 40 hours of observation between June 24 and August 3, 1946. Morning song was studied on ten trips, each of which began about an hour and a half before sunrise and ended when rhythmic singing ended. Throughout my study the time recorded was Standard Time. Observations outside of the blinds were made with an 8x binocular and a 32x telescope.

The females of Nests 2, 4, and 21 were marked with aluminum bands colored with nail varnish, and the female of Nest 21 was made more readily identifiable by cementing a yellow feather to her upper tail coverts. Each of these four birds was captured in a quarter-inch mesh wire trap built around the nest. The hinged, propped-up top of the trap was released by a string from the blind as soon as the bird settled on the nest. The sex of unmarked birds could sometimes be recognized through their call notes and songs. A few individuals could be recognized as such by special mannerisms or details of coloration.

Habitat and Population

The study area was largely second-growth woodland. Large-toothed aspens (*Populus grandidentata*) and quaking aspens (*P. tremuloides*) dominated, but there was a scattering of birch (*Betula papyrifera*), maple (*Acer rubrum*), and

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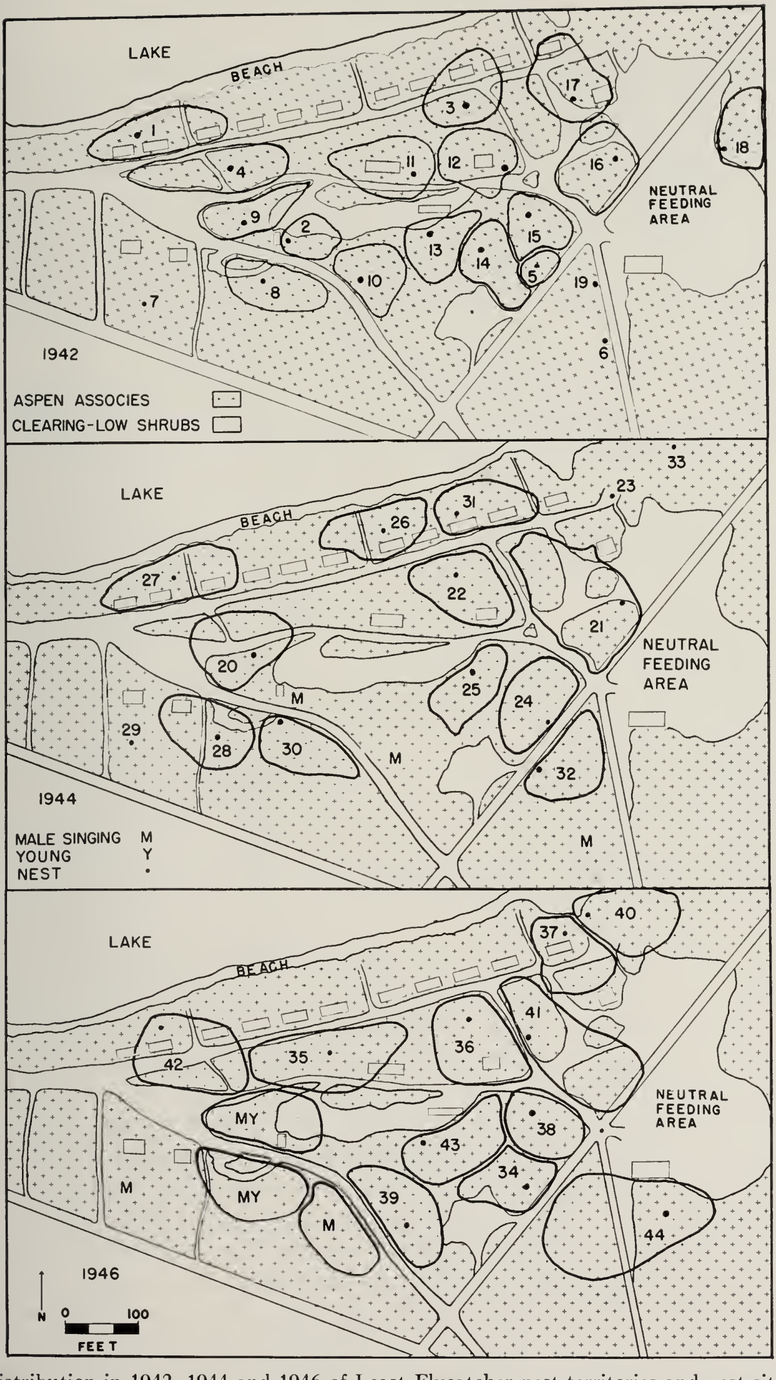

Distribution in 1942, 1944 and 1946 of Least Flycatcher nest-territories and nest-sites at the University of Michigan Biological Station. Note that in 1944 and 1946 certain singing males were not on territories.

pine (*Pinus resinosa*). The crowns of the large-toothed aspens formed a canopy 30 to 40 feet high. A lower leaf-stratum was composed of the tops of birch, maple, and quaking aspen saplings. The ground cover was primarily bracken (*Pteris aquilina*), under which a few shade-tolerant plants grew. Fire had destroyed the original forest in 1901.

The 7-acre area had a population density of 2.7 and 2.0 pairs of Least Flycatchers per acre, respectively, in 1942 and 1944. The birds seemed to like the constant human activity and the artificially open woods; farther away, where the aspen woodland was unbroken, they were much less common. The 14-acre area had a population density of 0.7 pairs per acre in 1946.

Censuses of bird populations respectively in aspen, beech-maple, and pine communities in Cheboygan County have revealed that the Least Flycatcher inhabits only the aspen and beech-maple associations. Prescott (1946) found

TABLE 1

Population Density in Least Flycatcher Breeding Habitats

Authority	Habitat Type	Years	Number of Acres	Total Pairs Counted	Average Per 100 Acres
Saunders	Orchard and shade trees	1930–31	50	6	12
Saunders	Aspen-cherry forest, undisturbed	1930–31	1166	43	3.7
Saunders	Aspen-cherry forest, cleared for camping	1930–31	123	4	3.3
Saunders	Aspen-maple thicket	1930–31	333	7	2.1
Hofslund	Beech-maple forest	1946	160	9	5.6
This paper	Open aspen woods	1942	7	19	271
This paper	Open aspen woods	1944	7	14	200
This paper	Open aspen (7 acres) plus closed aspen (14 acres)	1946	21	11	52

one Least Flycatcher in a pine community. It was singing along the border of a small island of aspens within the pine forest. Saunders (1936) encountered the Least Flycatcher in 4 out of 19 habitats that he censused in Allegany State Park, New York. An analytical summary of Least Flycatcher population data is given in Table 1.

Whereas neither Saunders nor Hofslund (1946) found as great a density of population as I did, their figures do demonstrate the Least Flycatcher's preference for open woods. Saunders found the greatest density in orchards and among shade trees—decidedly the most open of the habitats—and the smallest population in the aspen and red maple thicket—the least open habitat. Hofslund found that the species did not invade the forest interior but kept to the edges of the paths and roads crossing his study plot. We are forced to conclude, therefore, that open areas in the woods are a primary habitat requirement, and that trees of many sorts are suitable so long as there are openings among them. Forbush (1927:361) states that the species has "become accustomed to man and his works and prefers his neighborhood to more retired localities." Nearness to human habitations can hardly be considered a habitat requirement, however; the important feature of the human neighborhood is probably the man-made openings in the woods.

This preference for edge was clearly shown by the sites of the 44 nests I studied: 20 were on the edges of clearings or along roadsides; 18 were less than 10 feet from such an edge; and 6 were slightly more than 20 feet from the edge. The preference seems to be based on two requirements: shade for the nest, and an open area for feeding and for song posts.

I found that the larger open areas surrounding the woods (e.g., the saw mill clearing and the dump area) were used as neutral feeding grounds by all the Least Flycatchers which nested nearby. The availability of such an extensive neutral feeding ground may decrease intraspecific conflict and the size of individual territories, hence increase population density.

All territories included, or were bordered on at least one side by, an opening in the woods. The song posts used early in the morning were on these edges, and although the male moved about the territory during the singing period, most of the singing itself was done from the edge.

Interspecific Habitat Relationships

So segregated in their several niches were the various bird species of the area that I observed little evidence of interspecific competition. At Nest 21, a Chipping Sparrow (*Spizella passerina*) built its nest in the same maple tree, yet the two species lived together quite amicably. Four flycatchers—the Phoebe (*Sayornis phoebe*), Kingbird (*Tyrannus tyrannus*), Wood Pewee (*Contopus virens*) and Crested Flycatcher (*Myiarchus crinitus*)—nested and fed in areas immediately adjoining Least Flycatcher territories and sometimes briefly invaded them, but I observed no conflict. Williams (1936:382) commented on the interspecific ecological segregation of the breeding Acadian Flycatchers (*Empidonax virescens*), Wood Pewees, and Crested Flycatchers of a beech-maple climax community. "So far as food habits are concerned the flycatchers form a group by themselves, each species having its own hunting ground."

At first glance the Redstart (*Setophaga ruticilla*) and Least Flycatcher appear to occupy precisely the same habitat niche. The nest of the one resembles that of the other in site and structure. Yet Hofslund (1946) reported the nesting of the two species side by side without conflict in a beech-maple forest near Douglas Lake. He found, however, that the more abundant Redstart (38 pairs per 100 acres) nested throughout the woods, whereas the Least Flycatcher (6 pairs per 100 acres) nested only along paths and roads. Within my study area no Redstarts nested. The species seemed to prefer the dense, continuous maple forest farther away from the Biological Station.

I observed only one instance of interspecific conflict—that between a pair of nest-building Cedar Waxwings (*Bombycilla cedrorum*) and a pair of Least

Flycatchers whose nest contained eggs. The encounter took place on July 27, 1944. The flycatchers' nest was outside my study area, but on the Station grounds. I watched developments for 35 minutes, during which period the waxwings made three visits to the nest, stealing material each time. When they appeared in the vicinity both the male flycatcher, perching 50 feet from the nest, and the female, sitting on the nest, called rapidly; but not until the robbers began to tear at the nest did the male actually attack. He darted at their heads with bill snapping, hovered over them, and fluttered about them calling excitedly. The female *remained on the nest*, pecking at the waxwings and calling too, but she did not leave even though the whole structure rocked beneath her. The waxwings evinced little concern over the noise and attacks. Finally, on their third visit, the female flycatcher left the next when it began to tip over. Both flycatchers now flew at the waxwings, causing them to retreat momentarily. The end came when one of the waxwings pulled so much of the nest away that the three eggs and torn remains fell to the ground. Both flycatchers made a final assault, but when the waxwings flew off they carried pieces of the nest in their beaks.

What impressed me most about this fight was the failure of the male flycatcher to attack the waxwings when they first appeared in the vicinity of the nest. I was impressed, too, with the refusal of the female to leave her nest until the very last. Davis (1941:160) has said of the Kingbird that "the important characteristic of this interspecific fighting is that only the male fights." I have never witnessed an encounter between Least Flycatchers and a nest-robbing Blue Jay (*Cyanocitta cristata*), but I suspect that in cases of that sort, involving a considerably larger bird species or predatory mammal, both the male and female would instantly attack. Certainly, as I have many times observed, when a human being interferes at the nest both the male and female attack with swoops and bill-snapping and the attack does not cease until the human being has withdrawn.

Territory

Within its chosen habitat, the Least Flycatcher selects and defends a territory in which it spends much of its time, builds its nest, and gathers some food for itself and young. Beyond the borders of this territory it may use a neutral feeding ground, where individuals of both sexes feed without conflict.

The breeding cycle of the Least Flycatcher covers about 50 days. Nest-building requires about 5 days, egg-laying 3 to 6 days, incubation 15–16 days, fledging 14 days, and feeding of full-fledged young about 10 days. The earliest date on which I actually saw an active nest was June 19 (the nest held two young about three days old on that date). This nest must have been built in the last part of May. The latest date on which I found a nest under construction was June 24. The first nest of this pair had been destroyed. The female builds the nest, incubates the eggs, and broods the nestlings. Both sexes feed the young.

The male remains within the nesting area throughout nest-building, egg-laying, and incubation except when he visits a neutral feeding area. Occasionally he feeds the female while she is on the nest. I noted the following behavior at Nest 4 on the ninth day of incubation: "A few hours after I banded the incubating bird the male came to the nest to feed the female, giving his usual guttural *speetz*. This time instead of remaining on the nest the female flew off, flying wildly about the territory with the male in chase. After a few seconds of flight the female landed on a branch ten feet from the nest where the male fed her, after which she flew back to the nest. The male remained on the branch singing for about a minute."

Each nesting pair is dominant over other Least Flycatchers in its own territory, and intrusion of a neighboring individual or pair always incites immediate reaction of defense. The boundaries of territories seem to change somewhat from time to time, but even when a nest is destroyed and a new one built the general location of the territory does not change much. The largest territory I measured occupied 0.50 acres (21,881.5 square feet), the smallest 0.03 acres (1431.5 square feet). The average of 33 territories was 0.18 acres (8036.8 square feet). The average distance between nests was about 175 feet, the greatest 215 feet, and the least 60 feet. Territories are maintained by pursuit, threat-posture, fighting, and song.

Pursuit. When a Least Flycatcher appears in a Least Flycatcher territory not its own it is immediately recognized as an intruder by the resident male. The owner of the territory utters a sharp note and gives chase, both birds flying excitedly and swiftly about. If the intruder does not fly out of the territory, a fight ensues. The resident male forces the intruder to the ground, where the two posture (see below) and then engage in a tumbling struggle which ends in the retreat of the defeated bird (apparently always the intruder). After following the intruder a few feet beyond the territory, the resident male returns to a favorite perch and calls *che-bec*.

The male is usually the first to fly to the defense of the territory. The female's defense is different from the male's in some ways. First, she does not defend the entire territory but is primarily concerned with an area 20 feet in radius around the nest. She does not attack or pursue the intruder until it has come well within this restricted area; then, if her mate does not appear, she flies from the nest in pursuit. Usually when she thus leaves the nest only a pursuit flight occurs, for this is sufficient to force the trespasser out. If two birds enter the territory at the same time, the female sometimes assists the male in defense; in these cases, however, the male always is first to fly toward the enemy, the female following a few seconds later. This behavior I observed on six occasions.

Davis (1941:158) described this type of behavior in the Kingbird. "The pair which has already acquired the 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."

Threat-posture. Threat-display involves enlarging of apparent body size by fluffing out the breast feathers; raising the crest; extending, vibrating, and bending the wings; spreading and flicking the tail up and down; and crouching. Upon recognition of an intruder in the territory the resident male flicks his tail, raises his crest, crouches momentarily, and leaves his perch in pursuit. This requires only a second or two. Following the chase both birds may drop to the ground, crouch, and face each other with outstretched, vibrating wings. When the resident male has driven the other off, he returns to a favorite perch and sings *che-bec*. Each time he sings he flicks his tail and raises his crest.

The female threat-postures only occasionally. When, in defense of territory she meets an opponent, she spreads her tail, raises her crest, and fluffs out her breast feathers. She threat-postures only briefly and does so principally in opposing man, small mammals and such birds as are actually attacking the nest.

Davis (*loc. cit.*), writing of the Kingbird, described a display which he believed "served the same ends as the territory song in many passerine birds." He stated: "The fighting consists of air battles, conducted with 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. . . . The bird flies high in the air chattering with wings quivering and then, after tumbling, climbs high again and repeats the tumble several times." I have seen much aerial chasing among Least Flycatchers but never a display comparable to this.

Fighting. Fighting is closely related to pursuit. Often during a chase the two birds fly at each other just before dropping to the ground. Fighting can be so swift that only a flashing of feathers and whirling of two bodies is visible to the human eye. Fighting usually follows what appear to be attempts to intimidate through posturing. Only once have I seen what I was sure was a female Least Flycatcher fighting (see discussion above of the Cedar Waxwings).

Song. Song is important in establishment and maintenance of territory. Ornithologists are in wide agreement that the song of the male sounds very much like *che-bec* (Bent, 1942:221). This *che-bec* varies little within itself as a phrase. It is repeated rapidly during part of the morning song period; in daytime singing it is repeated less regularly and not very rapidly; and in flight it is sometimes mixed with certain unmusical notes. According to my observations the male rarely sings in the nest-tree.

The morning song is given daily by the male within the confines of the territory, usually a few feet above the level of, but not very near, the nest. It is a continual and more or less rhythmical repetition of *che-bec*. It is given from several song-perches in trees along the edges of the territory. Where several nests are close together (as were Nests 34, 38 and 44) most of the singing is done along the borders of the territories. All of the males of such an area seem to sing with the same tempo and intensity, as if performing in unison. They jerk their heads and flick their tails with each repetition of a song phrase. The females remain quietly on their nests during these joint performances.

About the time the female begins incubation the male's morning song is given from before dawn until about sunrise. It decreases in duration as the nesting cycle progresses. Nine of the ten mornings on which I paid special attention to morning song were clear. On July 18 the sky was overcast, but I could not see that this grayness of day affected the singing of the males in any way. On June 29 the very first *che-becs* sounded about 15 minutes before rhythmical singing started. At 3 o'clock (19 minutes before civil twilight), 15 males began rhythmical singing. They sang for 70 minutes, ending 14 minutes after sunrise. Morning song usually begins rather slowly in the semidarkness, increases in tempo as the sky brightens, and becomes slower again about sunrise. When sung most rapidly (as it was 30 minutes before sunrise on June 29 and July 4, in 1946), the *che-bec* is repeated about 60 times a minute. This fervent morning singing does not continue all summer. By July 15, the song

TABLE 2

Data on Least Flycatcher Morning Twilight Song in 1946

Bird	Date	Morning		First Call note		Rhythmic Song				
		Civil Twilight Began	Sunrise	Hour	Minutes before Sunrise	Hour began	Minutes before Sunrise	Hour Ended	Duration	Number of Males Singing
Least Flycatcher	June 29	3:19	3:56	2:45	71	3:00	56	4:10	70	15
	July 4	3:23	3:59	2:50	69	3:07	52	4:05	58	14
	July 12	3:28	4:05	3:10	55	3:20	45	3:50	30	10
	July 15	3:30	4:07	3:25	42	3:30	37	4:05	35	11
	July 18	3:32	4:10	3:30	40	3:40	30	4:05	25	10
	July 22	3:36	4:14	3:30	44	3:45	29	4:02	17	4
	July 25	3:39	4:17	3:35	42	3:45	32	4:04	19	4
	July 28	3:42	4:20	3:43	37	3:45	35	4:00	15	2
	Aug. 2	3:47	4:26	3:55	31	—	—	—	—	1
Kingbird	June 29		3:56			2:20	96			
	July 4		3:59			2:30	89	3:05	35	
	July 18		4:10			3:10	60	3:40	30	
	July 22		4:14			3:12	62	3:50	38	
	July 28		4:20			3:15	65	3:55	40	
Wood Pewee	July 12		4:05	3:14	51	3:18	47			
	July 18		4:10	3:16	54	3:25	45	3:45	20	
	July 25		4:17			3:40	37			

Sunrise and the beginning of morning civil twilight, recorded here in Standard Time, were determined for 85° W. longitude and 45° N. latitude from "Tables of Sunrise, Sunset, and Twilight", Supplement to the American Ephemeris, 1946. Morning civil twilight begins when the sun is 6° below the horizon and ends at sunrise. To convert Standard Time to Eastern Standard Time, add one hour.

began at civil twilight, lasted 35 minutes, and ended 2 minutes before sunrise. By the time the young were ready to leave the nest (July 22) it lasted only 17 minutes, stopping 12 minutes before sunrise. When the young scattered from the territory it stopped altogether (see Table 2).

The cessation of morning song in late summer is a gradual process, since the pairs are at various stages in the nesting cycle. Individuals which were late in nesting in 1942 did not sing much during my period of observation. Their song period was shorter than that of males at the same stage of the nesting cycle earlier in the season when all the birds of the area were singing. Many males singing in adjoining territories seem to stimulate one another. The quality and quantity of singing, then, do not depend entirely upon the stage the individual males have reached in the nesting cycle, but also upon the number of singing males in adjoining territories. The greater the number of males the greater the need for song—i.e., for defense of territory through song. When the young scatter, singing stops. In this respect the Least Flycatcher seems to differ from the Wood Pewee. Craig (1943:153) states that "daytime singing continues long after the end of the breeding season."

Mention of the Wood Pewee leads to a consideration of the ways in which the morning song of the Least Flycatcher resembles, and differs from, that of certain other flycatchers of the Douglas Lake region. The Wood Pewee's morning song certainly is much more complex, and also more musical. It is notable for its rhythmic quality. The Phoebe has an early morning song, but I know little about it. On June 25, 1946 I heard a Phoebe start singing about an hour and a half before sunrise. It stopped at sunrise. The Kingbird begins its song even earlier than the Least Flycatcher and Wood Pewee do (on June 29, 1946, more than an hour and a half before sunrise) and usually continues 30 to 40 minutes. The song is rhythmical and the basic phrase has several syllables. It decreases in duration and intensity as the season advances (see Table 2). The Crested Flycatcher has a twilight song (Nice, 1928:255) but I did not hear it, possibly because of the lateness of the season.

Daytime Song. Daytime song is never, apparently, the routine performance that morning song is. It may be given at any time during the day. Like morning song, it is a repetition of the phrase *che-bec.* Day time singing which I heard in 1946 lasted three to five minutes after interspecific territorial disputes, and the *che-bec* phrases were uttered about 50 times per minute during these periods. Daytime song accompanies the male's approach to the female (whether she is on the nest or not); it serves as a protest to invasion of the territory by a human being; and it may serve as territory advertisement whether or not there is threat of interspecific or intraspecific dispute.

Flight Song. The flight song has been variously described. Forbush (1927: 360) says that it consists of "a jumble of notes uttered in a kind of ecstacy" while the male "flutters about in a circle." Hoffman (1904:202) says that just before dusk the male, after flying up from a tree near the nest, sings a song in which "the call-note, *whit*, and the ordinary song, *se-bic'*, are repeated many times." Chapman's (1932:372) description of "crescendo passages" in which the male "literally rises to the occasion, and on trembling wings sings an absurd *chebêc, tooralooral, chebêc, tooral-ooral*" is puzzling. One hardly knows whether this is a flight song or not. I certainly have never heard such a song, though on two occasions during the early part of the incubation period a male on approaching the nest gave a series of flight-notes and *che-bec* phrases run together; and on another occasion, when adult flycatchers were defending one of their young against a Chipmunk (*Tamias striatus*), they gave a jumbled mixture of notes none of which sounded quite familiar. A well defined flight song which I witnessed at 7:30 p.m. on July 3, 1946, was performed 75 feet overhead. Hearing continuous *che-bec* song above me, I looked up, searched the sky, and saw a Least Flycatcher making short dips in its flight over the forest. Suddenly both song and flight ended as the bird closed its wings and dived straight down to the woods. While this song lasted, no other Least Flycatcher in the area was singing.

Evening Song. The above-described flight song is the only well defined song I have ever heard a Least Flycatcher sing in the evening. The male sings no evening twilight song in any way comparable to the morning song, though of course he may utter an occasional *che-bec* as he does otherwise during the day. The Wood Pewee often sings a twilight song in the evening.

Call notes of the female. The female does little, if any, true singing. She moves about the nest quietly. Occasionally she calls *whit* while feeding or as the male approaches and leaves the nest. She sometimes gives an extended series of *chweep*-notes. If this *chweep* is a song-note at all comparable to the male's *che-bec*, it differs in that it is softer and wholly unaccented at the end. I found that I could distinguish the female from the male on the basis of this note. Both the male and female called *whit*, of course, but only the male called *che-bec*, and only the female called *chweep*.

The female used her *chweep*-note in defending the nest against various animals, notably man. I observed a female fly off from a nestful of young when a Thirteen-lined Ground Squirrel (*Citellus tridecemlineatus*) came to the foot of the nest-tree. She attacked furiously, the outburst of *chweep*-notes lasting until the rodent departed. She gave a series of *chweep*-notes in the nest-tree before she returned to the nest and settled down to brooding. The male was nowhere to be seen, and did not return for some time.

Summary

In the vicinity of Douglas Lake, Michigan, the Least Flycatcher's principal nesting habitat is more or less open second-growth aspen associes. Of 44 nests studied in 1942, 1944, and 1946, 20 were along the very edges of clearings, 18 were less than ten feet from the edges, and 6 were slightly more than 20 feet back from the edges. The population density of favored habitat (i.e., aspen

woods intersected by roads and paths) was 200 to 271 pairs per 100 acres; that of unbroken aspen woods, not far away, 70 pairs per 100 acres.

The territories of the 44 pairs studied were of two sorts: (1) that in which a pair mated, nested *and fed* throughout the whole reproductive cycle, and (2) that in which a pair mated and nested, but fed in a neutral or communal feeding area adjoining. These neutral feeding areas were not defended. Nest territories varied in size from .5 acres to .03 acres (average of 33 measured territories: .18 acres). Territories were defended principally by the males, their singing being an important means of advertisement, defense and maintenance. The male's morning song began before dawn and ended about sunrise. It was a continual repetition of the phrase *che-bec*. When most fervent (just before sunrise early in the incubation period) it was repeated about 60 times per minute. Daytime song was desultory and sometimes followed territorial dispute. A flight song, performed in the evening 75 feet above the ground, was a rapid repetition of *che-bec* phrases. I heard no twilight evening song at all comparable to the twilight morning song. Throughout that part of the reproductive cycle which I observed (egg-laying to the scattering of the young), males devoted a definite part of each morning to singing.

During three visits of a pair of Cedar Waxwings which destroyed a Least Flycatcher nest in stealing material from it, the male flycatcher did not attack until the waxwings were at the nest, and the female flycatcher remained in the nest (which she defended to some extent by pecking) until the final visit, when the nest was pulled completely loose from its moorings. She then joined the male in aerial, but futile, attack.

There seemed to be no friction between Least Flycatchers and such Wood Pewees, Crested Flycatchers, Phoebes and Kingbirds as nested in the vicinity.

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48 New Jersey Avenue, Bergenfield, New Jersey

NEW LIFE MEMBER

Aaron Moore Bagg was born at Holyoke, Massachusetts on April 6, 1912, son of Aaron Clark Bagg and Helen Moore Bagg. As a child he was privileged to have the Duck Hawks of Mt. Tom as avian neighbors, and to gaze upon that priceless possession of the household—a watercolor portrait of a Duck Hawk by Louis Agassiz Fuertes. He attended Hotchkiss School and in 1934 obtained his bachelor's degree from Princeton. A newspaper writer by profession, he is an enthusiastic amateur ornithologist, being an Associate of the American Ornithologists' Union and a member of the Massachusetts and New Hampshire Audubon Societies. He is especially interested in hawk flights and has published thought-provoking papers concerning the correlation between barometric pressure-patterns and spring bird migrations. With Henry M. Parker he has been making a special study of the northward spread of the Turkey Vulture into New England. He became a member of the Wilson Ornithological Club in 1948. He is now serving as a trustee of the organization.

NEW BIRDS FOR THE STATE OF KANSAS

BY RICHARD AND JEAN GRABER

W. S. LONG, in his useful "Check-List of Kansas Birds" (1940:433), clearly pointed out the need for further field work in the western part of the State. Because of this, and also because George M. Sutton and his colleagues had recently found so much of ornithological interest in western Oklahoma, we visited the southwestern corner of Kansas for three and a half months (February 13 to May 27) in 1950, finding that the western-southwestern element in the avifauna was much more pronounced than had heretofore been realized. We collected at several localities in Meade, Morton, and Hamilton Counties. This region was semi-arid and flat for the most part. The lesser tributaries to the larger streams were completely dry most of the time. These lesser tributaries were called 'canyons', locally. Their banks were often precipitous, sometimes 50 feet high. The principal trees of the region were cottonwoods (*Populus* sp.) and these grew only along the streams.

Most of the specimens mentioned in this paper were collected in Morton County along the Cimarron River 8 miles south of Richfield. Here the river bed was about a quarter of a mile wide and completely dry. On either bank was an extensive stand of large, scattered cottonwoods, bordered by thickets of small cottonwoods, willows (*Salix* sp.) and *Tamarix*. Thickets of skunk-bush (*Schmaltzia trilobata* of Britton and Brown, 1913:483) grew on the north bank above these woods. Near the east end of the woods was a small cattail marsh, and along the periphery were several small water holes. We were in Morton County February 21–March 12, March 21–24, April 22–May 15, and May 19–27; in Hamilton County March 13–20, April 10–21, and May 16–18; and in Meade County the rest of the time.

During the course of our study we collected 12 birds not heretofore taken in Kansas, as well as one species believed to have been extirpated some time ago. This paper summarizes our data pertaining to the 13 above-mentioned forms. We identified our specimens at the University of Michigan Museum of Zoology, using the excellent comparative material in the Peet and Sutton collections as well as in the Museum collection itself.

We wish to acknowledge the fine cooperation of the State Forest, Fish and Game Commission, whose representatives, Director Dave Leahy, Superintendent Harry Smith of the Meade State Game Farm, and District Game Protector Ed Gebhard of Meade County, did all they could to help us. George Attwood, of the U. S. Soil Conservation Station in Morton County kindly gave us permission to collect on Station lands. Walter Posey of Elkhart helped in many ways to make our trip profitable. Especially do we wish to thank Dr. C. W. Hibbard for helping us in many ways, and Robert M. Mengel for identifying our *Empidonax* specimens.

Dendrocopos scalaris. Ladder-backed Woodpecker.

This species is fairly common in Morton County among cottonwoods 8 miles south of Richfield. We first encountered it February 26, when we saw a pair near the old Wilburton bridge and succeeded in securing the female. Between this date and May 20 we noted the species 9 times (collecting two females and a male on March 9 and a male on March 22) in a seven-mile stretch of the Cimarron between Wilburton and Elkhart bridges. On May 9 an excited female which probably had a nest allowed us to approach closely and refused to leave a certain part of the woods.

Though our five specimens are all from Morton County, this woodpecker probably ranges considerably farther north and east in the State. It has been reported in Colorado as far north as Pueblo County (Cooke, 1898:162), and in Oklahoma as far east as Ellis, Kiowa, and Tillman Counties (Nice, 1931:115; Sutton, 1936:432). We have compared our specimens with topotypical *cactophilus* and almost topotypical *symplectus* in the Sutton collection and decided, largely on the basis of the lightness of the under parts and breadth of the white bars on the back, that they are closer to *symplectus*. We are, of course, aware of Todd's expressed belief (1946:312–313) that *symplectus* is a synonym of *cactophilus*, but *symplectus* appears to us to be a whiter race.

Tyrannus vociferans. Cassin's Kingbird.

On May 14 near the south bank of the Cimarron River, 10 miles south of Richfield, we came upon a lone kingbird perched in a dead shrub in a large weedy pasture. We identified it as this species, but failed to secure it. On May 19, we saw two more Cassin's Kingbirds sitting on the sand in the middle of the dry bed of the Cimarron. They did not leave this open area, but were wary and stayed out of gun-range. On May 26, we encountered two pairs on the weedy slopes of low hills overlooking the north bank of the Cimarron near the Elkhart bridge, and succeeded in collecting a male (testes much enlarged).

Myiarchus cinerascens. Ash-throated Flycatcher.

Noted only among large cottonwoods along the Cimarron in Morton County, south of Richfield. Here we saw and heard one bird May 5, collected a female (ovary somewhat enlarged) May 7, and encountered one bird or a pair on each of four occasions May 8–23. The species seemed to prefer partial clearings in which there was some dead or fallen timber.

Empidonax wrightii. Wright's Flycatcher.

Of the 13 flycatchers of the genus *Empidonax* which we collected among the cottonwoods and willows 8 miles south of Richfield, seven proved to be *traillii*, three *minimus*, and three *wrightii*. The *wrightii* we took on May 8 (male and female) and 12 (male). In none of these were the gonads noticeably enlarged.

Corvus cryptoleucus. White-necked Raven.

Though alleged to have been extirpated many years ago (see Long, 1940:448; Goodrich, 1945:247; and A.O.U. Check-List, 1931, p. 226), this corvid is probably a fairly common summer resident today on the high plains of western Kansas. Game Protector Gebhard told us he had seen the species regularly in summer at least since 1941, in which year he had found it nesting on old windmill towers on the high plains of Hamilton and Kearney Counties. C. O. Shetterly of Syracuse told us he had been seeing the birds in summer (not in winter) since 1931. We first encountered the species (a pair) 13 miles north of Syracuse, Hamilton County. We saw the two birds clearly and heard them calling. When we returned to this area on April 18 we saw at least 19 birds, and collected one (a male with enlarged testes). One of two old nests we had observed earlier was being relined.

Our friend Robert M. Mengel, who travelled through Kansas this past summer, informs us that on August 21 he saw a flock of about 100 White-necked Ravens near the place at which we collected our specimen.

Vireo solitarius plumbeus. Plumbeous Solitary Vireo.

Vireo s. solitarius has long been known to migrate through Kansas, but of the 5 specimens of Solitary Vireo taken by us in Morton County, 8 miles south of Richfield, not one was *solitarius*. Four were *plumbeus* and one was *cassini*. The *plumbeus* we took May 8 (male and female), May 9 (singing male), and May 10 (female). In all of these the gonads were somewhat enlarged, but we did not find a nest.

Vireo solitarius cassini. Cassin's Solitary Vireo.

A female (ovary slightly enlarged) Solitary Vireo which we collected 8 miles south of Richfield clearly belongs to this dull colored western race.

Vermivora virginiae. Virginia's Warbler.

We encountered this species only in Morton County, in low cottonwoods 8 miles south of Richfield. We noted it May 4–10, always in mixed flocks of migrating warblers. We saw one on May 4, one (male collected) on May 6, two on May 8 (one collected, a male), and one on May 10.

Dendroica nigrescens. Black-throated Gray Warbler.

We found this warbler quite common between May 8 and 13, during which period we collected three females and a male. We encountered the species mainly in thickets of young cottonwoods and other scrubby trees along the Cimarron in Morton County.

Dendroica townsendi. Townsend's Warbler.

Noted on May 3, 11, and 20, on each date a single bird in woods along the Cimarron, 8 miles south of Richfield. Our only specimen, a female collected May 3, was with a company of Orange-crowned Warblers (*Vermivora celata*).

Piranga ludoviciana. Western Tanager.

This bird we saw many times May 2 to 26 (the end of our stay) and came to regard it as a fairly common transient. On May 6, 8 miles south of Richfield, we collected two males from a mixed flock of Bullock's Orioles (*Icterus bullockii*) and Western Tanagers. So far as we have been able to ascertain, *Piranga ludoviciana* has not actually been collected in Kansas heretofore, though Long (1940:453) called the species a rare summer resident in the west and stated that there were two published records for the State.

Chlorura chlorura. Green-tailed Towhee.

We first encountered this species on April 25, when we collected a beautiful male (testes somewhat enlarged) in a canyon opening into the north bank of the Cimarron River in Morton County, about 9 miles north and 3 west of Elkhart. The floors and walls of the canyons in this region were upgrown with *Schmaltzia*, and it was in a dense growth of this shrub that we found the bird. It was associating with Spotted Towhees (*Pipilo maculatus*). The following day we collected another male in the same canyon. We saw three other birds (the last on May 23), in thickets at the edge of extensive woodlands farther east along the Cimarron.

Aimophila ruficeps. Rufous-crowned Sparrow.

On May 21 we saw a Rufous-crowned Sparrow near Point Rock in Morton County, about 9 miles north and 2 miles west of Elkhart. The bird was on the floor of a wide draw, along the sides of which grew sparse clumps of *Schmaltzia*. The bird sought cover in this shrubbery, and we did not see it again.

Spizella breweri breweri. Brewer's Sparrow.

Brewer's Sparrow apparently is a common spring migrant in southwestern Kansas. We noted it throughout Morton County, encountering it first on April 8, when we collected a male (testes very small) in a dense clump of *Schmaltzia* along a rocky ledge above the Cimarron River. We recorded it on five dates thereafter, collecting three more specimens, all males with considerably enlarged testes, the last on May 1. The species inhabited canyons, sage pastures and the edges of woods but never strayed far from dense, shrubby cover. Twice we saw it along roadside fences.

On the basis of size our specimens are referable to the nominate race, though two of them (R.R.G. 425 and 465) are rather dark on the dorsum for that form. These two measure, respectively: wing 64, 63 mm.; tail, 60, 60. The other two (R.R.G. 360 and 435) measure: wing, 64, 62; tail, 60, 58.

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2201 Washburn Avenue, Topeka, Kansas

NEW LIFE MEMBER

Theodora Gardner Melone, a graduate of Vassar and of the Division of Library Instruction at the University of Minnesota, is now librarian of the Geology Library at the last-named institution. She is a member of the National Audubon Society, the Isaac Walton League, and the Minnesota Ornithologists' Union. Formerly on the Board of Directors of the Geological Society of Minnesota, she has served that organization also as chairman of its field-trips committee. She has been vice-president and program committee chairman for the Minnesota Bird Club. Joining the Wilson Club in 1947, Miss Melone promptly distinguished herself through her work as a member of our Committee on Aid to European Orinthologists. She is especially interested in bird behavior and life history studies. She has made several trips to northern Minnesota and to neighboring states, studying birds. She is enthusiastic over walking, bicycling and canoeing.

GENERAL NOTES

Ring-billed Gull chases Great Blue Heron.—On March 6, 1950, Mr. and Mrs. L. C. Fievet, Tom Atkeson, William Jernigan and I were observing birds along the sloughs of the Wheeler National Wildlife Refuge about five miles up the Tennessee River from Decatur, Alabama. A Great Blue Heron, *Ardea herodias*, which rose ahead of us, elected to cross the river but was immediately beset by a lone adult Ring-billed Gull, *Larus delawarensis*, which had been flying and resting along the main channel. The gull centered its attack on the heron's back, apparently attempting to pull loose some upper tail coverts. The pursuit lasted about 45 seconds, during which time the heron flew forward perhaps 200 yards. When the heron veered, turning back for the bank, the gull discontinued its harassing and resumed its search for food in the main channel.

Though both fish-eaters, the Great Blue Heron and Ring-billed Gull obtain their food in quite different ways so they can hardly be considered competitors. I am, therefore, at a loss to explain the gull's antagonism to the heron in the case just reported.—Thomas A. Imhof, *307 38th St., Fairfield, Alabama.*

Bald Eagles attack crippled gull.—About 8 o'clock on the morning of January 17, 1943, Louis Brown and I were on the north levee of the Chautauqua National Wildlife Refuge near Havana, Mason County, Illinois. While opening a gate into the Refuge we noticed an unusually large number of Bald Eagles (*Haliaeetus leucocephalus*) flying over the lake and perching in trees along the shore.

Though we did not have binoculars, we soon discovered what appeared to be a center of the eagles' interest—a rather large gull about 75 yards out in the lake and possibly 100 yards from where we were standing. It was dodging the slow, awkward swoop of a low-flying eagle. Immediately after the attack the gull resumed a normal sitting position in the water. Presently several eagles, in rough formation, swooped one after another at the gull, which obviously was too badly injured to fly, though we could not tell just what was wrong with it. It dodged all these attacks, sometimes by diving. When the immediate danger was over and the air about it had cleared, it resumed a resting position. It seemed to be about the right size and color for a Herring Gull (*Larus argentatus*).

The attacks were not yet over. A total of 12 eagles, including several adults with white heads and tails, circled over the lake at the same time. One after another the great birds swooped down on the gull. The harried bird managed to elude each attack, although two or three times escape was narrow. At least two eagles touched the water with their claws or toes, and another actually settled momentarily, rising ponderously from the surface and flapping away. The whole performance called to mind a squadron of bombers peeling off in sequence in their determination to reach an objective.

After the mass attack the eagles separated somewhat, though some of them continued to swoop at the gull, which by this time was much farther out from shore. Eventually it disappeared from our sight around a promontory. We do not know what happened to it.

The inability of the eagles to capture the gull seemed to us good evidence that they could not be considered very important from the standpoint of primary predation. We were much impressed by the ability of the clumsy, crippled gull to elude their attacks.—Lee E. Yeager, *Colorado Cooperative Wildlife Research Unit, Colorado Agricultural and Mechanical College, Fort Collins.*

A Ring-necked Pheasant × Prairie Chicken hybrid.—About 1933, near Ellendale, southeastern North Dakota, Burton Brown of Forbes, North Dakota, shot an interesting cross between a Ring-necked Pheasant (*Phasianus colchicus*) and a Prairie Chicken (*Tympanu-*

chus cupido). The bird was flushed with a group of pheasants in an area throughout which Prairie Chickens and Sharp-tailed Grouse (*Pedioecetes phasianellus*) were also fairly common. The mounted specimen came into the possession of the State Game and Fish Department. Here it was discovered by Roy N. Bach, coordinator of federal aid for North Dakota. Bach was instrumental in having it forwarded to the Fish and Wildlife Service, in Washington, D. C. It has recently been dismounted and made into a study skin.

A hybrid Ring-necked Pheasant × Prairie Chicken from North Dakota. Note especially the tail-shape, the partly feathered tarsi, and the pronounced dorsal barring. Photos by courtesy of the Smithsonian Institution.

I am indebted to Dr. John W. Aldrich of the Service for comments regarding the specimen's species characters, many of which clearly show in the accompanying Smithsonian Institution photographs. The bird (probably an immature male) resembles an adult male Ring-necked Pheasant in the following ways: 1. The bill is large, light yellowish, and shaped like that of a male Ring-neck. 2. The operculum and nostril are large and exposed. 3. The scales of the front toes are without lateral projections or 'snowshoes'. 4. The unfeathered lower half of the tarsus has a rudimentary spur. 5. There is a wattle-like bare area about the eyes. This area is not, however, so extensive as it is in an adult male Ring-neck. 6. There are distinct black ear tufts (see photo of dorsal surface).

The bird resembles a Prairie Chicken thus: 1. The upper parts, especially the feathers of the upper back, are strongly barred. 2. The flank feathers are strongly and completely barred on at least one web. 3. The tail has a dark brown terminal area on all but the middle pair of rectrices, and the color of this area is similar to that of the Prairie Chicken's tail. 4. The markings of the primary coverts (which do not show in either photograph) are very much like those of the Prairie Chicken. 5. The tarsi are feathered, in front, half way down to the toes.

The bare space on each side of the neck is somewhat larger than in a typical male Ring-neck, but the skin does not seem to have the slightly thickened quality characteristic of the booming sac of the Prairie Chicken. The reddish brown feathers of the underparts are tipped with black more or less as in the adult male Ring-neck, but they lack the brilliant metallic lustre. The tail is moderately graduated (wedge-shaped) but not nearly so long and pointed as that of a Ring-neck. The rectrices are neither square-tipped, as they are in the Prairie Chicken, nor extremely pointed, as they are in the Ring-neck. They are intermediate. The primaries are marked with white on their inner webs as are those of a pheasant, but the markings of the outer webs suggest those of the Prairie Chicken. The dark centers of the feathers of the lower back and rump have a suggestion of metallic sheen, but all these feathers are strongly barred.

The wing, bill, and toe measurements are about those of an average adult male Ring-neck, but the tail and tarsus are much shorter. The measurements, in millimeters, are: wing, 237; tail, 167; culmen from cere, 21; tarsus, 64; unfeathered portion of tarsus, 26; middle toe without claw, 46.

Natural or 'wild' hybrids among galliform birds have been recorded many times. Among the best known are those between the Capercailzie (*Tetrao urogallus*) and the Black Grouse (*Lyrurus tetrix*) (see Handb. Brit. Birds, 5: 210). Anthony (1899. *Auk*, 16: 180) has reported a cross between the Dusky Grouse (*Dendragapus obscurus*) and Ring-necked Pheasant taken near Portland, Oregon. I have reported a cross between *Pedioecetes phasianellus* and *Tympanuchus cupido* (1918. *Wilson Bulletin*, 30: 1–2, plate). Taverner (1932. Annual Report, 1930, National Museum of Canada, p. 89 and plate) has reported a cross between the Willow Ptarmigan (*Lagopus lagopus*) and Spruce Grouse (*Canachites canadensis*). Dr. Aldrich has called to my attention a hybrid between *Dendragapus obscurus* and *Pedioecetes phasianellus* (in the Fish and Wildlife Service collection) taken at Osoyoos, British Columbia, September 15, 1906, by C. deB. Green.—FREDERICK C. LINCOLN, *Fish and Wildlife Service, Washington, D. C.*

Foot-freezing and arrestment of post-juvenal wing molt in the Mourning Dove.—Scattered flocks of Mourning Doves (*Zenaidura macroura*) winter throughout south- and west-central Wisconsin. These flocks often suffer considerable mortality. A flock of approximately fifty birds at Menomonie, for example, dwindled to five during the winter of 1949–1950, according to H. M. Mattison. Four of this flock, caught by Mattison and me while live-trapping Bob-white Quail (*Colinus virginianus*), had badly frozen feet. Two more, caught later in that vicinity, as well as a third bird caught by hand in a shed at Horicon when I happened to be present, were caged indoors at Madison and cared for by Fred Wagner and myself. After about six weeks, the feet healed. Almost without exception, however, the frozen distal phalanges dropped off. This loss of bones and claws did not affect locomotion and perching, so far as we could see; but had the doves been obliged to obtain their own food in the wild during the convalescent period, their ground-scratching ability probably would have been seriously impaired. Some of the non-captive birds probably died as a direct result of starvation, but the combination of undernourishment and foot-freezing must have been lethal to many of them.

Arrestment of the post-juvenal molt was apparent in all three of the birds held captive. Of the other four trapped birds only two were given a wing molt examination. In one of these the molt of the primaries was complete; in the other the molt had been arrested. This phenomenon apparently is identical with that observed in the Bob-white by Thompson and Kabat (1950. *Wilson Bulletin*, 62: 20–31). The arrestment of molt varied in the four doves. In one bird the five outer juvenal primaries had been retained, in another bird four had been retained, in another three, in another two. The condition was bilaterally symmetrical in each case. The birds also retained, respectively, the outer four, three, two, and one white-tipped juvenal primary coverts. White-tipping and other evidences of immaturity were ap-

Left: Frozen feet of a Mourning Dove captured at Horicon, Wisconsin, February 8, 1950, and photographed the following day by Frank M. Kozlik. Right: Feet of the same dove after about six weeks of confinement. Photo by Robert A. McCabe.

parent also on unmolted feathers of the alula of the first two birds (two outer white-tipped feathers in the first; one in the second). The juvenal primaries were short, ragged, and faded dull brown, lacking entirely the sheen of the pearly gray new feathers. Swank (1950. *Texas Game and Fish*, Feb., pp. 5 and 21) states that six months are required for completion of the Mourning Dove's post-juvenal molt of primaries. If birds of late-hatched broods do not molt the outer primaries before the arrival of cold weather the molt may be arrested or suspended.—Donald R. Thompson, *Wisconsin Conservation Department, Madison.*

Great Horned Owl versus porcupine.—There are few published records of encounters between the Great Horned Owl (*Bubo virginianus*) and the porcupine (*Erethizon dorsatum*). The classic account is that of Eifrig (1909. *Auk*, 26: 58), quoted by Bent and by Forbush. The porcupine is not mentioned in the food habits study of this owl made by Errington, Hamerstrom and Hamerstrom (1940. *Iowa Agr. Exp. Sta. Research Bull.* 277).

On December 8, 1949, two Great Horned Owls were trapped near Ithaca, New York, and presented to the Laboratory of Ornithology at Cornell University. Judging by size they were a male and a female. The end of a porcupine quill was noted protruding from among the feathers of the right anterior portion of the neck of the female. This quill was extracted. It was 44 mm. long, and judging from the fragments of tissue adhering to the barbs, had penetrated to a depth of at least 6 mm. This depth of penetration, coupled with the fact that owls have a heavy protective layer of feathers, showed that the quill had been driven in with some force. The size and shape of the quill suggested the probability of its having arisen from the porcupine's tail, a notorious defensive weapon. No search for additional quills was made.

Evidence that this particular owl had attacked other prey usually avoided by most predators was the strong skunk-smell of its plumage. The skunk (*Mephitis mephitis*), of course, is well known as a prey species of the Great Horned Owl.—Kenneth C. Parkes, *Laboratory of Ornithology, Cornell University, Ithaca, New York.*

Western Burrowing Owl in Michigan.—The Burrowing Owl (*Speotyto cunicularia*) has "on several occasions . . . been taken outside its normal range" (Bent, 1938. "Life Histories of North American Birds of Prey," Part 2, p. 396). There are several published records for it in Wisconsin (see W. C. Pelzer, 1941. *Passenger Pigeon*, 3: 91 and H. L. Orians, 1948. *ibid.*, 10: July, back cover). R. L. Patterson (1946. *Wilson Bulletin*, 58: 53) has even reported observing a Burrowing Owl flying from ship to ship at sea more than a hundred miles off the mouth of the Gulf of California.

On May 1, 1949, three miles northwest of Chassell, Houghton County, Michigan, Bourdo chanced to encounter a Burrowing Owl along a road. It was on the ground, in open, rather flat farmland. On being stalked it pulled itself erect, as if in an attempt to see the stalker more clearly. Typical of it was a 'pumping' or bobbing motion, particularly of the head. It uttered no sound. After 20 minutes of being observed on the ground it flew to the top of a fencepost about 50 feet away. When flying it held its long legs toward the rear so that they extended well beyond the tail. Standing on the fencepost, it watched Bourdo for some time. It seemed more curious than afraid. It permitted the car to approach slowly to within 15 feet before flying off.

The following day (May 2), we found the owl in almost the same place—standing on a corner fencepost looking out across the hayfields and pasture-lands. After collecting it, we searched in vain for a burrow of any sort. At the base of a fencepost 30 feet north of the spot at which we had shot it we found the fresh remains of a Masked Shrew (*Sorex cinereus*).

The owl proved to be a female. It weighed 183.5 grams. It was heavily infested with *Docophorus communis*, a common biting louse of passerine birds. The stomach contained 8 cc. of mud and food, of which 2.5 cc. were food. The food items were: 1 earthworm, 2 spiders, 4 carabid beetles, 1 unidentified lepidopteran, and remains of 1 unidentified hymenopteran. In the crop were the spinal column (18 mm. long) and a few attached ribs of an unidentified small vertebrate.

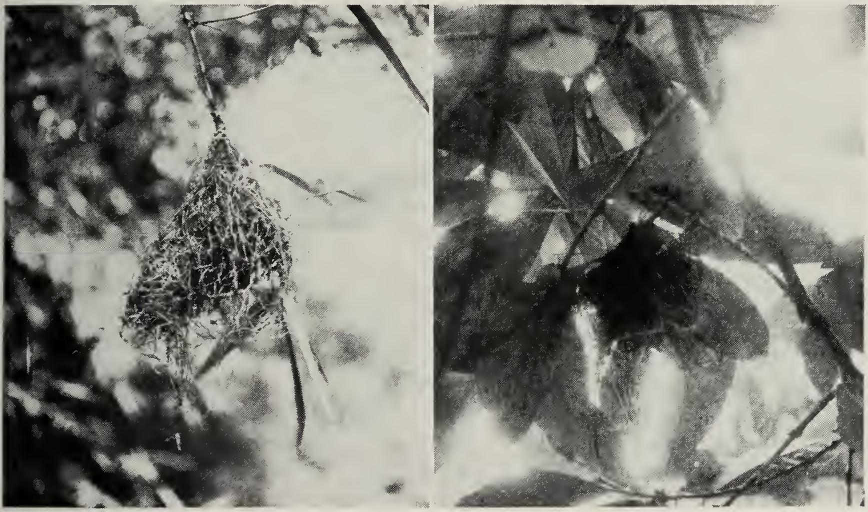
The Burrowing Owl specimen is now No. 118,163 in the collection of the Museum of Zoology at the University of Michigan. It is, according to Dr. J. Van Tyne, the first of the species to be recorded in Michigan. It has been identified as the western North American race, *S. c. hypugaea*. A photograph of it has appeared in a recent issue of *The Jack-Pine Warbler* (1950. 28: plate 2).—Eric A. Bourdo and Gene A. Hesterberg, *Michigan College of Mining and Technology, Houghton.*

The nest and eggs of *Tolmomyias poliocephalus*.—The tropical New World flycatchers of the genus *Tolmomyias* are small and dull colored, resembling somewhat those of the much better known and more northward ranging genus *Empidonax*. They are, however, rather heavy-billed, in this respect resembling the species of *Rhynchocyclus*. Hellmayr (1927. Cat. Birds of the Americas, Part 5, pp. 273–293) gives all the species of the closely related genera *Tolmomyias*, *Rhynchocyclus* and *Ramphotrigon* the common name Flat-bill, a not very satisfactory appellation.

On July 31, 1949 I spent some time watching a pair of *Tolmomyias flaviventris* (Yellow-vented Flat-bills) building a nest about 1.5 meters above the ground in a coffee shrub near

Paramaribo, Surinam. The nest seemed to be nearly complete and only one bird was building, but the other bird often accompanied it to the nest. When these birds were not present, another small bird came to the nest, alighted on the twig supporting it, pecked until it took some fibres from it, and flew away. The small robber came back again and again, each time taking nest material and always disappearing in the same direction. I was able to trace it and found the beginning of a nest—a few fibres hanging loosely on a twig of a small coffee shrub about 30 meters away.

On August 1 the nest of *T. flaviventris* was in a deplorable state. Much of the material was gone, especially the fine fibres by which it was attached to the twig. On the other hand, the nest of the robber had grown considerably, but I did not see the bird. Next day the last remnants of the nest of *T. flaviventris* disappeared. On August 8 the nest of the still unknown robber seemed to be nearly complete. It was a pouch of typical *Tolmomyias* shape, with entrance below at the side. Just beside it, on the same twig, was a nest of wasps. The presence



Nests of *Tolmomyias flaviventris* (left) and *T. poliocephalus*. Photographed respectively on June 15, 1947 and August 12, 1949 near Paramaribo, Surinam, by F. Haverschmidt. In each nest the entrance is at the lower left.

of these insects made examination of the bird's nest rather risky. There were still no eggs on August 12 although the bird left the nest on my approach.

On August 19 I collected the bird when it left the nest. It proved to be a female *Tolmomyias poliocephalus* (Gray-crowned Flat-bill), a species found about as commonly as *T. flaviventris* in the coastal area of Surinam. I have found it common also in the interior, on much drier, sandier ground, in woods bordering the savannas. In this interior habitat I have never found *T. flaviventris*.

Nothing in the extensive synonymy of *T. poliocephalus* as presented by Hellmayr (*op. cit.*, pp. 282–284) indicates that the nest and eggs of the Gray-crowned Flat-bill have been described. Nehrkorn (1910. Katalog der Eiersammlung, Berlin) does not describe them. The eggs are not in the collection of the British Museum (Oates and Reid, 1903. Cat. Coll. Birds' Eggs in the British Museum, Vol. 3, London) or in the large Penard oölogical collection from Surinam (Hellebrekers, 1942. *Zoologische Mededeelingen*, 24: 260). The nest was retort-shaped with an entrance-tube below the bottom proper. It was suspended from the middle of the branch and not at the extreme end of it. It was made of fine fibres and dry grasses and had no lining. The 2 eggs, which rested on the fine fibres of the bottom, were fresh, so perhaps the clutch was not yet complete. Their weight was 1.80 and 1.98 grams. They measured 18.4 × 13.2 and 19.1 × 13.4 mm. In ground colour they were creamy white (dead white after blowing). They were marked all over with small reddish spots and blotches. These markings were larger and more numerous at the larger end.—FR. HAVERSCHMIDT, *P. O. Box 644, Paramaribo, Surinam, Dutch Guiana.*

Behavior and habitat of *Thryophilus leucotis* in Central Panamá.—On July 15, 1950, in a damp thicket in the Juan Franco suburb of the city of Panamá, I observed an adult Buff-breasted Wren (*Thryophilus leucotis galbraithii*) feeding an almost full-grown, but still stub-tailed, young bird. Another adult wren was singing close by. For several minutes the adult which I was watching proceeded to work over the top of the young bird's head and back with its bill, as if searching for vermin or preening the feathers. While I had often watched monkeys busy with their social grooming, and seen birds picking ticks from the bodies of mammals, this particular form of bird behavior was new to me.

Thryophilus leucotis is a South American species which reaches its northern limit in central Panamá. In western Panamá and elsewhere in Middle America it is replaced by various forms of the closely related, and very similar, *T. modestus*. The most striking point of difference between the two species is this: in *leucotis* the wing-barring is sharp and black, in *modestus* it is vague and obsolescent. The two birds are so similar morphologically that some ornithologists would doubtless consider them conspecific but for the overlapping of their ranges in central Panamá. In this narrow zone of overlap there appears to be some tendency toward ecological segregation: *leucotis* prefers the more humid thickets, particularly those near water, *modestus* the drier, more open areas, near houses. At the Pacific coast locality mentioned above I heard a singing individual of each species within a hundred yards of each other, one in a wet thicket near a small stream, the other in a dry thicket on an open hillside. Similarly, on the humid, and formerly forested, Caribbean slope of the Canal Zone, *leucotis* has been recorded at the edge of small openings in heavy woodland (e.g., that on Barro Colorado Island), while *modestus* is found along roadsides and in the more extensive clearings. In western Panamá, beyond the range of *leucotis, modestus* is often noted in wet tangles and along river borders.

Both species indulge in antiphonal singing and utter a variety of loud, emphatic, whistled phrases which, though similar in basic character, are, according to my experience, sufficiently different in pattern to be distinguishable. *Leucotis* tends to end its phrases with a downward slur or drop in pitch, while *modestus* usually favors a rising or sustained *ee* as the final sound.—EUGENE EISENMANN, *Linnaean Society of New York, 11 Broadway, New York 4, New York.*

Some Remarks on West Indian Icteridae.—In his stimulating article, "Convergent evolution in the American orioles" (1950. *Wilson Bulletin*, 62: 51–86), Beecher suggests that two phyletic lines (*Icterus* and "*Bananivorus*") have arisen from "opposite ends" of the genus *Agelaius*. Thought provoking though this concept may be, certain of Beecher's statements relating to West Indian forms appear to me to be open to criticism.

Beecher is evidently of the opinion that *Agelaius* and "*Bananivorus*" entered the West Indies through Cuba from Honduras. He states (p. 59) that "*A. humeralis* may have reached Cuba from the ancestral *thilius* stock of Central America as a typical marsh-dweller when it [Cuba] was emergent in the Early Pliocene." Now, most students of West Indian natural history believe that the majority of species that reached the Antilles from Central America entered the region mainly via Jamaica, an island not shown on Beecher's map (p. 62) depicting evolution in the "*Bananivorus*" group. Jamaica is a "key-island" in any such discussion. The fact that neither "*Bananivorus*" nor *Agelaius* now inhabits this island is of no consequence when one speaks of early Pliocene invasions. In any case their absence is explained by the presence of *Icterus leucopteryx* and *Nesopsar nigerrimus*. The latter appears to be simply an aberrant *Agelaius* with bill modified for certain unusual methods of feeding (e.g., probing bromeliads). Incidentally, *Nesopsar* is an inhabitant of mountain rain forest and is entirely black in both sexes, although Beecher states (p. 64) that black plumage "seems singularly unadapted for forest-dwelling orioles." Moreover, the species is even more arboreal than *Agelaius humeralis* and *A. xanthomus*, which fact may be explained by the non-existence of extensive or suitable marsh habitat in Jamaica.

Beecher states (p. 59) that "the Recent inundation [of Cuba] accounts for" the arboreal adaptations of *A. humeralis*. It appears more likely, however, that the species was forced from the marsh environment through competition with *A. phoeniceus assimilis*, an Antillean form which is not arboreal. Since three weak-flying monotypic genera (*Cyanolimnas*, a rail; *Ferminia*, a wren; and *Torreornis*, a finch) now confined to the Zapata Swamp have evidently survived the marsh adaptations of the Pleistocene, it is inconceivable that *A. humeralis* was unable to do so.

In regard to West Indian forms of "*Bananivorus*," it appears to me that "*B.*" *dominicensis* reached the Antilles from Central America rather recently (during the Pleistocene), for there are no specific characters serving to separate it from the Central American *I. prosthemelas*, although Hellmayr (1937. Cat. Birds Amer., pt. 10: 117) unites merely the Bahaman *northropi* with *prosthemelas*. I agree with Beecher, and for reasons expressed by him, that the three Lesser Antillean forms should be regarded as distinct species. It appears that mutation has progressed more rapidly on these small islands, possibly as a result of the so-called 'Sewall Wright effect.' The extraordinary distinctness of the numerous races of Lesser Antillean wrens of the genus *Troglodytes* may also be due to this factor.

Finally, I wish to point out that no land bridge or "partial bridge" (p. 73) would have been necessary to account for the forms of *Icterus leucopteryx* on Grand Cayman and St. Andrew's. Hurricanes were far more likely responsible for the presence of this species on these islands.—James Bond, *Academy of Natural Sciences of Philadelphia.*

Records from Brewster County, Texas.—During April of 1949 my wife and I saw 119 species of birds in Brewster County, Texas. I am obliged to Dr. Josselyn Van Tyne for going over our notes and suggesting which observations are of sufficient interest to place on record. We collected no specimens. The geographical and ornithological nomenclature of our list follows, for the most part, that of Van Tyne and Sutton (1937. "The Birds of Brewster County, Texas," *Misc. Publ. Univ. Mich. Mus. Zool., No.* 37). Other papers which we have consulted are those of Borrell (1938. "New Bird Records for Brewster County, Texas," *Condor*, 40: 181–182), and of Stevenson and Smith (1938. "Additions to the Brewster County, Texas, Bird List," *Condor*, 40: 184).

Pied-billed Grebe (*Podilymbus podiceps*). One which we saw on the Rio Grande near Hot Springs on April 18 appears to be the only spring record for the county. Borrell (1938) and Stevenson and Smith (1938) have recorded it in the fall.

American Egret (*Casmerodius albus*). Three seen wading in the river near Boquillas on April 26. The species has been identified with certainty in Brewster County on two other occasions (Van Tyne and Sutton, 1937: 12–13).

Spotted Sandpiper (*Actitis macularia*). Seen three times along the Rio Grande, a single bird on each occasion. Our earliest record (one at Hot Springs, April 18) is considerably earlier than other published records.

Greater Yellow-legs (*Tringa melanoleuca*). A single bird observed at close range and heard calling along the Rio Grande near Hot Springs on April 18 is apparently the first of this species recorded in the county. It was chased off by a Duck Hawk (*Falco peregrinus*) which made several unsuccessful stoops.

Inca Dove (*Scardafella inca*). Two seen between Persimmon Gap and the Chisos on April 16. The species has been recorded regularly along the Rio Grande but not, heretofore, elsewhere in the county.

Barn Owl (*Tyto alba*). On April 23 one was picked up dead near the cabin of the Big Bend Park engineer. This cabin is located at the base of the Chisos Mountains near the junction of the road to Terlingua and that leading up into the Basin.

Great Horned Owl (*Bubo virginianus*). One was heard calling in the Chisos each night from April 24 to 27 inclusive.

Whitney's Elf Owl (*Micrathene whitneyi*). Elf Owls were heard calling around the Basin on April 17, 18, 21 and 22. These dates are all earlier than any previously recorded for the species.

Poor-will (*Phalaenoptilus nuttallii*). Two to four were heard calling almost nightly in the Basin between April 16 and 30. The earliest date previously published for the species is April 26.

Ash-throated Flycatcher (*Myiarchus cinerascens*). This species was common over most of the county. We found a nest with eggs in the Chisos on April 21.

Olive-sided Flycatcher (*Nuttallornis borealis*). One carefully observed and heard calling on the Lost Mine Trail in the Chisos, April 30. Published spring records for Brewster County are all for May and early June.

Bank Swallow (*Riparia riparia*). Two birds seen at close range near Santa Elena Canyon, April 17. The only two published records for this species in Brewster County are in May.

Veery (*Hylocichla fuscescens*). Since no specimen of this species has ever been collected in Texas, it must remain on the hypothetical list. I am sure, however, that it occurs. On April 29 in willows along the Rio Grande near Boquillas I heard a distinctive *vu* which I at once recognized. After a brief search I saw a thrush. I was so close that I could clearly discern the uniform cinnamon-brown back and tail and sparsely-spotted whitish breast.

Black-capped Vireo (*Vireo atricapillus*). We saw one of these attractive vireos on the Lost Mine Trail in the Chisos on April 30. Van Tyne and Sutton (1937: 80) record it only from the Glass Mountains in the northern part of the county.

Nashville Warbler (*Vermivora ruficapilla*). Two seen near Casa Grande in the Chisos Mountains, April 30.

Orange-crowned Warbler (*Vermivora celata*). Two seen in the upper part of Pine Canyon, April 30.

Colima Warbler (*Vermivora crissalis*). Two seen in the higher part of Pine Canyon in the Chisos Range, April 30. This should not be taken to indicate the scarcity of the species, since we spent very little time on the higher slopes where this bird lives.

American Redstart (*Setophaga ruticilla*). A male was seen in the Basin of the Chisos on April 25. The species has been recorded four times in Brewster County, three times in May, once in August (Van Tyne and Sutton, 1937: 88–89).

Hepatic Tanager (*Piranga flava*). We saw a beautiful male on the side of Casa Grande on April 28. The earliest spring record for this species otherwise is May 3 (Van Tyne and Sutton, 1937: 96).

Black-headed Grosbeak (*Pheucticus melanocephalus*). One appeared in the Basin on April 22 and was seen almost daily to the end of the month. This arrival date is the earliest on record for the county. Sutton collected a male in the Basin on April 30, 1935 (Van Tyne and Sutton, 1937: 98).

Painted Bunting (*Passerina ciris*). One was seen near the house of the park engineer as early as April 21.

Pine Siskin (*Spinus pinus*). Four were seen in Pine Canyon on April 30.

Baird's Sparrow (*Ammodramus bairdii*). We saw one near Marathon on May 1. The species has previously been recorded three times in Brewster County.

Song Sparrow (*Melospiza melodia*). We carefully identified one at Hot Springs on April 18. The species has been recorded from Brewster County four times previously.

McCown's Longspur (*Rhynchophanes mccownii*). We saw a beautiful male near Marathon, May 1. The species has been recorded from Brewster County heretofore only in mid-April (Van Tyne and Sutton, 1937: 114).—Allan D. Cruickshank, *Highland Hall, Rye, New York.*

NEW LIFE MEMBER

Robert Albert McCabe was born in Milwaukee, Wisconsin on January 11, 1914. He received his bachelor's degree from Carroll College, in Waukesha, Wisconsin in 1939. His graduate work was done under Aldo Leopold at the University of Wisconsin. For a time he was game manager at the Faville Grove Wildlife Area and biologist for the University of Wisconsin Arboretum. In 1946 he joined the staff of the University's Department of Wildlife Management. He has published several papers on game birds and mammals. Field work has taken him to México and Canada. He is now studying the ecology and population behavior of several birds and mammals. The Alder Flycatcher (*Empidonax traillii*) has long been of special interest to him. A paper by him on that species is soon to appear in *The Wilson Bulletin.*

EDITORIAL

Members of the Wilson Club who attended the Ninth International Ornithological Congress in France, in 1938, are not surprised to learn of the success of the Tenth Congress, the formal sessions of which were held June 10 to 17, 1950, at Uppsala, Sweden. Alexander Wetmore served as president, and Sven Hörstadius, of the University of Uppsala, as general secretary. The program included sessions devoted to evolution and systematics, migration and orientation, population dynamics, behavior, regional faunas, paleontology and anatomy. There was a round table discussion of bird banding. Headquarters were the student commons, 'Värmlands Nation,' at the University, and meetings were held in certain University rooms and a large hall adjacent. The 350-some persons who registered represented more than 25 countries. Just before the Congress there were excursions in southern Sweden, the University at Lund serving as a base. During the meetings there were visits to the forested country north of Uppsala, to certain islands off the coast, and to the town and country homes of Linnaeus. These last are maintained as public shrines. After the meetings there were long trips to Abisko and Ammernäs in Swedish Lapland. North Americans in attendance were the Arthur Allens, Dean Amadon, the Edward Chalifs, Lee Crandall, Jean Delacour, Herbert Friedmann, the Alfred Grosses, Mrs. J. Kelly, the F. C. Lincolns, the Hoyes Lloyds, the Robert Murphys, the Walter Naumburgs, the Roger Petersons, the Richard Poughs, the Dillon Ripleys, W. E. C. Todd, the Carll Tuckers, Josselyn Van Tyne, the C. Vauries, the William Vogts, and Alexander Wetmore. The W. H. Phelpses, both senior and junior, were there. The Phelpses divide their time between the United States and Venezuela.

As additions to, and replacements in, the committee of 100 forming the permanent body of the Congress, the following were elected: representing Canada, Hoyes Lloyd and L. L. Snyder; representing Venezuela, W. H. Phelps, Sr.; representing Brazil, Oliverio Pinto; representing Colombia, Armando Dugand; representing Chile, R. A. Philippi, B.; representing the United States of America, H. G. Deignan, A. H. Miller, A. L. Rand and J. Van Tyne. Dr. Wetmore was the Chairman of the official United States delegation named by the State Department.

The next congress will be held in Switzerland in 1954 and A. Landsborough Thomson, of England, will serve as president.

We are glad to learn from our newly appointed Membership Committee that a special effort is being made to increase the size of the Club. An outsider attending one of our meetings would hardly say that we needed more members—but we do. Every new member adds appreciably to our stature, knowledge, and power. The larger our Club the larger our *Bulletin* and the greater our influence. The best members are those who join not as a personal favor, but because of their abiding love for, and interest in, birds. If you know some one who should be a member send the name and full address of that person (typed or printed clearly, with the Miss, Mrs., Mr., or Dr. clearly indicated) to any of the following Membership Committeemen:

Seth H. Low, Chairman, Patuxent Research Refuge, Laurel, Maryland
Ralph M. Edeburn, Assistant Chairman, Marshall College, Huntington, West Virginia
Aaron M. Bagg, 72 Fairfield Ave., Holyoke, Massachusetts
Donald J. Borror, Dept. of Zoology and Entomology, Ohio State University, Columbus
Robert C. Conn, 769 Park Ave., Bound Brook, New Jersey
Fred T. Hall, Davenport Public Museum, Davenport, Iowa
Hal H. Harrison, 1102 Highland Street, Tarentum, Pennsylvania
Theodora G. Melone, Geology Library, University of Minnesota, Minneapolis
Harold D. Mitchell, 378 Crescent Ave., Buffalo 14, New York
Mrs. Dorothy Neal, P. O. Box 133, Demorest, Georgia

Four times a year *Bulletin* readers look at the black-capped warbler on the front cover—but how well do they know the bird? Though described in 1811, it has not been studied much, especially on its breeding ground. A paper on its nesting, accompanied by excellent kodachromes, has been submitted to us. We would like to reproduce one of the kodachromes in full color in 1951.

A color-plate costs at least two hundred dollars. The earnings of our Endowment Fund are large enough to meet the cost of one color-plate a year and this plate has been, traditionally, the frontispiece for the March issue. The color-plate for March, 1951 has already been arranged for, but we would like to present a Wilson's Warbler plate in June or September. We appeal, therefore, for contributions. We hope that further moneys for this color-plate fund may be obtained through auctions of original bird drawings. Since members of the Club may desire copies of the Crimson-collared Grosbeak picture in this issue, we have had an extra supply run off. These we are selling at twenty-five cents each. This money will go into the color-plate fund. Send your order to the editors.

Just as we go to press word reaches us of the death, on October 31, 1950, of Gertrude A. (Mrs. Henry J.) Nunnemacher, of Milwaukee, Wisconsin. Although never actually a member of the Wilson Club, Mrs. Nunnemacher was interested in birds all her life. Especially interested was she in the birds of México, a country she and her husband visited many times. The colored frontispiece in this issue of *The Bulletin* was made possible through her generosity. We hope that her relatives and friends, as well as members of the Club, will enjoy this picture.

Glowing with pride, we learn that the splendid new biology building at West Virginia University is to be named Brooks Hall—"in honor of the Brooks family of Upshur County whose sons have contributed extensively to West Virginia's biological research and to the state's biological literature." The four distinguished brothers, Alonzo Beecher Brooks (known to all his friends as 'A.B.'), Fred Ernest Brooks, Chandler Linn Brooks, and Earl Amos Brooks have, indeed, been great West Virginians, every one of them. And the son of the second of these brothers is our own Maurice Graham Brooks.

By invitation the Wilson Ornithological Club was officially represented at the inauguration of Dr. Gordon Gray as President of the Consolidated University of North Carolina, at Chapel Hill, October 8–10. Maurice Brooks asked Eugene P. Odum to serve us in this capacity. Dr. Odum has been a member of the Club's Council and he is now on our Editorial Committee. He is a graduate of North Carolina. His father, Howard W. Odum, is one of the most distinguished professors on the faculty of that university.

The following have been appointed as the Club's Conservation Committee: Robert A. McCabe, Chairman, William W. H. Gunn, Henry S. Mosby, William H. Elder, and Charles M. Kirkpatrick.

I. B. Boggs, of Morgantown, West Virginia, has consented to serve as a member of the Club's Endowment Committee. Leonard C. Brecher, of Louisville, Kentucky, is Chairman.

Making certain that a species of bird does *not* occur in a given area at particular seasons is far harder than ascertaining that it does, but knowledge of this sort is important and should not be neglected. From evidence of occurrence, and from that alone, we have long assumed that the House Wren (*Troglodytes aëdon*) is replacing the Bewick's Wren (*Thryomanes bewickii*) in many places because the latter cannot compete with the former. Yet is it not possible that the reverse is true: that the House Wren can gain a foot-hold only after the Bewick's Wren has declined in numbers? Wilson Club members living in regions now occupied by the Bewick's

Wren, but threatened by southward spread of the House Wren, can make a real contribution to the solution of this problem by determining the population and density trends of the Bewick's Wren in their regions *now*. The Baltimore Oriole (*Icterus galbula*), too, is to be watched. Is it disappearing from the southern part of its breeding range? And what bird species are being affected by the southward spread of the breeding of the Cowbird (*Molothrus ater*)?—Allan R. Phillips.

In a recent issue of *Bird-Banding* (1950. 21: 105–11), B. M. Shaub reported that the repeat behavior of Greater Redpolls at banding traps was notably different from that of Common Redpolls. "The Greater Redpolls repeated on an average of 9.6 times per individual [during a 35-day period] while the Common Redpolls repeated only 0.2 times per individual." Mr. Shaub has not given his birds scientific names, but he obviously thinks of these two Redpolls as distinct species. We wish that he had preserved at least two of the heaviest of his Greater Redpolls—one as a skin and one as a skeleton. The morphological characters of these specimens would be of great interest and value to taxonomists.—G. M. S.

Dr. Herbert Friedmann, Curator of Birds at the U. S. National Museum, is in Africa continuing his study of the parasitic breeding habits of birds. He is travelling through South Africa and southern Rhodesia, focussing his attention upon the Indicatoridae, the Honey-guides. En route to Africa he visited museums in Denmark, Holland, Belgium, France, Italy and England. His work is supported by grants from the American Philosophical Society and Guggenheim Foundation.

From Dr. A. J. Marshall of St. Bartholomew's Hospital Medical College in London comes this appealing letter, dated September 1: "I wonder if you could help me? I borrowed No. 4 of Volume 61 (December, 1949) of *The Wilson Bulletin* from the Library of the London Zoo—and, god help me, I've just spilt an enormous mug of tea over the damned thing. The combination of strong Australian-brewed tea and glossy American paper doesn't augur well for a final neat English binding and so in order to prevent an international incident between this Department and the Zoo I wonder could you please let me have a copy to give them? If you have one to spare I will arrange for some American friend to send the 50 cents in order to avoid the usual delay in transmitting money to the U. S." The needed copy has been received by Dr. Marshall.

The editors are grateful to the following for assistance in preparing for publication the material presented in this issue: John W. Aldrich, Aaron M. Bagg, William L. Brudon, L. Irby Davis, Eugene Eisenmann, Herbert Friedmann, John L. George, Mr. and Mrs. Richard R. Graber, William A. Lunk, A. D. Moore, Margaret Morse Nice, Robert W. Storer, James T. Tanner, and Dale A. Zimmerman. They are especially grateful to Elsa Hertz for her cheerful willingness to retype manuscripts.

ORNITHOLOGICAL LITERATURE

Studies in Bird Migration, being the Collected Papers of H. Chr. C. Mortensen, 1856–1921. Edited by Poul Jespersen and Å. Vedel Tåning. Published by Dansk Ornithologisk Forening, Ejnar Munksgaard, Copenhagen, 1950: 10 × 6½ in., 272 pp., with 32 photos, 12 figures, and 10 maps. Paper. Dan. kr. 18.

This publication in English of the collected papers of H. Chr. C. Mortensen honors this pioneer of bird banding on the 50th anniversary of his first intensive banding efforts. Like many European scientists, he was a schoolmaster who devoted all his spare time to research. His innovations were numerous. He was the first to band birds in large numbers for the specific purpose of studying migration. His initial attempts in 1890, with zinc bands, were unsuccessful. He then designed aluminum bands and in 1899 marked 165 Starlings (*Sturnus vulgaris*). He stamped numbers and letters on the bands so that each banded bird could be identified with certainty if retaken. He experimented with color banding and tail clipping in order to study individual breeding birds. Realizing the necessity for publicity if his work was to succeed, he corresponded with ornithologists at home and abroad, seeking their cooperation.

Many of the facts which Mortensen obtained by close observation have long since become general knowledge. The important point is that his careful observations were published for the information of other ornithologists. He recorded the following observations on subjects which now are considered essential in serious field studies: the manner of feces disposal at the nest of a Starling (pp. 26–27); the return of marked Starlings (p. 27) and White Storks (*Ciconia ciconia*) (pp. 208–216) to the same breeding areas in subsequent years; pre-migration wandering of young Buzzards (*Buteo buteo*) (pp. 39 and 59) and Kites (*Milvus milvus*) (p. 59) in different directions from the breeding area; brood size in *Buteo buteo*, and the presence of weaker nestlings "always . . . in the broods" (p. 108); the importance of stork pellets for food analysis. He began a skin and skeleton collection for the study of plumage and age differences. He foresaw the future need for international laws protecting waterfowl (p. 173).

His observations led him to ask the following questions about migrants (p. 45): "Where do they come from and whither do they go? How do they know their way? How high in the air do they go? How many miles do they travel in an hour? What moves them to change their place? Do the young or the old first leave the district or do they accompany each other?" In order to learn more about the status of migrants he sent well-considered questionnaires to those who found his marked birds. He soon learned that storks and birds of prey brought him more returns than did passerine birds. Through data gathered on the direction of migration from Denmark, he was able to report on the winter home of certain species, notably the Green-winged Teal (*Anas crecca*) and White Stork.

Any field worker who has tried to trap and band adult birds at their nests will be impressed by Mortensen's ingenuity in designing self-emptying traps for Starlings (pp. 74–79). Due to his knowledge of the habits of the Starling, he trapped 160 of them in one month.

Perhaps of equal value to the scientific contribution made by a man is the philosophy which motivates him. It is fitting, therefore, in reviewing a memorial volume honoring this pioneer ornithologist, to quote two passages from him. "Every human being has the need of spiritual revival through communion with the unfalsified, Wild Nature!" (p. 228). "And when this puzzle is eventually solved, new ones will arise and stimulate the enthusiasm of those who study the manifold ways of life and seek to understand them. There is something very satisfying about getting an answer from Nature to one's questioning—if one has asked in the right way!" (p. 65).

The anthropomorphism appearing at times in Mortensen's papers is now passé, but this can be overlooked by the reader who considers the date of writing and recalls that this style has not yet completely disappeared from our own ornithological literature. The papers are primarily of historical interest—so great has been the progress in banding with its concomitant contribution to our knowledge of migration! At the same time, Mortensen's thoroughness and persistence should give encouragement to those now exploring new aspects of bird study. Students of life histories, banding and related problems will find many pertinent tips in his papers.

It is unfortunate that the translation was not into idiomatic English.—Andrew J. Berger.

British Waders in Their Haunts. By S. Bayliss Smith. Illustrated with 53 photographs by the author and 26 by other photographers, with three plates of waders in flight drawn by Basil Laker. G. Bell & Sons, Ltd., London, England, 1950: $7\frac{1}{4} \times 9\frac{5}{8}$ in., ix + 162 pp. \$5.25. Obtainable through British Book Centre, 122 East 55th Street, New York 22, New York.

The photographic illustrations of this book are extraordinarily good. Some of them are clear, well lighted portraits of individual birds at rest; others show pairs at or near the nest; others are of close-knit flocks feeding, preening or dozing. Very few show the birds straddling or settling over their eggs, and not one is of a parent bird standing near a tethered young one. As the author states in his foreword, "nine out of ten photographs of birds are normally taken at the nest." The trouble with so many bird-at-nest photographs is that they do not present the bird in an average attitude. In the worst of them the brooding bird is panting from the heat because the sheltering vegetation has been cut away. In many of them the feet and lower part of the body are hidden by the nest. In even the most pleasing of them the bird has an instantly recognizable broodiness which is a good deal the same no matter what the species. In this book the photographs represent almost every activity of the adult shorebird. Especially vivid and interesting is F. P. J. Kooymans' study of two Ruffs (*Philomachus pugnax*) on their tilting round in the Dutch polders (dike-protected areas of low land). The birds have struck quite different poses—one standing high, the other crouching—but the raising of neck-plumage and the sham parrying and thrusting have obviously begun. The author's own study of a mass of shorebirds edging discreetly away from a Black-backed Gull (*Larus marinus*) is excellent in composition and inexplicably humorous. J. E. Sluiters' Wood Sandpiper (*Tringa glareola*) standing in shallow water (p. 103) is a well nigh perfect study of a wader and its distorted reflections. Experts in field identification will revel in such group photographs as that on page 117. The species have been carefully identified by the author, but no good field-student can look at the picture without identifying the birds all over again—for himself.

The photographs are of considerable taxonomic value. Studying them, one senses how color-patterns and body attitudes reveal degrees of relationship. It is highly doubtful that any ornithologist could, on examining the photograph by J. V. Vijverberg on page 104, without knowing where it had been taken, tell whether the bird was a Green Sandpiper (*Tringa ocrophus*) or a Solitary (*T. solitaria*). There are those, indeed, who now believe that these two birds actually belong to the same species. The similarity of the Common Sandpiper (*Actitis hypoleucos*) to the Spotted Sandpiper (*A. macularia*) is instantly revealed in Stanton Whitaker's excellent study of the former (p. 102). Subtle differences are revealed through a comparison of Mr. Whitaker's photograph of the Common Curlew (*Numenius arquata*) on p. 65 and T. M. Fowler's beautiful study of the Whimbrel (*N. phaeopus*) on p. 66.

The text explains in detail how Mr. Smith obtained his remarkable pictures. Placing the firmly built hide (blind) securely in an advantageous place, he remained inside it until the incoming tide drove the unsuspecting birds toward him and his camera. Some of his best photographs were made from a hide which had been in place so long that it was an accepted part of the shorebirds' habitat. He found that the size, shape and color of the hide did not matter so much in early autumn as later in the year. He regards the wind as the greatest enemy of the estuary photographer. He recommends a reflex camera and considers a long focus lens "an absolute necessity." He likes to work in strong sunlight. Intrigued as he is by recording the "intense vivacity" of high-stepping Redshanks (*Tringa erythropus*), scurrying Dunlins (*Erolia alpina*) and restless Oystercatchers (*Haematopus ostralegus*), he seeks conditions which will make possible the snapping of scene after scene with exceedingly brief exposures.

An interesting and valuable part of the book is the brief historical account of mankind's study of the shorebirds. In the early days so little was known about the several plumages of certain species that odd, even funny, names came into wide use. There were, for example, Red, Cinereous, Lesser and Cambridge Godwits; Red-legged, Ash-coloured, Brown, Greenwich and Aberdeen Sandpipers; Purres; Gambets; and so on. Careful bird students may comment that we are not very thoroughly enlightened, even today, about certain plumages and plumage-sequences; but at least we know much more than we did a century ago about the year-round distribution of the shorebirds. Within the memory of most persons who read this review the nests of certain shorebirds were for the first time found. At least two species have kept their nesting-grounds a secret—the Sharp-tailed Sandpiper (*Erolia acuminata*) and the Gray-rumped Sandpiper or Tattler (*Heteroscelus brevipes*). The author's reference to the discovery of the eggs of the Curlew Sandpiper (*Erolia ferruginea*) in Alaska must be a mistake. This species has been recorded several times along the coasts of Alaska and British Columbia, and it has been encountered in summer on Bering Island in the Komandorski group, but its eggs have never been found in Alaska.

The book closes with three useful plates showing shorebirds in flight, and a supplement in which the length, plumage and diagnostic characters, call notes, displays, food, distribution, movements, habitat out of nesting season, habitat in nesting season, nest, eggs, and incubation of all British shorebirds are briefly discussed.—George Miksch Sutton.

Audubon's Birds of America. Introduction and Descriptive Captions by Ludlow Griscom. Popular Edition. The Macmillan Company, New York, 1950: $5\frac{1}{2} \times 8$ in., 320 pp., 288 numbered colored plates. $2.95.

This is another in the series of ever smaller and less expensive presentations of Audubon's Birds of America brought out by the Macmillan Company. The plates chosen for reproduction have been decreased to 288. The reduction in number, as is pointed out in the introduction, has been accomplished by the elimination of erroneously recorded and "lost" species, as well as some others which are obscure or seldom seen. This is in line with the popular aim of the book. An innovation in this series is the arrangement in current taxonomic order of the species included.

Griscom's introduction provides a convenient thumbnail sketch of Audubon's life and work. This will prove new, however, only to readers with the barest knowledge of the subject. The introduction serves mainly as a vehicle for a 7-page discussion of conservation and ecological principles in general. Notwithstanding the fact that this is aimed at the lay reader, there are still a few statements which will not go uncontested by ornithologists. The assertion on page 23, for example, "By 1920 every North American bird was protected . . . " is of course untrue. And on page 27, "The balance of nature in a natural community is such that the community continues forever. This is accomplished by keeping the numbers of each living creature in a proper proportion," is in need of clarification.

As regards the pictures, which are the primary reason for the book's existence, it is unfortunate that most of the reproductions range from mediocre to extremely poor. A definite loss of quality is to be expected with such great reduction, yet this does not excuse the complete lack of color fidelity and the poor register of many of the plates. On the publishers' jacket appears the somewhat arbitrary statement, "John James Audubon was probably the greatest of American naturalists and undoubtedly the greatest of all bird painters." Let us hope that this singular praise does not have to be substantiated by the present reproduction of his work. "The . . . work," according to the introduction, "is designed to bring a selection of Audubon's paintings within the reach of all, so that everyone, even high school students, can get a glimpse of his decorative artistry and genius." It will be unfortunate if "even high school students" come to believe, thereby, that a Wilson's Plover (p. 144) is yellow, a dowitcher (p. 163), bright pink, or a Chuck-will's-widow (p. 215), a hue best described as chartreuse—to mention only a few.

The key numbers have been omitted in several cases where two or more species are shown on a single plate, so that the reader has no way of matching the birds illustrated with the numbers in the accompanying captions. In one instance (Bank and Violet-green Swallows, p. 236), numbers 1 and 2 both refer to Bank Swallows in the plate, while number 2 in the caption refers to the other species.

In all fairness it must be added that a few of the plates are quite creditable. Perhaps some readers will be stimulated by this book to learn more of an interesting and gifted historic figure.—Robert M. Mengel.

Wildfowling in the Mississippi Valley. By Eugene V. Connett, Editor. D. Van Nostrand Co. New York, 1949: $10\frac{1}{4} \times 7\frac{1}{2}$ in., xvi + 387 pp., 87 half-tones. $12.00.

This book is a collection of articles, essays, and stories about waterfowl along the Mississippi Flyway. Appropriately, it opens with a broad discussion of this flyway by Mr. Frederick C. Lincoln, who takes the reader from the Arctic Ocean to the Gulf of México. In discussing the decline of waterfowl, he points out that "the take of birds by the hunters of this flyway in the 1947 season had increased by nine percent, although the number of hunters had increased only two percent" (page 18). This greater efficiency of gunners in the harvest is one of the most vexing problems of our time.

A chapter, *The Breeding Grounds of the Mississippi Flyway*, by Bertram W. Cartwright is disappointing because of the way it overlaps Mr. Lincoln's discussion. Then again, here was a wonderful opportunity to present a clear picture of the breeding grounds to sportsmen in the light of new information: a challenge Mr. Cartwright did not accept.

Following these 2 chapters on the Flyway and its breeding grounds are 16 chapters on wildfowling, one each devoted to 3 Canadian Provinces and 13 states in the Flyway. Each chapter is written by a different local sporting authority, and there is a wide range of value in these accounts, as might be expected from an assortment of authors ranging from duck camp operators to professional naturalists. At least 2 chapters are valuable contributions to our wildfowl literature. Jack W. Musgrove gives us a detailed story of gunning in the old days, as this was recorded from old-timers.

The chapter on wildfowling in Missouri, by Leonard Hall, is an earnest, careful, clear statement on the waterfowl situation and a sportsman's reaction to current conditions. Here the non-shooting naturalist may inspect the temper and judgement of the gunner who takes sportsmanship to be an important part of his life and character.

The chapter on *Research on Wildfowl*, by Kenneth H. Smith, describes the work of the Illinois Natural History Survey, whose activities have had such a profound influence on waterfowl policy and management in the Mississippi Valley. It is pleasing, in this day and age when so much stress is placed on the bag, to see the last 2 chapters devoted to the arts and sciences of wildfowling, such as duck calling and decoy making. The duck hunter with a duck call, like the fisherman, has a good time practicing, even if the bag is light. Although it is something which cannot be measured, those who have made a study of wildfowling seem to agree that the man who is a careful, conservative hunter is the same man who is skilled in the crafts of his sport, the man who makes his own equipment and who calls his own birds.—Albert Hochbaum.

50TH CHRISTMAS BIRD COUNT. John W. Aldrich, Editor. Published by the National Audubon Society in collaboration with the U. S. Fish and Wildlife Service. April issue of *Audubon Field Notes*, vol. 4, 1950: 144 pp. (43–188), 8 half tones, 2 maps, paper cover. $1.00. A special reprint of the section on "instructions for making bird population studies" may be obtained for fifteen cents from the National Audubon Society, 1000 Fifth Avenue, New York, New York.

On the fiftieth aniversary of the Christmas Bird Count, which was originated by Frank Chapman as a substitute for the "Christmas Hunt", appears this special issue of *Audubon Field Notes*. The issue contains not only the result of the most recent counts but also the following: a history of the Christmas Count; a summary by Chandler S. Robbins of the largest counts of individual birds; instructions for making such bird population studies as the Christmas Count, the Winter Population Study, and the Breeding-bird Census; and a preliminary bibliography of articles based on the Christmas Counts. Thus, the issue is a reference work which should be kept handy by all those interested in quantitative bird studies.

The Christmas Count has been a tremendous success if for no other reason than that it has stimulated interest in birds. Only 27 persons took part in the first Count, while nearly five thousand participated in 1949. It would be impossible to measure the interest and enthusiasm generated during these annual counts, or to estimate the number of bird clubs which have come into being as a result of them. One observer, Charles H. Rogers, has participated in all fifty counts and Harry B. McConnell in all but one. These are indeed remarkable records, and there are many other individuals who have taken part over long periods.

The scientific value of the great mass of data accumulated in the 50-year span has not been fully determined. Only a few workers, notably Leonard Wing, have attempted large scale analyses. Some attempts to make use of the data have been disappointing because of the large number of variables encountered. For example, let us assume that more Mourning Doves were reported from certain localities in Ohio in 1949, a warm winter, than were reported from the same localities in 1940, a severe winter. At first glance the significance of the figures would seem to be obvious—that there were, indeed, more Mourning Doves in certain parts of Ohio in the mild winter of 1949–50 than in the severe winter of 1939–40. But were the samples, for either year, large enough? Did large concentrations of doves unduly influence the totals? Was coverage of the areas the same in the two years, or was it much more complete in 1949 than in 1940? Was more dove habitat covered in 1949 than in 1940? And so on. Where data can be shown to be truly comparable, and where other data (banding, censuses) can be correlated, confidence may be placed in the Christmas Counts. *All by themselves* the Counts probably have little scientific value. Results of recent years, where percentage of habitat has been indicated and where coverage has been uniform and complete, probably will prove to be much more usable than the indiscriminate listings of earlier years. One has the feeling that there is more gold buried in the mass of data than has yet been uncovered.—Eugene P. Odum.

THE SAGA OF THE WATERFOWL. By Martin Bovey. The Wildlife Management Institute, Washington, D. C., 1949: 8 × $10\frac{1}{2}$ in., xiv + 140 pp., 3 figs., 71 unnumbered plates. $5.00.

This attractive volume follows a number of recent books ("This Plundered Planet," Osborne; "Road to Survival," Vogt; "North American Waterfowl," Day) which have sought to point out the importance and the extreme urgency of conserving our natural resources.

Unlike the first two mentioned, it is concerned primarily with waterfowl; but that all are intimately related is evident. The physical factors upon which the conservation of waterfowl is based are of far-reaching importance to mankind as a whole. Bovey's approach, unlike that of the other authors mentioned, is mainly pictorial. If the old proverb "one picture is worth ten thousand words" has validity, this becomes a book of considerable content and importance.

This, then, is a picture book. After a brief foreword by the author, a list of illustrations and credits, and three attractive scratch-board vignettes by F. L. Jaques, the book consists mainly of photographs of wildfowl, and things pertaining to the history, destruction, and conservation of wildfowl. These are accompanied by a brief, running commentary. The arrangement is such as to present a graphic, fast-moving history of the wilderness that was, of the invasion of this continent by man, of the inevitable changes which ensued, and of the disastrous decrease of the ducks and geese. Then come the beginnings of the conservation movement, a period of hope, and a protrayal of the perilous situation which still exists today.

The author has done a good job. The commentary has an attractive, rhythmic quality, and the photographs, largely by Bovey or his sons, are excellent. A number of them are superb and go a long way towards achieving the effect of "ten thousand words." The book is competently printed on paper of moderate quality. Any changes which might be made would be, I think, matters of artistic opinion. I can find little requiring criticism. The price of five dollars may be a little high for a book of this size and type.

Many students of nature will wish to possess this book simply for the beauty of its contents. All wildfowlers who give sincere consideration to the future of their sport should have it, and it is to be hoped that they will circulate it widely among their less thoughtful friends. —Robert M. Mengel.

THE WILSON ORNITHOLOGICAL CLUB LIBRARY

The following gifts have been recently received. From:

William H. Behle—8 reprints
G. Reeves Butchart—1 bulletin
Clarence Cottam—6 bulletins
Eugene Eisenmann—1 reprint
Adrian C. Fox—2 books
Karl W. Haller—1 book
Leon Kelso—2 pamphlets
Emerson Kemsies—2 reprints
Charles W. Kossack—1 reprint
Ernst Mayr—3 reprints
Urban C. Nelson—3 reprints
Margaret M. Nice—6 books, 24 reprints
Fred M. Packard—1 book
Kenneth C. Parkes—3 reprints
Homer W. Phillips—2 reprints
Richard S. Phillips—4 reprints
J. Van Tyne—5 reprints
F. A. Ward—2 magazines
James B. Young—1 reprint
F. R. Zimmerman—1 reprint

CONSERVATION DEVELOPMENTS IN AMERICAN UNIVERSITIES

Conservation of natural resources has become a topic of steadily growing interest in many spheres of American life—among government agencies, book publishers, the public schools, and the general public, to mention only a few. It has become a matter of international concern, as attested by the Inter-American Conference on Conservation of Natural Resources held in Denver in September, 1948 (proceedings published and available), and the United Nations Scientific Conference on Conservation and Utilization of Resources held at Lake Success in August and September, 1949 (published proceedings now being issued). American colleges and universities have long played an important role in encouraging this increasing interest, and have frequently initiated new courses, curricula, and sometimes organizational units concerned with conservation. The recent reorganization and expansion in four major American universities in the conservation field may be of interest as an indication of this trend.

Cornell University in 1948 established a Department of Conservation in which were included its activities in fisheries, wildlife management, and forestry, together with all work in the background sciences of ornithology, mammalogy, ichthyology, and herpetology. While the new department was largely a reorganization of pre-existing activities at the University, it did include sufficient new support to permit the establishment of several new positions, involving teaching and research in wildlife management, oceanography, and fish culture, and extension work in fish and wildlife conservation.

About 65 undergraduates and 40 graduate students are majoring in the Department of Conservation in the various different specializations available. The undergraduate curriculum has been divided into four different specializations, depending upon the requirements of the students in question: fishery biology, wildlife management, conservation education (both for those who intend to teach in the conservation field or engage in general public relations or general education activities), and a curriculum in vertebrate zoology for those whose primary interest is ornithology, mammalogy, or other aspects of vertebrate zoology. Most of the students are encouraged to do some postgraduate work.

Michigan State College in December, 1949, established a Division of Conservation to coordinate all of the teaching, research, and extension activities in the field of conservation offered by the institution. The new Division of Conservation includes four departments: the Fisheries and Wildlife Department, Forestry Department, Department of Wood Utilization, and a Conservation Institute which offers work in park management, rural land use, soil and water conservation, and conservation administration. The new Division of Conservation administers a number of study and demonstration areas, including the Kellogg Bird Sanctuary, which is already well known to ornithologists. Its present technical staff totals about 60 men, and specialists in a number of additional fields are still being recruited.

The **University of Michigan** in 1950 organized a new School of Natural Resources which expanded and replaced the old School of Forestry and Conservation. Five curricula are offered—forestry, wood technology, wildlife management, fisheries, and conservation—each leading to the degree of Bachelor of Science. A fifth year is strongly recommended for those who desire full professional training.

Graduate work leading to the degree of Doctor of Philosophy or Doctor of Science is provided in any branch of the five major fields covered by the School. The School also emphasizes non-professional instruction relating to natural resources which will be of interest to students throughout the University. Special attention will be given to the philosophy and principles underlying the conservation of natural resources. Included in the new School is a newly established Charles Lathrop Pack Chair of Conservation, which has been filled by the appointment of Dr. Stanley A. Cain.

Yale University, with the cooperation of the Conservation Foundation, has established a new Chair of Conservation to which Dr. Paul B. Sears has been appointed, and has initiated in 1950–51 a graduate course leading to the Master of Science in Conservation. Its aim is to give a limited number of qualified students with various backgrounds and vocational interests an understanding of the basic principles of natural and social science involved in conservation. Account will be taken of the fact that conservation is achieved by the use of many different vocational techniques. The students' aptitude, training, and interests will be considered in relation to possible careers in public service, education, business or other professions. Wide latitude in the choice of courses in the curriculum is provided, but all students are expected to take courses in ecology, the ecological basis of conservation, and a seminar in conservation.—Gustav A. Swanson

THE IMPORTANCE OF SMALL MARSHES TO WATERFOWL

Mr. Albert M. Day, at the 15th North American Wildlife Conference in his first public comment on the results of the January waterfowl inventory said that "it looks now as though instead of gaining ground last year, we more than likely lost some of the previous years' gains and not only took the harvestable crop but also cut into the capital stock of this year's breeders." This statement rekindled at once the controversy in regards to duck numbers and the immediate response voiced in some regions was one of doubt and even of disrespect. It should be known by all that the January inventory is a joint effort carried out in a cooperative plan in Canada, in the United States, and in México, and that regional results are cleared through the separate administrative offices before being submitted to the Fish and Wildlife Service for final compilation. It is understandable that sportsmen of regions where winter concentrations have been heavy should adopt the optimistic viewpoint; and yet in the face of the final results it is as pointless for them to contest the complete analysis as it would be for a Republican state to contest an overall Democratic victory.

The waterfowl situation will not be secure until the optimists believe the evidence brought forth by these surveys, and until we are willing to let populations increase without immediate dividends in bag or season increases.

Mr. Day expressed concern regarding subsidized drainage, pointing to the heavy loss of breeding terrain resulting from this program. "Of real concern to all of us interested in waterfowl," he said, "is the accelerated pace agricultural drainage has assumed in recent years. The bulk of this is on privately-owned lands, but it is encouraged by government subsidies and guided by government soil conservation technicians. As a result, we are now losing essential breeding grounds and wintering habitats much faster than we are rebuilding them."

In large measure the drainage program goes ahead without a full understanding of its impact on breeding populations. There has developed in recent years a false belief that ducks are produced mainly on the large pristine marshes, and that small waters producing small numbers of ducks are relatively unimportant. The breeding-ground surveys of recent years have shown that the nesting populations of many of our important game ducks are spread thinly, even on the large marshlands. Agricultural lands may hold breeding numbers which in pairs per square mile closely approach or even exceed the breeding populations of the large, so-called "factory" marshes. Such agricultural breeding terrain covers a vastly greater area than the large, isolated marshlands, hence Mr. Day's statement that "the private landowners in this country hold the key to the bulk of the production of wildlife-waterfowl."

Mr. Day's approach to this drainage problem is fresh and encouraging. Most important, his research program is supplying the facts and figures which demonstrate the greater dollar value of the farm pothole in our national economy. Large marsh areas are vital to the welfare of our waterfowl, and great strides have been made in saving or restoring such waters. But the ultimate and the successful plan for waterfowl management cannot be established until we win administrative security for small waters on private lands.—Albert Hochbaum.

Announcement of Annual Meeting

Note: This is the official announcement of the annual meeting. No individual letters of announcement will be mailed but, as in the past, the completed program will be sent to members a short time in advance of the meeting.

Place and time. The Thirty-second Annual Meeting of the Wilson Ornithological Club will be held in Davenport, Iowa, Friday and Saturday, April 27–28, 1951. Headquarters will be the Davenport Public Museum, at 704 Brady Street. On Thursday evening, April 26, the Executive Council will meet. On Sunday, April 29, there will be organized field trips.

Davenport and how to reach it. Davenport, with a population of over 73,000, is on the Mississippi River 165 miles west of Chicago, 237 miles north of St. Louis, 331 miles south of St. Paul, and 177 miles east of Des Moines. It is on the main line of the Rock Island Railroad. The cities of Rock Island, Moline, and East Moline, just across the river in Illinois, join with Davenport in forming the Quad-Cities, a population area of over 200,000. The four cities, which are the center of the farm machine industry of the world, are connected by three bridges, those at either end being toll bridges, that in the middle a government 'free' drawbridge passing over Arsenal Island, the home of the Rock Island Arsenal. From this bridge there is an excellent view of the great roller dam and locks. Several city parks furnish good local birding. Credit Island Park, in the Mississippi, can be reached from the west part of Davenport. This park is highly recommended for birding unless flood waters happen to make it inaccessible. In April ducks, grebes, cormorants, herons and early migratory land birds are likely to be seen there.

The Davenport Public Museum. Registration, exhibits, and all sessions except the Annual Dinner will be at the Museum unless otherwise announced. The Museum was founded as the Davenport Academy of Science in 1867. Since 1877 it has been housed in the present central building. It contains outstanding collections representing local Indian cultures, Mississippi River history, and the civilizations of Japan, other oriental countries, and ancient Egypt. The collection of Peruvian pottery is notable. The natural science material is old but fairly representative. Among the mounted birds are many from the midwestern United States, Central America, and Japan. Once recognized internationally, the Museum has passed through a comparatively inactive period, but is now very much on the move. Its building program for the future is impressive.

Sessions. Sessions will begin at 9:00 A.M. and continue until about 5:00 P.M.

Special Events. There will be an exhibition of paintings by contemporary bird artists. It is hoped that all living American bird artists will be represented. Artists who wish to contribute should communicate, before January 1, with the Exhibit Committee, Davenport Public Museum, 704 Brady Street, Davenport, Iowa. It is to be hoped that members of the Wilson Club will see to it that all young and unknown artists have a place in this show.

Several artists are being asked to contribute original paintings and drawings of birds for an auction. These pictures will be offered at opening prices set by the artists. The difference between the opening prices and sale prices will go toward the *Wilson Bulletin* color-plate fund. Thus Club members will have an opportunity to acquire original paintings and at the same time to enhance the *Bulletin.*

An informal reception will be held in the Museum on Friday evening at 8 o'clock. Those attending may view the exhibit of bird art and meet the artists in attendance. Museum displays may also be inspected at this time, and guides will be provided.

The Annual Dinner will be held in the Gold Room of the Hotel Blackhawk at 7 o'clock Saturday evening. A short period of entertainment will precede the President's address.

Meeting of the Council. The Executive Council (all officers, all past presidents, and three elective members) will meet at the Museum on Thursday evening, April 26, at 7:30 o'clock. The Secretary requests that the Chairman of the several Committees send their written reports to him by April 15 so that these may be discussed by the Council.

Accommodations. All members are requested to write directly, to the hotel, and as soon as possible, for accommodations. Prices are:

	Single	*Double*
Hotel Blackhawk	$3.75 up	$5.25 up
Hotel Mississippi	4.00 up	6.00 up
Hotel Davenport	2.50 up	4.00 up
Hotel Dempsey	1.75 up	2.75 up
Hotel St. James	2.00 up	3.00 up

There are also numerous motels, tourist rooms and lower-priced hotels. The Local Committee will make every possible effort to arrange for suitable quarters of this sort. Write the Housing Committee, in care of the Museum, stating your desires. Special arrangements may be made for a limited number of students who write in advance.

Field Trips. The major attraction for bird students in the Mississippi Valley in late April is the migration of ducks and geese. Points of concentration for these waterfowl vary considerably with the season and final arrangements will be announced at the meeting. Trips will be provided to the best possible areas within a reasonable distance of Davenport. In late April of 1950 between five and ten thousand geese (Canada, Blue, Snow, and a few White-fronted and Hutchins's) could be seen near Savannah, Illinois, about forty miles north of the Quad-City area.

Hosts. Host organizations for this meeting are the Davenport Public Museum, the Tri-City Bird Club, and the Iowa Ornithologists' Union. The Local Committee in charge of Arrangements is as follows:

Chairman: Fred T. Hall, Davenport

Mr. and Mrs. Harry Carl, Davenport
Leo Doering, Rock Island
Elton Fawks, Moline
Rev. Thomas J. Feeney, Davenport
Miss Jeannette Graham, Davenport
Miss Rose Guite, Rock Island
Mrs. Marian Hawes, Moline
Norwood Hazard, Davenport
James Hodges, Davenport
Thomas J. Morrissey, Davenport
Mrs. Peter Peterson, Davenport
Mrs. E. K. Putnam, Davenport
Richard E. Schaefer, Davenport
Harold B. Yeaton, Davenport

Application for a Position on the Program

Members who have not yet published on their research, or who have motion pictures or slides of special interest, are urged to apply for a place on the program. Papers will be selected for their timely interest and their contribution to ornithology. In selecting papers, the Secretary will be assisted by the Local Committee and by other officers of the Club. Members who have nothing themselves to present may be able to suggest outstanding papers which the Secretary can secure for this meeting.

If you would like to appear on the program at Davenport, please write to the Secretary, Harold F. Mayfield, 2557 Portsmouth Avenue, Toledo 13, Ohio, not later than March 1, 1951. Please note that no more than one paper may be presented by any one member. A paper accompanied by motion pictures must not exceed 30 minutes. A paper accompanied by slides must not exceed 20 minutes. A paper without pictures must not exceed 15 minutes. A limited time for discussion will follow each paper.

In writing the Secretary, please supply *all* of the following information:

1. *Title of paper.* Give the title exactly as you want it to appear on the program.

2. *Abstract.* Prepare an abstract of your paper—brief, but sufficiently complete so that it may be used by the Local Committee for publicity and by the Secretary in preparing the meeting's proceedings.

3. *Time required.*

4. *Position.* State if it is essential that you appear at a particular time.

5. *Special equipment needed.* Blackboard, map hanger, pointer, etc.

6. *Motion pictures.* If your paper is to be illustrated with motion pictures give the following information: Size (16 mm. or 35 mm.). Color or black and white. Total footage. Number of reels. Size of reels.

7. *Slides.* If your paper is to be illustrated with slides, give the following information: Size ($3\frac{1}{4}''$ x $4''$, or $2''$ x $2''$). Color or black-and-white. Number of slides.

8. *Name.* Please write your name exactly as you wish it to appear on the program. Titles before names will not be used.

9. *Address.* Include the name of the institution with which you are asso-

ciated, if any. The name of this institution will appear after your name on the program.

MEMBERS

**Abbott, Cyril Edward, 651 E. First South, Apt. 8, Salt Lake City 3, Utah........ 1937
Abbott, Capt. Jackson Miles, The Engineer School, Fort Belvoir, Virginia...... 1948
Adalis, Miss Dorothy, 2121 Terrace Circle, Weirton, West Virginia............. 1950
*Adams, I. C. Jr., Box 158, Columbia, Missouri.............................. 1933
Addy, Charles Edward, 56 Spofford St., Newburyport, Massachusetts........... 1941
**Adelson, Richard Henry, 34 Wensley Drive, Great Neck, Long Island, New York.. 1938
**Afsprung, Arthur E., 3308 Bishop St., Cincinnati 20, Ohio..................... 1948
**Aldrich, John Warren, Fish and Wildlife Service, Washington 25, D. C........... 1930
*Alexander, Donald C[hild], 16 Pleasant St., Nahant, Massachusetts............. 1937
*Alexander, Gordon, Department of Biology, University of Colorado, Boulder, Colorado.. 1936
*Alexander, Maurice M[yron], Department of Forest Zoology, New York State College of Forestry, Syracuse 10, New York.............................. 1945
Alexander, R. C., 19207 Charleston Ave., Detroit 3, Michigan.................. 1949
*Allen, A[rthur] A[ugustus], Fernow Hall, Ithaca, New York.................... 1914
*Allen, Francis H[enry], 215 LaGrange St., West Roxbury 32, Massachusetts...... 1941
*Allen, Otis W., 504½ W. Market Street, Greenwood, Mississippi................ 1944
*Allen, Robert P[orter], Tavernier, Florida.................................. 1947
*Allin, Dr. A[lbert] E[llis], Provincial Laboratory, Fort William, Ontario, Canada.. 1943
Allyn, Dr. Paul Richard, 806 First National Bank Bldg., Springfield, Illinois...... 1944
*Alperin, Irwin M., 2835 Ocean Ave., Brooklyn 29, New York................ 1939
*Amadon, Dean, American Museum of Natural History, Central Park West at 79th St., New York 24, New York.. 1935
*Amidon, Mrs. Hilda F[arnum], 282 Sigourney, Hartford, Connecticut.......... 1942
*Ammann, George Andrew, Game Division, Department of Conservation, Lansing 13, Michigan.. 1935
*Anderson, Anders H[arold], 3221 E. Kleindale Rd., Tucson, Arizona............ 1937
*Anderson, John M., 38 N. Madison St., Port Clinton, Ohio.................... 1938
Anderson, Paul Knight, 126 W. River St., Orange, Massachusetts............. 1947
*Anderson, R[udolph] M[artin], National Museum of Canada, Ottawa, Ontario.... 1937
Anderson, William Deans, 3100 Beverly Rd., Austin 21, Texas................ 1950
*Andrews, James Clinton, 1 East York St., Nantucket, Massachusetts.......... 1947
Ansaldi, Mrs. Fay Haverstock, 1380 Penobscot Bldg., Detroit 26, Michigan.... 1949
Anthes, Clarence A[lvin], 713 Hamilton Ave., Waukesha, Wisconsin............ 1939
Anthony, Jesse D., 722 1st Ave. E., Grand Rapids, Minnesota................ 1944
Appel, Thomas G., 63 Sunnyside Ave., Pleasantville 2, New York............. 1950
Appleton, J[ohn] S[parhawk], Simi, California............................... 1936
*Arbib, Robert S[imeon] Jr., 231 West Lena Ave., Freeport, New York.......... 1947
Armington, Sven, Blanchegatan 18, Stockholm, Sweden...................... 1948
Armitt, Herbert T., 102 Orange Ave., East Paterson, New Jersey............. 1950
**Armstrong, Miss Virginia, Musketaquid Road, Concord, Massachusetts........ 1939
Arnett, John Hancock Jr., 6200 Ardleigh St., Philadelphia 38, Pennsylvania.... 1944
*Arnold, Elting, 514 Dorset Ave., Chevy Chase 15, Maryland.................. 1941
Arnold, Rev. Jay [Hartzell], 20 N. Pine St., York, Pennsylvania.............. 1945
Arny, Samuel A., 1435 Octavia St., New Orleans 15, Louisiana................ 1947

****—Honorary Member. ***—Life Member. **—Sustaining Member. *—Active Member. Others—Associate Members.

Aronoff, Arthur Edward, 59 W. 71 St., New York 23, New York 1948
*Arvey, M[artin] Dale, Dept. of Zoological Sciences, Univ. of Oklahoma, Norman, Oklahoma 1949
*Ashton, Randolph, 800 Crown St., Morrisville, Pennsylvania 1941
*Austin, Mrs. Harold C., 1116 Mandana Rd., Oakland 10, California 1950
*Austin, John Brander, 9 Chamonix Rd., St. Davids, Pennsylvania 1947
*Austin, Dr. Oliver L[uther], Post Office Box 236, Tuckahoe, New York 1930
Autry, Homer V. Jr., Post Office Box 1915, Charlotte, North Carolina 1949
*Axtell, Harold H., Buffalo Museum of Science, Humboldt Park, Buffalo 11, New York 1950
Ayer, Mrs. N[athan] Edward, 1300 Hillcrest Drive, Pomona, California 1936
**Aylward, David A., 20 Spruce St., Boston 8, Massachusetts 1945
Bacon, Brasher Collins Sr., Spring Lake Wildlife Sanctuary, Chickadee Hill, Madisonville, Kentucky 1948
Baechle, Rev. John W[illard], St. Joseph's College, Collegeville, Indiana 1943
Baer, Miss Myrtle W., 1237 N. Jefferson St., Milwaukee 2, Wisconsin 1941
***Bagg, Aaron Moore, 72 Fairfield Ave., Holyoke, Massachusetts 1948
*Bailey, Alfred Marshall, Denver Museum of Natural History, City Park, Denver 6, Colorado 1928
**Bailey, Harold H[arris], Rockbridge Alum Springs Biological Laboratory, Route 2, Goshen, Virginia 1908
Bailey, Mrs. H. M., 1020 Jones St., Apt. 4, Sioux City 18, Iowa 1918
Bailey, Robert A[lexander], Sarona, Wisconsin 1947
Bailey, Rolfe Wayne, 520 Second Ave., South Charleston, West Virginia 1946
***Baker, Bernard W., Route No. 1, Judson Road, Spring Lake, Michigan 1938
*Baker, John H[opkinson], 1165 Fifth Ave., New York, New York 1930
**Baker, Louis Stannard, 9 Washington Rd., Parlin, New Jersey 1949
*Baker, Maurice F[rank], Museum of Natural History, University of Kansas, Lawrence, Kansas 1947
*Baker, Paul S[eaman], 5545 Stonegate Dr., Dallas 9, Texas 1946
*Baker, Rollin Harold, Museum of Natural History, University of Kansas, Lawrence, Kansas 1938
*Baker, William C[alvin], 559 Euclid St., Salem, Ohio 1931
Baldwin, Mrs. Amy G., 6335 Kimbark Ave., Apt. B., Chicago 37, Illinois 1943
*Ball, Kathleen E., 240 Central Ave., London, Ontario, Canada 1946
Ball, William Howard, 5818 30th Ave., Hyattsville, Maryland 1924
*Balsom, Mrs. Amos Parker, 2209 E. Stratford Court, Milwaukee 11, Wisconsin 1949
*Bancroft, Miss Constance J[ordan], Indian Mountain School, Lakeville, Connecticut 1947
*Banks, Clinton S[eeger], 202 Wilma Ave., Steubenville, Ohio 1945
Banta, Miss Edna, Route 6, Connersville, Indiana 1945
*Barber, Bertram A[lpha], Department of Biology, Hillsdale College, Hillsdale, Michigan 1945
*Barber, Miss Lucy, Box 6092 Station A., Charleston 2, West Virginia 1950
*Barber, Miss Sarah C., Box 6092 Station A., Charleston 2, West Virginia 1950
*Barbig, Howard T., Route 10, Box 424, Ivanhoe Rd., Memphis, Tennessee 1949
*Barbour, Llewellyn P[helps], 94 Wood St., Willoughby, Ohio 1948
*Bard, Fred George, Provincial Museum, Normal School, Regina, Saskatchewan, Canada 1946
Barkalow, Frederick Scheck Jr., Box 5215, State College Station, Raleigh, North Carolina 1936

Barnes, Charles K[napp], 2026 L.W.W., South Bend 19, Indiana. 1949
Barnes, William Bryan, 311 W. Washington St., Indianapolis 9, Indiana. 1941
Barnes, W. Hughes, 12 N. College St., New Concord, Ohio. 1946
Barnickol, Mrs. Kathleen Marie, 3530 Washington Blvd., Indianapolis 5, Indiana. . 1948
**Barrett, J. P., 921 E. Central Ave., Ponca City, Oklahoma. 1950
Barrett, Lewis Le Roy, 1930 Lincoln St., N.E., Minneapolis, Minnesota. 1949
*Bartel, Karl E[mil] Edgar, 2528 West Collins St., Blue Island, Illinois. 1934
*Bartlett, Guy, 1053 Parkwood Blvd., Schenectady 8, New York. 1938
*Bartlett, Wesley H., 122 South Ridgley, Algona, Iowa. 1936
*Bartsch, Paul, Gunston Hall Rd., Lorton, Virginia. 1894
*Batchelder, Charles Foster, 7 Kirkland St., Cambridge, Massachusetts. 1927
*Batchelder, Edgar M[arden], 56 Orchard St., Marblehead, Massachusetts. 1941
***Batts, H[enry] Lewis Jr., 1211 Glenwood Ave., Kalamazoo, Michigan. 1946
Bauers, Harold A[ugust], 2321 N. 32nd St., Milwaukee 10, Wisconsin. 1947
Baumgartner, Milton D[aniel], 154 Kings Highway, Stillwater, Oklahoma. 1944
**Baxter, William Jr., 27 Virginia Ave., Rehoboth Beach, Delaware. 1945
*Beach, Pearle Leenhouts (Mrs. Walter H.), 328 Parsells Ave., Rochester 9, New York. 1941
*Beacham, Edward Derek, 238 Wineva Ave., Toronto 8, Ontario, Canada. 1950
Beal, John Lawrence, 408–410 E. Franklin Ave., Gastonia, North Carolina. 1949
Beard, Elizabeth Browne (Mrs. Allen Shelby), 9904 Berwick Rd., Rosedale Gardens, Plymouth, Michigan. 1942
Beardslee, Clark Smith, 132 McKinley Ave., Kenmore 17, New York. 1942
Beardsley, Miss M[argaret] Hortense, 410 S. Prospect St., Ravenna, Ohio. 1941
Beck, Rollo Howard, Planada, California. 1943
Becker, Mrs. Paul A., 251 E. Phelps, Owatonna, Minnesota. 1944
Bedell, Miss Marie L., 1430 W. 20th St., Lorain, Ohio. 1940
*Beebe, Ralph, 4169 Tenth St., Ecorse 29, Michigan. 1924
*Beebe, William, 33 West 67th St., New York, New York. 1944
*Beecher, William J[ohn], Chicago Natural History Museum, Chicago 5, Illinois. . . . 1948
Beemer, Mrs. Eleanor V[irginia], Pauma Valley, Pala, California. 1948
Behle, William H[arroun], Department of Biology, University of Utah, Salt Lake City, Utah. 1935
*Behrend, Fred W[illiam], 322 Carter Blvd., Elizabethton, Tennessee. 1944
Behrens, Harry Carl, 627½ 8th St., Rapid City, South Dakota. 1950
**Belcher, Paul Eugene, 988 Jefferson Ave., Apt. 3, Akron, Ohio. 1938
*Bell, Henry III, United States Geological Survey, Box 360, Grand Junction, Colorado. 1946
*Bellrose, Frank Jr., Illinois Natural History Survey, Havana, Illinois. 1935
Bennett, Holly Reed, 2457 Orchard St., Chicago 14, Illinois. 1949
*Bennett, Miss Mary A[llison], 623 E. Carroll St., Macomb, Illinois. 1933
*Benson, Mrs. Mary Heydweiller, 183 Cherry Rd., Rochester 12, New York. 1937
Benson, Seth Bertram, 645 Coventry Rd., Berkeley 7, California. 1930
*Bent, Arthur C[leveland], 140 High St., Taunton, Massachusetts. 1893
Berger, Andrew J[ohn], Department of Anatomy, East Medical Building, Ann Arbor, Michigan. 1940
Berger, Dan, 5026 N. Elkhart Ave., Milwaukee 11, Wisconsin. 1950
Bergstrom, E[dward] Alexander, 37 Old Brook Rd., West Hartford 7, Connecticut. . 1943
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Berlin, Grace [Fern] (Mrs. Herbert), R.F.D. No. 1, Monclova, Ohio. 1946

Beule, John D[avid], 312 W. 3rd St., Beaver Dam, Wisconsin.................. 1948
*Biaggi, Virgilio Jr., College of Agriculture, Mayagüez, Puerto Rico............ 1945
*Biggs, Joseph Daniel, 6624 First St., N. W., Washington 12, D. C............... 1949
Bilby, H[enry] A[nthony], 2 Sunnyside Cottages, Harlington, Middlesex, England.. 1947
Birch, Robert Lee, Department of Biology, West Virginia University, Morgantown, West Virginia........ 1950
*Bird, Dick, 34 QuAppelle Apts., Regina, Saskatchewan, Canada................ 1949
Bissonnette, T[homas] Hume, Trinity College, Hartford 6, Connecticut........ 1939
Black, Charles Theodore, Rose Lake Wildlife Experimental Station, Route 1, East Lansing, Michigan........ 1935
***Blain, Alexander W[illis], 2201 Jefferson Ave. East, Detroit 7, Michigan........ 1902
*Blake Charles H[enry], Woodland Way, Lincoln, Massachusetts.............. 1950
*Blake, Emmet R[eid], Chicago Natural History Museum, Chicago 5, Illinois.... 1939
*Blake, Grace R. (Mrs. Henry Seavey), 1933 Westwood Drive, Topeka, Kansas.... 1950
Blanchard, Harold H[ooper], 32 Calumet Rd., Winchester, Massachusetts...... 1946
Blazer, Warren G., 31 Conant Hall, Harvard University, Cambridge 38, Massachusetts........ 1949
**Bleitz, Donald Lewis, 5338 Hollywood Blvd., Hollywood 27, California.......... 1948
*Blincoe, Ben[edict] Joseph, 8766 N. Main St., Dayton 5, Ohio................ 1919
Blincoe, Edith J. (Mrs. Benedict J.), 8766 N. Main St., Dayton 5, Ohio........ 1926
**Blossom, Philip M[oss], 2422 E. Washington St., Pasadena, California.......... 1949
Boblitt, Mrs. Vella, 403 N. 3rd St., Bardstown, Kentucky..................... 1950
Bodmer, Olive A. (Mrs. Herbert A.), Box 14, Kenmare, North Dakota.......... 1950
*Boggs, Ira Brooks, West Virginia University, Morgantown, West Virginia...... 1938
Boldt, Wilbur, 214 East Seventh St., Ames, Iowa........................ 1949
**Bond, James, 1900 Race St., Philadelphia 3, Pennsylvania.................. 1945
*Bond, Richard M[arshall], 3322 SW Fairmount Blvd., Portland 1, Oregon...... 1936
*Booth, Mrs. Robert V. D., RFD No. 3, Johnnycake Ridge, Painesville, Ohio.... 1949
*Borden, Richard, 1031 Canton Ave., Milton, Massachusetts.................. 1947
*Borell, Adrey Edwin, Soil Conservation Service, Box 1348, Albuquerque, New Mexico........ 1936
*Borror, Donald J[oyce], Department Zoology and Entomology, Ohio State University, Columbus 10, Ohio........ 1927
**Boulton, Rudyerd, 3317 Dent Place N.W., Washington 7, D. C................ 1942
*Bourne, Raymond D[ory], 118 East Vine St., Oxford, Ohio.................. 1946
Bowdish, Beecher S[coville], Demarest, New Jersey...................... 1921
Bowen, Robert Marvin, 5009 Leeds Ave., Halethorpe 27, Maryland............ 1947
Bowers, J. Basil, 381 51st St., Oakland 9, California....................... 1942
Bowman, Robert I[rvin], International House, University of California, Berkeley 4, California........ 1948
Boyd, Miss Elizabeth M[argaret], Mount Holyoke College, South Hadley, Massachusetts........ 1941
Boyd, Hugh J., 24 Bedminster Rd., Bristol 3, England...................... 1946
*Boyer, George Frederick, RFD 1, West Sackville, New Brunswick, Canada.... 1949
**Brackbill, Hervey [Groff], 4608 Springdale Ave., Baltimore 7, Maryland........ 1942
Bradburn, Donald Muir, 461 Pine St., New Orleans 18, Louisiana.............. 1950
***Bradley, Miss Hazel L[ouise], 908 W. Michigan Ave., Jackson, Michigan........ 1944
Bradley, Homer L., Long Lake Refuge, Moffitt, North Dakota................ 1939
***Brandt, Herbert W., 2245 Harcourt Dr., Cleveland 6, Ohio.................. 1945
*Branum, Miss Florence [Pauline], 117 N. Ewing St., Lancaster, Ohio.......... 1946
Brauner, Joseph, 10817 Strathmore Dr., Los Angeles 24, California............ 1942

***Brecher, Leonard C[harles], 1900 Spring Dr., Louisville 5, Kentucky. 1939
Brecht, Miss Grace Elizabeth, 1328 Clinton Ave., Irvington 11, New Jersey. 1949
**Breckenridge, Walter J[ohn], Museum of Natural History, University of Minnesota, Minneapolis 14, Minnesota. 1929
Breiding, George H[erbert], 487 National Rd., Fulton, Wheeling, West Virginia. . 1942
**Brewer, Richard Dean, 1506 Edith St., Murphysboro, Illinois. 1949
*Brigham, Edward M[orris] Jr., Kingman Memorial Museum, Battle Creek, Michigan 1931
Brigham, Edward M[orris] III, Route 5, Box 19, Battle Creek, Michigan. 1950
*Brigham, H[erbert] Storrs Jr., 3817 Sedgwick Ave., New York 63, New York. . . . 1942
Bristow, Harry Sherman Jr., Pine Ave., Cedars, Marshallton, Delaware. 1942
Broadbooks, Harold E[ugene], Department of Zoology, University of Arizona, Tucson, Arizona 1950
Brockschlager, Miss Mary Elizabeth, 518 E. Fourth St., Cincinnati 2, Ohio. 1948
*Brokaw, De Witt P., 176 Rockview Ave., Plainfield, New Jersey. 1948
Broley, Charles L[avelle], Delta, Ontario. 1946
Brooks, Mrs. Benjamin Talbot, 119 Lindalou Drive, San Antonio 10, Texas. . . . 1945
*Brooks, Earle A[mos], 166 Plymouth Rd., Newton Highlands, Massachusetts. . . . 1933
***Brooks, Maurice Graham, Division of Forestry, Morgantown, West Virginia. . . . 1927
*Broun, Maurice, Route 2, Kempton, Pennsylvania. 1935
Brown, Clarence D., 222 Valley Rd., Montclair, New Jersey. 1938
Brown, E[lmer] E[vans], Davidson College, Davidson, North Carolina. 1945
*Brown, N[orman] Rae, Faculty of Forestry, University of New Brunswick, Fredericton, New Brunswick, Canada 1945
*Brown, Woodward H[art], 4815 Ingersoll Ave., Des Moines 12, Iowa. 1949
Brownsey, Mrs. Edgar George, 2911 San Isidro St., Tampa 9, Florida. 1946
Brueggemann, Miss Anna L[ouise], 584 Sheridan Ave., Columbus 9, Ohio. 1943
***Bruns, James Henry, 1820 Jefferson Ave., New Orleans, Louisiana. 1941
Bryan, Dr. Burton Donald, 162 French St., Fall River, Massachusetts. 1949
**Bryens, Oscar McKinley, 231 S. Main St., Three Rivers, Michigan. 1924
Buchanan, Forest Wendell, Amsterdam, Ohio. 1939
*Bucheister, Carl W., 1006 Fifth Ave., New York 28, New York. 1943
*Buckland, George, Route 1, Batavia, New York. 1949
*Buckstaff, Ralph Noyes, Oshkosh Public Museum, Oshkosh, Wisconsin. 1941
*Bures, Joseph August, Route 1, West Newton, Pennsylvania. 1946
*Burget, Russel Lincoln, Route 2, Perrysburg, Ohio. 1944
Burgin, Miss Muriel Beverly, 7 Upland Ave., Barre, Vermont. 1950
Burkhart, Mrs. Harriet H., Box 166, Old Valley Road, Union City, Pennsylvania. . 1949
*Burleigh, Thomas Dearborn, School of Forestry, University of Idaho, Moscow, Idaho 1922
*Burland, Lee J[ohnson], Snook Apts., Castleton-on-Hudson, New York. 1939
*Burlingame, Virginia S[truble] (Mrs. M. G.), 812 S. 8th St., Bozeman, Montana. . 1946
*Burner, Miss Florence H[elen], 5350 Reisterstown Rd., Baltimore 15, Maryland. . 1948
Burnett, Miss Frances L., Fernow Hall, Ithaca, New York. 1950
*Burns, Maurice E[dward], 735 W. 10th St., Escondido, California. 1948
Burns, Robert David, 1805 Greenleaf Dr., Royal Oak, Michigan. 1948
*Burr, Irving W[ingate], 265 Littleton St., West Lafayette, Indiana. 1945
Burr, Malcolm F., Barberry Hill Farm, Bethlehem, Connecticut. 1950
*Burt, William Henry, Museum of Zoology, University of Michigan, Ann Arbor, Michigan. 1928
*Bushwitz, Henry William, 2218 S. Baker St., Santa Ana, California. 1950

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Butler, Thomas Sheridan, 708 N. Poplar St., Paris, Tennessee 1949
*Butsch, Robert Stearns, Museum of Zoology, University of Michigan, Ann Arbor, Michigan 1947
Bytzko, Miss Anne, 13563 Arlington, Detroit 12, Michigan 1948
Cade, Tom, Box 626, College, Alaska 1950
Cagle, Fred R., Department of Zoology, Tulane University, New Orleans, Louisiana 1942
*Cahalane, Victor H[arrison], National Park Service, Washington 25, D. C. 1933
Caldwell, Miss Sara E[lizabeth], 193 Carpenter Rd., Mansfield, Ohio 1946
Calhoun, John B[umpass], Hamilton Behavior Station, Box 78, Bar Harbor, Maine 1949
Calvert, Earl Wellington, R.R. 2, County Home, Lindsay, Ontario, Canada 1937
Calvert, William J[onathan] Jr., 615 N. Pelham Rd., Jacksonville, Alabama 1942
Camburn, F. Lawrence, Edwin S. George Reserve, Pinckney, Michigan 1947
Campbell, Esther W. (Mrs. W. V.), 421 N. 9th St., Oskaloosa, Iowa 1950
Campbell, John David, 1222 W. State St., Geneva, Illinois 1944
Campbell, [John] Howard, 512 N. Vermont St., Albuquerque, New Mexico 1949
*Campbell, Louis W[alter], 4531 Walker Ave., Toledo 12, Ohio 1926
*Campbell, Miss Mildred F[lorence], 29 N. Hawthorne Lane, Indianapolis 19, Indiana 1938
Carl, Harry G., 2304 Davie St., Davenport, Iowa 1949
Carlander, Kenneth Dixon, Department of Zoology, Iowa State College, Ames, Iowa 1948
**Carnes, Mrs. Herbert E., 25 Kenwood Rd., Tenafly, New Jersey 1944
*Carpenter, Floyd S., 2402 Longest Ave., Louisville 4, Kentucky 1934
Carpenter, Forrest A[lmon], 7345 Bryant Ave. S., Minneapolis 19, Minnesota 1948
*Carpenter, Thomas L., 557 N. 68th St., Milwaukee 13, Wisconsin 1948
*Carroll, Col. Robert P., 305 Letcher Ave., Lexington, Virginia 1942
Carroll, William Baxter, Box 432, Siler City, North Carolina 1949
***Carrothers, Miss Verna, 14704 Alder Ave., East Cleveland 12, Ohio 1938
Carson, L[enwood] B[allard], 1306 Lincoln St., Topeka, Kansas 1948
*Carter, Dennis [Lee], Box 84, Thor, Iowa 1947
Carter, Bertha May (Mrs. E. W.), Route 4, Bowling Green, Ohio 1946
Carter, T. C., Northwestern State College, Alva, Oklahoma 1947
*Cartwright, Bertram William, 201 Bank of Commerce Bldg., Winnipeg, Manitoba, Canada 1930
*Cassel, J[oseph] Frank[lin], Department of Zoology, North Dakota Agriculture College, Fargo, North Dakota 1940
**Castellano, Leonard, 288 Hollywood Ave., Yonkers, New York 1950
*Castenholz, Richard William, 431 S. East Ave., Oak Park, Illinois 1949
*Cater, Milam B[rison], Box 133, Millboro, Virginia 1944
***Cavendish, Miss Virginia G., 1661 Sixth Ave., Huntington, West Virginia 1946
**Chalif, Edward Louis, 37 Barnsdale Rd., Short Hills, New Jersey 1947
*Challey, John [Raymond], 1349 2nd St. N., Fargo, North Dakota 1948
Chambers, Miss Amy C., 2905 Irving S., Minneapolis 8, Minnesota 1950
**Chambers, W. Lee, Robinson Rd., Topanga, California 1909
Chance, Edgar P[ercival], Ambarrow Wood, Sandhurst, Berkshire, England 1941
*Chapin, James P[aul], American Museum of Natural History, 79th St. & Central Park W., New York 24, New York 1945

**Chapin, John L[adner], Louisiana State University Medical School, New Orleans, Louisiana.... 1947
*Chapman, Floyd B[arton], 392 Walhalla Rd., Columbus 2, Ohio.... 1932
*Chapman, Herman Floraine, 712 South Dakota Ave., Sioux Falls, South Dakota.. 1947
Chapman, Lawrence B., 1 Woodridge Rd., Wellesley 81, Massachusetts.... 1940
Chapman, Mrs. Naomi Fran, Box 177, Flossmoor, Illinois.... 1945
*Chase, Henry B. Jr., 517 Decatur St., New Orleans 16, Louisiana.... 1932
Chatham, Comdr. Thurman, 112 Stratford Rd., Winston-Salem, North Carolina.. 1945
Chiavetta, Kenneth James, Conservation Commission, United States Department of Agriculture Bldg., Elkins, West Virginia.... 1948
*Childs, Henry E[verett] Jr., Museum of Vertebrate Zoology, Berkeley 4, California.... 1948
**Church, C[harles] T[homas], 70 Pine St., New York 5, New York.... 1945
*Chutter, Miss Mildred C., Box 229, Athens, Ohio.... 1936
Clark, Miss Martha L., Box 1176, Danville, Virginia.... 1949
***Clarkson, Mrs. Edwin O., 248 Ridgewood Ave., Wing Haven, Charlotte 7, North Carolina.... 1940
Clausen, Arthur William, 120 W. Main Street, Dwight, Illinois.... 1947
*Clay, William M[arion], Department of Biology, University of Louisville, Louisville 8, Kentucky.... 1947
Clemens, William B[ryson], 5½ Duane St., Cortland, New York.... 1942
*Clement, Roland C[harles], Box 31, Providence 1, Rhode Island.... 1941
Clements, H[iram] Everest, 49 Stoneham Rd., Rochester 10, New York.... 1949
*Clow, Miss Marion, Box 163, Lake Forest, Illinois.... 1929
*Cobb, Augustus S., 7403 Emlen St., Philadelphia 19, Pennsylvania.... 1949
*Cobb, Boughton, 25 East End Ave., New York, New York.... 1949
*Coffey, Ben Barry Jr., 672 N. Belvedere, Memphis 7, Tennessee.... 1927
*Cogswell, Howard L[yman], Museum of Vertebrate Zoology, University of California, Berkeley 4, California.... 1944
Cole, Richard D., Hillen Rd., Towson 4, Maryland.... 1949
Collias, Nicholas E[lias], Department of Zoology, University of Wisconsin, Madison 6, Wisconsin.... 1945
*Collins, Mrs. Edna, 1123 N. Hawthorne Lane, Indianapolis, Indiana.... 1948
Collum, Charles Edward, 1070 Lucile Ave., S.W., Atlanta, Georgia.... 1947
Collum, Thomas Francis, 1070 Lucile Ave., S.W., Atlanta, Georgia.... 1947
Comfort, James F., 27 N. Iola Drive, Webster Groves 19, Missouri.... 1947
Compton, Miss Dorothy M[ay], 22 Wilton St., Princeton, New Jersey.... 1945
*Compton, Lawrence Verlyn, Soil Conservation Service, Box 1898, Ft. Worth, Texas.... 1923
*Congdon, R[ussel] T[hompson], Medical Arts Building, Wenatchee, Washington.. 1944
Conkey, John H., 11 Chestnut Street, Ware, Massachusetts.... 1947
Conn, Robert Carland, 769 Park Ave., Bound Brook, New Jersey.... 1945
*Conrad, Charles L[ouis], 1206 Warwood Ave., Wheeling, West Virginia.... 1937
*Conway, Albert E., Department of Psychology, Lafayette College, Easton, Pennsylvania.... 1939
*Cook, Bill J[ames], 969 Congress Ave., Glendale, Ohio.... 1948
*Cook, Miss Fannye Adine, State Fish and Game Commission, 2550 N. State St., Jackson 44, Mississippi.... 1923
**Cool, Leon D. Jr., RFD 2, Rockville, Maryland.... 1950
Coombes, Robert Armitage Hamilton, The Zoological Museum, Tring, Hartfordshire, England.... 1936

Cope, James B[onwill], Earlham College, Richmond, Indiana. 1949
*Cottam, Clarence, Fish and Wildlife Service, Department of the Interior, Washington 25, D. C. 1929
Cottrell, George William Jr., 70 Lake View Ave., Cambridge 38, Massachusetts. . 1941
**Cottrille, Betty Darling (Mrs. W. P.), 6075 Brown's Lake Road, Jackson, Michigan 1950
*Cottrille, Dr. W[illiam] Powell, 408–411 Reynolds Bldg., Jackson, Michigan. 1949
Court, Edward J., 1723 Newton St., N.W., Mount Pleasant, Washington, D. C. . . 1944
Craighead, John J., Jackson, Wyoming. 1950
*Crawford, Alan Jr., White Horse Road, Devon, Pennsylvania. 1949
**Creager, Joe C[lyde], L. A. Cann Rd., Drawer 1267, Ponca City, Oklahoma. 1947
Crewson, Ray[mond] [Charles], 111 East Texas Ave., Sebring, Ohio. 1947
Crichton, Vincent, Chapleau, Ontario, Canada. 1948
*Crone, Miss Mary C., 6602 1st St., N. W., Washington 12, D. C. 1949
Crooks, Malcolm P., Apt. 3, 1134 Lee St., Charleston, West Virginia. 1950
Cross, Frank C., 9413 Second Ave., Silver Spring, Maryland. 1949
Crowder, Orville W[right], Chase, Maryland. 1946
*Cruickshank, Allan Dudley, Highland Hall, Rye, New York. 1939
Cruttenden, John Rudy, 2020 Main St., Quincy, Illinois. 1945
Cumming, Fairman Preston, 824 Sutton Hill Rd., Nashville 4, Tennessee. 1950
*Cunningham, Frederick Arthur, Foxholm, North Dakota. 1950
*Cunningham, James W., 3009 E. 19th Terrace, Kansas City 1, Missouri. 1935
*Cunningham, Miss Nance M., 3600 Mandell, Houston 6, Texas. 1950
*Cunningham, Tinsley Halter, Route 2, Seven Locks Rd., Rockville, Maryland. . . . 1950
Curtis, Miss Elizabeth L[ong], 5648 Beach Drive, Seattle 6, Washington. 1935
Curtis, Mrs. Vee Kaelin, 1450 Bancroft Way, Berkeley 2, California. 1950
*Dambach, Charles A., Ohio Division of Wildlife, State Office Bldg., Columbus 15, Ohio. 1934
Damon, David, Box 10188 Oaks Branch, Fort Worth, Texas. 1933
*Dana, Edward Fox, 57 Exchange St., Portland 3, Maine. 1939
**D'Angelo, Angelo [Ralph], 809 Palisade Ave., Union City, New Jersey. 1949
Daniels, Ben S[weet], 78 Wood St., Willoughby, Ohio. 1949
Daniels, George Goetz, 74 Phillips St., Boston, Massachusetts. 1949
Darby, Richard T[horn], 5046 Chancellor St., Philadelphia 39, Pennsylvania. 1948
**Darden, Mrs. Colgate W[hitehead] Jr., University of Virginia, Charlottesville, Virginia. 1943
Dater, Eleanor E. (Mrs. John Y. Jr.), 259 Grove St., Ramsey, New Jersey. 1949
Davey, Dr. Winthrop N[ewbury], University Hospital, Ann Arbor, Michigan. . . . 1941
*Davidson, Miss Sarah A., 344 Summit Ave., St. Paul 2, Minnesota. 1949
**Davidson, William Mark, 1504 Bodell St., Orlando, Florida. 1933
*Davis, Clifford Vernon, Department of Zoology and Entomology, Montana State College, Bozeman, Montana. 1945
*Davis, Dr. David E[dward], School of Hygiene and Public Health, Johns Hopkins University, Baltimore 5, Maryland. 1940
Davis, George W., 148 Northfield St., Montpelier, Vermont. 1941
Davis, Howard Henry, Little Stoke, Patchway, Bristol, England. 1947
*Davis, John, 1420 East Mountain St., Pasadena, California. 1939
*Davis, L[ouis] Irby, Box 988, Harlingen, Texas. 1933
Davis, Mrs. N. H., Plainfield, Vermont. 1950
*Davis, Russell S., Clayton, Illinois. 1947
Davis, W[illiam] B., Department of Wildlife Management, College Station, Texas. . 1938

Davis, William Franklin, 423 W. 46th St., Ashtabula, Ohio. . . . 1947
*Davisson, A. Paul, 1112 Fleming Ave., Fairmont, West Virginia. . . . 1947
Dawn, Walter H[enry], 1143 Rogers Ave., Brooklyn 26, New York. . . . 1945
Dawson, Richard G[len], 6114 Indiana Ave., Kansas City 4, Missouri. . . . 1949
*Dean, Mrs. Blanche Evans, 1503 Ridge Rd., Homewood, Birmingham 9, Alabama 1947
*Dear, Lt. Col. L[ionel] S[extus], Box 127, Port Arthur, Ontario, Canada. . . . 1939
Dechen, Mrs. Lillian Orvetta, 14 Summer St., Port Dickinson, Binghamton 6, New York. . . . 1939
*Decker, C[harles] O., 6450 Kenwood Ave., Chicago 37, Illinois. . . . 1938
*Deevey, Edward S[mith] Jr., Osborn Zoological Laboratory, Yale University, New Haven 11, Connecticut. . . . 1948
*DeGarmo, William Russell, Darby Apt. No. 5, 10th St., Elkins, West Virginia. . . . 1946
*DeGroot, Dudley Sargent, West Virginia University, Morgantown, West Virginia. . . . 1948
Dehner, Rev. Eugene W[illiam], St. Benedict's College, Atchison, Kansas. . . . 1944
***Delacour, Jean Theodore, American Museum of Natural History, Central Pk. West at 79th St., New York 24, New York. . . . 1944
Delaney, Joyce Marie, 471 Allard Rd., Gross Pointe Farms, Michigan. . . . 1950
Delavan, Wayne G., Route 2, Box 61, Bronson, Kansas. . . . 1943
*DeLime, John L., 101 No. 16th St., Murray, Kentucky. . . . 1949
*DeLury, Ralph Emerson, 330 Fairmont Ave., Ottawa, Ontario, Canada. . . . 1920
*Denham, Reginald [Francis], 100 Central Park South, New York 19, New York. . 1948
Denman, Clayton Charlton, 1751 Naomi Place, Seattle 5, Washington. . . . 1949
*Denton, J[ames] Fred Jr., 1510 Pendleton Rd., Augusta, Georgia. . . . 1935
Derby, James Vaughn Jr., 2704 Emmett Rd., Silver Spring, Maryland. . . . 1950
**de Schauensee, Rodolphe Meyer, Devon, Pennsylvania. . . . 1945
***Desmond, Hon. Thomas C[harles], Box 670, Newburgh, New York. . . . 1942
*Deusing, Murl, Milwaukee Public Museum, Milwaukee 3, Wisconsin. . . . 1937
Devitt, Otto Edmund, 68 Donegall Drive, Toronto 17, Canada. . . . 1935
Dice, Lee R[aymond], Laboratory of Vertebrate Biology, 1135 E. Catherine St., Ann Arbor, Michigan. . . . 1943
Dick, John Henry, Dixie Plantation, Meggett, South Carolina. . . . 1949
Dickinson, J[oshua] C[lifton] Jr., Department of Biology, University of Florida, Gainesville, Florida. . . . 1939
*Dickinson, Miriam S. (Mrs. William Winston), 2006 Reid Ave., Bluefield, West Virginia. . . . 1942
Diesselhorst, G[erd] [Felix], Emmering Hauptstrasse 32, Fürstenfeldbruck bei München, Bayern, Germany, American Zone. . . . 1949
Dietrich, Otto Killian, 225 Glendora Ave., Louisville 12, Kentucky. . . . 1947
Dill, Herbert H., United States Fish and Wildlife Service, Sumner, Missouri. . . . 1950
*Dingle, Edward von Siebold, Huger, South Carolina. . . . 1921
*Dittemore, Lester P., 1207 Byron Ave., Topeka, Kansas. . . . 1950
*Dixon, Miss Clara, Albion College, Albion, Michigan. . . . 1947
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Dixon, Keith Lee, Museum of Vertebrate Zoology, Berkeley 4, California. . . . 1946
**Dodge, Victor K[enney], 137 Bell Court West, Lexington 23, Kentucky. . . . 1935
Doerhoefer, Basil, Upper River Rd., Route 1, Louisville, Kentucky. . . . 1947
**Doering, Hubert R., 485 Clemens Ave., Kirkwood 22, Missouri. . . . 1945
Domm, Lincoln V[alentine], Department of Anatomy, University of Chicago, Chicago 37, Illinois. . . . 1936

*Donahoe, Dr. John D., 335 N. Summit Ave., Sioux Falls, South Dakota........ 1949
Dorney, Robert Starbird, Box D, Horicon, Wisconsin........................ 1949
*Douglass, Donald W., Game Division, Michigan Department of Conservation, Lansing 13, Michigan.. 1929
Dowling, Paul Bruce, 257 E. Beaver Ave., State College, Pennsylvania.......... 1950
Drechsler, H[oward] A., 1008 Pleasant St., Oak Park, Illinois.................. 1949
*Drum, Miss Margaret, 217 South St., Owatonna, Minnesota.................. 1937
*Dudley, John M[urchie], 20 Germain St., Calais, Maine...................... 1944
Duffield, Marjorie O[lney] (Mrs. John W.), Institute of Forest Genetics, Placerville, California.. 1948
*Duffy, John Joseph Jr., 1067 S. Campbell St., Springfield, Missouri............ 1950
Duflot, Miss Helen [Louise], 320 East 61 St., New York 21, New York.......... 1949
Dugan, Caldwell Norton, 446 14th Ave., N. E., St. Petersburg, Florida.......... 1948
***Dugan, Dr. William Dunbar, 221 Pierce Ave., Hamburg, New York............ 1945
*Du Mont, Philip A[tkinson], 4114 Fessenden St., N. W., Washington 16, D. C..... 1928
Dunbar, Munro, North Portal, Saskatchewan, Canada........................ 1950
Dundas, Lester Harvey, Rice Lake Wildlife Refuge, East Lake, Minnesota...... 1943
Dunn, George, 7026 College Ave., Kansas City, Missouri.................... 1950
Dunstan, Girvin R., 5030 Huron River Dr., Route 1, Dexter, Michigan.......... 1950
Dunt, R. H., "Lynhurst," Kenilworth Rd., Sale, Cheshire, England............ 1948
Dusi, Julian L[uigi], Department of Zoology and Entomology, Alabama Polytechnic Institute, Auburn, Alabama.................................. 1941
*Duvall, Allen Joseph, Fish and Wildlife Service, Washington 25, D. C........... 1942
Dyar, Mrs. Jessie Goss, 974 N. Audubon Rd., Indianapolis 19, Indiana.......... 1948
*Dyer, William A., 112 Allen St., Union City, Michigan...................... 1947
*Eagleson, Joseph P., 85 East Gay St., Columbus 15, Ohio..................... 1943
*East, Ben, Holly, Michigan.. 1948
*Eastman, Whitney H[askins], General Mills Inc., General Mills Bldg., Minneapolis 1, Minnesota.. 1941
*Eastwood, Sidney Kingman, 5110 Friendship Ave., Pittsburgh 24, Pennsylvania.. 1928
Eaton, Stephen W[oodman], Department of Biological Sciences, St. Bonaventure College, St. Bonaventure, New York.............................. 1942
Eckelberry, Don [Richard], Bentleyville Rd., Chagrin Falls, Ohio............. 1948
Eddy, Garrett, 4515 Ruffner St., Seattle 99, Washington..................... 1947
*Edeburn, Ralph M[ilton], Department of Zoology, Marshall College, Huntington, West Virginia.. 1947
*Edge, Mrs. Charles N[oel], 1215 Fifth Ave., New York 29, New York............ 1931
*Edwards, Ernest P[reston], Sweet Briar, Virginia 1947
**Edwards, James L., 27 Stanford Place, Montclair, New Jersey................ 1947
**Edwards, Robert Davis, c/o Stock Trend Service, 95 State Street, Springfield, Massachusetts.. 1945
***Edwards, Robert L[omas], Department of Biology, Harvard University, Cambridge 38, Massachusetts.. 1945
Edwards, R[oger] York, Department of Zoology, University of British Columbia, Vancouver, British Columbia, Canada.............................. 1948
*Edwards, Sylvia P. (Mrs. Robert L.), Department of Biology, Harvard University, Cambridge 38, Massachusetts.................................. 1946
*Eichler, Herbert Philip, 2211 Andrews Avenue, New York 53, New York........ 1949
*Eifert, Virginia S[nider] (Mrs. Herman D.), 705 W. Vine St., Springfield, Illinois.. 1941
***Eisenmann, Eugene, 11 Broadway, New York 4, New York.................... 1942

Eisenmayer, Miss Betty Jean, 1917 N. Main Ave., Springfield 1, Missouri. 1948
*Ekblaw, Dr. George Elbert, 511 W. Main St., Urbana, Illinois. 1914
*Ekdahl, Conrad H[oward], 401 N. Stone Ave., LaGrange, Illinois. 1949
**Eklund, Dr. Carl M[ilton], Rocky Mountain Laboratory, Hamilton, Montana. . . . 1945
*Elder, William H[anna], Wildlife Conservation Bldg., University of Missouri, Columbia, Missouri 1938
Ellarson, Robert S[cott], 431 Sterling Court, Madison 5, Wisconsin. 1948
Ellett, C[layton] W[ayne], Department of Botany, Ohio State University, Columbus, Ohio 1948
*Elliott, Dr. Richard M., 1564 Vincent St., St. Paul 8, Minnesota. 1940
Ellis, Miss Hazel Rosetta, Keuka College, Keuka Park, New York. 1942
Elstone, Robert Oliver, 249 Charlton Ave. West, Hamilton, Ontario, Canada. . . . 1949
Emerson, David L[owell], 25 Everett Ave., Providence, Rhode Island. 1939
***Emerson, Guy, 16 E. 11th St., New York 3, New York. 1938
**Emilio, S[hepard] Gilbert, Route 4, Laconia, New Hampshire. 1929
**Emlen, John Thompson Jr., Department of Zoology, University of Wisconsin, Madison 6, Wisconsin 1936
*English, P[ennoyer] F[rancis], Professor of Wildlife Management, Department of Zoology, Pennsylvania State College, State College, Pennsylvania. 1934
Ennis, J[ames] Harold, Cornell College, Mt. Vernon, Iowa. 1942
Erickson, John G[erhard], 1628 Louisiana Avenue, Minneapolis 16, Minnesota. . . . 1949
*Erickson, Mary M[arilla], Santa Barbara College, Santa Barbara, California. 1930
Erickson, Ray Charles, Box 113, Malheur National Wildlife Refuge, Burns, Oregon 1939
**Errington, Paul Lester, Iowa State College, Ames, Iowa. 1932
Eshleman, S[ilas] Kendrick III, 4045 Pine St., Philadelphia 4, Pennsylvania. 1947
Eskew, Cletis Theodore, 2010 Pearl St., Wichita Falls, Texas. 1949
**Eslinger, Kenneth N., % Josten's, 2019 Crawford St., Terre Haute, Indiana. 1950
*Estes, J. K., 1909 Speedway, Wichita Falls, Texas. 1950
**Eustice, Mrs. Alfred L., 1138 Sheridan Rd., Evanston, Illinois. 1944
*Evans, Evan Morton, 550 Park Ave., New York, New York. 1929
Evans, Robert L[eland], Rondaxe Mountain Fire Tower, Old Forge, New York. . 1949
Evans, Sylvia H. (Mrs. Harold), "Awbury," Germantown, Philadelphia 38, Pennsylvania 1949
*Evenden, Fred G[eorge] Jr., United States Fish and Wildlife Service, River Basin Studies Signal Depot, Sacramento, California. 1948
**Everest, David Clark, Rothschild, Wisconsin. 1949
Everett, Miss Constance Antoinette, 206 Ninth St. N.E., Waseca, Minnesota. . . . 1948
Eye, Osbra Lee, New, West Virginia. 1950
*Eynon, Alfred E., 5 Beach Rd., Verona, New Jersey. 1947
*Eyster, Marshall Blackwell, Department of Biology, Southwestern Louisiana Institute, Lafayette, Louisiana. 1947
Fairbanks, Virginia (Mrs. Paul H.), United States Forest Service, Pinehurst Ranger Station, Miramonte, California. 1949
Fales, John H[ouse], 1917 Elkhart St., Silver Spring, Maryland. 1939
Falls, J. Bruce, 173 Arlington Ave., Toronto, Ontario, Canada. 1948
**Fargo, William G[ilbert], 506 Union St., Jackson, Michigan. 1923
**Farmer, Earl Wilson, Box 1362, Steubenville, Ohio. 1946
*Farner, Donald S[ankey], Department of Zoology, The State College of Washington, Pullman, Washington 1941

Farrand, H. F., 7 Guest Lane, Wilmington 280, Delaware 1950
Farrar, William Edmund Jr., 184 College St., Macon, Georgia 1950
Fast, Arthur H., 4924 Rock Spring Rd., Arlington, Virginia 1950
*Fawver, Ben J[unior], State Teachers College, Mankato, Minnesota 1948
*Fedore, Robert R., 2781 Greytower Rd., Route 7, Jackson, Michigan 1949
*Feighner, Miss Lena Veta, 298-1 S. Tremont St., Kansas City 2, Kansas 1935
***Feigley, Miss Margaret D[enny], 544 Chestnut St., Winnetka, Illinois 1944
*Fennell, Chester M[artin], Post Engineers, Kyoto Post Command, APO 9, San Francisco, California 1949
Ferguson, Denzel Edward, 142 Kings Rd., Corvallis, Oregon 1950
*Ferguson, William, 5907 Mason St., Omaha, Nebraska 1946
*Fermanich, Carl Vincent, Kenmare, North Dakota 1950
Ferris, Frank F., 2828 Idlewood Ave., Youngstown, Ohio 1950
*Fichter, Edson Harvey, 256 S. 11th Ave., Pocatello, Idaho 1948
Fickett, Steve Burrows Jr., Box 29, Gulf Hammock, Florida 1950
Findley, J[ohn] Scott, 1201 S. Center Ave., Sioux Falls, South Dakota 1949
Finninger, Paul Charles, 1533 College St., Topeka, Kansas 1950
*Finster, Miss Ethel B., Louisburg College, Louisburg, North Carolina 1931
*Fischer, Richard B[ernard], Laboratory of Ornithology, Fernow Hall, Cornell University, Ithaca, New York 1942
**Fish, William Ralph, 302-B Entwistle St., China Lake, California 1950
*Fisher, Mrs. Glen, Route 3, Box 168, Oshkosh, Wisconsin 1948
*Fisher, Harvey I[rvin], Department of Zoology, University of Illinois, Urbana, Illinois 1949
*Fleisher, Edward, Brooklyn College, Brooklyn 10, New York 1947
Fleugel, James Bush, 1104 American National Bank Bldg., Kalamazoo, Michigan . . 1942
*Flexner, John Morris, 1331 Yale Station, New Haven, Connecticut 1948
*Fluck, Paul H., 73 N. Union St., Lambertville, New Jersey 1949
*Fluekiger, Miss Dora Whitman, Hotel Dauphin, Broadway at 67th St., New York 23, New York 1948
Flyger, Vagn F., Box 8, Solomons, Maryland 1950
**Foley, Edward J[ames], 5349 N. Bay Ridge Ave., Milwaukee 11, Wisconsin 1947
Folger, Miss Edith Virginia, Campus Gates Manor, Oxford, Ohio 1946
*Foote, Maurice E[dwin], 269 Lawrence St., Ravenna, Ohio 1932
Ford, Edward R[ussell], Newaygo, Michigan 1914
Fordham, Stephen Crane Jr., Delmar Game Farm, Delmar, New York 1948
Forsyth, Mrs. Louise A[nn], 71 Lebanon Rd., Hanover, New Hampshire 1940
Forsyth, Max Allyn, 1114 Mourer St., New Castle, Indiana 1948
Foster, Edwin G[arfield], 36 Arvine Park, Rochester 11, New York 1948
Foster, John Bristol, 136 Dawlish Ave., Toronto 12, Ontario, Canada 1950
Foster, Thomas H., West Road, Bennington, Vermont 1950
*Fox, Adrian C., Box 1451, Lincoln, Nebraska 1937
Fox, W[illiam] Sherwood, 270 Regent St., London, Ontario, Canada 1949
Francis, George [Reid], 382 Hillsdale Ave. E., Toronto 12, Ontario, Canada 1949
Frazier, Harold H[erman], 357 N. 1st East, Logan, Utah 1949
*Fredrickson, Richard William, 1019 Kentucky St., Lawrence, Kansas 1947
**French, Elizabeth Thomas (Mrs. C. T.), 1801 Las Lomas, Albuquerque, New Mexico 1943
Frey, Rev. Edward Snively, 517 Hummel Ave., Lemoyne, Pennsylvania 1950
*Fries, Waldemar Hans, 220 Valley Rd., Merion Station, Pennsylvania 1947

Frohling, Robert C[harles], 1218 Plane St., Union, New Jersey. 1949
*Frost, Herbert Hamilton, Ricks College, Rexburg, Idaho. 1941
*Frye, O. Earle Jr., Game & Fresh Water Fish Commission, Tallahassee, Florida. 1940
*Fryman, Miss Kathryn E[lizabeth], 114 Oak St., Wyandotte, Michigan. 1943
*Furniss, Owen C[ecil], Alberni, Vancouver Island, British Columbia, Canada. 1934
*Gabrielson, Ira N[oel], 1807 Preston Rd., Parkfairfax, Alexandria, Virginia. 1913
Gairloch, Stanley S[tanford], Kingston, Rhode Island. 1948
*Gale, Larry R[ichard], Box 296, Frankfort, Kentucky. 1948
*Galley, John E[dmond], 1610 W. Holloway Ave., Midland, Texas. 1945
Gallup, Frederick Norman, Box 614, Escondido, California. 1947
***Gammell, R[obert] T[heodore], Kenmare, North Dakota. 1943
**Ganier, Albert F[ranklin], 2112 Woodlawn Drive, Nashville 5, Tennessee. 1915
Garner, William V[aughn], 447 E. Wadsworth St., Philadelphia 19, Pennsylvania. 1948
Garrett, Miss [Mary] Lois, 1709 Chestnut St., Kenova, West Virginia. 1942
Garrett, Miss Vivian L., Box 135, Hiram, Ohio. 1949
Garrison, David L[loyd], Lincoln, Massachusetts. 1940
Garrity, Devin A[dair], 23 E. 26th St., New York 10, New York. 1949
Gashwiler, Jay S., Fish and Wildlife Service, 436 Federal Bldg., Salt Lake City, Utah. 1944
*Gates, Miss Doris [Berta], 814 W. 4th, North Platte, Nebraska. 1948
Gates, Mabelle F. (Mrs. Clough), 714 6th Ave. E., Superior, Wisconsin. 1949
**Gay, J. Adele (Mrs. Leslie N.), "Gay Willows," Hollins Ave., Baltimore 10, Maryland. 1949
Gensch, Robert Henry, United States Fish and Wildlife Service, 1001 Fidelity Bldg., Kansas City 6, Missouri. 1939
George, John L[othar], Department of Zoology, Vassar College, Poughkeepsie, New York. 1939
Gershten, Miss Blossom, Biology Department, Lake Forest College, Lake Forest, Illinois. 1949
Gerstell, Richard, 355 North West End Ave., Lancaster, Pennsylvania. 1939
Getzendaner, Mrs. Georgia Belle, 1814 Santa Fe., Corpus Christi, Texas. 1950
Gibson, George G[ordon], 265 Sheldrake Blvd., Toronto, Ontario, Canada. 1949
Gibson, Col. Robert Howard, Route 2, Box 336, St. Helena, California. 1949
*Gier, Herschel Thomas, Department of Zoology, Kansas State College, Manhattan, Kansas. 1937
Giesecke, Louise Bittner (Mrs. G. E.), 1307 11th Ave. N., Fargo, North Dakota. 1950
Gifford, Dr. Harold, 3636 Burt Ave., Omaha, Nebraska. 1936
Gilbert, Kathryn Helen, 714 1st Ave. W., Grand Rapids, Minnesota. 1945
Gill, C[harles] T[erry], Box 1607, Harlingen, Texas. 1947
Gill, Geoffrey, 24 Overlook Drive, Huntington, Long Island, New York. 1949
**Gillen, Harold W., Denslow Rd., New Canaan, Connecticut. 1944
*Gilliard, Ernest Thomas, American Museum of Natural History, Central Park W. at 79th St., New York 24, New York. 1949
Giltz, Maurice L[eroy], Department of Zoology and Entomology, Ohio State University, Columbus 10, Ohio. 1939
Ginn, William Edward, 511 E. Van Buren, Columbia City, Indiana. 1941
Glandon, Earl W., Stapleton, Nebraska. 1950
Glass, Miss Ruth, R.F.D. 1, Box 121, New Cumberland, West Virginia. 1950
Glazier, William H[enry] M[onroe], 36 High St., Peterborough, New Hampshire. 1948
Glenn, Robert W., 509 Orchard Ave., Avalon, Pittsburgh 2, Pennsylvania. 1934

Glick, Bruce, 103 S. Franklin Ave., Margate, New Jersey 1949
**Glore, W[alter] S[cott] Jr., 350 Maple Ave., Danville, Kentucky 1947
Glover, Fred A[rthur], Wildlife Management, Humboldt State College, Arcata, California 1947
*Goebel, Herman [John], 78–52 80th St., Brooklyn 27, New York 1946
Goellner, Karl Eugene, Coe College, Cedar Rapids, Iowa 1950
**Goetz, Christian John, 3503 Middleton Ave., Cincinnati 20, Ohio 1930
*Goldman, George M., 1755 N. Decatur Rd., N. E., Atlanta, Georgia 1947
Good, Ernest E[ugene], Department of Zoology and Entomology, Ohio State University, Columbus 10, Ohio 1937
Good, Wallace M., 1920 Massachusetts St., Lawrence, Kansas 1949
*Goodman, John David, Department of Zoology, University of Michigan, Ann Arbor, Michigan 1944
Goodpasture, Mrs. E. W., 408 Fairfax Ave., Nashville 5, Tennessee 1950
*Goslin, Charles R[ussell], 726 E. King St., Lancaster, Ohio 1940
*Goslin, Robert M[artin], 316 Wilson Ave., Columbus 5, Ohio 1936
Gosner, Kenneth Lynn, 698 Clifton Ave., Newark, New Jersey 1948
*Gowanloch, James Nelson, Department of Wildlife and Fisheries, 126 Civil Courts Bldg., New Orleans, Louisiana 1949
*Graaskamp, Lester William, Langdon Ave., Irvington-on-Hudson, New York 1949
Graber, Richard R., 210 W. 10th St., Florence, Kansas 1949
**Gram, Margaret [Edwards] (Mrs. H. James Jr.), 207 McKinley, Detroit 30, Michigan 1941
*Grange, Wallace, Babcock, Wisconsin 1930
*Grant, Cleveland P[utnam], 245 Davis St., Mineral Point, Wisconsin 1928
Grave, Kathryn Ann, Department of Zoology, Mount Holyoke College, South Hadley, Massachusetts 1947
Graves, Miss [Cynthia] Katherine, 1209 N. Illinois St., Apt. 28, Indianapolis 2, Indiana 1942
Grayce, Robert, 141 Main St., Rockport, Massachusetts 1946
***Greeley, Fred[erick], University Houses 15-B, Eagle Heights, Madison, Wisconsin 1942
*Green, N[orman] Bayard, Department of Zoology, Marshall College, Huntington 1, West Virginia 1943
**Greene, Albert E., 517 Oswego St., Ann Arbor, Michigan 1939
Greenhalgh, Clifton M., 1230 E. 1st St., S., Salt Lake City 2, Utah 1939
Greenwalt, Ernest J., Wichita Refuge, Cache, Oklahoma 1950
*Greer, Rev. Edward C., 422 E. 10th St., Davenport, Iowa 1948
Gregg, Pearl, Middlebourne, West Virginia 1949
*Gregory, Stephen S[trong] Jr., Box N., Winnetka, Illinois 1922
Griffee, W[illet] E., 510 Yeon Bldg., Portland 4, Oregon 1947
*Griffin, William W[elcome], 211 N. Madison St., College Park, Georgia 1946
**Grimes, S[amuel] A[ndrew], 4627 Peachtree Circle E., Jacksonville 7, Florida 1924
*Grimm, William C[arey], Pocono Lake, Pennsylvania 1939
***Grinnell, Lawrence I[rving], 710 Triphammer Rd., Ithaca, New York 1939
**Griscom, Ludlow, Museum of Comparative Zoology, Cambridge 38, Massachusetts 1937
*Groesbeck, William M[aynard], 376 Seneca Rd., Hornell, New York 1947
Grose, E. R., Box 38, Sago, West Virginia 1939
*Groskin, Horace, 210 Glenn Road, Ardmore, Pennsylvania 1937

*Gross, Alfred Otto, 11 Boody St., Brunswick, Maine. 1927
*Grube, G[eorge] E[dward], Department of Biology, Gettysburg College, Gettysburg, Pennsylvania. 1948
*Gruenewald, Robert Franklin, Box 422, Sanborn, Iowa. 1948
Guhl, A[lphaeus] M[atthew], Department of Zoology, Kansas State College, Manhattan, Kansas. 1948
Gullion, Gordon W[right], Museum of Vertebrate Zoology, University of California, Berkeley 4, California. 1947
*Gunderson, Harvey Lorraine, Museum of Natural History, University of Minnesota, Minneapolis 14, Minnesota. 1941
*Gunn, W[illiam] W[alker] H[amilton], 178 Glenview Ave., Toronto 12, Ontario, Canada. 1945
Hadeler, Catherine [Wilma], 900 Harmon Ave., Dayton 9, Ohio. 1945
*Hadley, Thomas E., 306 S. Saginaw St., Holly, Michigan. 1944
**Hagar, Mrs. Jack, Box 339, Rockport, Texas. 1930
**Hagar, Joseph A., Pleasant St., Marshfield Hills, Massachusetts. 1949
*Hague, Florence S., Sweet Briar College, Sweet Briar, Virginia. 1931
*Haines, Robert L[ee], 54 E. Main St., Moorestown, New Jersey. 1947
*Haines, T. P., 1395 Adams St., Apt. E., Macon, Georgia. 1941
*Hainsworth, William P[ickard], 216 Railroad Ave., North Andover, Massachusetts. 1930
*Hale, James B[all], 405 Washburn Place, Madison 3, Wisconsin. 1947
Hall, Fran, 518 Union St., Northfield, Minnesota. 1950
**Hall, Fred T., Davenport Public Museum, 704 Brady St., Davenport, Iowa. 1937
*Hall, George A[rthur], Department of Chemistry, West Virginia University, Morgantown, West Virginia. 1946
*Hall, Mrs. Gladys A[reta], 912 Douglas Ave., Kalamazoo 52, Michigan. 1947
Halladay, Ian R[ussel], 218 Belsize Dr., Toronto 12, Ontario, Canada. 1948
*Haller, Frank D[enver], 235 E. Mechanic St., Bloomfield, Indiana. 1940
Haller, Lt. Karl W., Box 3344, Killeen Base, Killeen, Texas. 1934
*Hallman, Roy Cline, Box 435, Port St. Joe, Florida. 1928
**Hamann, Carl F[erdinand], Maple Lane, Aurora, Ohio. 1947
*Hamerstrom, Frances [Mrs. Frederick N. Jr.], Plainfield, Wisconsin. 1948
*Hamerstrom, Frederick N. Jr., Plainfield, Wisconsin. 1934
*Hamilton, Charles W[hiteley], 2639 Fenwood Rd., Houston 5, Texas. 1948
*Hamilton, William J[ohn] Jr., Department of Conservation, Cornell University, Ithaca, New York. 1933
*Hammond, Merrill C[lyde], Lower Souris Refuge, Upham, North Dakota. 1939
Hamnett, William Lawrence, 2809 Kittrell Dr., Raleigh, North Carolina. 1950
*Hampe, Irving E., 5559 Ashbourne Rd., Halethorpe, Baltimore 27, Maryland. 1945
*Hamrum, Charles L[owell], Department of Biology, Gustavus Adolphus College, St. Peter, Minnesota. 1949
Hancock, James W[illiam], Route 1, Madisonville, Kentucky. 1946
*Handley, Charles Overton Sr., 6571 Roosevelt Ave., Charleston 4, West Virginia. . 1925
*Handley, Charles Overton Jr., Museum of Zoology, University of Michigan, Ann Arbor, Michigan. 1941
**Hann, Harry W[ilbur], 1127 Church St., Ann Arbor, Michigan. 1930
*Hanna, Wilson Creal, 141 E. F St., Colton, California. 1936
Hansen, Norman J., 223 N. Franklin St., Ames, Iowa. 1950
Hansman, Robert H[erbert], 1215 Ave. F, Fort Madison, Iowa. 1948

Hanson, E[lmer] C[harles], 1305 Wisconsin Ave., Racine, Wisconsin........... 1940
Harder, Richard C., Matfield Green, Kansas............................... 1949
Hardy, [Cecil] Ross, Professor of Biological Science, Orange-Los Angeles State College, 5400 E. Anaheim St., Long Beach 4, California.................... 1940
*Hardy, Frederick C., 133 N. Central St., Apt 2, Somerset, Kentucky........... 1948
*Harford, Dr. Henry M[inor], 926 Argyle Bldg., Kansas City 6, Missouri......... 1946
*Harley, James Bickel, Route 1, Box 394, Pottstown, Pennsylvania............. 1947
Harmon, Dr. Karl S., 209 S. Walnut St., Eldon, Missouri.................... 1947
*Harper, Francis, Huyck Preserve, Rensselaerville, New York................ 1930
Harrell, Byron Eugene, 1594 Stanford Ave., St. Paul 5, Minnesota............. 1943
Harrington, Fr. Elwin Raymond, O. F. M., Duns Scotus College, 9 Mile and Evergreen Roads, Detroit 19, Michigan.. 1950
Harrington, Dr. Paul, 813 Bathurst St., Toronto 4, Ontario, Canada........... 1948
**Harriot, Samuel C[arman], 200 W. 58th St., New York 19, New York........... 1934
Harris, Albert, Box 206, Hillsboro, North Dakota.......................... 1950
Harris, Dave, Box 84, Deadwood, South Dakota............................. 1947
Harris, Stuart Kimball, 33 Lebanon St., Winchester, Massachusetts........... 1946
**Harrison, Hal H., 1102 Highland St., Tarentum, Pennsylvania................ 1941
Harry, Gordon Bryan, 6160 Flushing Rd., Flushing, Michigan................ 1950
Hartley, Albert Thomas, Columbiana, Ohio................................. 1944
*Hartman, Frank A[lexander], Hamilton Hall, Ohio State University, Columbus, Ohio... 1941
*Hartmeister, Felix A., Box D, Horicon, Wisconsin.......................... 1949
*Hartwell, Arthur M[owry], 1506 Mt. Curve, Minneapolis, Minnesota........... 1940
Hartwell, Reginald Warner, 121 N. Fitzhugh St., Rochester 14, New York...... 1947
Harwell, Charles Albert, 2630 Hilgard Ave., Berkeley 9, California............. 1948
Haskins, Mrs. Edith D., 39 Park St., Hanover, New Hampshire............... 1941
*Hatch, [Clara] Grenville, 1548 Wilhelmina Rise, Honolulu 17, Hawaii......... 1948
Hauschild, John Orville, 922 Club Dr., High Point, North Carolina........... 1949
Hausler, Mrs. M., 7348 Paxton Ave., Chicago, Illinois...................... 1936
**Havemeyer, Henry O[sborne], Mahwah, New Jersey.......................... 1930
Haverschmidt, Fr., Box 644, Paramaribo, Surinam, Dutch Guiana............. 1946
Hawkins, B. L., Hamline University, St. Paul 4, Minnesota................. 1936
*Hawkins, Naomi M., 401 W. Pine St., Missoula, Montana.................. 1948
Hawksley, Mrs. Janet P., 123 Lafayette Circle, Cincinnati, Ohio............. 1942
Hawksley, Oscar, Department of Biology, Central Missouri State College, Warrensburg, Missouri.. 1948
*Hayden, H. Vincent, 157 Hobart St., Danvers, Massachusetts................ 1950
*Hazard, Frank Orlando, Wilmington College, Wilmington, Ohio............... 1946
Hazard, Norwood [Cady], 2815 Sheridan St., Davenport, Iowa............... 1949
*Heaps, Pearl, 1916 Park Ave., Baltimore 17, Maryland...................... 1949
**Hebard, Frederick V[anuxem], 1500 Walnut St. Bldg., Philadelphia 2, Pennsylvania.. 1940
Hecht, William Robert, 104 Ripley St., Columbia, Missouri.................. 1950
*Heckler, Sydney B., 1207 N. 7th St., St. Louis 6, Missouri.................. 1942
*Hedges, Harold C[harles], Route 2, Lake Quivira, Kansas City 3, Kansas....... 1940
Heed, William B[attles], 101 West Virginia Ave., West Chester, Pennsylvania.... 1947
*Heffelfinger, George W[right] P[eavey] Jr., Route 2, Mound, Minnesota......... 1948
*Hefley, Harold M[artin], Division of Biological Sciences, Mississippi Southern College, Station A, Hattiesburg, Mississippi............................. 1942

Heiser, J[oseph] M[atthew] Jr., 1724 Kipling St., Houston, Texas.......... 1939
Helfer, Louise, 111 Ninth St., Watkins Glen, New York.......... 1938
Henderson, Hon. William L., Gibson Island, Maryland.......... 1950
Henderson, Georgia Anne, 63 Old Forest Hill Rd., Toronto, Ontario, Canada.... 1950
Hendricks, G[eorge] Bartlett, % The Berkshire Museum, Pittsfield, Massachusetts.......... 1943
*Hendrickson, George O[scar], Department of Zoology and Entomology, Iowa State College, Ames, Iowa.......... 1933
Hengst, Mrs. James R., 2111 Park Hill Dr., Columbus 9, Ohio.......... 1948
*Henry, C. J., Seney National Wildlife Refuge, Germfask, Michigan.......... 1933
*Hensley, Marvin Max, Laboratory of Ornithology, Fernow Hall, Cornell University, Ithaca, New York.......... 1947
*Henwood, Mrs. Ethel May, 604 W. Main St., Urbana, Illinois.......... 1941
*Herman, Carlton M., Patuxent Research Refuge, Laurel, Maryland.......... 1946
Hessin, Miss Twila, Route 2, Nashport, Ohio.......... 1949
**Hesterberg, Gene A[rthur], Forestry Department, Michigan College of Mining and Technology, Houghton, Michigan.......... 1948
Hetrick, Louis Howard, 85 E. Water St., Gettysburg, Pennsylvania.......... 1950
Hetzel, Ralph Louis, 7322 Cornell, University City 5, Missouri.......... 1950
**Hewitt, Marvin Ward, Greensboro, Maryland.......... 1949
*Hewitt, Oliver H., Fernow Hall, Cornell University, Ithaca, New York.......... 1943
Hibbard, Edmund Arthur, Route 1, St. Cloud, Minnesota.......... 1950
Hick, Edward, 320 Victor St., St. Louis 4, Missouri.......... 1950
*Hickey, J[oseph] J[ames], 424 University Farm Place, Madison 5, Wisconsin.... 1940
***Hicks, Lawrence Emerson, 8 Chatham Rd., Columbus, Ohio.......... 1925
Hicks, Thomas W[illiam], Box 2382, University Station, Gainesville, Florida...... 1949
*Hiett, Lawrence D[avison], 1945 Ottawa Dr., Toledo 6, Ohio.......... 1929
Higgins, Thomas Francis, Box 221, Sound Beach, Long Island, New York.......... 1947
*Hill, Herbert Oliver, 329 Summit Ave., Redlands, California.......... 1938
Hill, Julian Werner, 1106 Greenhill Ave., Wilmington 56, Delaware.......... 1935
Hill, Raymond W., 3316 Kenmore Rd., Shaker Heights, Cleveland 22, Ohio...... 1941
*Hillmer, Davis B., 8228 Woodward Ave., Detroit 2, Michigan.......... 1926
*Hinds, Frank J., Biology Department, Western Michigan College of Education, Kalamazoo, Michigan.......... 1935
Hine, Ruth Louise, Department of Zoology, University of Wisconsin, Madison 5, Wisconsin.......... 1949
*Hinshaw, Thomas D[oane], 1827 San Juan Ave., Berkeley 7, California.......... 1926
*Hobson, Dorothy Madden (Mrs. L. G.), 1309 N. Pennsylvania Ave., Apt. 39, Indianapolis 2, Indiana.......... 1935
*Hochbaum, [Hans] Albert, Delta, Manitoba, Canada.......... 1942
Hock, Raymond J., Box 960, Arctic Health Research Center, Anchorage, Alaska. 1946
*Hodel, Earl M., Box 305, Elkin, North Carolina.......... 1949
Hodgdon, Kendrick Yale, 16 Welsh St., Frostburg, Maryland.......... 1950
*Hodges, Mrs. Elizabeth D[ole], 5001 Paseo, Kansas City 4, Missouri.......... 1948
Hodges, James, 324 W. 31st St., Davenport, Iowa.......... 1946
Hoffmeister, Linus C[hristian], 504 W. Ripa Ave., Lemay 23, Missouri.......... 1939
Hofslund, Pershing B[enard], Biology Department, Duluth Branch, University of Minnesota, Duluth, Minnesota.......... 1944
*Holcombe, Miss Grace Vera, 834 Mulvane Ave., Topeka, Kansas.......... 1949
Holden, Fenn M[itchell], Box 428, Grayling, Michigan.......... 1947

*Holland, Harold May, Box 615, Galesburg, Illinois. 1915
Horton, Louise D. (Mrs. M. B.), 360 Prospect St., Fall River, Massachusetts. . . . 1941
Hostetter, D[avid] Ralph, Eastern Mennonite School, Harrisonburg, Virginia. . . . 1937
Hough, Mrs. Eleanor Sloan, 1515 Mariposa Ave., Boulder, Colorado. 1941
Houle, Jeannette Ellen, 1214 5th St., S.E., Minneapolis 14, Minnesota. 1950
Houston, C[larence] Stuart, Box 459, Yorkton, Saskatchewan, Canada. 1948
Hovey, Percy L., Brookgreen Gardens, Georgetown, South Carolina. 1950
Howe, [Henry] Branch Jr., 414 W. Ponce de Leon Ave., Decatur, Georgia. 1943
*Howell, Joseph C., Department of Zoology and Entomology, University of Tennessee, Knoxville 16, Tennessee. 1938
*Howell, Thomas R[aymond], Museum of Vertebrate Zoology, University of California, Berkeley 4, California. 1947
*Hoyt, J[ohn] Southgate Y[eston], Box 54, Etna, New York. 1936
*Hubert, Philip Arthur Jr., 17 Lenox Rd., Summit, New Jersey. 1948
Hughes, Wallace, 624 S. W., 51st St., Oklahoma City, Oklahoma. 1947
*Hughes, Dr. W. W,. Embro, Ontario, Canada. 1944
Hulbert, Lloyd Clair, Box 901 C.S., Pullman, Washington. 1938
**Humphrey, Philip Strong, Museum of Zoology, University of Michigan, Ann Arbor, Michigan. 1948
Hundley, Marion Lee, Box 43, Granville, Ohio. 1950
Hunt, Helen C. (Mrs. E. C.), 302 N. Mill St., Eldon, Missouri. 1950
*Hunt, Ormond Edson, 8120 Jefferson Ave., E, Detroit 14, Michigan. 1937
Huntington, Charles Ellsworth, 38 Kildeer Rd., Hamden 14, Connecticut. 1950
Hurley, John B[eatty], 401 S. 17th Ave., Yakima, Washington. 1937
*Hutchinson, Arthur E., 40 Glendessary Lane, Santa Barbara, California. 1940
Hutchison, Robert B., 1719 Marine St., Boulder, Colorado. 1950
Imhof, Thomas A[nthony], 307 38th St., Fairfield, Alabama. 1950
**Ingersoll, Albert M[ills], 908 F Street, San Diego 1, California. 1921
Ivor, H. Roy, Route 1, Cooksville, Ontario, Canada. 1945
Jabinson, Marguerite N. (Mrs. L. R.), 1503 N. Pennsylvania Ave., Apt. 55, Indianapolis 2, Indiana. 1946
*Jackson, C[icero] F[loyd], University of New Hampshire, Durham, New Hampshire. 1936
Jacobson, Dr. Malcolm A[rthur], 57 W. 57th St., New York 19, New York. 1947
Jahn, Laurence Roy, 106½ Lake View Ave., Lake Mills, Wisconsin. 1950
James, Douglas Arthur, Vivarium Bldg., University of Illinois, Champaign, Illinois. 1946
Jameson, E[verett] W[illiams] Jr., Division of Zoology, University of California, Davis, California. 1941
**Janes, Anita A. (Mrs. Henry L.), 1032 College Ave., Racine, Wisconsin. 1949
*Janvrin, Dr. Edmund R[andolph] P[easlee], 38 E. 85th St., New York 28, New York. 1942
*Jaques, Florence Page (Mrs. F. L.), 610 W. 116th St., New York 27, New York. . 1950
**Jaques, F[rancis] L[ee], 610 W. 116th St., New York 27, New York. 1939
*Jaques, Dr. H[arry] E[dwin], 709 N. Main St., Mt. Pleasant, Iowa. 1949
*Jenkins, James H[obart], Department of Biology, University of Georgia, Athens, Georgia. 1939
*Jenner, William A., Apt. 201, 5516 Parkland Court, S.E., Washington 19, D. C.. . 1933
*Jensen, Mrs. Ove F., RFD, Maple City, Michigan. 1948
*Jeter, Horace Hearne, 4534 Fairfield Ave., Shreveport, Louisiana. 1950

Johnson, Albert George, 271 South St., Jamaica Plain 30, Massachusetts....... 1947
*Johnson, Donald T[heodore], 2336 W. 108th Place, Chicago 43, Illinois.......... 1947
*Johnson, Frank M[organ], 930 Greenbrier St., Charleston 1, West Virginia...... 1946
*Johnson, Irene W. (Mrs. Oscar), 38 Portland Place, St. Louis 8, Missouri........ 1931
Johnson, J[ohn] O[scar], 112 7th St., S.E., Watertown, South Dakota............ 1948
Johnson, Miss Mabel Claire, 30 Westfield Rd., West Hartford, Connecticut...... 1946
Johnson, Myrtle Elizabeth, 4647 55th St., San Diego 5, California.............. 1948
*Johnson, Robert A[nthony], 98 East St., Oneonta, New York.................. 1930
**Johnson, Dr. Rodney K[nox], 419 Pine St., Friend, Nebraska.................. 1949
Johnson, William M[cNutt], Route 6, Knoxville, Tennessee.................. 1939
Johnston, David Ware, Department of Zoology, University of Georgia, Athens, Georgia.......... 1943
Johnston, James W[eeks] Jr., 217 N. Wayne St., Arlington, Virginia............ 1948
Johnston, Richard F., 2223 Union St., Berkeley 4, California.................. 1949
*Johnston, Verna R[uth], 1812 W. Sonoma Ave., Stockton, California............ 1941
Jones, Glenn Ellis, 1115 W. Garver St., Norman, Oklahoma.................. 1950
*Jones, Harold C[harles], Box 61, East Carolina Teachers College, Greenville, North Carolina.......... 1929
Jones, John C[ourts], 5810 Namakagan Rd., Washington 16, D. C............... 1931
****Jones, Lynds, 352 W. College St., Oberlin, Ohio........................ Founder
*Jones, S[olomon] Paul, 509 West Ave., N., Waukesha, Wisconsin................ 1921
Jones, Thelma F., 2422 E. 74th St., Chicago 49, Illinois...................... 1949
Jorae, Irene Frances, Central Michigan College of Education, Mt. Pleasant, Michigan.......... 1942
Joyner, J[ohn] W[illiam] E[dwin], Box 647, Rocky Mount, North Carolina........ 1947
*Jung, Clarence [Schram], 6383 N. Port Washington Rd., Milwaukee 9, Wisconsin.. 1921
*Jurica, E., Lisle, Illinois.......... 1940
Kaerne, William H[arald], 127 Ruby St., Winnipeg, Manitoba, Canada.......... 1949
Kahmann, Karl W., Route 2, Hayward, Wisconsin.......................... 1941
*Kahn, Dina H[ope] (Mrs. Reuben L.), 1122 Michigan Ave., Ann Arbor, Michigan.. 1938
*Kalmbach, Edwin Richard, Fish and Wildlife Service, 546 Custom House, Denver 2, Colorado.......... 1926
*Kampf, Roy C., 555 Ruth St., Bridgeport, Connecticut...................... 1948
**Kase, John C[harles], 501 Chestnut St., Mifflinburg, Pennsylvania.............. 1937
Kaspar, John L[oren], 392 23rd St., Oshkosh, Wisconsin...................... 1947
**Keating, Dr. F[rancis] Raymond Jr., 620 10th Ave., S.W., Rochester, Minnesota.. 1944
Keeley, Katherine, 4801 3rd St., N.W., Washington, D. C..................... 1950
Keely, Josiah, Box 383, Huntington, Long Island, New York.................. 1947
**Kelker, George H., School of Forestry, Utah State Agricultural College, Logan, Utah.......... 1938
Keller, C[harles E[dward], 637 Eastern Ave., Indianapolis 1, Indiana............ 1946
Keller, Richard T[homas], 717 S. 16th St., St. Joseph, Missouri................ 1943
*Kelley, Mrs. Eliza Mabel, 71 Division St., Newport, Rhode Island.............. 1948
*Kelley, William N[eal], Route 14, Box 1070, Affton 23, Missouri................ 1948
Kelly, George Fleming, Department of Research and Education, Solomons, Maryland.......... 1947
*Kelsey, Homer Stone, 16 Chestnut St., Spring Valley, New York.............. 1945
Kelsey, Paul Manning, Route 1, Newfield, New York........................ 1948
*Kelso, Leon H[ugh], 1370 Taylor St., N.W., Washington 11, D. C............... 1930
Kemnitzer, Allen E[dward], 969 Five Mile Line Rd., Webster, New York........ 1949

*Kemsies, Emerson, 102 Farragut Rd., Greenhills 18, Ohio. . . . 1948
Kenaga, Eugene E., 1629 Isabella Rd., Route 5, Midland, Michigan. . . . 1949
*Kendeigh, S[amuel] Charles, Vivarium Building, University of Illinois, Champaign, Illinois 1923
**Kennedy, Bruce A[lbert] H[amilton], 389 West 10th Avenue, Columbus 1, Ohio. . . 1947
Kenyon, Karl W[alton], Fish and Wildlife Service, 2725 Montlake Blvd., Seattle 2, Washington. . . . 1948
*Kersey, Lulu Brooks (Mrs. Glen B.), 647 Gordon Terrace, Chicago 13, Illinois. . . . 1948
Kersting, Cecil Carl, 3722 East Apple, Route 6, Muskegon, Michigan. . . . 1950
Kessel, Miss Brina, Fernow Hall, Cornell University, Ithaca, New York. . . . 1946
Ketner, Keith B[rindley], 915 W. Reynolds St., Plant City, Florida. . . . 1949
Kiefer, Elizabeth D[eyo] (Mrs. Francis), 243 Gratiot Blvd., Port Huron, Michigan 1941
***Kieran, John, 4506 Riverdale Ave., New York 63, New York. . . . 1942
Kildow, T[homas] Monroe, Box 520, Tiffin, Ohio. . . . 1948
*Killip, Thomas III, 139 Edgeview Lane, Rochester 18, New York. . . . 1946
Killpack, Merlin L[eo], Roosevelt High School, Roosevelt, Utah. . . . 1950
Kimball, Miss Mary Boydston, 809 Main St., Sistersville, West Virginia. . . . 1950
Kindler, Mrs. Grace E[mma], Sheridan Drive, Route 1, Lancaster, Ohio. . . . 1937
King, John Arthur, Laboratory of Vertebrate Biology, University of Michigan, Ann Arbor, Michigan 1947
**King, Louise E. (Mrs. Stanley), 5533 Bryant Ave., S., Minneapolis, Minnesota. . 1944
*King, Margaret Jane, Physiology Department, Medical College of South Carolina, Charleston 16, South Carolina. . . . 1949
*Kirkpatrick, Charles M., Department of Forestry, Purdue University, West Lafayette, Indiana. . . . 1948
Kitz, William Martin, Box D, Horicon, Wisconsin. . . . 1950
Kizer, Richard Allen, 303½ State St., West Lafayette, Indiana. . . . 1947
**Klein, Richard P[aul], Jackson Rd., Route 4, Chagrin Falls, Ohio. . . . 1946
*Kletzly, Robert C[harles], Conservation Commission, Romney, West Virginia. . . . 1948
Klimstra, W[illard] D[avid], Zoology Department, Southern Illinois University, Carbondale, Illinois 1948
Klonick, Allan S., 828 Grosvenor Rd., Rochester 18, New York. . . . 1941
Kluge, Miss Helen H[enrika], Woodtick Rd., Waterbury 12, Connecticut. . . . 1942
Knollmeyer, Lewis Edward, Department of Commerce and Economics, University of Vermont, Burlington, Vermont 1945
Knox, Miss Margaret R[ichardson], 4030 Park Ave., Indianapolis 5, Indiana. . . . 1937
Koehler, Mrs. Arthur, 2308 11th Ave., Los Angeles 16, California. . . . 1941
*Kolb, C[harles] Haven Jr., 5021 Midwood Ave., Baltimore 12, Maryland. . . . 1937
**Kortright, Francis H[erbert], 633 Eastern Ave., Toronto 8, Ontario, Canada. . . . 1943
**Kosmopoulos, Leslie Walker, 2024 Garden St., Santa Barbara, California. . . . 1949
*Kossack, Charles W[alter], 715 S. Division St., Barrington, Illinois. . . . 1945
*Kozicky, Edward L[ouis], Department of Zoology and Entomology, Iowa State College, Ames, Iowa 1943
*Kramar, Nada, 1906 K St., N.W., Washington 6, D. C.. . . . 1947
*Kramer, Theodore C[hristian], 1307 Granger Ave., Ann Arbor, Michigan. . . . 1939
Kraus, Douglas L[awrence], Rhode Island State College, Kingston, Rhode Island. . 1942
Krebs, Juanita F[ile] (Mrs. R. W.), 3576 N. Blvd., Baton Rouge 12, Louisiana. . . . 1946
Krug, Howard H[enry], Chesley, Ontario, Canada. . . . 1944
Krumm, Kenneth, Lacreek National Wildlife Refuge, Martin, South Dakota. . . . 1948

*Kugel, Miss Agnes R[ose], Botany Department, Grand Rapids Junior College, Grand Rapids, Michigan . . . 1946
Kuhn, Kenneth H[erbert], 3734 N. 53rd St., Milwaukee 16, Wisconsin . . . 1949
Kuitert, Louis Cornelius, Agricultural Experiment Station, University of Florida, Gainesville, Florida . . . 1938
*Kutz, George C[arl], 705 S. Holcombe Street, Stillwater, Minnesota . . . 1944
Kyle, Mrs. Jennie Lynne, 2000 Albemarle Place, Winter Park, Florida . . . 1947
*Kyllingstad, Henry C[arrell], 1419 Santa Cruz Dr., Santa Fe, New Mexico . . . 1940
Laakso, Martin, Westminister College, Fulton, Missouri . . . 1948
Lacey, Miss Mifton H., Box 614, Canton, Ohio . . . 1939
Lacey, Mrs. Trammell Calhoun, Box 328, Nacogdoches, Texas . . . 1950
*Lagler, Karl F., Department of Zoology, University of Michigan, Ann Arbor, Michigan . . . 1941
Laing, Charles Corbett, 762 N. Van Buren St., Milwaukee 2, Wisconsin . . . 1948
Lake, Robert N., Woodstock, Vermont . . . 1941
Lambert, Adaline Train (Mrs. Howard T.), 1903 Ross St., Sioux City, Iowa . . . 1947
***Lambert, Bert H., The Huntington Hotel, Pasadena, California . . . 1936
*Lancaster, Douglas A[lan], 1437 8th St., S., Fargo, North Dakota . . . 1949
*Land, Hugh Colman, 3372 8th St. Road, Huntington, West Virginia . . . 1950
*Larrabee, Austin Park, 4815 Beach Dr., Seattle 6, Washington . . . 1921
*Laskey, Amelia Rudolph (Mrs. Frederick Charles), 1521 Graybar Lane, Nashville 12, Tennessee . . . 1928
*Latimer, Alice Roana, 1014 8th St., Bismarck, North Dakota . . . 1950
Latzko, Gordon Charles, Box 160, Muhlenberg College, Allentown, Pennsylvania . . . 1948
*Lawlor, Abigail (Mrs. Gene), Victor, Iowa . . . 1947
Lawrence, Mrs. Louise de Kiriline, Rutherglen, Ontario, Canada . . . 1946
Lawrie, James Harry, 16560 Oakfield Ave., Detroit 35, Michigan . . . 1950
Lay, Daniel Wayne, Buna, Texas . . . 1939
*Lea, Robert B[ashford], 24 N. Worth Ave., Elgin, Illinois . . . 1940
Leavitt, Benjamin Burton, Department of Biology, University of Florida, Gainesville, Florida . . . 1947
*Lee, [William] Donald, 431 Greenmount Blvd., Dayton 9, Ohio . . . 1947
**Lee, Miss Zell Charlotta, 1423 Douglas St., Sioux City 18, Iowa . . . 1946
*Leebrick, Karl C[layton] Jr., Route 3, Canastota, New York . . . 1946
*Leedy, Daniel L[ovey], Fish and Wildlife Service, Branch of Wildlife Research, Washington 25, D. C. . . . 1936
*Legg, William C[larence], Mt. Lookout, West Virginia . . . 1939
Lehrman, Robert L., 412 E. 79th St., New York 21, New York . . . 1950
**Lengemann, Miss Martha A., 360 Cedar St., Imlay City, Michigan . . . 1946
*Leopold, A[ldo] Starker, Museum of Vertebrate Zoology, Berkeley 4, California . . . 1940
*Leopold, Frederic, Burlington, Iowa . . . 1950
Levi, Herbert W., University of Wisconsin, Extension Center, Wausau, Wisconsin . . . 1949
Levy, Alice K[lund] (Mrs. H. P.), 840 Seward St., Hollywood 38, California . . . 1941
Lewis, C. Bernard, The Science Museum, Institute of Jamaica, Kingston, Jamaica, British West Indies . . . 1947
*Lewis, Harrison Flint, Dominion Wildlife Service, Department of Mines and Resources, Ottawa, Ontario, Canada . . . 1939
*Lewis, Brother Hubert, La Salle Institute, Glencoe, Missouri . . . 1940
*Lewy, Alfred, 2051 E. 72nd Place, Chicago 49, Illinois . . . 1915

Lieftinck, John E[dmund], 1826 W. Market St., Akron 13, Ohio 1945
*Lien, Helen J. (Mrs. Boyd M.), 5148 29th Ave., S., Minneapolis 17, Minnesota 1944
*Ligon, J[ames] Stokley, Box 950, Carlsbad, New Mexico 1948
*Lincoln, Frederick Charles, Fish and Wildlife Service, Washington 25, D. C. 1914
Lindauer, Millard R., 8509 Atlantic Ave., Margate, New Jersey 1949
*Linsdale, Jean M[yron], Jamesburg Route, Monterey, California 1928
**Linton, M[orris] Albert, 315 E. Oak Ave., Moorestown, New Jersey 1941
**Linz, Arthur William, 468 Stevens Ave., Ridgewood, New Jersey 1950
**Livesay, [Elizabeth] Ann, 712 S. MacArthur Blvd., Springfield, Illinois 1948
*Lloyd, C[lark] K., 11 N. Elm St., Oxford, Ohio 1925
*Lloyd, Hoyes, 582 Mariposa Ave., Rockcliffe Park, Ottawa, Ontario, Canada 1922
**Lockwood, Dr. Robert M., Veterans Administration Hospital, McKinney, Texas. 1949
Loetscher, Frederick W[illiam] Jr., 507 W. Main, Danville, Kentucky 1946
Logan, Dulaney, R.F.D. 1, Box 449, Louisville 1, Kentucky 1950
Longley, William H[oward], Box 362, Kasson, Minnesota 1943
Lord, Frederick P[omeroy], 39 College St., Hanover, New Hampshire 1939
Loring, George G[ardner], Prides Crossing, Massachusetts 1949
Lovell, Harvey B., 3011 Meade Ave., Louisville 13, Kentucky 1936
***Low, Seth Haskell, Patuxent Research Refuge, Laurel, Maryland 1931
*Lowe, William Joseph, 205 Second St., Bismarck, North Dakota 1947
***Lowery, George H[ines] Jr., Museum of Zoology, Louisiana State University, Baton Rouge, Louisiana 1937
Lowther, Malcolm Alfred, 706 Hazelwood, Detroit, Michigan 1944
*Ludwig, Claud C[ecil], 279 Durand St., E., Lansing, Michigan 1938
***Ludwig, Dr. Frederick Edwin, 2864 Military St., Port Huron, Michigan 1941
*Lueth, Francis X[avier], Coden, Alabama 1947
Lukens, William Weaver Jr., Upper Gulph Rd., Radnor, Pennsylvania 1947
Lundin, Harry, Sparbanksvägen 11, Stockholm 32, Sweden 1948
**Lunk, William A., 1328 Springfield St., Willow Run, Michigan 1937
Lupient, Mrs. Mary [Louise], 212 S.E. Bedford St., Minneapolis 14, Minnesota 1944
*Luthy, Ferd Jr., 306 N. Institute, Peoria, Illinois 1937
**Lyman, Clara Cross (Mrs. Frederick C.), 1716 Colfax Ave., S., Minneapolis, Minnesota 1944
Lyons, Rhoda G. (Mrs. Robert C.), 25 Woodland St., Huntington, Long Island, New York 1940
*MacFayden, Clifford J[ames], 816 Duplex Ave., Toronto, Ontario, Canada 1948
MacLeod, Charles Franklyn, Department of Zoology, University of British Columbia, Vancouver, British Columbia, Canada 1949
*MacLulich, D[uncan] [Alexander], 15 Bellwood Ave., Ottawa, Ontario, Canada 1933
*MacMullan, R[alph] Austin, Game Division, Department of Conservation, Lansing 13, Michigan 1940
*MacQueen, Mrs. Peggy Muirhead, 48 New Jersey Ave., Bergenfield, New Jersey . . 1940
McAlister, [James] Don, 1723 Cardiff Rd., Columbus 12, Ohio 1949
McAllister, Claude Huntley Jr., Route 2, Box 171, Wilmington, North Carolina . . 1950
*McAtee, Waldo Lee, 3 Davie Circle, Chapel Hill, North Carolina 1911
***McCabe, Robert A[lbert], 424 University Farm Place, Madison, Wisconsin 1942
*McCamey, [Benjamin] Frank[lin] [Jr.], Plant Science Department, University of Connecticut, Storrs, Connecticut 1945
*McClure, Bernice, 2543 Woodburn Ave., Apt. 10, Cincinnati 6, Ohio 1948
**McClure, H[owe] Elliott, Box 292, Station A., Bakersfield, California 1942

McClure, John Francis, 7050 N. Oatman Ave., Portland 17, Oregon. . . . 1949
*McConnell, H. B., 142 E. Warren St., Cadiz, Ohio. . . . 1948
McCravy, Tucker, 78 Ridge Rd., Lyman, South Carolina. . . . 1949
**McCue, Earl Newlon, Box 104, Morgantown, West Virginia. . . . 1941
*McCullagh, Dr. E[rnest] Perry, 2020 E. 93rd St., Cleveland, Ohio. . . . 1937
McDonald, Malcolm E., Box 42, Ann Arbor, Michigan. . . . 1936
McEldowney, Sue Hiett, 705 Washington St., Newell, West Virginia. . . . 1949
McEntee, Elinor G. (Mrs. Howard G.), 490 Fairfield Ave., Ridgewood, New Jersey. . . . 1948
**McGaw, Elizabeth T[aylor] (Mrs. G. Hampton), 18 Beech St., Woodsville, New Hampshire. . . . 1945
*McGeen, Daniel S., 1231 Cass Lake Rd., Pontiac, Route 9, Michigan. . . . 1944
McKay, Arlie K[yle], Route 2, Box 252, Baytown, Texas. . . . 1949
McKay, Reginald R., 1310 Willowbranch, Apt. 18, Jacksonville 5, Florida. . . . 1950
*McKeever, Christopher Killian, 1043 Carroll St., Brooklyn 25, New York. . . . 1948
McKeever, J[ames] L[awrence], 516 Homewood Ave., Peterborough, Ontario, Canada. . . . 1949
McKinley, Daniel L[awson], % Poultry Station, Mountain Grove, Missouri. . . . 1948
*McKinley, George G[ael], 104 N. Western Parkway, Louisville 12, Kentucky. . . . 1945
McKinney, Robert G[erhard], 86 Hurstbourne Rd., Rochester 9, New York. . . . 1948
*McKinney, Mrs. Walter A., 2932 S. Woodward Blvd., Tulsa 5, Oklahoma. . . . 1945
*McKnight, Edwin T[hor], 5038 Park Place, Friendship Station, Washington 16, D. C. . . . 1936
McLaughlin, John Harvey, Bellepoint, West Virginia. . . . 1949
McLeod, John Allen Jr., 113 E. Hendrix St., Greensboro, North Carolina. . . . 1950
McMannama, Miss Zella Vida, 3959 15th Ave., N.E., Seattle 5, Washington. . . . 1950
**McMath, Robert R., Lake Angelus, Route 4, Box 104, Pontiac 4, Michigan. . . . 1934
McMillan, John Frank, College of St. Thomas, St. Paul, Minnesota. . . . 1950
McMurray, Arthur A., 924 Aubra St., Memphis 11, Tennessee. . . . 1939
McNeill, Richard E[arl], 10638 Charlevoix Ave., Detroit 14, Michigan. . . . 1948
McQuarrie, Harold James, Gore Bay, Manitoulin Island, Ontario, Canada. . . . 1950
Maass, Miss Frances Blanche, 85-41 102 St., Richmond Hill, Long Island, New York 18, New York. . . . 1948
*Mack, H[orace] G[ordon], % Gilson Mfg. Company Ltd., Guelph, Ontario, Canada. . . . 1937
**Mackenzie, Dr. Locke Litton, 829 Park Ave., New York 21, New York. . . . 1947
**Madtes, George R[ummel], 622 Glenwood Ave., Youngstown 2, Ohio. . . . 1949
Magath, Dr. Thomas Byrd, Mayo Clinic, Rochester, Minnesota. . . . 1935
*Magner, J[ohn] Marshall, 516 Bacon Ave., Webster Groves 19, Missouri. . . . 1948
*Mahlburg, Milton William, 1109 Grant Ave., Rockford, Illinois. . . . 1949
*Mainster, Raymond Waite, 3716 Croydon Rd., Baltimore 7, Maryland. . . . 1949
Malinowski, John Carl, Boxwood, 323 N. College Parkway, Frederick, Maryland. . . . 1949
**Mallory, Dwight H[arcourt], 17 Sherwood St., Brockville, Ontario, Canada. . . . 1946
*Manley, C[alvert] H[amilton], 1113 Woodmont Ave., New Kensington, Pennsylvania. . . . 1946
*Manners, Edward Robert, 216 New Broadway, Brooklawn, New Jersey. . . . 1942
Manning, T. H., 37 Linden Terrace, Ottawa, Canada. . . . 1950
**Mannix, Lucille Marie (Mrs. J. R.), 11424 Cedar Rd., Apt. E 2, Cleveland, Ohio. . . . 1947
*Manville, Richard H[yde], Department of Zoology, Michigan State College, East Lansing, Michigan. . . . 1941

*Mara, Robert M[ichael], The Dearborn Inn, Dearborn, Michigan. 1949
*Marfield, George R[owland], 1820 S. Olive Ave., Alhambra, California. 1948
*Margolin, Abe S[tanley], Phoenix College, Phoenix, Arizona. 1944
Markle, Millard S., Earlham College, Richmond, Indiana. 1948
Marks, Jack Loran, 1504 S. W. Salmon St., Portland, Oregon. 1949
Marsh, Miss Lillian [Irene], Tall Oaks, River Rd., Route 5, Manitowoc, Wisconsin. 1949
Marshall, Dr. A. J., St. Bartholomew's Hospital Medical College, Charterhouse Square, London E. C. 1, England. 1950
*Marshall, Raymond O[scar], Route 2, Columbiana, Ohio. 1945
*Marshall, Terrell, 372 Skyline Dr., Park Hill, North Little Rock, Arkansas. 1944
*Marshall, William H[ampton], Division of Entomology and Economic Zoology, University Farm, St. Paul 1, Minnesota. 1942
Martin, Paul S[chultz], Box 532, West Chester, Pennsylvania. 1946
**Marvel, Carl S[hipp], 404 W. Pennsylvania Ave., Urbana, Illinois. 1949
**Maslowski, Karl H[erbert], 1034 Maycliff Place, Cincinnati 30, Ohio. 1934
Mason, C[harles] N[athan] Sr., 6432 31st St., N. W., Washington 15, D. C.. 1947
*Mason, Esther, 2523 Montgomery St., Louisville 12, Kentucky. 1941
Mayer, Bird Wells (Mrs. John H.), 103 S. Miller St., Cynthiana, Kentucky. 1948
*Mayfield, G[eorge] R[adford], Vanderbilt University, Nashville, Tennessee. 1917
*Mayfield, Harold F[ord], 2557 Portsmouth Ave., Toledo 12, Ohio. 1940
***Mayr, Ernst, American Museum of Natural History, 79th St. and Central Park West, New York 24, New York. 1933
*Mazzeo, Rosario, 120 Elm St., North Cambridge 40, Massachusetts. 1947
Meacham, Frank B., State Museum, Raleigh, North Carolina. 1948
Mead, Frank Waldreth, 227 Brighton Rd., Columbus 2, Ohio. 1948
**Meade, Dr. Gordon M[ontgomery], Trudeau Sanatorium, Trudeau, New York. 1937
Meanley, Brooke, 4513 College Ave., College Park, Maryland. 1950
Mehner, John F., 1003 James St., Pittsburgh 34, Pennsylvania. 1949
**Meitzen, Logan H[erman], Star Route 2, Box 63, Anahuac, Texas. 1947
Mellinger, E[nos] O[ren], Chincoteague National Wildlife Refuge, Box 62, Chincoteague, Virginia. 1939
***Melone, Theodora G[ardner], Geology Library, University of Minnesota, Minneapolis 14, Minnesota. 1947
*Meltvedt, Burton W., Paullina, Iowa. 1930
Mendall, Howard L[ewis], 28 Pendleton St., Brewer, Maine. 1936
Meng, Heinz Karl, 116 Miller St., Ithaca, New York. 1943
**Mengel, Jane S[trahan] (Mrs. Robert M.), 20 East Shore Dr., Whitmore Lake, Michigan. 1948
**Mengel, Robert M[orrow], 20 E. Shore Dr., Whitmore Lake, Michigan. 1937
*Menninger, Phil B., 1724 Collins Ave., Topeka, Kansas. 1949
*Meredith, Col. Russell Luff, c/o General Delivery, Augusta, Montana. 1946
*Meritt, James Kirkland, 99 Battle Rd., Princeton, New Jersey. 1944
***Merry, Miss Katherine, State Teachers' College, Wayne, Nebraska. 1944
**Mers, W[illiam] H[enry], 1659 Marlowe Ave., Cincinnati 2, Ohio. 1949
*Messner, Clarence John, 308 McKinley, Grosse Pointe 30, Michigan. 1944
**Metcalf, H[omer] N[oble], Department of Horticulture, Montana State College, Bozeman, Montana. 1944
**Metcalf, Zeno P[ayne], State College Station, Raleigh, North Carolina. 1900
*Mewaldt, L[eonard] R[ichard], Department of Zoology, Washington State College, Pullman, Washington. 1947

*Meyer, Henry, Department of Biology, Ripon College, Ripon, Wisconsin. 1939
**Meyerriecks, Andrew J[oseph], Box 4251, University of Tennessee, Knoxville, Tennessee. 1948
*Meyers, Dr. Kenneth Lewis, 2601 Far Hills Ave., Dayton 9, Ohio. 1949
Michaud, Howard H[enry], 824 N. Chauncey St., West Lafayette, Indiana. 1938
Michaux, Joy Houston (Mrs. Frank W.), 1607 Bluff St., Wichita Falls, Texas. . . . 1947
Michener, Mrs. Harold, 418 N. Hudson Ave., Pasadena 4, California. 1950
Mickey, Arthur B[ayard], 1516 Rainbow Ave., Laramie, Wyoming. 1935
Middleton, Douglas S[arsfield], 7443 Buhr Ave., Detroit 12, Michigan. 1946
*Middleton, Mary Elizabeth (Mrs. Archie D.), Brady, Nebraska. 1948
*Mikkelson, Edyth A. (Mrs. Herbert G.), 4200 Chicago Ave., Minneapolis 7, Minnesota. 1948
Miles, Eleanor Burgess (Mrs. Philip E.), 1900 Arlington Place, Madison 5, Wisconsin. 1943
*Miller, Alden H[olmes], Museum of Vertebrate Zoology, University of California, Berkeley 4, California. 1930
Miller, Mrs. Alice, 4600 Firestone Ave., Terrace 7, Dearborn, Michigan. 1944
Miller, Mrs. Clarence Heath, 1354 Herschel Ave., Cincinnati 8, Ohio. 1941
***Miller, Douglas Scott, 122 Lawrence Ave., E., Toronto, Ontario, Canada. 1939
Miller, Mrs. Helen Burns, Spring Gap, Maryland. 1950
Miller, J[ames] Robert, 137 Haven Rd., University Heights, Syracuse 10, New York. 1946
Miller, Jerome Stapleton, 1338 Washtenaw Ave., Ann Arbor, Michigan. 1949
*Miller, Loye H[olmes], University of California, 405 Hilgard Ave., Los Angeles 24, California. 1939
*Miller, Lyle [DeVerne], 650 Almyra Ave., Youngstown, Ohio. 1947
Miller, Richard W., 113 W. 8th St., Cambridge, Ohio 1948
Miller, William R[osewarne], Fish and Game Service, Route 1, Milton, Vermont. . 1946
Mills, Robert H[enry], 511 Allen St., Bryan, Ohio. 1941
*Milnes, Miss Hattie K[ernahan], 331 Gowen Ave., Mt. Airy, Philadelphia 19, Pennsylvania. 1935
*Minard, Elbridge Alden, 25 Maple St., Auburndale 66, Massachusetts. 1950
Miner, Miss Edna Wolf, 2206 Brun Ave., Houston 19, Texas. 1947
*Minich, Edward C., 1047 Fairview Ave., Youngstown 2, Ohio. 1923
Minnick, Wilbur Shaffer, Conley Rd., Route 3, Painesville, Ohio. 1949
Miskimen, Miss Mildred, Dept. of Zoology, Ohio State University, Columbus 10, Ohio 1950
*Mitchell, Harold Dies, 378 Crescent Ave., Buffalo 14, New York. 1936
**Mitchell, Mrs. Osborne, Brazilian Traction, 25 King St. W., Toronto, Ontario, Canada. 1933
**Mitchell, Mrs. R. V., Wade Park Manor, East 107th St., Cleveland 6, Ohio. 1943
*Mitchell, Miss Verna E., 1900 F St., N. W., Washington 6, D. C.. 1949
**Mitchell, Dr. Walton I[ungerich], 398 Vassar Ave., Berkeley 8, California. 1893
Mockford, Edward [Lee], 4140 Graceland Ave., Indianapolis 8, Indiana. 1946
*Moe, Miss Jean G., Flora Stone Mather College, W. R. U., Cleveland 6, Ohio. . . . 1950
Mohler, Levi L[app], 1000 S. 35th St., Lincoln 8, Nebraska. 1942
*Mohr, Charles E[dward], Audubon Nature Center, Greenwich, Connecticut. . . . 1947
*Monk, Harry C[rawford], 406 Avoca St., Nashville 5, Tennessee. 1920
***Monroe, Burt L[eavelle], Ridge Rd., Anchorage, Kentucky. 1935
*Monroe, Burt L[eavelle] Jr., Ridge Rd., Anchorage, Kentucky. 1946
*Monson, Gale, Box 1717, Parker, Arizona. 1933

*Moore, Miss Dora, French Creek, West Virginia. 1934
*Moore, Mrs. Margaret Rodes, 335 W. Lexington St., Danville, Kentucky. 1949
Moore, Robert B[yron], 3434 Hollywood Dr., Baton Rouge 5, Louisiana. 1947
***Moore, Robert Thomas, Meadow Grove Place, Flintridge, Pasadena 2, California. . 1939
*Moran, James Vincent, 50 Seaverns Ave., Jamaica Plain 30, Massachusetts. 1943
*Moreno, Abelardo, Museo Poey, Cátedra "U", Escuela de Ciencias, University of Havana, Havana, Cuba 1949
Morrell, Charles K., 119 E. Maxwell St., Lexington, Kentucky. 1943
*Morrell, Miss Elise, 1311 White Ave., Knoxville 16, Tennessee. 1942
Morrison, Kenneth Douglas, National Audubon Society, 1000 Fifth Ave., New York 28, New York 1950
*Morrissey, Thomas J[ustin], 325 McClellan Blvd., Davenport, Iowa. 1946
*Morrow, Dessie Powers (Mrs. John Jr.), 1320 N. State St., Chicago 10, Illinois. . . . 1949
*Morse, John Salls, Sanbornton, New Hampshire. 1947
**Morse, Miss Margarette Elthea, 122 W. South S., Viroqua, Wisconsin. 1921
*Morton, Duryea, 135 Park Ave., Greenwich, Connecticut. 1947
Morton, Miss Thelma [Pauline], 1300 Burch Ave., N.W., Cedar Rapids, Iowa. . . . 1947
Mosby, Henry S., Virginia Cooperative Wildlife Research Unit, Blacksburg, Virginia 1950
Moser, Dr. Howard Franklin, 315 Cresswell St., Ridley Park, Pennsylvania. . . . 1949
*Moser, Jane Myers (Mrs. R. Allyn), Route 1, Benson Station, Omaha 4, Nebraska 1946
*Moser, Randolph, 470 E. Washington St., Apt. D., Pasadena 6, California. 1944
**Moser, Dr. R[euben] Allyn, Route 1, Benson Station, Omaha 4, Nebraska. 1940
*Mossman, Dr. H[arland] W[infield], 2902 Columbia Rd., Madison 5, Wisconsin. . 1948
*Mott, Peter Rhoades, Lawrencevile, New Jersey. 1949
Moule, John W[illiam], 68 North Oval St., Hamilton, Ontario, Canada. 1948
Muckley, Marion (Mrs. R. L.), 73 E. Elm St., Chicago 11, Illinois. 1950
**Mudge, Edmund W. Jr., 5926 Averill Way, Dallas, Texas. 1939
*Mueller, Helmut Charles, 2756 N. Palmer St., Milwaukee 12, Wisconsin. 1949
*Mumford, Russell E[ugene], Box 22, Mt. Vernon, Indiana. 1949
*Munter, Rear Admiral W[illiam] H[enry], (Retired), 4518 52nd Ave., N. E., Seattle 5, Washington 1933
Murdock, James Ingram, 311 Irving Ave., Glendale 1, California. 1940
*Murie, Adolph, McKinley Park, Alaska. 1932
*Murie, O[laus] J., Moose, Wyoming. 1934
*Murphey, Eugene Edmund, 432 Telfair St., Augusta, Georgia. 1935
*Murphy, Paul C[harles], 935 Goodrich Ave., Apt. 10, St. Paul 5, Minnesota. 1944
Murray, Rev. J[oseph] J[ames], 6 White St., Lexington, Virginia. 1931
Murray, Miss Gladys M., 5 California Apts., Charleston 1, West Virginia. 1950
*Musgrove, Jack W[arren], 2414 Adams Ave., Des Moines 10, Iowa. 1947
Musselman, T[homas] E[dgar], 124 South 24th St., Quincy, Illinois. 1940
Myers, Buford M[acMartin] Jr., 2609 Calhoun St., New Orleans 15, Louisiana. . . . 1948
Myers, Milton Merle, 135 Cambridge Ave., Dayton 6, Ohio. 1949
Myers, Robert Hamilton, 311 E. Main St., Frankfort, Kentucky. 1950
Nauert, Miss Erna, 7351 Sharp Ave., St. Louis 16, Missouri. 1948
Neal, Dorothy Phillips (Mrs. Charles), Box 133, Demorest, Georgia. 1946
*Neff, Johnson Andrew, 546 Custom House, Denver, Colorado. 1920
*Nelson, Arnold Lars, 3256 Van Hazen St., N. W., Washington 15, D. C.. 1932
*Nelson, Charles E[llsworth] Jr., 124 Oxford Rd., Waukesha, Wisconsin. 1937

Nelson, Detlof B[ennett], 269 E. 140th Place, Dalton, Illinois . . . 1947
Nelson, S. Page, McDonogh, Maryland . . . 1950
***Nelson, Theodora, 315 East 68th St., New York 21, New York . . . 1928
Nelson, T. W., 432 Jewell Ave., Topeka, Kansas . . . 1949
Nelson, Urban C., Box 1887, Juneau, Alaska . . . 1939
Nero, Robert William, Department of Zoology, University of Wisconsin, Madison 6, Wisconsin . . . 1947
*Nessle, James P., 1823 Barrows St., Toledo 13, Ohio . . . 1936
Netting, M[orris] Graham, Carnegie Museum, Pittsburgh 13, Pennsylvania . . . 1941
Nevius, Mrs. Richard, Route 1, Greeneville, Tennessee . . . 1940
*New, John, 340 W. 86th St., New York 24, New York . . . 1946
*Newman, Robert J[ames], Museum of Zoology, Louisiana State University, Baton Rouge, Louisiana . . . 1950
*Nice, L[eonard] B., 5725 Harper Ave., Chicago 37, Illinois . . . 1932
***Nice, Mrs. Margaret Morse, 5725 Harper Ave., Chicago 37, Illinois . . . 1921
**Nichols, Charles K[etcham], 212 Hamilton Rd., Ridgewood, New Jersey . . . 1933
*Nichols, John Treadwell, American Museum of Natural History, 79th St. and Central Park W., New York 24, New York . . . 1941
*Nichols, L[eon] Nelson, 331 E. 71st St., New York, New York . . . 1937
Nicholson, Donald John, 1224 Palmer St., Orlando, Florida . . . 1945
*Nickell, Walter Prine, Cranbrook Institute of Science, Bloomfield Hills, Michigan . . . 1943
Nieland, Carol G., Biology Bldg., University of Wisconsin, Madison 6, Wisconsin . . . 1949
Nields, James F. Jr., Hardwick, Massachusetts . . . 1950
**Nielsen, Beatrice Wise (Mrs. G. W.), 149 Ridgecrest Ave., Los Gatos, California . . . 1945
Niemann, Philip George, 4873 Underwood, Detroit 4, Michigan . . . 1950
Niess, William Victor, 2343 Hickory St., St. Louis 4, Missouri . . . 1950
*Nighswanger, Paul F., Route 9, Alva, Oklahoma . . . 1950
*Nordquist, Theodore C., 2701 York Ave. N., Robbinsdale 22, Minnesota . . . 1941
Noren, Oscar B., 17015 Kinlock, Detroit 19, Michigan . . . 1945
*Nork, Theodore J., 451 Wrightwood Ave., Chicago 14, Illinois . . . 1947
Norman, James L[ee], Department of Zoology, University of Oklahoma, Norman, Oklahoma . . . 1948
*Norris, Frank G[iles], Route 3, Steubenville, Ohio . . . 1946
Norris, Robert Allen, Museum of Vertebrate Zoology, University of California, Berkeley 4, California . . . 1941
Norris, Russell T[aplin], 50 Milk St., Newburyport, Massachusetts . . . 1939
*Norse, William J[ohn], 531 W. 211th St., New York 34, New York . . . 1939
*North, George W[ebster], 249 Charlton Ave., W., Hamilton, Ontario, Canada . . . 1941
*Northrop, Myron, % A. S. Aloe Company, 1831 Olive St., St. Louis 3, Missouri . . . 1945
***Nowland, Paul J., 700 Equitable Bldg., Wilmington, Delaware . . . 1950
Nunnemacher, Gertrude A. (Mrs. H. J.), 2815 E. Newberry Blvd., Milwaukee 11, Wisconsin . . . 1950
*Oberholser, Harry Church, 2933 Berkshire Rd., Cleveland Heights, Cleveland 18, Ohio . . . 1894
*O'Conner, Esther [Laura], 4344 Locust Ave., Kansas City 4, Missouri . . . 1940
*Odum, Eugene P[leasants], Department of Zoology, University of Georgia, Athens, Georgia . . . 1930
Odum, Howard Thomas, Osborn Zoological Laboratory, Yale University, New Haven, Connecticut . . . 1946

Oliver, Mary C[lara], Box 406, Silver City, New Mexico. 1934
*Olsen, James H[arold], Box 11, Worthington, Ohio. 1947
**Olsen, Dr. Richard E., 3325 Franklin Rd., Route 3, Pontiac, Michigan. 1938
**Olson, Gladys E[lizabeth] (Mrs. Simon), 1115 Homewood Dr., Lakewood 7, Ohio. . 1942
Olson, Mrs. Monrad J., Box 145, Sanish, North Dakota. 1946
Ommanney, G. G., P.O. Box 14, Hudson Heights, Quebec, Canada. 1944
Omoto, Jean H[ideko], 6040 Woodlawn Ave., Chicago 37, Illinois. 1949
*O'Neil, Norah Selby (Mrs. Mike), 1311 Bonham St., Commerce, Texas. 1949
**O'Reilly, Ralph A. Jr., Davisburg, Michigan. 1936
*Oresmen, Stephen B[ergel], 115 Central Park West, New York 23, New York. . . . 1949
Orians, Rev. Howard Lester, 1611 16th Ave., Monroe, Wisconsin. 1947
Österlöf, Sten, Näsby Alle 14, Näsbypark, Sweden. 1950
Ott, Louis Frederick, 2527 N. Wahl Ave., Milwaukee 11, Wisconsin. 1941
*Overing, Robert, Route 4, Raleigh, North Carolina. 1930
Owen, Oliver S., Laboratory of Ornithology, Fernow Hall, Cornell University, Ithaca, New York. 1948
*Owre, Oscar T., 2625 Newton Ave., S., Minneapolis 5, Minnesota. 1935
*Packard, Fred Mallory, 1214 16th St., N. W., Washington 6, D. C.. 1949
*Palmer, Ralph S[imon], New York State Museum, State Education Bldg., Albany 1, New York. 1934
*Palmer, T[heodore] S[herman], 1939 Biltmore St., N. W., Washington, D. C.. . . . 1914
**Palmquist, Clarence O[scar], 7400 N. Odell Ave., Chicago 31, Illinois. 1945
*Pangborn, Mark W[hite], 125 E. 49th St., Indianapolis, Indiana. 1948
Parker, Clarence J[oseph], 821 N. Garfield Ave., Alhambra, California. 1948
*Parker, Henry M[elville], 86 Buckingham St., Apt. 24, Cambridge, Massachusetts. . 1941
**Parkes, Kenneth Carroll, Laboratory of Ornithology, Fernow Hall, Cornell University, Ithaca, New York. 1946
Parks, G. Hapgood, 99 Warrenton Ave., Hartford 5, Connecticut. 1950
*Parks, Richard Anthony, 2303 Pembrook Pl., N. E., Atlanta, Georgia. 1942
Parmelee, David F[reeland], 533 Harding Ave., Iron Mountain, Michigan. 1949
*Partch, Max L[orenzo], 1536 11th Ave., S. E., St. Cloud, Minnesota. 1940
Paterson, James Bruce, 111 The Maples, Fox Chapel, Pittsburgh 15, Pennsylvania. 1950
*Paul, Mrs. Harold Gilmore, 84 N. Stanwood Rd., Columbus 9, Ohio. 1948
Paulson, Clarence, Seneca, Wisconsin. 1949
Paynter, R[aymond] A[ndrew] Jr., 208 Forest Hill Rd., Hamden 14, Connecticut. . 1946
Pederson, Donald P[enhallegon], 43 E. Lattimore Rd., Rochester, New York. 1948
Peelle, Miles L., 1039 College St., Adrian, Michigan. 1940
Penner, Lawrence R., Department of Zoology and Entomology, University of Connecticut, Storrs, Connecticut. 1940
Perkins, Mrs. Mary Loomis, 1305 S. 52nd St., Omaha 6, Nebraska. 1946
*Perner, Margaret E., 2487 Noble Rd., Apt. 23 B, Cleveland Heights 21, Ohio. . . . 1943
Perry, William L[ouis], Newport, Florida. 1949
Peters, Ellen, 442 5th St., Brooklyn 15, New York. 1942
Peters, Harold S[eymour], 968 Cumberland Rd., N. E., Atlanta 6, Georgia. 1924
*Peterson, Alfred, Box 201, Brandt, South Dakota. 1931
Peterson, Arnold J[erome], 3628 Gregory St., Madison, Wisconsin. 1949
*Peterson, Mrs. C[harles] E[mil], Madison, Minnesota. 1936
Peterson, Randolph L., Division of Mammals, Royal Ontario Museum of Zoology, Toronto 5, Ontario, Canada. 1946
***Peterson, Roger Tory, Box 7, Glen Echo, Maryland. 1942

*Petrides, George A., Division of Conservation, Michigan State College, East Lansing, Michigan 1942
**Petroskey, Helen Martha, Box 91, Hiram, Ohio 1949
***Pettingill, Olin Sewall Jr., Carleton College, Northfield, Minnesota 1930
*Pettit, Lincoln C[oles], Hiram, Ohio 1948
***Phelps, William H[enry], Apartado 2009, Caracas, Venezuela 1940
***Phillips, Allan Robert, 113 Olive Rd., Tucson, Arizona 1934
**Phillips, Cyrus Eastman II, 255 Polk St., Warsaw, Illinois 1944
*Phillips, Homer Wayne, 1418 A, Brackenridge Apts., Austin, Texas 1947
Phillips, Richard Stuart, 834 Liberty St., Findlay, Ohio 1944
*Phillips, William W., Box 153, Doniphan, Missouri 1949
*Pickett, Merle N[aomi], Tall Oaks, River Rd., Manitowoc, Wisconsin 1949
Pierce, Fred J[ohn], Winthrop, Iowa 1947
*Pierce, Robert Allen, Barlow, Mississippi 1941
*Pinney, Mary Edith, Wilson, Kansas 1948
*Pirnie, Miles David, Conservation Institute, Michigan State College, East Lansing, Michigan 1928
*Pitelka, Frank Alois, Museum of Vertebrate Zoology, University of California, Berkeley 4, California 1938
Pittinger, Mrs. Cornelia Milhollin, Route 2, Gaston, Indiana 1947
**Pittman, James Allen Jr., 421 East Concord, Orlando, Florida 1945
*Plaisted, Walter William, 95 Newcomb Rd., Tenafly, New Jersey 1949
Plath, Karl, 305 S. Cuyler Ave., Oak Park, Illinois 1942
*Platt, Dr. Ruth M[ontague], 441 Lyceum Ave., Philadelphia 28, Pennsylvania 1948
Pomeroy, Lawrence R., Box 212, Pass-a-Grille Beach, Florida 1948
**Poole, Cecil A[very], 1764 Topeka Ave., San Jose 11, California 1942
Poor, Hustace Hubbard, 230 E. 71st., New York 21, New York 1935
**Porter, Dr. Eliot F[urness], Route 1, Box 5B, Sante Fe, New Mexico 1947
Porter, Richard D., 3130 Ogden Ave., Ogden, Utah 1950
*Porter, T[homas] Wayne, Department of Zoology, Michigan State College, East Lansing, Michigan 1938
*Potter, David M., 1557 Timothy Dwight College, Yale University, New Haven 11, Connecticut 1946
Potter, Beatrice B[rown] (Mrs. George C.), 2111 Malvern Rd., Charlotte 7, North Carolina 1948
Potter, Julian K[ent], 437 Park Ave., Collingswood, New Jersey 1915
Potter, Louis Henry, Route 2, West Rutland, Vermont 1941
***Pough, Richard H[ooper], 33 Highbrook Ave., Pelham 65, New York 1938
Prather, Millard F[illmore], 1129 Brown-Marx Building, Birmingham 3, Alabama . . 1940
Prescott, Kenneth Wade, Museum of Zoology, University of Michigan, Ann Arbor, Michigan 1946
*Preston, Frank W[illiam], Box 149, Butler, Pennsylvania 1948
*Prill, Albert G., Main St., Scio, Oregon 1921
*Prucha, Alma H., 1716 N. Prospect Ave., Milwaukee 2, Wisconsin 1942
Puckette, Mrs. Charles, Box 291, Heavener, Oklahoma 1950
Puett, May Wilson, Box 2183, Greenville, South Carolina 1950
*Putnam, William L[loyd], Dominion Entomological Laboratory, Vineland Station, Ontario, Canada 1945
Putnam, Loren Smith, Department of Zoology, Ohio State University, Columbus 10, Ohio 1942
Quam, Mrs. Mary Battell, Box 716, Paoli, Pennsylvania 1944

Quay, Thomas L., Zoology Department, North Carolina State College, Raleigh, North Carolina . . . 1939
*Quay, W[ilbur] B[rooks], Locustville, Virginia . . . 1949
Quimby, Don C., Department of Zoology and Entomology, Montana State College, Bozeman, Montana . . . 1942
*Ragusin, Anthony V[incent], Box 496, Biloxi, Mississippi . . . 1937
Rahe, Carl W., 9005 Tioga Ave., Cleveland 5, Ohio . . . 1931
*Ramey, Ralph E[merson] Jr., 174 S. Ardmore Rd., Columbus 9, Ohio . . . 1948
*Ramisch, Miss Marjorie [Viola], 1835 Noble Rd., East Cleveland 12, Ohio . . . 1943
*Ramsay, A[lfred] Ogden, McDonogh School, McDonogh, Maryland . . . 1949
Ramsden, Charles Theodore, 8 and 19, Vista Alegre, Santiago, Cuba . . . 1914
Rand, Austin L., Chicago Natural History Museum, Chicago 5, Illinois . . . 1950
**Randall, Clarence B[elden], 38 S. Dearborn St., Chicago, Illinois . . . 1949
Randall, Robert Neal, 117½ Fifth St., Bismarck, North Dakota . . . 1939
Randle, Worth S., 3614 Shaw Ave., Cincinnati 8, Ohio . . . 1949
Rapp, Robert R[umsey], 34 Main St., Ridgefield, Connecticut . . . 1948
Rapp, William F[rederick] Jr., Gaylord Hall, Doane College, Crete, Nebraska . . . 1941
*Rausch, Robert [Lloyd], United States Public Health Service, Box 960, Anchorage, Alaska . . . 1947
*Rawson, George William, CIBA Pharmaceutical Products, Inc., Lafayette Park, Summit, New Jersey . . . 1947
*Rea, Gene, 251 Leland Ave., Columbus 2, Ohio . . . 1948
*Read, Bayard W[hitney], Upper Dogwood Lane, Rye, New York . . . 1949
**Rebmann, G. Ruhland Jr., 729 Millbrook Lane, Haverford, Pennsylvania . . . 1941
Reed, Parker Crosby, 27 Hayes Ave., Lexington, Massachusetts . . . 1949
*Reeder, Miss Clara Maude, 1608 College Ave., Houghton, Michigan . . . 1938
Rees, Earl Douglas, 1504 N. Main St., Findlay, Ohio . . . 1946
Reese, C[arl] R[ichard], 266 East Dunedin Rd., Columbus 2, Ohio . . . 1948
**Reese, Teresa S. (Mrs. Hans H.), 3421 Circle Close, Shorewood Hills, Madison 5, Wisconsin . . . 1941
Reeve, Alexander Jardine, 276 Renfrew St., Winnipeg, Manitoba, Canada . . . 1950
**Rehfisch, Miss Carol, 562 Arlington Ave., Berkeley 7, California . . . 1949
*Reilly, E[dgar] M[ilton] Jr., 305 East Veterans Place, Ithaca, New York . . . 1946
Remington, Charles L[ee], Osborn Zoological Laboratory, Yale University, New Haven 11, Connecticut . . . 1944
*Renn, Miss Elmira Virginia, 2010 38th St., S. E., Washington 20, D. C. . . . 1949
*Rett, Egmont Z[achary], Museum of Natural History, Santa Barbara, California . . . 1940
*Reuss, Alfred Henry Jr., 2908 Edison St., Blue Island, Illinois . . . 1936
*Reynard, George B., 728 Parry Ave., Palmyra, New Jersey . . . 1950
*Reynolds, Mrs. Perry J, 1652 Virginia Park, Detroit 6, Michigan . . . 1948
*Reynolds, William Pius, 1330 Foulkrod St., Philadelphia 24, Pennsylvania . . . 1948
Rice, Dale [Warren], 432 W. 42nd St., Indianapolis 8, Indiana . . . 1946
Rice, Mrs. Harry Wilson, 3940 Richfield Rd., Minneapolis 10, Minnesota . . . 1940
Richdale, Lancelot Eric, 23 Skibo St., Kew, Dunedin SW1, New Zealand . . . 1945
Richter, Carl H., 703 Main St., Oconto, Wisconsin . . . 1947
*Ricker W[illiam] E[dwin], Pacific Biological Station, Nanaimo, British Columbia, Canada . . . 1943
*Riggs, Carl D[aniel], Department of Zoology, University of Oklahoma, Norman, Oklahoma . . . 1943
*Ripley, Sidney Dillon II, Litchfield, Connecticut . . . 1946
*Ritchie, Dr. Robert C., 611 Woburn Ave., Toronto 12, Ontario, Canada . . . 1944

*Robbins, Chandler S[eymour], Patuxent Research Refuge, Laurel, Maryland.... 1941
***Robbins, Eleanor C[ooley] (Mrs. Chandler S.), Patuxent Research Refuge, Laurel, Maryland.... 1936
Roberts, Harold D., 610 Harrison St., Black River Falls, Wisconsin.... 1946
Robins, C[harles] Richard, 3300 N. Third St., Harrisburg, Pennsylvania.... 1949
Roby, Edwin F[orrest], 427 North Tracy Ave., Bozeman, Montana.... 1948
Roesler, Carol S. (Mrs. M. Stuart), June Rd., Cos Cob, Connecticut.... 1949
Roesler, M. Stuart, June Rd., Cos Cob, Connecticut.... 1949
***Rogers, Charles Henry, East Guyot Hall, Princeton, New Jersey.... 1903
***Rogers, Mabel T., 203 N. Columbia St., Milledgeville, Georgia.... 1947
*Rogers, Mrs. Walter E., Box 385, Appleton, Wisconsin.... 1931
Rogge, Charles Henry, 207 S. Euclid Ave., Sioux Falls, South Dakota.... 1950
Rooney, James P., 1514 S. 12th Ave., Yakima, Washington.... 1947
***Root, Oscar M[itchell], Brooks School, North Andover, Massachusetts.... 1940
*Rorimer, Irene Tuck (Mrs. J. M.), 28 Outer Dr., Oak Ridge, Tennessee.... 1938
*Rose, Dr. W[illiam] C[umming], 710 W. Florida Ave., Urbana, Illinois.... 1949
Rosene, Walter Jr., 1212 Jupiter, Gadsden, Alabama.... 1942
*Rosewall, O[scar] W[aldemar], Department of Zoology, Louisiana State University, Baton Rouge, Louisiana.... 1931
*Ross, C[harles] Chandler, 7924 Lincoln Dr., Chestnut Hill, Philadelphia 18, Pennsylvania.... 1937
Ross, James B., Department of Biological Sciences, University of Pittsburgh, Pittsburgh 13, Pennsylvania.... 1949
Routa, Albert, 331½ E. Main St., Clarksburg, West Virginia.... 1950
***Rudd, Clayton G[lass], 315 Medical Arts Bldg., Minneapolis 2, Minnesota.... 1944
Ruecker, Miss Emilie, Seapowet Ave., Tiverton, Rhode Island.... 1943
Ruhr, C[lifford] E[ugene], 1007 Laurel St., Atlantic, Iowa.... 1947
Rutter, Russell James, Huntsville, Ontario, Canada.... 1950
Ryan, Richard, 5009 Broadway, New York 34, New York.... 1949
Sabin, Walton B., 122 Sims Rd., Syracuse 10, New York.... 1945
Sait, Carroll C[harles], 4134 Old Orchard Ave., Montreal 28, Quebec, Canada.... 1949
*Samsell, Theodore R., 438 Wilson St., Elkins, West Virginia.... 1949
*Sanders, Earl, 1808 Vincent St., Brownwood, Texas.... 1949
Sandy, Tirzah M., University Hospital, Baltimore 1, Maryland.... 1950
*Satterly, J[ack], 100 Castlewood Rd., Toronto 12, Ontario, Canada.... 1947
*Satterthwait, Mrs. Elizabeth Allen, 806 W. Ohio St., Urbana, Illinois.... 1925
Sauer, Dr. Gordon C[henoweth], 448 E. 20th St., New York 9, New York.... 1949
*Saugstad, N[els] Stanley, Route 4, Minot, North Dakota.... 1939
*Saunders, Aretas A[ndrews], Box 141, Canaan, Connecticut.... 1934
*Saunders, George B[radford], Fish and Wildlife Service, 546 Custom House, Denver 2, Colorado.... 1926
Saunders, Richard Merrill, 9 McMaster Ave., Toronto 5, Ontario, Canada.... 1948
***Savage, James, Buffalo Athletic Club, Buffalo, New York.... 1939
*Sawyer, Miss Dorothy, 1656 Bradley St., Schenectady 4, New York.... 1937
Schaeffer, David A[lan], 405 Pine St., West Reading, Pennsylvania.... 1949
Schaub, Mary Hall (Mrs. J. B.), 1040 Isabella St., Wilmette, Illinois.... 1939
*Schneider, Miss Evelyn J., 2207 Alta Ave., Louisville 5, Kentucky.... 1935
Scholes, Mrs. Doris Kathryn, 385 E. Hall St., Bushnell, Illinois.... 1947
Scholes, Robert T[hornton], 260 Crittenden Blvd., Box 243, Rochester 7, New York.... 1946
Schoonover, Lyle James, Chautauqua Refuge, Havana, Illinois.... 1950

***Schorger, A[rlie] W[illiam], 168 N. Prospect Ave., Madison, Wisconsin.......... 1927
**Schramm, Wilson [Cresap], 321 Kensington Rd., Syracuse 10, New York........ 1944
*Schreiner, Keith M., Ollie, Iowa.. 1949
Schumm, William George, 302 C St., LaPorte, Indiana....................... 1944
Schwartz, Charles Walsh, 131 Forest Hill, Jefferson City, Missouri............. 1950
Schwendener, Mrs. Carl M., 1722 N. 48th St., Milwaukee 8, Wisconsin.......... 1949
*Scotland, Dr. Minnie B[rink], 42 Continental Ave., Cohoes, New York.......... 1938
*Scott, Mrs. Dorothy Dean, 1508 La Loma Ave., Berkeley 8, California.......... 1948
Scott, D. M., Department of Zoology, McGill University, Montreal 2, Quebec, Canada... 1950
Scott, Fred T., Pittsburg, New Hampshire.................................. 1948
*Scott, Frederic R[obert], 4600 Coventry Rd., Richmond 21, Virginia............ 1947
**Scott, Peter, The New Grounds, Slimbridge, Gloucestershire, England.......... 1947
Scott, Thomas G[eorge], Section of Game Research and Management, Illinois Natural History Survey, Urbana, Illinois.............................. 1936
*Scott, W[alter] E[dwin], Mendota Beach Heights, Madison 5, Wisconsin........ 1938
Sealander, John A[rthur] Jr., Department of Zoölogy, University of Arkansas, Fayetteville, Arkansas... 1947
Seaman, George Albert, Box 147, St. Thomas, Virgin Islands................. 1950
**Sedwitz, Walter W[illiam], 229 W. 36th St., New York 18, New York............ 1947
Seeber, Edward L[incoln], 186 Wabash Ave., Kenmore 17, New York.......... 1944
*Seibert, Henri C., Ohio University, Athens, Ohio........................... 1941
**Sener, Miss Ruth, 233 Charlotte St., Lancaster, Pennsylvania................ 1943
Serbousek, Lillian, 1226 Second St., SW, Cedar Rapids, Iowa..................1935
**Shackleton, Elizabeth C[atterall] (Mrs. Walter H.), Route 1, Box 76 A, Prospect, Kentucky.. 1947
**Shackleton, Walter H., Route 1, Box 76 A, Prospect, Kentucky................ 1947
*Shaffer, Chester M[onroe], Eagle Lake, Florida............................ 1934
*Shaftesbury, Archie D., Women's College, University of North Carolina, Greensboro, North Carolina... 1930
Shannon, Bernice [Irene] B[eladean] (Mrs. Francis P.), 504 W. Ormsby St., Louisville 3, Kentucky.. 1949
Sharp, Ward M., Pennsylvania State College, 206 Forestry Bldg., State College, Pennsylvania.. 1936
Shaub, Benjamin Martin, 159 Elm St., Northampton, Massachusetts.......... 1948
Shaver, Jesse M[ilton], George Peabody Teachers' College, Nashville, Tennessee. . 1922
Shaw, Dr. Charles H[icks], Bremen, Ohio................................. 1941
**Shearer, A[mon] R[obert], Box 428, Mount Belvieu, Chambers Co., Texas........ 1893
*Shelford, Victor E[rnest], University of Illinois, Vivarium Bldg., Champaign, Illinois.. 1931
Shetler, Stanwyn G[erald], Route 2, Hollsopple, Pennsylvania................ 1949
Short, Wayne, National Audubon Society, 1000 Fifth Ave., New York 28, New York.. 1941
Shuman, Miss Bertha C., 136 S. 19th St., LaCrosse, Wisconsin................ 1947
*Sibley, Charles G[ald], Department of Natural Sciences, San Jose State College, San Jose 14, California.. 1942
Sieh, James G[erald], State Fish Hatchery, Spirit Lake, Iowa.................. 1948
*Siess, L. Colette, 129 Poplar Ave., Hackensack, New Jersey.................. 1950
**Simmons, Mrs. Amelia C., 2742 N. Maryland Ave., Milwaukee 11, Wisconsin.... 1943
***Simmons, Edward McIlhenny, Avery Island, Louisiana..................... 1942

***Simmons, Grant Gilbert Jr., Lake Ave., Greenwich, Connecticut. 1949
*Simon, James R., Jackson Hole Wildlife Park, Moran, Wyoming. 1947
Simon, Stephen Wistar, 7727 York Rd., Towson 4, Maryland. 1947
*Simpson, Mrs. Roxie Collie, 6624 First St., N.W., Washington 12, D. C.. 1949
Sims, Harold L[ee], 714 St. Philip St., Thibodaux, Louisiana. 1942
*Singleton, Albert Roland, 3968 Marburg Ave., Cincinnati 9, Ohio. 1948
Sjodahl, Sven Erik, 7013 Noble Ave., Cincinnati 24, Ohio. 1949
Skaggs, Merit B[ryan], Eagle and Dodds Rds., Route 1, Willoughby, Ohio. 1934
Skelton, Mrs. Kathleen, 353 W. 57th St., New York, New York. 1949
*Slack, Miss Mabel, 1004 Everett Ave., Louisville 4, Kentucky. 1934
Slud, Paul B., Box 122, Kiamesha Lake, New York. 1950
Smalley, Alfred E[vans], Open Hearth, Lewistown, Pennsylvania. 1946
*Smith, Dr. A[rthur] F[rancis], Manning, Iowa. 1934
*Smith, Allen G[ordon], Box 603, Brigham City, Utah. 1949
Smith, Carl E[rnest], Halsey, Nebraska. 1947
Smith, Earl E[mmett], Harvard Forest, Petersham, Massachusetts. 1947
Smith, Miss Emily, Route 1, Box 387, Los Gatos, California. 1948
*Smith, Frank R[ush], Route 2, Box 100, Laurel, Maryland. 1910
*Smith, Harry M[adison], Department of Zoology and Physiology, University of Wyoming, Laramie, Wyoming. 1936
Smith, Miss Marion L[ucille], 429 S. Willard St., Burlington, Vermont. 1949
Smith, Orion O., Box 150 A, Spring Creek Rd., Rockford, Illinois. 1936
Smith, Richard Huston, 811 S. Willson St., Bozeman, Montana. 1949
*Smith, Robert L[eo], Route 1, Reynoldsville, Pennsylvania. 1945
Smith, Robert Skalak, 12904 Melgrove Ave., Garfield Heights, Ohio. 1950
*Smith, Roy Harmon, 183 N. Prospect St., Kent, Ohio. 1936
Smith, Wendell Phillips, Wells River, Vermont. 1921
Smith, Winnifred Wahls (Mrs. E. R.), Winghaven, Route 1, Two Rivers, Wisconsin. 1946
Snapp, Mrs. R. R., 310 W. Michigan, Urbana, Illinois. 1940
Snow, Mabelle (Mrs. C. S.), 2211 Chester Blvd., Richmond, Indiana. 1950
Snyder, Dana Paul, Museum of Zoology, University of Michigan, Ann Arbor, Michigan. 1949
*Snyder, L[ester] L[ynne], Royal Ontario Museum of Zoology, Queen's Park at Bloor St., Toronto 5, Ontario, Canada. 1929
Sooter, Clarence Andrew, 1156 E. 78th St., Kansas City 5, Missouri. 1940
Sorrells, Curtis Cooper, 2308 10th Ave., S., Nashville 4, Tennessee. 1950
***Sorrill, Anna Marie (Mrs. Tom), Tom Sorrill Farm, Ursa, Illinois. 1950
Sowls, Lyle K[enneth], Delta Waterfowl Research Station, Delta, Manitoba, Canada. 1949
Spangler, Miss Iva M., 128 E. Foster Parkway, Fort Wayne, Indiana. 1939
*Speirs, Doris Huestis (Mrs. J. M.), "Cobble Hill", Route 2, Pickering, Ontario, Canada. 1936
Speirs, J[ohn] Murray, "Cobble Hill," Route 2, Pickering, Ontario, Canada. . . . 1931
Spencer, Haven Hadley, 4961 Packard Road, Ypsilanti, Michigan. 1946
***Spencer, O[live] Ruth, 1030-25 Avenue Court, Moline, Illinois. 1938
Sperry, Charles Carlisle, 1455 S. Franklin St., Denver 10, Colorado. 1931
Spofford, Walter R[ichard] II, Department of Anatomy, Syracuse Medical College, Syracuse, New York. 1942
Springer. Paul F[rederick], Patuxent Research Refuge, Laurel, Maryland. 1946

*Stabler, Robert M[iller], Colorado College, Colorado Springs, Colorado.......... 1939
*Staebler, Arthur E[ugene], W. K. Kellogg Bird Sanctuary, Route 1, Augusta, Michigan.......... 1937
**Stahl, Miss Marjoretta Jean, Kimberly, West Virginia.......... 1942
*Stamm, Anne L. (Mrs. Frederick W.), 2118 Lakeside Dr., Louisvile 5, Kentucky.. 1947
Stark, Miss Wilma R[uth], Meridian Hill Hotel, 16th St., N. W., Washington, D. C.......... 1939
Starrett, William C[harles], Illinois State Natural History Survey, Route 2, Havana, Illinois.......... 1933
Stauffer, James Milton, 4452 33rd Ave., S., Minneapolis 6, Minnesota.......... 1949
*Stauffer, Ralph Stanley, 170 W. Washington St., Hagerstown, Maryland.......... 1949
Stearns, Edwin I[ra] Jr., 928 Grant Ave., Plainfield, New Jersey.......... 1945
*Steele, William Soles, 151 Glasgow St., Guelph, Ontario, Canada.......... 1948
*Steffen, Earnest William, 1000 Maplewood Dr., Cedar Rapids, Iowa.......... 1944
Steilberg, Robert H., 555 Sunset Rd., Louisville 6, Kentucky.......... 1949
Stevens, Charles E[lmo] Jr., 426 2nd St., N.E., Charlottesville, Virginia.......... 1947
*Stevens, O. A., State College Station, Fargo, North Dakota.......... 1926
Stevenson, Henry M[ills], Department of Zoology, Florida State University, Tallahassee, Florida.......... 1943
Stevenson, James O[sborne], Fish and Wildlife Service, Washington 25, D. C..... 1933
Steward, Orville Milton, Long Island Agricultural and Technical Institute, Apt. 3, Farmingdale, Long Island, New York.......... 1950
*Stewart, Dr. Charles Amery, Route 1, New Albin, Iowa.......... 1949
*Stewart, Miss Mildred, 2219 Devonshire Dr., Cleveland 6, Ohio.......... 1949
*Stewart, Paul A[lva], 8640 N. State St., Westerville, Ohio.......... 1925
Stewart, Robert Earl, Patuxent Research Refuge, Laurel, Maryland.......... 1939
*Stillwell, Jerry E., Box 5742, Dallas 2, Texas.......... 1935
**Stine, Miss Perna M., Route 5, Olney, Illinois.......... 1931
*Stitt, Merle E., 3 Keppler Court, Ann Arbor, Michigan.......... 1950
***Stoddard, Herbert Lee, Sherwood Plantation, Route 5, Thomasville, Georgia.......... 1916
Stofer, Martha Miller (Mrs. W. E.), 730 Grand Ave., Glen Ellyn, Illinois.......... 1948
*Stokes, Allen W., 1014 University Bay Dr., Madison 5, Wisconsin.......... 1950
Stoner, Emerson Austin, 149 East L. St., Box 444, Benicia, California.......... 1947
***Stoner, Lillian C. (Mrs. Dayton), 399 State St., Albany 6, New York.......... 1945
*Stophlet, John J[ermain], 2612 Maplewood Ave., Toledo 10, Ohio.......... 1934
*Storer, Robert Winthrop, Museum of Zoology, University of Michigan, Ann Arbor, Michigan.......... 1938
*Storer, Tracy I[rwin], Division of Zoology, University of California, Davis, California.......... 1928
*Straw, Richard M[yron], 973 W. County Rd. B., St. Paul 8, Minnesota.......... 1947
Strecker, Robert L[ouis], Zoology Department, University of Wisconsin, Madison 6, Wisconsin.......... 1949
*Street, Phillips B[orden], 520 Packard Bldg., Philadelphia 2, Pennsylvania.......... 1946
Street, Thomas M., State Department of Health, Bureau of Vector Control, 2180 Milvia St., Berkeley 4, California.......... 1940
***Strehlow, Elmer William, 520 E. Montana St., Milwaukee 7, Wisconsin.......... 1941
*Stringer, Kirby [Odell], Box 772, Memphis 1, Tennessee.......... 1950
Stringham, Dr. Emerson, Box 986, Kerrville, Texas.......... 1940
****Strong, R[euben] M[yron], 5840 Stony Island Ave., Hyde Park Station, Chicago, Illinois.......... Founder

Struthers, Dana R., 4858 Fremont Ave., S., Minneapolis 9, Minnesota. 1948
Stullken, Donald Edward, Department of Forestry and Conservation, Purdue University, West Lafayette, Indiana 1950
Stupka, Arthur, Great Smoky Mountains National Park, Gatlinburg, Tennessee. . 1935
***Sturgeon, Myron T., Department of Geography and Geology, Ohio University, Athens, Ohio 1934
*Sturm, [William] Louis, S. O. M. Center Rd., Solon, Ohio. 1943
*Suthard, James G[regory], 1881 Raymond Ave., Long Beach 6, California. 1936
Sutherland, Mrs. Robert L., 1513 Gaston Ave., Austin 21, Texas. 1950
Suttkus, Royal Dallas, Fernow Hall, Cornell University, Ithaca, New York. 1947
***Sutton, George Miksch, Museum of Zoology, University of Michigan, Ann Arbor, Michigan 1920
Swanson, Gustav [Adolph], Fernow Hall, Cornell University, Ithaca, New York. . 1927
Svärdson, Gunnar, Ödmårdsvägen 17, Traneberg, Sweden. 1949
*Swedenborg, Ernie D[avid], 4905 Vincent Ave., S., Minneapolis 10, Minnesota. . . . 1929
*Sweet, William O., 175 Park St., Attleboro, Massachusetts. 1949
**Taber, Wendell, 3 Mercer Circle, Cambridge, Massachusetts. 1936
*Tabler, Fan Boswell (Mrs. William B.), 2923 Riedling Dr., Louisville 6, Kentucky 1947
*Tabor, Miss Ava Rogers, 305 Canal Blvd., Thibodaux, Louisiana. 1940
*Taintor, Mrs. Elizabeth Taber, 11 Story St., Cambridge 38, Massachusetts. 1945
Tallman, William S[weet] Jr., 4 Linden Place, Sewickley, Pennsylvania. 1940
Tanghe, Leo J[oseph], 852 Stone Rd., Rochester 16, New York. 1943
Tanner, James Taylor, Department of Zoology, University of Tennessee, Knoxville 16, Tennessee 1937
Tashian, Richard E[arl], 178 Canonchet Ave., Gaspee Plateau 5, Rhode Island. . . . 1949
***Taylor, Dr. Arthur Chandler, 309 N. Drew St., Appleton, Wisconsin. 1929
***Taylor, Mrs. H. J., 900 Santa Barbara Rd., Berkeley, California. 1916
*Taylor, H[erbert] S[tanton], 1369 Fair Ave., Columbus 5, Ohio. 1948
*Taylor, Joseph William, 590 Allen's Creek Rd., Rochester 10, New York. 1946
*Taylor, Dr. R[obert] L[incoln], 810 Highland Dr., Flintridge, Pasadena 2, California 1947
*Taylor, William Ralph, Museum of Zoology, University of Michigan, Ann Arbor, Michigan 1940
*Teachenor, Dix, 1020 W. 61st St., Kansas City, Missouri. 1923
*Teale, Edwin Way, 93 Park Ave., Baldwin, Long Island, New York. 1948
Tenney, Albert R., Route 1, Toronto, Ohio. 1949
*Terrill, Lewis McIver, 216 Redfern Ave., Westmount, Montreal 6, Quebec, Canada 1948
Thacher, S. Charles, 2918 Brownsboro Rd., Louisville 6, Kentucky. 1942
*Thomas, Edward S[inclair], Ohio State Museum, Columbus 10, Ohio. 1921
*Thomas, Landon B[aillie], 1006 Blaine St., Edgerton, Wisconsin. 1947
*Thomas, Ruth H. (Mrs. Rowland), 410 E. Green St., Morrillton, Arkansas. 1937
Thompson, Daniel Q., 521 E. Mifflin St., Madison 3, Wisconsin. 1945
Thompson, Donald R[uff], 2920 Shore Acres Rd., Madison 4, Wisconsin. 1947
Thompson, Mrs. Helen Taylor, St. Francis Lane, Lockhaven, Norfolk 5, Virginia. . 1949
*Thorley, Robert F., 3 Midland Gardens, Bronxville 8, New York. 1946
Thorne, Oakleigh II, Box 347, Islip, Long Island, New York. 1947
Thornton, Wilmot A[rnold], Department of Zoology, University of Texas, Austin 12, Texas 1948

***Thorp, George B[oulton], 118 Maple Ave., Pittsburgh 18, Pennsylvania........ 1935
Thorson, Thomas B[ertel], Department of Zoology, University of Washington, Seattle, Washington........ 1949
*Throne, Alvin L., State Teachers College, Milwaukee 11, Wisconsin........ 1949
Thurow, Gordon [Ray], 5555 Woodlawn Ave., Chicago 37, Illinois........ 1948
*Tilley, Francis Thomas, 26 Mohican Ave., Buffalo 8, New York........ 1944
Tinbergen, Niko[laas], Department of Zoology, University Museum, Oxford, England........ 1947
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**Todd, Elizabeth D. (Mrs. Paul H.), 918 W. Main St., Kalamazoo 48, Michigan.. 1939
Todd, George K[endall], Laramie County Health Unit, 315 W. 20th St., Cheyenne, Wyoming........ 1943
*Todd, Henry O[liver] Jr., Woodbury Rd., Murfreesboro, Tennessee........ 1938
Todd, Mabel Sellers (Mrs. A. P.), 1622 Cherryhurst Ave., Houston 6, Texas........ 1940
*Todd, W[alter] E[dmond] Clyde, Carnegie Museum, Pittsburgh 13, Pennsylvania.. 1911
*Tomich, P[rosper] Quentin, Hastings Reservation, Jamesburg Route, Robles del Rio, California........ 1948
*Tomkins, Ivan Rexford, 1231 E. 50th St., Savannah, Georgia........ 1931
Tordoff, Harrison B[ruce], Natural History Museum, Kansas University, Lawrence, Kansas........ 1947
**Tout, Wilson, Box 678, North Platte, Nebraska........ 1946
**Townsend, Miss Elsie White, Department of Biology, Wayne University, Detroit, Michigan........ 1938
***Trautman, Milton B[ernhard], Stone Laboratory, Put-in-Bay, Ohio........ 1932
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*Tryon, C[larence] A[rcher] Jr., Department of Biological Sciences, University of Pittsburgh, Pittsburgh 13, Pennsylvania........ 1942
***Tucker, Mrs. Carll, Penwood, Mount Kisco, New York........ 1928
*Tucker, Robert Edward, 245 N. Auburndale, Memphis, Tennessee........ 1942
*Tucker, Walter A[ndrew], 728 S. Remington Rd., Columbus 9, Ohio........ 1948
Tuttrup, Miss Jane, Bowie Mill Rd., Route 1, Derwood, Maryland........ 1949
Tvedt, Harold B[loom], Box 506, McNary, Arizona........ 1941
**Twomey, Arthur C[ornelius], Carnegie Museum, Pittsburgh 13, Pennsylvania.... 1936
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*Uhler, Francis Morey, Patuxent Research Refuge, Laurel, Maryland........ 1931
**Uhrig, Corinne (Mrs. Alex B.), Box 28, Oconomowoc, Wisconsin........ 1926
Umbach, Miss Margaret, 2526 East Dr., Fort Wayne 3, Indiana........ 1941
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Van Dyke, Henry I., 242 Greenwood Ave., Battle Creek, Michigan 1950
Vane, Robert F[rank], 600 Dows Bldg., Cedar Rapids, Iowa 1946
***Van Tyne, Josselyn, Museum of Zoology, University of Michigan, Ann Arbor, Michigan 1922
***Vaughan, William C[oleman], 115 Fairbanks Ave., Kenmore 17, New York 1938
Vaurie, Charles, % American Museum of Natural History, 79th St. and Central Park W., New York 24, New York 1946
*Vincent, Bro. Ignatius F.S.C., Christian Brothers College, East Parkway at Central, Memphis 4, Tennessee 1949
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*Walker, Charles F[rederic], Museum of Zoology, University of Michigan, Ann Arbor, Michigan 1939
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Walker, M[yrl] V[incent], Zion National Park, Springdale, Utah 1943
***Walkinshaw, Lawrence Harvey, 1703 Central National Tower, Battle Creek, Michigan 1928
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*Webster, Clark G[ibbons], Patuxent Research Refuge, Laurel, Maryland 1948
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*Weise, Charles M[artin], 654 Orchard Ave., Bridgeville, Pennsylvania 1949
*Weiser, Virgil Leonard, 507 2nd Ave., E., Dickinson, North Dakota 1946

*Weller, Milton Webster, Route 1, Columbia, Missouri ... 1950
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Weston, Henry G[riggs] Jr., Department of Biology, Grinnell College, Grinnell, Iowa ... 1947
**Weston, Robert, Old Ferry Rd., North Castine, Maine ... 1944
Wetherbee, David K[enneth], Museum of Natural History, 12 State St., Worcester 8, Massachusetts ... 1947
*Wetmore, Alexander, United States National Museum, Washington 25, D. C. ... 1903
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Weyer, Albert E., Department of Zoology, North Dakota Agricultural College, Fargo, North Dakota ... 1949
*Weyl, Edward Stern, 6909 Henley St., Philadelphia 19, Pennsylvania ... 1927
Wheatland, Miss Sarah B[igelow], 85 Sachem St., New Haven, Connecticut ... 1942
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***Wineman, Andrew, 150 Michigan Ave., Detroit, Michigan ... 1934

***Wing, Harold F[rancis], Route 3, Jackson, Michigan........ 1941
*Wing, Leonard [William], Department of Wildlife Management, Texas A. & M. College, College Station, Texas........ 1924
Winn, Howard Elliott, 398 N. Elm St., West Bridgewater, Massachusetts........ 1947
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*Wood, Norman B., 2605 School St., Two Rivers, Wisconsin........ 1950
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*Worley, John G[raves], 237 Charleston St., Cadiz, Ohio........ 1936
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*Wyatt, Miss Grace, College Station, Murray, Kentucky........ 1946
*Wylie, William L[ewis], 1310 National Rd., Wheeling, West Virginia........ 1947
Yeager, Lee E[mmett], Colorado Wildlife Research Unit, Colorado A & M College, Fort Collins, Colorado........ 1939
*Yeatter, R[alph] E[merson], Illinois Natural History Survey Division, Urbana, Illinois........ 1932
Young, Howard [Frederick], Department of Zoology, University of Arkansas, Fayetteville, Arkansas........ 1947
Young, J. Addison II, 60 Argyle Ave., New Rochelle, New York........ 1942
**Young, James B[oswell], 514 Dover Rd., Louisville 6, Kentucky........ 1937
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*Zilioli, Miss Teresa, 570 S. Greyfriars, Detroit 25, Michigan........ 1949
*Zimmerman, Dale, 480 North Almont St., Imlay City, Michigan........ 1943
*Zimmerman, Fred R[obert], 4110 Birch Ave., Madison 5, Wisconsin........ 1935
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