RECENT LITERATURE

Reviews by Donald S. Farner and others

BANDING

1. Conclusions Established on Banded Black-Headed Gulls in Berlin in the Winter of 1942-1943. (Feststellungen an beringten Lachmöwen in Berlin, Winter 1942/1943.) W. Tettenborn. 1943. *Journal für Ornithologie,* 91(2/3): 286-295. This is an interesting paper based on the results of reading the numbers of banded Black-headed Gulls, *Larus ridibundus* L., in the field. Sixty of the 74 thus identified were from the more than 1000 banded by Dr. Werner Rüppell from the winter of 1935-1936 to December 1939 for the purposes of *Ortstreue* investigations. These were banded in the Berlin area. Of these 60, three had been banded in the winter of 1935-1936, four in 1936-1937, 29 in 1937-1938, 23 in 1938-1939, and one in December 1939. Of the 74 whose bands which were read, 28 repeated during the winter, one as many as seven times. Many of the gulls remained at least four months at the winter locality in Berlin. A tabulation demonstrating *Platztreue* contains records of eight gulls which were seen at the same locality where they were banded during a previous winter and eight which were seen only a short distance from the banding locality. "This tabulation contains only some examples. In many other cases I have seen banded gulls during the winter of 1942-1943 in the neighborhood of places at which they were banded as winter visitants by Dr. Rüppell a number of years previously. My results support therefore the thesis of Dr. Rüppell that not only are migratory birds bound to their breeding locality but also to their winter locality." An interesting example is cited. A gull was captured on 16 December 1935 and transported with others to Lucerne, Switzerland, where, on the day after its arrival, it was released. On 9 January 1936 it was captured at Zürich and released. On 10 November 1936 it was again seen in Berlin at its banding locality. Also on 3 February 1943 it was once more seen at the same locality. The author also presents evidence showing that in winter these gulls appear to stay in certain definite and constant associations which may or may not be pairs. The birthplaces of four of the 74 gulls are known. Two were in Latvia and two in Germany. —D. S. F.

MIGRATION AND INVASIONS

2. Investigations Concerning Homing of Migrating Hooded Crows after Displacement. (Versuche über Heimfinden ziehender Nebelkrähen nach Verfrachtung.) Werner Rüppell. 1944. *Journal für Ornithologie,* 92(1/2): 106-132. Between 1935 and 1939 about 900 Hooded Crows, *Corvus cornix cornix* L., were captured in spring migration in the Kurischer Haff and were banded and sometimes in addition were marked with dyed feathers; 507 were transported to Flensburg (750 km.), 118 to Essen (1025 km.), and 271 to Frankfort am Main (1010 km.) by railroad or aircraft. Up to 1944 there have been 176 recoveries (19.6 percent) of banded birds and two observations of birds with dyed feathers. Of the birds released at Flensburg (near the Danish border) and recovered during the ensuing half year, all except one showed migration in a northeasterly direction *similar to the direction in which they would have migrated from the Kurischer Haff.* One was found in Lithuania ten days after release indicating a return to its original range and migratory route. Of the birds released at Flensburg and recovered in summer one year after the release, all except six were found in the normal northeast direction from Flensburg, indicating that *they had not only been displaced during the summer following the release but returned to the displaced summer range the next summer.* Three of the six exceptions were recoveries in

Russia and Finland in the normal northeastern direction from the Kurischer Haff indicated that returns to the *original* summer range had been effected. Of the winter recoveries of the birds released at Flensburg, ten were recovered in the *normal winter range* for birds of this species which *migrate through the Kurische Haff.* The eleven other winter recoveries were in southern Sweden, Denmark, Schleswig, Belgium, England and Scotland; this constitutes *a displaced winter range* corresponding to the displaced summer range. The situation with the birds released at Essen (near the Netherlands border) was very similar. Most of the recoveries during the summer were in the normal northeasterly direction from Essen but four returned to the original range north of the Kurischer Haff. Among the winter recoveries three show a displacement corresponding to the displaced summer range and two were recovered in the winter range possibly normal for the birds migrating through the Kurischer Haff or possibly showing displacement. Likewise similar are the results from the birds released at Frankfort am Main although there was a greater scattering among the recoveries. Also the general movement was northeastward; one recovery from Riga indicates a return to the original summer range. Six winter recoveries were in the range normal for birds of the species migrating through the Kurischer Haff although only one is regarded with certainty as not representing displacement. At least three show certain displacements corresponding to the displaced summer range. One was recovered 600 km. southwest of Frankfurt. Obviously a small portion of the birds (20 out of 176) possessed the *ability to make their way back to their original range* whereas the majority retained their *sense of relative direction* both in spring and fall migration resulting in the assumption of *westwardly displaced summer and winter ranges.* "(Apparently) all recoveries, which may be concluded to show return to the original range (in the individual experiments 4+4+1 recoveries in the normal summer range, 10+0+1 recoveries in normal winter range) pertain to old crows whereas young crows probably have not accomplished return to the home range. This is explained by the fact that old experienced crows have an advantage as opposed to young, through a great knowledge of terrain, a better developed visual retention (topographical memory), a stronger striving to seek out again the previous years' dwelling place (greater *Ortstreue*) and also probably through the ability, thanks to practice and experience, to maintain somewhat more precisely the principal direction of migration." "The orientation methods of migrating Hooded Crows (return to home locality through maintaining of an inherent general migration direction and the additional means of memory for places) is thus different from the ability to return to the home locality assumed for other migratory birds, for it appears to permit a directed search for the home locality from great distances (return to home locality by means of 'awareness of a goal')." (p. 124).—D. S. F.

3. The Relation of the Snowy Owl Migration to the Abundance of the Collared Lemming. V. E. Shelford. 1945. *The Auk*, 62(4): 592-596. A well documented report which adds more evidence to the generally accepted thesis that the periodic southward migration of the Snowy Owl, *Nyctea scandiaca* (Linn.) and other northern species is caused by (or at least related to) periodic sharp decline in food supply. At Churchill, on the edge of the tundra, a peak in lemming abundance is reached every three or four years followed by a sharp decline and low abundance the following winter. In each of the recent years of decline (1930-31, 1934-35, 1937-38, 1941-42) there has been a Snowy Owl invasion of variable size in northern United States. This paper was written before the large 1945-46 emigration of owls which, however, fits into the theory perfectly. Since the lemmings were known to be reaching a peak in 1943-44 an invasion would be expected in next year or two and was indeed predicted by Roland C. Clement in August 1945 when he observed the lemming decline in northern Quebec (see Gross, *Bulletin of the Massachusetts Audubon Society*, 30(2): 31). Data for

various parts of the tundra indicate that peaks of and subsequent declines in mammal abundance are not always reached simultaneously in different areas. Therefore, the author suggests that the "difference in the size of the southward migrating Snowy Owl population is probably related to the somewhat spotty distribution of large populations of rodents which enables the owls to find their prey by migration from place to place within the tundra in years for which rodent declines are not quite general."—E. P. ODUM.

4. The Chickadee Flight of 1941-1942. Hustace H. Poor. 1946. *Proceedings of the Linnaean Society of New York*, 54-57: 16-27. A very interesting analysis, by means of records from banding stations and Christmas censuses, of an "eruption" of the population of *Parus atricapillus* Linn. in northeastern United States; this "did not represent a cycle maximum, but apparently was the result of an unusually large production of young during the preceding breeding season, or increased survival of all ages, or both." The winter of 1941-42 also produced the third flight in history of the Acadian Chickadee, *Parus hudsonicus littoralis* Bryant, south to New York City (the eleven specimens taken were all in first-winter plumage), and of the Hudsonian Chickadee, *Parus hudsonicus hudsonicus* Forster, to Wisconsin. The spring of 1941 was very early, April temperatures being abnormally high and inducing early nesting and more second broods than usual; the year was very dry and seems to have favored survival of young. The populations both in 1940 and 1942 were low, so that "the 1941 population peak appears to have been rather suddenly produced and dissipated."—M. M. NICE.

PHYSIOLOGY

5. Studies on the Daily Rhythm of Caged Migrant Birds. (Studien über die Tagesrhythmik gekäfigter Zugvögel.) Pontus Palmgren. 1944. *Zeitschrift für Tierpsychologie*, 6(1): 44-86. This interesting and important paper is the result of daily recordings, by means of a special apparatus, of the movements of four Song Thrushes, *Turdus ericetorum philomelus* Brehm and twelve European Robins, *Erithacus rubecula* (Linn.). There are four rather distinct phases of activity patterns in these typical night migrants. The winter *non-migratory phase* is characterized by morning and evening maxima of activity, the latter usually being better developed but the former more prolonged. Towards the beginning of migration the morning and evening maxima decline somewhat. The *spring migratory phase* is characterized by the nightly migratory restlessness (Zugunruhe). The morning maximum, when present, is significantly weaker and the evening maximum often disappears completely. The migratory restlessness ordinarily begins after a "sleeping pause" in the evening and reaches a maximum and declines before midnight. Sometimes it begins after midnight or even early in the evening. Occasionally there are numerous periods of migratory restlessness during a single night. Another variant is the appearance of two maxima of activity at night. Also migratory unrest may occur during the day or it may occur late in the day causing a noticeable delay in going to sleep. The *summer non-migratory* phase is very similar to the winter non-migratory phase except that the morning maximum is more intense than the evening maximum, although it is less regular and more prolonged than the corresponding maximum in winter. The *autumn migratory* phase is very similar to that of spring. The author believes that these records correspond fairly well with natural activity and cites evidence in support of this. The times of going to sleep and awakening follow the times of sunset and sunrise rather closely. An interesting hypothesis based on harmonic analyses is proposed. It is suggested that the daily rhythm is composed of components in the manner that a musical note consists of a fundamental tone and overtones. Very slight changes in the amplitude of one of the component oscillations

could modify completely the total daily rhythm. "The change from non-migratory phase to migratory phase could be traced to a reversal of the 'fundamental oscillation', accomplished through a transitional stage with decreasing amplitude. This assumption explains the otherwise completely puzzling phenomenon that the activity in daytime begins to decrease well before the appearance of the nightly migratory restlessness." Other probable explanations based on this hypothesis are discussed. A most interesting paper suggesting a score of fruitful experimental problems.—D. S. F.

6. More about Chimney Swifts. (Chimney Swifts Roosting at Ardmore, Pa. Horace Groskin. *The Auk*, 62(3): 261-270. Chimney Swift 'Thunder'. A. D. Moore. *The Auk*, 63(1): 70-72. Rumbling Noise Made by Chimney Swifts in Chimney. H. A. Allard. *The Auk*, 63(1): 84. More Concerning the Thundering and Clapping Sounds of the Chimney Swift. Ralph W. Dexter. *The Auk*, 63(3): 439-440.) The recovery of Chimney Swift bands in Peru has stimulated considerable interest in the habits of this species in the United States. Groskin watched a large ventilator chimney for 31 evenings timing the mass descents basing his estimates on an average of ten birds per second. A peak of abundance of 10,000 swifts entered the chimney between September 21 and 27, and about 37 minutes was required for such a flock to enter the chimney. Early morning observations indicated that a much longer time was required for a flock to leave, many birds returning to the chimney soon after leaving even in good weather. When Groskin stated that no roaring noise was heard when the swifts were entering and leaving the chimney, he unwittingly started a lively discussion on Chimney Swift noise. Dr. A. H. Moore, bringing his knowledge of physics and engineering to bear, points out that the thundering noise could be caused by resonance and that Groskin's chimney was not of correct dimensions to produce resonance. Allard and Dexter, on the other hand, report that when disturbed the Chimney Swift is capable of making considerable noise by clapping its wings against its body or against the chimney. Consequently, there appears to be at least two distinct "chimney swift noises," one resulting from resonance when the birds are entering or leaving, the other an alarm clap produced when the swifts are at rest in the chimney. Future chimney observers would do well to distinguish between these and other auditory manifestations of roosting swifts.—E. P. Odum.

7. Mechanical Value of Grit for Bobwhite Quail. Ralph B. Nestler. 1946. *Journal of Wildlife Management*, 10(2): 137-142. Experiments with pen-raised quail at the Patuxent Research Refuge showed that grit is not essential as a grinding agent in the gizzard. Young quail, wintering birds and breeding stock on a gritless but otherwise balanced diet survived and functioned as well as birds having access to grit.—John T. Emlen, Jr.

8. Underwater Actions of Diving Ducks. Allan Brooks. 1945. *The Auk*, 62(4): 517-533. Observations under unusually favorable conditions revealed that none of twelve species of diving ducks used its wings in normal progression under water (wounded birds may use their wings) and most held their wings close to the body. The White-winged Scoter, *Melanitta fusca deglandi* (Bp.), and the Surf Scoter, *Melanitta perspicillata* (Linn.), (but not the American Scoter, *Oedemia nigra americana* Swains.), however, swam under water with the alula stiffly extended outward and downward sometimes giving the bird the appearance of having the entire wing extended under water.—E. P. Odum.

9. The Flight of the Sunbird. (Der Flug des Nectarvogels *(Cinnyris).*) Karl Zimmer. 1943. *Journal für Ornithologie*, 91(4): 371-387. This is a most interesting analysis of the flight of *Cinnyris senegalensis* (L.) using motion pictures taken at 600 frames per second. Light flashes at 1/50 second made possible

the calculation of the frequency of the pictures. The down beat of the wing, when hovering without forward or backward movement of the body, is principally from above and behind to below and forward. The duration of an uninterrupted wing beat is 1/10 second. As seen from the side the wing tips describe an ellipse, the anterior edge of which is made by the downward and forward beat. As seen from above, an irregular ellipsoid is described by the wing tips the proximal edge being formed by the forward and downward part of stroke, the distal being formed by the upward and backward part of the stroke. This ellipsoid is broad in front and restricted posteriorly. The mean duration of the up beat calculated from the side is 0.057 seconds; that of the down beat is 0.043 seconds. Calculated from above the calculations are reversed the means being 0.044 and 0.056 respectively. For *Estrilda astrild* (Linn.), a small weaver finch, the duration of a complete stroke is about 0.3 seconds. A slight pause in both occurs at the end of the up stroke. When the bird turns to the left without forward or backward movement, the right wing shows a more rapid and powerful down stroke. A strip showing the bird in backward flight indicates a steep inclination of the body and strongly supined wings beating forward thus giving it backward propulsion. The aerodynamic analysis of the wing beat has many interesting facts. The down stroke involves an angle of 160-170° from above to below and 170-180° from forward to behind. The rate of angular displacement is 3600° per minute. Speed of the wing tip during the down stroke is 4.0 meters per second; during the up stroke, 3.3 meters per second.—D. S. F.

FOOD HABITS

10. Food of Finnish Woodpeckers. (Beiträge zur Kenntnis der Biologie finnischer Spechte. II Die Nahrung.) Alpi Pynnönen. 1943. *Annales Zoologici Societatis Zoologicae-Botanicae-Fennicae Vanamo,* 9(4): 1-60. Detailed study of three species. The Great Spotted Woodpecker, *Dryobates major major* (Linn.) lives in winter entirely on seeds of pine and spruce, in summer on ants and other insects. The Lesser Spotted Woodpecker, *Dryobates minor minor* (Linn.), in winter feeds chiefly on larvae and adults of the beetle *Phyllodecta;* in summer on miscellaneous insects. The Black Woodpecker, *Dryocopus martius martius* (Linn.) eats chiefly ants, although in winter it takes many beetles of the Cerambycidae group. Comparisons are made with food habits in other parts of Europe. With the Great Spotted Woodpecker, young birds were found to molt the lining of the gizzard shortly before leaving the nest, adults in November.—M. M. Nice.

11. Predation by Grackles. Hustace H. Poor. 1946. *Proceedings of the Linnaean Society of New York,* 54-57: 54-55. In the Brooklyn Botanical Garden *Quiscalus quiscula* (Linn.), has been observed attacking English Sparrows, *Passer domesticus* Linn., pouncing on the latter while bathing in a pool; victims were found with their skulls crushed and the breasts and abdomens eaten in pools "close to bushes or low branches which would provide cover for a grackle awaiting its victim." All the attacks came in May.—M. M. Nice.

BEHAVIOR

12. A Review of the Inborn Behavior Patterns of the Mid-European Cormorant; their Function, Ontogenetic Development and Phylogenetic Origin. (Eine Uebersicht der angeborenen Verhaltungsweisen des mitteleuropaischen Kormorans *(Phalacrocorax carbo sinensis* (Shaw and Nodd.)), ihre Funktion, ontogenetische Entwicklung und phylogenetische Herkunft.) A. Kortlandt. 1940. *Archives Néerlandaises de Zoologie,* 4(4): 401-442. A very inter-

esting account based on 2300 hours of observation and much color-banding. The author deals with behavior patterns concerned with self-preservation, with fighting and intimidating and with reproduction. Cormorants drive each other from piles by threat behavior, raised wings and feathers, and loud cries, but real fighting only takes place for the possession of a nest or when two females fight over a male (p. 418). The distinction between male and female during the time of pair formation lies in the voice, loud in the male, gasping *(keuchend)* in the female (p. 430). The male is more attached to the nest than is the female, needing it during his whole stay in the breeding colony, while the female's interest starts later and wanes earlier. Young start to work with twigs at the age of two weeks and at four and five weeks bring twigs from nearby and fasten them in the nest. In most pairs the male broods, feeds and "waters" the young more than does the female. At six weeks the young make their first flights from the nest. At 13 weeks they leave the colony and migrate along the coast to France, Portugal, and even Tunis; only a few survive. The adults stay more or less in the nesting region; the annual loss of breeding males is 12 to 14 percent, of females 18-20 percent.

In the brief English summary the origin of the innate forms of behavior are emphasized: "The manner in which the parents give their young drink . . . is in the process of phylogenetically arising from a form of greeting. Only a small proportion of parents and young show this waterpouring and drinking form of behavior. The ontogenetic development of behavior-systems proves in six cases out of seven to be just the reverse of the biogenetic principle of Haeckel." The paper is illustrated with photographs and many sketches.—M. M. NICE.

13. Interaction between Instincts. (Wechselwirkung zwischen Instinkten.) A. Kortlandt. 1940. *Archives Néerlandaises de Zoologie*, 4(4): 443-520. (Two-page summary in English.) This investigation grew out of the author's observations on cormorants and other birds. For a concept of instinct he depends very much on McDougall. But whereas McDougall posits 18 separate instincts, Kortlandt thinks rather of one system within which the instincts are differentiated and integrated. He gives many observations to prove that instincts interact in the following three ways. (1) All instincts draw upon the organism's supply of energy. If, on a certain day, one instinct is exercised a great deal, others must be exercised less or not at all. (2) The animal is, generally speaking, not able to inhibit an aroused impulse; every actuation of an instinct leads to some action or other. If, due to any cause, an instinctive drive is prevented from issuing in its usual form of behavior, it "sparks over" to another behavior group (always to the same one, indicating an innate connection); *e.g.*, the fleeing impulse to preening, etc., the fighting impulse to mating and nesting (Tinbergen's "substitute activities"). This sparking-over operates mutually; *e.g.*, from the sexual and nest-building drive to fighting, and *vice versa*. Action without sparking-over is named "autochthone"; with sparking-over, "allochthone." (3) A bird often responds instinctively to the instinctive actions of its fellows. This sometimes leads to sparking-over; *e.g.*, the sight and sound of others fighting may stimulate a cormorant to sexual behavior, nesting activity, etc.—WALLACE CRAIG.

14. Aggressive Display of the Ringed Plover. George Edwards, Eric Hosking and Stuart Smith. 1947. *British Birds*, 40(1): 12-19. By means of two blinds near a nest of *Charadrius hiaticula hiaticula* Linn., a stuffed plover, a mirror, and three observers, very interesting results and fine photographs were obtained. Both male and female attacked the dummy vigorously, displaying in such a way that the tail gave "a black and white frame to the similarly contrasted *motif* of the alternations of black and white of the breast, forehead and crown. The general effect is striking and has an obviously high threat-value." (p. 13). It "needed the presence of the dummy *plus* another bird to evoke full aggressive display in the third." (p. 16). When on the day the eggs were hatching, the

dummy was placed within three feet of the nest, and attacks had failed to dislodge it, the male tried "injury-feigning" in an attempt to lead off the intruder. "When 'injury-feigning' failed too, in its purpose, the cock reverted to attack, and when the pair were working together, it was evident that the advent of the hatch had greatly intensified their reactions." The plovers vented their emotions on a pair of Wheatears and a Mistle-Thrush in their territory. The problems of nuptial and threat displays are discussed with references to the literature. A stimulating paper.—M. M. NICE.

15. Display of Sand-Martin. Alex. S. Thom. 1947. *British Birds*, 40(1): 20-21. Two communal displays of Bank Swallows, *Riparia r. riparia* (Linn.), on a sanded road on Cambridge Sewage farm are described. On July 6 some 250 birds were displaying as pairs, one bird hovering over the other, then indulging in an aerial chase. On September 15, 2000 Bank Swallows were present; "much preening and sand-bathing were noted," as well as threat displays and attempted copulation. Somewhat similar behavior has been recorded for four other species of swallows (Nice, *Transactions of the Linnaean Society of New York*, **6: 78**, 1943).—M. M. NICE.

16. Observations on the Territory and Breeding Behaviour of the Willow-Warbler. D. J. May. 1947. *British Birds*, 40(1): 2-11. Excellent study of *Phylloscopus t. trochilus* (Linn.) on a 15-acre common in Surrey. The average area of each territory was just over one-third of an acre; every male eventually obtained a mate during the two years. The female builds and incubates, while the male assists in varying degrees with the feeding of the young. Injury feigning was noted in four cases. Fledging lasted 13, 14, 15 and 16 days. From 152 eggs in 26 nests 85 young were fledged—56.6 percent. "Judging by Nice's (1937) summary of similar studies, the Willow-Warbler's nesting success is between that of open-nesting birds (40.5-46.7 percent) and hole-nesters (55-76 percent)—probably what one would expect with its domed ground nest." No less than six broods were taken by cats.—M. M. NICE.

17. Some Cases of Polygamy of the Pied Flycatcher (*Muscicapa h. hypoleuca* Pall.) (Några fall av polygami hos svart och vita flugsnapparen (*Muscicapa h. hypoleuca* Pall.).) Lars von Haartman. 1945. *Vår Fågelvärld*, 1945: 27-32. In a ringed population of Pied Flycatchers near Åbo, Finland, four cases of polygamy were found. In each case the male had left the first territory as soon as his mate started laying and had established a new territory; in 1943, 17 of 24 males had two or more territories. "In all the cases studied the bigamous male took part in feeding the young of the first nest, but not of the second."—M. M. NICE.

18. "Anting" of Starling. Leslie Gregory. 1946. *British Birds*, 39(12): 374. Four juvenile and an adult male *Sturnus vulgaris* Linn. were feeding on a swarming ant's nest; two of the juveniles anted.—M. M. NICE.

19. Roosting Habits of the Irish Coal-Tit, with some Observations on other Habits. Robert F. Ruttledge. 1946. *British Birds*, 39(11): 326-333. Three years' observation on marked individuals of *Parus ater hibernicus* Ogilvie-Grant. Roosts are sometimes holes in rotting tree-trunks *excavated* by the birds, sometimes behind ivy, etc. At night the birds "are not very responsive to noise or even to light, but they awake immediately and leave the roost if the tree-trunk or branch, etc., is lightly tapped or jerked." Some Coal-Tits are remarkably sedentary, even in winter. "In late winter and early spring especially, though indeed at all times to some extent, the volume of song is much dependent on birds of adjacent territories being close to one another." The author believes that "the sedentary individuals at any rate, remain paired for life. Pairs keep together, or

when widely separated, regain contact by the use of the call-note."—M. M. NICE.

20. Nature's Linguists: A Study of the Riddle of Vocal Mimicry. Alec H. Chisholm. 1946. Melbourne. Brown, Prior, Anderson Pty. Ltd. 24 pp. Some 50 Australian birds have been shown to be mimics, a dozen species, including the two Lyrebirds and five Bower-birds, "use vocal mimicry consistently." Among introduced birds, the Starling is "the only assured mimic"; one of these in Melbourne was heard to imitate the notes of ten native species. Commenting on "the prevalence of vocal mimicry in Australia," the author says: "Our birds generally are vocally individual, distinctive, sharply defined, and so invite mimicry." Eight photographs are given of different "mockers."—M. M. NICE.

LIFE HISTORY

21. Studies on the Biology of Finnish Woodpeckers. I. (Beitraege zur Kenntnis der Biologie finnischer Spechte. I.) Alpi Pynnönen. 1939. *Annales Zoologici Societatis Zoologicae-Botanicae-Fennicae Vanamo,* 7(2): 1-166. This is a very fine paper on four species in Joensu in eastern Finland (62°N.): Black Woodpecker, *Dryocopus martius martius* (Linn.); Great Spotted Woodpecker, *Dryobates major major* (Linn.); White-backed Woodpecker, *Dryobates leucotos leucotos* (Linn.); and the Lesser Spotted Woodpecker, *Dryobates minor minor* (Linn.). Many of the birds were banded and some were marked with paint; individuals and pairs were followed throughout whole days, and openings were bored into nesting holes. Drumming is heard only in spring and summer, especially from an unpaired male, or when a strange pair appears in the neighborhood, or a person intrudes during nesting, or after a woodpecker has been caught and released, or in answer to a neighbor's drumming, or sometimes at the start of a new phase in the nesting cycle. In all-day records of the Great Spotted Woodpecker an unmated male drummed 598 and 504 times, but only five times and then none at all when paired and in the process of nest-building. With another pair there was considerable drumming during nest-building—194 and 75 instances—, and 225 during egg laying. Females drum to a small extent. There is no drumming in winter, although the Great Spotted may defend his cone supply from intruders more bitterly than he does his nesting territory.

The female Black Woodpecker remains true to her territory, while males wander; pair formation may take place in the fall. The female Great Spotted Woodpecker sometimes takes the initiative in pair formation. The male usually takes the initiative in nest building and ordinarily does the larger share. Most holes face the north, as the north side of the trees are usually rougher and thus easier for the birds to cling to. One Great Spotted pair excavated a hole in eight days, while another took over a month; one pair of Lesser Spotted Woodpeckers accomplished the task in five days. In all species the male incubated at night. The incubation period of the Black and Great Spotted Woodpeckers was twelve days. I worked out two tables from the charts and text.

In the three *Dryobates* species, the much larger share of the male is apparent; the females often give up all effort to feed as the young grow older (a Great Spotted female occasionally bringing food, but eating it herself or dropping it), and this indifference apparently leads at times to the death of some of the young. Twice, however, a Great Spotted female and once a Lesser Spotted female spent the night with the young. The fledging period of the Great Spotted Woodpecker is 21 to 23 days, of the White-backed Woodpecker 27-28 days, and of the Black Woodpecker 27 days. Charts are shown of increase in weight and the growth of feathers. A male Great Spotted Woodpecker was caring for his young two weeks after they left the nest, while a male Black Woodpecker does so for at least a month, and

ALL-DAY RECORDS ON INCUBATION OF WOODPECKERS

Species	Nest	Time	Length of day	Periods on the Nest				Percent time on nest
				Male		Female		
				Number	Length	Number	Length	
Great Spotted	a	1st day	14 hrs. 27 min.	19	23.7	5	7.8	60.4
	a	5th day	13 hrs. 55 min.	11	28.6	13	21.1	70.7
Black	b	2nd day	12 hrs. 4 min.	3	89.9	3	124.0	91.0
	b	4th day	13 hrs. 15 min.	2	144.5	3	98.7	68.0

ALL-DAY RECORDS OF PARENTAL VISITS TO NESTS WITH YOUNG

Species	Nest	Time	Length of day	No. Young	Number of Visits		
					Male	Female	Both
Great Spotted	c	3rd day	17 hrs. 20 min.	?	?	?	122
	c	13th day	18 hrs. 49 min.	?	188	96	284
	d	6th day	16 hrs. 42 min.	5	90	0	90
White-backed	e	4th day	16 hrs. 34 min.	5	?	?	51
Lesser Spotted	f	?*	15 hrs. 25 min.	4	194	0	194
Black	g	6th day	15 hrs. 30 min.	3	6	6	12†
	h	21st day	12 hrs. 15 min.	3	5	6	11†
	g	24th day	15 hrs. 40 min.	3	14	15	29†

*Young left the nest 6 days later.

†Black Woodpeckers feed by regurgitation, like our Flicker, *Colaptes auratus* (Linn.). See Sherman, 1910, *Wilson Bulletin*, 22: 135-166.

the young stay together for another month. From Table 17 we read that in 19 nests of the four species 102 eggs were laid, while in ten of these and eight other nests 67 young were fledged.

Diagram 42 gives the time of going to roost of a Black Woodpecker in relation to sunset; in spring and especially summer the bird retired progressively earlier in relation to sunset, but in fall and winter at sunset or even later. In mid-winter woodpeckers leave their nests before sunrise and in mid-summer Great Spotted Woodpeckers started to feed their young as early as 1:30 a.m. The Pied Flycatcher, *Muscicapa hypoleuca* (Pallas), and Wryneck, *Jynx torquilla* Linn., may drive the Lesser Spotted Woodpecker from its hole; once the author saw a Wryneck pair assisting in feeding the young of a pair of Lesser Spotted Woodpeckers. —M. M. NICE.

22. Nesting Activities of the Grey Thrush. G. R. Gannon. 1945. *The Emu*, 44(4): 290-304. A pair (or pairs?) of Grey Thrushes, *Colluricincla harmonica* (Lath.) nested five years in succession on the verandah of the observer's home. Incubation was unsuccessful each year, and eggs were abandoned successively 22, 22, 22, and 21 days after the beginning of incubation. The sixth attempt in 1942 was successful although it seems possible that a different male was involved. In 1942 two clutches were hatched. The incubation period was 17 days, 10 hours for one egg and 18 days, three hours for another. The female always sat on the eggs or young at night. An interesting observation was made in 1941 when the female carried food to the nest on the third day after the young *should* have been hatched. There are many other interesting notes.—D. S. F.

23. Notes on Swainson's Warbler in Central Georgia. Brooke Meanley. 1945. *The Auk*, 62: 395-410. In the Ocmulgee bottomlands below Macon, Swainson's Warbler, *Limnothlypis swainsonii* (Aud.), is common in the mature swamp forests which have a rank undergrowth, a habitat also favored by the Hooded Warbler, *Wilsonia citrina* (Bodd.); the Kentucky Warbler, *Oporornis formosus* (Wils.); the Acadian Flycatcher, *Empidonax virescens* (Vieill.); and the Cardinal, *Richmondena cardinalis cardinalis* (Linn.). "Cane in mature or immature form *must* be present" on its breeding ground in this region, a requirement, the reviewer might add, which seems to be almost universal for the coastal plain nesting population of this species. At least one nest and pair have been recently found in the coastal plain of Georgia occupying a caneless territory (unpublished record by Robert A. Norris). Three areas are described where observations were made; in one area only an unmated male could be found, while in the other areas several pairs and nests were located. Compared with other warblers, Swainson's is a lethargic, "individualistic" species, best located by its distinctive song and call notes. Even after the breeding season it rarely associates with other warblers in the late summer and early fall flocks. Both Meanley and Dr. J. Fred Denton have much additional information which, it is hoped, will be published in the near future.—E. P. ODUM.

24. Life History of the Blue-throated Green Motmot. Alexander F. Skutch. 1945. *The Auk*, 62(4): 489-517. This is another of Skutch's very interesting life history studies of species representative of various families of tropical American birds. The Blue-throated Green Motmot, *Aspatha gularis* (Lafr.), differs from most motmots in lacking the racket-shaped tail feathers and in living in the oakpine forests (and to some extent cypress) at high altitudes (7000-9000 ft.) rather than in the dry lowlands, the habitat of most members of the family. In common with other motmots it remains paired the year around and nests in burrows in roadside banks or natural slides after the manner of its near relatives, the kingfishers. Unlike the lowland motmots, however, the Green Motmot uses burrows as roosting places during most of the non-breeding season, a pair of birds

almost always being observed to enter very late in the evening and leave very early in the morning; the departure of the pair was often accompanied by a vocal ceremony or "dawn song." During the nesting season four burrows were opened from above to permit observation. The eggs, three in number, were laid in April, one every other day. Incubation apparently began with the last egg and continued 21-22 days, both sexes alternating in about four hour shifts during the day. The eggs were left uncovered for a short period in the morning and again in the late afternoon; both parents spent the night in the burrow. The nestlings, naked at hatching, became much more heavily clothed in down than their relatives of the warm lowlands. Development was slow, nestlings remaining 29-31 days in the burrow, even though they were fed fairly frequently by both parents (19 times during four hours observation in one case). Droppings were not removed but accumulated in the burrow. As soon as favorable weather prevailed after the nestlings left, the adults began digging new burrows near the old ones. Both sexes alternated in digging the new burrow working in 2-3 hour morning and afternoon periods in one case. Earth was loosened with the bill and kicked backwards with the feet, never carried in the bill. The new burrows were then used until after the next breeding season. When the young birds dig their burrows remained something of a mystery, but since digging activity was observed only in June and July, it was thought that the young may pair and dig burrows at the same time as the parents. A captive hand-reared nestling went through digging motions when a little over a month old.—E. P. Odum.

25. Some Remarks on the Life History of the Black-necked Grebe (*Podiceps n. nigricollis* Brehm). A.L.J. van Ijzendoorn. 1944. *Limosa,* 17(1): 8-13. This Grebe which belongs to the same species as our Eared Grebe, *Colymbus nigricollis californicus* Heermann, is an uncommon breeder in Holland; the author made some observations on the methods of feeding, bathing, fighting ("Grebes are bill-fighters; . . . above or under water") and on relations between mates and young. When the chicks are about a week old, each parent takes part of the brood and after this "seem to shun each other, are even hostile when they meet." The young bird takes food out of the parent's bill, and the author suggests "that the golden feathers on both sides of the head serve to direct the attention of the young ones to the bill, as their source of food." After being fed, the chick immediately swims away from the parent, an "instinctive flight" that does not occur in the Dabchick, *Podiceps ruficollis* (Pallas), and Great Crested Grebe, *Podiceps cristatus* (Linn.). At two weeks the young can feed in all the adult methods—by diving, swimming, dipping and pecking, and at three weeks they are fully independent.—M. M. Nice.

ECOLOGY

26. The Sparrow-Hawk as a Predatory Enemy of Song Birds. (De Sperwer als roofvijand van zangvogels.) L. Tinbergen. 1946. *Ardea,* 34(1-3): 1-213. This is a remarkable treatise of the role of *Accipiter nisus* (Linn.) in the regulation of the populations of small birds. The populations of the English Sparrow (*Passer domesticus* Linn.), the Chaffinch (*Fringilla coelebs* Linn.), the Great Tit (*Parus major* Linn.) and the Coal-Tit (*Parus ater* Linn.) were studied quantitatively and the resulting data submitted to thorough statistical analysis. The general procedure in population studies was to estimate the population in spring by sample counts. Mortality was calculated from reproductive rates or from banding data. Most of the investigation was done in 1941-1943.

The English Sparrow population was estimated by determining the mean number of pairs per dwelling and multiplying this by the number of houses in the area. Because of restricted food supplies and the severe winters, the English Sparrow populations were at a low level for the period 1941-1944. The estimated *monthly* mortality rates were 13-14 percent for 1941, 9-12 percent for 1942, and 11 percent

for 1943. These represent *annual* mortality rates of about 83 percent, 73 percent and 74 percent respectively. The numbers of Chaffinches, Great Tits, and Coal-Tits were estimated by means of a technique based on the numbers of males occupying territories and the classification of the results according to habitats for purposes of calculation. The Chaffinch and Great Tit populations suffered from the severe winter of 1941-1942. Mortality among the Chaffinches was computed by use of banding data. These indicate a mean *monthly* mortality of eight percent (= annual mortality *ca.* 63 percent). Interestingly this figure is too low for the Scandinavian Chaffinches which have an annual mortality rate about 66 percent, have a higher reproductive rate, and are migratory whereas the Dutch Chaffinches are resident. The mean monthly rate for the Great Tit, based on calculations from the reproductive rate, was found to be about 13 percent (= *annual* mortality *ca.* 81 percent). For the Coal-Tit the data were obtained similarly and show a mean *monthly* mortality rate of 15 percent (= *annual* mortality *ca.* 86 percent).

The number of song birds killed by Sparrow-Hawks was derived from data on the stock of Sparrow-Hawks, the percentage which each species occupies in the food of the hawks, the ration of small birds per hawk per unit of time. Part of the Netherlands Sparrow-Hawk population is resident and part drifts southward in winter; Scandinavian Sparrow-Hawks winter in the Netherlands. *Hunting biotopes* contain all types of terrains which have "sufficient relief in vegetation or surface." Only completely open areas or dense woods appear to be unsuitable. *Breeding biotopes* include usually a certain amount of woods. Scotch-pine, the most common tree in the Netherlands, is the most common nesting-tree. Nests are usually crown-high. "From year to year the nests of Sparrow-Hawks are situated at about the same places. So one can easily distinguish individual breeding territories." (p. 191). When one member of a pair fails to return in spring another mate is usually attracted to the territory. Hence occupation of a territory is continuous from year to year even with the changing of the individual members of the pair from time to time. The annual mortality rate based on the population of adults plus fledged young is 60 to 75 percent. About 80 species of vertebrates were found to be sources of food. There is a tendency to overlook inconspicuous species such as small rodents in dense low vegetation; only two wrens, *Troglodytes troglodytes* L., were taken as compared to 76 of the more conspicuous robins, *Erithacus rubecula* Linn., although the two species appear in about equal numbers in the hunting areas. "Food specialization," the preponderant use of a species or a few species as prey, is due not to specialism in the actual selection of food but rather to a persistent use of certain restricted hunting areas from which presumably a fairly random sample of the potential prey is obtained. "The question arises if all types of terrain bearing tree or shrub growth are visited by hunting hawks. A careful comparison of the faunae of different habitats and the food lists of individual pairs confirms this question with respect to the areas investigated and shows that *hunting takes place in the villages and along the farmyards, in the full-grown mixed plantations, in the pinewoods, in the young plantations, along the heaths covered with a scattered growth of Scotch pine and along coppices.*" (p. 195). Local variations in diet reflect local differences in fauna. The feeding radius of the hawks apparently is little more than three kilometers. Seasonal and annual variations in diet reflect changes in the faunae. There is a tendency for the females to take larger prey.

In order to show the influence of the hawks on passerine species, the percentages of English Sparrows, Chaffinches, Coal-Tits, and Great Tits in the food of the hawks in the investigated areas were calculated. Mean estimates for three years indicate that, of the entire Sparrow-Hawk diet, English Sparrows constitute 13.5-20 percent (corrected) in May and 11-16 percent in August; Chaffinches about four percent in May; Great Tit, 3-9.5 percent based on data from May and June-September; Coal-Tit 2.5-5.5 percent (corrected) for May and 2.5-5.5 percent (corrected) for June-September. Means for 1941, 1942 and 1943 for Hulshorst-Hierden

indicate that the English Sparrow population in May is reduced 8.4 percent (corrected) by Sparrow-Hawk predation and 3.9-4.7 percent in August; Chaffinches are reduced 2.5 percent, Great Tits, 5.7 percent, and Coal-Tits 2.3 percent all in May. For Ermelo, the second experimental area, the reduction (mean for 1941, 1942, 1943) is 4.1 percent (corrected) for English Sparrows in May and 2.0-2.5 in August; for Chaffinches it is 2.0 percent in May and for Coal-Tits it is 2.0 percent (corrected) in May. Of interest is the percentage of total mortality attributable to Sparrow-Hawk predation. The means for the Hulshorst-Hierden area for May 1941, 1942, and 1943 indicate for the English Sparrow, 79 percent (corrected), 30 percent for Chaffinches, 44 percent for Great Tits, and 15 percent (corrected) for the Coal-Tit. The corresponding data for Ermelo are English Sparrow 40 percent (corrected), Chaffinch 20 percent, and Coal-Tit 13 percent (corrected). In August the relations change somewhat as shown by the date for Hulshorst-Hierden: English Sparrow 37-46 percent, Great Tit 16 percent and Coal-Tit (corrected) 6 percent. The data for Ermelo show a similar change. The inherent variables are almost infinite. However, the author does a remarkably excellent job in his statistical evaluation of the calculated results. Many important conclusions and ideas, including a discussion of the difficulties of assigning an "economic" value to a species, must of necessity, be omitted from such a brief review as this. This treatise, which concludes with a 25-page summary in English, is recommended to ecologists and all interested in wildlife management.—D. S. F.

27. Mourning Doves in Nebraska and the West. H. E. McClure. 1946. *The Auk*, 63(1): 24-42. A summary of observations on *Zenaidura macroura* (Linn.): 3,878 nestings during three years in Iowa, 385 during three years in Nebraska, and ten in California. The percentage of success of nests was 47.9, of eggs 45.6 (47 percent of the 7,264 eggs in Iowa, 44.5 percent of the 734 eggs in Nebraska, and 65 percent of the 20 eggs in California). The number of young raised per nesting was 0.87, per successful nesting 1.8. Roadside censuses on 77,000 miles of driving in Nebraska gave an average of 33.5 doves per hundred miles in contrast to 11.2 counted by Siegler and Newman *(Journal of Wildlife Management*, 1944) in east Texas. For the months of June and July the Texas average was 16, the Nebraska average 55; in Oklahoma during these months in 1920-23 on 1,565 miles we found an average of 31.

The author's method of computing a season's nesting attempts for Iowa from counting the active nests in a locality in June was found to fit conditions in Nebraska. When it comes to computing the number of adults involved, I do not understand why he says, "the average number of nesting attempts per pair is conservatively placed at six" (p. 40) when in his 1943 report *(Research Bulletin*, 310, Ames, Iowa) he found "the average number of brood attempts was 5.4, 5.1 and 4.6, respectively in 1938, 1939 and 1940." (p. 384).—M. M. Nice.

28. Community Selection by Birds on the Helderberg Plateau of New York. S. Charles Kendeigh. 1945. *The Auk*, 62(3): 418-436. This paper analyzes ecological factors influencing the choice of grassland, bushland, deciduous and coniferous forest by various species, especially warblers on the Huyck Preserve in central New York. In general, differences in density and arrangement of leaves and twigs and other "structural" features of the vegetation appeared to be more important than the differences in micro-climate; however, light intensity was suggested as possibly important (a possibility that perhaps could be tested experimentally?). Food probably is not a primary factor in local community selection except possibly in the sparrow group. Many species undoubtedly choose bushland or forest rather than grassland because they require elevated song, feeding, or nesting surfaces. Reasons why some species choose evergreen, others deciduous forest are not so obvious but the striking difference in feeding and nesting surfaces produced by needle leaves as compared with broad leaves may be the critical factor. As the author points out, one must often look into the past for suggestions as to

the reasons for different community selections; avoidance of competition, past climatic cycles, fortuitous formation of stereotyped behavior patterns undoubtedly all play a part. Sometimes choice of a particular ecological community is correlated with morphological adaptations but most often the choice seems to have a physiological or psychological basis. Perhaps the most valuable part of the paper is the series of concise descriptions with literature comparisons of the community niche and nesting sites of warblers and vireos in the Helderberg Plateau region. The paucity of published information on local habitat selection of common birds is noteworthy. Every experienced ornithologist knows where birds occur in his area, but few ever accurately record information on the ecological requirements. Since community selection of a species, for example, the Black-throated Green Warbler, *Dendroica virens virens* (Gmelin), often differs markedly in different parts of the range, the value of local studies such as reported in this paper are greatly increased by comparison with similar observation in other areas.—E. P. Odum.

29. Breeding Birds of the Pigmy Conifers in the Book Cliff Region of Eastern Utah. Ross Hardy. 1945. *The Auk*, 62(4): 523-542. The pigmy conifer or piñon-juniper woodland appears to occupy a sufficiently large area (in the interior Great Basin and Colorado River regions of Colorado, Utah, Arizona, New Mexico, Nevada, and west-central California) and to have a sufficiently distinctive biota to be considered as one of the major biotic areas or biomes of North America. Consequently, a report on the bird life of two representative areas within the piñon-juniper biome is of more than local interest. The author points out that moisture is the critical environmental factor, the unevenly distributed 10-13 inch rainfall being an important factor accounting for the parkland-like growth of stunted junipers and piñon pines (proportion about three junipers to one piñon) which occupy a wide altitude belt between the lowland desert scrub or grassland communities and the heavier forests of higher altitudes. Food is scarce and hence is a factor limiting the abundance of birds, but nesting sites are plentiful and varied enough to reduce competition for them to a minimum. The Piñon Jay, *Cyanocephalus cyanocephalus* (Wied), and Gray Titmouse, *Parus inornatus ridgwayi* Richmond, are the most characteristic species of the community and with the Lead-colored Bush-tit, *Psaltriparus minimus plumbeus* (Baird), make up the principal obligatory permanent residents (that is, species generally restricted to pigmy conifers). The author states that the jay ranges widely in flocks up to 50 or more, and nests "in colonies," but he does not make clear the meaning of the latter statement. The birds of a flock apparently pair off in the spring and nest in the same general vicinity, but no mention is made of territorial behavior or territory size except that in one case "recently abandoned nests within a quarter-mile radius indicated that a large colony had nested." After nesting "each family seemed a separate unit within the larger social group—the flock." The titmice traveled in family groups for a short time after nesting, but were observed singly or in pairs, often associated with other species, during most of the year. Bush-tits commonly formed troops of 6-30.

Other important permanent residents of the piñon-juniper community were the Raven, *Corvus corax* Linn., and various birds of prey (Golden Eagle, *Aquila chrysaëtos canadensis* (Linn.); Western Red-tail, *Buteo jamaicensis calurus* Cassin; Eastern Sparrow Hawk, *Falco sparverius sparverius* Linn.; and Montana Horned Owl, *Bubo virginianus occidentalis* Stone), most of which depend on the rugged nature of the topography for nesting sites rather than on the vegetation. The important nesting summer residents comprised about 10 species as follows: Mountain Bluebird, *Sialia currucoides* (Bechst.); Magpie, *Pica pica hudsonia* (Sabine); Western Gnatcatcher, *Polioptila caerulea amoenissima* Grinnell; Black-throated Gray Warbler, *Dendroica nigrescens* (Towns.) (not observed except in the piñon-juniper areas); Mourning Dove, *Zenaidura macroura marginella*

(Woodh.); House Finch, *Carpodacus mexicanus frontalis* (Say); Chipping Sparrow, *Spizella passerina* (Bechst.); Lark Sparrow, *Chondestes grammacus* (Say); Howell's Nighthawk, *Chordeiles minor howelli* Oberh.; and Rock Wren, *Salpinctes obsoletus* (Say). It is interesting to note that no summer resident or permanent resident woodpeckers are mentioned, but that "cavities made by winter-visiting woodpeckers in living junipers are commonly utilized by the Mountain Bluebird for its nests." Of the total of 79 species observed, 17 were considered winter visitors and about 40 as migrants or foragers from other communities.—E. P. ODUM.

CENSUSES AND POPULATIONS

30. Storks in the Netherlands in 1942 and 1943. (Gegevens over de Ooievaar, *Ciconia c. ciconia* in Nederland in 1942 en 1943.) Fr. Haverschmidt. 1944. *Ardea*, 33(1/2): 39-42. These are the results of the annual stork census in Holland. Breeding results were extraordinarily bad in both seasons. In 1942 there were 142 inhabited nests with a total of 191 young with a mean of 1.3 young per nest and 2.7 young per nest with young. Seventy nests had no young. In 1943 there were 108 inhabited nests with a mean of 1.3 young per nest and 3 young per nest with young. Sixty-one nests had no young.—D. S. F.

31. Mobility of Bobwhite Quail in Southwestern Texas. Valgene W. Lehmann. 1946. *Journal of Wildlife Management*, 10(2): 124-136. The Bobwhite Quail on and around a 960-acre tract of mesquite semi-prairie in southwestern Texas were subjected to an intensive trapping and banding program between April, 1942, and February, 1944. A total of 2,509 birds were caught in drive traps and banded; 787 recoveries were obtained on 699 birds during the study period. Recovery records are grouped according to season and time interval. Most (63 percent) of the birds recovered after from six months to two years were retaken within a quarter mile of the place of banding, and records obtained from 10 coveys trapped four or more times indicated that covey ranges varied from one-quarter to one-half mile in length and from 100 to 200 yards in width. Ranges regularly overlapped those of neighboring coveys and fighting between coveys was rarely observed. Long movements of a mile and more were encountered during every season but were most numerous during summer and fall. Extensive shuffling during the winter was indicated by the appearance of new, unmarked birds and the disappearance of marked residents. A figure derived by adding together the number of these two groups of birds and termed "population turnover" amounted to "at least 72 percent" of the total population during the winter of 1942-43. The author concludes that the birds under study were less sedentary than Bobwhite populations studied by Stoddard and Errington. A direct comparison with Stoddard's banding data would have been valuable in this connection.—JOHN T. EMLEN, JR.

32. Bobwhite Quail Reproduction in Southwestern Texas. Valgene W. Lehmann. 1946. *Journal of Wildlife Management*, 10(2): 111-123. This report, crowded with interesting observations and statistics, covers nesting studies on the Bobwhite Quail population of a 960-acre mesquite-grass prairie area in southwestern Texas in 1942 and 1943. With the aid of an ingenious flushing bar mounted on the front bumper of a pick-up truck, 194 nests were found. Special care was exercised in attempts to avoid attracting predators to the nest sites, stilts being used on occasion.

Breeding extended from late March, before coveys were dissolved, through September. Pairing was principally between members of the same coveys. Breeding activity fluctuated during each season, reaching peaks during periods of rainfall and nearly ceasing during periods of drought. The birds congregated during

lulls into nonbreeding associations of from 6 to 16 birds. Clutch size and hatchability were greatest in early nests (14.8 eggs, 94 percent) and lowest in late summer nests (10.5 eggs, 71 percent). Forty-six percent of the study nests brought off young, the highest success (57 percent) occurring in midsummer when coyote pressure was lightest. Of the 102 next failures, 96 were attributed to predators, 80 of them to coyotes.

The ratio of young birds to adults in the fall (October-November) trapping period was 2.5:1 in 1942 and 1.0:1 in 1943. The total population increased during the latter year from 596 (fall, 1942) to 735 (fall, 1943). This association of a low representation of young with a substantial population gain is attributed to a shuffling of populations in response to local irregularities in breeding success and is interpreted as indicating that age ratio statistics in themselves are of questionable value as measures of breeding season success. These interpretations might be questioned in the light of Errington's observations on the inverse relation of summer gain to population density in Wisconsin quail (*Ecological Monographs,* 15: 1-34, 1945).—JOHN T. EMLEN, JR.

CONSERVATION AND WILDLIFE MANAGEMENT

33. The Outlook for Farm Wildlife. Aldo Leopold. 1945. *Transactions of the Tenth North American Wildlife Conference:* 165-168. Wildlife management has been active for twenty years, nevertheless: "Wildlife habitat in fertile regions is being destroyed faster than it is being rebuilt. Many imported and also native species exhibit pest behavior. A general disorganization of the wildlife community seems to be taking place." "In the effort to rescue one value, we trample another. Wild plants and animals suffer worst because we can't spend much cash on controls or preventives. Everything we lose will be replaced by something else, almost invariably inferior." There are two opposing philosophies of farm life: "*The farm is a food factory,*" and, "*The farm is a place to live.* The criterion of success is a harmonious balance between plants, animals, and people; between the domestic and the wild; between utility and beauty." An important, thought-provoking paper.—M. M. NICE.

34. Significance of Racial Variation in Birds to Wildlife Management. John W. Aldrich. 1946. *Journal of Wildlife Management,* 10(2): 86-93. This paper opens with a well organized and simply expressed presentation of the principles of individual variation, ecological adaptation and species formation. Upon this background of how nature has adapted subspecies to their natural geographic ranges, the author examines game-bird introductions and transplants. Species isolated by physical barriers may have all the adaptive requirements for other areas, and thus may readily establish themselves when transported across the barriers; such has been the case with the House Sparrow, the Starling and the Ring-necked Pheasant in North America. Stocking one portion of the range of a variable species with individuals of another geographic race is rarely successful, however. The very existence of morphologic and other differences in the alien race may be regarded as adaptations to another environmental situation. Such stocking may even be highly undesirable, for interbreeding with the native population may cause a reduction in the adaptability of that population to the local environmental conditions. Cooperation between wildlife managers and museum taxonomists should be of value in selecting appropriate stocks for local introductions. The ideas expressed in this article are preeminently sound. They could well be disseminated to a large public of sportsmen as well as to game managers and technicians.—JOHN T. EMLEN, JR.

35. Potential Value of Islands for Controlled Studies on Upland Game Birds. Ralph B. Nestler. 1946. *Journal of Wildlife Management,* 10(3): 239-

241. Great difficulties stand in the way of using precise experimental methods for research studies of game birds under natural conditions. Such factors as predation, human disturbance and local movements of the birds are usually impossible to control or measure with an accuracy consistent with modern experimental procedure. Fenced inclosures or exclosures may make it possible to set up reasonably controlled areas for field experiments with wild mammal populations but are rarely applicable to bird studies. Islands provide a solution which should be exploited. Einarson's study of Pheasants on Protection Island off the Washington coast is cited as an example of what can be done. The author notes but does not comment on the irregular behavior of this pheasant population. It should be noted that irregularities of a similar nature frequently appear in island populations and indicate that even here the gap between the controlled laboratory and natural conditions is not completely bridged.—JOHN T. EMLEN, JR.

36. The Hungarian Partridge in Wisconsin. Robert A. McCabe and Arthur S. Hawkins. 1946. *The American Midland Naturalist,* 36(1): 1-75. The Hungarian Partridge, *Perdix perdix* Linn., was first introduced into Wisconsin in 1908. The stock was derived from Bohemia and doubtless was of the nominate race. Five thousand were released in lots of 1000 each in Wakesha County. A simultaneous and more successful planting was made in Alberta. Other plantings raised the total of originally introduced birds to 6,470. The present range of the species in Wisconsin includes the 20 southeastern counties where the main soil types are silt loam, prairie, and peat with red-clay areas along Lake Michigan to the north. This is an area of diversified farming and dairying with farms averaging about 140 acres. There are also isolated populations in Polk, St. Croix, and Buffalo counties on the Mississippi River in northwestern Wisconsin. These are derived from local introductions or an "eastward drift from Minnesota plantings." The first open season in Wisconsin was in 1919. Since 1932 the annual kill has varied from 2,145 in 1944 to 26,248 in 1939; kill per square mile of area open to shooting has varied from 0.4 in 1944 to 3.8 in 1939. There has been a marked decline in kill since 1939. This paper is based primarily on the studies conducted during the attempt to manage a Hungarian Partridge population in the Fayville Grove area in Jefferson County. A probable climatic explanation for the failure of the Hungarian Pheasant to become more successful in Wisconsin lies in the fact that the summer temperatures are considerably higher than those of its native home in Europe. Low winter temperatures apparently have no appreciable effect on the population. Predation, both in winter and summer, is relatively unimportant or, at the most, of local importance. "After the formation of pairs, nesting sites are chosen in cover at least eight inches high," primarily in hay fields. The average clutch was 17 eggs; hatchability over six years varied from 74 to 93 percent. Sixty-eight percent of 435 nests failed to produce young. The mowing of hay caused 77 percent of the failures. Phenologic studies show in all six years that hay mowing coincided with the peak of hatching. This may be an important factor in the low Hungarian Partridge densities in Wisconsin. Sex ratio among the embryos was about 57 percent females; among adults, 58 percent males. Only 25 percent of the spring survivors were found by the nesting censuses. The fate of the other 75 percent is unknown but it is highly probable that they were nonbreeders. Observations on behavior among captive chicks showed that for the first 24 hours the chick makes no effort to eat or drink. During the second day random pecking is observed. After a few days pecking becomes selective. Up to sixteen days at least the chicks would pursue and pick up live insects but did not eat them. At five weeks insects were taken readily. Scratching began at three weeks. "When the birds were three months old they became excited or 'wild' when anyone approached." (p. 61). "Indiscriminate pecking was also instrumental in teaching young partridges to drink" (p. 61). Dusting was observed at three weeks but not at eight days. Captive birds selected food in the

following order of preference: wheat (22 percent), atlas sorgo (19 percent), buckwheat (16 percent), rice (12 percent), yellow corn (12 percent), honeydew cane (8 percent), white corn (6 percent), barley (5 percent), soybeans (0 percent). Food selection by pheasant, quail, and Hungarian Partridge in the wild was in the following order of preference: yellow corn, honeydew cane, atlas sorgo, white corn, buckwheat, soybeans, rice, wheat, barley. There had been previous conditioning to yellow corn. This is an excellent study not only because of its contribution to the knowledge of the Hungarian Partridge but even more as an example of the varied approaches and techniques and that can and should be applied to wildlife research.—D. S. F.

37. Development of Natural Resources: the Coming Technological Revolution on the Land. H. H. Bennet. 1947. *Science*, 105: 1-4. Forcible statement of the absolute necessity that people in general realize that "productive land" is the basis of our living, that it "is neither limitless nor inexhaustible," and that "Time is running out between the impending pincers of an ever-increasing population and a dwindling area of productive land." Past exploitation in this country is being corrected to some degree by the Soil Conservation Service, but a very definite program of social planning is imperative for the future. The same article, entitled "Revolution on the Land," appears in *Audubon Magazine*, 49: 28-36, 1947.—M. M. Nice.

38. Too Many Mouths. William Vogt. 1946. *Land*, 5: 259-265. A straightforward and impressive analysis of "carrying capacity" of the world for human beings. "The spring song of male birds is the expression of a psychological limiting factor," the cannibalism of the lizard, *Tropidurus*, is its check on overpopulation. We in America "have destroyed more natural resources, the principal basis of our wealth, than has any people anywhere on earth in a comparable amount of time. . . . We have poisoned the predators that held the grassland pests in check, and now we are spending millions of dollars poisoning the pests. We have drained 100 million acres of swamps and marshes that once fed our underground waters and supplied enormous quantities of waterfowl and fur bearers; and now produce little but mosquitoes." Over most of the earth, "the carrying capacity of the land is far below that of the United States. Most of this land *if its productivity is not to be destroyed* must be used only for forests or light grazing. . . . A thousand acres of Amazon forest could probably not produce as much wealth as a single acre of Iowa corn land." "What few people, aside from a small group of scientists, realize is that man's ignoring of natural laws has long been undermining civilization and that he has set in motion forces quite as dangerous to our modern way of life as is the new bomb."—M. M. Nice.

AVIFAUNAL DYNAMICS

39. A Comparison of the Summer Resident Birds Today and Forty Years Ago in a Small Area in Massachusetts. Stanley Cobb. 1945. *The Auk*, 62(4): 606-610. On a 75-acre diversified area reported to have changed little in forty years the House Wren, *Troglodytes aëdon aëdon* Vieill., and Towhee, *Pipilo erythrophthalmus erythrophthalmus* (Linn.), were observed to be common in 1943-44, absent in 1903-04. It might be added that both species have been reported to have increased and to have invaded new territory in other parts of the eastern U. S. The House Sparrow, *Passer domesticus* Linn., has decreased (correlated with the disappearance of horses and barns) and the Black-throated Green Warbler, *Dendroica virens virens* (Gmel.); Yellow Warbler, *Dendroica petechia aestiva* (Gmel.); Redstart, *Setophaga ruticilla* (Linn.); Kingbird, *Tyrannus tyrannus* (Linn.); and Bluebird, *Sialia sialis sialis* (Linn,). are re-

ported to be less common or absent in recent years. Spraying of orchards is suggested as a possible cause of the latter decreases, but the data are much too meager and the possibility of unrecognized ecological changes too great to justify definite conclusions.—E. P. ODUM.

SYSTEMATICS

40. Ecologic Differentiation of Populations, Races, and Species in Birds. (Oekologische Sippen-, Rassen-, und Artunterschiede bei Vögeln.) Erwin Stresemann. 1943. *Journal für Ornithologie*, 91(2/3): 305-324. This is a lecture delivered to the 61st annual meeting of the Deutsche Ornithologische Gesellschaft in July, 1943. In discussing the use of trinomial nomenclature, the author recognizes its potential value in showing relationships of varying forms; however, the use of the simple geographic criterion, by which morphologically similar forms which replace each other geographically are regarded as subspecies whereas those occurring in the same area are regarded as separate species, has resulted in many instances in a large *Rassenkreis* composed of forms of varying degrees of differentiation. Species or subspecies which vary little throughout their range are nevertheles divided into *populations* (Sippen) which lack morphologic differences but which may show differences in egg color, song, nest construction, etc. Field ornithologists can contribute much to the recognition of such populations. The *geographic race* or *subspecies* of the systematist is recognized by distinct morphologic characteristics. Populations (Sippen) are the origins of new species. Two types of isolation are recognized, *chorologic* in which there are physical barriers within the range of the species and *ecologic* in which groups of individuals have become fixed in different biotopes. In the latter, *panmixia*, mass interbreeding, is prevented by ecologic rather than physical barriers. Those species occupying a variety of biotopes *(euryoek species)* may often in reality be collections of populations each of which occupy one biotope only *(stenoek populations)*. *Populations* (Sippen) may arise when a stenoek form becomes euryoek. Long continued ecologic isolation produces genotypic variations either by mutation or the selection by the environment of new combinations. The author does not restrict the concept of ecologic races to those instances where two or more lie in the same geographic area but applies it to races of a species which have ecologic differences for "it appears unimportant in the development of characteristic differences, whether or not the newly conquered biotope lies within or outside of the distributional area of the original population." Most geographic races are *chorologically* as well as *ecologically* separated. Examples of independent action of each are given. Populations (Sippen) may remain ecologically separated for long periods without morphologic differentiation. Ecologic isolation of North African larks, however, has produced races in 5,000-10,000 years. Similar differentiation has occurred in crossbills. Ecologic isolation of a population, or parts thereof, may result from one of two fundamental conditions: (1) Chorologic isolation occurs first followed by adaptation to different ecologic conditions. (2) Population pressure forces some individuals into a new biotope. Secondarily there may be chorologic isolation. Colonization of a new biotope occurs where *biocoenotic resistance* is least. In the latter type intermediate populations often die out. Long isolation of races thus separated may result in species. In purely chorologic separation the formation of characters is undirected, non-adaptive, and accidental. Populations separated ecologically show changes which can be correlated with the environment. The action of selection appears to be rapid when protective coloration is involved. The action of selection on a physiologic basis may proceed as rapidly but is less noticeable. The author's definition of a species is that by Bauer and Timoféeff slightly modified: "As species or *Artenkreis* we should designate such a group of morphologically or physiologically similar indi-

viduals, characterized by common characteristics, particularly geographically or ecologically varying races or populations, which interbreed and form intergrading populations among themselves insofar as geographic or ecologic barriers allow, in contrast to other such groups (species) which under natural conditions have attained practically complete biologic isolation." (p. 321).—D. S. F.

41. An Analysis of the Definition of Units of Classification in Ornithology. (Essai sur la définition des unités des classification en ornithologie.) R. Verheyen. 1946. *Le Gerfaut*, 36(2): 67-89. Although systematic categories are accepted and used daily by ornithologists, precise definitions of them are often difficult and vary with the different authors. "The species is a dynamic, independent and natural unit. . . . The individuals belonging to a species vary within a limited framework within whose limits many of the descriptive characters as well as certain physiologic, anatomic, and ecologic traits oscillate. . . . The species is characterized by its properties. . . . (1) Because of its morphologic, physiologic, and ecologic instability the species has a limited duration. Its general aspect changes with its phylogenetic age. (2) The individual variability is one of the most important characteristics of the component of the species. . . . This variability is manifested . . . through differences in morphologic, physiologic, and ecologic characters. (3) The collective or geographic variability can manifest itself in a group of individuals, belonging to the same species and living together, isolated by geographic or climatic barriers." (p. 69). Individual variation is the basis for geographic variation. Each individual variant represents a possible past, present, or future variant geographic group of birds. "(4) All of the elements of a species are joined together through geneologic relation. . . . (5) Geographic differentiations are not necessarily of the same phylogenetic age. . . . (6) The members of any species whatsoever give a high percentage of fertile offspring. This percentage is never lower than that resulting from the crossing of individuals of two different species. (7) A species is distinguished from another through the mean and extreme morphologic, physiologic, and ecologic values. (8) The species is isolated psychologically; that is to say, its sexual behavior makes copulation with an individual of another species incomprehensible. . . . (9) *Of all of the categories of classification, the species only is a natural reality* [ital. reviewer]. (10) The members of a species can inhabit the entire world, their area of distribution is not always limited at the place where another zoogeographic province begins. The term species encompasses the ideas which are the bases of the conceptions of the *Formenkreis* (Kleinschmidt); *Artenkreis*, *Rassenkreis* and *Genus geographicum* (Rensch); and *Formengruppe* (Laubmann). (12) The role of the systematist consists of the determination of the limits of individual variability of the members of a given species, to compare the morphologic series permitting the reconstruction of the steps traversed in geographic differentiation, to establish the morphologic, physiologic, and ecologic relationships among the different components of a species, to delimit the area of distribution of the species studied and to explain its causes. (13) The designation of the species corresponds to a binomial formula." (p. 74).

The author defines the subspecies as follows: "The subspecies is a group of individuals which have the same hereditary morphology and same physiologic characters, which interbreed successfully, which have a common mode of life, and which occupy a definable area of distribution, on the limits of which it can form intermediate individuals, by means of interbreeding with individuals belonging to another subspecies of the same species . . ." (p. 74). Among the properties of a subspecies the author indicates that the subspecies is an incipient or potential species, but that, although it may be a statistical unit, it is not a natural unit. The subspecies of a species may be characterized by small morphologic and ecologic differences. Subspecies have sufficiently distinctive characters to establish their genealogy. The origin of the subspecies is due to a variation in geno-

type. "The subspecies constitutes a portion of a species. It constitutes an important phase in the evolution of the species." (p. 75). Most species date to the Tertiary whereas subspecies are Recent. "Whereas the species contains all of the *genovarieties* derived from an ancestral stock, the subspecies is considerably more homogeneous." (p. 76). The author states that in the majority of cases subspecies inhabit geographic regions inaccessible, or accessible only with difficulty, to other subspecies of the same species. When the ranges of two subspecies of the same species do come together there may be ecologic differences so that it is not realized that large numbers do not interbreed; also there may be decreased interfecundity so that interbreeding is uncommon; two subspecies may interbreed freely but the mixed population is restricted perhaps by increased numbers of lethal factors; or there may be extensive successful interbreeding with a gradual transition from one subspecies to another. The areas of distribution of subspecies of a species are geographically mutually exclusive. "Conforming to the interpretation of the rules of nomenclature, the subspecies is designated by a trinomial formula." (p. 78).

The *geographic race* is described as embracing the concept of the subspecies but distinguishable by its "properties." It comprises a group of individuals, belonging to the same subspecies, affected by a collective variation in one particular aspect. The distinctive characters of a geographic race are dependent on the climate of its distributional area. These characteristics are hereditary and do not disappear in captivity. "*The geographic race is a part of the subspecies. Its morphologic characters show a pronounced tendency toward uniformity.*" [ital. reviewer, p. 78]. Adjacent geographic races usually differ only slightly. "The environment does not act directly on the aspect of the bird; it may influence after generations the hormonal equilibrium of the individual, which may cause, in turn, the changes in pigmentation and probably also the relative dimensions of different parts of the skeleton . . ." (p. 79-80). "According to the rules of nomenclature the geographic race ought to have a trinomial designation." This is defended as practical since the difference between the subspecies and geographic race is quantitative only. It is suggested that names for phenotypic variations be preceded by and designated by "f." (= *forma*).

The *geographic population* is defined as comprising a group of individuals, originating from a definite region, in which the morphologic characteristics are not uniform but show, on the confrary, a tendency towards one or another of the various geographic races of the same subspecies." (p. 80). Geographic populations occupy areas between the geographic races of a subspecies. The author suggests the nomenclatorial designation of designating these geographic populations by "pop." followed by a combination of the names of the geographic races for which it is intermediate or transitional.

The *subgenus* is a unit comprising a varying number of species having similar instinctive behavior in regard to nesting and rearing of young, as well as similar feeding habits, incubation periods, kind of eggs, length of toes and tarsus, type of beak, etc. In the case of the *genus*, "the differences among the species which enter into the composition of the genus are slightly more important; they are principally of morphologic order particularly wing formula, disposition of colors, and tail measurements." (p. 83). The *subfamily* groups together usually several or many genera based on internal morphology and similar type of life. The *family* is based largely on internal morphology. The *order* is a grouping of families with similar anatomic characters and whose young are hatched at the same stage and which have, to a certain degree, a similar mode of life.—D. S. F.

42. The Taxonomy of the Robin, Erithacus rubecula (Linnaeus). David Lack. 1946. *Bulletin of the British Ornithologists' Club*, 66: 55-64. Following introductory remarks concerning the taxonomic status of *Erithacus* and *Luscinia* as well as other closely related genera, the author discusses the subspecies of the robin. The five subspecies recognized in this treatise are *superbus*

Koenig of Gran Canaria and Tenerife in the Canary Islands, *hyrcanus* Blanford of Persia, *witherbyi* Hartert of eastern Algeria and Tunisia, *melophilus* Hartert "in most of Britain," and *rubecula* (Linnaeus) in northern, eastern, and central Europe as well as in the Azores, Madeira, and western Canary Islands and in part of Morocco. "A possible sixth race, *tartaricus* Grote from the Urals, was not examined." There is intergradation between *rubecula* and *hyrcanus* in the Caucasus, between *rubecula* and *witherbyi* in southern Iberia and in parts of North Africa, and between *rubecula* and *melophilus* in the areas around the North Sea and the English Channel; separate names have sometimes been applied to these intergrading populations. Although alike in plumage, *witherbyi* and *melophilus* are separated by 1,000 miles and by forms of different plumage; however, the wing length of *witherbyi* is sufficiently smaller to justify subspecific recognition. On the other hand the breeding birds of the Azores and other Atlantic islands cannot be separated from *rubecula,* the plumages being practically identical and the differences in measurements too slight to warrant subspecific recognition, this despite the occurrence of distinct forms between their ranges. Of considerable interest are the comments of the author concerning the concept of the subspecies, particularly in reference to the robin. "The taxonomic genus is a convenient unit for cataloguing related species. The taxonomic species has real validity and also great practical convenience. But the taxonomic subspecies or geographical race presents serious difficulties, both logical and practical. Formerly this concept was of great value, as it drew attention to the existence of geographical variation within the species. Further, it worked well when birds had been collected only from discrete regions each of which was well separated from the next, and it still works well for many insular or otherwise isolated forms, such as *superbus* in the case of the Robin. But when, as now for the Robin, the subspecies concept is applied to extensive collections made over a large land area, the practical difficulties become considerable, many judgments are inevitably arbitrary, and the use of subspecific names, so far from helping, actually becomes misleading as a description of the type of variation." "First, the use of separate names implies a degree of separation between populations which often does not exist. . . . In general, subspecies usually intergrade with each other, and this may be represented . . . by writing the two subspecific names with a linking sign." (p. 62). It is pointed out that the latter convention has difficulty in not showing the way in which they intergrade. "The use of subspecific names not only implies discontinuity where none may exist, but also unity where there may, in fact, be discontinuity." "One therefore begins to wonder whether subspecific trinomial terminology is not beginning to outlive its usefulness and validity. Certainly in the case of *Erithacus rubecula,* it is both simpler and more accurate to describe subspecific variations in terms of geographical trends, and to omit altogether the tyranny of subspecific names." (p. 63). This is a thought-provoking paper.—D. S. F.

MORPHOLOGY AND ANATOMY

43. Age and Sex Criteria and Weights of Canada Geese. William H. Elder. 1946. *Journal of Wildlife Management,* 10(2): 93-111. Over 1,000 wild-trapped live geese and a similar number of hunters' kills provided a sample for study of the large goose population (estimated at 50,000) of Horseshoe Lake, Illinois, during the winters of 1941-42 and 1942-43. Sex and age classes showed highly significant differences in body weight: Juvenile (first year) females averaged 6.5 pounds, adult females 7.0 pounds, juvenile males 7.5 pounds and adult males 8.4 pounds. The heaviest bird examined was an adult male weighing 11 pounds, 9 ounces. Weights declined significantly in all sex and age groups in late December. These reductions were apparently correlated with a reduction

in food supply resulting from exhaustion of local grain crops planted for the geese. Birds were still underweight at the end of the winter season and in what was considered poor condition for the northward flight. Criteria for aging and sexing birds were investigated. A terminal notch in the central rectrices and a lesser pigmentation in flight feathers were the only diagnostic plumage characters found in first-year birds. Old birds tended to have a denser body plumage than young birds but could not be positively identified on this basis.

Cloacal examinations were made on trapped birds, on hunters' kills and on a large captive flock on a nearby farm. Changes with advancing age were noticed as follows: The naked area around the vent changes from pink in juveniles to bluish black in old birds; in males the penis is longer in adults than in young; in females a clitoris was found, small in juveniles, relatively large in adults; the bursa of Fabricius decreases irregularly with advancing age. Geese without a bursa were thought to be at least three years old; those with bursae less than 15 mm. in length were probably two or three years old; birds with bursae over 15 mm. were considered to be in their first, second or third years. Cloacal characters are, for the most part, controlled directly by the sex hormones and consequently reflect physiological rather than chronological age. A variable condition is therefore to be expected in a species like the Canada Goose, individuals of which may breed for the first time in either their second, third or fourth years.—JOHN T. EMLEN, JR.

44. Adaptations and Comparative Anatomy of the Locomotor Apparatus of the New World Vultures. Harvey Irvin Fisher. 1946. *The American Midland Naturalist*, 35(3): 545-726. This is a noteworthy paper of such scope and detail that a justifiably adequate review is scarcely possible. Its primary purpose, which is accomplished well, is to describe the structural differences in the bones and muscles of the New World vultures, family Cathartidae. Information was derived from dissections and from studies of skeletons. The skeletons of *Gallus*, *Pandion*, and *Aquila* were used for comparative purposes. Tables show the measurements and various ratios of measurements of the bones of the wing and pectoral girdle for the various genera. Thirty-four pages are given to the description, including origin, insertion, and innervation, of the muscles of the pectoral girdle and the wing. This and the accompanying table giving the ratios of the volumes of these muscles in the various genera constitute a very important part of the monograph. Of inestimable value also is a table of synonymy of names applied by Shufeldt, Fürbinger, Gadow, Howell, and the author to the muscles of the wing and pectoral girdle. Similar treatment is given the muscles and bones of the tail, pelvic girdle, and legs. A general summary (pp. 706-710) presents well the correlations between the locomotor apparatus in the genera of Cathartidae and their characteristic types of flight and use of legs. This is a major contribution to functional and descriptive avian anatomy.—D. S. F.

45. Variation of Plumage and of Form in Birds. V. Ornithological Teratology. (Les variations de plumage et de forme chez les oiseaux. V. Teratologie ornithologique., Marcel Legendre. 1941. *L'Oiseaux et la Revue Française d'Ornithologie*, 11(3): 167-186. The author assembles a number of instances of abnormalities and monstrosities which have been recorded for birds, and classifies them as (1) *Polysarcie adipeuse*, or extra flesh, (2) non-ossified skull or lack of beak or other part, (3) polydactylism, (4) horn production, (5) lack of feathers, partial or total, as simple abnormalities. In classifying monstrosities, he lists, as simple monsters, cyclocephalics, with one eye. As double monsters, there are eusomphalics, with a small amount of junction, in which group several classifications are listed, and monomphalics, where the fusion is more or less complete, with several classifications. In this last group are included those forms with double beak, extra limbs, etc.—M. DALE ARVEY.

46. Variation of Plumage and of Form in Birds. VI. Aberrations. (Les variations de plumage et de forme chez les oiseaux. VI. Les Aberrations.) Marcel Legendre. 1942. *L'Oiseaux et la Revue Française d'Ornithologie,* 11(3): 167-186. Aberrations in birds are simple variations from the normal in plumage, involving a portion of the plumage only, due to mutation. These are treated in this portion of the work, as *Perdix perdix* ab. *montanus,* and it is suggested that this nomenclature be followed, to distinguish from a fixed mutation, color phase, dimorphism, or a monstrosity.—M. DALE ARVEY.

EVOLUTION

47. Some Critical Phylogenetic Stages Leading to the Flight of Birds. William K. Gregory. 1946. *Proceedings of the Linnaean Society of New York,* 54-57: 1-15. Very interesting account of avian evolution with sketches of the evolution of the pelvis in bird-like dinosaurs and birds, a series "From fish to bird in seven stages," and a chart showing "Comparative history of invertebrates and vertebrates" in relation to Geologic Periods, as well as a bibliography.—M. M. NICE.

BOOKS

48. Handbook of German Birds. III. (Handbuch der deutschen Vogelkunde. III.) Günther Niethammer. 1942. Becker & Erler. Leipzig. 568 pp. The third and final volume of this admirable handbook has just come to me through the kindness of Dr. Stresemann; unfortunately it is very scarce, as the bulk of the edition was destroyed by bombing. This volume treats of the Tubinares, Podicipedes, Colymbi, Columbae, Pteroclytes, Alcae, Laro-Limicolae, Otides, Grues, Ralli and Galli; it has one colored plate of gallinaceous birds and 51 line drawings. Each species is treated under many headings: description, including weight; general distribution; distribution in Germany; migration; biotope; food; parasites; and a long and detailed section on reproduction, including courtship, description and site of nest, share of sexes in building, size of set and egg dates, number of broods, intervals in egg-laying, description, size and weight of eggs, share of sexes in incubation, length of incubation and fledging, etc., with citations of authorities.

The author and those ornithologists who are named as co-workers are to be congratulated on this scholarly work which shows wide field acquaintance with the birds and also a thorough knowledge of the literature in Europe, England, and, in some cases, America. We in this country need to emulate the English and German ornithologists and prepare a "Handbook of American Birds." But first we sorely need to gather the fundamental facts of their life histories.—M. M. NICE.

49. A Bibliography of Birds. With Special Reference to Anatomy, Behavior, Biochemistry, Embryology, Pathology, Physiology, Genetics, Ecology, Aviculture, Economic Ornithology, Poultry Culture, Evolution and Related Subjects. Part 3. Subject Index. Reuben M. Strong. 1946. Zoological Series, Field Museum of Natural History 25, Part 3, Publication: 581: 1-528. This third volume of Dr. Strong's great bibliography is as impressive as its predecessors, published in 1939. There are six and a half pages devoted to bibliographies and two and a half to periodicals containing abstracts or reviews of publications referring to birds. The main part of this subject index is concerned with 120 main topics, such as sex, skeleton, skull, smell, social relations, sound production, speciation, etc., with a multiplicity of sub-topics, references being to author and year. "The comprehensive search for literature ended in 1926," but "other references were added as they came to attention even as late as 1938." Dr.

Strong's profession—the teaching of anatomy—is evident in the preponderance of the main headings in this field, only about one-fifth being concerned with field ornithology, yet there is an astonishing array of such topics listed—21 pages of them, for instance under "Habits." The 4th volume—the Finding Index—will greatly add to the usefulness of the present and earlier volumes. Ornithologists and other zoologists owe a great debt to Dr. Strong for his tireless zeal, his scholarship and endless patience in carrying through a task of such incredible magnitude.—M. M. NICE.

50. Prairie Wings. Edgar M. Queeny. 1946. Ducks Unlimited, Inc. New York. xiv + 256 pp. 167 photos. 1 map. $15.00. The end sheets of this handsome volume show the myriads of ducks on Wilcox Lake, Arkansas, and plunge the reader directly into the world of waterfowl. The pages that lie between explain and illustrate this world in a manner new and unique. Two duck hunters, one a writer and photographer (Edgar M. Queeny), the other an artist and photographer (Richard E. Bishop), combine their talents with text, photos and sketches to explain how ducks live, particularly how they fly. Of the 241 pages that comprise the body of the book, two-thirds is devoted to duck flight. The photographs of the ducks in flight are listed, but many explanatory figures are not. These explanatory figures are numbered 1, 2, 3, etc., in each chapter, hence the same numbers appear under different illustrations throughout the book. This may make references to them confusing.

In the preface the author mentions "our increased waterfowl population" (1946), a statement that will undoubtedly raise the eyebrows of ninety-five percent of America's duck hunters.

The author's writing is eloquent and almost classical (Chapter I, "Between-Season Nostalgia"), but is never stilted or affected. The technical and esthetic aspects of duck flight are treated with equal dexterity. There is much new information on the technical aspect, which is explained in the light of aerodynamics. Glen L. Martin, the airplane manufacturer, and his engineers have contributed to this explanation by defining technical terms in a way that can be understood by the lay reader. The role each part of the duck's anatomy plays in flight is discussed (Chapters IV and V), photographed, and also clarified by Bishop's sketches. The wing and its function is treated in such a way that no one having read this book should be ignorant of how birds fly.

The photographs are superb. All are action shots and each one, whether it be a portrait or one of a sequence, is esthetically enjoyable and technically provocative. Those photographs that were manipulated for some reason are listed: there was *no* attempt at nature faking. There is some repetition of flight positions in the illustrations, but it is the kind of repetition of which one never tires.

Three chapters do not deal specifically with ducks. One realistically describes a guide of the Grand Prairie Marshes. In so doing the author gives the reader a good picture of himself as well. Another tells of the author's favorite Labrador retriever, and the last is a summary of Mr. Queeny's indoctrination into the field of wildlife photography.

The reader feels that this is the story of the well-to-do duck hunter, where a pedigreed dog, a special duck-calling guide, a private gun club, expensive cameras, etc., make for wildfowling at its best. Sharing Mr. Queeny's experiences in this book gives the factory worker who hunts in an overcrowded marsh or the farm boy who has but one small slough as his Grand Prairie, a chance to read about and see duck shooting at its best.

The addenda contain camera notes and miscellaneous duck information that the author has gleaned from the literature, plus a section on the rudiments of flight by Glen L. Martin. There is a bibliography of six titles and a 2½-page index. This volume was published by Ducks Unlimited, but nowhere in the text is there

any mention of this organization and its activities. Ducks Unlimited is to be congratulated in this undertaking, as this book will go far in disseminating knowledge and appreciation of our waterfowl. Unfortunately the cost of the book will be prohibitive for most duck hunters. It is nevertheless worth every penny of the price.—ROBERT A. MCCABE.

51. Wild Acres. A Book of the Gulf Coast Country. Henry H. Kopman. 1946. Dutton. N. Y. 189 pp. $3.00. Out of long experience, from boyhood enthusiasm to wildlife protection with the National Audubon Association and Biological Survey, Mr. Kopman has written lovingly of the strange, wild country in southern Louisiana and Mississippi and its wealth of bird life. The procession of birds of bayou, swamp and Gulf is described throughout the seasons from winter with its contrasts of warmth and cold to lovely spring and exuberant summer. This book will be greatly appreciated by nature lovers who live in this fascinating region and by the many who visit it, and it will do much to open the eyes of these fortunate people to the beauties around them.—M. M. NICE.

52. Animal Inn. Virginia Moe. 1946. Pictures by Milo Winter. Boston. Houghton. 174 pp. $2.50. Out of a passionate love and deep sympathy for wild animals and a fine zeal to share her attitude and discoveries with others, Miss Moe has written in straightforward fashion of her experiences at the Trailside Museum of the Cook County (Illinois) Forest Preserves, where she and the neighborhood children have cared for a varied assortment of native creatures from deer mice to deer, turtles, salamanders, Barred and Screech Owls, and a host of baby birds. While each chapter tells something of the proper and imaginative care of these guests, the emphasis lies on the behavior of different species and individuals,—how the instinctive actions fit them for life in the wild, how they learned to adapt themselves to life with friendly people. There is much of value here on animal behavior, especially on four species of squirrels, on prairie dogs and on 'possums. A fascinating book, full of original observation, and adorned with most engaging sketches.—M. M. NICE.

53. Life Histories of North American Diving Birds. Arthur Cleveland Bent. 1919. A reprint of *U. S. National Museum Bulletin* 107. 207 pp. Published by Dodd, Mead and Company, Inc. 1946. Ornithologists will welcome the appearance of the reprint of the rare first volume of Bent's *Life Histories.* This is an exact reproduction of the original bulletin although prepared in a regular library binding with a cloth format.—D. S. F.

NEWS ITEM

As a result of a reorganization within the Fish and Wildlife Service, Mr. Frederick C. Lincoln, who has been in charge of the Section of Distribution and Migration of Birds for many years, is now attached to the Office of the Director as wild-life assistant. Dr. John W. Aldrich takes Mr. Lincoln's place as chief of the section.

CORRECTION

In Review No. 40, *Bird-Banding*, 18, no. 1, 1947, p. 44, line 37 should read, "on and off the nest is not given, but out of every hour the bird averaged 10 to 15 . . ."