two periods totalling 25 minutes, I then watched on until the 19:02 sunset. At 17:44 and 18:22 the woodpecker (a color-banded one) appeared and looked into his excavation, but at no time did any other bird appear, and watching early the next morning also showed no activity. Presumably the eggs were an incomplete clutch of the House Sparrows. A search of considerable literature shows no record of the Red-bellied Woodpecker taking eggs, but Bent (*U. S. Nat. Mus. Bull.* **174**: 254, 1939) gives two records for the Gila Woodpecker (*C. uropygialis*).—Hervey Brackbill, 2620 Poplar Drive, Baltimore, Maryland, 21207.

RECENT LITERATURE

BANDING AND LONGEVITY

(See also 24, 27, 28, 29, 30, 31, 71, 82.)

1. Report on bird-ringing for 1967. R. Spencer. 1968. *Brit. Birds,* **61** (11): 477-523.—The usual sort of bird-banding report, with an introduction, list of publications, table of birds banded and recovered, cumulative totals for the banding scheme to date by species, and a "selected list" of recoveries reported during 1967. More birds were banded than in 1966 (some 22,000 more, to be specific), and there were some changes in which species were banded. There shows in this report the continued emphasis on single dramatic recoveries (by discussing them in the text and marking them especially in the data section). The notes by Reese (review **4**) should warn us against this kind of emphasis; I should like to see stress laid upon those species for which many consistent recoveries exist. To some extent this is done in the report. For instance, map 2 shows recoveries of the Swift (*Apus apus*) and the Yellow Wagtail (*Motacilla flava*) in Africa. New recoveries are plotted by solid shapes, previous ones by open ones, so that one can judge that 1967 really contributed greatly to our knowledge of these species (there were three previous swift recoveries in Africa eight more in 1967; three previous wagtails, 11 more in 1967).—Jack P. Hailman.

2. Bird report: 1967. Lord Medway, I. C. T. Nisbet and D. R. Wells. 1968. *Malayan Nat. J.,* **21** (4): 185-200.—This is the sixth in a series, the rest of which are conveniently referenced. With this review, the Review Editor establishes a policy of noting as many annual banding reports as possible from all over the world, so that the reader may consult these at leisure. However, because of the increasing volume of such reports and the relatively little analysis they contain, most will be cited by title only, being reviewed only in cases where the reports appear to contain information or analyses of broad interest.—Jack P. Hailman.

3. Recoveries in Great Britain and Ireland of birds ringed abroad. R. Hudson. *Brit. Birds,* **62** (1): 13-22.—Banding reports (see review **1**) usually have the opposite orientation: they concentrate on where birds go when they leave a country. Yet both kinds of summaries help round out our knowledge of migration patterns, and equal attention should be drawn to Hudson's kind of report.—Jack P. Hailman.

4. Some thoughts on recoveries. J. Reese. 1969. *EBBA News,* **32** (2): 79-80.—The author writes letters for further information to persons who recover his birds. A Brazilian missionary informed him that the actual recovery site of his bird was 150 miles from the place used by the Banding Laboratory taken from the postmark! Another recovery turned out to have been reported from the landing gear of an airplane, so that the bird may have been killed far from the landing strip from which it was reported. Other kinds of errors are also reported. The reply rate for requests for further information is sadly low, but the usefulness of the information gained is surely high. This report goes to show once again that single recoveries should *always* be treated as suspect. Until multiple recoveries yield a consistent pattern only the most tentative conclusions should be drawn.—Jack P. Hailman.

5. **The use of teflon for banding penguins.** R. L. Penny and W. J. L. Sladen. 1966. *J. Wildlife Manag.*, 30 (4): 847-850.—Metal imprinted with numbers is laminated between layers of Fluorocarbon plastic (FEP or teflon) and reshaped to fit the flippers. Samples after a year show the unique bands to be superior to metal bands in terms of plumage abrasion and metal fatigue.—Jack P. Hailman.

6. **Bird in the hand.** H. J. deS. Disney. 1968. *Australian Bird Bander*, **6** (4): 84-85.—Attention is hereby called to this regular column that reviews characteristics for aging and sexing birds in the hand. If every journal of banding would establish such a column for its own area of coverage, the problem of misdentification of banded birds would decrease significantly.—Jack P. Hailman.

7. **Recoveries of Red-tailed Hawks banded in Saskatchewan.** C. S. Houston. 1967. *Blue Jay*, **25** (3): 109-111.—To quote, "With this issue begins a series of maps showing recoveries of birds banded in Saskatchewan. The maps are compiled from data on a computer 'print-out' of all recoveries of Saskatchewan-banded birds (excluding waterfowl), supplied by the U. S. Fish and Wildlife Service, through the Canadian Wildlife Service." The recoveries are tabulated by banding date, method of recovery and recovery locality, under separate grouping for each bander and locality (sometimes the number of individuals banded at that locality is also given). Most of the *Buteo jamaicensis* were shot. The recoveries shown on the map tail off just east of south through the great plains, and then scatter out along the coasts to the east and west of Louisiana.—Jack P. Hailman.

8. **Recoveries of Black-crowned Night Herons banded in Saskatchewan.** C. S. Houston. 1967. *Blue Jay*, **25** (3): 112-113.—See review **7** for explanation of this series of papers. Sad to tell, many of the *N. nycticorax* were shot. Recoveries lead off a bit east by south from Saskatchewan, then turn decidedly southwestward in the region of Saint Louis, continuing southward through Texas into tropical eastern Mexico. There are also three recoveries from the Georgia-Florida region.—Jack P. Hailman.

9. **Recoveries of Marsh Hawks banded in Saskatchewan.** C. S. Houston. 1968. *Blue Jay*, **26** (1): 12-13.—The pattern for *Circus cyaneus* is a shot-gun mapping of points from western Texas to western Georgia, with a few points elsewhere.—Jack P. Hailman.

10. **Recoveries of Swainson's Hawks banded in Saskatchewan.** C. S. Houston. 1968. *Blue Jay*, **26** (2): 86-87.—The pattern for *Buteo swainsoni* goes nearly directly south from Saskatchewan to Texas, with birds also taken in Wisconsin and Alabama. Nearly all were shot.—Jack P. Hailman.

11. **Recoveries of Bronzed Grackles banded in Saskatchewan.** C. S. Houston. 1968. *Blue Jay*, **26** (3): 136-138.—The species is *Quiscalus quiscula*, and the common name refers to the northern race of the Common Grackle. Recoveries line up through the states on the west bank of the Mississippi River, after tailing southeast from Saskatchewan into Minnesota. Most were shot.—Jack P. Hailman.

12. **Recoveries of Robins banded in Saskatchewan.** C. S. Houston. 1968. *Blue Jay*, **26** (4): 182-184.—There is only one recovery between Saskatchewan and southern United States, where *Turdus migratorius* spreads out from Virginia to Texas. A disturbing proportion of these recoveries resulted from shot birds. Houston's summaries, but particularly the maps, help appreciate the migration patterns of Saskatchewan species. Would that there were more such mapped summaries of recoveries. It is good to see that at least a fraction of the files of the Fish and Wildlife Services of the United States and Canada are drawn upon for analysis. Without such analyses, at least occasionally, it seems very difficult to justify the expense of running general banding programs for anything other than specified and planned projects.—Jack P. Hailman.

13. Saskatchewan bird banders: Judge J. A. M. Patrick (1873-1943). C. S. Houston. 1967. *Blue Jay,* **25** (4): 172-174.—This series by C. Stuart Houston, of which the present paper is the eighth, is probably the only series of biographies in the literature specifically devoted to birdbanders. Maps give distributions of recoveries of two of Judge Patrick's most commonly banded species.—Jack P. Hailman.

14. Siberian Crane longevity. M. Davis. 1969. *Auk,* **86** (2): 347.—A female *Grus leucogeranus* became a member of the collection at the National Zoological Park, Smithsonian Institution, Washington, D. C. on 26 June 1906 and died 22 March 1968, having lived there for 61 years and 9 months.—Margaret M. Nice.

15. Ageing and sexing Rough-legged Hawks in Wisconsin and Illinois. F. Hamerstrom and J. D. Weaver. 1968. *Ontario Bird Banding,* **4** (4): 133-138.—The title as printed refers to "Rough-winged" hawks, but the text is correct and the species is definitely *Buteo lagopus.* Preliminary notes using plumage, cere and iris color, and the "fault bar method." Of interest to hawk banders.—Jack P. Hailman.

MIGRATION, ORIENTATION AND HOMING

(See also 1, 3, 4, 7, 8, 9, 10, 11, 12, 32, 36, 52, 66, 67.)

16. The origin of Palearctic bird migration. (Proiskhozhdenie pereletov ptits palearktiki.) A. V. Mikheev. 1969. *Zhurn. obshschei biologii,* **30** (1): 72-79. (In Russian with English summary.)—The author argues that in the main the element ruling seasonal migration is the birds' response to the annual succession of seasons, and to the essential changes of environment accompanying the seasons. To correlate origin of migration and the routes followed to historical dispersion of the species as some authors have done is not justified since the stimuli to migrate and the routes followed are 2 distinct phenomena arising from different causes. Avian migration in the Palearctic originated in the early Tertiary (Eocene) when most birds acquired capacity for prolonged flight, and annual seasons became clearly defined. With further cooling of world climate migrations became extensive and a general pattern of migration routes similar to the modern appeared by the late Tertiary. In the ice ages some migratory changes were effected but not so pronounced as generally believed. Present beliefs in the role of history in establishing migration routes rest on presumption of eternal permanency of pathways and wintering grounds once established. Actually they are as constant as the contemporary ecological factors which really control them, and attachment to routes is annually recreated anew by each generation of the species. Migration over expanses alien to their nesting biotope indicates not the relict nature of the route, but the ecological plasticity of the species, modeled by ecologo-geographic conditions in the present epoch. Here, again, is the envionment versus heredity contest. The author, professor of Zoology in the Moscow Pedagogical institute, has long studied the anatid migrations to molting grounds, quite complex in Eurasia.—Leon Kelso.

17. On the influence of a static magnetic field on the orientation of the Robin. (Über den Einfluss statischer Magnetfelder auf die Zugorientierung der Rotkelchen (*Erithacus rubecula*).) W. Wiltschko. 1968. *Z. Tierpsychol.,* **25**: 537-558. (In German with English summary.)—Experiments on the orientation of Robins in closed rooms under natural and artificial magnetic fields (see *Bird-Banding,* **37**: 210, 1966, rev. no. 9) were continued with 102 different birds on 775 bird-nights. The most significant new finding is that orientation in the "correct" direction (i.e., at the correct angle to the magnetic field) was observed only when the magnitude and dip angle of the artificial field were reasonably close to those of the earth's undisturbed field. As in previous experiments, the orientation was extremely weak, and Wiltschko can be justifiably criticized for lumping together data from many birds with different levels of activity before making statistical tests. But the cumulative evidence for this magnetic orientation is becoming as convincing as that for some of the more obscure statistical phenomena in pigeon homing, and carping about statistical methods will not explain it away.—I. C. T. Nisbet.

18. Disturbances of the earth's magnetic field and biological rhythms (of the beetle, Trogoderma). (Vozmushscheniya zemnogo magnitnogo polya i biologcheskaya ritmika zhyka *Trogoderma.*) V. B. Chernyshev. 1968. *Zhurn. obshschei biologii,* **29** (6): 719-722. (In Russian with English summary.)—The diurnal rhythm of *Trogoderma glabrum* Herbst. was recorded through 284 days under natural light and constant temperature. While usually active by day only, marked deviations from the regular rhythm occurred. These were found to have a statistically significant correlation to geomagnetic field disturbances (magnetic storms), which, the author states, confirms Brown's belief in the relation of biological rhythms to geophysical factors; that the biological rhythm of *Trogoderma* clearly reflects the effect of sunspots (which cause magnetic storms) on animal activity. These results may be considered ornithologically relevent in light of much speculation in the past regarding a possible sunspot effect on game bird cycles and migrations.—Leon Kelso.

19. Evidence of solar influence on orientation of caged Homing Pigeons. (Possibilité de mise en evidence du rôle soleil dans l'orientation des pigeons voyageurs captifs.) G. Moreau, and J. Pouyet. 1968. *Alauda,* **36** (1-2): 108-120. (In French.)—In absence of sunlight their attempts to escape the cages were random in direction, while in sunlight these efforts took a definite direction, which shifted according to the hour of the day. This shift showed no correlation to the position of the sun.—Leon Kelso.

20. The migration of passerine night migrants across the English Channel studied by radar. J. L. F. Parslow. 1969. *Ibis,* **111** (1): 48-79.—This paper is concerned with the spring and autumn movements of long-distance migrants (warblers, flycatchers and small thrushes) into and out of southern England, and includes a valuable summary of the seasonal occurrence of the various species at a major banding station. Nocturnal migration started about 38 minutes after sunset, with only very slight variation from night to night, and there was direct evidence that essentially all the birds which flew on any one night took off within a few minutes. As Parslow points out, it is not too dark to see birds at this time, and it is surprising that there are so few visual observations of them setting out on migration. The usual direction of migration was NNW in spring, SSE in autumn, although birds emigrating from northern France (as little as 25 miles away) in autumn usually few SSW. The mean track appeared to be deviated by crosswinds: estimation of headings suggested that on average the birds did not compensate for drift. The largest movements coincided with favourable winds (and correspondingly had above-average ground speeds). "Temperature had no effect in autumn, and though there was more migration with warmer than cold weather in spring, this need not have been due to the influence of temperature as such."

The observations were made between 1959 and 1963, and the paper makes no reference to any work published subsequently. In the meantime a number of Parslow's techniques and arguments have been questioned or extended, so some of his conclusions are unlikely to be accepted. However, his observations of wind-drift are the most convincing yet published, and should re-open discussion of this question.—I. C. T. Nisbet.

21. Radar observations of direction and directional scatter of night migration in Switzerland. (Radarbeobachtungen über die Richtung und deren Streuung beim nächtlichen Vogelzug im Schweizerischen Mittelland.) P. Steidinger. 1968. *Orn. Beob.,* **65** (6): 197-226. (In German with English summary.)—The mean direction of night migrants at Zürich in October, as measured by the radar MTI-wedge method, was about 243° (WSW), about 10° more to the west than that of day migrants. During the night the mean tracks turn towards the right by some 20°, independent of changes in the wind. Disoriented movements were observed only in association with rain: on other overcast nights, even with rain, orientation appeared normal, and migration appeared to be inhibited only when overcast and rain were combined with headwinds. Migration appeared to be deviated by crosswinds, a phenomenon illustrated with some quite convincing diagrams.—I. C. T. Nisbet.

22. Orientation rhythm of the Carabidae. (Orientatsii ritmy Carabidae.) G. G. Mletsko. 1969. *Z. obshchei biologii,* **30** (2): 232, 233. (In Russian, with English summary.)—The lively controversy on solar radiation in avian orientation makes these experiments on darkling beetles of interest. Experimental release on an asphalt plot about $100m^2$, of *Broscus cephalotes* L. (9,000 releases by day, 4,000 by night), *Carabus nemoralis* Mull. (4,500 by day), and *Pterostichus vulgaris* L. (6,500 by day), finds that orientation dayround follows a definite and consistent pattern; that an endogenous rhythm is the major factor in the orientation which appears to be correlated to the magnetic field of the earth, this correlation being evident by night as well as by day. Solar radiation appears to stimulate movement but not to control the direction in the orientation. —Leon Kelso.

23. Notes on the autumn passage of the Merlin, Falco columbarius, in the north of Ireland. J. W. Greaves. 1968. *Irish Naturalists' J.,* **16** (3): 66-71.—On the basis of 12 years of observation its flight pattern is presented in detail. The coastwise migration of its prey, passerine birds, is the controlling factor.—Leon Kelso.

24. The migration of the Arctic Tern. A. M. Gwynn. 1968. *Australian Bird Bander,* **6** (4): 71-75.—Three of the 15 *Sterna macrura* reported from Australia were banded at the extreme opposite end of the globe. The paper attempts a new sketch of the species' migrations to see how the Australian recoveries fit in. Apparently they come east from the tip of Africa after migrating south in the Atlantic.—Jack P. Hailman.

25. Spring migration through southeast Morocco. K. D. Smith. 1968. *Ibis,* **110** (4): 452-492.—This is a detailed report on four seasons' work at an oasis on the extreme northern edge of the Sahara desert. "The observations . . . . provide decisive evidence of broad-front migration across the whole width of the Moroccan Sahara, with strong circumstantial evidence that many birds fly straight over it in fair weather." Barn Swallows banded on different days were later recovered at different longitudes in Europe: in conjunction with the occurrence of species and subspecies far west of their usual range, this suggests that some birds are subjected to large lateral displacements while crossing the desert. Especially noteworthy are the descriptions of large "falls" of exhausted migrants in association with cold northerly winds and rain: many of these birds were unable to find food and died before the weather improved.—I. C. T. Nisbet.

26. Migration of Nutcrackers in Cisbaikal. (Migratsiya kedrovok v pribaikale.) E. M. Chernikin. 1969. *Okhota i okhotniche khozyaistvo,* **1969** (3): 20, 21. (In Russian.)—In the winter of 1968/69 a feature of Eurasian bird life was another mass migration of *Nucifraga caryocatactes* from USSR into western Europe. This account indicates how it appeared to observers nearer the Siberian source of the movement. Along the southeastern Baikal shore, in a belt about 300 m wide, flocks of 10 - 120 passed southward at the rate of 1,200 per 20 minutes throughout the daylight hours, starting July 28 and continuing to August 12, 1968. At Davshe village they turned southeastward, this population not evidently moving toward western Europe. At about this time and later incidentally mass movements of *Scirurus carolinensis* were in progress in eastern U. S. Examination of 23 Nutcrackers shot for the purpose found their stomachs full, mostly of cedar-pine nuts, and their viscera "literally swimming in fat". Never before had observers seen such fat "kedrovka". Yet, a widespread crop failure of pine nuts and berries in eastern Siberia was the cause suggested. Restlessness in populations of other animals was noted in the fall of 1968; unusual numbers of Russian brown bears invaded villages; cannibalism among the bears and attacks on humans were reported. The editor of the journal invites hunters to contribute additional observations. This would suggest a checkout of notes for Nutcracker movements in U. S. during the past winter, or a watch for possible irruptions in the coming fall.—Leon Kelso.

27. The return of the Swallow (Hirundo rustica) from winter quarters. (Vozvrashschenie lastochki derevenskoi (*Hirundo rustica* L.) S mest Zimovki.) A. B. Kistyakovskii, L. I. Kotkova, and L. A. Smogorzhevskii. 1969. *Vestnik Zoologii,* **3** (1): 50-52. (In Russian, with English summary.)—Of 272 breeding adults banded (151 at the Black Sea Reserve, and 121 near Kaneva) spread over a period of 4 years, returns from winter quarters in Africa of as high as 26% in the following spring were realized. From certain localities 60% returned. Some shifts of breeders to other nesting localities were detected. One male banded in 1964 did not return during 1965 and 1966, but was back in 1967. A female banded 1964 was found nesting 24 km from its former site. It is noted therefore that % of non returns is no index of mortality.—Leon Kelso.

28. Notes on banding of the White Pelican and Pygmy Cormorant in the Tereka delta. (Materialy po koltsevaniyu rosogo pelikana i malogo balkana v delte Tereka.) Ya. V. Sapetin. 1968. *Migratsii zhivotnykh,* **5:** 113-115. (In Russian.)—This report of only 3 returns from 106 banded white pelicans (*Pelecenus onocrotalis*), and 25 from 405 Pygmy Cormorants (*Phalacrocorax pygmaeus*) banded at this Caspian Sea locality finds them wintering on the lakes of eastern Azerbaidzhan.—Leon Kelso.

29. Brambling migration on the Courish Spit per trapping and banding data. (Migratsii yurka po dannym otlova i koltsevaniya na Kurskoi Kose.) V. A. Paevskii. 1968. *Migratsii zhivotnykh,* **5:** 153-160. (In Russian.)—On 146 returns from 18,260 banded 1957-1965, it was found that there are 2 principal fall routes: west and southwest through Germany and Belgium, and south and southwest through northern Italy. Rate of passage for females was determined as 62.8, and for males, 54.3 km per day. Winter mortality was higher for males.—Leon Kelso.

30. White-fronted Goose migration according to banding data. (Migratsii belolobogo gusa po dannym Koltsevaniya.) M. I. Lebedeva. 1968. *Migratsii zhivotnykh,* **5:** 12-23. (In Russian.)—On the basis of returns to the USSR of 300 banded in Netherlands two geographic populations are distinguished: north European, and west Siberian. In both populations the spring and fall flights follow different routes.—Leon Kelso.

31. Age and sex differences in the dispersion of Pied Flycatchers. (Alters-und Geschlechtsunterschiede in der Dispersion des Trauerschnappers (*Ficedula hypoleuca*).) R. Berndt and H. Sternberg. 1969. *J. Orn.,* **110** (1): 22-26. (In German with English summary.)—An extremely useful goal of banding is to determine the locality-faithfulness (*Ortstreue*) of breeding birds, for dispersion tendencies are critical factors in range extension, gene mixture and other factors in the biology of birds. The authors report that in this case females and ma es breeding for the first time show only moderate faithfulness to the locality in which they were reared, but after that males show a marked faithfulness to their first breeding site, whereas females may be found even farther away than initially. These conclusions are based on mean figures from 101 young males, 829 young females, 130 older males and 1,339 older females.

Since the data form nothing like normal distributions with increasing distances, but all show monotonically decreasing curves, it is rather questionable what "mean" distances show us about the dispersion. A single long-distance recovery can greatly elevate the mean. A better measure might be to take the distance which includes 50% of the birds (median), which measure can be picked from the table. When this is done, rather different conclusions emerge. The young birds, according to the text, have mean dispersals of 4.5 km. regardless of sex. However, the table indicates that nearly 50% of the birds breed within 1,000 meters of their rearing place, and 60-70% within 2,000 meters. The contrast is even more striking with the adults, whose mean values show a whopping sex difference (females: 2 km, males: 140 m). The median value is almost exactly 100 m for males, and is just slightly larger for females. What the data actually do seem to show is that the 50% of the females that do not breed within 100 or so meters of the previous year's may wander farther from it than do the males.

The figure graphs the data on linear coordinates, but the shape of the dispersion curves suggests an exponential relationship between number of individuals and distance. It is a shame that such hard-to-come-by data were not more completely analyzed.—Jack P. Hailman.

POPULATION DYNAMICS

(See also 26, 29, 46, 61, 62, 87.)

32. The influence of eruptive movements, age, population size and other factors on the survival of the Shag (Phalacrocorax aristotelis (L.)). G. R. Potts. 1969. *J. Anim. Ecol.*, **38** (1): 53-102.—Along with several other species of seabirds in the British Isles, the Shag has shown a marked increase in numbers since 1900. In the area covered by this study, on the east coast of England (mostly about the Farne Islands), the numbers of breeding birds have risen from 10 pairs in 1905 to 1,900 pairs in 1965, a mean rate of increase of 11% per annum. This lengthy study considers the effect of several factors on the survival of this species.

The mortality rates of first-year birds from the Farnes is about 50% and following that is about 17% per annum, with little further tendency toward age-specific mortality. Mortality patterns differ with populations of Shags also; most deaths occur in winter in the Farnes population. A high autumn mortality, reported in certain other populations, will result in disproportionately large losses of late-hatching individuals. At times when extended high mortality of first-year birds occurs, there will be a delayed increase of mortality of the oldest birds of the population. These dieoffs of adults in each case occurred just before or during the beginning of a breeding season, and since the oldest individuals nest first, Potts suggests that this increase in death rate is caused by the onset of breeding activity. Male survival is about 5% higher than that of females at each age class, resulting in an unbalanced sex ratio. Some evidence suggests that this difference in mortality is independent of their breeding biology. Successful breeders (ones that regularly raise three to four young) enjoy a higher survival rate than those having low success or no success in breeding.

Shags, especially first-year birds, frequently undergo eruptive dispersal, in which they journey considerably farther from the home colony than in other years. Such dispersal is correlated with prolonged onshore winds, which appear to decrease the availability of food sources (principally sand eels) either by causing the prey to take cover or by roiling the water so much that they are not readily visible to the Shags. There is a low rate of emigration from the Farnes breeding population to others prior to initial nesting at two years (about 8%) and an even lower rate after initial nesting (under one percent per annum).

Several possible causes of death are discussed. The majority of dead Shags examined appeared highly emaciated, having lost nearly 30% of their body weight and three-fourths of their liver lipids. As an explanation Potts invokes Selye's general adaptation syndrome, which is so general as to be a rather unsatisfactory answer and one that is open to second-guessing on the basis of data presented. Diseases appeared to be of minor consequence. In the past human exploitation of the birds apparently has been of major importance in keeping numbers of this species and other species of seabirds at a low level, though this now appears to be of lesser importance. Other possible demises, as by capture in fish-nets and by oilings, apparently are only minor factors in this population. As is usually the situation in field studies, the case for predation is a very nebulous one, though no major predators (other than man) appear to exist. Pesticide levels (only dieldrin and DDT metabolites were found) were at a low enough level that they do not provide a strong case for modification of reproductive rates, as opposed to the situation with many of our raptors.

Potts argues that at its present level the Shag population of the Farne Islands is not food-limited, as it is so fashionable to suppose in many populations. Rather, mortality is particularly high when environmental conditions prevent the efficient harvesting of the resource. The eruptions have been reported frequently since this population was very small and appear to be movements that increase the possibility of finding areas where the individuals can forage effectively, rather than responses to high densities of birds. The rapid 200-fold increase in Shags since 1900 suggests itself that food has traditionally not been a limiting factor. This tremendous increase in numbers appears to be the result of relaxation of human exploitation and persecution. The Shag and other seabirds may currently be reclaiming their ancestral range.—Douglass H. Morse.

33. **A comparison of Red Grouse (Lagopus l. scoticus) stocks with the production and nutritive value of heather (Calluna vulgaris).** R. Moss. 1969. *J. Anim. Ecol.*, **38** (1): 103-122.—The Red Grouse on the treeless moors of Scotland is strongly dependent upon one species of plant, heather, for food and cover. It is well known that burning of heather will result in increases in numbers of grouse. However, certain workers have noted that both density and breeding success are not similar on all managed moors, and that on ones overlying basic rocks densities and breeding success are higher than would be predicted from the stock of heather. Plants from these areas contain more potassium, phosphorus, cobalt, and copper than those growing in areas overlying granite. It has been hypothesized that heather growing over basic rocks is more nutritious than in other areas, and this paper attempts to investigate certain aspects of this matter.

No correlation was found between production of heather or proportion of young heather and the breeding performance of grouse. Neither did the level of depletion of young growth over the winter from dieback and grazing of all animals correlate with their breeding success. In addition to a difference in the chemical composition of heather depending upon the nature of the underlying rock, a difference in the constancy (percent of sampled quadrats in which present) of other plants was noted. Several species of plants were significantly more constant in sampling areas over basic rocks than in ones over granite.

The quality of the diet may be particularly important in the spring during egg-laying, when chemical demands of the hens are high. Since earlier work has suggested that stocks of phosphorus and nitrogen are inadequate for egg-laying in at least some stocks of heather, the particularly high levels in the stands overlying basic rocks may enrich the diet maximally. In addition the next most important food item, *Vaccinium myrtilus*, contains higher quantities of these nutrients than heather. Either the greater nutritive value of heather, the greater constancy of other vascular plants, or both factors in combination appear to be of great importance in determining breeding success. Work to untangle these variables is currently in progress.—Douglass H. Morse.

34. **The breeding ecology of the Red-footed Booby in the Galapagos.** J. B. Nelson. 1969. *J. Anim. Ecol.*, **38** (1): 181-198.—The Red-footed Booby population of the Galapagos Islands exhibits a number of striking traits, which include nonseasonal egglaying, a clutch size of only one, high egg loss and mortality of nestlings, and extremely long fledging and post-fledging periods. Nelson's main focus in this paper is to correlate these factors with environmental conditions existing on the Galapagos. In an attempt further to support these points he uses freely data that he has obtained upon the North Atlantic Gannet, which represents the direct antithesis with regard to breeding ecology in the family Sulidae.

Nelson's thesis is that food shortage is the major factor regulating populations of sulids. He makes this point particularly strongly in this paper; unfortunately, what data are presented to support this argument are of an extremely indirect nature. It appears that there is a common impression that colonies of tropical seabirds are limited by their food supply; while this may be so, some direct information bearing on this matter, difficult as it may be to obtain, would be most welcomed. It should be emphasized that on the Galapagos, Red-footed Boobies nest only on the northern islands of Wenman, Culpepper, and Tower, and hence do not come under appreciable influence of the rich Humboldt Current.

The breeding ecology of Red-footed Boobies on the Galapagos differs from populations of this species studied off British Honduras and Christmas Island (Indian Ocean), a difference that Nelson attributes to the harsh environmental regime of the Galapagos. This species lays eggs every month of the year on the Galapagos. However, waves of breeding activity may be noted, which Nelson believes to be correlated with a relative plenty of food. In many cases birds building nests would abandon, as would birds with eggs and young, a disruption attributed to a shortage of food. The tendency toward waves of activity is explained as a means by which at least the energetic expense of courtship and nest building can be dispensed with while adequate food sources exist. In addition to the many pairs that did not produce eggs, there was a very high loss of eggs (70% during 1964, the year of this study). Individuals that built a nest and either abandoned it, lost their egg, or lost their young before four weeks of age, renested from 30-44 weeks later (mean = 36 weeks). Hence, those that failed the first time were able to attempt again in less than one year. If young were raised to over four weeks, however, renesting would not occur until 49 to 65 or more weeks later (mean = 56 weeks). These individuals then bred somewhat over a year after the previous cycle, but did not skip nearly a year.

Growth of young in this population was extremely slow, with a mean fledging time of 130 days and a mean period of partial or total dependency after leaving the nest of 90 days. Nelson feels that this long period of dependency lessens the post-fledging mortality significantly. Nevertheless, during the year that he studied this population, the egg and chick mortality were such that only 8.4% of the eggs gave rise to fledged young. Furthermore, there were known instances of post-fledging mortality. This level of loss is so high that it is improbable that the population could maintain itself; thus, it is assumed that 1964 was an unusually unfavorable year for this population.

The Galapagos population of the Red-footed Booby and the North Atlantic Gannet represent two extremes of intra-familial divergence in breeding ecology, in response to maximally different environmental pressures. As opposed to the booby, the gannet is a strongly seasonal breeder, has a predictable food source during the breeding season, does not feed its young after fledging, and has a low pre-fledging and high post-fledging mortality.—Douglass H. Morse.

35. Population changes in the land birds of a small island. D. Lack. 1969. *J. Anim. Ecol.*, **38** (1): 211-218.—Lack contributes this study in hope that it will add to the knowledge of colonization and extinction of islands. Skokholm is an unforested island of 96 hectares, which lies only about three km off the coast of Wales. As a result one would predict a high extinction rate (it is of small size and low habitat diversity) and high colonization rate (it lies near to the mainland). This island has been censused for 34 years, thus providing the necessary information for such a treatment. Thirty species have been recorded as nesting from Skokholm, of which six have nested each year of the census. Most of the others are sporadic, and in many cases where breeding is recorded for several years in a row, banding studies have shown that single pairs of individuals have been involved that have remained for a considerable period of time.

In order to provide information for comparison, Lack presents data from other islands that have had long-term censuses performed upon them: Skomer, a few hundred meters from the mainland and three times the size of Skokholm (7 years); Bardsey, four km from the mainland and two times the size of Skokholm (14 years); and Lundy, 18 km from the mainland and four times the size of Skokholm (16 years). In addition to size and isolation, these islands differ somewhat from Skokholm in habitat diversity. When compared to the corresponding years of censuses on Skokholm, it is apparent that there are more constant residents on them than on Skokholm, probably due in part to their larger area and larger population sizes, which will not become expirated as readily. In most cases there were considerable yearly fluctuations in numbers of several species. While in some cases there appeared to be changes resulting from severe weather, in others there were apt to be striking yearly differences that were not found on other islands. In two cases a high constancy in numbers occurred year after year (Oystercatcher and Raven), and Lack hypothesizes that these species are regulating their own numbers through territoriality. In other regular species, strong fluctuations occurred, and Lack concludes that they are not regulating their own numbers, at least during most years.—Douglass H. Morse.

36. The amount of predation due to *Falco eleonorae* on fall migrants. (Der Eingriff der Eleonorenfalken in den herbstlichen Vogelzug.) E. Stresemann. *J. Orn.*, **109** (4): 472-474. (In German with English summary.)—The answer calculated is one out of every 600 migrants. Calculations are as fun in ornithology as elsewhere; but when are ornithologists going to calculate probable errors or limits on their means, in the manner of the rest of science?—Jack P. Hailman.

37. The runt of the nest as a biological problem. (Das Nesthäkchen als biolögisches Problem.) H. Lohrl. 1968. *J. Orn.*, **109** (4): 383-395. In German with English summary.—In hole-nesting birds, runts are not organically inferior to their older nest-mates, since they grow at the normal rate when placed in another nest. The runt is usually the last hatched because of a positive feedback system that is of advantage to the production of young. Parents feed the most active nestlings first, those that stretch out farthest in their gaping at the nesthole. Therefore, if there is insufficient food to go around, the runt seldom gets fed, and becomes progressively weaker. The result is that the entire brood is not prejudiced by a low food supply, as it might be if the food were distributed equally and all nestlings died for lack of adequate food.

In other kinds of birds the situation may be slightly different. With predatory birds such as hawks the older nestlings may trample the younger ones, or out-compete them for food dropped at the nest by the parents. The older sibs may even eat the younger ones (which seems a particularly parsimonious use of protein). The runt phenomenon in open-nesting passerines is rarer, and not well understood. It seems to this reviewer that the runt phenomenon is not at all "to be regarded as an incomplete adaptation of the mechanisms controlling clutch size" but should be looked for in species in which some years there will be sufficient food for all young hatched, while in others food will be in short supply.—Jack P. Hailman.

38. Effect of laying data on chick production in Oystercatchers and Herring Gulls. M. P. Harris. 1969. *Brit. Birds*, **62** (2): 70-75.—This is another fine, if short, paper from the studies of M. P. Harris. *Haematopus ostralegus* that nest early leave about eight times the number of young left by late breeders, although once they are fledged, young of all times apparently have equal mortality rates (survival after one month is less than 20% and may be as low as 15% on the average). The picture with the gull is less clear, since *Larus argentatus* populations are increasing.—Jack P. Hailman.

39. Evaluating the Christmas count records of Bobwhite in Tennessee. J. T. Tanner and R. S. Collier. 1969. *Migrant*, **40** (1): 1-5.—In attempting to determine the status of *Colinus virginianus* from the Christmas bird censuses since 1930 in Tennessee, the authors have succeeded in substantiating some of the fears commonly voiced by others who have attempted to use such data. Figure 1 is a good example. If one takes a common, easily observed bird (in this case the Cardinal, *Richmondena cardinalis*) and plots the number of individuals seen as a function of the total number of "party-hours" recorded by the census-takers, then clearly the density of Cardinals is a linear function of the number of hours spent in the field. The authors thus suggest that the Cardinal could be used as an "index" species, and the ratio of Bobwhites to Cardinals computed in order to see year-to-year variations in Bobwhites. As the authors recognize, the "Bobwhites per 100 Cardinals" index is confounded by year-to-year variations in the Cardinals themselves. Nevertheless, Bobwhites do show much annual variation, although the mean population appears to have been stable since 1930. In sum, "the use of an 'index bird' offers possibilities for evaluating the numbers recorded in Christmas counts, but is not an ideal method."—Jack P. Hailman.

NESTING AND REPRODUCTION

(**See also 34, 37, 38.**)

40. Breeding activity of the Cape White-eye Zosterops virens capensis Sundevall in the Southwest Cape. H. J. Broekhuysen and J. M. Winterbottom. 1968. *Ostrich*, **39:** 163-176.—This is a summation of observations on seven nests with references to 153 Nest Record Cards in the Cape Bird Collection. Territorial behavior in this species "can be present or absent." Nest building and incubation are performed by both sexes. The length of attentive periods in incubation at one nest "varied from 1 minute to 85 minutes with an average of 10.1 minutes for the total of 125 attentive periods recorded." This gave an overall average of 94% coverage, in contrast to results with three South African species where the female alone incubates and in which the average coverage per hour was 62, 65, and 70% respectively. The incubation period was short - 11-12 days and the same was true of the fledgling period.—Margaret M. Nice.

41. Studies on the life of the Common Myna, Acridotheres tristis tristis (Linnaeus) [Aves: Passeriformes: Sturnidae]. Sudhindranath Sengupta. 1968. *Proc. Zool. Soc., Calcutta,* **21:** 1-27.—This species is associated with man throughout India, and is a great devourer of insect pests. It nests in cavities in buildings, and in palm trees. Little incubation takes place during day time, but the adults instead place pieces of green leaves on the eggs. Night incubation starts after laying of the second egg and is performed only by the female. The incubation period averages 13-14 days; nestling life 17-24 days. Both parents feed the young, averaging from 7-13 times an hour during the first 7 days, and between 13 and 16 times an hour for another 15 days. One brood is raised. The first-hatched chicks rapidly outgrow their siblings, the youngest of which usually perish from starvation.—Margaret M. Nice.

42. Breeding biology of Rock Doves. G. K. Murton and S. P. Clarke. 1968. *Brit. Birds,* **61** (10): 429-448.—The nesting of feral *Columba livia* in a cave and in an old, disused beacon tower on the Yorkshire coast was followed with fortnightly visits for two full years. Egg laying continued throughout the year with lulls in July and December; only about one-fourth of the population bred in winter. Each pair averaged 5 clutches per year; hatched 4 eggs and raised 4-5 young to fledging. Of the 769 eggs laid 65% hatched, 20% were taken by predators (mainly Jackdaws, *Corvus monedula*), and 10% were deserted, this happening most often in winter. Total breeding success was 46%, i.e. the percentage fledged of the eggs laid.—Margaret M. Nice.

43. Nesting behaviour of the Black-necked Grebe Podiceps nigricollis in southern Africa. II: Laying, clutch size, egg size, incubation and nesting success. G. J. Broekhuysen and P. G. H. Frost. 1968. *Ostrich,* **38:** 242-252.—The grebes (See No. 44) bred from the first week of September to the end of October in 1967, the usual clutch being 3-4 eggs. Both sexes incubated and the eggs hatched in about 21 1/2 days. Casualties to the eggs were brought about by unidentified predators in 22 cases and by "water movement." The nests were mostly frail and floating, yet usually anchored to a rooted bush. Strong northwest winds and choppy waves destroyed 40 of them despite the birds' endeavors to rebuild them. Losses were very high, only 12 chicks hatching from 223 eggs—about 5%. It would seem that these grebes had made a poor choice of nesting site.—Margaret M. Nice.

44. Nesting behaviour of the Black-necked Grebe Podiceps nigricollis (Brehm) in southern Africa. I. The reaction of disturbed incubating birds. G. J. Broekhuysen and P. G. H. Frost. 1968. *Bonner Zool. Beiträge,* **19** (3/4: 350-361.—This grebe, which we call the Eared Grebe (*P. caspicus californianus*), has been considered a rare breeder in South Africa but appears to be increasing in numbers. The authors discovered a large colony on one of the artificial pans of the Strandfontein Sewage Disposal Works. Here they carried out a series of experiments on the frequency with which the incubating parents covered their eggs before leaving them upon the approach of the observer. At the 65 nests no clear picture resulted except that the behavior increased as the clutch grew: of 103 sets of 1-2 eggs 17% were completely covered, 21% partly covered and 62% left uncovered during the tests; whereas with 3 or more eggs, the corresponding figures were 28, 46 and 26.—Margaret M. Nice.

45. Breeding biology of the Brown Skua, Catharacta skua lonnbergi (Mathews) at Signy Island, South Orkney Islands. R. W. Burton. 1968. *Brit. Antarct. Surv. Bull.,* **15:** 9-28.—Of 110 breeding pairs, 60 were studied 1958-1965, with detailed observations on 20-30 pairs for 3 years. Annual mortality was about 9%. The species is polygamous; its nesting season October through December. After a brief courtship in the last week of November the nest is built; nests are located 50-250 m apart; the first egg is deposited 2 days after nest completion; the second, 2 days later. Incubation lasts about 30.5 days; the young attain flight at 60 days age, but stay around the nest 3-4 weeks longer. The ratio of grown young to eggs deposited is about 60%. Most of the mortality occurs before hatching. Adults and young prey mainly on penguin and shearwater colonies. Other foods include fish taken from other birds, and marine invertebrates picked up along the shore.—Leon Kelso.

46. Observations on parasitic nesting in the Tufted Duck (*Aythya fuligula*). (Tecken på boparasitism hos Viggen (*Aythya fuligula*) inom ett begränsat fjärdområ de i åbolands skärgård.) K. A. Fredrikson. 1968. *Ornis Fennica,* **45** (4): 127-130. (In Finnish, with English summary.)—The Redhead (*A. americana*), referred to in this paper as the American Tufted Duck, is known to be a nest parasite. This paper does not just report another species with the same habits, however; it implicates egg color as a variable. "Thus in groups containing 4 or more unsuccessful eggs all the eggs were brown . . .". Successful nests had entirely olive-green eggs.—Jack P. Hailman.

47. Polyhedral territories of animals. P. R. Grant. 1968. *Amer. Nat.,* **102** (923): 75-80.—Non-contiguous territories might be expected to be circular, but as densities increase the territories might be expected to become angular, so that no space goes unutilized as a no-man's land. Ultimately, in hexagonal packing arrays, each territory would assume a hexagonal shape itself. Data on territory shape taken by Holmes are used to show that territories of *Calidris melanotos* are angular, not circular (as if anyone ever doubted it).—Jack P. Hailman.

48. Nesting trees of woodpeckers in different forest types. (Gnezdovye derevya dyatlov v razlychnykh tipakh lesa.) K. N. Blagosklonov. 1968. *Ornitologiya,* **9:** 95-102. (In Russian.)—An analysis of preferred nesting trees of *Dendrocopus major, D. minor, D. medius, D. leucotos, Dryocopus martius, Picus viridis,* and *Picoides tridactylus,* finds that tree preference is controlled by their ability to excavate cavities therein. Woodpecker species also show varied preference in diameter and height of nesting tree and freshness of the wood wherein excavating. Nesting trees chosen are not correlated to preferred feeding trees. Some nest trees are chosen and occupied by 2 or more species of woodpeckers. The larger woodpeckers excavate in larger trees at greater heights above the ground.—Leon Kelso.

BEHAVIOR

(See also 47, 53, 68, 85, 86, 88, 89, 90.)

49. Behavioral ontogeny of the Mockingbird. R. H. Horwich. 1969. *Wilson Bull.,* **81** (1): 87-93.—In previous papers (*Wilson Bull.,* **77** (3), 1965 and *Bird-Banding,* **37** (4), 1966) the author describes his techniques in raising and carefully watching 38 *Mimus polyglottos,* many of them from the egg. In the present paper he compares his results on this species with those of Rand's study on development of the Curve-billed Thrasher (*Toxostoma curverostre*) (*Bull. Amer. Mus. Nat. Hist.,* **78:** 218-242, 1941), *using as a guide the five periods of development in altricial birds as proposed by me* in 1962. ("Development of behavior in prococial birds", *Trans. Linnaean Soc. N. Y.,* **8**) A more detailed source would have been my "Behavior of the Song Sparrow and other passerines" (1943. *Trans. Linnean Soc. N. Y.,* **6**) reprinted by Dover in 1964.

Mr. Horwich carried out his studies under admirable conditions at College Park, in the University of Maryland; here proper heating devices and an abundance of insectivorous food were at hand, hence he was able to watch his subjects from the beginning. He gives a detailed record of the development of preening each day from day 1 through day 5, and later each day till full establishment at day 10. The first four days I had been unable to watch with any of my birds because of lack of adequate heat and food for neonates. In general the Mockingbird showed a "slightly slower rate than the Song Sparrow (*Melospiza melodia*)", while the thrasher was slower still. Marked differences occurred in two activities. The first song of the Song Sparrow was heard on day 13, that of the Thrasher on day 18, and of the Mockingbird on day 27. Chasing one another started at 25 days with the Mockingbird, about 60 with the Song Sparrow, while "no actual aggressive behavior" was noted with the thrashers "for the first 10 weeks."

In the last quarter of a century, besides my own "Precocials", this is the fourth time I have come upon studies of the development of avian species where the author has followed my proposed ontogenic scheme, originally developed in 1938 while studying under Dr. Konrad Lorenz's direction at his home near Vienna. The first three articles were on birds in three different orders: Falconiformes - California Condor, *Gymnogyps californianus* (Koford, 1953); Cuculiformes, an African Cuckoo, *Cuculus solitarius* (Liversidge, 1955); Passeriformes, Red-eyed Vireo, *Vireo olivaceus* (Southern, 1958). It is indeed gratifying that Mr. Howwich's scholarly study corroborates my findings.—Margaret M. Nice.

50. Consocial tact and attachment in domestic chicks. E. A. Salzen. 1969. *Behaviour*, **33** (1-2): 38-51.—Is physical contact between the chick and the object to which it imprints necessary? Moving colored balls were used as objects in several experiments, and chicks responded better to those inside their cage than outside, and also imprinted better to them (as measured by later choice tests).

A second series of groups was run in which a cloth ball and a wire-covered ball were used, and presented either hanging (so that it would move) or fixed in the cage. Group A with the hanging cloth ball and group B with the hanging wire-covered ball were virtually identical in responses during training to their particular object, and chose that object over the other to the same degree in later choice tests. In group E, where the two objects were presented simultaneously and *fixed* inside the cage, the chicks again did not treat them significantly differently. However, in group C, in which the simultaneous objects were *hanging*, chicks greatly favored the bare ball. This preference is "explained" curiously (p. 47), as follows. ". . the difference in movement rather than the contact possibilities . . . might account for this preference for the unprotected ball." The remaining experimental group D (fixed cloth ball, hanging wire ball) does show that the preference can be switched to the covered ball when the cloth ball is fixed, but I do not understand how this result explains the preference for the bare ball in group C when *both* were hanging. The authors conclude that the type or presence of tactile contact is unimportant in eliciting social responses and in forming contact.

The curious results of the second experiment do not seem to lead easily to the conclusion drawn. Further, it would have been interesting to know the results of the rest of the experimental design that apparently was not run: fixed cloth ball group, fixed wire ball group, wire ball fixed plus cloth ball hanging. Perhaps completion of the experiment would allow a more complete interpretation. Another point caught my eye: "Klopfer and Hailman (1964) have also worked with Peking ducks and found no preferential following on the second day after hatching if the ducklings had seen but not followed the training object on the first day" (p. 39). The data (*Z. Tierpsychol.*, **21:** 755-762) actually reveal some ducklings that appeared to be strongly imprinted to an object previously seen but not followed. Indeed, that was one of the points *stressed* in that report.—Jack P. Hailman.

51. A stochastic analysis of the maintenance behaviour of Skylarks. J. D. Delius. 1969. *Behaviour*, **33** (1-2): 137-178.—This long paper is of inestimatable importance for what it attempts, rather than for what it succeeds in doing. The paper is not easy to understand or summarize, and so we had better begin with the underlying problem. It is apparent that higher animals are not stimulus-response or response-response machines: give the same stimulus at different times and the animal may do different things, or after having done A, it sometimes does B, sometimes C, sometimes something else. In other words the animal has internal processes that dictate its responses, and these unobservable processes we collect under terms like "drive", "motivation" and the like. One hope of making behavior more predictable, of discovering its underlying organization, lies in a quantitative analysis of the whole of an animal's ongoing behavior: a temporal and sequential analysis. For this ambitious attempt, Juan Delius picked the maintenance behavior of *Alauda arvensis*, in which the units of behavior are rather unambiguous (preening, stretching, flying, scratching, etc.), and where the events occur on a time-scale that is possible to record without immense difficulty.

The first important section of this paper is entitled ANALYTICAL METHODS. The first method discussed is that used by engineers to deduce mathematical relations between input and output variables of a system, which in the case of behavior might be called stimulus and response. The idea is to present the stimulus in the form of a sinewave which is varied in frequency. If (and only if) the system is linear, the output will be a sinewave, whose amplitude and phase shift from the input determines, by appropriate analysis, the general mathematical relations between input and output. The obvious difficulties are many: stimuli cannot usually be controlled, stimuli (except really simple kinds) are not amenable to sinewave kinds of presentation, and biological systems are rarely linear. A modification of the technique is random-signal analysis, in which the input is a continuous random variable and the output is mathematically decomposed into sinewaves of various frequencies and amplitudes, and compared with a similar treatment of the input. Still, one must record the input (stimuli impinging upon an animal), and still the system must be linear.

A further, and related, type of analysis is random-event-series analysis, which is more applicable to behavior. When a series of discrete events occur successively in time, they may be analysed from two viewpoints. Either take the time intervals between successive points, which yields a plot of successive interval lengths, or else take an arbitrary sampling time and count the number of events that fall within successive samplings. Either sort of data can be treated with the autocorrelational and crosscorrelational methods that underlie the method of decomposition of complex variables into sinewaves mentioned above. In this method, the behavior of animals is considered to be a train of signals to the observer, and, as is so often the case with traditional, descriptive analysis of behavior, an actual chain of stimuli impinging upon the animal is by needs ignored. Such is the dilemma.

Moving to the results, very briefly, the first section of analysis is on INHOMOGENEITY AND TRENDS. This section filters the data to remove obvious confounding variables. Males and females differ significantly in mean rates of occurrence of maintenance behavior, and the occurrence of maintenance activities varies through the season in single individuals. There are also time-of-day differences. Although it seems reasonable to select data showing "stationarity" for the sake of the ambitious analysis to follow, it is unfortunate that data selected for different kinds of analyses were not the same, for no direct comparison among methods is fully possible.

Delius then goes on to show some effects of stimuli upon the maintenance behavior, such as the arrival of the observer, the weather, etc. As expected, many environmental stimuli have effects, both qualitative (eliciting or suppressing a particular pattern) and quantitative. The detailed analysis proper then begins.

First, Delius applies the very widely used methods of TRANSITIONAL PROBABILITIES between successive behavior patterns, in which each pattern constitutes a row and also a column of a contingency table or matrix. In this case, the preceding behavior pattern is in the column, the following one in the row (they are often, perhaps usually, presented the other way round). One can then discover whether certain patterns tend to follow at higher or lower probability than expected by chance, using traditional methods based on the chi-square statistic. In this case, Delius restricts the analysis to patterns occurring in bouts where the time between events is less than a minute (figure 12). Clearly, many comfort movements tend to follow themselves, but the analysis also shows that a "both-wings-stretch" is particularly likely to follow a "body-shake" and particularly unlikely to follow "scratching." Some suggestions as to why the particular results occurred are offered. The same kind of analysis is then applied on a large scale (greater than one minute between patterns), and nothing follows anything but itself significantly. This seems to indicate that in short chains or bouts of behavior preceding patterns help to determine the next behavioral pattern exhibited, but that longer-term organization of behavior is not so simple. It might also be pointed out that no behavior pattern, even in the short chains, is completely dictated by the preceding one. The highest probability of transition is the sequence in which a "wing-and-leg-stretch" is immediately followed by "both-legs-stretch" in about 62% of the cases. On the negative side, preening never follows stretching. The point of this is that knowledge of what the animal is doing this instant only stochastically (probabilistically) predicts what it will do next. Perhaps a knowledge of the whole preceding sequence of patterns would help the prediction even more.

The next subject is analysis of TEMPORAL INTERVALS, which is accomplished in a manner highly similar to that used in survivorship of banded birds. If a behavior pattern is occurring randomly in time, then a semilogarithmic plot of its cumulative inter-response-intervals should plot as a straight line, in the manner of demographic curves of constant rates of mortality. Figure 14 plots not only "body-shake/body-shake" kind of interval curves, but also those for "body-shake/scratching", "scratching/body-shake", and so on. Many of these graphs conform to the straight lines predicted by the Poisson process (randomly occurring), which suggests that the occurrence of one behavior pattern does not influence the time of occurrence of the next. However, in several cases departure is obvious. There are too many short intervals (concave curve), indicating bunching of behavior sequences in time, such as scratching/preening, body-shaking/both-wing-stretching, and so on. For others there are too many long intervals (convex curve), suggesting that, for example, scratching inhibits flying and flying inhibits stretching. It is fascinating to me that this analysis does not correlate with the previous, purely sequential, analysis, and one wishes that exactly the same behavior patterns had been used in both cases.

The next analysis is entitled FREQUENCY CORRELATIONS. The method is based on the usual kinds of correlational graphs. In a given 15-minute interval (or some other arbitrary observation time), one counts the number of times each behavior pattern was expressed. Repeated observation periods allow drawing up of a graph that might show, for instance, that when both wings were stretched frequently, then the wing-and-leg stretch also occurs frequently, and when one is of low occurrence, so is the other. A line of correlation can be fitted to the data, and a correlation coefficient that varies between zero (no correlation) and one (perfect correlation) can be calculated. Delius made these correlations between every pair of behavior patterns, but added another twist. Correlations were made for various lengths of observation periods, and then the correlation coefficient is plotted as a function of the continuous observation time (figure 16). Some interesting patterns emerge. Both kinds of stretching occur together regardless of the observation span, whereas there is a very low correlation between preening and both-wings-stretching over any span. Scratching and flying are well correlated over 15-minute periods, but not over longer ones.

The next important analysis is AUTO- AND CROSSCORRELATIONS for which the methods are difficult to summarize. Visualize the intensity of a behavioral pattern or its frequency in some small time interval plotted on a time scale, so that there are irregular peaks and troughs of a continuously varying curve. If we now pick an arbitrary time difference, called the lag, we can measure the height (amplitude) of the curve (that is, the intensity or frequency of the behavior) at the start and finish of the lag. And we can continuously move this lag along the time scale, and thus get a succession of pairs of amplitudes, which can be plotted on a correlation graph. The trick is now to vary the lag time. The lag time yielding the highest correlation corresponds to the cycle time (wavelength) in the data. When the correlation is plotted against the lag, the graph is called an autocorrelation graph.

Imagine now graphs for two different behavior patterns on the same time scale. The lag is defined as the time on one graph to the time on the next, but is otherwise similar. Thus correlation between two different behavior patterns emerges, and this is referred to as cross-correlation. Figure 18 plots auto- and cross-correlations for the comfort movements. The auto-correlations show, for instance, that there is a rough rhythmicity in both-wing-stretching, which tends to occur at two-hour intervals, whereas body-shaking shows little or no rhythmicity.

The crosscorrelations show a variety of patterns, but wing-and-leg-stretches tend to occur with, and then two hours following, both-legs-stretches, as would be predicted from the previous combination of analyses. Unfortunately, the scale of time lags in Figure 18 is based on half-hour increments; a finer-grain analysis would be highly desirable.

Next, we come to INTENSITY FUNCTIONS which plot the instantaneous probability of a behavior pattern occurring following the occurrence of something (such as the behavior itself, another behavior pattern, etc.). The analysis is somewhat similar to auto- and cross-correlation, in that a time interval (analogous to the "lag") is chosen, and, beginning with the event of interest, the number of events following within the time interval are noted. Then the interval is moved to the next event, and so on, until one obtains a plot of the number of events in the interval as a function of successive intervals. The time interval used for the analysis here was five minutes, and figure 20 shows that most of the curves reveal a very low probability of anything following anything else, except that patterns tend to follow themselves with a high probability. However, body-shakes have an unusually low probability of following one another immediately, whereas flying has a high probability of occurring after almost anything.

The remaining analyses in the paper are INTERVAL AUTOCORRELATIONS and SPECTRAL FUNCTIONS, for which there is inadequate data for comparison with the other methods. A short DISCUSSION section concludes the paper.

The justification for such a long summary of a single paper lies in the potential importance of this contribution. None of the methods are original with Delius, and some of them have been applied to animal behavior by previous workers. Nowhere, however, (at least to my knowledge) has anyone attempted a direct comparison of the methods on the same behavior, and in this respect this paper is monumental — one to which many, many future workers will have to refer. That it is the most thorough analysis of comfort movements in birds ever attempted is of secondary importance to its general ambitious aim of predicting behavior. My criticisms are twofold, obvious and probably could not have been avoided. First, Delius does not thoroughly compare the different methods, nor does he draw any set of guidelines about which are most useful for what (although much of this is implicit in the methods and results, and therefore could be gotten with some effort by the reader). Second, the analytical methods are all "two-dimensional" and "one-step", by which I mean that they are of the form "Given that A has occurred, this is what will happen . . ." We need still greater depth of analysis, such as "given that A then B has occurred . . ." as distinct from "given that B then B has occurred . . .". My suggestion is mammoth, and Delius is not to be faulted for what he has not done, but, rather, praised for what he has.

This paper shows that ethology is coming of age. In previous reviews in this section over the last year, I have pointed out the increasing sophistication of ethology in areas of experimental design, control of experimental variables, and physical analysis of stimuli. Add to this list stochastic analysis of behavior. I do not deny that all the descriptive work in behavior is over; far from it. However, I have a hunch that the highly original leaps forward in ethology of the next generation will be made by those who transcend the highly original contributions of the previous workers, such as Margaret Nice, Niko Tinbergen, Konrad Lorenz and others. And as a teacher, I happen to know that today's graduate students in behavior are poring over Delius's paper and others like it.—Jack P. Hailman.

ECOLOGY

(See also 16, 60, 95.)

52. Seasonal movements in the Australian honeyeaters (Meliphagidae) and their ecological significance. A. Keast. 1968. *Emu*, **67** (3): 159-209.—The Meliphagidae is a large and morphologically diverse family in Australia. A correlation exists between the environmental condition and the number of species present and their tendency to engage in seasonal movements. The tendency to undertake movements is stronger in dry areas and ones with only periodic or aperiodic rainfall than in areas of higher or more constant rainfall, respectively. Rainfall may be of considerable importance in regulating blooming periods of flowers, which are heavily utilized for nectar by honeyeaters, and which appear to be the usual proximal stimulus for these movements. The movements usually take place outside the breeding season, though if conditions are unfavorable in some species, they may engage in them rather than breed. The family is noteworthy in that the majority of their movements are not of a latitudinal or altitudinal nature, but are either of a local nature or of a truly nomadic character, apparently in response to their specialized food source.

Keast believes that the radiation of this group is the result of past competition (present competitive exclusion) for food. Several species living in areas with impoverished faunas forage somewhat differently from their conspecifics in populations with more similar species. In addition, differences in nomadic movements in these species may act to reduce possible competition. The few species that migrate north and south the length of the continent have a long narrow wing; where less extensive distances are traversed, differences in wing length and shape are not clearly marked.—Douglass H. Morse.

53. The biology of the Northern Three-toed Woodpecker. (Zur Biologie des Dreizehenspechts *Picoides tridactylus* L.) K. Ruge. 1968. *Orn. Beob.*, **65** (3): 109-123. In German with English summary.—Breeding, range, foraging, tree-ringing, drumming and displays are reported, along with some comparisons with the Great-spotted Woodpecker (*Dendrocopos major*). In both species, the drumming increases in frequency toward the end, but the drop in pitch mentioned by the author does not appear to be substantiated by the sonograms (figures 9 and 10). Indeed, it is difficult to see immediately how a woodpecker could control the frequency spectrum of its drumming sound. What is apparent in the sonogram is an absence of the higher noisy harmonics in the final notes; however, the major sounds themselves are also less dark. My guess is that the last drums in a series are not as loud (perhaps because in striking faster, the bird cannot strike as hard). The higher frequencies in the sound then drop in intensity below the threshold of recording on the sonograph paper, but an amplitude section (not done) might show all the sounds to have the same frequency spectra. It is possible that the higher frequencies in the terminal drums also drop below hearing thresholds of the birds, and thus could possibly result in a lower perceived pitch, but this speculation goes way beyond the analysis presented.—Jack P. Hailman.

54. Tit niches in two worlds: or homage to Evelyn Hutchinson. D. Lack. 1969. *Amer. Nat.*, **103** (929): 43-49.—The title is derived from a famous paper by the Yale ecologist Hutchinson entitled "Homage to Santa Rosalia, or, Why are there so many species of animals?" (*Amer. Nat.*, **93:** 145-159, 1959). There are more species of *Parus* with overlapping ranges in Europe than there are in America. Lack thinks this is because the American species are at an earlier evolutionary stage of dividing up the environmental resources.—Jack P. Hailman.

55. Bird species diversity and habitat diversity in Australia and North America. H. F. Recher. 1969. *Amer. Nat.*, **103** (929): 75-80.—Nearly a decade ago, Robert MacArthur and his brother published a short paper that has had a remarkable influence on avian ecology (R. MacArthur and J. W. MacArthur, *Ecology,* **42:** 594-598, 1961). The elements of the question, somewhat simplified, are as follows. The bird fauna of a habitat can be richly diverse (about equal numbers of many different species) or can lack diversity (by having only a few species, or having only a few common species and many rare ones). In order to measure diversity (D), the MacArthurs applied Shannon's well-known equation from information theory: $D = \Sigma p (-\log p)$. The probability (p) of encountering a certain species within the habitat is found by the ratio of all the individuals of that species (in a sample census) to the total number of individuals of birds in the same census. When p is computed for all species, and the expression $p (-\log p)$ is then calculated for each, the sum of these expressions gives a measure of the bird-species diversity (BSD). The BSD varies greatly from habitat to habitat, as any bird-watcher knows.

It seems reasonable that the BSD might be predicted from a knowledge of the plant diversity in the habitat. It was MacArthur's particular insight, perhaps based on the reasonable assumption that birds are not good botanical systematists, that something other than plant *species* diversity might be a predicter. Specifically, the diversity by which the foliage is distributed vertically was chosen for analysis. Three heights were found to make an adequate prediction, and these correlate roughly with layers of grasses and herbs, shrubs and bushes, and trees.

The amount of foliage occurring in these three layers is measured in any one of a number of ways, and the Shannon equation is applied as the sum of the p (-log p) values for the three layers to yield a foliage-height diversity (FHD). It turned out that if BSD were plotted as a function of FHD, the data points described a linear relation: the more evenly the foliage is distributed vertically, the greater the diversity of birds living in the habitat.

MacArthur's subsequent studies have shown that this relationship holds true only in North America, the situation in tropical America being different. Recher has taken data from the comparable south-temperate region of Australia in this paper, and shown that data points from five habitats fit remarkably well on MacArthur's North American graph. It seems clear that a new, more predictable theoretical structure for avian ecology on a world-wide basis is beginning to emerge.—Jack P. Hailman.

CONSERVATION AND ENVIRONMENTAL QUALITY

(See also 8, 12, 32.)

56. A plea for Federal protection of the Peregrine Falcon. D. Dekker. 1969. *Can. Field-Nat.*, **83** (1): 64-66.—An eloquent presentation of the plight of *Falco peregrinus* throughout the world due to pesticides as well as to persecution from so-called "falconers." For instance, in Europe, "on some of the migratory routes and wintering grounds, such as the Dutch lowlands, pesticides were used in concentrations which *directly* resulted in the crippling and dying of tens of thousands of potential prey species of the Peregrine. The (easy) capture of one or three of these birds may well have resulted in quick doom to a raptor. According to Voous (1965), in two months in the spring of 1960 27,000 dead birds were picked up in the Netherlands, of which 159 were hawks and owls. It is estimated that about 10 times that many birds were killed as a result of the distribution of seeds treated with Parathion expressly to kill harmful birds and rodents."

As to the Western Hemisphere (see also review **57**), the status of this magnificent bird "shows a dangerous trend towards total extirpation . . . The time to protect the Peregrine is *now*."—Margaret M. Nice.

57. Peregrines and pesticides in Alaska. T. J. Cade, C. M. White and J. R. Haugh. *Condor*, **70** (2): 170-178.—Detailed data on the occupancy of cliff nesting sites, the prey, pesticide residues in the prey and pesticide residues in the tissues of *Falco peregrinus* are tabulated. Perhaps the greatest hope for survival of this endangered species lies in the remote populations of Alaska, which still appear to be reproducing at a normal rate. However, ". . . the widespread occurrence of pesticide residues at rather high levels in the eggs and tissues of these falcons allows us no sanguine feeling about their future."—Jack P. Hailman.

58. DDT residues in Adelie Penguins and a Crabeater Seal from Antarctica: ecological implications. W. J. L. Sladen, C. M. Menzie and W. L. Reichel. 1966. *Nature*, **210**: 670-673.—Samples of liver and fat from *Pygoscelis adeliae* in the Cape Crozier colony, plus tissue from a young male seal (*Lobodon carcinophagus*) revealed DDT and DDE residues of low concentration. Two interesting controls were incorporated in this study. First, a banded Emperor Penguin (*Aptenodytes forsteri*), which had been collected by Dr. Edward Wilson in July 1911 during the British Expedition and which had been left on the floor of a stone igloo a few miles away, was also analyzed. Second, all the material was subjected to two independent tests for residues in different laboratories. The Emperor showed no residues, the other animals showed 13-115 parts per billion in liver and 24-152 ppb in fat (one laboratory) and 11-64 ppb in liver and fat (other laboratory). (Billion here is the U. S. billion, which is 10^9.) By comparison, one investigation has shown DDT residues in human body fat in the United States to be about 7 parts per million (or 7000 ppb). The comparison suggests the Antarctic populations are in no immediate danger. Still, neither of the two species used ranges from the ice pack and thus surely has never come into direct contact with an area in which DDT is being used. Like the study of peregrine falcons in Alaska (review **57**), this investigation demonstrates that no area of the world is safe from biocides. The problem is truly global. Let us hope that Sladen will look again at Antarctic animals to see if the rate of accumulation of biocides in these animals is increasing significantly.—Jack P. Hailman.

59. Observations on oil pollution and wintering Purple Sandpipers, *Erolia marstima* (Brunnich), in Nova Scotia. P. C. Smith and J. S. Bleakney. 1969. *Canad. Field-Nat.*, **83** (1): 19-22.—In February 1967 part of the shoreline of the Bay of Fundy became polluted with bunker oil to a vertical distance of 30 feet. As late as 5 July there were patches of sticky wet oil on drift logs and rocks in places visited by the authors. The question asked was how does the pollution affect an intertidal shorebird such as the Purple Sandpiper? Oiled feathers left the plumage matted and in some cases exposed, but any mortality would be due to exposure, not the flightless condition experienced by waterfowl that get caught in oil slicks. Stomach contents revealed prey to be periwinkles (*Littorina saxatilis* and two larger species), which are eaten whole and ground in the gizzard. Unfortunately, there is inadequate information available from this species to determine whether its foraging was shifted by the pollution. The main prey found does not occur in the middle and lower tidal zones, where pollution would presumably have its greatest effects.—Jack P. Hailman.

60. Ant dispersal for forest protection. (Rasselenie muravev dlya zashchity lesa.) V. F. Zavednyuk. 1968. *Lesnoe khozyaistvo*, **21** (8): 71-72. (In Russian.)—While not pertinent to birds directly, this topic is very much so indirectly since to lift the danger in chemical biocides from forest birds means the substitution of natural biological controls for the artificial. This and legions of reports like it in central and eastern European literature testify to the effectiveness of relocating anthills (chiefly of genus *Formica*) in forests to take advantage of the monumental destruction the ants wreak on insect pests. This also points up the biological information gap that exists between the East and West. The "sowing" of anthills method has not even been tried experimentally in the U. S., per letter of the U. S. Forest Service. To take the article reviewed for a sample: While chemical control was ineffective for hawthorn and green oak roller-moths, ant colonies of *Formica polyctena* (5 hills per hectare) destroyed vast quantities of their larvae and adults, reducing pest damage to insignificance. The Leopard Moth (*Zeusera pyrina*) is very pernicious to tree stands in the European USSR. Tree groups mysteriously non-infested were found to be protected by ant colonies which destroyed the noxious larvae and eggs. In the Gorki region the artificial dissemination of anthills in a variety of localities successfully checked the numbers of sawflies, webworms, silkworms, and other pests. Moreover ants loosen the soil and work organic substances into it, so that trees growing near anthills are provided more nutritive substances. It is concluded that in sylviculture the use of anthills is a most important hygienic measure.—Leon Kelso.

PARASITES AND DISEASES

(See also 78.)

61. Suspected pox virus infection of a Dunlin. G. H. Green. 1969. *British Birds*, **62** (1): 26-27.—Pox virus is well known from Columbiformes, Galliformes and a few passerines (e.g., canary). Ecological studies may sometimes place too little emphasis on the role of disease in population regulation, simply because so little is known and summarized about avian diseases for species other than game and commercial forms. The pox on the leg of this *Calidris alpina* suggests that it "was sufficient impediment to prevent adequate feeding." Diseases may cause mortality indirectly, and more needs to be learned about such factors.—Jack P. Hailman.

62. Heart worm, *Sarconema eurycerca*, infection in Whistling Swans, *Cygnus columbianus*, in Chesapeake Bay. B. L. Holden and W. J. L. Sladen. 1968. *Bull. Wildlife Disease Assoc.*, **4**: 126-128.—All seven Maryland individuals investigated had myocardial infections of about a dozen worms, mostly females. This nematode, whose life cycle is unknown, infects at least three species of swans and two species of geese. Although implicated in the deaths of swans, the Chesapeake population of whistlers appears not to be decreasing so that light infections may not be pathogenic.—Jack P. Hailman.

63. On the feather mite (Acarina, Analgesoidea) fauna of waterfowl in Turkmeniya. (K faune perevykh kleshschei (Acarina, Analgesoidea) vodoplavayushschikh ptits Turkmenii.) D. Kurbanova. 1968. *Izvestiya Akad. Nauk. Turkmenskoi SSR, ser. biol.*, **1968** (6): 50-55. (In Russian.)—On 998 waterfowl of 21 species, in 6 families (Rallidae, Laridae, Anatidae, Colymbidae, and Phalacrocoracidae) 14 species of feather mites were found on 315 specimens, or 31.5% ratio of infection. The general rule of Dubinin, that certain bird groups have their own inherited feather-mite fauna, evolved simultaneously with the host, is supported by this study; also that ancestrally-related birds have similarly related parasites.—Leon Kelso.

PHYSIOLOGY AND PSYCHOLOGY

(See also 50.)

64. Neuromuscular mechanisms of wingbeat in hummingbirds. S. Hagiwara, S. Chichibu, and N. Simpson. 1968. *Zeit. vergl. physiol.*, **60** (2): 209-218.—By use of advanced and complicated mechanical and electronic equipment described in detail, the action of the major pectoral muscles of *Calypte costae, C. anna,* and *Selasphorus sasin* was analyzed. Among interesting points brought out was the fact that the wingbeat frequency was comparatively uniform for all species studied, 35-45 per sec., in both hovering and forward flight. Velocity of forward flight was regulated by amplitude of wingstroke, which was controlled by the number of motor units involved in the muscle contractions, and by the rate of nerve impulses sent in each motor unit. In hovering flight there was a single muscle contraction per wingbeat; in forward flight there was a multiple or tetanic contraction of muscles through a series of 2-5 nerve impulses per wingbeat, emitted at a rate of 300-500 impulses per second. The power of muscular contraction increased in proportion to the number of neural impulses per wingbeat.—Leon Kelso.

65. Upon the wings of the wind. Vance A. Tucker. 1968. *New Scientist*, **38** (603): 694-696. A study of energy expenditure in parrakeet flight in experimental dynamic tubes. They were "flown" in artificial wind currents of varying velocities in aerodynamic tubes. Their gas metabolism was measured by continuous air current through a mask fitted over the head leading to a gas analyzer. Minimum energy expenditure was at 35 km/hr. current; maximum was at 42 km/hr. Per 1 gm weight for 1 km distance 3 calories expenditure were calculated. Loss of water by evaporation and excrement at 20°C air temp. was 1.1% of body weight per hour; at 36-37° C, 3-4 times greater. Respiration rate was 175-300 per min. depending on flight speed. Wingbeats and respiration rate are not synchronized.—Leon Kelso.

66. Weight loss of birds during nocturnal migration. D. J. T. Hussell. 1969. *Auk*, **86** (1): 75-83.—Eighty Veeries were caught or killed during the night of 6-7 May 1965 at Long Point lighthouse, Ontario. The birds obtained later in the night weighed less, on average, than those obtained earlier, the average rate of weight loss being 1.3 percent of body weight per hour. A similar study of Ovenbirds in September gave a figure of 1.0 percent body wt/hr. Hussell notes that several published estimates of the rate of weight loss in other species are lower than these figures, but on the next page he mentions that he had rejected several smaller samples of birds because they did not show significant relationships between weight and time. This comment reveals a methodological trap: "significant" in this context means "significantly different from zero", but the test is irrelevant, because we are not seeking to determine *whether* birds lose weight, but *how much* they lose. Other things being equal, smaller estimates of a quantity are less likely to differ significantly from zero; hence rejecting them systematically biases upwards the estimates that are accepted. The legitimate procedure in such cases is to use all the data available: if some of the estimates thereby obtained are less reliable than others (whether they are based on smaller samples or for any other reason) this will be reflected in larger standard errors. There is then an objective procedure for assigning to them a smaller weight when compiling averages. In Hussell's case the estimates that were suppressed were based on smaller samples and hence would have been assigned small weights, so these remarks do not detract from the value of his careful measurements, but they draw attention to a pitfall which has to be taken into account when evaluating the reports of others.—I. C. T. Nisbet.

67. Spring weights of trans-Saharan migrants in Morocco. J. S. Ash. 1969. *Ibis,* **111** (1): 1-11.— During the expeditions described in review number **25**, more than 5,500 birds of 79 species were netted and weighed. Mean weights for five species were between 26 and 44 percent lower than those of fat birds of the same species weighed at about the same dates on the south side of the Sahara. Weights of birds of the same species arriving in the British Isles are only slightly higher than those in Morocco, suggesting that the former also have made a long journey across Europe.—I. C. T. Nisbet.

68. Stimulus preferences and discrimination in neonatal ducklings. P. H. Klopfer. 1968. *Behaviour,* **32** (4): 309-314.—The results of this experiment on discrimination of colored patterns with heat reward coupled with previous results using the same sets of stimuli in imprinting studies and in discrimination training with water reward (*Science,* **156:** 1394-1396, 1967) show that pairs of stimuli are or are not discriminated depending upon the kinds of test involved. I find these results puzzling.—Jack P. Hailman.

69. Stimulus generalization as signal detection in pigeons. D. S. Blough. 1967. *Science,* **158:** 940-941.—Psychophysics is the science that relates physical stimuli to behavior, and the current trend in psychophysics is to relate perception to stimuli by means of a statistical theory of the probability of detection. The subject is somewhat involved, but the present study takes a rather different aspect of perception and shows how it also may be treated with signal-detection theory.

Pavlov discovered the phenomenon of stimulus generalization. If an animal is trained to respond to one stimulus (say, a certain wavelength of light), then it also responds to similar stimuli that were not specifically involved in the training (e.g., other wavelengths of light close to the training wavelength in the spectrum). The response rate or intensity to these other stimuli is proportional to their similarity with the training stimulus, so that one can measure response gradients over the values of the stimuli. These are the classic stimulus-generalization gradients.

In this study Blough trained pigeons to peck at a key when it was lighted by a wavelength of 582 nm. In later tests pigeons pecked at any wavelengths beween 575 and 590 nm; the closer to 582, the higher the peck rate. The curve obtained (peck rate as a function of wavelength) is a sort of bell-shaped curve peaking at or near 582 nm. The ultimate purpose of the analysis is to develop a technique for making this curve quantitatively predictable.

Blough's approach is as follows. One takes shifting criteria for judging whether the pigeon really detected a difference between 582 nm and each other wavelength. All the stimuli were presented many times, each time for 30 sec. during which a certain number of pecks were recorded. As the first test, we say that any number of pecks more than nine (an arbitrary criterion) indicates the pigeon detects the stimulus. The percentage of trials in which 582 received 10 or more pecks is first computed. Then the percentage of trials in which each other wavelength separately also received 10 or more pecks is computed. A plot is made with the percentage of detection of 582 nm on the horizontal axis and the percentage of each other stimulus on the vertical axis, so that for a criterion of 10 pecks, each wavelength yields a plotted point. The entire procedure is now repeated using a new criterion, such as 15 pecks, and so on, until a whole family of curves is generated, each wavelength having a curve.

When the families of curves are generated, they are replotted using probability axes rather than the usual arithmetic ones. The transformed plots yield straight lines for the curves. These lines are tolerably parallel to one another, except that there is a slight difference in slope between those wavelengths longer than the training stimulus and those shorter. This indicates to me that the animal is not assessing the stimuli by wavelength alone. Two possibilities are: (1) the brightness of the stimulus affects its efficacy (brightness was not controlled), or (2) the animal assesses spectral position by frequency rather than wavelength (the two are not linearly related: see Hailman, *J. Opt. Soc. Amer.*, **57**: 281-282, 1967).

Intuitively, the analysis yields a direct measure of how similar two stimuli appear to an animal that is independent of the general response level of the animal. It also seems a promising tool for assessing which aspect of a stimulus is really controlling the behavior, since in this case the deviation from parallelism in the curves suggests the animal is attending to something other than wavelength alone. The study illustrates the sophistication toward which animal psychophysics is struggling.—Jack P. Hailman.

MORPHOLOGY AND ANATOMY

70. Red-Winged Blackbird nestling growth compared to adult size and differential development of structures. L. C. Holcomb and G. Twiest. *Ohio J. Sci.*, **68**: 277-284.—These experiments were carried on in 1964 and 1965 in Ohio and Michigan. A large number of nestling *Agelaius phoeniceus* were weighed and measured for five characters every day. "Mean weight of 18 neonates was 3.19g, which was 7.5 percent of 18 adult female weights (41.6) and 79 percent of 18 fresh egg weights (4.08g)." The authors found that "The differential increase of size in different body parts shows a distinct correlation with their function while in the nest, those which were used during nest life developed in the first five days and those required after fledging developed in the last five days." This is careful, detailed work with good coverage of the literature from American sources with the addition of Heinroth's classic paper of 1922.—Margaret M. Nice.

71. Wing length of Lapwing (*Vanellus vanellus*) before and after skinning, with remarks on measuring methods. K. Vepsäläinen. 1968. *Ornis Fennica*, **45** (4): 124-126.—Further evidence that wings shrink upon skinning. Published "wing-lengths" can refer to the live bird in the hand, the shot bird and the skinned bird. Since all are different, perhaps we need a new terminology for measurements, such as "live w-l", "dead w-l" and "skin w-l."—Jack P. Hailman.

72. Geographic variation in size of the Great Tit (Parus major L.). (Geograficheskaya izmenchivost razmerov bolshoi sinitsy.) P. V. Terentev. 1969. *Byull. Moskovskogo obshch. isp. prirody, otdel. biol.*, **74** (1): 135-140. (In Russian, with English summary.)—Measurements of 527 specimens of 25 Eurasian subspecies show that: (1) they vary clinally, but not merely in the usual Bergmann rule (larger northward, smaller southward) order; (2) there are two main centers of geographic longitudinal variation, in mid European Russia, and about at the boundary between west and east Siberia; (3) variation in total wing length shows correlation to summer temperature; (4) ratio of wing-to-tail length varies both per geographic longitude and temparature, those from mid European Russia having longer wing with relatively short tails; those from between east and west Siberia having both longer wings and tails; (5) the shortening of tail with July temperature above 27°C is regarded as a special case of Allen's rule; (6) geographic size variation is not correlated to any modification of habits.—Leon Kelso.

PLUMAGES AND MOLTS

(See also 6, 70.)

73. The ventral coloring of the Lammergeyer. P. A. Clancey. 1968. *Bokmakierie*, **20** (2): 36, 37.—Advances arguments against belief that rusty-colored wash on breast feathers originates from dust bathing. It is suggested that the source of the tint is the skin, and that its absence in captivity is explained by food deficiencies. More definite research rather than suggestion is needed however.—Leon Kelso.

74. The water repellency and feather structure of cormorants, Phalacrocoracidae. A. M. Rijke. 1968. *J. Exp. Biol.*, **48:** 185-189.—Upon publication of a review of a paper in *Ostrich* (review no. **58**, *Bird-Banding*, **40:** 65-67, 1969) a reader called our attention to a paper with exactly the same title, published by the same author, in a different journal the following year. Since publication of the same paper in two different journals (especially if they are in the same language) is considered by many to be a breach of professional ethics, the contents—and not merely the titles—of the two papers must be compared in order to see if the papers are indeed duplicates.

The second paper, under review here, is arranged with an introduction, a section entitled "liquid repellency and surface structure," and a section entitled "measurements on the feathers of cormorants", plus a summary and references. This sequence is identical in the first paper. Within the obvious limits of editorial adjustment of phrasing, the introductions are word-for-word duplicates in the two papers. The section on "liquid repellency . . ." in the second paper is more complete than in the first, and the questions raised in the previous review are largely answered by the more careful and complete presentation of the equations involved. There is in addition a diagrammatic cross-section of two barbs with the variables labeled. The section on "measurements . . ." is titled a paragraph earlier in the otherwise identical text of the second. Table 1 is identical, except that data for the Bank Cormorant (*Phalacrocorax neglectus*) have been added to the other species. The summary has been rewritten, and the bibliography contains a few additional references.—Jack P. Hailman.

ZOOGEOGRAPHY AND DISTRIBUTION

(See also 31, 35, 55, 96.)

75. A new species from the Palearctic region: *Apus caffer*. (La Neuva especie de vencejo en el paleartico: *Apus caffer*.) O. del Junco and B. Gonzalez. 1969. *Ardeola*, **12** (2): 115-127. In Spanish, with English summary.—Apparently referable to *A.c. caffer* from Rhodesia, the species nests with *Hirundo daurica* in Spain. The nearest African records from this swift are from Nigeria, but it should be looked for in Morocco nesting with the same swallow species. (From the summary.)—Jack P. Hailman.

76. The Common Eider (Somateria mollissims L.) in the Black Sea Reserve area. (Gaga obyknovennaya (*Somateria mollissima* L.) v raione chernomorskogo zapovednika.) B. V. Sabanevskii. 1969. *Vestnik zoologii* (Kiev), **3** (2): 82. (In Russian.)—While it has been observed there annually through spring and summer since 1964, both sexes in small numbers, no nests have been found.—Leon Kelso.

77. Some features of northeastern Taimyr avifauna. (Nekotorye osobennosti avifauny Severo-vostochnogo Taimyra.) V. M. Sdobnikov. 1969. *Zool. Zhurn.*, **48** (3): 400-406. (In Russian, with English summary.)—The Taimyr peninsula is one of the farthest north localities of continental Eurasia. The total of 78 bird species (67 of them breeders), at 72-79° nor. lat., is rather high as compared with similarly located (67-72°) Gidansk tundra which has 49 species (47 nesting), and Indigirka tundra (70-72°) with 47 species (46 nesting). In this locality in recent years there has been an about 3° northward extension of ranges of Willow Grouse, Pomarine Jaeger, Long-tailed Jaeger, White-fronted Goose, Horned Lark, White Wagtail, and Bluethroat, evidently correlated to recent warming of the climate, as has been noted in Iceland, Norway, and the Baltic Sea. —Leon Kelso.

SYSTEMATICS

(See also 30, 71, 72, 84, 85.))

78. A list of ectoparasites recorded from colies. J. A. Ledger. 1968. *Ostrich,* **39** (4): 231-235.—Much of the literature on avian parasites remains buried in the parasitological publications where it is rarely seen by ornitholgists. Here such literature on the Coliiformes is reviewed, yielding seven mites, two ticks, two flies, a flea and six lice. Comparisons of ectoparasites, sometimes a useful method of determining affinities of hosts, does not in this case lend weight to the suggestion that colies are closely related to swifts.—Jack P. Hailman.

79. The songs of five species of *Passerina*. W. L. Thompson. 1968. *Behaviour,* **31** (3-4): 261-287.—Similarities in the physical structures of the songs parallel the morphological groupings of the species.—Jack P. Hailman.

80. On the Palaearctic quails. R. E. Moreau and P. Wayre. 1968. *Ardea,* **56** 3/4): 209-227.—The domesticated Japanese quail and the wild quail of Europe are considered by most to be conspecific (*C. coturnix japonica* and *C.c. coturnix,* respectively). Intermediate populations from Asia are sometimes referred to a third group. The question asked here is: how many species are there in these Palaearctic quails? An analysis of specimens and of genetic crosses fails to yield an unequivocal answer.—Jack P. Hailman.

81. A new martin of the genus *Pseudochelidon* from Thailand. Kitti Thonglongya. 1968. *Thai Natl. Sci. Papers, Fauna Ser.,* No. 1, 10 pp.—This paper introduces a new series of publications; inquiries and manuscripts should be sent to the Editor, ASRCT, 196 Phahonyothin Road, Bang Khen, Bangkok, 9, Thailand. The new species is *P. sirintarae,* which joins *P. eurystomina* as the second member of the genus. Suggested common name is White-eyed River Martin.—Jack P. Hailman.

82. Geographic populations of the Pintail in USSR. (Gegraficheskie populyatsii shilokhvosti v SSSR.) T. P. Shevareva. 1968. *Migratsii zhivotnykh,* **5**: 29-67. (In Russian.)—On the basis of 309 banding returns it is stated that 4 populations may be distinguished: European, Euro-Siberian, west-Siberian, and Chukotsk.—Leon Kelso.

83. The relationships of the Seed-snipe (Thinocoridae) as indicated by their egg white proteins and hemoglobins. C. G. Sibley, K. W. Corbin and J. E. Ahlquist. 1968. *Bonner Zool. Beitr.,* **19** (3/4): 235-248.—Sibley has led the ornithological contingent among systematists using the new technique of electrophoresis to help make taxonomic decisions. Very roughly, the technique is as follows. Proteins are taken from an animal and extracted chemically and by centrifugation; proteins from the blood, lens of the eye, and (in birds) from the egg white are commonly used. The protein solution is then placed on a starch gel through which electricity is passed, and the proteins "migrate" toward the positive electrode because of the net electric charge on the protein macromolecule. Since different proteins, of which there are an indefinitely large variety, migrate at different rates they form characteristic bands on the gel after a sufficient time. The stained bands differ in width and distance from the starting point, so that the complement of proteins and protein components forms a characteristic pattern for a species. The patterns among species can then be compared for similarities, which are assumed to represent evolutionary affinities.

This study shows that the probable relatives of the Seed-snipes are the Charadriiformes. Previous studies have placed their affinities in a variety of places among the birds.

Taxonomists using traditional characters may question the reliability of this character. Why is this protein analysis so good an indicator of relationships that taxonomic decisions are published almost without reference to traditional characters? The reasoning is this. The genetic endowment of an animal is its DNA. The DNA (deoxyribonucleic acid) determines the structure of RNA, which in turn determines the sequences of chaining in amino acids, which are the building blocks of proteins. Thus, by studying proteins, one is only a few steps away from studying the genes themselves. The fault, as I see it, with this reasoning is the hidden assumption that protein structure is inherently a conservative taxonomic characteristic, not subject to the subtle pressure of natural selection. This seems nonsense, as there is no particular *a priori* reason to believe protein structure to be nonadaptive. Indeed, the very inaccessibility to analysis of selection pressures or protein structures seem to me to cry out for extreme caution. This is not to say protein analysis is useless in taxonomy, but only that its reliability cannot be properly assessed at present.—Jack P. Hailman.

EVOLUTION AND GENETICS

(See also 16, 31, 54.)

84. A hybrid grouse, *Lagopus* x *Canachites*, from northern Ontario. H. G. Lumsden. 1969. *Canad. Field-Nat.*, **83** (1): 23-30.—If we are to understand evolutionary, ecological and behavioral relationships of species, we need far more information on hybrids. I have observed scores of individuals over years of watching birds that I suspected of being hybrids. Few are collected, and it seems a worthy task, until more information is accumulated, to note briefly the existence of hybrids whenever they are reported, lest we fall prey to taking too facile a view of the reality of the avian species concept.—Jack P. Hailman.

85. The bill-color as a potential isolating factor between *Pytilia phoenicoptera* Swainson and *Pytilia lineata* Heuglin (Family Estrildidae). (Die Schnabelfarbung als potentieller Isolationsfaktor zwischen *Pytilia phoenicoptera* Swainson and *Pytilia lineata* Heuglin (Familie: Estrildidae).) J. Nicolai. 1968. *J. Orn.*, **109** (4): 450-461. In German, with English summary.—The first species occurs in a latitudinal belt in west Africa, the other in a circular pocket in the eastern part of the continent. The allopatric species differ primarily in bill-color, the former being black, the latter red. When placed together in various ratios in captivity they breed true, and thus are probably valid species, not subspecies as often thought. The characteristics producing the isolation are called "potential isolating factors" since they are not necessary to keep the forms from interbreeding in the wild. This kind of study greatly helps solve the problem of arbitrary species designations in allopatric forms.—Jack P. Hailman.

FOOD AND FEEDING

(See also 26, 32, 33, 34, 37, 45, 48, 59, 61, 73.)

86. The role of experience in the development of food preferences in gull chicks. V. E. Rabinowitch. *Anim. Behav.*, **16:** 425-428.—Chicks of *Larus argentatus* and *L. delawarensis* were fed on one of three kinds of food (chopped earthworns, pink and green catfood), and then given choices after five days. They preferred their rearing food when it was one of the choices, and when not, they often failed to feed at all, suggesting that they must learn to recognize food. The study strengthens my own contention from very different kinds of evidence (*Behav. Suppl.*, **15**, 1967) that gull chicks learn their food.—Jack P. Hailman.

87. Observations of the Siberian Saker Falcon on the Upper Ob. (Nablyudeniya nad sibirskii balobanom v verkhnem priobe.) A. P. Kuchin. 1968. *Ornitologiya,* **9:** 103-107. (In Russian.)—During 3 years observation of *Falco cherrug saceroides* a definite range expansion was noted in the Altai foothills along with an increase of the Red-necked Groundsquirrel population. The latter, a principal food, was brought to the nest from distances up to 5 km. At first the male alone does the foraging, bringing food for both female and young; later the female flies to meet the male, taking food from it in mid-air; in the final days of nest life the female also shares the hunting. Numerous details were recorded on development of young in two nests.—Leon Kelso.

SONG AND VOCALIZATIONS

(See also 53, 79, 93.)

88. Song development in the Indigo Bunting. J. O'H. Rice and W. L. Thompson. 1968. *Anim. Behav.*, **16:** 462-469.—In sum, *Passerina cyanea* learns the detailed characteristics of its song, "but this learning seems to involve primarily a refinement of a basic pattern which the bird is able to produce without ever having heard an indigo bunting song." Another study which helps us to piece together the ways in which the environment shapes the genetic endowment in order to create behavior.—Jack P. Hailman.

89. The basis for individual recognition by voice in the Sandwich Tern (*Sterna sandvicensis*). R. E. Hutchison, J. G. Stevenson and W. H. Thorpe. 1968. *Behavior*, **32** (1-3): 150-157.—The title of this paper might better read: "There is variation among individual Sandwich Terns in the physical structure of the 'fish-call' given while bringing food to young, so that *if* Sandwich Terns have individual recognition then these differences in calls *might* have something to do with that recognition, *if* the auditory systems of the chicks are capable of discriminating the individual differences."—Jack P. Hailman.

90. The relation between organization and function of song in Cardinals. R. E. Lemon. 1968. *Behaviour*, **32** (1-3): 158-178.—*Richmondena cardinalis* sings a bout of one song-type, then switches to another; this paper reports when it uses a particular song-type in territorial encounters. Whether two males "match" their song-types while in a singing duel is measured in three different ways, apparently original with the author: (1) proportion of bouts matching (pbm), in which the total number of bouts of B is the denominator, and the number of bouts of A that were also sung by B is the numerator (Obviously B/A may give a different proportion than A/B, and the author says "it is frequently convenient to show only one ratio, or to average the scores if differences exist"—thus obliterating important distinctions, it would seem); (2) the proportion of matching minutes (pmm), which is the no. of min. in which both A and B are singing the same type divided by the total minutes; and (3) the mean latency of matching (mlm), which is the time from the onset of a song type in A to the time of the onset of the same song type in B, summed over all song types and divided by the number of such matches. (The hitch in this last measure is that the latency is only counted when the song types overlap in time, thus biasing the analysis.)

The results show matching to some extent between adjacent males, and suggest the matching is higher the closer the two birds are to one another. They also suggest some waning of the matching with repeated or continued performance. I think the entire phenomenon would be more clearly elucidated by a simple probability distribution of different song types in different situations, including territorial proximity. The measures of matching used here probably do the job at one level, but the kind of approach championed by Delius (see review **51**) might yield a much clearer picture of the control of singing in the Cardinal.—Jack P. Hailman.

PHOTOGRAPHY

91. Bird-photography by stalking. J. B. Bottomley. 1968. *Brit. Birds*, **61** (12): 546-549.—Instructions for a technique usually considered taboo at best and inefficient at worst.—Jack P. Hailman.

92. British bird-photographers, 11: M. D. England. I. J. Ferguson-Lees. 1969. *Brit. Birds*, **62** (2): 66-69.—The highlight of the samples of England's photographs must be plate 9, showing a Spotted Flycatcher (*Muscicapa striata*) incubating in its nest atop a carved wooden head. Courtship feeding in the Nuthatch *Sitta europaea* (plate 16) is also a very worthy photo.—Jack P. Hailman.

RECORDINGS

93. New Palearctic bird sound recordings. J. Boswall. 1969. *Brit. Birds*, **62** (2): 49-65.—This is the third of a series of papers (other two referenced herein) listing recordings of bird calls and songs. It will be of great value to bioacusticians.—Jack P. Hailman.

BOOKS AND MONOGRAPHS

94. *The Double Helix.* James D. Watson. 1968. Signet Books, New York. 143 pp. 95c paperback.—Now in paperback for less than a dollar every schoolboy can learn that even great scientists are human and oftimes naive. It is household knowledge that the author shared with Francis Crick and Maurice Wilkins the 1962 Nobel Prize for discovering the structure of DNA; less well known is Watson's intimate contact with ornithology. One fateful evening "Honest Jim" had an insight about DNA while Francis was out partying. In writing about their meeting the following morning, Watson lets slip his odious past: "Reporting that even a former birdwatcher could now solve DNA was not the way to greet a friend bearing a slight hangover."

Actually, Watson is defending himself in this passage. For, months earlier, when he did not understand enough crystallographic theory to interpret some X-ray pictures of tobacco-mosiac virus (TMV), Watson had sought the mathematical aid of Crick's quick mind: "Luckily, merely a superficial grasp was needed to see why the TMV X-ray picture suggested a helix with a turn every 23 Å along the helical axis. The rules were, in fact, so simple that Francis considered writing them up under the title, 'Fourier Transforms for the birdwatcher.'"

What readers of the book will not discover is that molecular biologists sometimes become birdwatchers, as well as vice versa. In fact, one of Watson's own doctoral students—who was associated with the exciting discovery of a kind of ribonucleic acid instrumental in transmitting information from the genetic DNA material to the building of proteins—abandoned molecular biology entirely after getting his degree, and spent many happy days with me watching birds in the Galapagos archipelago. (Risebrough is now engaged in important research concerning the effects of biocides on living matter.)

The book does document Watson's fruitful undergraduate days: "This wish [to avoid chemistry] partially arose from laziness since, as an undergraduate at the University of Chicago, I was principally interested in birds and managed to avoid taking any chemistry or physics course which looked of even medium difficulty." The striking parallel with Charles Darwin's undergraduate days cannot be overlooked. This vast sampling of great minds provokes me to introduce a new principle into the study of the history of science, which I shall modestly call Hailman's Principle: "A little birdwatching never hurt anyone."—Jack P. Hailman.

95. Desert Biology. G. W. Brown, Jr. (editor). 1968. Vol. I. Academic Press, N. Y. 575 pp., $29.50.—A review in length of this projected treatise on widely varied biological aspects of arid regions is appearing in a number of *Science*, May, 1969. It does not dwell upon the two review articles of ornithological importance: Temperature regulation and water economy of desert birds, by William R. Dawson and George A. Bartholomew, and Temperature regulation in desert mammals, by the same authors. For anyone engaged in monographing any desert locality or species the other chapters in this volume also provide many pertinent facts that would not otherwise be available.—Leon Kelso.

96. Birds of the Kolyma Highlands. (*Ptitsy Kolymskogo Nagorya.*) A. A. Kishchinskii. 1969. "Nauka" Publishing House, Moscow. 188 pp., 26 figures, 13 tables, bibliography of 109 titles. 96 kopecks (about $2.00 U. S.). (In Russian, with English summary.)—The Kolyma, one of the major rivers of arctic Siberia, flows from headwaters in mountains bordering the Sea of Okhotsk. The Kolyma highlands here explored is that area between 59-63° north latitude and 147-158° longitude, bounded southward by Magadan and the Shelikov gulf areas. While based on two years of exploration and about 500 collected specimens this report provides new life history information on such arctic alpine breeders as the rare *Calidris tenuirostris*, and *Histrionicus histrionicus*. There is a foreword, an introduction reviewing previous work, a chapter (1) on the physico-geographical and ecological features of the area, a systematic annotated list (2) of the 177 species recorded, a chapter (3) discussing the ornithogeographic features of the area, a chapter (4) on the economic aspects and human settlement effects on the avifauna, followed by the bibliography, and a 4-page summary in English. The all-around thoroughness of the discussions in the 2 latter chapters and elsewhere suggests the hand of Dr. L. A. Portenko, who is editor of this volume and a long time authority on birds of the eastern Siberian region.

In this area the tree limit on the coast is at 100 - 200m altitude, but inland it is at 400 - 600m. Near the coast the upper limit of shrubbery is 600 - 700 m, while inland it is 1,000 - 1,200 m. Thus here as elsewhere in the arctic there is a curious inversion, or reversal of order of life zones, near bodies of water. On the Sea of Okhotsk forest tundra and its fauna extends southward coastwise to 59° nor. lat., while inland it advances only to 69° n.l., so that traveling inland the observer goes from arctic tundra to wooded taiga.

There is zonation within zones; from 1,200 to 2,000 m altitude in the alpine zone an alpine stony desert prevails which has little but sparse lichen and moss vegetation and an avian population of but 4 - 8 per square kilometer, and this mainly of the Dotterel *Eudromias morinellus,* and *Calidris tenuirostris.*

Of the 177 species recorded, 60 are marginal, i.e., of the lower valleys or sea-coast, 6 are rare visitors, and 111 are residents proper of the uplands. About 85% of the species in the Kolyma uplands are breeders, and 15% are winter residents or migrants. Sparsity of species and individuals is characteristic of each locality visited, regarded as testimony to the severity of the climate. The temperatures are: January, −36 to −44°C, minimum, −67; July, 12 - 16, maximum 35°C. The frost-free period is only 2 months. Precipitation is 20 - 40 cm per year. Bird censuses found numbers per sq. km. as follows: original lowland larch forests, 40 - 120; river bottomlands, 80 - 200; forest burns, 100 - 140; open regrowing larch cutovers, 200 - 280; lower alpine 20 - 25. There is but one definite migration route, along the Okhotsk coast; migratory passage over the mountains is dispersed, no marked concentrations of individuals having been observed.

Discerning observers have noted that without the presence of one particular plant species all vertebrate animal life over eastern Siberia would be much more restricted, and locally even impossible. This is the creeping or Stone Pine, *Pinus pumila,* whose wingless meaty seeds provide food, and its thickets - shelter, for fur-bearers, and the murine rodent food of fur bearers, as well as for native humans. Its inevitable symbiont and seed distributor, *Nucifraga caryocatactes,* the Eurasian Nutcracker, or kedrovka, is favored herein with 7 pages of additional life history information.—Leon Kelso.

97. ***British Birds.*** Edited by Stanley Cramp. I. J. Ferguson-Lees, P. A. D. Hollom and E. M. Nicholson. 1969. Volume **62,** Number 1. Witherby, London.— An old friend has a new cover: a sort of off-orange, with a simple print style and a diagrammatic bird. Several internal changes are documented in the opening editorial of this first number in the new format. The cover bird is explained: "The Red Grouse was originally chosen because it was the only British bird species not indigeneous anywhere else, but nowadays it is regarded as conspecific with the northern Holarctic Willow Grouse and so the flying emblem may symbolise the less insular attitudes of ornithology today."—Jack P. Hailman.