FIG. 1. Humerus bones of a Gadwall duck showing broken area on left humerus.

such a way would be able to withstand the rigors of a sustained migration flight.—Bruce D. J. Batt, Delta Waterfowl Research Station, Delta, Manitoba, Canada.

RECENT LITERATURE

BANDING AND LONGEVITY

(See also 9, 10.)

1. Banding ethics. F. S. Schaeffer. 1969. *EBBA News*, **32**: 243-246.—The bander has responsibilities to the birds, the public, other banders and the banding laboratory. Ethics are discussed under these heads in this article that should be widely read by banders.—Jack P. Hailman.

2. Long Point Bird Observatory: 1967 Report. D. J. Hussell, R. W. Stamp, P. S. Woodford, J. Bradshaw, M. Bradstreet and W. A. Martin. 1969. *Ontario Bird Banding*, **5**: 7-50.—Migration peaks, banding (including recoveries and returns) and other station activities are recounted. More than 10,000 birds were banded.—Jack P. Hailman.

3. Population dynamics of geese and brant in northern Kazakhstan. (Dinamika chislennosti gusei i kazarok v sevsrnom Kazakhstane.) A. Solomatin. 1971. *Byull. moskovskogo obshch. isp. prirody, otdel. biol.*, **76**(1): 89-99. (In Russian, English summary.)—Another item in the history of decline, here it was

90% over the four recent decades. The annual total now is about 1,000,000, mostly migrants, only the Greylag Goose being resident here. Hunting plus other human disturbances, particularly drying up of smaller lakes owing to field plowing down to the waters' edge, are the main causes.—Leon Kelso.

4. Dispersal of Dunlin *Calidris alpina* in relation to sites of birth and breeding. M. Soikkeli. 1970. *Ornis Fenn.*, **47**: 1-9.—Dispersal is low (half of the birds nest within 2 km of where they hatched), which correlates with the polytypic subspeciation of this circumpolar species. All pairs breed within 0.3 km of the previous year's nest, and meet each year by migrating back to this area. (See also review no. **8**.)—Jack P. Hailman.

5. Marking methods for House Sparrows. C. H. North. 1969. *Ring*, **60**: 238-242.—Methods, pros and cons for marking *Passer domesticus* with neck, wing, leg and plumage markers are discussed.—Jack P. Hailman.

6. The American Goldfinch: the well-known enigma. A. L. A. Middleton. 1970. *Ontario Bird Banding*, **6**: 29-38.—Three problems concerning *Spinus tristis* can be answered with professional ornithologists and amateur banders cooperating: the two annual molts, geographic variation in clutch size and parasitism by the Cowbird, *Molothrus ater*.—Jack P. Hailman.

7. New Evening Grosbeak longevity record. W. E. Savell. 1969. *EBBA News*, **32**: 220.—Fourteen years for a male *Hesperiphona vespertina* appears to be the record.—Jack P. Hailman.

MIGRATION, ORIENTATION AND HOMING

(See 2, 4, 43.)

POPULATION DYNAMICS

(See also 3, 29, 33, 56.)

8. Mortality and reproductive rates in a Finnish population of Dunlin Calidris alpina. Soekkili. 1970. *Orn. Fenn.*, **47**(4): 149-158.—Detailed statistics from 1962-9 are given on a color-banded population of some 60 pairs of breeding Dunlin; these show that the main annual survival mortality rate could be estimated at 25% per year. "Approximately 20% of first breeders were one year old and the others two years old. Breeding birds had a mean life expectancy of 3.5 years and lived 5.3 years on an average. The oldest bird known in the population was 14, and the turnover of an age class was found to be 20 years."

"Adult birds present hatched 1.26 young per bird annually. Out of 453 young ringed as young, 15.5% were recovered in later years and a mean survival rate 26-30% during the first year was estimated." Unfortunately success of nesting declined during the last three years of the observations. An impressive study with many tables. (See also review no **4.**)—Margaret M. Nice.

9. Mortality rates of some Finnish passerines. E. Haukioja. 1969. *Ornis Fenn.*, **46**: 171-177.—A major contribution of this paper is the methods of selectively utilizing recovery data in order to calculate true mortality rates. Recommended reading for banders.—Jack P. Hailman.

10. Mortality rate of Finnish Caspian Terns *Hydroprogne caspica*. M. Soikelli. 1970. *Orn. Fenn*, **47**(4): 177-179.—This, the world's largest species of tern, nests abundantly along the Finnish coast; the chicks have been banded in large numbers and a great many have been recovered. "A mean annual mortality rate of 12 ± 3% was calculated for Finnish Caspian Terns past 1.5 years of age. This rate equals an expectancy of further life of 7.8 years. The oldest specimens known to carry rings are 19 and 20 years old." After this age there appears to be a high rate of loss of the ordinary aluminum rings.—Margaret M. Nice.

11. Territory and breeding density in the Great Tit, *Parus major* L. J. R. Krebs. 1971. *Ecology*, **52**(1): 2-22.—Krebs has looked into the role played by spring territoriality in regulating the breeding density of the Great Tit in England. In the process of this rather rambling narrative he relates the results of a wide variety of observations, many backed up with field experiments, that lead him to his conclusions. The results are well integrated with the massive ecological literature on this species as well as with the literature upon other species. In the latter instance Krebs sometimes overplays his hand, with a consequent distraction from the major theme that he is pursuing.

He commences with a capsule of the findings of the Oxford group upon the Great Tit in Wytham Woods, which summarizes these studies succinctly. He then proceeds to describe a set of removal experiments, which he carried out to test whether the disappearance of birds from their spring territories would result in other birds appropriating them. These were performed soon after all birds had set up territories (the crucial date being determined from results of a previous year). In virtually every case the vacated areas were occupied by other birds. Sometimes adjacent territory holders took over these areas; in other cases, birds from the outside occupied them. The latter birds were in most cases territory holders in nearby hedgerows, presumably inferior areas, judging from nesting success there. Their territories were not occupied by other individuals; apparently there is no surplus of "floaters" in this population that takes over suboptimal areas in the case of their abandonment. This density level distinguishes this population from a number of populations of other species that appear to have large floating populations of nonbreeding individuals. Though Krebs does not conclude definitely what factors keep birds separated, he suggests that vocalizations normally do this. Similarly to a few other species that have been tested, the Great Tit has the ability to distinguish the songs of particular individuals of its species. Within the confines of the study it appears that the food supply of the previous winter does not affect the size of the breeding population of the following spring, a factor that was determined by giving extra feed one winter. Not discussed is the problem of the evolutionary strategies available to these species, given the rather unpredictable abundance of seed stores in these forests. Regulation could be through behavioral means that were evolutionarily geared to poor seed seasons.

Krebs feels that territories could function to preserve a food supply for the young near the nest. However, he then points out that predation is higher in closely-spaced nests than in more distantly spaced ones, leading him to the suggestion that the major function of territorial spacing is as a defense against predators, with resource supplies being a secondary factor. Since the tits studied nested primarily (or exclusively) in artificial nesting boxes, this conclusion is hard to evaluate. However, it seems to fly in the face of the case that Krebs has been building up to this time.

He then launches into an interesting discussion of what factors may limit total numbers of breeding individuals. This is of particular interest, since in 1961 numbers of nesting Great Tits were 70 per cent higher than in any other year. He hypothesizes that the timing of setting up territories may be of importance. If all individuals settle at the same time, then territorial density may be higher than at other times. The 1961 situation found an extremely high proportion of first-year birds nesting. The synchrony of setting up territories is diminished usually by the old birds that claim previous territories, which they begin to frequent in late winter. There is also a direct correlation between early spring temperature and breeding density. In warm springs some individuals may settle early, decreasing the synchrony and possibly resulting in a low breeding density. Thus, in a mild winter (which might facilitate high survival) a mechanism may act that results in a low breeding density. (Since the breeding individuals might on the whole be in better condition than after hard winters, they might also be able to raise more young, a point not considered by Krebs.)

Lastly, Krebs argues that while territory determines the numbers of birds breeding, it exerts at most only a weak density-dependent effect, as a result in the yearly variability of territory size.

This is a most important paper for students of territory and density regulation, as a result of the wealth of subjects discussed in it. While the reviewer tends not to agree with all of Krebs' conclusions, he feels that Krebs has made a solid contribution toward further understanding in these areas.—Douglass H. Morse.

12. Territory limiting the size of the breeding population of the Oystercatcher (*Haematopus ostralegus*)— a removal experiment. M. P. Harris. 1970. *J. Anim. Ecol.*, **39**(3): 707-713.—Considerable anecdotal information exists on the role of territoriality as a factor limiting population density; however, few experiments on this subject have been conducted under natural situations (see also review **11**). Harris' experiments are thus of considerable interest, particularly because the life histories of several of the birds involved (either removed or having had a mate or neighbor removed) were well-known through earlier colorbanding studies in the study area on Skokholm. Where one bird of a breeding pair was removed a mate was quickly obtained, either from a resident nonbreeding flock or from a nearby pair. When both birds of a pair were removed, adjacent pairs appropriated certain parts of the territory, but did not increase the size of their territories, apparently occupying only the most favored parts of this territory and giving up less favorable parts of their territories. Reestablishment of territories was such that no extra territories became available, which may in part have been due to the lateness of the occupation. Several of the removed birds were subsequently released and generally returned to their breeding area. They usually were able to chase out the individuals that had taken up their territory in their absence, even being successful in reacquiring their former mates. The data thus suggest that territoriality does limit the size of the breeding population in the Oystercatcher. It apparently increases the reproductive success of the individuals that do attain territories and provides them with a dependable source of food.—Douglass H. Morse.

13. Predation by the fox (*Vulpes vulpes* L.) on colonies of the Short-tailed Shearwater (*Puffinus tenuirostris* (Temminck)) in Victoria, Australia. F. I. Norman. 1971. *J. Appl. Ecol.*, **8**(1): 21-32.—The European red fox is one of the many exotic animals introduced to Australia. The present study documents its predation upon two Shorttailed Shearwater colonies. Predation on these birds was lower at a colony where rabbits were present than where they were absent, presumably because of this alternate food source. During the season when shearwaters were absent, the rabbit made up the only vertebrate food item of the foxes. These foxes' diets were composed largely of rabbits and shearwaters, with somewhat smaller volumes of invertebrates (mostly crabs) being taken. Diets were determined by analyses of scats, mortality of shearwaters both from corpses found and from scats. Predation appeared to be highest upon nonbreeding birds, which normally remain at night on the surface of the colony, rather than in burrows like the adults and chicks. In one colony the inroads into this sub-population, from which future breeders probably are recruited, might be sufficient to decrease the size of the breeding population eventually; in the other, they form only a small percentage of normal loss, judging from other studies.—Douglass H. Morse.

14. On the occurrence of the Grasshopper Warbler (*Locustella naevia*) and River Warbler (*L. fluviatilis*) in Finland related to the bird watching activity. K. Eriksson. 1969. *Ornis Fenn.*, **46:** 113-125.—While the former species appears to be increasing, larger number of reports are actually due to greater numbers of reporters (measured quantitatively in three ways). In fact, the number of reports has not increased in proportion to the number of watchers, and the species may be declining in numbers. Reports of the latter species appear to be increasing in proportion to the number of observers.—Jack P. Hailman.

NESTING AND REPRODUCTION

(See also 11, 61, 66, 67, 75.)

15. Biological significance of interrupted incubation during egg deposition in birds. (Biologicheskoe znachenie preryvistoi inkubatsii v period yaitsekladkii ptits.) A. Bolotkinov, A. Shuakov, Y Kamenskii, and V, Korolev. 1970. *Biol. nauki*, **13**(12): 17-21. (In Russian.)—Examination of one rail and 22 passerine species finds that incubation begins with the first egg laid but proceeds in two stages: interrupted, during deposition, and relatively continuous, after-

ward. The former effects some embryo development while reducing or eliminating loss by a long sojourn in the nest, and also accounting for varied size in the young. This is supported by experimental work with the domestic fowl.—Leon Kelso.

16. Biomass production by House Sparrow (*Passer d. domesticus* L.) and Tree Sparrow (*Passer m. montanus* L.) populations in Poland. R. Mackewicz, J. Pinowski, and M. Wieloch. 1970. *Ekol. Polska*, **18**(23): 465-501.—This paper is essentially an in-detail documentation of the breeding biology of House and Tree sparrows in several areas in Poland. These areas differed in temperature regimes as a result of altitude and local geography. The study was closely synchronized with similar efforts carried out elsewhere in the world and used procedures agreed upon by the Working Group on Granivorous Birds of the International Biological Program.

Initiation of laying for the first brood depends primarily upon the average temperature of the preceding week. A substantial rise in temperature at that time (to about 10 °C mean weekly temperature) is correlated with the commencing of a large number of clutches. However, relatively warm temperatures in the second and third weeks before egg laying are of importance also, and sometimes females will consequently start laying following a period of cold weather.

In Poland both species have three broods yearly, except in the mountains where the season appears to be too short to make this possible. Where three broods are raised, the earlier the first brood is begun, the more third broods will be raised. Clutch size did not differ significantly between the different stations; however, it differed markedly from that for the same species in some other parts of the world. Both egg loss and nestling mortality were lower in the mountains (where the sparrows raised only two broods) than in the other areas. The lower mortality thus made up for the lack of a third brood. In most cases mortality in the first brood was greater than in the second brood, and mortality was highest in third broods where present.

The authors then consider the total biomass production of a pair of adults. This (or at least the number of healthy young produced by a pair) is a matter of considerable concern, because it will give a true estimate of recruitment. Though clutch size did not differ with study area, the proportion of individuals raising second or third clutches differed markedly, resulting in a greater possible variation in production than would be obtained if clutch sizes differed and mortality was similar. Too often this factor is ignored in studies of this sort.—Douglass H. Morse.

17. The breeding biology of the Black-backed Storm-petrel *Fregetta tropica*. J. R. Beck and D. W. Brown. 1971. *Ibis*, **113**: 73-90.—This little-known, nocturnal procellariiform breeds on at least six island groups above 40° south latitude. Included in this report on a three year study at Signy Island (South Orkney Islands) are sections dealing with habitat, nest-site, feeding and courtship behavior, and reproduction (pre-egg stage, incubation period, growth of the chick, fledging). The authors' data on Wilson's Petrel (*Oceanites oceanicus*) are sprinkled throughout for comparative purposes.

Several aspects of Signy Island *F. tropica* stand out as unusual among hydrobatids studied to date. Colonies are very small and loosely aggregated (100-200 pairs total compared with an estimated 200,000 pairs of Wilson's Petrels on the same island). Incubation spell length is extremely regular; 75% of 52 spells lasted 72 h before changeover between mates. Significant reproductive failure may be caused by snow blockage of entrances to nest sites in talus slopes.

Other Procellariiformes have been sexed by noting the distended cloaca of the female soon after laying. Apparently *F. tropica* can also be sexed before laying by the females' "considerably thicker and more bulbous cloacal lips."—Thomas C. Grubb, Jr.

18. The Mississippi Kite (*Ictinia misisippiensis*). D. Seibel. *Kansas Ornithol. Soc. Bull.*, **22**(1): 6-7.—A pair of Kites at Arkansas City, Kansas began incubating on 23 June, the one egg hatching on 14 July. In the afternoons, parents shaded the chick from the sun with outstretched wings. Feeding averaged every quarter hour, principal food being cicadas and Chimney Swifts (*Chaetura pelagica*)! Body feathers were plucked before eating all but the head, wings tail and

feet, which were left fastened in a bunch. Cicadas are eaten on the wing by adults, by bending the head down to pick at the prey held in the talons.

Adults sheltered the young during rain on 28 July, but did not later (9 August). Notes on the plumage development of the young bird are given. On 8 August the young bird left the nest, apparently prematurely, and was placed on lower branches of the nesting tree where the parents fed it. Two days later it had climbed the 30 feet back to the nest. Real fledging apparently came on 12 August, and the following day the young bird killed numerous cicadas brought live by the parents, after failing on the first and dropping it. The nesting tree was cut down by the owner on 4 September, and the parents were still feeding the young when last seen on 6 September.

Not a bad study for a 14 year old ornithologist.—Jack P. Hailman.

ETHOLOGY AND PSYCHOLOGY

(See also 11, 38, 55, 58, 59, 60, 64, 65, 67, 68.)

19. Direct effect of rain on birds: a review. R. J. Kennedy. *Brit. Birds*, **63:** 401-414.—The most dramatic possible effect is to replace insulating air trapped in the feathers with conducting water, causing death by hypothermia. The scant evidence on behavioral adaptations to prevent this is reviewed under the heads of postures adopted, seeking of shelter, inhibition of flight, comfort movements and other behavior. A request for information to readers of *British Birds* yielded but six replies, and much more data are clearly needed.—Jack P. Hailman.

20. Risk of visual detection and pursuit by a predator and the selective advantage of flocking behavior. I. Vine. 1971. *J. Theor. Biol.*, **30**(2): 405-422.—Previously proposed explanations for flocking include: "confusion effect" on predators, cooperative defense, increased efficiency of detection of predators, mutual facilitation of flight following detection, and even "collective mimicry" of larger species. To this is added a proposal that for a variety of considerations, discussed in mathematical terms and formulae, the most suitable dispersion is a tight circular flock of all the prey animals in the vicinity. "Normally the safety of the group as a whole is likely to be best assured by behavior which provides the greatest individual safety." . . . "If the flock itself moves, this may or may not facilitate its detection. . . . In either case the individual advantages of flocking in terms of reducing the pursuit risk for any given animal will be best maintained if the flock moves as a compact unit."—Leon Kelso.

21. Winter flock structure and behavior of the Carolina Chickadee. G. O. Wallace. 1970. *Migrant*, **41:** 25-29.—Mean *Parus carolinensis* per flock was 4.1 birds. There is no consistent leader in the flock, which moves erratically at a mean of about 1200 feet per hour, more rapidly in the morning than in the afternoon.—Jack P. Hailman.

22. Effects of colored backgrounds on food selection by penned Mourning Doves (*Zenaidura macroura*). W. Goforth and T. Baskett. 1971. *Auk*, **88**(2): 256-263.—Three experimental sets were employed to test color background on feeding reactions. Blue was preferred over red, green, and yellow in that order. A variety of references in the bibliography given indicate decided aversion to yellow. Perhaps in time a "chromodynamic" effect will have to be recognized in nature. Various botanical researches have suggested that conspicuous flower colors confer a thermodynamic benefit, and color even affects seed germination and growth (e.g. Studies in light sensitivity of *Plantago major* L. M. Rezle and I. Horvath, *Acta biologica* (Hungary), **14** (1-4): 29-33, 1968.—Leon Kelso.

23. The function of Oystercatcher piping behaviour. P. B. Heppleston. 1970. *Brit. Birds*, **63:** 133-135.—When an intruding *Haematopus ostralegus* entered a territory the defender exhibited piping 101 out 115 times, but when the first bird landed outside the territory (10-50 m), the territory holder piped only 2 of 87

times. When the intruder did land in the territory and the defender piped, the intruder fled 94 of 116 times; when the defender did not pipe, the intruder fled 11 of 19 times. Therefore, contrary to past literature, piping appears to be a territorial defence display, although its effectiveness is not dramatically vindicated by these data.—Jack P. Hailman.

ECOLOGY

(See also 6, 11, 16, 17, 19, 20, 21, 55, 56, 57, 71, 77, 78.)

24. Distribution on environmental gradients: theory and a preliminary interpretation of distributional patterns in the avifauna of the Cordillera Vilcabamba, Peru. J. Terborgh. 1971. *Ecology*, **52**(1): 23-40.—The study of species distributions along gradients has been largely confined to plants. Here, Terborgh extends this work to birds and in the process attempts to formulate theory that will allow prediction with some simplicity. This paper is based upon four summers of field work in the Cordillera Vilcabamba of eastern Peru, a large area of still-pristine wilderness.

Terborgh investigated the bird fauna along an altitudinal gradient ranging from about 570 m to 3500 m. Temperature changes with regularity along this gradient, and there is little evidence that any part of this vertical transect has inadequate moisture during the year. The location relatively near to the equator insures that possibilities for strong seasonality (as found in high latitudes) will be minimized. Sampling was accomplished with mist nets, and Terborgh acknowledges the difficulties of using the data as a random sample. He worked with over 400 species and handled over 5,000 individuals in this study.

His theory is composed of three non-overlapping but complementary models. Model I: distributional limits of species on a gradient are determined by factors in the physical or biological environment that vary continuously and in parallel with the gradient. Model II: distributional limits of species are determined by competitive exclusion. Model III: distributional limits are determined by habitat discontinuities (ecotones). It is immediately apparent that models I and III are essentially catch-alls of possible factors; they are separated by the criterion of whether a species' altitudinal limits correspond with a major ecotonal discontinuity or not. For purposes of the latter matter, the transect is separated into four parts: lowland rain forest, montane rain forest, cloud forest, and monte chico (elfin forest). While Terborgh gives criteria that allow him to separate the gradient into these four categories easily (e.g., only the lowland rain forest has giant trees 50-60 m in height), it is of course problematical whether the birds use the same criteria. If species have congeners and their altitudinal amplitudes are truncated, then this is used as evidence for Model II. Using this basically taxonomic criterion, it seems likely that there will be candidates other than congeners, also that certain pairs of congeners may not display this characteristic well: competitive exclusion could occur on gradients other than strict altitudinal ones (e.g., one congener could use the canopy of trees, another the understory—in such a case they might seldom overlap). It would be possible to refine this criterion further if intensive studies were made upon the critical species, obviously a virtually impossible task within the scope of this project. In spite of these possible drawbacks, a good percentage of congeneric species pairs exhibited the truncations predicted.

Using these criteria, Model I accounts for about one-half of the distributional limits; Model II, about one-third; and Model III, about one-fifth. It is apparent that more analysis is necessary before Models I and III can be expected to have a clearly-defined biological relevance. Terborgh himself recognizes this fact. Further, data used to support Model II may be accepted as adequate evidence of competitive exclusion by certain rigid empiricists. However, these criteria may make possible and feasible an analysis of competitive exclusion at a community level. It is easy to find fault with Terborgh's theory (actually modifications of different ideas used elsewhere by other workers); however, this is generally the case for theories that attempt an understandably simple explanation of an obviously complex phenomenon. Terborgh is to be congratulated for attempting to accomplish a difficult task.—Douglass H. Morse.

25. Clutch size of the Reed Bunting *Emberiza schoeniclus*. E. Haukioja. 1970. *Ornis Fenn.*, **47**: 101-135.—Here is an important study on the control of clutch size in passerine birds. Highlights include these findings: There were no differences among broods of different sizes with regard to predation rate on nest, hatchability of eggs, mortality of nestings or weight of young. However, postfledging mortality differs with clutch size, and "the most efficient brood size was five" while the mean clutch size was 5.14. Parents more than a year old had more efficient output of offspring than younger parents. Natural selection at the individual level appears to account for the ultimate control of clutch size, there being no need to postulate group selection. The sample sizes behind the conclusions seem quite adequate.—Jack P. Hailman.

26. Clutch sizes of introduced European passeriformes in New Zealand. G. Niethammer, translated by F. C. Kinsky. 1970. *Notornis*, **17**: 214-222.—Eleven of 12 species showed a reduction in egg number, six being statistically significant. The author attributes the effect not to differences in light intensity, but to disturbance due to greater population densities in New Zealand.—Jack P. Hailman.

27. Breeding communities of birds in mid-field afforested areas. M. Gromadzki. 1970. *Ekol. Polska*, **18**(14): 307-350.—This is a descriptive study of the breeding birds found in clumps of trees, shelterbelts, hedges, and shrubbelts of agricultural areas. Apparently these small plots are studied ornithologically more often than in this country, judging from the literature cited on the subject in this paper. Included in these citations is a substantial Russian bibliography. The plots studied in Poland by Gromadzki support a different bird fauna from the surrounding fields; only 4 of the 44 species recorded in a large number of study areas occur on open ground with no trees or shrubs. Eighteen of these species regularly made up 60 to 90 percent of the bird fauna. As the size of the plots studied decreased the number of true forest species decreased also, with a proportionate increase in forest-edge species.—Douglass H. Morse.

28. Immediate effects of hardwood removal and prescribed burning on bird populations. E. Michael and P. Thornburgh. *Southwestern Nat.*, **15** (3): 359-370, 1971.—Of pine, pine-hardwood (25% hdwd.), and control (36%) forest areas in Nacogdoches Co., Texas, the no. and variety of birds increased following partial hardwood removal; but decreased in the control area within 1-2 years.—Leon Kelso.

29. Patterns of hatching success in subarctic birds. J. R. Jehl, Jr. 1971. *Ecology*, **52**(1): 169-173.—This paper is largely an appraisal (with another set of data) of parts of Ricklefs' monograph of nesting mortality in birds (*Smithsonian Contrib. Zool.*, no. **9**). Ricklefs predicted that hatching success would be greater in birds of the arctic than in birds of the temperate zone. Jehl's data from Churchill, Manitoba, support this prediction, but (according to Jehl) do not bear out several of Ricklefs' other predictions. Ricklefs suggested that birds with precocial young would have higher hatching success than ground-nesting altricial species; however, the Churchill data do not support this suggestion. Ricklefs suggested that nesting mortality due to predation would be negligible in many arctic species; however, Jehl cites examples of several species in his studies where nest mortality due to predation was substantial. Ricklefs predicted that nesting losses through predation would be density-dependent; however, Jehl can find no support of this idea. Jehl's comment that many more data are needed to resolve this matter is most apt. His contribution constitutes the second set of data on nesting success available from high-latitudes (the other being that of Williamson, Thompson, and Hines from northern Alaska), still far too few for general testing of theory. None of Jehl's data are subjected to statistical analysis, which is unfortunate and in several cases compromises the power of his statements. In certain cases it is questionable whether appropriate statistics would back his assertions of differences.—Douglass H. Morse.

WILDLIFE MANAGEMENT AND ECONOMIC ORNITHOLOGY

(**See also 71.**)

30. Ground cover for airports. Anonymous. 1970. *Science dimension,* **2**(1): 28-31.—Reduction of danger from bird "strikes" to airplanes by establishing on and around airports a plant cover that is unattractive or repellent to birds is the object of a Canadian research project. The prospect is that this might be cheaper and more effective than sound or microwave propagation. —Leon Kelso.

31. Studies on the changing role of weeds of the genus *Polygonum* in the diet of the Partridge *Perdix perdix* L. G. R. Potts. 1970. *J. Appl. Ecol.,* **7**(3): 567-576.—With our still increasing trend toward monocultures in crop management, there is considerable interest in its effect upon bird populations. The present study considers the availability of food to the Partridge. Being a species of the open country, it should be particularly susceptible to trends toward monoculture. As adults Partridges are highly vegetarian, with the genus *Polygonum* (smartweeds), common cropweeds, being a major item in their food. However, new biocides are capable of removing these plants effectively, making this food source considerably scarcer. Adults apparently do well on cultivated cereals; however, the young require particular insectivorous food items, which provide essential amino acids. Judging from chemical analyses, the adults probably could survive as well on the cereal crop as on the weeds; however, the weeds support a number of insects that the young feed upon. Thus, limitation of numbers may be the result of food supplies for young, rather than for the adults. In this study the Partridges took far more cereal grains than weed grains, but this factor is only revealed by two lines in a rather large table. Some data were also gathered upon the food of the Red-legged Partridge (*Alectoris rufa*), which did not reveal any important differences from those of the Partridge, though this larger species prefers somewhat bigger food items than the Partridge.—Douglass H. Morse.

CONSERVATION AND ENVIRONMENTAL QUALITY

(**See also 3, 31, 70, 71, 72, 73, 74, 76, 77**)

32. DDT in fats of antarctic animals. H. Brewerton. 1969. *New Zealand j. sci.,* **12**(2): 194-199.—Concentration of DDT in Adelie Penguins, *Pygoscelis adelinae,* 2-to-7 times that in Weddell Seals, and six times higher in penguins near research stations, Ross Island, than in those from Cape Hallett, 400 miles distant.—Leon Kelso.

33. The Golden Eagle survey in Scotland in 1964-1968. M. J. Everett. 1971. *Brit. Birds,* **64:** 49-56.—The population had dropped to about 29% production of young of its 1937-1960 level by 1961-63, when pesticides were in great use. Following a 1966 ban on organo-chlorine compounds, dieldrin residues in the eggs dropped 60%, and offspring-production rose to 72% of the 1937-1960 level. Human disturbance at the nest is also a large mortality factor. Perhaps, then, with bans on the biocides and preserves for the nesting birds there is a chance.—Jack P. Hailman.

34. Pigeons: a new role in air pollution. M. Tansy and R. Roth. 1970. *Jour. Air Pollution Control Assoc.,* **20**(5): 307-309.—In Pennsylvania nine country plus seven city (downtown Philadelphia) feral pigeons were analyzed for comparison of lead content of their feather, bone and softer parts. While no lead was found in the gizzards and the slight amount in the blood was uniform, the ratio of, presumably motor exhaust derived lead in city pigeons was four or more times greater, particularly in the feathers, the plumage of one individual holding about 40% of the total Pb content. In human city dwellers the blood lead content is much higher than in the rural. "The detailed sources from which this metal was derived and its mode of entry into the bird, however, required further elucidation;" *i.e.,* this leads into a new problem. How could the feathers acquire this except by

atmospheric absorption? They remark that city bird and rodent populations usually regarded as pests can be analyzed as indicators for pollutions dangerous to man—Leon Kelso.

PARASITES AND DISEASES

(**See also 6, 35.**)

35. Rats and moa extinction. C. A. Fleming. 1969. *Notornis*, **16**: 210-211.—Some 27 species of moas placed in seven genera became extinct during the late Holocene for reasons that are not clear. Fleming now reports serious injury inflicted at night to incubating albatrosses by the Polynesian Rat (*Rattus exulans*), which opens festering wounds on the birds. Annual mortality due to this effect alone is about 1.0-2.5%.—Jack P. Hailman.

PHYSIOLOGY

(**See also 19, 22, 39, 42, 56.**)

36. Co-ordination between the activity of the heart and the flight muscles during flight in small birds. A. Aulie. 1971. *Comp. Biochem. Physiol.*, **38**A: 91-97.—The author found that in the budgerigar (*Melopsittacus undulatus*) the heart rate was equal to the rate of wingbeat while in a finch (*Sporophila* sp.) it was only one-half. The heart was rarely found to increase its rate simultaneously with an increase in wingbeat.—Joel Cracraft.

37. Dependency of reaction of tectum opticum neurons of pigeon midbrain on velocity of visual stimulation. (Zavisimost reaktsii neironov tectum opticum srednego mozga golubya ot skorosti dvizheniya zritelnykh razdrazitelei.) I. P. Huts. 1970. *Vestnik moskovskogo univ., otdel. biol.*, **25**(6): 108-110. (In Russian.)—Through microelectrode contacts, sensitivity to motion as slow as 6 degrees, and possibly only one degree, per second, across the visual field, on a scale of 360°, was recorded. Most acute responsiveness lay in the cells of the deepest tectal layers. Considering this acuity could not some cells be responsive and perceptive of mere passage through space?—Leon Kelso.

38. Roadrunners: energy conservation by hypothermia and absorption of sunlight. R. D. Ohmart and R. C. Lasiewski. 1971. *Science*, **172**: 67-69.—By sunbathing, *Geococcyx californianus* saves a mean of 551 cal/hr,and further saves energy by becoming hypothermic at night.—Jack P. Hailman.

MORPHOLOGY AND ANATOMY

(**See also 47, 48.**)

39. Bioenergetic limitations to bird size. (Bioenergeticheskie ogranichiteli razmerov ptits.) V. Dolnik. 1970. *Ekologiya*, **1**(6): 62-69. (In Russian.) 7 figs. Bibliography of 11 titles.—On modern empirical formulae correlating metabolic indices to weight, minimal, optimal, and maximal sizes for birds are calculated. The results correspond satisfactorily to what is observed in nature. Beyond 1,000 grams body weight bird flight is more difficult aerodynamically, and above 10,000 gms it is scarcely possible, except by special modes, e.g. soaring by vultures. It is admitted that size limitation need not be effected exclusively or even primarily by energy requirements, but by combination with other factors. —Leon Kelso.

40. The deep digit flexor in bird wings. (Glubokii paltsev v kryle ptits.) B. K. Stegmann. 1971. *Byull. moskovskogo obshch. isp. prirody, otdel. biol.*, **76**(1): 79-88 (In Russian, English summary.) 5 figs.—The flexor digitorum profundus tendon of the bird wing extends along the ventral side of the 2nd digit, where attached to the base of its terminal phalanx. In some bird groups, pre-

sumably more primitive, it branches off along digit 1 to its apex. Formerly it was believed that only in the Hoatzin does it move the claw-tipped digits, enabling the flightless young to climb about trees and shrubbery. It is now known that fledglings of the Touracos (Musophagidae) have the same structures and capacity.—Leon Kelso.

41. Comparative myology of the hind limb of procellariiform birds. R. D. Klemm. 1969. *Southern Illinois Univ. Monogr. Sci. Ser.*, no. **2**: 1-269.—In this study Klemm examines the hindlimb myology of 34 species (19 genera) of the Procellariiformes. His purpose is threefold: (1) to provide qualitative and quantitative data on muscular variation, (2) to assess the myological data with regard to taxonomic information, and (3) to make possible correlations between differences in structure and behavior. Of the several comparative myological studies of the hindlimb published in the last five years or so this is easily the best. Nevertheless, Klemm is only successful with respect to the first of his goals—describing the variability—and the analysis he presents concerning taxonomic and functional problems has serious shortcomings.

In the descriptive section comparisons are made with *Diomedea immutabilis*. Quantitative data of interspecific variability were collected on fresh and preserved material, and great care was taken to make the measurements consistent among the specimens. This point is extremely important and was well appreciated by Klemm. Various measurements such as origin width, belly length, width, and thickness were made for each muscle. The interspecific comparison includes information on differences in muscle origins and insertions and muscle size but does not treat factors such as fiber architecture.

In addition to those muscles usually included in most hindlimb muscle formulae, Klemm has also chosen five muscles which to him are of systematic importance. His principle reason for using these five is that none "can be correlated with any particular habit. . . ." His belief that these "nonadaptive" characters contain more systematic information is extremely questionable. Klemm also argues that certain character-states of some of these muscles are primitive retentions from ancestors and thus unite the groups in question. He has, of course, provided the best argument for rejecting these characters as having phylogenetic information. In all, Klemm attempts to quantify 15 myological characters and he expresses similarities of different taxa in terms of a percentage of relationship. I fail to see that this provides a useful taxonomic analysis. Very little systematic information is contained in the statement (p. 154): "the Diomedeidae and Pelecanoididae show equal relationship (67%) to the Procellariidae."

Klemm's functional analysis is based mainly upon the assumption that muscle volume is correlated with the amount of force a muscle can generate (Klemm frequently uses the term power incorrectly). This is not true; several of my recent reviews in Bird-Banding discuss this problem, and I will not repeat my criticisms here. That Klemm misunderstands some of the subtleties of functional analysis is shown by the statement (p. 117) "while strength of a muscle is directly related to its cross-sectional area, the force which the muscle exerts can be varied by changing its origin or insertion, or both." Here, he does not differentiate between the cross-sectional area of the muscle and the cross-sectional area of the fibers-in a pinnate muscle they are not the same. Moreover, he apparently means torque, not force, in this quotation. For these and other reasons, I believe that the reliability of much of his functional analysis is questionable. It is a gross oversimplification to compare "power" output of the muscles in such a manner.

In summary, Klemm has presented a considerable amount of interesting comparative data, but his application of these data to systematic and functional questions probably does not provide many new and reliable conclusions about these birds.—Joel Cracraft.

PLUMAGES AND MOLTS

(**See also 6.**)

42. Plumage color and energetics. S. Lustick. 1971. *Condor*, **73**(1): 121, 122.—In experiments with species having plumages between black and white color extremes, data obtained on absorption vs reflection of solar and artificial radiant energy is presented. It is indicated that internal body adjustments occur to maintain energy economy. However, still exists the belief in the passivity of the plumage, omitting that radiation may "boil off" gases, hydrogen and its compounds which are much more transmissive of heat than plain air or oxygen.—Leon Kelso.

43. On molt of primaries in swallows during the fall flight. (O linke makhovnykh perev u lastochek na osennem prolete.) E. Gavrilov. 1971. *Z. zhurn.*, **50**(4): 599-602. (In Russian, English summary.—Prevailing opinion is that palearctic swallows, with the exception of the Crag Martin, *Ptyonoprogne rupestris*, molt in winter quarters, where remiges and rectrices are replaced. The non-migratory element of the Common Swallow, *Hirundo rustica*, molts near nesting localities. In banding operations at Chokpaik Pass, Karatau, west Tyan Shan, in fall of 1969, last half of August, through September and early October, of 445 Bank Swallows, *Riparia riparia*, examined, 145 had begun molt of primaries variously of nos. 1-6, counting in-outward. Of this 145, 37 were in process of growing feathers, the replaced of the remaining 106 were already grown out; their sequential ones had not been molted. Evidently these were cases of molt arrested during migration. Of 316 Common Swallows banded, 21 showed arrested primary molt; of 74 House Martin, *Delichon urbica*, none; of 44 Red-rumped Swallow, *Hirundo daurica*, 18. The primaries most frequently molted were nos. 1-3. In a few cases corresponding greater coverts had been replaced.—Leon Kelso.

44. Identification of albino Herring Gulls *Larus argentatus*. K. Mikkola. 1970. *Ornis Fenn.*, **47**: 172-176.—An important indication is that past references to Iceland Gulls (*L. glaucoides*) may be misidentified albino Herring Gulls.—Jack P. Hailman.

ZOOGEOGRAPHY AND DISTRIBUTION

(See also 14, 24, 26, 29, 44.)

45. Taxonomic evaluation and systematic status of the Relict Gull. (Taksonomicheskaya otsenka i sistematicheskoe polozhenie reliktovoi chaiki, *Larus relictus* Lonnb.) E. Auezov. 1971. *Z. zhurn.*, **50**(2): 235-242. (In Russian, English summary.)—Previously known but from one specimen (considered at length by Vaurie, *Auk*, **79**(3): 303-309, 1962), a colony of this form has been found at Lake Alakul, Kazakhstan; measurements and other details of 11 specimens are recorded. Additional specimens were found in Russian museums from Transbaikal and the Yellow Sea. Rather than variety or hybrid the author regards it as specifically distinct; thus more complete field exploration definitely reinforces or alters previous determinations.—Leon Kelso.

46. On terrestrial vertebrates of Central Yamala. (K izucheniyu nazemnykh pozvonochnykh tsentralnogo Yamala.) E. Karaseva, Y. Telitsyn, V. Lapshov, and Y. Okotskii. 1971. *Buyll. moskoskogo obshch. isp. prirody, otdel. biol.*, **76**(2): 22-26. (In Russian, English summary.)—This is a survey of vertebrate life on River Seyakha, 16 km SW. of Seyakh village, 70° north latitude, in July and August 1969, during an irruption of the Ob Lemming, *Lemmus obensis*. This rodent was present in densities of 700-2000 per hectare; its gestation period, 18-19 days; its sexual maturity attained in 14-15 days at warmest time of the year there. Of avian interest, the chief raptor benefiting therefrom was the Rough-legged Hawk, *Buteo lagopus*; Snowy Owls, *Nyctea scandiaca*, were scarce, and of Short-eared Owls, *Asio flammeus*, none. Of strangely parallel increase, and the most abundant bird, was the Long-tailed Duck, *Clangula hyemalis*; its broods averaging only 3.5 young, whereas 10 years previously the average was 6.5. King Eider, *Somateria spectabilis*, was second in abundance, while Pintails, *Anas acuta*, were common.—Leon Kelso.

SYSTEMATICS AND PALEONTOLOGY

(**See also 41, 45.**)

47. Functional anatomy in systematics. R. L. Zusi. 1971. *Taxon*, **20:** 75-84.—Zusi discusses many aspects of systematics and their relationship to functional anatomy. Some of the subject matter he treats are hierarchical ranking, recognition of adaptive radiation, convergence, parallelism, and so forth. All of his examples come from birds. Unfortunately, some of these subjects are too briefly discussed and then somewhat ambiguously. Thus, more discussion was needed as to just what are the criteria used to recognize convergence and most closely related groups and whether these criteria are actually derived from functional studies or from a prior comparative analysis (which does not have to be functional). In general, I do not think Zusi has clearly defined the roles that functional anatomy plays in systematics, but he has given a fairly good summary of most current thought.—Joel Cracraft.

48. Taxonomic position and morphological peculiarities of the genus *Pagophila*. E. N. Kurotshkin [=Kurotchkin]. 1970. *Acta Ornithologica* (Warsaw), **12:** 269-291. (In English; Polish and Russian summaries).—After a comparative analysis of the skeleton (principally using a large number of ratios of skeletal measurements) the author concludes that the Ivory Gull (*Pagophila eburnea*) has closer affinities to the Larinae despite some similarities to the Stercorariinae.—Joel Cracraft.

49. The paleospecies of woodpeckers. P. Brodkorb. 1971. *Quart. J. Florida Acad. Sci.*, **33:** 132-136.—The author reviews all records of fossils that have been or are now referred to the Picidae. He also describes a new species of ivory-billed woodpecker, *Campephilus dalquesti*, from the upper Pliocene (early Blancan in age) of Texas.—Joel Cracraft.

50. Catalogue of fossil birds: part 4 (Columbiformes through Piciformes). P. Brodkorb. 1971. *Bull. Florida State Mus.*, **15:** 163-266.—This is the fourth of a five part series cataloguing the fossil birds of the world. Once again biologists are in the debt of Professor Brodkorb for this very important work. There can be little doubt that the "Catalogue of Fossil Birds" is the most significant advance in avian paleontology since Lambrecht's *Handbuch der Palaeornithologie*.

This volume covers the Columbiformes, Cuculiformes, Psittaciformes, Strigiformes, Caprimulgiformes, Apodiformes, Trochiliformes, Coliiformes, Trogoniformes, Coraciiformes, and Piciformes. The final volume will treat the Passeriformes.

As in past volumes Brodkorb may occasionally arouse some ire among systematists with his nomenclatural changes, although in this case his changes are likely to be less controversial than those in previous volumes. For example, he uses Halcyonidae for Alcedinidae and Atelornithinae for Brachypteraciinae. All of these names have been in frequent use, and here the law of priority probably should be strictly applied. This has not been true in his past catalogues where the rule of *nomen oblitum* has been ignored.

Brodkorb proposes several new taxa: (1) Apopempsinae, a new subfamily in the Musophagidae (for *Apopempsis*, new genus), (2) a new genus, *Eostrix*, in the Protostrigidae, and (3) a new family, Zygodactylidae, in the Picidae.

The compiler of such a catalogue faces an uncertain audience. On the one hand, there are those who will find innumerable faults with his decisions on nomenclature and taxonomy. On the other, those who use the catalogue on a regular basis in their research will have a difficult time conveying to others the tremendous importance of the work. I would like to place myself between these extremes, but definitely closer to the second.

Most of the faults of this and the other catalogues are not the result of Brodkorb's treatment but are inherent in any checklist, e.g., like those of Peters. Thus, we are constantly faced with the puzzling arrangement (or re-arrangement) of taxa for which there is no explanation. Brodkorb has worked almost exclusively from the literature and considering the problems this entails, he has done an admirable job. And I believe that such justifications need not be part of a formal

checklist. However, I do think that these authors should provide some rationale for these decisions in other papers. Brodkorb has done this to some extent but not on the scale that is needed. It is, for example, just as important for future workers to know a given arrangement was arbitrary (and this is certainly justified considering the enormity of the material) or whether there was a very good reason for the change. Another problem of checklists is that they can provide a false foundation for other kinds of studies. This is certainly the case with the fossil Catalogues. Because most of these Catalogues are based on the literature, much of it 19th century, the systematics is frequently unreliable. For example, I am currently revising several of the important fossil avifaunas of Europe, and there will be a large number of differences from Brodkorb's checklist. Quantitative statements about these faunas derived from Brodkorb's Catalogue could be misleading. But I must emphasize again, this is a problem of nearly all checklists.

As a person who spends considerable time on avian paleontology, I have found these Catalogues to be invaluable in my research. The above criticisms probably have little effect on the working paleontologist but they do have serious consequences for the interpretations of most other systematists. I think one may have to do some research in avian paleontology to really grasp the enormous amount of work that Dr. Brodkorb has put into compiling these Catalogues. I consider them to be some of the more important contributions to avian systematics in a very long time.—Joel Cracraft.

51. *Zonotrichia robusta* n. sp. (Aves, Passeriformes, Emberizidae) from the medial Pleistocene of Buenos Aires Province. (*Zonotrichia robusta* n. sp. (Aves, Passeriformes, Emberizidae) del Pleistoceno medio de la Provincia de Buenos Aires). E. P. Tonni. 1970. *Ameghiniana*, **7**: 161-165 (In Spanish).—Describes a new species of *Zonotrichia* from the medial Pleistocene (Ensenaden in age). The type includes both upper and lower jaws. Tonni considers this discovery to be evidence for a neotropical origin for the genus.—Joel Cracraft.

52. A new ostrich from the middle Sarmatian of Moldavia. (Novyy straus iz srednego sarmata Moldavii). Y. N. Kurotchkin and A. N. Lungu. 1970. *Paleont. zhur.*, **1**: 118-126 (In Russian).—A new species, *Struthio orlovi*, is described from upper Miocene deposits of Moldavia SSR and is the oldest known record of the genus. The holotype, a distal end of a right tibiotarsus, differs from the other species of *Struthio* in a number of characters. The authors review the fossil species of this genus and conclude that a number of described forms represent a single species, *S. asiaticus*.—Joel Cracraft.

EVOLUTION AND GENETICS

53. On species' extinction, an attempt at mathematical analysis. (O umiranii vidov (popytka matematicheskogo analizakh.) S. Bozhich. 1971. *Zh. obshch. biologii*, **32**(1): 45-55. (In Russian, English summary.)—With the Ivory-billed Woodpecker (*Campephilus principalis*) possibly extinct, with other species on the way, this and other genetic analyses, or rationalizing, may be of significance. Elaborate mathematical treatment of genetic factors plus examination of geological history of some animal groups, particularly diatoms, foraminifera, and molluscs, finds some species genetically predetermined for extinction, evanescent, while others are predestinatedly permanent, regardless of environment or passage of time. "The duration of a species' existence is an allelic specific character regulated by the species' genes."—Leon Kelso.

54. Evolution in the House Sparrow. II. Adaptive differentiation in North American populations. R. F. Johnston and R. K. Selander. 1971. *Evolution*, **25**: 1-28.—The authors continue their discussion of the phenetics of the North American House Sparrow (*Passer domestious*). Though they might eschew this notion, the authors seem to be putting the tools of numerical taxonomy to work on problems of phylogeny and evolution, rather than the original, descriptive purposes for which numerical taxonomy was devised. "Principal-components analysis" of measurements of 16 morphological characters of House Sparrow skeletons yields three main components, which explain some 70% of the variance:

one component is related to gross size (and Bergmann's rule), one related to the ratio between body core size and limb size (and Allen's rule), and a third seems to be the mirror image or reverse of the second. There are significant regressions of the first two principal components, for both sexes, on measures of climate, which strengthens the probable relation between morphological variation and climate. The authors' three-dimensional diagrams, contour maps, and clustering of operational taxonomic units stretch their data: the number of operational taxonomic units is small, fewer than 40 localities for all North America, for such manipulations of the data. The single operational taxonomic unit in the Midwest and the single operational taxonomic unit in the Northeast provide a mute commentary on the extent of cooperation among scientists. Besides having few operational taxonomic units, the authors have few specimens in many operational taxonomic units; sample size is not uniform, with some collection sites (populations, operational taxonomic units) having as few as five or zero specimens per sex, while two sites have both sexes represented by more than 50 animals. Indeed, 23 of the 33 sites listed in Table 1 have fewer than 20 specimens measured for one or the other sex. Moreover, the authors admit to difficulty with this lack of specimens, since they deleted sites with fewer than five specimens from their statistical analyses, and this deletion included the sites with extremes of climate, such as Death Valley. Perhaps due to the lack of specimens, the authors did not stratify or otherwise control their data for the growth of sparrows with age, which will affect morphometric studies: on page 19 the authors indicate significant differences between adult and immature specimens, but elsewhere analyze their data, ignoring these significant age-related differences. Three-fourths of their samples of birds used as operational taxonomic units were collected in the period October-November-December, while the rest of the samples were taken in every month except May. Thus, the authors have sufficiently small sample sizes that the differences in body size of immature and adult specimens might affect their data and, in addition, the authors have samples which have the differing age compositions (and metric compositions) that are characteristic of populations of birds at different times of the year. Can this be called the fault of the authors, or is this the fault of the non-cooperating "free enterprise" structure of science, which we maintain? It does seem that there is an excess of ornithologists who might have cooperated to collect more and larger samples of House Sparrows more evenly distributed over the continent and all in the same month.

The authors approach the question, whether the House Sparrow in North America has differentiated morphologically as much as it has in Europe, in a straightforward manner: perusal of the variability shown in descriptive statistics both within and between collecting sites. For both continents, similar variability within sites was found. But between locality variability seems to be less in North America: females are significantly less variable between localities in North America than they are in Europe, while males are also less variable, though not significantly so. Therefore, the authors suggest that the North American representatives of the House Sparrow have not yet fully differentiated to match morphology to climatic gradients.—Frank Enders.

FOOD AND FEEDING

(**See also 11, 17, 18, 22, 31.**)

55. Factors governing the hunting behaviour and selection of food by the Great Tit (*Parus major* L.) T. Royama. 1970. *J. Anim. Ecol.*, **39**(3): 619-668.—Since its appearance a decade ago, L. Tinbergen's theory of the search image as the mechanism accounting for the feeding "preferences" of birds has gained considerable acceptance, in spite of certain inherent problems pointed out by a number of workers. Royama has in this paper made an extensive analysis of a number of factors crucial to this theory. The central information comes from photographic records of food being brought to nestling Great Tits in Wytham Woods near Oxford, England. He thus has gathered the same type of evidence (food brought to nestlings) from the same species used by Tinbergen (though in a different country). Supplementary earlier observations made in Japan are also included.

Basically, young tits are fed primarily insects, or which lepidopterous larvae constitute an overwhelmingly large proportion. Smaller amounts of other insects and spiders are presented. There is a seasonal succession of the insects (many of them are available only during part of the nestling season). There is no simple relationship between abundance of a food species and its appearance in the fare presented to the young. In some cases a prey species was taken commonly before its abundance became great and then was nearly ignored; in certain cases, an inverse relationship between abundance and utilization appeared. Royama stresses strongly the possibility that the rate of utilization of certain of these species may be strongly tied to the availability of other prey species; thus, there is a serious problem of interactions among the data that was not given adequate consideration by Tinbergen.

Royama then constructs a model as an alternate to Tinbergen's. It is based upon the efficiency of feeding, under the assumption that the more efficient forager (all other things being equal) could feed more offspring than a less efficient one. Thus, there should be selection for efficiency in feeding mechanisms. As a predator encounters increasingly abundant food sources, the proportion of time spent in processing the prey increases to the point where prey populations over certain abundances should not be more favored than ones considerably more abundant (assuming the prey to be similar in other respects). If a predator has more than one potential food source, in order to feed maximally profitably it should feed upon the more abundant of the two sources most frequently, subject to the immediately preceding comment. If prey were equally profitable in the two food sources, the predator should choose randomly among the two. Since food sources may be changing in time (old ones disappearing, new ones appearing, existing ones changing in composition) it is important that some time be spent in keeping track of the situation, essentially as insurance.

The model presented fits the data of Tinbergen but does not assume his particular concept of specific search images. That hypothesis assumed a random distribution of the prey species and random searching by the predator. Royama presents data to show that the Great Tits he studied did not present prey in a random sequence. Even a rare item, if once presented, showed a strong tendency to be repeated. Tinbergen argued that conditioning does not take place when the density of the prey species (and hence the frequency of encounters) was low. Royama's data suggest that conditioning may take place extremely quickly, perhaps also possibly described as a search image (in the sense of von Uexküll), though not one with the special conditions of Tinbergen's. To account for the dropping off of values at high densities, Tinbergen sought another explanation (the birds seek to avoid monotony). Royama claims that his hypothesis covers high-density situations without seeking such a separate explanation. He finds only one case in his tit studies where special items appear to be sought out (spiders for young nestlings). He questions whether the different species of lepidopterous larvae provide a less monotonous diet than would a single species. At certain stages some adults feed nestlings the former type of diet. While this is a logical argument, it seems to the reviewer that this part of Royama's thesis is not based on as solid evidence as some other parts of it. More data are needed. In fairness to Royama, it must be pointed out that he stresses this point in several places.

On the whole large items should be more economical to prey upon, unless they are considerably rarer than small items. Particularly, this should be true for nestlings, since the adults may have to carry the food some distance to feed them. Interestingly enough, the adults feed larger prey to their nestlings than they themselves eat at the same time. Also after the young fledge and follow the adults they are fed food that averages smaller than that they were fed in the nest. Clearly the strategy of profitability changes when the food does not have to be transported. Tinbergen based his argument only upon food fed to nestlings, not considering in his analysis that eaten by the adults.

Royama concludes by offering some suggestions for studies to test more fully his hypothesis.

L. Tinbergen's theory of search images has received wide acceptance even though, as Royama points out, the hypothesis has not been proven. For this reason, among others, it seems imperative that the serious student read both the original and Royama's paper.—Douglass H. Morse.

56. Selection of food by Icelandic ptarmigan in relation to its availability and nutritive value. A. Gardarsson and R. Moss. 1970. *Symp. British Ecol. Soc.*, **10:** 47-71.—This analysis follows the changes in food choices during the period of a year in the Rock Ptarmigan (*Lagopus mutus*). The data are then compared with those on ptarmigan and Red Grouse (*L. lagopus*) in Scotland. They indicate that Icelandic ptarmigan have marked feeding choices and one that differs from those of ptarmigan and Red Grouse in Scotland. These choices (particularly buds of the willow *Salix herbacea* in the winter and knotweed *Polygonum viviparum* in the spring) are utilized far in excess of their relative abundance in the habitat. Preliminary chemical analyses suggest that they are the most nutritious items available in the habitat. When they become exhausted or unavailable, the ptarmigan switch to other foods. In the spring hens eat more proteinaceous food than cocks, which may be related to the high demands placed upon females in molting and egg-laying. Males molt after the breeding season. Heather (*Calluna vulgaris*) and crowberry (*Empetrum nigrum*), principal food items of the Scottish birds, form but a minor part of the diet of Icelandic birds. While the Icelandic birds are feeding on what appear to be the most nutritious items available, the Scottish birds seem to get along well with their fare, which brings up the interesting question of why the two populations differ so markedly in their food. This question is not taken up in the main part of the paper, but in a subsequent question-and-answer period a participant points out that there are few other grazers in Iceland and by implication that there are more in Scotland. Like several other contributions presented at this symposium, this paper represents work still in progress. The reviewer assumes that the question of diets in Iceland and Scotland will be aired in detail by the authors at a later time.—Douglass H. Morse.

57. Factors affecting the diet and feeding rate of the Redshank (*Tringa totanus*). J. D. Goss-Custard. 1970. *Symp. British Ecol. Soc.*, **10:** 101-110.—This paper is basically a summary of work that has appeared elsewhere (see review # **45** in *Bird-Banding*, **41:** 329-330, 1970), with additional discussion of some experiments still in progress. The new contribution presented here is evidence that Redshanks quickly learn to select large prey (parts of meal worms) in artificial holes and pass by the small prey. The mechanism by which choices are made are not discussed. The experiments involved only two birds (both hand-reared) up to the time of writing. The question of prey-size selection is of importance to the Redshank, since the amphipod *Corophium volutator* is a principal food in the estuarine mudflats in Scotland where Goss-Custard performed his field studies. This prey species, which shows considerable size variation, lives in shallow burrows. In the field Redshanks take a disproportionately high number of large *Corophium*. If these prey could be selected with considerable ease, it should be most efficient for a bird to take the large ones and leave the small ones—if large ones are not rare. When the density of large prey was markedly reduced in an experiment, the birds commenced taking small prey. Goss-Custard plans further experiments to test the relative efficiencies of taking just large or both large and small prey, depending upon the densities and size distributions of the prey population.—Douglass H. Morse.

58. On the Nutcracker's gathering and cracking of nutlets of the Cembra Pine. (Der Tannenhäher (*Nucifraga caryocatactes*) beim Sammeln und Knacken von Nüsschen der Zirbelkiefer (*Pinus cembra*).) H. Löhrl. 1970. *Anzeiger der Orn. Gesell. in Bayern*, **9**(3): 185-196. (In German, English summary.)—Many observations in field and captivity maintain among various things that (supported by 2 photos) the species actually cracks and hulls the nutlets between the mandibles by simple pressure, contrary to the belief of several previous observers.—Leon Kelso.

59. The Wrybill: a feeding adaptation. E. G. Turbott. 1970. *Notornis*, **17:** 25-27.—*Anarhynchus frontalis* is apparently the only known bird species with its beak growing laterally curved (always to the right). Observations by the author show that feeding on mudflats is accomplished by twisting the head to the right, and then sweeping the side of the bill against the surface from right to left—a motion apparently quite effective in capturing mudflat prey. Buller's (1873) explanation of the Wrybill's peculiar bill, involving scraping of stones, has long

been considered far fetched, and Turbott says they feed only on the muddy drifts in river beds, not on the stones as Buller's theory demands.—Jack P. Hailman.

60. Notes on a Crested Grebe's nest at Lake Mapourika. G. Chance. 1970. *Notornis*, **17**: 87-91.—One page of text and four fine full photos of feeding the fluffy chicks raise an interesting question about *Podiceps cristatus*. Why do the parents pluck and feed feathers to the chicks? The author quotes Westmore (no specific citation) as having speculated "that the feathers act as a strainer to prevent fish bones or large pieces of chitin from entering the intestine" by accumulating in the pyloric lobe of the stomach.—Jack P. Hailman.

61. On the food and feeding habits of the Great Grey Shrike *Lanius excubitor* in Finland. S. Grönlund, J. Itämies & H. Mikkola. 1970. *Orn. Fenn.*, **47**(4): 167-171.—This study, the first made in Finland on the summer food of the bird we call the Northern Shrike, was based on a nest containing 8 young. The parents regularly spent 30-45 minutes collecting prey which they impaled in a larder near the nest; then fed the young for 15 minutes, after which they repeated the process.

A meticulous study was made of the food of the family through the collection of pellets of which 61 were found whole. Insects comprised 52% of 251 examples of prey. Remains of wasps were found in 23 of the 61 pellets, of bumble bees in 22, of voles in 47 and shrews in 13. The favorite vertebrate prey was the lizard *Lacertaa vivipara*.

Studies of fall pellets of this species showed an even larger percentage of insects than had those in summer, but in winter the food was confined to birds and mammals.—Margaret M. Nice.

62. On occurrence and feeding habits of Short-eared Owl in Finland 1964-68. H. Mikkola and S. Sulkava. 1969. *Ornis Fenn.*, **46**: 188-193.—Comparisons are made between data from this study and another made at a different location at a different time of year.—Jack P. Hailman.

63. Impack of *Asio otus* L. on the small mammal population in Romania. M. Hamar and B. Schnapp. 1971. *Ann. Zool. Fennici*, **8**: 157-159.—Analysis of pellets shows that the Long-eared Owl takes about ten times as many mammals as birds, both in terms of individuals and biomass. There is an attempt to estimate predation pressure quantitatively by making assumptions of the range over which an owl hunts and "that each bird regurgitates 2 pellets a day, one in the field and one under the trees . . .".—Jack P. Hailman.

64. Fish jumping into Heron's mouth. J. Griffiths and G. Griffiths. 1969. *Brit. Birds*, **62**: 382-383.—The situation is not quite as suicidal as it sounds. The *Ardea cinerea* stood at a two-foot waterfall with bill open and snapped up two to four fish per minute as the fish tried to leap the fall.—Jack P. Hailman.

65. Birds, moths and lights. C. T. Collins. 1970. *Urner Field Observer*, **12**: 32.—Some birds have acquired the habit of feeding on insects attracted to lights, and further instances should be looked for.—Jack P. Hailman.

PHOTOGRAPHY AND RECORDINGS

(**See also 58, 60, 77, 78.**)

66. Studies of less familiar birds. 158: Wallcreeper. H. Löhrl. 1970. *Brit. Birds*, **63**: 163-168.—*Tichodroma muraria* inhabits high mountain ranges of Europe and Asia, especially in the Himalayas. The Wallcreeper, with its crimson wing patches and spectacular soaring flights, is the only European song bird that is not a migrant, feeds exclusively on insects and yet manages to survive with a single brood of few young—from one to five chicks.

"Nest losses are extremely rare," largely due to inaccessibility of nesting holes in rocky crags. Of 23 broods found over the years by Dr. Löhrl, only one was robbed, probably by a weasel *Mustela ermina*. Incubation, performed by the

female, probably lasts 15-17 days. The chicks stay in the nest till fully fledged, probably about 26 days. Both sexes sing, but the birds have no call notes, no "notes of agitation" when the nests seems to be threatened. Fourteen excellent photographs are given of the birds and their wild habitat in the Austrian Tyrol. A fascinating account of a notable species.—Margaret M. Nice.

67. Studies of less familiar birds, 162: Siberian Jay. A Blomgren, with photographs by A. Blomgren, J. B. Bottomley and S. Bottomley. 1971. *Brit. Birds,* **64:** 25-28 + plates 1-8.—This regular feature, consisting of plates and a brief accompanying text, focuses in this issue on *Perisoreus infaustus,* and is noted here because the pictures seem unusually good. They are not the mere portraits of most plates, but illustrate various phases of the species' nesting cycle. —Jack P. Hailman.

68. Studies of Avocet behaviour. P. J. S. Olney, with photographs by W. H. van Schieveen and E. Hosking. 1970. *Brit. Birds,* **63:** 206-209 and plates 32-39.—The really fine photographs show grouping, displays, attack, fighting, preening, copulation and other behavior, accompanied by a brief explanatory text.—Jack P. Hailman.

MISCELLANEOUS

69. ***British Birds and the Future.*** Editors. 1970. *Brit. Birds,* **63:** 1-5.—The journal will broaden its geographic coverage and encourage more review articles, among other outlooks for the future.—Jack P. Hailman.

BOOKS AND MONOGRAPHS

70. ***Since Silent Spring.*** Frank Graham, Jr. 1970. Houghton-Mifflin, Boston. XVI + 333 pp. $6.95.—The text of this and the author's later and also historical "Man's Dominion" repeats among other things the story of Eisenhower's ex businessman Secretary of the Interior, Douglas McKay, "ousting" three career diplomats (so to speak) from the Fish and Wildlife Service (actually they were but removed from executive powers, and chose to leave being unwilling to stay and "take it" in lesser status as others had to do). This would omit that such was long since standard procedure and any protest was simply "spoil sport" in our fair city. That those three had, to take a biblical allusion, slain their thousands and tens of thousands (or dozens and scores anyway) careerwise goes unmentioned. Ancient residents of the capitol city could but wish that citizenry back home could or would learn what is par for the course here in D. C. using their tax money; then so many protest marches would be less necessary. Napoleon remarked, it has been said, that "history", is but fiction agreed upon. This well-received and well-selling book is decidedly better than that, but history tends to solidify or crystallize around certain points made permanent by repetition, leaving gaps between, which are likewise durable. D. McKinley notes that if there is a scientific sin worse than pure negativism it is the notion that the future of the country, race or president depends upon a sunny report. It is a distinct gain that in this author's books ornithology and conservation have had to go beyond that restriction.—Leon Kelso.

71. ***The Ecosystem Concept in Natural Resource Management.*** G. M. Van Dyne, ed. 1969. Academic Press. New York. XII—383 pp. $16.50.—This is perhaps the first book in applied ecology to attempt merging and correlating eastern European concepts and methods on a substantial scale, particularly with regard to the terms biocenose and biogeocenose. "An ecosystem results from the integration of all the living and nonliving factors of the environment for a defined segment of space and time." (p. VII.) The 13 authors, mostly western U. S. and Canadian, contribute an introduction, and 10 chapters, covering: The natural resource ecosystem, Historical development, Procedures for grassland study, Watershed ecosystem concept and nutrient cycles, The arctic tundra, Range management, Forestry viewed in an ecosystem perspective, Fish and game

management (this inevitably being the one of most ornithological import), Watershed management, and Implementing the ecosystem concept in training in the natural resource sciences. Each contribution is reinforced with high quality graphic illustrations, and bibliography, and altogether this seems quite suitable as a college text. There are author and subsubject indices.—Leon Kelso.

72. ***Where Have All the Flowers, Fishes, Birds, Trees, Water, and Air Gone?*** O. Segerberg, Jr. 1971. McKay, New York. 303 pp. $6.95.—Along with this book we may consider a review of it under a suggested title: "Ecology without tears," by S. Love, Washington Post, C4, 12 June 1971. He assures us that it is all the better that the author is not academic, but a journalist, who knows how to translate the "technical jargon of the ecologist into a readable form", this being a fine reward for your years of graduate school labor and expense. He also assures us that whatever is happening to the environment, its doomsday prediction has become a boon to the publishing business, so many ecology texts having appeared in the past year that many bookstores reserve a separate section for them. Love thinks Segerberg "did a great job", but that is best left to the reader's judgment.—Leon Kelso.

73. ***Death as a Way of Life.*** R. A. Caras. 1971. Little, Brown. N. Y. 173 pp. $5.95.—"Must man hunt?", one reviewer's suggestion for an alternate title, reminds the conservation world that in addition to the control racket, wildlife carries the burden of another business wherein, in 1965, 13.6 million hunters spent 185.8 million aggregate days and a billion dollars. A question not raised but of import to us is what can the impact of small ornithological societies' committees and published annual reports be in opposition to all this? Then, so many medals and other citations have been awarded the former poisoners and hunters that both sides are compromised.—Leon Kelso.

74. ***Must they die? The Strange Case of the Prairie Dog and the Black-Footed Ferret..*** Faith McNulty. 1971. Doubleday, New York. Illustrated, 86 pp. $4.95.—This is an expansion of an article in *The New Yorker* reviewed previously (*Bird-Banding,* **41:** 319, 1970, review no. **21**) into a book as there suggested. There is additional evidence and discussion, and a section of rather good black-and-white photos of subjects and environment. *"It will do the Fish and Wildlife Service no harm"* (W. L. McAtee wrote to dissatisfied former colleagues, 21 September 1944) *"and probably yourselves no good to attempt to fight or disparage it; the struggle is too unequal. Others have tried it, including, several years ago, a somewhat influential group, who opposed the control operations, but they accomplished nothing."* Miss McNulty today, however, would carry on the fight anyhow, although after all these years, the control business has yet to be controlled, being carried on for the benefit of cattle grazing in broad areas,"an empire larger and richer than that of Alexander", with a human population of 1-3 per square mile, if that much.—Leon Kelso.

75. ***An Eagle to the Sky.*** Frances Hamerstrom. 1970. The Iowa State University Press, Ames, Iowa. 143 pp. $4.95.—Both Part I and II deal with Fran's experiences with two hand-raised female Golden Eagles *Aquila chrysatos.* From the first part we learn that Chrys laid her first egg when four years old, that despite frigid weather in central Wisconsin, nest-building started in February with stick play between Chrys and Fran; that Chrys always began to sing a "curious melodious song" at this period; that she first laid on April 10 and expected Fran to take her daily turn at warming the eggs, for "she had a notion" that Fran was her mate. Two infant Red-tailed Hawks, *Buteo jamaicensis,* were adopted and reared by Chrys; "Big Chick" was disturbed at the cheeping of "Little Chick" and scurried to the edge of the nest leaving Little Chick to be fed. Fran states that this behavior is characteristic of partly grown Cooper's Hawks, *Accipiter cooperii,* and harriers, *Circus* sp. All of Fran's attempts to introduce a male Golden Eagle to Chrys ended in failure for the powerful great female simply tried to kill the small, gentle male. Elaborate attempts at artificial insemination also failed.

Part II is concerned with training another bird, teaching her to hunt and returning her to the wild in the Far West. It is a record of enthusiasm, courage and dauntless meeting of obstacles.

The book is illustrated with many photographs and with delightful sketches from the pen of Deann De La Ronde, an enthusiastic young artist who lived with the Hamerstroms for several months.—Margaret M. Nice.

76. ***Bird Life in the Royal Parks, 1967-68.*** Ministry of Public Building and Works. 1970. Her Majesty's Stationery Office, London. 34 pp.—A report on the status of birds in sanctuaries in the Royal Parks of England and Wales, which includes a report by the Committee, selected observations in some parks, and tables of birds recorded.—Jack P. Hailman.

77. ***Birds of Rocky Mountain National Park.***. Allegra Collister. 1970. Museum Pictorial No. 18., Denver Mus. Natural Hist. 64pp. $1.00.—Anyone interested in birds who plans to visit the Rocky Mountain National Park is strongly urged to buy this most informative guide book from the Denver Museum of Natural History. Mrs. Collister, the author, is a notable bird-bander, having ringed more than 40,000 birds since 1948!

This Park extends for 405 square miles and in its confines it ranges from the Upper Sonoran to the Arctic Alpine Life Zone, so it is understandably rich in varied wild life. Under the name of each bird is given its status in the Park, with dates for rarities, and occasionally items of interest. For instance, a nest of the Dipper, *Cinclus mexicanus* was occupied for 32 years, "presumably by successive generations." Notes are given on nestings, on occurrence on Christmas censuses, etc. This is a book to make one homesick to revisit this beautiful, fascinating Park. Much praise is due the great array of magnificent photographs of birds, mostly taken by Alfred Bailey and Robert Niedrach.—Margaret M. Nice.

78. ***Ecology of Colorado Mountains and Arizona Deserts.*** Helen Moenke. 1971. Museum Pictorial, No. 20. 96pp. $2.50.—This informative study, edited by Alfred M. Bailey, author of *Birds of Colorado* (1965), is a clearly written, interesting account of the rich life-zones in Colorado from the Arctic Alpine to Upper Sonoran. For its wealth of superb photographs and its illuminating descriptions of many aspects of ecology it can be most highly recommended.—Margaret M. Nice.

THE PRESIDENT'S PAGE

This is the last issue of *Bird-Banding* to be published under the editorship of E. Alexander Bergstrom; after twenty-one years as editor, Mr. Bergstrom is resigning.

Those of us who have not been editors cannot fully comprehend the significance of an editorship of such longevity. Proper appreciation of 21 years of editing manuscripts, checking proofs and corresponding with authors and printers—in short, being an editor—can only be appreciated by editors. But we non-editors have a visible measure of the perseverance and dedication that have characterized Mr. Bergstrom's editorship and that is 84 issues of *Bird-Banding*.

Actually Mr. Bergstrom has carried on a tradition of editorial excellence and longevity established by his predecessors. Charles L. Whittles, the first editor, served 15 years, while James Lee Peters served 12 years. All three editors made their unique contri-