RECENT LITERATURE

Edited by Bertram G. Murray, Jr.

BANDING AND LONGEVITY

(See 52)

MIGRATION, ORIENTATION, AND HOMING

(See also 12, 13)

1. Arrival of birds from spring migration in relation to vegetational development. T. Slagsvold. 1976. *Norw. J. Zool.*, **24:** 161–173.—Slagsvold has compared the spring arrival of dozens of bird species with the phenophases of plants at six localities scattered over Norway, using both his own data and published information of other workers. One interesting result was that at Bergen, on the southwestern coast, phenophases of plants were slightly earlier (mean of 1.1 days) than at Drammen, at the same latitude but in the southeastern corner of the country; yet bird arrivals averaged 4.2 days earlier at Drammen than at Bergen. This disparity is explained by Bergen's location along the ocean, where vegetation growth tends to become accelerated over that at inland locations, and by Drammen's position nearer to the main flyway of migrants from the south into Norway. For the country as a whole, there was a six-day delay in bird arrival for each ten-day delay in plant development, i.e., the progression of bird arrival at higher latitudes and altitudes was faster than the progression of plant growth. Slagsvold also noted that the earlier arriving species varied considerably in arrival date at a given locality from year to year, whereas "late" arriving species had much less variation in arrival time. This finding has been noted by other workers, and the author discusses possible reasons for these variations.—Harry E. LeGrand, Jr.

2. Vernal migration patterns of certain avian species in southern Michigan. B. Pinkowski and R. Bajorek. 1976. *Jack-Pine Warbler*, **54:** 62-69.—The authors examined the arrival dates of 29 common or conspicuous migrant and summer resident species, based on records over a seven-year period. Their data suggest, in general, that granivorous, omnivorous, and aquatic species tend to arrive earlier than strictly insectivorous species. The data also show that the earlier arriving species (mostly with mean arrival preceding 28 April, and especially those arriving in March) have a greater variance in arrival than the later arriving species. Earlier species are more "weather" migrants (more influenced by weather) than are later birds, called "instinct" migrants. The authors' use of the terms "weather" and "instinct," even though borrowed from the literature, to describe migrants, is unfortunate, and these terms should be avoided. The terms "early spring migrant" and "late spring migrant" would suffice and would avoid ambiguities. Another misleading statement made is that "Males of certain species regularly preceded females onto the breeding grounds." This implies that males preceding females is not a common occurrence among birds, whereas it is well known that male songbirds precede females in spring arrival for nearly all species. Pinkowski and Bajorek summarize seven differences between "weather migrants" and "instinct migrants," based on arrival dates, wintering grounds, food preferences, flight behavior, and body size. Although many of the data presented are common knowledge to persons who carefully monitor spring migration, it is nonetheless valuable to have such information in published, tabular form.—Harry E. LeGrand, Jr.

3. Observations of the fall migration of Greater Snow Geese across southern Quebec. H. Blokpoel, J. D. Heyland, J. Burton, and N. Samson. 1975. *Can. Field-Nat.*, **89:** 268–277. The authors conducted a detailed study of the 1971 fall migration of Greater Snow Geese (*Chen caerulescens atlantica*) from their staging ground on the St. Lawrence River near Quebec City across southern Quebec (province). Data were gathered both by observers scattered over the

southern portion of the province and by radar at the Quebec City Airport. Results from both methods were similar and showed that the majority of geese migrated south from their staging area during only two periods: 30–31 October and 8–9 November. The birds appeared to select favorable winds for migration, as they migrated SW-SSW during the first period and S during the second period.—Harry E. LeGrand, Jr.

4. Autumn migration of shorebirds in the Kingston area of Ontario, 1964-1974. R. D. Weir and F. Cooke. 1976. *Can. Field-Nat.*, **90:** 103-112.—Here is the first systematic study of shorebird migration east of the western Great Lakes and west of New England and Quebec. Data on 25 species include the first records for the Western Sandpiper (*Calidris mauri*) and Red Phalarope (*Phalaropus fulicarius*) near Kingston, Ontario. Baird's Sandpiper (*Calidris bairdii*), Purple Sandpiper (*C. maritima*), and Stilt Sandpiper (*Micropalama himantopus*) were more common in the Kingston area than expected. Adults migrate distinctly earlier than young-of-the-year in Semipalmated (*Charadrius semipalmatus*) and Black-bellied (*Pluvialis squatarola*) plovers, Lesser (*Tringa flavipes*) and Greater (*T. melanoleucus*) yellowlegs, Pectoral (*Calidris melanotos*), White-rumped (*C. fuscicollis*), and Semipalmated (*C. pusillus*) sandpipers, and dowitchers (*Limnodromus sp.*). Males migrate earlier than females in the Pectoral Sandpiper, the only species in which sexual dimorphism was sufficiently pronounced to permit field identification.—Edward H. Burtt, Jr.

5. An experiment on the orientation of juvenile Starlings during spring migration. A. C. Perdeck. 1974. *Ardea*, **62:** 190–195.—This study is a sequel to the earlier well known work where Perdeck showed that adult Starlings (*Sturnus vulgaris*) were able to compensate for a longitudinal displacement (Type III navigation) whereas first-flight migrants, apparently relying on a simple compass system (Type II orientation), exhibited no change in their orientation behavior following transportation. In this study Perdeck addresses the question of whether or not juveniles are able to relocate their hatching areas following a winter displacement by transporting nearly 3,000 juvenile Starlings captured in the Netherlands south-southeast to Zurich, Switzerland. Examination of the recovery locations of the displaced and nondisplaced birds revealed no real differences between the two groups. The results imply that juvenile Starlings in some way "record" the position of their hatching area and, sensing a displacement, correctly compensate and return to the hatching area. Note that spring migration involves a *known* goal for the first-year migrant (assuming the hatching area represents a goal), whereas during fall migration a previously experienced location or area does not exist for the first-flight bird. Unfortunately Perdeck's experiment suffers from the various problems associated with recovery of banded birds such as notoriously low recovery rates and lack of knowledge of the course the bird traveled between banding and recovery site. For example, only six displaced Starlings were recovered during the breeding season following displacement, and only nine additional birds were reported during subsequent seasons. Nevertheless, the evidence does indicate that individuals returning for the first time to their hatching area presumably to breed possess goal orientation abilities.—Frank R. Moore.

6. Avian orientation errors in short distance homing. (Oshibki orientatsii ptits pri blizhnem khominge.) N. Plokhinskii and L. Supun. 1977. *Biol. Nauki*, **1977**(5): 129–134. (In Russian.)—Homing from distances of 0 to 10 km from nests by the common Barn Swallow (*Hirundo rustica*) was studied on releases at the Black Sea Reserve from 1964 to 1975. Biomathematical calculations were employed, based mostly on methods elaborated by western workers. Calculated error values on initial direction and subsequent corrective flight course indicated higher accuracy in females (1,150 releases) than in males (766). There was less error by both sexes in returns over steppe and mixed-forest country than when released at sea. Orientation error appeared unrelated to wind direction and velocity but increased during rains and cloudy weather.—Leon Kelso.

POPULATION DYNAMICS

(See 20)

NESTING AND REPRODUCTION

(See also 19, 29, 49)

7. The breeding biology of two Lake Erie Herring Gull colonies. R. D. Morris and G. T. Haymes. 1977. *Can. J. Zool.*, **55**: 796–805.—The breeding biology of *Larus argentatus* in two Lake Erie colonies was studied over four years. The usual data on hatching and fledging success, influence of date on laying, and influence of clutch synchrony are reported. Incubation attentiveness was similar for two-egg and three-egg clutches. Hatching success was independent of incubation attentiveness even below 75% attentiveness. Some data on PCB and DDT residues in eggs are recorded.

This is a fairly routine study of Herring Gull biology, albeit competently executed. I must ask, though, whether there is any case for continuing this type of investigation for this species? What are needed for gulls now are three types of study: (1) long-term studies of the caliber of Coulson and Horobin's work on the Arctic Tern (see review 8), (2) studies of their behavior outside the breeding season, and (3) fieldwork on the less-well studied species. Continued work at breeding colonies of Herring Gulls to my mind can be justified only if the bird is being used as a "white rat" for a subject rather than a species study. We no longer need more-of-the-same for Herring Gulls.—Raymond J. O'Connor.

8. The influence of age on the breeding biology and survival of the Arctic Tern *Sterna paradisea*. J. C. Coulson and J. Horobin. 1976. *J. Zool., Lond.*, **178**: 247–260.—This paper reports analyses based on over 30 years of ringing young Arctic Terns on the Farne Islands off the east coast of England. Mated birds were closely similar in age, rarely more than two years apart. Colonies were reformed each year by the older birds. Birds of 8+ years arrived 17 days ahead of the three-year-olds. No first-year birds and only about 5% of the second-year birds returned to the colony. Of the third-year birds present in the colony only about 30% bred, the remainder commencing breeding as four-year or even (ca. 5%) as five-year-olds. Younger birds tended to nest in more unsuitable areas nearer the tide-line than older birds. Birds of all age-classes laid at about the same date. Clutch sizes were lowest in young birds, peaked in the 6 to 8 year group, and declined in older birds. Egg volume increased over the first six years, although only slightly (ca. 8% variation), but clutch volume varied more markedly (ca. 30%). Hatching success increased monotonically with age, as did the number of chicks reared per pair. Chicks of older (8+ year) parents grew significantly faster than those of younger parents. Two estimates of survival rate yielded 86.7% and 88.0%, with no evidence of age-specific mortality (among breeding birds). Breeding success during a dinoflagellate bloom in the 1968 season was severely reduced, partly through physiological effects but mainly because of the food shortage caused by fish mortality.

Long term studies of seabird biology are all too few and a fair proportion of those extant are due to Coulson's group. This paper is a significant addition to the available information in this field.—Raymond J. O'Connor.

9. Age of first breeding in Puffin, *Fratercula arctica* (L.). L. Petersen. 1976. *Astarte*, .(2): 43–50.—Determining the age at which breeding begins in long-lived seabirds has always been a problem. This study involved a massive ringing effort. A total of 32,121 Puffins were banded at the Westmann Islands (Iceland) between 1953 and 1974, of which 4,564 were recovered by 15 February 1975. Results indicated that most begin to breed at 5 to 6 years of age. Few if any 4-year-old birds and no 1- to 3-year-old birds occupied burrows. Here the Puffin population was "several million" strong. The harvest for human use was about 100,000 per year. Because only 7.2% of the catch was breeding birds, "there is little danger of overexploitation using present-day methods of catching." Birds of the same sex at the same colony may start to breed at different ages. Variations may occur between colonies of the same species. One definite opinion advanced is: "We do not know what factors induce birds to breed upon return to the colony. We do know, however, that many seabird populations have non-breeding segments which may include birds fully capable of breeding. The presence of mature non-breeders (so-called 'floaters') seems to have been shown convincingly in one alcid species only. . . . A population of floaters may well be present in seabird species other than Cassin's Auklet (including Puffin) which have large non-breeding populations."—Leon Kelso.

10. Breeding success and prey availability in a Ural Owl, *Strix uralensis* Pall., population in central Sweden. A. Lundberg. 1976. *Zoon* (Acta Univ. Uppsaliensis), **4**(1): 65–72.—Ural Owl courtship display is often associated with vocal communication and courtship feeding between male and female. The main foods available to Ural Owls at this time (March) are probably Bank Vole (*Clethrionomys glareolus*), and Field Voles (*Microtus agrestis*), and to some extent non-migratory bird species. Breeding success is synchronized with vole abundance in early spring. Thus, good reproduction occurs in years with high vole populations in early spring, and irregular breeding or nonbreeding occurs in years with low vole density. Physiological factors and the nutritional status of the female during the prebreeding period are assumed to determine breeding success. The bulk of food given to young consists of such species as the Water Vole (*Arvicola terrestris*) and birds. The former makes up more than 65% of the total food given the young. Among the birds utilized, the Wood Pigeon (*Columba palumbus*) predominates. (Adapted from author's summary.)—Leon Kelso.

BEHAVIOR

(See also 9, 22, 30, 50)

11. Bird behaviour and earthquakes. M. Lowry. 1976. *Notornis*, **23**(3): 266.—In New Zealand at least one major earthquake was followed by reports of animals behaving oddly shortly before the event. Yet seismologists have not had occasion to use bird behavior as an aid for earthquake prediction. Anyone who has seen actions by birds (or other animals) that would indicate anticipation of an earthquake is asked to contact the author of this note at the Seismological Observatory, Geophysics Division, DSIR, Box 1320, Wellington, New Zealand. The length of time between the bird reaction and the shock felt by the onlooker is of particular interest. If animal behavior is ever to be used as an aid to quake prediction, it is timely to assemble instances on which predictions could be based. —Leon Kelso.

12. A physicochemical mechanism for magnetic field detection by migratory birds and homing pigeons. M. J. M. Leask. 1977. *Nature*, **267**: 144–145.—Probably no other cue among the array of possible direction-finding mechanisms in avian migratory orientation has engendered as much interest and lively debate as geomagnetism. Based on the accumulated evidence, migratory birds and homing pigeons are apparently capable of gaining directional information from the Earth's magnetic field. A critical issue and certainly a source of lingering doubt among some investigators regarding magnetism and orientation is the nature of the biological mechanism of sensitivity in birds. To date the sensory process remains unknown.

Leask outlines a plausible model for the detection of magnetic information based on a physicochemical mechanism located in the avian eye. In principle the process occurs at the molecular level, involves molecules of the retina such as rhodopsin, and in very general terms is dependent on the systematic transition of the key molecule(s) between excited and relaxed energy states. Leask cautions that the model places rather stringent constraints on the various molecular parameters, yet the existing data suggesting that birds do sense and in turn utilize the Earth's magnetic field as an orientation cue are for the most part consistent with the model. Noteworthy is the fact that given its dependence on the visual modality the proposed detection process becomes inoperative in darkness. Leask's effort should stimulate not only experimental testing of the model but also the development of other plausible models of the sensory detection of geomagnetic stimuli.—Frank R. Moore.

13. Sensitivity of the homing pigeon to an Earth-strength magnetic field. M. A. Bookman. 1977. *Nature*, **267**: 340–342.—Bookman's exciting results show rather clearly that pigeons (*Columba livia*) are sensitive under laboratory conditions to the presence of an induced magnetic field comparable to that of the geomagnetic field. Up to this point, the evidence that homing pigeons and migrant birds were responsive to magnetic stimuli has been derived indirectly from homing trials with pigeons, cage experime

free-flying nocturnal migrants. However, various conditioning paradigms, including one's employing an autonomic response such as heart rate, have consistently failed, with one exception, to demonstrate sensitivity to magnetic stimuli. Reille (*J. Physiol., Paris*, **60**: 85–92, 1968) did report positive results but attempts to repeat his findings have been unsuccessful.

Bookman designed a paradigm wherein a homing pigeon could move freely through a flight tunnel situated within a controlled magnetic environment. The tunnel technique permitted greater activity, including voluntary flight, during a test period. He found that training was more effective if a pair of birds was used together, and he succeeded in training three pairs of pigeons to discriminate between the presence and absence of a 0.5 gauss field. Interestingly, successful discrimination was associated with "flutter activity" of the birds in the tunnel, i.e., sustained hovering, jumping, rapid turning, or short flights. Fluttering is possibly directly involved in some way with perception of magnetic stimuli, but more likely it is merely associated with general sensory activation that accompanies orientation behavior. Needless to say, replication of the results will be anxiously awaited. Given this initial success, the technique may be valuable in addressing the question of the actual mechanism(s) responsible for detecting magnetic stimuli.—Frank R. Moore.

14. Some observations on the biology of the Cassowary in northern Queensland. F. H. J. Chrome. 1976. *Emu*, **76**: 8–14:—Here is an interesting account of a little studied species, the Cassowary (*Casuarius casuarius*). Males and females are territorial, although female territories may include several smaller territories of males. Females are larger, brighter, and more dominant than males. The evidence suggests that serial polyandry is the reproductive strategy employed, although the male initiates courtship. The behavioral descriptions are clear, and the authors use descriptive names, a commendable tactic. However, functional interpretation is liberally mixed with results, yielding a confusing potpourri of data and speculation. The discussion of diet is hard to follow because data in the text disagree with data in the table. The discussion is circular in that the author convincingly demonstrates why tropical rainforests would not favor territoriality, but Cassowaries are territorial, so Chrome shows how tropical rainforests favor territoriality in the Cassowary. By the end of the paper I knew much about Cassowaries, but wondered what effect tropical rainforests really had on territoriality.—Edward H. Burtt, Jr.

15. Stereopsis in the falcon. R. Fox, S. W. Lehmkuhle, and R. C. Bush. 1977. *Science*, **197**: 79–81.—By an ingenious procedure an American Kestrel (*Falco sparverius*) was trained to respond to a rectangle standing out of an array of red and green dots. A hood with spectacles allowed monocular vision to be tested. Rotating the pattern through 90° required retraining the bird. The reviewer supposes that field ornithologists have not had any doubt of the existence of stereopsis in many birds, including Falconiformes and Strigiformes. This, however, may be the first completely unequivocal demonstration in any vertebrate other than a mammal.—C. H. Blake.

16. Mass formation of Coot rafts on Baraby Lakes (Western Siberia). (Protsess formirovaniya massovykh skoplenii lysukh (*Fulica atra* L.) na ozerakh Baraby, Zapadnaya Sibir.) A. Koshelev. 1977. *Ekologiya*, **1977**(2): 88–92. (In Russian.)—In a regional study, 1969–1975, of 30 months observation, local and transient flocks were distinguished. Assembling at 55 to 80 days of age, the former comprised 50 or more individuals. Signal calls controlled their movements. As rafts enlarged, "food parasitism" appeared. Groups of 2 to 5 seized aquatic vegetation from bills of swans and diving ducks. Transient rafts were mostly of yearlings. Individuals frequently moved from one flock to another. Molting rafts of yearlings, 400 to 2,500 birds, kept to separate sites in open water. Age groups held to their aggregates, both as to individuals and the species as a whole. They maintained synchronized daily rhythms of local activities. Synchrony of action, even automatic, affords economy of energy by favoring fat storage for fall migration. Birds in rafts suffer fewer and less successful raptor attacks. Concertedly on guard, they readily perceive danger. Shared food search enhances success through synchrony of action, and readies physiological and psychological preparation for migration.—LeonKelso.

17. Changes in sensitivity of female budgerigars to male vocalizations. S. Gosney and R. G. Hinde. 1976. *J. Zool., Lond.*, **179:** 407–410.—An earlier experiment from the Madingley group had suggested the existence of a diurnal rhythm in photosensitivity on the part of female *Melopsittacus undulatus*; birds on a 6 + 2 h day laid sooner when the additional 2h began 12h after dawn than either earlier or later. But that experiment was confounded with changes in the timing (but not frequency) of male vocalizations and could be interpreted as due to a diurnal rhythm in female sensitivity to male calling, rather than to light. The experiments reported here show that there was indeed a diurnal rhythm in sensitivity to male vocalizations but that it was out of phase with a separate rhythm in photosensitivity; birds were more likely to lay if exposed to males calling during the first half of the day. Gosney and Hinde suggest it is adaptive for females to be most responsive to male song when males are most likely to be singing, i.e., the early morning for most passerines. The experiment now needed is an analysis of diurnal variation in calling by male budgerigars.—Raymond J. O'Connor.

18. Visual search in the pigeon: hunt and peck method. D. S. Blough. 1977. *Science*, **196:** 1013–1914.—White Carneau pigeons were trained to peck an *O* in a display to obtain food. In trials one *O* appeared in random positions among one or more *X*'s. Time to peck the *O* increased with the number of *X*'s. Reaction time peaked at about 0.3 sec (or less) or at about 0.5 sec. Overall the graph was bimodal for each bird, the higher mode becoming later as the number of *X*'s increased.—C. H. Blake.

19. Rooks, *Corvus frugilegus* Linnaeus, 1758, in one of the Cracow Parks. Z. Grodzinski. 1976. *Acta Zool. Cracov.*, **21**(14): 465–500.—Rooks are of interest to naturalists for their daily and seasonal routine, diet, reproduction, and migration. This colony was observed from 1969 through 1975. The disintegration rate of nests and their four phases of reconstruction were detailed. Colony persistence rested largely on individual urge to maintain nests through fall and winter and also on "passive cooperation," which drew them to the park. Autumnal knock-down of nests is recommended for dispersal of noxious colonies. "Man's attempts to interfere directly with the life of the rookery only temporarily reduced the number of nesting birds. The next breeding season similar numbers of Rooks turned up again in the nesting area. During the six-years of observations the rookery was destroyed four times . . . 1971, 1972, and 1975. The nests were knocked off in the second decade of March, and three times in the second decade of April." Those of March caused great losses (90%) of the nests "and disturbed the normal life of the colony for a day." All observers agree that Rooks are very social birds. "They live constantly in groups, set up breeding colonies of varying sizes, the young flocking in common roosts. Flocks are not marked by compactness in contrast to Jackdaws. The evening return to a roost is not a repetition of the morning flight. Above all it lasts twice as long." Rooks assembling from an extensive area may form a flock of several thousand. "The formation of any hierarchic organization in a flock of Rooks whose size may be almost unlimited, from several hundred to several thousand birds, is out of the question." Pinowski's term "passive cooperation," the rally of birds to a common pre-roosting place, is discussed. "Rooks eat everything they can swallow, not excluding indigestible rubber and plastic objects. They feed on vegetable and animal food, dead and alive, garbage and carrion. They choose sites for nesting according to criteria known only to themselves." A review of Rook literature in general supplements this article.—Leon Kelso.

ECOLOGY

(See also 8, 9, 23, 29, 50)

20. Species turnover rates on islands: dependence on census interval. J. M. Diamond and R. M. May. 1977. *Science*, **197:** 266–270.—Even if the authors had not used birds as the source of data, this paper would have merited a review. While it is intuitive to suppose that there is an inverse relation between turn-

over rate (T) and census interval (t), the relation is approximately logarithmic. The authors derive expressions for the "incidence" (asymptotic probability of a species being present at any random moment) and for the probability of a species immigrating or being extirpated, the equilibrium number of species present, the turnover rate and its coefficient of variation. The last decreases asymptotically to a constant value with increase of t.—C. H. Blake.

21. Factors influencing desertion of colony sites by Common Terns (*Sterna hirundo*). R. D. Morris and R. A. Hunter. 1976. *Can. Field-Nat.*, **90:** 137–143.—Common Terns are disappearing from the Great Lakes. Why? One colony vanished following several years of inadequate recruitment. Another colony experienced widespread reproductive failure, probably the result of PCB and DDE contamination. Overshadowing these isolated instances is the usurpation of nesting habitat by Ring-billed Gulls (*Larus delawarensis*), which nest earlier than Common Terns in locations used by terns. When the terns arrive to establish territories, they find the gulls already in possession. The expanding gull population requires more space every year and leaves less habitat open for terns. There is no overt competition between species; the gulls are simply winning the scramble for a limited resource.—Edward H. Burtt, Jr.

22. Vegetation associated with Kakapo (*Strigops habroptilus* Gray) in Sindbad Gully, Fiordland, New Zealand. P. Johnson. 1976. *New Zeal. J. Botany,* **14**(2): 151–159.—This flightless, nocturnal, browsing parrot is reportedly known from only a few individuals persisting in the Milford Sound area where the forests are mostly unmodified by introduced browsing mammals. In February 1975 three males had both courtship and "garden" territories at 600–900 m altitude at a gully head, where steep slopes, waterfalls, and avalanches largely determined the vegetation pattern. These courtship territories comprised foot-trodden trail and bowl systems in Silver Beech (*Nothofagus menziesii*) forest. A "kakapo garden" is described as a scrub-covered "debris fan," floristically very rich, apparently, in edible berry patches. Adjacent areas showing no signs of kakapo use are assessed as unsuitable for food or shelter. "It must be stressed that the three territories belong to male birds: the habitat requirements of female kakapo are unknown." There is a purported complete list of the vascular plants in the three territories' booming and feeding sites and in the area as a whole. "Considering the degree to which New Zealand vegetation has been modified by introduced browsing animals, it would be interesting to know how it developed in the presence of herbivorous birds, which are now mostly extinct. But these Sindbad Gully kakapo leave surprisingly little sign on the plants they use and seem to cause little modification of their habitat."—Leon Kelso.

WILDLIFE MANAGEMENT AND ECONOMIC ORNITHOLOGY

23. Harvesting natural populations in a randomly fluctuating environment. J. R. Beddington and R. M. May. 1977. *Science,* **197:** 463–465. This paper considers the effects of environmental randomness on the dynamics of animal populations. The mathematics developed should be useful in game management as well as in fishing and whaling. The aim is to show the bases for maximum sustained yield. This of course implies that there is a harvestable surplus. Simplifying assumptions are made as to the intrinsic net growth rate (logistic) and the rate of harvest (catch per unit effort linearly proportional to size of population). Conclusions: (1) the predictability of the catch tends to vary inversely with the catching effort, particularly if over-exploitation occurs, (2) "these effects are relatively more pronounced under a harvesting strategy that seeks to keep the yield constant," (3) if the "present value of discounted net revenue" is maximized there may be feedbacks that will tend to stabilize the system, (4) it is usually undesirable to use non-feedback policies (say maximum sustained yield) in resource management.— C. H. Blake.

24. Selectivity of range grass seeds by local birds. C. Goebel and J. Berry. 1976. *J. Range Manage.,* **29**(5): 393-395.—Relative to artificial seeding of arid rangelands in the Pacific Northwest, 25 bird species in the wild were offered a variety of grass seeds in feeding stations, "cafeteria-style." Small-seeded annual grass species proved more acceptable than the perennial forms

with larger akenes. "Thus, local bird preferences could indirectly contribute to the degradation of a range community." It was found that no natural repellent quality exists in the small-seeded species.—Leon Kelso.

25. The effect of Hooded Crows on hill sheep farming in Argyll, Scotland. D. Houston. 1977. *J. Appl. Ecol.*, **14:** 17–29.—Hooded Crows (*Corvus cornix*) are widely blamed by Scottish sheep farmers for killing young lambs and for pecking the eyes out of ewes when the ewes are "couped", i.e., on their backs and unable to right themselves because of their wool being wet and heavy or because of their being heavy with lamb. This study showed that the crows usually selected weak or starving lambs that would die even if not attacked by crows. Also, "couped" ewes normally soon die if not found and helped by the shepherd, and economic loss resulting from crows attacking "couped" ewes is negligible.—Paul A. Stewart.

26. Starling damage in vineyards of southeast Kazakhstan and analysis of acoustic repulsion results. (Vredononosnaya deyatelnost skvortsov na binogradnikakh yugo-vostoka Kazakhstana i analiz rezultatov ikh akusticheskogo otpugivaniya.) A. Semya. 1976. *Ornitologiya*, **12:** 160–165. (In Russian.)—The Rose-colored Starling (*Sturnus roseus*) and the Common Starling (*S. vulgaris*) have been objects of acoustic control operations in the Alma-Ata area. Damage to vineyard crops as high as 40% was reported. Experimental broadcasting of recorded "distress calls" over extensive vineyard plots was 90% effective against Turkestan Starlings. Here repellence was less effective on birds after perching (85%) than at the moment of their alighting (100%). Duration of repellent effect of broadcast varied according to time of day and location of section guarded. Strangely, it was markedly longer in the morning hours when the Starlings were hungry. Effectiveness of repellent signals was reduced when the Starlings were feeding in company with House Sparrows. Notwithstanding some favorable results through use of acoustic repellence, these operations were not considered thorough and adequate. They invited further investigation of observed geographic variations of responses to broadcasts of distress signals. Certain age differences in response to them have been evident.—Leon Kelso.

27. Starling (*Sturnus vulgaris* L.) predation on grass grub (*Costelytra zealandica* (White), Melolonthinae) populations in Canterbury. R. East and R. P. Pottinger. 1975. *New Zeal. J. Agri. Res.*, **18:** 417–452.—When aided by irrigation and grazing management, Starlings reduced infestations of grass grubs to population levels doing little damage to pastures. The authors concluded that economically acceptable control of grass grubs by Starlings may be possible in localized areas having large concentrations of these birds in autumn and winter.

In the southeastern United States, similar research is needed on the effect of Starlings in controlling green carib beetles (*Cotinus nitida*). My observations suggest that Starlings may be important agents limiting damage done by these insects, common pests on lawns, golf courses, and gardens. Thus far just about everyone, including the United States Fish and Wildlife Service and the National Audubon Society (*Audubon*, **78:** 118–125, 1976), has shown willingness to have blackbirds and Starlings killed without research first being done to determine whether the birds are more beneficial than harmful.—Paul A. Stewart.

CONSERVATION AND ENVIRONMENTAL QUALITY

(**See also 51**)

28. Mass mortality of birds of prey caused by Azodrin, an organophosphorus insecticide. H. Mendelssohn and U. Paz. 1977. *Biol. Conserv.*, **11**(3): 163–170.—Because Levant Voles (*Microtus guentheri*) had reached densities of 2400/ha, farmers in Israel sprayed alfalfa fields with Monocrotophos (Azodrin). Damage had been heavy with forage grazed down to soil level. Notwithstanding all advice, fields were sprayed from the air with Azodrin at higher concentrations than those recommended. There was no official interference.

Soon after spraying an 8 km² area in the winter of 1975–76, 150 raptors were found dead in the field, with 69 others paralyzed (they recovered). The original raptor population of 319 included *Aquila clanga, A. heliaca, Buteo rufinus, B. buteo, Milvus migrans, Circus aeruginosus, C. cyaneus, Falco tinnunculus, Asio flammeus, A. otus,* and *Tyto alba.* "This case shows that persistent organophosphorus pesticides may cause widespread secondary poisoning and may be as dangerous as, for example, thallium. As far as is known at present they do not, however, accumulate in the body as chlorinated hydrocarbons and metals do."—Leon Kelso.

PARASITES AND DISEASES

29. Effects of the haematophagous mite *Ornithonyssus bursa* on nestling starlings in New Zealand. R. G. Powlesland. 1977. *New Zeal. J. Zool.*, **4**: 85–94.—In an interesting article the author presents data showing an apparently long established, and relatively stable, host-parasite relationship, During a normally wet breeding season, heavy mite infestations of tens of thousands per nest box cause neither increase in mortality nor significant decrease in nestling weight. In a dry summer, heavy infestations did not increase mortality, but nestling weight did decline significantly. Although we all assume some negative impact from parasites, there are few studies like this showing the negative, yet not devastating, effect of an established host-parasite relationship.—C. J. Ralph.

PHYSIOLOGY

(See also 15)

30. Behavioural adaptations of the Jackass Penguin, *Spheniscus demersus* to a hot, arid environment. P. G. M. Frost, W. R. Siegfried, and A. E. Burger. 1976. *J. Zool., Lond.*, **179**: 165-187.—This study was directed towards establishing how Jackass Penguins, already well insulated against heat losses while swimming, cope with the heat loads encountered while nesting on hot arid African islands. Nests in burrows had less extreme temperature regimes than had surface nests, although the details varied with burrow orientation; the differences reflected in part the effects of wind and in part the effects of radiation. Burrow orientation depended primarily on the prevailing slope of the ground, but within this there were significant preferences for certain orientations.

The numbers of birds at the colonies were higher at night and lowest in the hottest, middle part of the day. Movements of birds between colony and beaches by day were mainly associated with periods of drinking, bathing, and preening, often in response to heat stress on the breeding flats. These flats were an average of 2.3 °C warmer than were the beaches. Most breeding activity (courtship, building, mating) took place at dawn and dusk, but chick feeding was mainly in late afternoon and evening. Incubation change-overs took place at dusk.

Body temperatures in a captive bird (measured by radio-telemetry) were higher on warm sunny days than on cool overcast days. Activity increased body temperature, but use of shade decreased it; burrows were particularly effective in this respect. Non-incubating birds oriented with their backs to the sun, except at mid-day, and this effect was not influenced by the wind direction. Other postural adaptations (exposure of axillae, resting on metatarsals to allow heat loss from feet, etc.) were also noted.

Frost et al. contrast the stability of aquatic thermal conditions with the instability of terrestrial environments and relate the permanency of morphological insulation and the flexibility of behavioral thermoregulation during incubation to these contrasting demands. The paper is a substantial contribution to the understanding of thermoregulatory demands during breeding.—Raymond J. O'Connor.

31. Response to CO_2 of intrapulmonary chemoreceptors in the Emu. R. Burger, P. Nye, F. Powell, C. Ehlers, M. Barker, and M. Fedde. 1976. *Respir. Physiol.*, **28**(3): 315–324.—"We conclude that intrapulmonary chemoreceptors in

the paleopulmonic lung of the Emu (*Dromiceius novaehollandiae*) exhibit similar characteristics to those in birds that possess varying amounts of neopulmonic parabronchi, such as the duck and chicken." It is accepted, here and elsewhere, that the latter represent a more modern evolutionarily advanced development, including one-directional air flow. This is a marked distinction between respiration of birds and mammals.—Leon Kelso.

32. Respiratory responses of ducks to simulated altitude. J. Colacino, D. Hector, and K. Schmidt-Neilsen. 1977. *Respir. Physiol.*, **29**(3): 265-281.—Domestic ducks were exposed to simulated altitudes of 3,000, 6,000, and 9,000 m to study respiratory change. Respiratory minute volume (VE, ptps) increased with altitude relative to increased respiratory frequency, whereas "tidal volume" was little changed. The quantity of air moved remained nearly unchanged with increasing altitude. "Research over the past decade has established that the air sacs of birds form a mechanical bellows system that permits a unidirectional flow of gas over the lung (paleopulmo). It is generally accepted that the unidirectional gas flow permits gas exchange to be more effective than would otherwise be possible, and thus play a primary role in altitude tolerance."—Leon Kelso.

33. Pulmonary arteriovenous anastomoses in the avian lung: do they exist? M. Abdalla and A. King. 1976. *Respir. Physiol.*, **27**(2): 187–191.—Fifteen experiments were conducted with adult "chickens" to analyze possible transfer of spores and microspheres through tissues of the venous section of the pulmonary cycle. No such anastomoses were found. It was concluded that they do not exist.—Leon Kelso.

34. Avian muscular dystrophy: functional and biochemical improvement with diphenylhydantoin. R. K. Entrikin, K. L. Swanson, P. M. Weidoff, G. T. Patterson, and B. W. Wilson. 1977. *Science*, **195**: 873–875.—This hereditary condition prevents a chick, placed on its back from righting itself, and is relieved by a combination of diphenylhydantoin and moderate exercise.—C. H. Blake.

35. Endothelial damage and thrombocyte adhesions in pigeon atherosclerosis. J. C. Lewis and B.A. Kottke. 1977. *Science*, **196**: 1007-1009.—The White Carneau breed of domestic pigeon is notable for spontaneously developing atherosclerosis at known sites in the arterial system. Thrombocytes (platelets) are involved in this condition. Fine scanning EM photographs of the lesions are presented.—C. H. Blake.

36. Thermal sensitivity of different skin areas in pigeons. R. Necker. 1977. *J. Comp. Physiol.*, A, **116**(2): 239–246.—Body temperature control in homeotherms is dependent both on core temperatures and skin temperatures. Weakly anesthetized pigeons regulated their body temperatures at hypothermic level. During recovery from anesthesia the birds shivered continuously at ambient temperature of about 22 °C. Moderate heating of the most sensitive areas of the back suppressed shivering. Feathered areas on back, wing, and breast showed decline of heat sensitivity in that order. "Graded stimulation was followed by graded response." There was no response at all to cooling bare areas of the feet. "The beak seems to have only a small thermal sensitivity . . . . The skin of the back turned out to be the most sensitive area."—Leon Kelso.

37. Egg size in relation to weight of egg-laying female *Turdus merula and Turdus philomelos*. J. Pikula. 1976. *Zool. Listy*, **25**(1): 65–72. (In English with Russian summary.)— Several authors, including Groebbels (1937), Van Tyne and Berger (1961), Welty (1964), Lack (1968), and Pettingill (1970), state that egg weight increases relative to weight increase of the female when comparing species of birds. "Unfortunately the only comparative data available pertain to domestic birds." A linear correlation was found between body weight and egg weight by analysis of a long series of measurements of Blackbird (*Turdus merula*) and Song Thrush (*T. philomelos*) in forest communities near Brno, Czechoslovakia. "On the first day of incubation after having laid the last egg in a complete clutch, the female was captured on her nest and weighed. At the same time the eggs laid by this female were weighed and measured." This inves-

tigation confirmed that, "Within the species, the mature birds of greatest body weight usually lay the largest eggs, and birds of lighter weight lay smaller eggs."—Leon Kelso.

38. The cold effect of catecholamine content of the large pectoral muscles in passerine birds. (O vliyanii kholoda na soderzhanie khatekholaminov v bolshoi grudnoi myshtse u vorobinykh ptits.) A. Davydov and V. Shlyapina. 1976. *Zhurn. evolyuts. biokhimii i fiziol.*, **12**(5): 477–479. (In Russian with English summary.)—It is understood that discharge of catecholamine and associated a noradrenalin into the muscular system enhances oxygen consumption and energy production requisite for sedentary birds' survival in sub-zero temperatures. For testing physiological mechanism of cold adaptation, four species (*Serinus canaria, Passer domesticus, P. montanus, Fringilla coelebs*) were kept in open-air cages in Leningrad during winter at −6 to −25 °C. They did not differ in catecholamine content from those of the first two species kept in laboratory conditions at −15 to −20 °C. However, for *P. montanus* repeated cooling to −10 °C only at night, doubled the catecholamine and, especially, the noradrenalin content in the pectoral muscles. This theoretically exerts a "calorigenic effect," a higher energy expenditure at that time.—Leon Kelso.

MORPHOLOGY AND ANATOMY

39. Amphibious visual optics of the eyes of the Double-crested Cormorant (*Phalacrocorax auritus*) and the Brown Pelican (*Pelecanus occidentalis*). J. G. Sivak, J. L. Lincer, and W. Bobier. 1977. *Can. J. Zool.*, **55:** 782–788.—The refractive state of the eyes of the two species was measured in air and water, their chromatic aberration determined, and the corneal radii of curvature in live and dead birds assessed. Refractive errors were essentially zero in air for both species, as in birds generally. Chromatic aberration was 0.75 to 2.00 diopters and thus inadequate to correct the refractive error on immersion in water. The refractive state measurements in water showed a considerable ability on the part of cormorants to correct for the hyperopia induced by immersion. This ability was eliminated by anesthesia in cormorants and was absent in pelicans. The cornea of neither species was unduly flattened. These results imply large accommodative ability in the cormorant but not in the pelican, a difference adaptive in relation to their respective pursuit and plunge-dive hunting strategies.—Raymond J. O'Connor.

PLUMAGES AND MOLTS

40. The development of juvenile plumage and postjuvenile molt of the Rustic Bunting in the Leningrad region. (Formirovanie yunosheskogo naryada i postyuvenalnaya linka ovsyanki remeza, *Emberiza rustica*, v leningradskoi oblasti.) T. Ryumkevich. 1976. *Zool. Zhurn.*, **55**(11): 1695–704. (In Russian with English summary.)—Plumage development during growth of young Rustic Buntings occurs mainly in two periods: nesting (first 12 days), when most of the feathers are developing, and post-nesting (about 20 subsequent days), when additional feather tracts emerge which are not replaced during the postjuvenal molt. In the Leningrad district this occurs about 15 June to 18 September. Early broods start and mostly complete the postjuvenal molt in the definitive juvenile stage, whereas later broods merge the close of juvenal plumage growth with the beginning of the postjuvenal molt. Captive young, exposed to photoperiods of 14 L: 10 D hours per day, molted at a faster rate, requiring 35 days on the average, than those exposed to 18L: 6 D hours per day (some subjected to 13.5 L: 10.5 D hours per day) whose more prolonged molt lasted about 60 days. An abundance of line drawings and diagrams traces individual feather growth and replacement on the main tracts of wing plumage.—Leon Kelso.

41. Photoperiodic regulation of the molt of Ortolan Buntings of the Leningrad region. (Fotoperiodicheskaya regulyatsiya linki sadovoi ovsyanki, *Emberiza hortolana* L., iz leningradskoi oblasti.) T. Ryumkevich. 1976. *Vest. Leningradskogo Univ., Biol. Div.*, **1976**(16): 19–25. (In Russian with English

summary.)—Experimental photoperiodic regulation was applied to juveniles and adults from nests in the Leningrad area. Molt started at 18 to 33 days of age and was not in pace with or under evident control of day length. Molt rate was more correlated with season, early or late, and markedly increased on shortening of daylight from 18 to 14 hours. During postnuptial molt with daylengths reduced from 18.5 to 10.15 hours, the adults replaced all their plumage except a few secondaries. On daylengths reduced from 17.5 to 12.5 hours there was only partial replacement on any of the main feather tracts. From mid-November and on through the winter the time and amount of prenuptial molt in both juveniles and adults was not regulated by photoperiod. Thus the experimental results were unpredicted. Buntings confined in October for 16-hour photoperiods began intensive molt in 7 to 14 days.—Leon Kelso.

42. Preliminary results of an ornithological exploration of the islands of Vitiaz and Dampier Straits, Papua, New Guinea. J. M. Diamond. 1976. *Emu*, **76:** 1–7.—In the Vitiaz and Dampier Straits, midway between eastern New Guinea and the Bismarck Archipelago at the western end of the Solomon Islands, lie the islands Umboi, Long, Tolokiwa, Sakar, Crown, Ritter, and their satellite islets. Here the avifauna from the Bismarck Islands mixes with the avifauna from New Guinea, and here less than 150 years ago volcanic eruptions destroyed the fauna and flora of Long and Ritter. In addition to studying the recolonization of Long and Ritter, Diamond found several species on Umboi that are endemic to the Bismarck archipelago. Diamond also reports the first record of the Pintail (*Anas acuta*) from the New Guinea region. He confirms that the Black-tailed Whistler (*Pachycephala melanura dahli*) and the Golden Whistler (*P. pectoralis citreogaster*) are separate species. Furthermore, Diamond's evidence suggests that the black myzomelid of the Bismarcks is related to the myzomelids of the Solomon Islands, not to *Myzomela nigrita* of New Guinea.—Edward H. Burtt, Jr.

43. Additional bird observations on the West Mirage Islands, Great Slave Lake, Northwest Territories. D. L. Trauger and R. G. Bromley. 1976. *Can. Field-Nat.*, **90:** 144-148.—Since 1922, 65 species of birds have visited or bred on the West Mirage Islands. Of 30 species that bred on the islands in the past, only 19 species nested or reared young between 1968 and 1973. Seven species that formerly nested on the islands were observed between 1968 and 1973, and all but the Hudsonian Godwit (*Limosa haemastica*) probably bred on the islands. Four species that formerly bred on the islands no longer occur there, and three species now breeding on the islands were unrecorded prior to 1968.—Edward H. Burtt, Jr.

SYSTEMATICS AND PALEONTOLOGY

(See 42, 53)

EVOLUTION AND GENETICS

44. Plant-animal mutualism: coevolution with Dodo leads to near extinction of plant. S. A. Temple. 1977. *Science*, **197:** 885–886.—In 1973, the population of a large sapotaceous tree (*Calvaria major*), endemic to Mauritius, consisted of 13 individuals, estimated to exceed 300 years in age. The seeds produced did not germinate. The woody endocarp may reach 15 mm in thickness and cannot be reptured by the embryo. The pits have been found in association with Dodo (*Raphus cucullatus*) remains. Calculations are given to show that the Dodo could abrade or weaken the endocarp in its strong gizzard, permitting germination of the seed. Nuts were force-fed into turkeys, 10 were recovered, reduced in size but uncrushed. Three of these germinated.—C. H. Blake.

45. The genetics of bridling in Guillemots from a study of hand-reared birds. D. J. Jefferies and J. L. F. Parslow. 1976. *J. Zool., Lond.*, **179:** 411–420.—The Guillemot (*Uria aalge*) dimorphic over its Atlantic range, with a "normal" morph and a "bridled" variety, distinguished by a white orbital ring from which a white line runs down a furrow behind the eye towards the nape.

Jefferies and Parslow report here the important discovery that the bridle develops in young guillemots from 54 to 66 days after hatching, although it is later lost temporarily in first winter plumage, eclipsed by the white feathering of the neck in that plumage. Working from sex-ratios of birds dissected in the course of pollution studies, they show the gene concerned must be autosomal rather than sex-linked. Finally, using eight hand-reared birds of known parentage, they show the data are compatible with bridling being a recessive variant. Some rather tatty data on the growth rates of some 19 hand-reared birds suggest that bridling was not linked with any obvious difference in growth rate or energetic efficiency.

This paper is significant in getting away from the older field survey approach developed by Southern in the late 1930's and coming to grips directly with the breeding genetics of bridling. Jefferies and Parslow are perhaps lucky in observing the key matings they required for a definitive conclusion, given their small sample of pairings, but at least they looked for pairings and their outcome. They themselves acknowledge there remains the possibility of multiple-allelic inheritance (which would not be identifiable on their sample size) but justifiably resort to Occam's Razor. Their demonstration that bridling is recognizable at 8 weeks, not at 8 months as previously thought, opens the way for systematic studies of the subject by anyone wishing to argue the case.—Raymond J. O'Connor.

46. A discrete mathematical model of the speciation process. (Diskrethaya matematicheskaya model protsessa vidoobrazovaniya.) V. Kovrov and D. Kosolapova. 1977. *Zh. Obschei Biol.*, **35**(3): 359–364. In Russian with English summary.)—The likelihood of speciation directed through preference for certain foods was analyzed by mathematicians of the Kirensky Institute of Physics. May there exist within a population inherent preferences for foods to which individuals are most attracted? It was found that a definite regime of intake maintains a dominant role in evolutionary trends. With a regular feeding procedure a stable speciation course is feasible, as illustrated and indicated by the authors' mathematical modeling. With random irregularity of feeding under intense competition for food, speciation may be retarded or impossible.—Leon Kelso.

FOOD AND FEEDING

(See 10, 16, 19, 24, 46, 49)

SONGS AND VOCALIZATIONS

(See also 17, 26)

47. Preliminary studies in acoustic orientation in *Collocalia spodiopygia*. J. Roberts, D. Smyth, and A. Spain. 1976. *Search* (Sydney, Australia.), 7(3): 97–98.—The Gray Swiftlet lives in totally dark caves but is a diurnal forager. Observations in the wild were supplemented by sound analysis of five captive individuals. Vocalization took three forms: (1) Calls, fundamental frequency of 2 kHz, with "bulk of energy" at 5 to 8 kHz, (2) "Screeches," emitted during apparent conflicts over roosting sites in caves, mostly of 4 to 6 kHz energy, and (3) Echo-locating "clicks," mostly of 4 and 9 kHz but ranging from 2 to 16, given in a dual or paired sequence. Rate of pulse emission increased as a bird neared a solid surface or was disturbed. Recorded pulse intervals ranged from 0.066 to 0.104 seconds. "Further study of the acoustic orientation process, while intrinsically interesting, may also assist in the development of low-frequency navigating devices for the blind. . . .Firstly the mechanism whereby the sounds are produced remains unknown. Also, what features of the calls allow an individual to recognize its own echoed pulse? Perhaps the most pertinent question is the reason for the evolution and maintenance of the ability to echonavigate." A high and constant level of activity is maintained at night in the dark cave roosting sites, suggesting that sonar echoes may serve to maintain normal social interaction.—Leon Kelso.

MISCELLANEOUS

48. The use and misuse of the coefficient of variation in analysing geographical variation in birds. D. D. Dow. 1976. *Emu*, **76:** 25–29.—Is the culmen length of a Willow Flycatcher (*Empidonax trailii*) more variable than the culmen length of the Alder Flycatcher (*E. alnorum*)? Are there morphological reasons to maintain the separate status of the Rose-breasted (*Pheucticus ludovicianus*) and Black-headed (*P. melanocephalus*) grosbeaks? Answers to such questions depend on comparisons of the frequently misused, misunderstood coefficient of variation. Hence,the article opens by explaining how to calculate and use the coefficient of variation. The author stresses the criteria, often neglected, for deciding whether a statistical test is one- or two-tailed. Dow then shows how to calculate the standard error of the coefficient of variation, which enables him to use the *t*-test as a comparative statistic. However, the *F*-test, suggested by Lewontin (*Syst. Zool.*, **15:** 141–142, 1966), appears to be a more powerful statistic for comparison of coefficients of variation. Nonetheless, both the *F*-test and the *t*-test are insensitive to differences in coefficients of variation calculated from small samples. When small samples are used, transformation of the original data to logarithms before analysis results in the most powerful test.—Edward H. Burtt, Jr.

BOOKS AND MONOGRAPHS

49. Sexual Size Dimorphism in Hawks and Owls of North America. N. F. R. Snyder and J. W. Wiley. 1976. *Ornithol. Mongr.*, No. 20. 96 p. $7.50.—This is an interesting paper, and some significant contributions to raptor biology are presented. Although their treatment and analysis are original, only about one half of the materials given is new whereas the remainder is either a review or re-analysis of existing literature data. The nature of the material and the manner of presentation, however, made some sections arduous reading.

Major sections deal with (1) the correlation of dimorphism with diet, (2) correlations with predation on birds, (3) female size superiority, (4) disadvantages of sexual size dimorphism, and (5) a discussion of species that diverge from the correlation with bird predation. There proved to be a rather clear and highly significant correlation between the degree of dimorphism and the presence of birds in diet: the more birds, the greater the dimorphism. A plot showing amount of mammals as food in relation to the degree of dimorphism is of interest. Raptors with the same degree of dimorphism showed a range of less than 10% to 100% mammal utilization in their diet. There was no correlation between dimorphism and vertebrates in general in the diet.

The second section, correlation with predation on birds, contains the majority of the new data, mainly from Snyder's work on the Cooper's Hawk (*Accipiter cooperii*, in Arizona. Dr. Snyder and his wife Helen have accumulated some most exciting and useful data on *A. cooperii* from Arizona, and in many respects it is unfortunate that this monograph was not simply a presentation of those data plus the related data on congeners. The strength of the conclusions in this section relies in part on the fact that there were good breeding bird biomass data (mainly passerine) from eight different habitats within Arizona (R. Balda, Ph.D. dissertation, Univ. of Illinois). Some of these habitats, and presumably their avian biomasses, are virtually translatable to the author's main study sites. The data on avian biomass are particularly useful to Snyder and Wiley in the analysis of the distribution of prey species taken by the Sharp-shinned Hawk (*A. striatus*). For example, within the riparian canyon habitat the deviation between the expected (as judged from the known biomass data) and observed frequency of prey items for the various size classes of birds that the hawk takes (bushtit to robin size) varied from a -2.1 to a $+3.2$ for the male and -5.6 to $+2.6$ for the female. Such data are exceptionally nice because a shortcoming of most raptor work is the fact that the people studying the raptor have no handle on the prey base. This study does not suffer from that deficiency.

Some data were presented that suggested a clear timing of egg laying with the presence of a migrant bird food base, although timing of nest building was not affected by the appearance of that prey base. Unfortunately no rigorous analysis could be made because of the lack of an adequate sample size. Small

sample sizes often plague raptor work, however, and so it was to be expected. Many of the suggestions made regarding food relationships are also necessarily based on small sample sizes. One well designed experiment demonstrated that feeding rates did not change as young were purposely added to or taken from nests. Most of the decline in the feeding rates of young in both *Accipiter* and *Buteo* took place late in the breeding season.

Based, then, on their data on the division of labor between sexes, the relationship between prey populations and timing of breeding success or reproductive losses and various food related parameters, the authors generate their theory of sexual size dimorphism. Basically, the theory argues that the extent of dimorphism depends most critically on the regularity with which the species is stressed by food shortages during the latter part of the breeding season when both sexes are foraging. Their model suggests that bird prey species are much less available than mammals during this time period. The greater late season decline in bird prey is hypothesized to produce a greater degree of dimorphism in raptors utilizing avian prey than in mammal-eating species: a food base partitioning, as it were, because of food shortages. They conclude that the reversal in size dimorphism may be a chance effect but is more likely related to advantages in copulation, incubation, brooding, and nest defense by larger females. Data suggesting these latter ideas are certainly not convincing.

In general, their discussion of the various theories of reversed dimorphism (e.g., courtship advantages, larger eggs) adds little information to these hypotheses over their present form. For example, under the existing hypothesis that nest defense is better accomplished by a larger female, we are left wondering why a thrush, sparrow, or heron does not gain the same advantage and thus show a similar reversed dimorphism trend. What I find distracting is that, aside from generating yet another hypothesis on sexual size dimorphism, it is difficult to test rigorously much of the information given. Most of the incongruities that I found in their analyses are known to the authors, who mention them in the final few pages. For example, they suggest that food habit data are biased by studying prey remains at nests. True enough. They then say that to avoid this bias they have used stomach contents to derive food habits, i.e. percent mammals vs. percent birds vs. percent invertebrates, etc. Their entire data on the Peregrine Falcon (*Falco peregrinus*) were drawn from U.S. Fish and Wildlife Service files. Based on the stomach contents they conclude that 20% of the peregrines' diet is invertebrates. This derives from the fact that much of the peregrine stomach material comes from autumn migrants, and the invertebrates are simply from the stomachs of the prey that peregrines have eaten. Further, how can one draw rather rigorous conclusions about breeding season food habitats (since their theory is based on the breeding season) by studying nonbreeding birds (although in the case of the peregrine they are probably very nearly the same)? They make the same error on the Prairie Falcon (*Falco mexicanus*) and show that 45% of the diet is invertebrates. Thus, they seemingly fall into the very trap they try to avoid, even though their basic assumption may be valid as I have seen to some degree in studying the Bald Eagle (*Haliaeetus leucocephalus*).

Perhaps a detailed analysis of those bird groups not showing the reverse dimorphism but that fill a similar niche or do similar jobs as do some raptors (e.g., shrikes, herons) is in order to offer greater credence to the various hypotheses. They suggest that the Osprey (*Pandion haliaetus*) and the Mississippi Kite (*Ictinia mississippiensis*), because they are most divergent from the dimorphism vs. bird-feeding correlation, are logical species to be studied to lend support to their hypothesis. Perhaps this should have been done before writing the monograph.

All in all this is a worthwhile paper. The major value and contribution are in the new data they present from their field studies on breeding accipiters and buteos.—Clayton M. White.

50. Social Organization and Behavior of the Acorn Woodpecker in Central Coastal California. Michael H. MacRoberts and Barbara R. MacRoberts. 1976. *Ornithol. Monogr.*, No. 21. 115 p. $7.50.—The Acorn Woodpecker (*Melanerpes formicivorus*) surely is one of the very few non-rare, nongame bird species to have inspired national (see *Condor*, **76:** 230–231, 1974) and now international (held Spring 1977) symposia. This monograph, based on a partly color-banded population at Hastings Natural History Reservation, Monterey County, California, helps the uninformed to understand why Acorn Woodpeckers elicit

such enthusiasm. Basically, two attributes, shared with the eusocial hymenopterans, set these birds apart. First, they exhibit a communal social system, wherein nonbreeding group members participate in incubation, brooding, and feeding of nestlings and fledglings. Although this kind of sociality is now known to be rather widespread in tropical regions, it is rare in the north temperate zone. Second, the woodpeckers achieve this complex social organization by reducing annual fluctuation in their food supplies. This is accomplished by cooperative storage and defense of thousands of acorns in specially developed storage trees or "granarys."

The first 33 pages of the monograph deal with the feeding ecology of the woodpeckers. The relationships among acorns, storage sites, and the communal social system are clearly presented, and the reader easily develops an appreciation for the interplay between ecology and social behavior.

A second major aspect of this study is a consideration of the adaptive significance of communality. The authors attempt to analyze relationships between group size and territory size, and between group size and number of storage holes. These results suggest that larger groups are better able than smaller groups to hold, or to take by strength of numbers, prime resources (e.g., acorn-laden oaks, granary trees).

The authors' attempts to answer basic questions about the communal breeding system of this species are only partly successful, as they state. Parentage was not determinable by the methods used, nor did the authors choose to analyze intra-group relationships on the basis of probable parentage (e.g., the male that remained overnight with the nestlings probably was their parent - to judge from other woodpecker species). Thus no conclusions, even tentative ones, were established as regards the role of kin selection in the evolution of communality in Acorn Woodpeckers, other than a statement to the effect that groups are probably composed primarily of individuals that are close relatives. I felt that here the authors were perhaps overly cautious.

The stability of the territorial system of these woodpeckers was disturbed by infrequent complete failure of acorn crops. When this occurred territories were deserted. Often entire stocks disappeared; sometimes they returned, and sometimes new, often unidentified groups moved in. In either case the same territories, with their acorn-producing oaks, granary trees, and roost sites were held year after year by one group or another. New territories were not developed during this study. These observations suggest that suitable space and especially the particular resources within the territories (e.g., granary trees) are major factors influencing the evolution of this form of sociality (see J. L. Brown, *Amer. Zool.*, **14:** 63–80, 1974).

Two long appendices deal with displays, primarily vocal, and group compositions and histories, respectively. These sections provide much important information, at least some of which could have been more completely synthesized and presented in the main body of the monograph. For example, an overview of vocal communication, emphasizing the graded nature of many calls and relating this in at least a loose way to the communal social system would have provided the reader with some feeling for this aspect of Acorn Woodpecker behavior. As another example, inter-flock movement, which is an important aspect of communal social systems, in inadequately considered here. Although firm conclusions concerning patterns of movements probably could not be drawn, due to disappearances of individuals and whole flocks, and due to the number of unbanded birds in the study flocks (about 133 of the members of the 24 study flocks were unmarked), a more thoughtful consideration of this topic was warranted. Something could have been written about numbers of emigrants per flock and flock size, or about the fact that emigrants usually traveled in twosomes of the same sex.

The decision not to offer explanations concerning the adaptive significance of various phenomena, together with unanswered questions concerning parentage of young and intra-group genetic relationships in general, left me with a mild feeling of dissatisfaction. One wants to know more about these birds, and it sometimes appears that the authors could have extracted more information (or provided more in the way of strong inferences) from the data. Since they did not do so, the appendices are especially valuable.

To sum up, this is a well and interestingly written study of a fascinating bird. Fortunately for Acorn Woodpecker enthusiasts, some important questions remain unanswered. And, because the adaptive significance of avian communality still is not well understood for any species, this study provides valuable insights, and

some possible answers, to more general sociobiological questions that extend beyond Acorn Woodpecker biology per se.—J. David Ligon.

51. Rare, Endangered, and Little-known Birds of USSR. (Redkie, ischeziyushchie, i maloizuchenye ptitsy SSSR.) A. Vinokurov, Ya. Sapetin, and S. Priklonskii, Eds. 1976. Central Laboratory of Nature Conservation, USSR Ministry of Agriculture. Transactions of Oksk State Reserve, No. 13. Moscow. 224 p. (In Russian, price uncertain.)—For each of 30 species this small, pocket guide includes a black-and-white drawing, an elementary map of its range, a descriptive paragraph on its common characters, range, and status, and a life history summary, insofar as known, by an author who has observed the species for some time. Other authors give brief statements on the species' status in their particular areas. The 30 species, using the book's common and Latin names, are: Red-faced Cormorant (*Phalacrocorax urile*), Japanese Crested Ibis (*Nipponia nippon*), Eastern White Stork (*Ciconia boyciana*), Barnacle Goose (*Branta leucopsis*), Red-breasted Goose (*Rufibrenta ruficollis*), Bar-headed Goose (*Eulabeia indica*), Swan Goose (*Cygnopsis cygnoides*), Chinese Merganser (*Mergus squamatus*), Yellow-legged Button Quail (*Turnix tanki*), Japanese Crane (*Grus japonensis*), Siberian White Crane or Sterkh (*G. leucogeranus*), White-naped Crane, (*G. vipio*), Hooded Crane (*G. monacha*), Ibis Bill (*Ibidorhyncha struthersii*), Spotted or Nordmann's Greenshank (*Tringa guttifer*), Solitary Snipe (*Gallinago solitaria*), Least Whimbrel (*Numenius minutus*), Australian Curlew (*N. madagascariensis*), Asiatic Dowitcher (*Limnodromus semipalmatus*), Red-legged Kittiwake (*Rissa brevirostris*), Ross's Gull (*Rhodostethia rosea*), Aleutian Tern (*Sterna aleutica*), Rhinoceros Auklet (*Cerorhinca monocerata*), Tibetan Sandgrouse (*Syrrhaptes tibetana*), Scaly-bellied Green Woodpecker (*Picus squamatus*), Mongolian Skylark (*Melanocorypha mongolica*), Henderson's Ground Chough (*Podoces hendersoni*), Hodgson's Bushchat (*Saxicola insignis*), Yellow-browed Bunting (*Emberiza chryzophris*), and Jankowski's Bunting (*E. jankowskii*). It is readily apparent that most of these species are nonpasserine (all but five), of comparatively large size, predominantly inhabiting wetlands, of inland and far-eastern distribution, and with limited, fragmented, and disjunct ranges. The numerous contributors take the opportunity to record much general life history information on these species. For example, the discussion on the Siberian White Crane takes 22 pages, and much of it is new.—Leon Kelso.

52. Sex and Age Key of Passerine Bird Fauna, USSR: A Manual. (Opredelenie pola i vozrasta vorobinykh ptits fauny SSSR. Spravochnik.) N. Vinogradova, V. Dolnik, V. Efremov, and V. Paevskii. V. Ilichev, Ed. 1976. "Nauka" Press. Moscow. 189 p. (In Russian. Price uncertain, about 91 kopecks.). —This is the most comprehensive USSR text on bird-banding, assembled in correlation with a variety of texts on the subject that have been appearing in recent years, including the works of Drost, 1951; Arnheims, 1968; Cornwallis and Smith, 1960; Williamson, 1960, 1962, 1964; and Svensson, 1970. It is designed for use of professional zoologists engaged in banding, instructors, and graduate students employed in research. There is a foreword, an introduction, and sections on directions for banding, for examination and measurements of living birds with illustrated definitions of the terms employed, descriptions of sex and age characters, modes of *in vivo* examination of birds, and methods of semiquantitative modes of analysis of molting data. This latter involves estimation of extent of molting progress by the weight of feathers molted, a rather complicated and controversial method. Even more problematical is the final section and main body of the work, which includes for nearly all the USSR passerines the extreme and average measurements of wing (folded) and tail, proposed as definitive of ages and sexes throughout the seasons. The extent of overlap as shown appears too broad for assurance of reliability. A "nice try" is suggested in respect to the extensive experience and labor of the authors concentrated here. The 10 illustrations for aiding bird-banders' work are well-planned and serviceable. The importance of the devotion, training, and experience of the individual research worker is emphasized throughout.—Leon Kelso.

53. Catalogue of Birds, USSR. (Katalog Ptits, SSSR.) A. I. Ivanov. 1976. "Nauka" Press. Leningrad Division. Leningrad. 275 p. (In Russian. Price uncertain, about $5.00.)—This may be compared conveniently with the L.

Stepanyan book, reviewed in *Bird-Banding* (**45**: 89, 1977), "Composition and Distribution of USSR Avifauna. Non-passeriformes." Unlike the latter this covers the whole avifauna with complete detailed ranges of all species but not of subspecies. No diagnostic characters of any taxons are given. Two special features are a statement of biotope preference and a history of occurrence in case of rarities. There are indices of Russian and Latin names, the latter including more recent synonyms.—Leon Kelso.

54. Not As the Crow Flies. T. Shortt, 1975. McClelland and Stewart Limited, Toronto, Canada. 255 p. Illustrated by the Author.—Of books about birds there seems no end, as has been noted before, but of books about "birders," revealing themselves(?), rather few. The lifetime of work by the author in world-wide exploration, in assembling collections and exhibitions, in wildlife study and photography, and in other roles for the Canadian Museum must be too well known in natural history circles to need remark. But readers at large must be impressed with the scope of pictorial and verbal vignettes from scenes on voyages, such as, northern Canada, Nascopie, Klondike, Alaska, Mexico, Trinidad, Ecuador and Galapagos, India, and African Expeditions. "I was eleven years old. The big double-barreled Liege twelve-guage shotgun kicked violently and the thunderous explosion rocketed through the woods. Up near the top of the tall, slender poplar the crow swayed for a second, then plummeted straight to the ground." If any flavor lingers which would lessen the taste for the book the shooting and collecting, graphically described, might be the cause. Provision of an index to species and biotopes, of birds in particular, would amply facilitate the book for all naturalists' use.—Leon Kelso.