J. Field Ornithol., 62(4):528–539

RECENT LITERATURE

Edited by John A. Smallwood

MISCELLANEOUS

1. Maximum dive depths attained by auks feeding young on the Isle of May, Scotland. M. P. Harris, H. Towll, A. F. Russell, and S. Wanless. 1990. Scottish Birds 16: 25–28.—Maximum dive depths were measured by means of inexpensive gauges attached to the upper-back feathers of 13 Common Guillemots (*Uria aalge*), 12 Razorbills (*Alca torda*), and 10 Atlantic Puffins (*Fratercula arctica*). Each gauge consisted of a 10-cm length of flexible plastic tubing (1.6 mm internal diameter) marked at 1-cm intervals, sealed at one end, and lined internally with a thin layer of soluble indicator (powdered sugar). As the gauge is carried underwater, pressure forces liquid into the tube, melting the sugar. Maximum depth (in meters) was calculated by the equation $d = 10.08 (L_i/L_f - 1)$, where L_i and L_f are the initial and final lengths of indicator in the tube. Repeated submergences of the gauges to a constant depth, however, may allow additional water to be forced into the tubes, resulting in overestimation of depth. The authors were able to overcome this problem by reading the gauge with a 60× telescope upon each bird's return from a single foraging trip. Median depths recorded for guillemots was over 40 m, and ranged from 10–52 m. Razorbills dove from 14–32 m deep (median value was 23 m) and puffins dove from 21–33 m deep (median value was 25.5). [Inst. of Terrestrial Ecology, Hill of Brathens, Banchory, Aberdeenshire AB31 4BY Scotland.]—J. A. Smallwood.

2. Censusing of diurnal raptors in a primary rain forest: comparative methods and species detectability. J. M. Thiollay. 1989. J. Raptor Res. 23:72–84.—As part of his study of falconiform raptors inhabiting the lowland rain forest of French Guiana, the author employed four survey methods: (1) mapping the movements of soaring territorial pairs, (2) the number of individuals concurrently seen flying over a definite area, (3) mapping the movements of birds seen or heard in the understory, and (4) an understory strip census. In this paper, the methods are compared and recommendations are made in regard to various forest species. The first method was appropriate for Gray-headed Kites (*Leptodon cayanensis*), Hook-billed Kites (*Chondrohierax unicinatus*), Rufous-thighed and Double-toothed Kites (*Harpagus diodon* and *H. bidentatus*), Tiny and Bicolored Hawks (*Accipiter superciliosus* and *A. bicolor*), Gray-bellied Goshawks (*A. poliogaster*), White Hawks (*Leucopternis albicolis*), Great Black-Hawks (*Buteogallus urubitinga*), Crested Eagles (*Morphnus guianensis*), Black-and-White Hawk-Eagles (*Spizastur melanoleucus*), Black Hawk-Eagles (*Spizaetus tyrannus*), and Ornate Hawk-Eagles (*S. ornatus*). An instantaneous count was appropriate only for Cathartid vultures and American Swallow-tailed Kites (*Elanoides forficatus*). For most species, the author recommends using several complementary methods; however, the forest-falcons (*Micraster* spp.) and caracaras (*Daptrius* spp.) were censused effectively by only one method each, mapping understory movements and the strip census, respectively. Because of differences in species detectability, an abundance index (such as mean number of individuals observed per hour) is comparable within but not between species. [Lab. d'Ecologie, E.N.S., 46, rue d'Ulm, 75230 Paris, Cedex 05, France.]—J. A. Smallwood.

BANDING AND LONGEVITY

(see also 7, 10, 22)

3. The Bartos trap: a new raptor trap. R. Bartos, P. Olsen, and J. Olsen. 1989. J. Raptor Res. 23:117–120.—This paper describes the construction and use of a trapping device developed by the senior author. The Bartos trap is a new member of the family of automatically triggered bow nets. The trap differs from other bow nets in that the bow mechanism is located at the top of a funnel shaped enclosure. The trap consists of two compartments: the upper compartment is open on the top and has the trigger mounted on its base, while the lower compartment holds the lure animal. The trap has several advantages over other bow netting systems. The trap may be set in a variety of configurations on the ground or suspended in the air. When sprung, the captured bird is enclosed in the top

compartment. When the trap is set above ground, the captured bird should be fairly safe from predators; therefore, this set need not be continuously monitored. The trap is inexpensive, lightweight, and collapsible. [Lot 5 Lamont Close, Mardi, NSW 2259 Australia.]—J. A. Smallwood.

MIGRATION, ORIENTATION, AND HOMING

(see also 21, 22, 24)

4. Sunset orientation of Robins, *Erithacus rubecula*, with different fields of sky vision. R. Sandberg. 1991. Behav. Ecol. Sociobiol. 28:77–83.—The author conducted a series of orientation cage experiments on migratory Robins in Sweden from early September through the first week of November in 1987–1988. The focus was to determine whether these birds use visual and nonvisual orientation cues differentially depending on the particular migratory situation they experience. Robins tested with the visible sky section reduced to 90° around the sunset zenith exhibited a mean orientation almost precisely towards the average sunset azimuth, with little scatter around the mean angle. Conversely, when the birds had a more extensive view of the sunset sky (160°), they oriented in a north-south distribution significantly different from the reduced sky vision and from the average sunset position ($P < 0.05$ in both cases). Among birds exposed to the limited sky, no significant differences in mean migratory direction or in concentration of headings were detected between early and late tests (run before vs. after 7 October). However, birds exposed to the 160° horizon yielded a significant difference in mean orientation between early and late tests ($P < 0.02$), but not in scatter of headings ($P > 0.05$). In addition, experiments using mirrors to create a counterclockwise deflection of visual sunset cues resulted in a clear deflection of preferred directions by Robins from a southwesterly mean orientation toward more easterly headings. These results indicate the importance of either an unrestricted view of the sunset sky or, more specifically, of visual information close to the horizon in order for Robins to achieve accurate migratory orientation. Differences in the orientation behavior of birds exposed to different manipulatory effects of the magnetic field suggest that their migratory cues may vary depending on the specific circumstances associated with the migratory effort. [Dept. of Ecology, Univ. of Lund, S-223 62 Lund, Sweden.]—Danny J. Ingold.

5. Inheritance of migratory direction in a bird species: a cross-breeding experiment with SE- and SW-migrating Blackcaps (*Sylvia atricapilla*). A. J. Helbig. 1991. Behav. Ecol. Sociobiol. 28:9–12.—Young of the year of many migrating passerine bird species are able to migrate long distances to species- or population-specific wintering grounds. The author crossbred hand-raised Blackcaps from Germany (near Frankfurt/M. and Radolfzell) and eastern Austria (a total of 16 pairs) in order to study the mode of inheritance of their autumn migratory behavior patterns. The F1 offspring ($n = 68$) oriented toward mean directions that were significantly different ($P < 0.05$) from both parent populations. The directional choices of the F1 hybrids were not significantly linked to the sex of their respective parents, nor were there any significant differences in mean orientations among siblings versus non-siblings. The data show that population-specific migratory directions in the Blackcap have a genetic basis which can be altered by cross-breeding. Moreover, since the F1 generation was phenotypically intermediate between both parental groups, there likely is a polygenic basis to the trait (or less likely a single locus without dominance). [Max-Planck Inst. für Verhaltensphysiologie, Vogelwarte Radolfzell, W-7760 Möggingen, Germany.]—Danny J. Ingold.

6. Shorebird migration at artificial fish ponds in the prairie-forest ecotone of northwestern Arkansas. K. G. Smith, J. C. Neal, and M. A. Mlodinow. 1991. Southwest. Nat. 36:107–113.—Migrating shorebirds were monitored at a 23.2-ha fish hatchery in Benton County from March 1981 through September 1988 in order to deterine species occurrence and the relative abundance and frequency of each species. Twenty-five species occurred during spring most years, and most of these passed through the region between mid-April and late May. Semipalmated, Least, White-rumped, and Stilt sandpipers (*Calidris pusilla, C. minutilla, C. fuscicollis,* and *C. himantopus*, respectively) were most numerous, while Killdeer (*Charadrius vociferus*), Lesser Yellowlegs (*Tringa flavipes*), Common Snipe

(*Gallinago gallinago*), and Least, White-rumped, and Semipalmated sandpipers were the most frequently observed spring species. Twenty-three species occurred during fall migration, mostly in August and September. The most abundant fall species was the Pectoral Sandpiper (*Calidris melanotos*), while Killdeer, Least and Pectoral sandpipers, and Common Snipe were observed most frequently. Fall migration occurred over a longer period of time than spring migration due to adults of many species migrating first followed later by juveniles in the fall. Some species, including the Lesser Golden-Plover (*Pluvialis dominica*), Willet (*Catoptrophorus semipalmatus*), Short-billed Dowitcher (*Limnodromus griseus*), Wilson's Phalarope (*Phalaropus tricolor*), and Semipalmated, Least, Stilt, and Baird's (*Calidris bairdii*) sandpipers, had larger peak numbers in spring than in fall. These species are trans-Atlantic migrants during fall and usually migrate east of the Great Plains. This study demonstrates the importance of artificial bodies of water which serve as secondary stop-over sites for migrating shorebirds. [Dept. of Biological Sciences, Univ. of Arkansas, Fayetteville, AR 72701 USA.]—Danny J. Ingold.

7. Fall movement of Black-capped Chickadees analyzed through banding re-encounters. E. W. Brooks. 1991. N. Am. Bird Bander 16:1–8.—The author examined all (n = 83) records of Black-capped Chickadees (*Parus atricapillus*) banded during fall (here defined as 1 August to 12 January), 1922 through 1988, and re-encountered in a different 10-minute block the same season. Movement patterns during years of chickadee irruptions were compared to those of nonirruptive years. Short distance movements (less than 20 km) were analyzed separately from longer distance movements. The number of re-encounters in irruptive years was twice that of nonirruptive years, both for short and long distance movements. For long distance movements, the average distance moved during irruptive years (234 km) was greater than that during nonirruptive years (96 km), as was the average rate of movement (5.9 versus 2.6 km/day). In the northeastern United States, movements of hatching year (HY) birds were compared to those of older (after hatching year, AHY) birds. The author concludes that most HY birds took a coastal route while AHY birds were equally likely to take a coastal or inland route.

The author suggests that the results of this study differ from several other reports relating to fall migration in chickadees. One quarter of the known-age birds which underwent a long distance movement were AHY birds; this is contrary to a cited suggestion that only HY chickadees migrate. Six (27%) HY birds in the Northeast took inland routes while four (57%) AHY birds took coastal routes, contrary to the generalization that adults move inland while HY birds travel along the coast. Also, movements occurred between 1 November and 7 January in nine (11%) of the birds which moved. The author expresses "skepticism of studies which based survival rates of chickadees on site tenacity between 1 November and 1 March" (i.e., Brittingham and Temple, 1988, Ecology 69:581–589).

The importance of these conclusions is difficult to assess due to sample size considerations. In regard to age specific migration routes, the trend found in this study was, in fact, that HY birds were more likely than AHY birds to follow the coast; however, this difference was not significant (Fisher's exact test, P = 0.89). Given the relatively small sample size (n = 29), the reader should be particularly cautious in drawing inferences based on failing to reject the null hypothesis. In regard to movements during the period 1 November to 1 March, only nine of "nearly 15,000" re-encounters indicated movements beyond the 10-minute block during that period. The reader is not told how many total re-encounters occurred during that period; it is possible that movement then is extremely rare. [1435 Waterwells Rd., Alfred Station, NY 14803 USA.]—J. A. Smallwood.

POPULATION DYNAMICS

(see 14, 17, 19)

NESTING AND REPRODUCTION

(see also 10, 12, 14, 16, 23)

8. Natural history of the American Kestrel in Venezuela. T. G. Balgooyen. 1989. J. Raptor Res. 23:85–93.—American Kestrels (*Falco sparverius*) were studied in western

Venezuela from December 1982 to May 1983. Thirty-six kestrels were collected for morphometric data. These kestrels were smaller than North American kestrels (e.g., mean weights for males were 95.0 versus 103.7 g, and for females 108.1 versus 117.7 g), but exhibited sexual size dimorphism similar to that of northern birds. The breeding behavior of kestrels in the study area was similar to that observed in North America, except that the [mean?] size of the defended area was only 0.12 km^2, compared to 0.24–5.86 km^2 for cited North American studies. The author reports on nest sites, territory defense, copulations, prey transfers, eggs and young, nesting success, predation, and caching behavior. [Dept. of Biological Sciences, San Jose State Univ., San Jose, CA 95192 USA.]—J. A. Smallwood.

BEHAVIOR

(see also 8, 14, 15, 18, 24)

9. Do Common Ravens yell because they want to attract others? B. Heinrich and J. M. Marzluff. 1991. Behav. Ecol. Sociobiol. 28:13–21.—Animal species aggregate in large numbers at localized food bonanzas using a variety of means, including cuing in on specific signals given by those discovering food. Signals such as vocalizations often attract a crowd and thus facilitate recruitment or information parasitism (recruitment occurs when the assembled group enhances the signaler's fitness whereas information parasitism decreases the signaler's fitness). In the northeastern United States, non-breeding vagrant Common Ravens (*Corvus corax*) frequently assemble in large numbers at carcasses to feed. In previous studies, the authors concluded that the ultimate function of such group formation was to enable juveniles to overpower territorial adults and access defended foods unavailable to single birds (thus group formation constitutes recruitment).

In this study the authors conducted an experiment on 20 immature and two adult ravens in an aviary to determine the proximate factors that elicit the "yell" vocalization (which attracts nearby conspecifics to large carcasses). Hunger and placement of food significantly influenced yelling rate and the number of birds yelling ($P < 0.01$). Immatures yelled more frequently as their hunger levels increased; however, a relative reduction in their yelling was noticable when food was placed with the increasingly hungry adults. Yelling also was modified by social status such that alpha birds actively suppressed the yelling of other dominants. However, when dominant birds were removed from the flock, new birds consistently yelled for the first time. Moreover, when dominant birds were reintroduced, the percentage of group yelling remained high rather than returning to previous levels (and previously dominant birds were unable toi reestablish their former dominant status within the flock). These results suggest that hunger and status advertisement are the primary proximate factors that result in yelling, even though it has likely been amplified by natural selection because of the benefits of group foraging. [Dept. of Zoology, Univ. of Vermont, Burlington, VT 05405 USA.]—Danny J. Ingold.

10. Color bands function as secondary sexual traits in male Red-winged Blackbirds. K. J. Metz and P. J. Weatherhead. 1991. Behav. Ecol. Sociobiol. 28:23–27.—The results of numerous studies indicate that the red epaulets of male Red-winged Blackbirds (*Agelaius phoeniceus*) function as signals of threat during territorial defense, but also may be concealed and thus serve as indicators of social status. In order to assess the effects of additional red coloration on male red-wings, the authors equipped each of 19 territorial males with five red plastic color bands (three on one leg and two on the other), and 19 others with five black bands near Seeley's Bay, Ontario (during 1989). Red-banded males suffered increased intrusion rates on their territories, particularly by neighbors banded with black or unbanded. While all 19 black-banded males were able to maintain their territories, 11 of 19 red-banded males lost their territories to other males (4 to black-banded neighbors and 7 to unbanded neighbors). Although losers were neither smaller nor weighed less than winners, they possessed larger epaulets relative to their body mass than red males that retained their territories. These results indicate that red bands somehow interacted with the red epaulets of males in a way that solicited an increased aggressive response against them. Moreover, the data suggest that neighboring territorial red-wings continually test one another's competitive ability relative to the amount of red coloration they possess, thus pre-

venting males from displaying dishonest signals. [Dept. of Biology, Carleton Univ., Ottawa, ON K1S 5B6 Canada.]—Danny J. Ingold.

11. Observations of autumnal courtship behavior in Peregrine Falcons. A. J. Meier, R. E. Nobel, and P. M. McKenzie. 1989. J. Raptor Res. 23:121–122.—Peregrine Falcons (*Falco peregrinus*) frequently maintain pair bonds after the breeding season, and some individuals apparently mate for life. Intrapair social interactions of peregrines outside the breeding season have been poorly studied. In this report the authors describe courtship behavior of two pairs of peregrines during October on an island in Puerto Rico. One pair consisted of two adults while the other consisted of an adult female and a male in juvenal plumage. Observed behaviors included undulating flights, soaring, stooping, hitched-wing displays, aerial talon locking and tumbling, vocalizations, and one instance of copulation. [School of Forestry, Wildlife and Fisheries, Louisiana State Univ. Agricultural Center, Baton Rouge, LA 70803 USA.]—J. A. Smallwood.

12. Responses of breeding American Kestrels to live and mounted Great Horned Owls. N. W. Gard, D. M. Bird, R. Densmore, and M. Hamel. 1989. J. Raptor Res. 23: 99–102.—Breeding American Kestrels (*Falco sparverius*) frequently direct interspecific agonistic behavior toward other cavity nesters and potential predators. The purpose of this study was to examine the aggressive behavior of kestrels toward Great Horned Owls (*Bubo virginianus*) intruding within an occupied kestrel territory. Kestrels breeding in nest boxes in southwestern Quebec were presented live and taxidermic mounts of owls. As a control, a live white Leghorn chicken (*Gallus domesticus*) whose feathers had been dyed brown to mimic the owl coloration also was presented. Intruder birds were placed either 10, 50, or 100 m from the nest box. Kestrel responses during 10 minutes of presentation included number of calls and number of stoops. Trials were conducted during two phases of reproduction: incubation and nestling. In general, live owls elicited responses from more kestrel pairs than did taxidermic mounts or the control chicken, and those responses were more intense. Likelihood of response and response intensity were inversely related to the intruder bird's distance to the nest box. Kestrels behaved similarly during the incubation and nestling phases. [Macdonald Raptor Research Centre, Macdonald College of McGill Univ., 21111 Lakeshore Rd., Ste. Anne de Bellevue, PQ H9X 1C0, Canada.]—J. A. Smallwood.

13. Unusual roost site selection and staging behavior of Black-shouldered Kites. W. S. Clark and B. K. Wheeler. 1989. J. Raptor Res. 23:116–117.—Black-shouldered Kites (*Elanus caeruleus leucurus*) are known to form communal night roosts during winter. These aggregations typically consist of tens of birds perched in trees. In this paper the authors describe their observations of a group of over 100 individuals which roosted communally in a sugar cane field in southern Texas. Groves of large trees, apparently suitable for roosting, were within sight of the cane field. Not only were the number of birds involved and the choice of roosting site unusual, but the birds also exhibited staging behavior prior to roosting, not previously reported for this species. Prior to flying together in the cane field, the birds first gathered close together on the ground in a recently plowed field. [4554 Shetland Green Rd., Alexandria, VA 22312 USA.]—J. A. Smallwood.

ECOLOGY

(see also 9, 18, 22, 24)

14. Seabird life histories and the marine environment: some speculations. R. E. Ricklefs. 1990. Colon. Waterbirds 13:1–6.—Seabirds share life history characteristics of low reproductive rates, delayed reproductive maturity, and long developmental periods and lifespans. In this guest editorial Ricklefs urges the rethinking of seabird population dynamics, behavioral mechanisms, and evolution as shaped by the interactions of birds and their environment. He suggests that the traditional paradigms are no longer consistent with observation and experimental results (e.g., brood-enlargement experiments) and hence the standard explanations for seabird life history phenomena need to be re-examined. He offers speculative hypotheses and suggests research directions to test them for a number of problem areas, including reproduction rates, adipose tissue in nestling petrels, long incubation periods, slow postnatal growth, long prereproductive periods, and population regulation factors. He

suggests investigating density-dependent depression of food supplies and differences between nearshore and pelagic species' exploitation of marine resources. The author concludes that seabirds make suitable study animals for investigating a wide variety of biological problems.

This is a heuristic paper with lots of speculation and many challenging ideas. It should be read by all seabird biologists, even if they might not agree with all the arguments the author presents. [Dept. of Biology, Univ. of Pennsylvania, Philadelphia, PA 19104 USA.]—William E. Davis, Jr.

15. Inter- and intra-specific diet overlap during lean times between *Quelea erythrops* and bill morphs of *Pyrenestes ostrinus*. T. B. Smith. 1991. Oikos 60:76–82.—Inter-specific competition for food resources results in more specialized feeding strategies, as suggested by Schoener (1982, Am. Sci. 70:586–595). This hypothesis predicts that competing species shift their foraging habits to dissimilar food sources. Smith monitored the seed ingestion of the ploceid finch, *Quelea erythrops,* and two different bill morphologies of the African estrildid finch, *Pyrenestes ostrinus.* He noticed that the ploceid finch most closely matched the small billed estrildid finch in beak size and seed preference. His results showed that a dramatic decline in the number of seeds available corresponded to a shift toward feeding on harder seeds by the small estrildid finch morph. The small morph's switch to the harder seed increased its overlap with the larger morph. The reduced overlap between species lends strong evidence to inter-specific competition, but Smith needs to explain further how an increase in foraging overlap demonstrates intra-specific competition. [Dept. of Integrative Biology, Univ. of California, Berkeley, CA 94720 USA.]—T. A. Keller.

WILDLIFE MANAGEMENT AND ECONOMIC ORNITHOLOGY

(see also 2, 6, 17, 25)

16. Hazards to raptors from strychnine poisoned ground squirrels. J. K. Schmutz, K. A. Rose, and R. G. Johnson. 1989. J. Raptor Res. 23:147–151.—In many agricultural regions populations of unwanted rodents are "controlled" through poisoning campaigns. This practice has raised the concern over the potential harm posed to nontarget species, which may either ingest the poison bait directly or be exposed to toxins secondarily through the consumption of the poisoned carcasses of target animals. Many raptorial species fall into the latter category. Nestling raptors may be particularly vulnerable to this sort of exposure, as there is less opportunity to select prey. This study was conducted in a mixed-grass prairie in Alberta, Canada, where Richardson's Ground Squirrels (*Spermophilus richardsonii*) frequently are the target of poisoning campaigns. In this area ground squirrels comprise more than 65% of the prey biomass consumed by Swainson's Hawks (*Buteo swainsoni*). The purpose of this study was to simulate the field conditions under which Swainson's Hawk nestlings are exposed to poisoned ground squirrels, and to evaluate the potential deleterious effects of such exposure.

Ground squirrels were captured and fed oats which had been treated with a commercial rodenticide (2% strychnine, applied according to label instructions); most died within 12 hours. Squirrel carcasses were eviscerated and deposited, one carcass each day for three consecutive days, into Swainson's Hawk nests. The three-day period was chosen to simulate the duration of a typical poisoning campaign. Nestling growth and survival was compared to that of control nests. A total of 52 nestlings consumed 67 poisoned ground squirrels; 49 of these chicks survived the treatment period. Survivorship did not differ significantly ($P > 0.19$) from that of the control nests (all 28 control chicks survived the 3-day period. Forty-two (72%) treated chicks reached banding age (3–21 days after treatment), compared to 28 (82%) control chicks; this difference also was insignificant ($P > 0.32$). Further, during the three days of treatment there was no significant difference ($P > 0.79$) in weight gain between treatment and control chicks.

The result that poisoned carcasses apparently had little effect on the growth and survival of the chicks was unexpected by the authors. They suggest that evisceration of the carcasses likely was an important factor. Squirrels probably die very quickly once the strychnine is absorbed from the gastrointestinal tract into the bloodstream; thus toxicity levels in consumed tissues probably were rather low. The authors warn, however, that although many raptor species regularly discard the viscera of large prey, smaller prey often are eaten entirely, and

the viscera of large prey may be eaten during times of food stress. Further, some of the squirrels died with poisoned grain still in their cheek pouches, which could pose a threat to the predator. Finally, the results must be viewed in light of several uncontrolled variables which existed during the experiment. The authors point out that it is unknown how much "clean" food was brought to the treated nests by the adult hawks. Also, it may be possible that the control nests may have been exposed to prey contaminated as the result of agricultural practices rather than by the experimental treatment. [Dept. of Biology, Univ. of Saskatchewan, Saskatoon, SK S7N 0W0, Canada.]—J. A. Smallwood.

CONSERVATION AND ENVIRONMENTAL QUALITY

(see also 6, 16)

17. Status of the Greater Flamingo in Haiti. J. A. Ottenwalder, C. A. Woods, G. B. Rathburn, and J. B. Thorbjarnarson. 1990. Colon. Waterbirds 13:115–123.—There is concern about recent population declines of the Greater Flamingo (*Phoenicopterus ruber*) in the Caribbean area, and there is little published information on the status of this species in Haiti since 1928. Aerial surveys of traditional flamingo habitat in 1982 and 1983 were supplemented by flamingo counts made during manatee, sea turtle, crocodile, seal, and opportunistic ground surveys conducted from 1975–1986. The authors report flamingo numbers and present detailed descriptions of localities and habitats, as well as a thorough review of historical reports. They found no evidence of flamingo breeding activity, and the last report of nesting dates back to the 1920s. The authors estimate that the flamingo population is as high as 1000–3000 during the non-breeding winter season, and suggest that local populations recently have declined. One factor which may have influenced the decline is human population increase with 80% of the people living in rural areas. Flamingos generally are found in the dry life zones where human population density is low. Flamingos also are captured for the international bird trade, and heavily hunted for food. Habitat degradation, such as clear cutting of mangroves, also is implicated in the decline. The authors recommend that the Haitian government initiate conservation practices, including the legal protection of flamingos, and management plans for the conservation of wetlands. [Dept. de Zoología, Investigación y Conservación, Parque Zoológico Nacional, Apt. 2449, Santo Domingo, República Dominicana.]—William E. Davis, Jr.

PHYSIOLOGY

(see 14, 24)

MORPHOLOGY AND ANATOMY

(see 8, 15)

PLUMAGES AND MOLTS

(see also 10)

18. The significance of subadult plumage in Darwin's finches, *Geospiza fortis*. B. R. Grant. 1990. Behav. Ecol. 1:161–170.—Gradual acquisition of definitive adult plumage is common among male passerines. By way of introduction the author reviews the three major hypotheses postulated to explain this phenomenon. First, the cryptic hypothesis states that young males, which are competitively inferior to older, more experienced males, enhance their chances of survival to later age classes by being inconspicuous. Second, the female mimicry hypothesis suggests that young males gain access to territories and females by dishonestly signaling their gender, and thus avoid being expelled by older males. Third, the status-signaling hypothesis states that competitively inferior males avoid contests with older males by honestly signaling subordination; survival to subsequent age classes is enhanced by reductions in energy expenditure and risk of injury.

In the present study, the author observed color banded Darwin's finches (Medium Ground Finches) on Isla Daphne Major in the Galápagos and empirically examined the fitness consequences of possessing different plumage stages during different age classes. Male finches

initially are brown and streaked, and through successive molts acquire entirely black plumage. Six plumage stages were recognized. The rate at which males acquired definitive plumage ranged from two to more than six years. Heritability of acquisition rate was examined by comparing the plumge stage of fathers and sons during an equivalent age (their second year). Heritability was significant ($P < 0.02$, $n = 19$); thus acquisition rate may be considered a labile trait.

Breeding in Darwin's Finches is tied closely to the wet season. Annual variation in rainfall is extreme, and in dry years the birds forego breeding altogether. Thus, longevity is of critical importance to the lifetime reproductive success of these birds. Males which took longer to acquire definitive plumage were more likely to survive dry periods than were males with faster acquisition rates. Enhanced survival was attributed to avoidance of conflict with older males by signalling subordinate status during both breeding and nonbreeding seasons. However, black males which did survive produced more fledglings in their first breeding season than did lighter males of the same cohort. This study demonstrates the likely selective mechanism which operates on plumage acquisition rate in this species. [Dept. of Ecology and Evolutionary Biology, Princeton Univ., Princeton, NJ 08544 USA.]—J. A. Smallwood.

ZOOGEOGRAPHY AND DISTRIBUTION

(see also 2, 17)

19. An archeozoological contribution to the recent history of the seabirds of Lavezzi Island (Corsica, southern France, 14th–20th century). [Contribution archeozoologique a l'histoire recente des oiseaux marins de l'Ile Lavezzi (Corse—XIV^{e}–XX^{e} siecles).] J-D. Vigne, C. Lefevre, J-C. Thibault, and I. Guyot. 1991. Alauda 59:11–21. (French, English summary.)—Six species of seabirds are known to have nested in recent years on Lavezzi Island between Corsica and Sardinia in the Mediterranean: Cory's Shearwater (*Calonectris diomedea*), British Storm-petrel (*Hydrobates pelagicus*), Shag (*Phalacrocorax aristotelis*), Common Tern (*Sterna hirundo*), Auduoin's Gull (*Larus audouinii*), and Yellow-legged Herring Gull (*Larus argentatus cachinnans*). In addition, two species, the Great Cormorant (*Phalacrocorax carbo*) and Manx Shearwater (*Puffinus p. yelkouan*) are regular visitors to the area. Of these eight species, the authors identified remains of adults and immatures of Cory's Shearwater, Manx Shearwater, and Shag among about 1500 bird bones excavated from middens at Santa Maria Lavezzi. These date from the 14th to 18th centuries and apparently represent birds caught by human residents for food. Relative abundance of bones suggests that Shag and Cory's Shearwater populations have remained stable, that the Yellow-legged Herring Gull has recently increased in numbers, and that the Manx Shearwater has declined. The potential predation of introduced black rats (*Rattus rattus*) on young Manx Shearwaters is discussed.—Jerome A. Jackson.

20. Eurasian Tree Sparrow in Minnesota. R. B. Janssen and P. Svingen. 1990. Loon 62:175–176.—The first sighting of a Eurasian Tree Sparrow (*Passer montanus*) in Minnesota occurred at a bird feeder in Eagan, Dakota County, on 20 June 1990 (the bird returned sporadically to the feeder through 6 July). Since there was no evidence that the bird was an obvious escape or that it had been transported to the region, it was accepted as the first state record as an accidental species. [10521 S. Cedar Lake Rd., #212, Minnetonka, MN 55343 USA.]—Danny J. Ingold.

21. A Whooping Crane in Minnesota. M. Hedemark and W. D. Svedarsky. 1990. Loon 62:177–181.—On 11 October 1990, the senior author sighted a single Whooping Crane (*Grus americana*) among a flock of approximately 1000 Sandhill Cranes (*G. canadensis*) in a plowed wheat field near Gatzke, in Marshall County. On 21 October 1990, the junior author spotted a single Whooping Crane in a flock of about 5000 Sandhill Cranes on a flood control impoundment on Burnham Creek Wildlife Management Area near Crookston (Polk County). [Box 56 Rt. 2, Gatzke, MN 56724 USA.]—Danny J. Ingold.

EVOLUTION AND GENETICS

(see 5, 14, 18)

FOOD AND FEEDING

(see also 1, 8, 9, 14, 15, 16)

22. Evidence of food-based competition among passerine migrants during stopover. F. R. Moore and W. Yong. 1991. Behav. Ecol. Sociobiol. 28:85–90.—When intercontinental migrants with similar food requirements and heightened energy demands concentrate at stopover sites, competition for available food resources may occur and could be intense. In order to test this hypothesis, the authors conducted a series of predator-exclosure experiments (designed to measure the effect of bird predation on foliage-dwelling arthropods) as well as an intense mist-netting effort (to obtain the weights of migrants) from late March through early May 1988 in Cameron Parish, Louisiana. Lepidopteran (Geometridae) larvae, the most common prey item, were significantly more abundant inside exclosures on four of six sampling dates ($P < 0.05$), indicating that migrants may have depressed food abundance on the study site. Moreover, eight of nine species that stopped on days when the density of birds was high (days when ≥ 100 migrants of any species were mist-netted) were less likely to gain mass compared to low density days (days when ≤ 50 migrants were mist-netted). These data suggest that food-based competition did occur among migrants at this stopover site, reducing the probability of individuals to meet their energetic requirements. [Dept. of Biological Sciences, Univ. of Southern Mississippi, Hattiesburg, MS 39406 USA.]—Danny J. Ingold.

SONGS AND VOCALIZATIONS

(see also 9)

23. Song as an attractant for male and female European Starlings, and the influence of song complexity on their response. D. J. Mountjoy and R. E. Lemon. 1991. Behav. Ecol. Sociobiol. 28:97–100.—To test the hypothesis that female European Starlings (*Sturnus vulgaris*) are attracted to nest sites by the songs of males, the authors conducted playback experiments at a series of starling nest boxes at Ste. Anne de Bellevue, Quebec, during two breeding seasons. Contrary to prediction, both females and males were attracted toi song boxes at a significantly greater rate ($P < 0.001$) than to control boxes. Moreover, females entered only those boxes in which a complex song consisting of 40 different phrase types was used, whereas males were significantly more likely ($P < 0.01$) to enter boxes where a simpler song was played. These data not only demonstrate that singing by breeding male starlings serves at least in part to attract females, but it also provides the first experimental evidence that passerine song attracts intruding males into a "defended" area (i.e., territory). Males may be attracted by song because it often indicates the location of a potentially suitable nest cavity that they may be able to usurp. On the other hand, males that sing complex songs may discourage potential male intruders, as well as enhance their chances of attracting females. [Dept. of Biology, McGill Univ., 1205 Ave. Docteur Penfield, Montreal, PQ H3A 1B1, Canada.]—Danny J. Ingold.

BOOKS AND MONOGRAPHS

24. Bird migration: physiology and ecophysiology. E. Gwinner, ed. 1990. Springer-Verlag, New York. 435 pp. $110.—This volume contains excellent reviews, but few of the papers contain any new material. Consequently, for workers familiar with the field, the book does little more than bring together the scattered literature. For ornithologists not current on the migration literature, the book provides a wealth of information in a single volume. Unfortunately, its price will put it out of the reach of all but libraries and wealthy ornithologists. Unlike previous volumes, this one deals with the physiology and mechanisms of migration rather than on the orientation and navigation of migrants. The papers are grouped into five topics: patterns of migration, ecological and behavioral aspects of migration, physiological adaptations to migration, avian flight, and strategies and tactics of migration.

Williams and Williams summarize data on the overwater paths of migrants as they cross specific oceans. Several large species of shorebirds appear to make longer flights than previously suspected of 6000 to 7500 km nonstop in the western Pacific, between Australia

or New Zealand and China. Johnson and Herter report on bird migration to and from the Arctic, where migrants make up 95% of the total number of avian species. They discuss both the patterns of migration in the Arctic and the hypotheses on its evolution. Important factors include weather, delaying migration, and low food availability, resulting in late spring arrival and reproductive failure. Pearson synthesizes the published information on the movement of passerines through Kenya and Uganda with his new data. Most birds interrupt their migration and undergo molt in this area before continuing their migration when the rains start. Many species use a more easterly route on their northward migration than on their southward migration. Brudener and Jenni review the role of the Alps as a barrier to European migrants. Migrants tend to follow ridges that are closely aligned to their migratory direction, which results in a funneling of migrants between the Jura and the Alps mountain ranges. Longer distance migrants with heavy fat stores are more likely to cross the Alps than are southern populations. Richardson updates his 1978 review of the influence of weather on the timing of migration. The new results confirm the findings he reported earlier that birds generally tend to avoid migrating in inclement weather. Birds most frequently fly with following winds, but other factors are more variable in their influences. Jehl reviews and discusses molt migration in taxa other than the waterfowl where it is best known. Many of the more primitive families show simultaneous molt of the remiges, but not necessarily in the postbreeding molt. The resulting flightlessness is associated with an atrophy of the flight muscles and a hypertrophy of the leg muscles, reflecting the differences in locomotion.

The second group of papers deals with the ecological and behavioral aspects of migration. Ketterson and Nolan review the evidence from field studies on the attachment of migratory birds to specific sites and discuss the neural basis of site recognition. Although this site attachment appears to be an imprinting-like process, it could just as easily be explained by a gradual process that culminates in attachment. The question remains unanswered. Terrill reviews the movements of migrants within their nonbreeding (=winter) ranges. Some species are highly sedentary while others move about within their range. Unusually cold weather and decreased food availability are associated with such facultative movements. Schwabl and Silverin examine the factors that influence the variations in the tendency of individuals to migrate and their autumnal departure. The importance of exogenous controls (social dominance, weather, food, etc.) of partial migration remains to be tested. The influence of endogenous (hormonal) control varies according to species and appears to be facultative. Leisler discusses habitat selection and use by temperate-tropic migrants on their non-breeding ranges. Migrant habitat selection is partially influenced by availability, but migrants show low preferences for extensive mature forest, especially wet lowland forests. During competitive interactions migrants never dominate year-round residents, but this does not result in migrants being excluded from mixed-species flocks or suitable habitat. Although migrants exhibit a greater flexibility of diet and habitat on their non-breeding ground than on their breeding grounds, residents are morphologically more diverse. The ecological aspects of migrants and residents is reviewed by O'Connor. Migrants exploit seasonally variable habitats and are especially sensitive to diffuse competition from residents.

The third section of the book deals with the physiological adaptations to migration. Martin examines the visual problems faced by nocturnal migrants. The importance of visual cues to nocturnal migrants is well documented; in fact, they may be the most important source of directional information. Not enough presently is known about their minimum sensitivity thresholds to draw any conclusions, but they do not seem to be capable of distinguishing details at night. Bairlein reviews the influence of nutrition and food selection on fat deposition in migrants. The greatest weight gains (up to 100%) occur in long distance migrants. Weight gains involve both hyperphagia and an increase in the efficiency of food (especially fat) utilization; the converse applies to weight losses. Furthermore, studies have shown seasonal shifts in food preferences. Fruit provides an easily digested diet high in fat, calories, and water. Ramenofsky very thoroughly reviews fat storage and metabolism and its role in supplying energy for migration. The flight muscles, especially of migratory species, are well adapted to store and use fatty acids for energy. Lipolysis increases during migration to supply the energetic demands. Wingfield, Schwabl and Mattocks review the effects of the endocrine system on migratory behavior and physiology. These effects, in some species,

include hypertrophy of flight muscles and an increase in hematocrit. Although androgens are involved in the preparation for vernal migration, they have no influence on autumnal migration. A number of other hormones (thyroid, corticosteroid, prolactin, and catecholamines) have various influences on migratory physiology. Gwinner reviews the circannual rhythm of bird migration and its controls. Circannual rhythms have been demonstrated conclusively in 13 species of migratory birds, and appear to occur in an additional five species. Although photoperiod is the overpowering synchronizing factor, the effects of long and short days differ qualitatively and quantitatively. Berthold reports that the occurrence of migration and its circannual regulation appears to be genetically transmitted. In spite of this, there seems to be a great deal of plasticity in distance and direction traveled, such that migrants can exploit newly formed, suitable habitats.

The fourth unit is more general and deals with several aspects of avian flight. The mechanisms and energetics of flight are reviewed by Rayner. The production of lift by the wing results in the creation of vortices. The strength of the vortex is indicative of the amount of lift being produced, and its measurement permits the calculation of the energy required for flight. As a result of the mechanical constraints on flight power and speed, most migratory species are relatively small birds. The efficiencies of the flight muscle are around 0.10 in small birds and increases with size. The physiological aspects of flight are reviewed by Butler and Woakes, based primarily on data from birds flying in wind tunnels. In spite of its shortcomings, the technique is the most accurate available. Power consumption during flapping flight is about 10 times resting level and over twice the maximum metabolic rate of small mammals. The pectoralis muscle is large, up to 35% of the body mass, and composed primarily of fast oxidative glycolytic fibers in flying species. Avian circulatory and respiratory systems are adapted to support the high metabolic demands of flight. Nachtigall reviews the effects of long flights on energetics and water balance. During the first hour of flight pigeons use carbohydrates for fuel then gradually switch to fats. Nonevaporative methods are used to dissipate heat as long as possible because excessive evaporation may result in dehydration.

The final section deals with the strategies and tactics of migration. Alerstam and Lindström discuss the role of fat deposition in the flight speed and range of migrants. The optimal strategy for a migrant depends on its fat load more than fat deposition rates or time factors. Foraging strategy depends on whether time, energy, or threat of predation is most important to the migrant. The various strategies available to migrants crossing the Sahara are reviewed by Biebach. No single strategy is used by all species and a species may use different strategies in different seasons. The two most frequent strategies are to fly non-stop over the desert or to fly at night and rest in the shade during the day. If the bird is able to maintain itself in 10°C air or cooler, it theoretically can balance evaporation with metabolic water production. Depletion of fat reserves, inability to achieve cool air, and head winds make intermittent migration a more economical strategy. Dolnik discusses the strategies used to cross inhospitable desert and mountain habitats in central Asia. Much of the data he presents is new. Birds had the heaviest fat loads in the least hospitable habitats: deserts, followed by mountains. Birds in forested areas had the smallest fat deposits. Birds remaining at desert oases were leaner than birds that passed through, and usually gained weight. There was much intraspecific variation in fat deposits and rates of weight gain. Unlike migrants crossing the Sahara, the basic strategy used by birds crossing central Asian deserts is to refuel during stopovers. Evans and Davidson review the migration strategy used by shorebirds at high northern latitudes. The migration patterns of subadult shorebirds is poorly understood. Although first year birds of some species undertake the return journey to the breeding grounds, the young of other species remain on their nonbreeding grounds. Shorebirds show some plasticity in winter site philopatry. Competition between species may affect their distribution during migration and on the non-breeding grounds. Flight muscle hypertrophy during migration seems to be an adaptation for long overwater flights found in most shorebird species. Drent and Piersma explore the energetics of "leap-frog" migration in several Arctic-breeding shorebirds. Birds traveling farther show higher daily energy expenditures during the southward movement, but the data from northward migration are less clear. Presumably this migration pattern results in less intraspecific competition. Walsberg discusses the problems facing researchers investigating the energetics of migration. Obtaining energetic data from flying birds is difficult, involving either birds flying in a wind tunnel wearing a mask

and associated apparatus, or unencumbered birds using doubly labeled water. Unfortunately, both techniques have their shortcomings. These can be partially compensated by an increased sample size and improved theoretical approaches to the problem.—Robert C. Beason.

25. The dove chronicles: whistling wings. H. E. McClure. 1991. Boxwood Press, Pacific Grove, California. 99 pp. $9.95, softcover.—This book is a popular tale written somewhat in the genre of Thornton W. Burgess of "Adventures of Prickly Porky" and the "Old Mother West Wind" stories of a couple generations ago—but with a much more factual thread to the story. McClure follows the lives and adventures of "Zee" and "Naida," a pair of Mourning Doves (*Zenaida macroura*), and their friends (most with Indian names meaning "dove" or somesuch). Although extremely anthropomorphic, this book will appeal to some audiences and it does accurately portray the species' natural history and the travails that Mourning Doves must face: flimsy nests that are easily blown down, disease, and hunters.

Ah yes, hunters. Militant hunters will no doubt take exception to this book—and no doubt militant anti-hunters will embrace it. The story *is* emotionally charged. One of the characters, "Stump Face," survived having his beak blown away. Perhaps the emotion is justified. I've never understood the rationale for southern dove hunts in early September at a time when many southern doves still have eggs or young in the nest. McClure questions "Is this wildlife management?" Although not a scientific treatise, this should be on the "must read" list of dove biologists and students in wildlife management or wildlife management ethics courses. It's provocative.—Jerome A. Jackson.