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RECENT LITERATURE

Edited by Robert C. Beason

RESEARCH TECHNIQUES

1. **DNA analyses in avian ecological studies.** K. Ishida. 1996. J. Yamashina Inst. Ornithol. 28:51–80. (Japanese, English summary.)—This extensive review of the use of DNA analyses in avian studies focuses heavily on North American work, discusses the tools of DNA analyses, ethical problems, and future possibilities. Ishida identifies three major, though interrelated fields of study: molecular phylogeny, molecular genetics, and conservation genetics. He notes that although RFLP of mitochondrial DNA has been the method of choice for detecting polymorphism, PCR-directed sequencing technique is becoming common and Microsatellite DNA and MHC are anticipated to become important in the near future. Illustrations borrowed from the North American literature include the sapsucker (*Sphyrapicus*) polymorphism work of Cicero and Johnson (1995, Auk 112:547–563) and the chickadee (*Parus*) work of Gill et al. (1993, Evolution 47:195–212). While the Japanese text will be of little value to most North American ornithologists, the 5 pages of literature citations (most in English) are a wonderful gateway to this exciting field. Perhaps an English translation is forthcoming? [Univ. Forest in Chichibu, Univ. of Tokyo, Hinoda-machi, Chichibu, Saitama, 368, Japan.]—Jerome A. Jackson.

BEHAVIOR

(see also 9, 16, 17, 18, 21, 24, 26, 35, 38)

2. **Sentinel behavior, seasonality, and the structure of bird flocks in a Brazilian savanna.** Ornithol. Neotropical 7:43–51.—Mixed-species flocks occur in the Brazilian savanna throughout the year, but were most common in the dry season (March–July). Fruit production was highest during the birds' reproductive season, when mixed-species flocks were least common. Twenty-five species were observed in mixed-species flocks including permanent resident, migratory transients and seasonally resident species. Most of the species in these flocks were passerines, especially tyrannid flycatchers. The nuclear species of the flocks were the White-banded Tanager (*Neothraupis fasciata*) and the Suiriri Flycatcher (*Suiriri suiriri*). Four other species were commonly observed in the flocks: Narrow-billed Woodcreeper (*Lepidocolaptes angustirostris*), Grassland Sparrow (*Myospiza humeralis*), Plain-crested Elaenia (*Elaenia cristata*) and House Wren (*Troglodytes aedon*). Flock composition varied seasonally, especially with the arrival and departure of migratory species. Male and female White-banded Tanager served as sentinels, usually one at a time. Participation in a mixed-species flock resulted in the tanagers spending less time on sentinel duty compared to conspecific flocks. Participation in mixed-species flocks did not result in changes of foraging behavior or substrate by the common species. [Dept. de Zoologia, Univ. de Brasilia, 70910 Brasília, DF, Brasil.]—Robert C. Beason.

3. **Female aggression in the European Starling during the breeding season.** M. I. Sandell and H. G. Smith. 1997. Anim. Behav. 53:13–23.—It has been suggested that female-female aggression is used by mated females to maintain their monogamous status. Sandell and Smith examined the intensity of intraspecific competition in the European Starling (*Sturnus vulgaris*) to determine what role it played in the mating system of this species. A caged starling, either a male or female, was placed near the nest box of an already mated pair during different parts of the breeding cycle and aggressive responses were examined. Additionally, in one colony every second male received an additional nestbox, and the location of the mated male and female relative to the added nest box was examined. Females were most aggressive toward other females and the intra-sexual aggression peaked during the relaying period of the breeding cycle. Furthermore, females spent more time near their nest site during the relaying period when their mates had access to additional nest boxes than when they did not. Three hypotheses were advanced that may explain the intra-sexual female aggression observed by the authors: defense of resources, defense against brood parasitism, and defense of paternal care, of which the latter was proposed to explain the aggression

observed. It was suggested that this aggression is used by female starlings to maintain monogamy. [Ecology Bldg., S-223 62 Lund, Sweden.]—Jeffrey P. Duguay.

4. Artificial colour mutation: do red-painted Great Tits experience increased or decreased predation? F. Gotmark and J. Olsson. 1997. Anim. Behav. 53:83–91.—Although favored by sexual selection and other processes, the conspicuous bright colors of many birds are assumed to be disfavored by increased predation. A controversial hypothesis suggests that bright birds are aposematic or unprofitable, by being distasteful, vigilant, or agile. Gotmark and Olsson used live manipulated Great Tits (*Parus major*) to examine how bright coloration influences the risk of predation. During the two years of this study 1655 Great Tit nestlings were manipulated. Nestlings were either painted red (treatment—approximately 40% of nestlings in a brood) or painted yellow (control—approximately 60%) on all yellow and white feathers (under parts, cheek, neck patch, wingband and outermost tail feathers) and were banded with an aluminum band. A metal detector was used to search for bands in Sparrowhawk (*Accipiter nisus*) nests and at sites known to be frequented by the hawks. The hypothesis that novel bright mutants are avoided by predators was not supported, red tits were taken at a higher rate than controls. These findings contrast those of other studies using stuffed mounts with conspicuous bright markings. However, Gotmark and Olsson's study was the first to use manipulated live birds. Possible explanations for the disparity between their study and that of others are given. [Dept. of Zoology, Univ. of Goteborg, Medicinaregatan 18, S-413 90 Goteborg, Sweden.]—Jeffrey P. Duguay.

5. Assortive mating in captive cowbirds is predicted by social experience. T. M. Freeberg. 1996. Anim. Behav. 52:1129–1142.—To examine the effects of social experience on assortative mating in adult Brown-headed Cowbirds (*Molothrus ater*), the author housed four groups of juvenile male and female cowbirds from a South Dakota population in aviaries either with adults from the same population or with adults from an Indiana population. The South Dakota and Indiana populations of cowbirds are different subspecies and the communicative cultures of the two populations are distinct. During both years of the study, both males and females paired with unfamiliar birds of the same cultural background most often, 71.4% in year 1 and 86.2% in year 2. Additionally, during year 2 77.3% of the observed copulations were between birds of the same cultural background. Freeberg concludes that social experience predicts assortative pairing and mating in cowbirds. [Dept. of Biology, Indiana Univ., Jordan Hall, Bloomington, IN 47405, USA.]—Jeffrey P. Duguay.

6. Temporary male removal increases extra-pair paternity in Eastern Bluebirds. E. A. Macdougall-Shackleton, R. J. Robertson, and P. T. Boag. 1996. Anim. Behav. 52:1177–1183.—The authors conducted a male removal experiment to determine if male absence increases extra-pair paternity in Eastern Bluebirds (*Sialia sialis*). Eleven experimental and 14 comparison families were studied during the summers of 1992 and 1993. DNA analysis of young and putative parents revealed that males that had been detained for two days during their mate's fertile period were more likely to be cuckolded than control males. Three potential explanations for the greater frequencies of extra-pair young in experimental nests were advanced. (1) The mate replacement hypothesis suggests females whose mates were detained may have been behaving as if widowed or deserted; (2) the mate guarding hypothesis proposes that females whose mates were removed may have been freed from the constraints that being guarded places upon their mating decisions; and (3) the supplemental copulation hypothesis in which removed males have a reduced opportunity to dilute and devalue rival sperm. [Dept. of Ecology and Evolutionary Biology, Princeton Univ., Princeton, NJ 08544, U.S.A.]—Jeffrey P. Duguay.

7. Males on guard: paternity defences in Violet-green Swallows and Tree Swallows. B. A. Beasley. 1996. Anim. Behav. 52:1211–1224.—Violet-green Swallows (*Tachycineta thalassina*) and Tree Swallows (*T. bicolor*) are both secondary cavity nesters and both forage on aerial insects away from their nests. Beasley wanted to determine if the paternity-defense strategies of these two congers were similar. It was revealed that male Violet-green Swallows used mate guarding as a paternity defense, whereas male Tree Swallows used frequent within-pair copulations. Additionally, the author conducted male and female removal experiments to examine ecological factors that alter the trade-off between guarding mates versus nests and

thereby determine the use of alternative paternity defenses. Removal experiments suggested that male Violet-green Swallows compete for females directly. Detained males had a low risk of nest usurpation and a high risk of cuckoldry. Male Tree Swallows, in contrast, were found to compete for resources required by females. Removed male Tree Swallows suffered high risks of both nest loss and paternity loss. Female removals confirmed this. Detained female Tree Swallows were replaced by unmated female floaters, but detained female Violet-green Swallows were not. It was concluded that differences in paternity defense between Violet-green Swallows and Tree Swallows depends on different availabilities of nest sites and mates. [Bamfield Marine Station, Bamfield, British Columbia, Canada V0R 1B0.]—Jeffrey P. Duguay.

8. Gargle vocalizations of Black-capped Chickadees: test of repertoire and video stimuli. M. C. Baker, T. T. Tracy, and L. E. Miyasato. 1996. Anim. Behav. 52:1171–1175.—Fifteen captive Black-capped Chickadees (*Parus atricapillus*) were tested using video imaging and gargle vocalizations to determine if threat is communicated by the gargle repertoire. Birds were tested using video images of a gargling Black-capped Chickadee or no bird paired with different gargle repertoire sizes. The response of test birds to the video of a stimulus bird with three gargle types was significantly more aversive than the response to both three gargle types without a stimulus bird and a stimulus bird alone. The authors conclude that Black-capped Chickadees find the presence of a potential rival that is gargling with multiple gargle types to be more threatening than one using a single-gargle repertoire. [Biology Dept., Colorado State Univ., Fort Collins, CO 80523, U.S.A.]—Jeffrey P. Duguay.

FOOD AND FEEDING

(see also 4, 38)

9. A northern population of Willow Tits (*Parus montanus*) did not store more food than southern ones. A. Brodin, K. Lahti, L. Lens and J. Suhonen. 1996. Ornis Fennica 73: 114–118.—For many species of birds over-wintering in colder climates, energy stored either in the form of body fat or food caching provides birds with the reserves necessary to survive through the cold winter months. Birds living in higher latitudes with longer colder winters would be expected to hoard food at a greater rate than conspecifics living further south. The geographic distribution of Willow Tits makes them well suited to a study to determine if food hoarding intensities differ between populations in different climatic zones. Observations were conducted on 93 birds from three different climatic regions. Observation periods were broken into 60 s time frames during which the number of food items eaten and stored were recorded. It was expected that individuals in the northern climes, where the winters tend to be harsher, would hoard food at a greater intensity than conspecifics to the south. However, it was found that tits in the central region hoarded food more intensely than the populations to the N and S. This reflects similar findings in a comparable study of Crested Tits (*P. cristatus*) in which hoarding intensities were found to be the greatest in the population occupying the central part of the range. The authors suggest that the observed differences in hoarding intensity in the Willow Tits could be attributed to the overall supply of storable food items encountered. Willow Tits in the central study area were observed to have encountered food at a higher rate than did those in either the north or south. The eating intensities were similar in all study areas, leading the authors to conclude that eating intensity is closely linked with hoarding, with individuals storing food only after they fulfilled their maintenance requirement. First year birds (subordinates) in the north were observed to hoard food at a higher intensity compared to adults in the same area. Interestingly, this phenomenon was not observed in central and southern populations. While the cause for this behavior was not determined, the authors thought that foraging at a higher intensity may be more energetically demanding. Subordinates such as the first year birds have secondary access to food and have higher mortality during the winters in the colder areas. Thus, the subordinate members of the population may have to work harder to build up an adequate food supply to last them through the winter months. [Dept. of Zoology, Stockholm Univ., S-10691 Stockholm, Sweden.]—Sue Bennett.

10. Food choice by seed-eating birds in relation to seed chemistry. M. Díaz. 1996. Comp. Biochem. Physiol. 113A:239–246.—This is a review paper in which the author ex-

amines the effects of nutrients and energy content of seeds and the presence of secondary compounds on food choice by granivorous birds. Seed selection by birds appears to depend more on seed size and the ability of the bird to digest it than on the nutritional or energy value it contains. Small birds take more energy-rich seeds, but only small-sized seeds because of mechanical constraints (i.e., a small bill), but larger birds preferentially took larger seeds without selecting for nutritional value. Seeds that are avoided contain toxic compounds such as tannins and especially alkaloids. Seeds from Malvaceae, Convolvulaceae, Rubiaceae and most Leguminosae are rarely or never eaten because of the amount of secondary compounds they contain. Most of the data on seed choice in birds is circumstantial. There is a need for manipulative studies (in addition to observational studies) on seed choice using wild seeds rather than cultivated grains and on a variety of species. Questions that remain unanswered include whether switching between granivorous and insectivorous diets is facultative or based on nutritional needs. [Dept. de Biología Animal I, Facultad de Biología, Univ. Complutense de Madrid, E-28040, Madrid, Spain. E-mail: mdiazbio@eucmax.sim.ucm.es.]—Robert C. Beason.

11. Nestling food of the Great, Coal, Willow and Crested Tits in the subalpine Larici-Cembretum of the Upper Engadine, Switzerland. [Die Nestlingsnahrung von Kohl-, Tannen-, Alpen- und Haubenmeisen im Lärchen-Arvenwold des Engadins.] H. Mattes, J. Tumbrinck and M. Fischbacher. 1996. Ornithol. Beob. 93:293–324. (German, English summary)—The nestling food of Great (*Parus major*), Coal (*P. ater*), Willow (*P. montannus*) and Crested Tits (*P. cristatus*) was studied in the Upper Engadine Valley using neck ligatures on the young from 1982–1992. The greatest similarity was between Coal and Willow Tits; which mostly took bugs (Sternorrhyncha) and spiders, but flies (Diptera) were also important. An important component of Crested Tit nestling diet was beetles, especially weevils (*Otiorhynchus*). Great Tits showed the greatest difference in diet from the other species, offering their young beetles and moths and objects that resemble them such as seeds and soil. Consequently, this species had a high nestling mortality rate. Caterpillars were less important in the diets of the Engadine tits than in those of the lowlands. The size of food items fed to nestling was dependent on what was available. The small tits had a large overlap in prey sizes, but were different from the Great Tit. [Inst. für Landschaftsökologie, Robert Koch-Str. 26, D-48149 Münster, Switzerland.]—Robert C. Beason.

12. Predation at intermountain west fish hatcheries. W. C. Pitt and M. R. Conover. 1996. J. Wildl. Manage. 60:616–624.—In an attempt to assess the impacts of avian predation on fish at hatcheries, the authors surveyed hatchery managers and conducted field observations. Both state and private hatchery managers in Utah, Wyoming, and Idaho were questioned regarding fish predators and annual production losses. From May 1993 to September 1994, surveys were conducted at two state-owned Utah hatcheries. During 24-hour observation periods, the authors recorded species present, the amount of time spent foraging, foraging behavior of individuals, and the number of predated or wounded fish. The estimated annual fish loss resulting from avian predation was calculated. Great Blue Heron (*Ardea herodias*), Black-crowned Night Heron (*Nycticorax nycticorax*), California Gull (*Larus californicus*), Caspian Tern (*Sterna caspia*), Osprey (*Pandion haliaetus*), and Belted Kingfisher (*Megaceryle alcyon*) preyed upon hatchery fish. Losses from mammalian predators, which fed primarily on dead fish, were less than those from birds. Avian predation losses accounted for 7.1% and 0.5% of total production at the two tested hatcheries, resulting in annual losses of $40,469 and $1971, respectively. When surveyed, hatchery managers had estimated 15% annual losses attributable to avian depredation. Because birds were reluctant to forage near people or buildings, the authors suggest that hatcheries encourage visitors and locate expensive or vulnerable fish near buildings or areas with high human activity. Although effective, netting exclosures are costly, especially to small private hatcheries. [Berryman Inst., Dept. of Fisheries and Wildlife, Utah State Univ., Logan, UT 84322, USA.]—Sherry Meyer.

13. Diet composition and prey size of the Great Cormorant (*Phalacrocorax carbo sinensis*) wintering in rivers and gravel-pits of central Spain. [Composición de la dieta y tamaño de presa del cormoran grande (*Phalacrocorax carbo sinensis*) durante su inviernada en rios y graveras del centro de España.] G. Blanco, F. Gomez, and J. Morato. 1995. Ardeola 42:125–131. (Spanish, English summary.)—With increasing numbers of breeding Great Cormorants

in Europe, wintering populations in Spain have also increased. Blanco et al. studied a wintering population southeast of Madrid and collected prey remains and regurgitated pellets beneath roost sites in poplars (*Populus alba*) and tamarisk (*Tamarix gallica*), October–March 1993–94. Number of birds using the roost averaged between 83 (in March) and 460 (in December). Carp (*Cyprinus carpio*) constituted 64.7% of prey individuals identified from 107 pellets and were found in 64.5% of the pellets; they also constituted 87% of the 139 regurgitated fishes recovered. Pellets also included *Barbus* spp. (16.5% of prey; 20.6% of pellets) and black bullheads (*Ictalurus melas* (5% of prey; 4.7% of pellets), and these taxa constituted 9.3 and 3.7% of regurgitated fish. Other fish prey were unidentified. [Dept. de Biologia Animal, Univ. de Alcala de Henares, E-28871, Madrid, Spain.]—Jerome A. Jackson.

14. Foraging behavioural ecology of the Superb Lyrebird. A. Lill. 1996. Corella 20:77–87.—The Superb Lyrebird (*Menura novaehollandiae*), restricted to moist forests of southeastern Australia, is vulnerable because it nests and forages on the ground, has a low reproductive rate, and is a poor flyer. The author reports on a study of food availability and forging behavior aimed at determining how lyrebirds exploit their soil invertebrate food resources, how food availability is related to the initiating of breeding, and to provide information useful for the conservation of the species. Foraging behavior observations were made on birds in the Sherbrooke Forest Park, Victoria, population, some of which were color-banded. A number of foraging parameters were recorded (e.g., prey capture rate, digging bout duration, digging rate), defecation intervals were timed, faeces collected and energy densities determined, and the soil invertebrate fauna was extensively sampled and identified to the taxonomic level of order. A wealth of data are presented in a series of tables. Invertebrate biomass and density showed substantial clumping and temporal variation. Male and female Lyrebirds had similar time-activity budgets, and representative foraging routes for six males and six females are presented diagrammatically. Lyrebirds appear to exhibit low selectivity among prey which would be expected of birds that utilize concealed, spatially patchy resources, and may find food by trial-and-error searching (as suggested by highly variable digging bout durations and prey capture rates). Their low defecation rate and mean faecal energy density suggest that lyrebirds are efficient in energy assimilation and have a slow gut passage rate. The data suggest that maximizing food availability for fledglings may influence the time of initiation of breeding. Lyrebirds have large territories that accommodate their energetically costly foraging for a patchy and slow renewing food resource, and thus may be particularly vulnerable to effects of forest fragmentation. This is a paper loaded with foraging data about a vulnerable and fascinating bird, but it leaves many questions partially answered and should produce heuristic effects. [Dept. of Ecology and Evolutionary Biology and Psychology, Montash Univ., Clayton, Victoria 3168 Australia.]—William E. Davis, Jr.

15. The effect of predator presence on body mass in captive Greenfinches. K. Lilliendahl. 1997. Anim. Behav. 53:75–81.—The size of fat reserves in birds has been viewed as a trade-off between redation risks and starvation. Lilliendahl exposed two separate flocks of captive Greenfinches (*Carduelis chloris*) to either two rotating plastic bottles suspended from strings (control) or a rotating stuffed Sparrowhawk (*Accipiter nisus*) and a plastic bottle (treatment) to examine the relationship between body mass of finches and the level of predation risk. The rotating device was set up such that a cardboard box hid one object (bottle or hawk) from the finches. In this way, it seemed as though the hawk suddenly appeared during the trial. Birds exposed to the Sparrowhawk took significantly more time to resume feeding than when exposed to bottles only, indicating that the hawk was perceived as a threat. Additionally, the increased predation risk resulted in a reduction in body mass of the finches, supporting the idea that an elevated body mass is costly. [Dept. of Zoology, Stockholm Univ., S-106 91 Stockholm, Sweden.]—Jeffrey P. Duguay.

SONGS AND VOCALIZATIONS

(see also 8, 45, 46)

16. Response of American Redstarts (suborder Passeri) and Least Flycatchers (suborder Tyranni) to heterospecific playback: the role of song in aggressive interactions and interference competition. P. R. Martin, J. R. Fotheringham, L. Ratcliffe, and R. J. Robertson.

1996. Behav. Ecol. Sociobiol. 39:227–235.—Interspecific response to song in distantly related competitor bird species is considered rare and occurs only in species that engage in interspecific aggression. Least Flycatchers (*Empidonax minimus*) and American Redstarts (*Setophaga ruticilla*) are distantly related avian taxa but show similarities in their morphologies related to food acquisition and foraging behavior, and thus engage each other in competitive interference interactions. Here, the authors examined the role of song in interspecific aggression between Least Flycatchers and American Redstarts using playback tapes during one breeding season in Ontario. Least Flycatchers were dominant in all interactions with redstarts and responded to redstart song by aggressively approaching the source of the song which in turn facilitated visual location and subsequent attack of a redstart in the flycatcher's territory. Redstarts repsonded to flycatcher song in their territory by decreasing the frequency of their flights and song rates. The authors suggest that reduced redstart song and flight in the presence of flycatchers serves as a defensive behavior, and they present observational data that suggest that flycatchers were dependent on redstart flight for visual recognition of redstarts prior to attacking them. The results of this study clearly demonstrate that Least Flycatchers and American Redstarts are able to recognize each other's songs (which are extremely different from each other) and respond to them in a specific way. The specific responses of both species to each other's songs suggest that heterospecific song recognition in this case is an adaptive behavior rather than misplaced intraspecific aggression. [Montana Cooperative Wildlife Research Unit, Univ. of Montana, Missoula, MT 59812, USA.]—Danny J. Ingold.

17. Song behaviour and reproductive strategies in a duetting wren, *Thryothorus nigricapillus*: I. Removal experiments. R. N. Levin. 1996. Anim. Behav. 52:1093–1106.—Mate removal experiments were conducted on five males and five females from 10 pairs of Bay Wrens (*Thryothorus nigricapillus*) to determine if vocal duetting functions in pair bond maintenance and/or territory defense in this species. Neither males nor females changed their song phrase repertoire when singing with a new mate. Additionally, duet precision did not change following a mate change. These results indicate that duetting does not function in pair bond maintenance in the Bay Wren. Mate removal did not result in loss of territory. All 10 birds whose mates were removed successfully defended their territories, suggesting that duetting does not function in joint territorial defense in the this species. It was suggested that unpaired males use song to attract females. This is supported by an increased song rate of greater than 4-fold when males were unpaired following removal of their mate. It also was suggested that males may participate in duets to access and/or invest in a mate in some way. The function of duetting by males in established pairs remains unclear. [Dept. of Biology, Pomona College, Claremont, CA 91711, USA.]—Jeffrey P. Duguay.

NESTING AND REPRODUCTION

(see also 3, 5, 6, 7, 11, 28, 33, 40, 42, 44)

18. Parental care in the European Starling, *Sturnus vulgaris*; nestling provisioning. M. I. Sandell, H. G. Smith and M. Bruun. 1996. Behav. Ecol. Sociobiol. 39:301–309.—The amount of energy male birds invest in offspring is determined in large part by their mating status. In polygynous species, the extent to which males feed nestlings from different nests is highly variable. The way in which polygynous males divide their nest effort between primary and secondary nests has a profound influence on the evolution of polygyny in birds. In this study, the authors examined European Starlings during three breeding seasons in southern Sweden to determine how males assist with feeding nestlings in relation to their mating status, and to analyze the effect of parental care on reproductive success. Polygynous males fed nestlings as much as monogamous males, but they divided their efforts disproportionately among broods. Polygynous males predominately fed the nestlings of their primary female, and they apparently used the amount of time that lapsed between the onset of the primary and secondary nest as a cue to determine how much to invest in secondary nests. Polygynous males proportioned their investment between primary and secondary nests more equally during incubation than during nestling feeding, a trend also shown in the Pied Flycatcher (*Ficedula hypoleuca*). A negative relationship was detected between male and female feeding frequency at polygynous nests demonstrating that females compensated for reduced help by

increasing their feeding rate; however, this compensation was incomplete since the total feeding frequency at primary and secondary nests was lower than that at monogamous nests. These data strengthen the idea that in many instances polygyny decreases female fitness as a result of reduced male support in feeding nestlings. In contrast to Belgian populations of European Starlings, secondary female starlings of polygynous males in this study were unable to settle and initiate nesting asynchronously in relation to the primary female, and were thus unable to significantly reduce the costs associated with their mating status. [Dept. of Animal Ecology, Lund Univ., S-223 62 Lund, Sweden.]—Danny J. Ingold.

19. Paternal expenditure is related to brood sex ratio in polygynous Great Reed Warblers. I. Nishiumi, S. Yamagishi, H. Maekawa, and C. Shimoda. 1996. Behav. Ecol. Sociobiol. 211–217.—Trivers and others predicted that in polygynous animals in which there is variation in the reproductive success among adults influenced by parental investment, parents should invest a greater proportion of their energy in male offspring versus female offspring. Although this theory has been supported by several studies, it has often been difficult to distinguish whether differences in offspring investment result from sex differences in the demand of offspring related to sexual size dimorphism (i.e., male offspring may be more vigorously), or whether differences are truly a consequence of parental manipulation. The authors of this study address this question by examining the relationship between parental feeding ratio, sex-brood ratio, and brood size in Great Reed Warblers (*Acrocephalus arundinaceus*) during three breeding seasons in central Japan. Young warblers were sexed using the polymorphic microsatellite loci located on the Z chromosome. A significant positive correlation between male parental expenditure and sex brood ratio, independent of an increase in nestling food demands associated with sex size dimorphism, was detected. Conversely, maternal feeding frequencies were not related to either brood size or brood sex ratio. Female feeding frequencies were also independent of male feeding frequencies and brood status (e.g., monogamy or polygyny). These data seem to demonstrate that male Great Reed Warblers preferentially invest more energy in their sons versus their daughters. The authors discuss a variety of hypotheses that address the difference between male and female feeding patterns in Reed Warblers and the trade-off in males between parental effort and mating effort. Based on their findings, the authors suggest that sex-biased provisioning may occur in species in which paternal feeding does not differentially affect the survival of chicks of either sex. [Dept. of Zoology, National Science Museum, 3-23-1 Hyakunin-cho, Shinjuku-ku, Tokyo 169, Japan.]—Danny J. Ingold.

20. Seasonal trends in observations of raptors in the central Swedish mountains. A. A. Smith. 1996. Ornis Svecica 6:123–126.—Predation is a primary cause of mortality in most Lagopid grouse populations, however relatively little research has been conducted regarding the effects of predation on the Lagopid population and predator abundance, largely because of the inhospitable terrain and severe climatic conditions associated with Lagopid breeding and wintering grounds. Surveys conducted between May 1993 and August 1995 revealed that raptors were more likely to be observed during the 4 summer months than in the 8 winter months. No raptors were observed in November or December of any year. The general trend was of high raptor abundance in spring and late summer, followed by few sightings in winter when the raptors migrated away from the mountain areas. Late winter (February) sightings were believed to be mostly migrant or dispersing juvenile birds. The absence of sightings in June and July was postulated to reflect changes in the energetic requirements of adult raptors as they hunted closer to the nest (away from the study area) to feed young. The increase in observations in late summer is probably due to the influx of fledged young. This is the time when young grouse are fledging, leading to increased risk of predation of grouse of all age classes. The author cautions that results from non-systematic observations such as this are greatly influenced by several inimical factors making between year differences difficult to interpret. [Edward Grey Inst., Dept. of Zoology, South Parks Road, Oxford OXI 3PS, U.K.]—Sue Bennett.

21. Hatching asynchrony and survival of insurance offspring in an obligate brood reducing species, the American White Pelican. R. M. Evans. 1996. Behav. Ecol. Sociobiol. 39: 203–209.—Brood reduction in most avian species is facultative and is considered to be an adaptation that results in the demise of last-hatched offspring during years when food is

particularly scarce. White Pelicans (*Pelecanus erythrohynchos*) lay a clutch of two eggs and are an obligate brood reducing species (species in which over 90% of broods are reduced) in which brood reduction occurs independent of variations in food supplies. In this study, the author examined White Pelicans during two breeding seasons in Manitoba to test the hypothesis that the B-chick (last-hatched chick) contributes to parental fitness by serving as a potential replacement for failed A-offspring (first-hatched chicks). This "insurance hypothesis" predicts a high probability of B-chick survival only up to a point in which A-chick offspring are most likely to fail. Only one of 94 unmanipulated two-egg broods and one of 84 manipulated two-egg broods (1.1% combined) produced two fledged chicks; B-chick mortality was primarily the result of starvation associated with harassment brought on by the older chick. A-chick mortality occurred at 13.5% of unmanipulated nests where the A-egg hatched. The mass of A-chicks at these nests was not significantly affected by hatching asynchrony at any point during the nestling phase. One-week weights of B-chicks that died within the next three days were significantly lower than the weights of those that survived beyond this period. Hatching asynchrony (0–4 days in White Pelicans) had a profound effect on B-chick survival, with mortality occuring at a significantly younger age as hatching asynchrony increased. These data support the common notion that size differences within a brood resulting from hatching asynchrony result in the competitive demise of the last-hatched nestlings. The failure of hatched A-chicks to survive was most notable during the first 5–7 days post hatch. It was during this period that a robust mean B-chick survival of over 80% (when expressed as days after hatching of the A-chick) also occurred; however, this initial period of concomitant survival was followed by a rapid drop in B-chick survival relative to the day that the A-chick hatched. These data support the "insurance hypothesis" in this species since brood reduction was timed to insure the survival of B-chicks during the first 5–7 days post hatch to be available to replace failed A-eggs or chicks. The author suggests that it is uncertain whether hatching asynchrony in White Pelicans is an adaptation that resulted from selection pressures to achieve this result and discusses some possible alternative selection pressures. [Dept. of Zoology, Univ. of Manitoba, Winnipeg, MB R3T 2N2, Canada.]—Danny J. Ingold.

22. Reproductive success of grassland birds at east-central Illinois airports. E. L. Kershner and E. Bollinger. 1996. Am. Midl. Nat. 136:358–366.—The authors surveyed seven grasslands surrounding small- to medium-sized airports (3 ha to 1200 ha) in order to determine the nest density, reproductive success and the effects of moving on grassland-nesting birds from mid-April to mid-August. One-hundred and forty-seven total nests were found, the majority of which (71%) were from Eastern Meadowlarks (*Sturnella magna*). Other nesting species included Grasshopper Sparrows (*Ammodramus savannarum*; 8.2%), Savannah Sparrows (*Passerculus sandwichensis*; 8.2%), and Red-winged Blackbirds (*Agelaius phoeniceus*; 7.5%). Overall nest density for all airports was 0.79 nests/ha; nest density was 0.56 nests/ha for meadowlarks and 0.06 nests/ha for both Grasshopper and Savannah Sparrows. Overall nest density and nest success declined as mowing height decreased and mowing frequency increased; mowing resulted in 44% of all nest failures while nest predation was a distant second (23%). Nest success combined for all species was 14%, ranging from 6% in Red-winged Blackbirds to 100% in Horned Larks (*Eremophilia alpestris*). Eastern Meadowlarks had a nest success rate of 14%. Average population densities for grassland birds were generally high (1.16 meadowlarks/ha; 1.14 Grasshopper Sparrows/ha; 1.91 Savannah Sparrows/ha) suggesting that these species were attracted to airport grasslands. However, the overall nest success for all species (14%) was even lower than what is considered typical for grassland birds (25–55%), and the authors suggest that these and other airport grasslands may be ecological traps. The reasoning is that airport grasslands are often fairly large and thus attract a variety of grassland-nesting birds; however, numerous confounding factors (e.g., mowing and other disturbances) prevent successful nesting efforts such that these areas are really population sinks rather than sources. Since F.A.A. regulations stipulate that vegetation around runways should not reach heights that create "wildlife habitat," the authors recommend that for small to meduim-sized rural airports, grassland birds be discouraged from nesting there in the first place. Although this might seem counterproductive, birds would be forced to seek other nesting habitat that should lead to greater reproductive success. An increased mowing regime could be used to

discourage birds from initiating nest attempts at airports. [Dept. of Animal Sciences, Univ. of Illinois, Urbana, IL 61801, USA.]—Danny J. Ingold.

23. Utilization of artificial floating objects as nest platforms by Little Grebes and Eurasian Coots in Lake Teganuma, Central Japan. T. Hiraoka. 1996. J. Yamashina Inst. Ornithol. 28:108–112.—Three Little Grebe (*Podiceps ruficollis*) and 2 Eurasian Coot (*Fulica atra*) nests were found atop floating objects within stands of natural vegetation. The objects ranged from a natural log, to a polystyrene foam board, to wooden boards, to an old automobile tire. At least 2 of the grebe nests appeared successful and one of the coot nests may have been successful. The potential for development of artificial nest platforms for these species is suggested. Eurasian Coots are known to use artificial nest platforms in the western Palearctic. [Yamashina Institute for Ornithology, 115 Konoyama, Abiko, Chiba Pref., 270-11 Japan.]—Jerome A. Jackson.

24. Dispersion, size and orientation of bowers of the Great Bowerbird *Chlamydera nuchalis* (Ptilonorhynchidae) in Townsville City, tropical Queensland. C. B. Frith, D. W. Frith, and J. Wieneke. 1996. Corella 20:45–55.—The Great Bowerbird is the largest of the 19 species of bowerbirds, in 16 of which males clear and decorate display courts and construct bowers of sticks—externalized secondary male sex characteristics. Great Bowerbirds construct an 'avenue' bower, usually of two parallel rows of upright sticks. Typically there is a display platform at each end of the avenue with one platform more profusely decorated with an assortment of snail shells, bones, flowers, etc. This paper is a preliminary report on an intensive study of 54 of 80 Great Bowerbird bowers in Townsville City. Variations in bower size, structure, and orientation were examined and compared to reports in the literature with a primary goal of stimulating further study of avenue-building bowerbirds. Subjective assessments of bower geometric and decoration qualities supplemented direct measurements, and the authors found, for example, that larger bowers were generally of higher geometric and construction quality and better decorated. About two-thirds of the avenues were oriented within 45° of a NNW-SSE axis which would provided maximum sunlight exposure for morning display on the southern display platform, and for afternoon display on the northern platform. Red decorations are predominately placed on the E side of the avenue where they would receive maximum light in the morning when most displaying occurs. This paper presents a fascinating array of detailed observation and inferences about Great Bowerbird bowers and behavior, and thorough comparisons with the literature. It should have its desired heuristic effect and be of interest to students of avian mating systems and evolution. ['Prionodura', P.O. Box 581, Malanda, Queensland 4885, Australia.]—William E. Davis, Jr.

25. Observations on colour-banded Regent Honeyeaters *Xanthomyza phrygia*. A. J. Ley, D. L. Oliver, and B. Williams. 1996. Corella 20:88–92.—The biology—especially the movements—of the endangered Regent Honeyeater is poorly known, which makes conservation and recovery strategies problematical. From 1991–1995, 46 Regent Honeyeaters were banded in northern New South Wales, Australia. The authors present a preliminary report on sightings of the marked birds and the new information that the sightings provide. Two birds banded the same day in April, 1995, were observed nesting in November, one 42 km away, the other at the banding site. One bird banded in November, 1993, after nesting, was observed nesting again at the banding site two years later. These observations suggest some degree of breeding site fidelity, and other sightings suggest some level of regional fidelity throughout the year. At least two pairs nested twice in a single season at the same location, indicating monogamy and site fidelity at least through a single breeding season. Observed local movements also indicate the use of a wide range of habitats and suggests that conservation efforts may need to focus on more than just localized breeding sites. The sex of 15 marked birds was established by observing nesting behavior, and confirmed that males are larger than females in all body measurements. This study emphasizes the enormous advantage of having individually marked birds in avian studies. [19 Lynches Road, Armidale, NSW 2350, Australia.]—William E. Davis, Jr.

26. Nest-site selection in Savannah Sparrows: using gulls as scarecrows? N. T. Wheelwright, J. J. Lawler, and J. H. Weinstein. 1997. Anim. Behav. 53:197–208.—Although there may be substantial risks involved, birds often nest near predators. Two explanations for this

behavior have been advanced: (1) Birds may be constrained in acquiring safer nests and are thus forced to nest near predators. (2) The benefits of nesting near predators outweigh the costs. To evaluate possible advantages and disadvantages of nesting near predators, the authors compared the behavior and reproductive success of Savannah Sparrows (*Passerculus sandwichensis*) nesting in the presence of Herring Gulls (*Larus argentatus*). A marked, known population of Savannah Sparrows in which reproductive success and heritability of behavior could be estimated over an eight year period was used. This study was conducted on Kent Island in the Bay of Fundy, New Brunswick, Canada. With no mammalian predators on this island, Herring Gulls and American Crows (*Corvus brachyrhynchos*) are the most important predators, with crows being more efficient than gulls. Crow and Herring Gull models were presented to nesting Savannah Sparrows and the sparrow's behavior was monitored. Female sparrows perceived the models as a threat. Additionally, they were able to distinguish predators and considered crows a greater threat than gulls. Nesting gulls also were exposed to crow models. Gulls responded aggressively to crow models, often (62.5% of the time) making physical contact with the crow model. Overall, the number of sparrow nests was negatively correlated ($P = 0.02$) with gull density. However, sparrows nesting near gulls reproduced as successfully or better than sparrows that avoided gulls. Given that Savannah Sparrows are able to distinguish between the two predators and that nesting near gulls conferred a reproductive advantage to nesting sparrows, why did they tend to avoid gulls? The authors suggest that the heritable trait to nest near gulls is low and the strength of directional selection favoring it relatively weak. It is suggested that the decision to nest near a predator requires overcoming innate and adaptive fears and that the short-lived Savannah Sparrow (2 years) may have insufficient time to learn that "the enemy of one's enemy is one's friend". [Dept. of Biology, Bowdoin College, Brunswick, ME 04011, USA.]—Jeffrey P. Duguay.

27. Nest predation: the relative effects of nest characteristics, clutch size and parental behaviour. W. Cresswell. 1997. Anim. Behav. 53:93–103.—The effect of parental nesting behavior on the probability of nest predation was examined by comparing the failure rate of 145 natural Blackbird (*Turdus merula*) nests with parental care with that of the same nests with artificial clutches but without parental care during the 1995 breeding season in Edinburgh, Scotland. Mortality rates for experimental and natural nests did not differ significantly during either the egg or chick stage. The chick stage for experimental nests contained eggs, but was the same duration as the chick stage for natural nests with nestlings. The probability of nest failure for natural nests was independent of its physical characteristics when Blackbirds were present. However, when Blackbirds were absent from the same nests, the probability of nest failure was determined by its detectability and height. Cresswell provides an argument for lower predation rates on natural nests being due to nest defense by the parental birds. Those interested in studying vegetation characteristics associated with successful and predated nests would do well to read this paper. [Applied Ornithology Unit, Graham Kerr Bldg., Div. of Environmental & Evolutionary Biology, IBLS, Glasgow Univ., Glasgow G12 8QQ, U.K.]—Jeffrey P. Duguay.

MIGRATION, ORIENTATION, AND HOMING

(see 37, 39, 49)

HABITAT USE AND TERRITORIALITY

(see also 16, 22, 29, 30)

28. Territorial and breeding behaviour of the Rufous Treecreeper (*Climacteris rufa*) in the Stirling Ranges, Western Australia. A. M. Rose. 1996. Corella 20:55–61.—This is the first study of the breeding biology of the Rufous Treecreeper. The study took place in open wandoo (*Eucalyptus wandoo*) woodland in Stirling Range National Park. Forty-one individuals were banded during this 3.5 year study, including 26 which were color-banded. The author reports a wealth of natural history information about Rufous Treecreepers, particularly about territorial and nesting behavior. Five treecreeper territories, several of which had subordinate adult males, averaged nearly 8 ha. Of 9 young birds banded none remained in its natal territory and only two remained nearby, suggesting a pattern of emigration. Most pairs produced two broods from August to January and one produced three. Females did most of the

nest building (hollows in live or dead limbs or trunks) and helpers and juveniles did not assist. Only the female incubated but males fed incubating females. Incubation lasted 17 days and young fledged in 28. The author suggests that the requirement of hollows for nesting and roosting may be a limiting factor in the species' distribution and may partially account for its precipitous decline in the severely fragmented wandoo forests of the wheat belt region of Western Australia. This study demonstrates the importance of establishing a color-banded study population, and provides important natural history information about this endangered species. [Dept. of Conservation and Land Management, Locked Bag 104, Bentley Delivery Centre, Bently, WA 6983, Australia.]—William E. Davis, Jr.

ECOLOGY

(see also 1, 32, 33, 34)

29. Effects of landscape matrix and habitat structure on a bird community in northern Finland: a multi-scale approach. J. Jokimäke and E. Huhta. 1996. Ornis Fennica 73:97–113.—Increasing development and the resulting fragmentation of habitat has a substantial impact on habitat structure and selection for birds. The majority of forest fragmentation studies have been conducted in agricultural and heavily managed landscapes and have largely concentrated on patch size, shape and degree of isolation. However, results of such studies may have limited applicability in the context of looking at an entire landscape such as a forested area. The objective of this study was to attempt to determine the effects of scale, i.e., landscape matrix as opposed to local habitat, and its importance to bird-habitat relationships. Three different scales were analyzed: large-scale matrix (4 km^2), small-scale matrix (4 ha), and within local habitat (<0.79 ha). The analysis correlated bird species richness and abundance, and/or ecological groupings to scale, landscape matrix and habitat structure to determine the significance of and overall relationship between birds and their environment. Forest fragmentation and edge amount were found to have a positive relationship with managed forest species, edge species and habitat generalists. However, a negative relationship was found between edge amounts and virgin forest species and hole-nesters. Both the landscape matrix and habitat components were found to be important for managed forest species, with the landscape matrix being of greater importance. At the habitat level, both the structural and floristic components were equally important to managed forest species. Among migratory species habitat components were found to be more important than landscape matrix. In observing habitat generalists species, it was concluded that these birds benefited most from deciduous forests, whereas virgin forest species benefited more from a mixed-tree species composition. The authors concluded that birds respond to the environment individually and the response is scale dependent. Species composition and abundance were dependent on large scale factors other than the individual's immediate habitat. [Arctic Centre, Univ. of Lapland, P.O. Box 122, FIN-96101 Rovaniemi, Finland.]—Sue Bennett.

POPULATION DYNAMICS

(see also 20, 47)

30. Distribution and abundance of Hazel Grouse in Hokkaido, Japan, based on questionnaire. Y. Fujimaki and H. Konishi. 1996. J. Yamashina Inst. Ornithol. 28:81–91. (Japanese, English summary and figure and table captions.)—This study of the distribution and abundance of *Bonasa bonasia* is based on 1561 responses from 1912 questionnaires that were distributed—an enviable response rate. Although questions on the questionnaire are not provided in English, from the summary and tables it is clear that respondents were asked about eggs, nests, chicks, and adults, habitat in which the birds were found, and relatively precise location as to where the birds were found. It is also clear that the questionnaires did not go specifically to biologists or individuals who could identify one bird from another. The authors report that average clutch and brood sizes reported were much smaller than those known for the species and suggest that some reports may have been of Nightjar (*Caprimulgus indicus*) or Woodcock (*Scolopax rusticola*) eggs or young. Given this source of probable error, the authors still considered the data obtained "fairly reliable." Most nests and eggs were found in May and June. Clutch sizes ranged from 2–11; brood sizes from 1–10. Birds killed

by hunters included 532 males and 340 females or sex unknown. Habitats were coniferous or deciduous broad-leaf forest or larch plantation and were at altitudes between 200 and 800 m. [Laboratory of Wildlife Ecology, Obhiro Univ. of Agriculture and Veterinary Medicine, Inada, Obihiro, 080, Japan.]—Jerome A. Jackson.

31. A report on eight years of banding rehabilitated birds. S. Smith. 1996. Corella 20: 20–25.—Since 1985 rehabilitated native birds, including injured and hand-raised orphaned birds, have been banded prior to release by the WA Native Bird Hospital (Western Australia). The author reports on recoveries through June, 1993. A total of 3578 birds of 124 species were banded and 125 birds of 25 species were recovered. Seven birds were recovered twice, and the longest recovery distance was 1323 km for a Nankeen Night Heron (*Nycticorax caledonicus*). Nearly half of the recoveries were within three months of release, but 15 birds were recovered 1–2 yrs later. An Australian Magpie (*Gymnorhina tibicen*) was recovered 6 yrs after release, a Singing Honeyeater (*Lichenostomus virescens*) after 6 yrs and 9 mo. In general, the species most frequently banded were the most frequently recovered. The study provides evidence that rehabilitation is at least partially successful. The 3.5% recovery rate is substantially smaller than the 9% rate for all Australian birds over a 19 year period, but the time frame for possible recovery was only 8.5 yrs for the rehabilitated birds and no comparison on a species by species basis was made. [WA Native Bird Hospital Inc., P.O. Box 232, Mundaring, WA 6073, Australia.]—William E. Davis, Jr.

32. Survival, movements and habitat use of Aplomado Falcons released in southern Texas. C. J. Perez, P. J. Zwank, and D. W. Smith. 1996. J. Raptor Res. 30:175–182.—A former breeder in parts of southern Arizona, New Mexico, and Texas, the Aplomado Falcon (*Falco femoralis*) was last documented nesting within the U.S. in 1952. Habitat loss and pesticide contamination are the probable causes for the decline of this endangered species. In an effort to reintroduce these falcons to their historic range, hatching year birds were released at Laguna Atascosa National Wildlife Refuge in southern Texas during 1993 and 1994. A total of 38 birds were released over the two year period. Of these, 14 individuals (11 males, 3 females) were radiotagged to monitor their survival, movements, and habitat use. The released falcons experienced a 24% mortality rate, possibly caused by predation. Falcons traveled an average daily linear distance of 34±5 km. At about 75 days following release, they began to consistently use specific foraging and roosting sites. Roost sites were located in honey mesquite (*Prosopis glandulosa*), huisache (*Acacia smallii*) and trecul yucca (*Yucca treculeana*), frequently on the edge of open areas. Roosting habitats contained a mean density of 3.6 woody plants/ha and were approximately 46% vegetated. Falcons often foraged in habitats containing honey mesquite, sea oxeye (*Borrichia trutescens*), prickly-pear (*Opuntia lindheimeri*), or trecul yucca. Foraging sites contained a mean density of 2.6 woody plants/ha and were approximately 60% vegetated. Foraging sites were typically located within 2 km of roosting locations. [New Mexico Coop. Fish and Wildlife Research Unit, New Mexico State Univ., Las Cruces, NM 88003, USA.]—Sherry Meyer.

33. A banding study of Cincinnati area Great Horned Owls. J. B. Holt, Jr. 1996. J. Raptor Res. 30:194–197.—From 1964 to 1992, Great-horned Owl (*Bubo virginianus*) nests were located and chicks were banded within a 80 km radius of Cincinnati, Ohio. Of the 1570 nestlings banded over the course of the study, 151 bands were recovered. Forty-two percent were from owls found dead, 10% were from owls caught in traps, 9.3% were from road killed owls, 6.6% were from shot owls, and the remainder were recovered from live birds or were of uncertain outcome. Forty-three percent of nesting attempts were located in old Red-tailed Hawk (*Buteo jamaicensis*) nests, while another 43% were in snags or cavities. Artificial nesting platforms were used in 10% of the nesting attempts. Pairs often utilized the same territory for two or more years. On average, 47% of pairs nested successfully, 15% failed, and 38% of pairs did not attempt to nest. The average clutch contained 2 young (64%), although broods of 1 (31%) and 3 (5%) also occurred. The mean productivity for successful nests was 1.7 young. Exceptionally high productivity during 1970 was correlated with a peak in rat populations. [853 Johnson St., North Andover, MA 01845-5513, USA.]—Sherry Meyer.

ZOOGEOGRAPHY AND DISTRIBUTION

(see also 48, 50)

34. Avian abundance in sun and shade coffee plantations and remnant pine forest in the Cordillera Central, Dominican Republic. J. M. Wunderle, Jr., and S. C. Latta. 1996. Ornithol. Neortropical 7:19–34.—Because of the large area in the Neotropics that is devoted to coffee cultivation, conversion from traditional shade coffee plantations to sun coffee is expected to have significant effects on the avian species diversity. The authors sampled the three forest types, expecting the greatest diversity in the pine forest which is the most structurally and floristically diverse habitat and least in the sun coffee plantations which are the simplest habitats. There were significantly more birds in the pine forest and the shade coffee than in the sun coffee. The difference was attributed to permanent resident species being more abundant in pine and shade coffee. In contrast, Nearctic-Neotropic migrants were more common in sun coffee. Twenty-four of the 41 species recorded showed significant differences in distribution: 12 were most common in pine, 6 in sun coffee, and 6 in shade coffee. The native pine forest had more specialists with 9 species found only in pine forest, 3 species in shade coffee, and only 1 species was limited to sun coffee. The estimated species richness was much higher in the pine forest than either type of coffee. Nectivores were more common in shade coffee (67% of the individuals) than sun coffee (25%) or pine forest (25%). Fruit and seed eaters were most common in sun coffee (48% of the individuals; 26% for pine and 3% for shade coffee). Insectivorous birds were more common in pine forest (49%) than in shade coffee (30%) or sun coffee (27%). The authors conclude that although sun coffee plantations may increase a regions' biodiversity by attracting brushland species, these species are not the ones most likely to be threatened with habitat loss. The greatest contribution to the biodiversity of an area is from the pine forest fragments and shade coffee plantations because they provide habitat for forest species. [Dept. of Biological Sciences, 110 Tucker Hall, Univ. of Missouri, Columbia, MO 65211, USA.]—Robert C. Beason.

SYSTEMATICS AND PALEONTOLOGY

(see 1)

EVOLUTION AND GENETICS

(see also 19, 21, 40)

35. Sexual ornamentation, condition, and immune defence in the House Sparrow *Passer domesticus*. A. P. Møller, R. T. Kimball, and J. Erritzoe. 1996. Behav. Ecol. Sociobiol. 39: 317–322.—Male secondary sexual characteristics serve as a reliable indicator of a male's health and thus may also reflect a male's ability to cope with parasites and parasitic infection. One version of this postulate, the immunocompetence handicap hypothesis, assumes that the ability of males to signal females is inhibited by the negative effects of androgens such that they may have to choose their level of signaling short of what would be optimal in sexual selection. Since relatively little emperical information exists on the relationship between sexual ornamentation and any measure of immune response, the authors addressed the following questions in 70 male House Sparrows: (a) is the size of the bursa of Fabricius (a region of the cloaca that plays a central role in antibody production in young birds) negatively related to badge size and the level of testosterone production, and (b) is the size of the bursa related to the health of male sparrows and their current levels of parasitic infection. The bursa became significantly smaller during the first year of life in male House Sparrows and no difference in bursa size was detected between males and females. A significant negative correlation was detected between badge size and bursa volume ($P = 0.005$), such that males with larger badges (and presumbably healthier) had smaller bursae. Conversely, badge asymmetry, which could also be an indicator of general condition, was not correlated with bursa size. Relative testis volume and relative bursa volume were not significantly related, but directional asymmetry in testis size (another correlate of badge size) and bursa size were positively related. Sparrows in poor condition might be expected to have more fault bars on their feathers. If this is the case, individuals with more fault bars might also be expected to have larger bursa. Indeed the authors found a significant positive correlation between bursa

volume and the number of fault bars. Fluctuating wing and tarsus asymmetry, on the other hand, did not serve as indicators of bursa size. These data generally support the immunosuppression hypothesis since they show that male House Sparrows with larger badges have lower levels of immune response compared to males with smaller badges, and that healthier males, generally those lacking fault bars, had a relatively smaller bursa of Fabricus. [Laboratoire d'Ecologie, CNRS URA 258, Univ. Pierre et Marie Curie, Bat. A, 7eme etage, 7 quai St. Bernard, Case 237, F-75252 Paris Cedex 5, France.]—Danny J. Ingold.

PHYSIOLOGY AND DEVELOPMENT

(see also 15, 39)

36. Relationship of basal to summit metabolic rate in passerine birds and the aerobic capacity model for the evolution of endothermy. M. S. Dutenhoffer and D. L. Swanson. 1996. Physiol. Zool. 69:1232–1254.—Basal metabolism (BMR) is primarily a function of the metabolism of internal organs, while maximal metabolism is mostly a function of skeletal muscle metabolism. Basal and maximum (summit) metabolic rates were positively related to body mass for 10 species of passerines that were tested. An analysis of the residuals from the log-log regression of basal and maximum metabolic rates relative to body mass were significantly correlated ($r = 0.869$, $P = 0.001$), indicating that the correlation is independent of body mass. Basal metabolic rates were significantly higher in winter birds (Dark-eyed Junco [*Junco hyemalis*], Black-capped Chickadee [*Parus atricapillus*], Tree Sparrow [*Spizella pusilla*]) than previously reported but may have been due to the colder winter temperatures. Maximum metabolic rates were also significantly higher in juncos and chickadees. These results indicate that there is some plasticity in the winter metabolic rates and variations in temperature are probably responsible for the different metabolic rates. [D. L. S., Dept. of Biology, Univ. of South Dakota, Vermillion, SD 57069-2390, USA.]—Robert C. Beason.

37. Variability in basal metabolic rate of a long-distance migrant shorebird (Red Knot, *Calidris canutus*) reflects shifts in organ sizes. R. Piersma, L. Bruinzeel, R. Drent, M. Kersten, J. Van der Meer, and P. Wiersma. 1996. Physiol. Zool. 69:191–217.—The authors compared the body composition and basal metabolic rate (BMR) of two subspecies of Red Knots that breed in the high Arctic. One subspecies (*C. c. islandica*) spends the nonbreeding season in temperate western Europe and the other (*C. c. canutus*) in tropical West and South Africa. In addition to examining wild birds, captive birds were also studied. Captive birds had lighter lean organs, especially digestive organs (stomach, intestines, kidneys and liver). Wild birds from the temperate latitudes had larger lean masses than birds in tropical Africa. Knots wintering in the tropics had lower BMRs than conspecifics wintering at temperate latitudes. Similarly, birds maintained in captivity a long time had lower BMRs than their free-living counterparts. The authors concluded that long distance migrants such as knots adjust their metabolic rates and lean mass depending on the demands of their environmental conditions. [Netherlands Inst. for Sea Research (NIOZ), P.O. Box 59, 1790 AB Den Burg, Texel, The Netherlands. E-mail: theunis@noiz.nl.]—Robert C. Beason.

38. Fattening strategies in dominance-structured Greenfinch (*Carduelis chloris*) flocks in winter. M. Hake. 1996. Behav. Ecol. Sociobiol. 39:71–76.—Greenfinches, which form dominance-structured flocks in winter, were studied in January in outdoor and indoor aviaries to analyze fattening strategies and to quantify the adjustment of reserves by birds of different social status to experimental changes of food predictability and to weather changes. Low-ranked Greenfinches carried larger body reserves than higher ranked individuals, suggesting that subordinates, which had decreased access to food, perceived a greater risk of starvation. Moreover, when food predictability was experimentally decreased, subordinates increased their fat reserves significantly more than dominants. In response to severe weather conditions, dominant birds increased their body reserves more than subordinates. This demonstrates that although birds of lower social status had larger reserves than individuals of higher rank, dominant individuals had a greater potential to compensate by feeding when the risk of starvation increased. The results of this study suggest that fattening strategies in Green Finches is largely dependent on social status and that low-ranked individuals, which likely incur greater costs of acquiring and maintaining reserves, experience a lower probability of

surviving the winter than dominants. [Dept. of Zoology, Section of Animal Ecol., Univ. of Goteborg, Medicinaregatan 18, S-413 90 Goteborg, Sweden.]—Danny J. Ingold.

PLUMAGES AND MOLTS

(see also 35)

39. The timing of post-juvenile molt and fuel deposition in relation to the onset of autumn migration in Reed Warblers *Acrocephalus scirpaceus* and Sedge Warblers *Acrocephalus schoenobaenus*. S. Hall. 1996. Ornis Svecica 6:89–96.—Long distance migrants, especially those at more northern latitudes must arrive at the breeding grounds, breed and depart in a relatively short span of time. The pressures this time constraint imposes on first year birds requires that juveniles fledge and almost immediately prepare for the long migration. Quickly acquiring a full set of wing and tail feathers and a good quality of body plumage is imperative if the bird is to survive its first migration. If the post juvenile molt takes place quickly enough, departure time from natal grounds may also be expedited, thereby reducing migratory time pressures. In this study Hall analyzed data obtained from an 11-year banding study in South Central Sweden to estimate the time period from juvenile to first winter plumage and departure times. Body mass, visible body fat load and juvenile molt score were recorded for all birds. Re-trapping data suggested that Reed Warblers took longer to acquire their first winter plumage than Sedge Warblers (34 vs. 22 days). Molt patterns between these two species were markedly different. Sedge warblers acquired first winter plumage by filling in only bare body areas with replacement feathers whereas reed warblers proceeded through the entire molt sequence. Fuel deposition rates were similar between the two species; Reed warblers registered 0.38 g/day and Sedge Warblers 0.34 g/day. However, fuel storage at time of departure was found to be significantly different between the two. Reed Warblers were observed to leave with a much greater fuel store in relation to lean body mass compared to the sedge warbler (21% vs. 6.2%). One possible explanation for this could be different migratory strategies undertaken by the two species. Time of departure from natal grounds differed by about 18 days, with Sedge Warblers leaving earlier. The author notes a previous study in southernmost Sweden where Sedge Warblers were also observed to have departed with lower amounts of stored fat, but in this case the Sedge Warblers were found to depart several days after Reed Warblers. The author cautions against drawing any general conclusions about the underlying reasons or causative agents for the difference noted between the Reed and Sedge Warblers. [Kyrkängsbacken 8 bv, 141 35 Huddinge, Sweden.]—Sue Bennett.

40. Occurrence of albino chicks from presumably the same pair of *Corvus corone*, during continguous eight years. N. Kuroda and T. Kazama. 1996. J. Yamashina Inst. Ornithol. 28:92–97. (Japanese, English summary.)—How often do we just note with curiosity the occurrence of albinos or leucistic birds in a population without making any effort to study their success as individuals and their interactions within a population? Kuroda and Kazama followed what has presumably been the same unusual pair of Carrion Crows over 8 years. One adult was normally pigmented, the other (sex not noted) a buff-colored mutant. Between 1986 and 1993, these birds produced an estimated 32 chicks, of which 9 were albino and one (illustrated) had extensive white on the vanes of its primaries and secondaries. Each year the nest included 1 or 2 abnormally plumaged chicks. The authors noted that the albino chicks dropped from the nest before fully grown and suggested that they had not been adequately fed. They also reported albino fledglings and adults from 3 other localities in the region. [Yamashina Inst. for Ornithology, Konoyama, Abiko City, Chiba Pref., 270-11 Japan.]—Jerome A. Jackson.

41. A sexual difference in plumage of Brown Shrike subspecies, *Lanius cristatus superciliosus*. M. Takagi. 1996. J. Yamashina Inst. Ornithol. 28:103–105.—Takagi captured adult Brown Shrikes during the breeding season (June, July), 1992–1995, on Hokkaido, Japan. He sexed the birds by the presence or absence of an incubation patch; females incubate, males do not. Using calipers he measured the width of the white band on the forehead to the nearest 0.01 mm. Mean width for 12 males was 6.46±1.79 mm (range = 3.5–10.45), and for 8 females was 3.47±0.88 (range = 2.59–5.24). The difference reported was significant (P = 0.0005). However measurements taken should be repeatable and I wonder, given the vagaries

of plumage and caliper positioning, if this measurement could possibly be repeatable at an accuracy of 0.01 mm. Dial calipers, electronic balances, etc. are wonderful tools, but often give us a false sense of accuracy. I suggest continued examination of the plumage pattern, increased sample sizes and use of a level of measurement accuracy that can demonstrated as repeatable. Having said this, I applaud Takagi's recognition of a plumage character that might be used in identifying the sex of some individuals—particularly within a mated pair—without capturing them. The differences shown in Fig. 1 of the manuscript are striking, but apparently the extremes, since overlap in measurements of the sexes was indicated. [Lab. of Applied Zoology, Faculty of Agriculture, Hokkaido Univ., Sapporo, 060, Japan.]—Jerome A. Jackson.

PARASITES AND DISEASES

(see also 35)

42. Of Great Tits and fleas: sleep baby sleep. P. Christe, H. Richner, and A. Oppliger. 1996. Anim. Behav. 52:1087–1092.—This study was conducted to determine how a common hematophagous ectoparasite, the hen flea, *Ceratophyllus gallinae*, affected nest sanitation and sleeping patterns of Great Tits (*Parus major*). The authors also were interested in determining if a trade-off between sleeping at night and foraging during the day existed for Great Tits. Twelve nests were kept parasite-free and 13 nests were infected three times between laying of the first egg and hatching of the nestlings. Behavior of female parents was recorded during the day and at night. Females in infested nests allocated more time to nest sanitation (27.1%) than females in parasite-free nests (8.3%). Additionally, between midnight and 0300, females in parasite-free nests spent more time in the sleeping position (73.5%) and had longer bouts of uninterrupted sleep than females in infested nests (48.1% of time in sleeping position), a difference that was significant. No difference in feeding trips per hour was found between females of infested and parasite-free nests. Sleep was interrupted in the infested nests, yet the function of sleep in birds is poorly understood. The authors suggest a better understanding of the function of sleep in birds is needed. [Inst. de Zoologie et d'Ecologie Animale, Univ. de Lausanne, CH-1015 Lusanne, Switzerland.]—Jeffrey P. Duguay.

WILDLIFE MANAGEMENT AND ENVIRONMENTAL QUALITY

(see also 12, 22, 23, 32, 47, 48)

43. Management of human visitation to seabird islands of the Great Barrier Reef Marine Park region. T. Stokes, K. Hulsman, P. Ogilvie, and P. O'Neill. 1996. Corella 20:1–13.—The Great Barrier Reef Marine Park (GBRMP) extends along the coast of Queensland for more than 900 km and 22 species of seabirds nest on more than 78 islands in the park. In the last decade the area has experienced radically increased usage, with increased settlement in coastal areas and expanded ecotourism. In 1987 13% of the islands were within one-day tourist vessel range, in 1994 59%, and by 2001 a projected 86%. This increase has resulted largely from increased vessel technology. The GBRMP is a multiple use park that allows most forms of recreational and commercial usage including resource extraction. The park is managed by both federal and local authorities and permits are required for most usage. An increase in tourism infrastructure has occurred on the 19 resort islands in the park and in adjacent coastal areas, and together with increased vessel range and usage pose substantial management problems. A variety of regulations currently restrict usage of seabird islands, ranging from preservations zones surrounding two major islands that are closed to all visitation except approved research, to seasonal closure during nesting season and strict controls on aircraft usage. Aerial surveillance records indicate that 12 islands get high or very high usage, 66 moderate or low. The authors have included a detailed description of permit requirements, assessment criteria for considering permits, the principles of seabird-human interaction used in establishing visitor management strategies, and usage permitted on the 15 islands with highest human visitation. The authors conclude that a general ban on human visitation is impractical and not warranted, but that more information on private and unauthorized visitation is needed. They present a code of conduct for people that visit seabird islands and make specific recommendations, e.g., regular access should be prohibited on

small islands where gull predation is likely to result from human disturbance. This paper presents a detailed assessment of the complicated management problems for a major seabird breeding region which is undergoing substantially increased anthropocentric pressure. It should be of interest to anyone making management decisions about, or with interests in, seabird conservation. [Great Barrier Reef Marine Park Authority, P.O. Box 1379, Townsville, Qld 4810, Australia.]—William E. Davis, Jr.

44. Habituation to human disturbance by breeding Bridled Terns *Sterna anaethetus*. J. N. Dunlop. 1996. Corella 20:13–16.—The author reports on the response of nesting Bridled Terns to human intrusion at two colonies in Western Australia which historically have been exposed to very different levels of human disturbance. The nesting habitats and nesting densities on Penguin and Bridled Islands were comparable, and adults were tending chicks on both, although the chicks were older on Penguin I. In the experiment, an observer walked toward a nesting tern and recorded the distance at which the tern flushed (n = 35 on Penguin I., n = 39 on Bridled I). The terns on Penguin I., which has been subject to regular human disturbance since 1918 (currently 80,000 visitors during the breeding season), allowed significantly closer approach before flushing than did the terns at Bridled I., which has been rarely visited. The author suggests that this is opposite to the expected response assuming that site tenacity declines as chicks become older. Hence the author attributes the differences in response to habituation by the Penguin I. terns. The patterns of human activity at Penguin I. have been generally predictable and benign, and the population of nesting terns has actually increased in the past two decades. Hence, the author concludes that management of seabird colonies for human access should involve establishment of human presence gradually, with predictable patterns of human movement and behavior. The suggested management strategy conflicts to some degree with more standard critical distance guidelines. This is an interesting paper which should be of interest to conservationists and wildlife managers. [162 Swansea St. East, East Victoria Park, Western Australia 6101, Australia.]—William E. Davis, Jr.

PHOTOGRAPHY, RECORDINGS AND SOFTWARE

45. Eastern birds by sight & sound. CD-ROM for the Macintosh. 1995. NatureWare, 3210 Dudley, Lincoln, NE 68503, $35.—The illustrations that are used on this CD-ROM are mostly from the works of Louis Agassiz Fuertes and appeared in Birds of New York, Birds of Massachusetts, Birds of Texas, as well as in National Geographic and Bird Lore magazines. There are additional paintings by Allan Brooks, George Sutton, Bruce Horsfalls, Walter Weber, and Cliff Lemen. Unlike the other CD-ROMs currently on the market, this one does not seemed to be designed for use as a supplemental field guide. The pictures are by well-known artists and very good, but do not indicate field marks. The songs are helpful, but usually only 1 or 2 songs of each species with no geographic variation indicated. The write-up on each species is very limited and does not provide any additional cues to identification. There are three options to using the CD-ROM: flashcards, a matching game, and a lookup for specific birds, either by species or habitat. Flashcards is an identification quiz, but of preset groups of birds. There is no option of selecting the species to be quizzed over. The matching game is based on remembering where the two matching cards are located and not useful in learning the birds. The option of looking up a species is the one most people will find useful. The user interface is not what most computer users, especially Macintosh users, have come to expect from their applications. There are no "closeboxes" or "growboxes" for the windows, but some windows can be dismissed by clicking on their bar, whether intentionally or accidentally. If a screen-saver becomes active with the program is running, often it becomes necessary to restart the program. There seems to be some conflicts for control of the screen. Overall, the CD-ROM provides some nice pictures and vocalizations that birders may find useful as a supplement to learning bird identification, but this CD-ROM lacks the flexibility and power of other offerings that are on the market; its price is also lower.—Robert C. Beason.

46. North American birds with Roger Tory Peterson multimedia CD-ROM version 1.1, for Windows 3.1 and Windows 95. 1996. Houghton Mifflin Interactive, Somerville, MA. List price $69.95.—This software is recommended for persons aged 10 and over, using IBM-

compatible 486 or higher computers having at least a 2X CD-ROM drive, 22 kHz 16-bit sound card, SVGA display, 8 megabytes of RAM, 20 megabytes of available hard drive space, and a mouse. A version for Macintosh computers is not available. This CD is designed to do all the jobs that a good field guide can do, but better (as long as you don't mind doing it at a computer). Upon command, it will show a large image of each of the 672 birds that normally occur in North America (49 states and 12 Canadian provinces), plus stray, extirpated, and exotic birds, for a total of 949 species. All are illustrated with a painting, and most with a field photograph. The paintings are from Roger Tory Peterson's A Field Guide to the Birds of Eastern and Central North America, fourth edition (1980), and A Field Guide to Western Birds, third edition (1990). The field photographs, from various sources, are outstanding. The text is from Kenn Kaufman's Lives of North American Birds (1996). All three source books are published by Houghton Mifflin, Boston, MA. Bird names are according to the American Ornithologists' Union. Each illustration of a regularly breeding species is accompanied by a recording of its typical song (mostly ranging from 10 to 22 seconds in length) from the Cornell Laboratory of Ornithology. Clicking on a few other buttons on the species screen will bring up the summer and winter range map, a description of the species' habitat, nesting and feeding behavior, and population status. To help with the field identification of a species, clicking on a button will apply a set of the Peterson field mark arrows to the painting, pointing out the features that distinguish this species from similar species, and choosing another button will bring multi-species color plates taken from the Peterson field guides to show this bird in relation to the others on its group page and the group pages of similar-looking species.

Figuring out the name of an unknown bird is simplified by first limiting (filtering) the possibilities to species that fit the right habitat, right season of the year, and the correct state or province. The user may also specify the bird's dominant color, approximate size, and whether the bird is clearly in one of Peterson's defined visual categories, such as bird of prey, fowl-like, swimmer, or wader. The program then presents a short list of all the non-exotic species that meet the restrictions that were specified. Each suggested name is easily matched with its full-color illustration and song to help determine the correct identification.

State check-lists are simple to create. Just a few clicks of the mouse produced a list of 325 species for Illinois. In comparison, H. D. Bohlen's book The Birds of Illinois (1989, Indiana University Press, Bloomington, IN) lists 297 regularly occurring species and 99 reported vagrants in Illinois. The Houghton Mifflin Interactive CD-ROM has included all the regular breeders and visitors, plus some of the vagrants.

The disk also includes a vast array of bird identification quizzes, programmable from easy to difficult, with the test species available by song only, or sight only, or with various combinations of clues (range, habitat, etc.). Tests can be limited (filtered) to birds from just a single state, habitat, size, color, or other restrictions. Several portions of the disk show Roger Tory Peterson telling about birds, birding, personal advice, and anecdotes. His voice and moving pictures are fairly good, but not nearly the quality of normal television and movie productions. There are also illustrated discussions (some with movies) on basic ornithology, migration, conservation, birding hot spots, etc.

One section of the program allows the user to keep a life list, or any number of lists (annual, state, trip, etc.) by simply selecting bird names from an on-screen check-list. A nice feature of these lists is that clicking on any bird name on a list will bring its color photo. But there are several notable disadvantages to the life list part of the program. The birds can not be listed in taxonomic order, but only alphabetically by common name or by Latin name. And if two birding companions wanted to create similar but slightly different individual lists after a big birding trip, there is no way to create the second list by modifying the first; each list must be built species by species. Any species that is to be entered on a life list or other list must be accompanied by a date between 1970 and 2037. Therefore, sightings before 1970 can not show the accurate date, nor will the program allow the date spaces to remain blank. Extensive notes about each sighting can be recorded. Once a life list or other list has been created, it can be printed. Unfortunately, however, the program will not print a compact list, but shows only four species entries on a page, spaced to allow for the extensive notes on each species (whether any notes were written or not) so a 100-bird trip list prints

onto 25 pages. The program does not provide a tally of how many birds are included on any user-created list.

Software to access the World Wide Web is on the disk, so that users can easily connect to Peterson Online (which can also be contacted by using a search in most web browsers). Peterson Online leads to birding chats, current birding information, numerous articles from Bird Watcher's Digest, daily rare bird alerts by region, birding events calendar, commercial products market, activities for young birders, and links to a wealth of bird-related internet addresses. These links include birding organizations, sanctuaries, museums, government agencies, and many others.

We found a few minor programming errors. Although the individual species accounts of the Belted Kingfisher (*Ceryle alcyon*), Ringed Kingfisher (*Ceryle torquata*) and Wood Thrush (*Hylocichla mustelina*) are accurate, including the normal body sizes, these three species will not appear in the list for any state or region if a normal body length is specified. Only if a body length of 0 inches is allowed will these three appear on the list. A similar problem occurs with many of the exotic species. The program is quite easy to install on a computer, and if a user decides to eliminate it, there is a single-click icon to uninstall it.—Edwin and Evelyn Franks.

BOOKS AND MONOGRAPHS

47. Demography of the Northern Spotted Owl. E. D. Forsman, S. DeStefano, M. G. Raphael and R. J. Gutiérrez, Eds. 1996. Studies in Avian Biol. 17:1–122. Cooper Ornithol. Soc. $20.00.—This volume is the proceedings of a workshop held in Ft. Collins, CO, December 1993, and contains 14 papers. The first three provide information on the biology and history of the species and on the research techniques used to study it. The remaining papers deal with the demographics of the Northern Spotted Owl (*Strix occidentalis caurina*) in various parts of its range, except the final two papers that provide a synthesis of the demographic analyses. Most of the demographic papers deal with the different populations of Oregon, with one paper each on the owls of Washington and California. The annual survival rate of female owls captured as adults has declined significantly, based on both short-term and long-term data. The survival rates of adult males are also declining, but not as rapidly. The data for juveniles are too sparse to accurately determine their survival rates, but the overall trend is also a decline in survival. Based on these survival rates, it appears that on most, if not all, of the study areas, the Northern Spotted Owl populations are declining and are not at equilibrium. Furthermore, the rate of population decline is accelerating. The results of these studies were used by President Clinton's administration to develop and implement a plan to protect large areas of mature and old-growth forest, but allow some limited harvest of older forests. This plan was immediately challenged in court by industry, as being illegal, and by environmental groups, because it was inadequate to protect the owls.—Robert C. Beason.

48. A checklist of the birds of Chile. S. N. G. Howell. 1996. American Birding Assoc., P.O. Box 6599, Colorado Springs, CO 80394, USA. 32 pp, paper. $4.95.—Chile, 4200 km long, but never more than 320 km wide, ranges in habitat from the Atacama Desert, to other high Andes habitats, to coastal scrub, to temperate rain forest, to the cold islands of the extreme south. Within this area 410 species of birds have been documented, a pittance compared to adjacent areas of South America, a result of isolation by the Andes. Appendices list 19 additional species known from Chile's distant island territories, and 20 species of hypothetical occurrence. Each species is assigned to 1 or more of 4 biogeographic regions, 10 status categories, and 6 abundance categories. In general the list is utilitarian, providing space for ticking off records on several visits and providing enough information to suggest what the birder might encounter and where. A bibliography of 26 references will also be useful to those interested in advance preparation for a trip. I find the avifauna of Chile fascinating: 43 species endemic to Chile and adjacent Argentina, 9 strictly Chilean endemics, 3 additional endemics from the Juan Fernandez Islands. The avifauna is dominated by non-Passerines, and within the Passeriformes, by the suboscines (38 tyrant flycatchers). Only 2 wood warblers and one vireo (all North American migrants) are known from Chile. Chile can boast of having the southern counterpart of our Ivory-billed Woodpecker (*Campephilus*

principalis), the Magellanic Woodpecker (*C. magellanicus*) among its endemics—for now. Unfortunately North American forest industries are heavily into clear-cutting the southern beech (*Nothofagus*) forests it calls home.—Jerome A. Jackson.

49. How birds migrate. Paul Kerlinger. 1995. Stackpole Books, Mechanicsburg, PA. 228 pps. ISBN 0-8117-2444-1. $16.95, paper.—For those looking to expand their knowledge and understanding of the phenomenon of avian migration but have a difficult time wading through the more technical journals and books, this latest offering of Paul Kerlinger will be more to their liking. This non-technical, easy to read book provides insights into many of the more technical aspects of avian migration. Topics are presented in a way that makes them more comprehensible for those that are less scientifically inclined, or for those that want to know more. Each of the fifteen chapters addresses questions that we have all probably pondered at one time or another. Starting with the "why's" of bird migration, Kerlinger progresses to discussing such topics as different modalities of study, basic physiology of bird flight, aerodynamics, migratory barriers, rest and refueling, navigation and flight strategies among several others. Each chapter contains a brief introduction to the topic and also offers specific "Case Studies" to further illustrate how the topic actually applies. Pat Archer's illustrations are nicely done and well appointed, contributing to and enhancing the points Kerlinger makes. The more technical topics such as flight strategies, flight speed and distance, etc., retain enough pertinent facts without over-simplification. After learning the why's and how's of migration, the final chapter leaves the reader to contemplate what is perhaps the biggest threat facing migratory birds today: habitat loss and fragmentation and the resulting consequences suffered by birds on migration. This chapter illustrates how our actions affect the natural world, a very appropriate ending to the book. Upon discovering all the amazing feats a small warbler must endure during migration, it is discouraging to realize that despite all our knowledge, habitat is being lost at an alarming rate, threatening populations of migratory birds. Finally, for the reader motivated to learn more, a list of further readings is provided at the very end, including some keystone works in the study of migration. In his preface, Kerlinger states that in writing this book he attempted to merge scientific and popular writing to allow those interested in migration the opportunity to really understand and appreciate the phenomenon. Only with understanding and knowledge can we ever hope for real change to come about in the preservation of migratory bird habitats.—Sue Bennett.

50. The birds of Hungary. G. Gorman. 1996. Christopher Helm, London. 192 pp. maps of distribution. b&w drawings. ISBN 0-7136-4235-1. £19.99. **The birds of Greece.** G. Handrinos and T. Akriotis. 1997. Christopher Helm, London. 334 pp. maps of distribution. b&w drawings, b&w photographs. ISBN 0-7136-3929-6. £25.00.—English-written books on the avifaunas of Eastern Europe have been unavailable, either to the visitors going to watch birds or anyone looking for more detailed information on the birds of each of the countries. Two books published in one year by Christopher Helm have started to fill this niche. Neither The Birds of Hungary nor The Birds of Greece are field guides. Except for several dozen drawings in each book, a user will not find color plates depicting bird. What they will find is the vast amount of data provided in both books, in many cases, first time published data. Both books have similar format and style; the general or introductory part and the species accounts. The general part deals with topics such as geographical background, climate and vegetation, history of ornithology, bird habitats, and bird conservation. Many readers will find the chapters on conservation especially appealing because both of the countries are refuges for many endangered species. The introductory part in the Hungarian book covers 27 pages, and in the Greek book, 92 pages (including 22 pages of b&w photographs). The heart of both books is the species accounts. Three-hundred and sixty-three species were recorded in Hungary as of January 1995, and 422 species in Greece as of December 1995. The books differ in this part even though they both provide up-to-date and accurate information. The species in G. Gorman's book are divided into two categories: regularly occurring species, and rare visitors and vagrants. In the first category, 281 species are described. Each account starts with a brief general section followed by its status in Hungary, status internationally, distribution, and timing and range map. All of the species in Handrinos and Akriotis' book are arranged in one section. The species texts are missing the headings used in Gorman's book. Hence, orientation in the former book is easier. Regarding the vast amount of information provided

in each account on the Greek birds, the headings would be very useful. The species accounts for the Greek birds are as exhaustive as they could be. The description of the breeding or migratory status is supported by exact dates (day, month, year) and numbers of individuals recorded at different places making the accounts truly impressive. Since the 1970s foreign birdwatchers visiting Greece provided 482 observation reports with a half million individual bird records. Information in the species accounts also include banding recoveries and subspecies status. The book closes with a checklist of birds (not included in Gorman's book) and bibliography including 1,005 citations. Every birdwatcher will be pleased to find that both books list exact places where the rare species, large numbers of wintering birds, or migrants occur. No doubt both books make an important contribution to our knowledge of the Eastern European avifauna. If you plan a trip to these countries, do not hesitate to own a copy.—Josef Kren.