

RECENT LITERATURE

Edited by Robert C. Beason

RESEARCH TECHNIQUES

1. **Nightlighting minimizes investigator disturbance in bird colonies.** T. D. Bowman, S. P. Thompson, C. A. Janik, and L. J. Dubuc. 1994. *Colon. Waterbirds* 17:78-82.—Investigator disturbance has been linked to reduced reproductive success in a variety of colonial waterbirds. This paper contains a report on nightlighting as a means of reducing some aspects of investigator disturbance. This study was conducted on Anaho Island, a refuge in Pyramid Lake, Washoe County, Nevada. Crews of 3-6 with handheld 6V halogen spotlights, banded 1270 birds from 1988-1992. Flightless young of American White Pelicans (*Pelecanus erythrorhynchos*), Double-crested Cormorants (*Phalacrocorax auritus*), and California Gulls (*Larus californicus*) were easily caught. Adult pelicans and cormorants flushed from nests but returned within an hour of investigator departure. Gulls flushed but returned to nests in minutes, and no predation or cannibalism was observed. Gull chicks remained at or near nests and hence were not attacked by adult gulls. The authors reported low incidence of dead banded chicks during return visits after fledging, and concluded that banded chick mortality was low, and that there was no evidence that chick survival was adversely influenced by capture and banding. The authors emphasize the importance of scouting colonies at a distance before nightlighting trips to help minimize disturbance. Nightlighting was also useful for censusing species that are difficult to detect, e.g., Black-crowned Night Herons (*Nycticorax nycticorax*). Nightlighting advantages over daytime visits include reducing or eliminating gull predation and reducing thermal stress on eggs and chicks. [U.S. Fish and Wildlife Service, Stillwater National Wildlife Refuge, P.O. Box 1236, Fallon, NV 89406, USA.]—William E. Davis, Jr.

BEHAVIOR

(see also 11)

2. **Experimental and natural changes in the peacock's (*Pavo cristatus*) train can affect mating success.** M. Petrie and T. Halliday. 1994. *Behav. Ecol. Sociobiol.* 35:213-217.—In a previous study, Petrie demonstrated a correlation between the degree of elaboration of peacock's trains and their mating success and also showed that females selectively mated with males with the most elaborate trains. This suggests that female choice is responsible for mating patterns on the lek but does not necessarily provide conclusive evidence that elaborate male trains are the only or even the main cue that females respond to. In order to determine more precisely the importance of a male peacock's train morphology in determining its reproductive success, the authors conducted an experiment by removing 20 of the eyespots from 11 wild males and compared their subsequent mating success to a control group of males. The authors had already determined beforehand that the number of spots on a male's train is significantly positively correlated with the number of copulations it achieves ($P < 0.015$). The results of the experiment indeed demonstrated that there was a significant decline in mating success of individuals in the experimental group compared to the control group ($P = 0.0347$). Moreover, the authors found that if the relative number of eye-spots on an individual changes naturally with respect to the number of eye-spots in the trains of other males at a lek site, then the relative number of copulations that male obtains tends to change in the same direction (although not significantly; $P = 0.054$). These data seem to reaffirm the idea that variation in male peacock train morphology affects their mating success, and that female choice is the driving mechanism that results in nonrandom male mating success. [Dept. of Zoology, South Parks Road, Oxford, OX1 3PS, UK.]—Danny J. Ingold.

FOOD AND FEEDING

(see also 23)

3. **Great Horned Owl food habits at Mono Lake, California.** P. A. Aigner, M. L. Morrison, L. S. Hall, and W. M. Block. 1994. *Southwest. Nat.* 39:286-288.—The contents of over

400 Great Horned Owl (*Bubo virginianus*) pellets collected in 1990 and 1991 from two islands of Mono Lake, California (Paoha and Negit) were analyzed to establish baseline data on the island fauna. Mammals comprised the majority of remains identified from pellets taken from both islands (74% on Paoha and 84% on Negit), and rodents were the most frequently occurring of these (about 70% on both islands). About two-thirds of the rodent prey remains on Paoha were from deer mice (*Peromyscus maniculatus*) while about one-third were from montane voles (*Microtus montanus*). Conversely, on Negit, virtually all rodent remains were from deer mice with only a tiny percentage of vole remains (0.7%). On both islands, birds comprised the second largest group of prey items (16.4% on Paoha and 10.3% on Negit), and California Gull (*Larus californicus*) remains were the most prevalent at both locations. Insects, scorpions, and other arthropods were only rarely detected in the pellets. Between-island differences in prey remains largely reflect differences in the fauna on the two islands. Deer mice have been recorded on both islands, but voles have never been recorded on Negit. The data seem to reflect similar trends in Great Horned Owl feeding habits at other cold-desert locations in the southwestern U.S., to the extent that voles, where present, are consumed frequently. Conversely, the rate of mouse and bird consumption on these islands is much greater than reported for other Great Basin locations. The higher bird consumption rate is likely the result of large numbers of nesting gulls in the area. [Dept. of Environ. Science, Policy, and Manage., Univ. of California, Berkeley, CA 94720, USA.]—Danny J. Ingold.

4. **Foraging behavior of White-faced Ibises (*Plegadis chihi*).** J. A. Amat and F. D. Rilla. 1994. *Colon. Waterbirds* 17:42–49.—In this study the authors examine the interactions among habitat, flock size, and sex as these factors influence the foraging behavior of White-faced Ibises in grasslands and wetlands in SE Uruguay in 1991. Data recorded included habitat type, sex, group size, prey captures, periods of vigilance, and agonistic encounters. Solitary ibises were encountered more frequently in wetlands and defended feeding territory vigorously. Females were proportionally more abundant in grasslands. Ibises foraged in more densely packed flocks in wetlands and fighting and supplanting attacks were more common in wetlands than in grasslands. Males, which are larger and have longer bills, were more aggressive, particularly in wetlands. Solitary ibises assumed alert posture more frequently than birds in groups. Prey capture rates increased with group size in wetlands, and in groups up to 6–10, but less thereafter, in grasslands. Higher capture rates and larger prey suggest that wetlands are a better foraging habitat. The authors suggest that larger flocks in grasslands may have lower capture rates because of prey disturbance (withdrawal into burrows), and that the higher proportion of females in grasslands may be related to conspecific aggression, especially from males. [Estación Biológica de Doñana, C. S. I. C., Apartado 1056, E-41013 Sevilla, Spain.]—William E. Davis, Jr.

5. **Feeding ecology of Trumpeter Swans breeding in South Central Alaska.** T. Grant, P. Henson, and J. Cooper. 1994. *J. Wildl. Manage.* 58:774–780.—Spring and summer foods of Trumpeter Swans (*Cygnus buccinator*) were examined in order to better understand factors that affect Trumpeter Swan habitat use and breeding success. Data are reported from 7574 feeding observations from 5 pairs and 4 broods in 1988 and 3 pairs and 1 brood in 1989. Before and during egg laying, adults foraged primarily on submerged aquatic macrophytes. During incubation, the percent time adults spent feeding on submerged aquatics declined as they began feeding on emergent vegetation. Horsetail (*Equisetum fluviatile* and *E. arvense*) was the first to appear and was the most common food observed in the incubation diet. Males spent more time feeding on submerged aquatics and less time on horsetail than did females during incubation and post-hatch. During the post-hatch period, adults and young spent more time feeding on horsetail than all other foods combined. Cygnets fed on the fruiting bodies, young aerial shoots, and aerial shoots and aerial whorls of the horsetail while adults consumed the distal portion of the plant. Cygnets spent less than 2% of their feeding activity on animal material. Invertebrates were eaten during the first few days after hatch, usually in conjunction with treading behavior by adults. Cygnets spent less time feeding on submerged aquatics and more time dabbling than adults. The authors conclude that wetlands dominated by horsetail, sedge (*Carex lyngbyaei*) and submerged aquatics provide the necessary food resources for rapid pre fledgling cygnet growth. Wetlands dominated by pond lily

(*Nuphar polysepalum*), mare's tail (*Hippuris vulgaris*), and buckbean (*Menyanthes trifoliata*) appear to be poorer in quality and may not provide the adequate food resources for cygnet recruitment. The authors recommend further research on cygnet food preferences and fledging success. Once this is determined, wetlands can be managed to provide the species composition necessary for cygnet growth and survival. [Dept. of Fisheries and Wildlife, Univ. of Minnesota, Zoo Hodson Hall, St. Paul, MN 55108, USA.]—Robin J. Densmore.

6. Barn owl prey in southern La Pampa, Argentina. S. Tirant. 1992. *J. Raptor Research* 26:89–92.—Barn Owls (*Tyto alba*) in La Pampa, Argentina inhabit calden (*Prosopis caldenia*) forests, Monte Desert shrublands and agricultural habitats. Pellets were collected in 1986 and 1988 from two study areas characterized by all three habitat types. Ninety-six pellets were collected from the first study site and 110 from the second. Barn owls preyed largely on cricetid rodents. Pellet analysis revealed that primary prey species in the first study area included *Akodon azarae*, *Calomys* sp., and *Eligmodontia typus*, found in nearly equal proportions. *Calomys* sp. (52.1%) and *E. typus* (25.7%) were prevalent in the second study area. Barn owls in La Pampa preferred smaller prey species. Geographic variation in Barn Owl diets and prey vulnerability are discussed. [Museo Provincial de Ciencias Naturales y Antropológicas, Pellegrini 180, 1600 Santa Rosa, La Pampa, Argentina.]—Robin J. Densmore.

7. Factors affecting the use of a freshwater and an estuarine foraging site by egrets and ibises during the breeding season in New York City. A. D. Maccarone and K. C. Parsons. 1994. *Colon. Waterbirds* 17:60–68.—In this paper the authors report on a 1988 foraging ecology study of Great Egrets (*Casmerodius albus*), Snowy Egrets (*Egretta thula*), and Glossy Ibises (*Plegadis falcinellus*) at Goethals Bridge Pond (GBP), a freshwater pond not affected by tides, and Rahway River (RR), a tidally-influenced estuarine wetland, which are prime foraging areas for birds from three local breeding colonies. Based on the numbers of each species present in the breeding colonies, at GBP Great and Snowy egrets were significantly more abundant than expected, and Glossy Ibises less. Snowy egrets were more abundant than expected at GBP during medium and high tides and lower than expected at low tide, suggesting that higher water levels during medium and high tides made foraging at RR difficult. More Glossy Ibises foraged at GBP at high tide, again suggesting that high water levels at RR drove birds to nontidal GBP. The water level at GBP fluctuated through the breeding season and the numbers of Glossy Ibises and Snowy Egrets were inversely correlated to water depth. Great Egrets were not as affected by tidal changes at RR, or water depth at GBP, possibly because they can forage successfully in deeper water. All three species were more abundant than expected at GBP during early morning, possibly because low-oxygen water drove prey fish to the surface. At RR Snowy Egrets were present in expected numbers, but Great Egrets were lower. At low tide Snowy Egrets and Glossy Ibises were more abundant at RR than expected. Snowy Egrets had higher striking success and capture rates at GBP, but inter- and intraspecific aggression at GBP may have limited its use, and mummichogs, the dominant prey items, averaged smaller at GBP.

The authors do a nice job of evaluating the different factors that influence foraging behavior in this near-urban environment. [Biology Dept., Friends Univ., Wichita, KS 67213, USA.]—William E. Davis, Jr.

SONGS AND VOCALIZATIONS

8. A study on song mimicry by the Redstart (*Phoenicurus phoenicurus*) in the Fontainebleau Forest, France. [Le chant imitatif du Rougequeue à front blanc (*Phoenicurus phoenicurus*): une étude en Forêt de fontainebleau, Seine-et-Marne, France.] J. Comolet-Tirman. 1994. *Nos Oiseaux* 42:267–277. (French with French, English and German summaries.)—Thirty-six males imitated an average of 17 species, including some that they would have heard only during migration. The most frequent models were *Phylloscopus* (17.5% of the imitations) and *Parus* (10.5%). [11 Rue Colbert, F-78000 Versailles, France.]—Robert C. Beason.

NESTING AND REPRODUCTION

(see also 1, 2, 19, 25)

9. Response of female Great Tits, *Parus major*, to photoperiodic stimulation and the presence of a male. P. Jonsson. 1994. *Ornis Svecica*. 4:41–47.—Estradiol concentration and

ovarian growth in caged and free-living female Great Tits were measured and compared in an attempt to determine the influence of photoperiodic stimuli and male presence on ovarian maturation. Females were separated into two groups: Group 1: female/male pairs, with access to nest-building facilities kept on a long day regimen (20L:4D); Group 2: female/female pairs, also kept on the long day regimen. A third group consisting of female/female pairs was maintained on short days (8L:16D). Free-living females served as a reference group. All females in the study, both free-living and caged, had estradiol levels that remained low throughout the experiment, and showed no significant difference between groups. Females from the long day groups were compared and it was found that those females kept in the presence of a male showed no difference in estradiol secretion or follicular growth. It was unknown why sexually mature males failed to promote the maturation process. However, it was theorized that some unknown environmental factor was missing or the stress imposed on the females depressed gonadotropin secretion. Females kept in the short day regimen failed to demonstrate any ovarian size increase. Long day regimented females exhibited incomplete ovarium and follicle growth. In free-living females, follicle growth occurred at the same time circulating levels of estradiol increased. The lack of ovarian growth in captive females may therefore have been the result of insufficient estradiol production. The hyperstimulation of long day regimented birds is hypothesized to inhibit gonadal growth. This in turn may have resulted in the males failing to properly stimulate the females at a point critical to follicular development as a result of their own testicular regression. Testing this hypothesis could be accomplished by substituting males that are in an earlier phase of the sexual cycle. Females from group 1 had significantly smaller largest follicles than females in group 2. Possible explanations include the possibility that the males in group 1 had an inhibitory effect on the females, or that the female/female pairs resulted in the development of competition between the two individuals, based on the supposition that a male would choose the most mature. [Dept. of Zoology, Medicinaregatan 18, S-413 90 Goteborg, Sweden.]—Sue Bennett.

10. Orientation and spacing of nesting boxes used by Eastern Bluebirds and Tree Swallows. S. G. Parren. 1994. *Sialia* 16:127–129.—The general belief among those who erect nest boxes for Eastern Bluebirds (*Sialia sialis*) is that the cavity entrance should face in a southerly or southeasterly direction to enhance nesting success. In this study, the author determined that Eastern Bluebirds did not occupy nest boxes that faced in a southerly direction (90° to 270°) in a greater proportion than expected by chance ($n = 78$ occupied boxes; $P = 0.705$). Moreover, when the range of directions was narrowed to 135° to 150°, bluebirds still did not occupy these boxes significantly more than boxes facing in other directions ($P = 0.211$). A similar trend was detected for Tree Swallows (*Tachycineta bicolor*) in which boxes facing in a southerly direction (90° to 270°) were occupied in proportions about equal to those expected by chance ($P = 0.443$). The author suggests that nest-box orientation should be based largely on knowledge regarding the local conditions and ease of observation rather than simply erecting all boxes in a southerly or southeasterly direction. Regarding the spacing of nest boxes, there is widespread agreement that bluebirds will not typically nest closer than 90 m of each other; Tree Swallows, on the other hand, will tolerate other nesting swallows within about 30 m. The author's data generally confirm these observations. Only four boxes occupied by bluebirds were closer than 90 m to other nesting bluebirds, while swallows frequently nested within 30 m of other swallows, as well as bluebirds, about half of the time. However, significantly more bluebirds (18.3%) occupied nest boxes within 15 m of nesting Tree Swallows than did other nesting swallows (6.5%) ($P = 0.047$). These data suggest that pairing nest boxes within 15 m should help discourage swallows from occupying all of the available nest boxes on a bluebird trail and provide an advantage for bluebirds. [Nongame and Nat. Heritage Program, Vermont Fish and Wildl. Dept., 103 S. Main Street, Waterbury, VT 05671-0501, USA.]—Danny J. Ingold.

11. Female reactions to male absence after pairing in the Pied Flycatcher. O. Ratti. 1994. *Behav. Ecol. Sociobiol.* 35:201–203.—In Pied Flycatchers (*Ficedula hypoleuca*), females that mate with an already-mated male are at a disadvantage since such males mainly concentrate their feeding efforts on the young of the primary brood. Nonetheless, females occasionally do mate with already-mated males. When this occurs and females remain with an

already-mated male, it suggests that they either have not evolved a response strategy to the absence of males or that they have assessed that the costs of finding an unmated male are too high. In this study, male Pied Flycatchers in Finland were removed from their territories for 60 min to mimic the behavior of polyterritorial males. This allowed the author to investigate the response of females soon after settlement to the absence of their mates. Only 4 of 22 females abandoned their mates after removal, even though there were available unmated males nearby. These data seem to be consistent with a "deception" hypothesis since females did not use occasional male absence as a cue to evaluate the breeding status of their mates. [Dept. of Biology, Univ. of Jyväskylä, Yliopistonkatu 9, FIN-40100 Jyväskylä, Finland.]—Danny J. Ingold.

12. Four young Golden Eagles (*Aquila chrysaetos*) reared in the French Alps. [Quatre jeunes d'Aigle royal (*Aquila chrysaetos*) s'envolent de la même aire dans les Alpes françaises.] J.-F. Desmet, C. Couloumy, J. Blondel, and C. Lavigne. 1994. *Nox Oiseaux* 42:305–310. (French with French, English and German summaries.)—A trio (1 male and 2 females) of Golden Eagles successfully reared 4 young in a single nest. Both bigamy and successful rearing of so many young is exceptional. [GRIFEM Groupe Rech. et Info. sur la Faune et les Ecosystèmes de Montagne, F-74340 Samöens, France.]—Robert C. Beason.

13. Wading bird nesting at Lake Okeechobee, Florida: An historic perspective. P. G. David. 1994. *Colon. Waterbirds* 17:69–77.—Lake Okeechobee is managed with a multiple-use strategy which includes competing objectives (e.g., flood control, agricultural water supply, wildlife resources, and recreation). Controlled water levels are highest at the beginning of dry season (water supply) and lowest at the beginning of wet season (flood control). This paper contains a history of wading bird use at the lake and examines the impact of managed water level changes on breeding wading birds. Surveys of breeding colonies were conducted from 1957–1960, 1971–1976, and intensively from 1977–1988. Anecdotal reports dating from the 1930s describe Lake Okeechobee as an important wading bird nesting locality. A critical event occurred in 1978 when a new water regulation schedule increased water levels at all seasons by more than a foot, thus affecting foraging habitat for wading birds, and flooding critical willow tree nesting areas. Preregulation (1957–1978) means, excluding Cattle Egrets (*Bubulcus ibis*), of nearly 5000 breeding pairs fell to a postregulation mean of about 2000 (1978 = 6633 pairs; 1988 = 1298). Cattle Egret numbers increased from 200 pairs in 1957 to 10,400 in 1978, but declined to 4000 in 1988. White Ibises (*Eudocimus albus*) peaked in 1974 at 10,000 pairs, but declined to 200 in 1988. Great Egrets (*Casmerodius albus*) and Glossy Ibises (*Plegadis falcinellus*) have experienced significant declines. The author suggests that increased water levels have influenced both foraging opportunities and nesting substrate. The loss of willows at a key colony has been particularly damaging. In addition, the increase in Cattle Egret numbers may have affected nesting trees. The author concludes that future decisions concerning water regulation schedules must consider the impact of these decisions on wading birds and other wildlife. [Dept. of Research, South Florida Water Management District, P.O. Box 24680, West Palm Beach, FL 33416, USA.]—William E. Davis, Jr.

14. Distribution of the Tengmalm's Owl (*Aegolius funereus*) in natural cavities in the Jura vaudois. [Répartition de la chouette de Tengmalm (*Aegolius funereus*) dans les sites naturels du Jura vaudois (Suisse).] P.-A. Ravussin, P. Walder, P. Henrioux, V. Chabloz, and Y. Menétray. 1994. *Nox Oiseaux* 42:245–260. (French with French, English and German summaries.)—In the Jural mountains, 160 of 161 nests located were between 1040–1390 m elevation. Most (98.1%) of the cavities were excavated by Black Woodpeckers (*Dryocopus martius*) in large beeches (*Fagus sylvatica*). The cavity openings averaged 48.9 cm in diameter and were a mean of 9.1 m high, with 85% above 7 m. [CH-1446 Baulmes, Switzerland.]—Robert C. Beason.

MIGRATION, ORIENTATION, AND HOMING

(see 21)

HABITAT USE AND TERRITORIALITY

(see also 4, 6, 7, 13, 14, 18, 26)

15. New birds on the block: new neighbors increase defensive costs for territorial male Willow Ptarmigan. P. Eason and S. J. Hannon. 1994. *Behav. Ecol. Sociobiol.* 34:419–426.—

Previous studies have demonstrated that there are potentially numerous benefits associated with site fidelity or breeding philopatry in various taxa, particularly in birds and mammals. Among these are increased familiarity with a territory which may facilitate finding food or avoiding predators, increased familiarity with a mate, and increased familiarity with neighbors. Some studies have shown that having familiar neighbors can be beneficial by reducing the level of fighting between neighbors, but generally do not address the question of whether the benefits of such familiarity persists year after year. The goal of the authors in this study was to test the hypothesis that defending a territory against former neighbors from a previous year is less costly than defending it against new neighbors. To this end, the authors observed Willow Ptarmigan (*Lagopus lagopus*) on the subalpine tundra of Chilkat Pass in northwestern British Columbia during the 1991 breeding season. They found that territorial males with new neighbors spent significantly more time in defense compared to territorial males with former neighbors ($P < 0.01$). Moreover, males with several new neighbors spent more time defending their territories than males with fewer new neighbors, and males with both new and former neighbors spent most of their time fighting with their new neighbors. The intensity of fights involving new neighbors was also significantly greater than fights between former neighbors ($P < 0.05$). Although there appeared to be some age differences in fighting behavior (i.e., fights involving two yearlings were more extreme than other fights), the significant differences observed in fights between new and former neighbors were not solely the result of the effects of age on fighting behavior. Based on the results of this study, the authors suggest that the presence of new neighbors appears to be costly to male ptarmigan, and that the process of familiarization with a new neighbor likely resulted in the increased costs. Thus, male ptarmigan may be able to alleviate the costs of establishing and defending a territory through nest-site fidelity. [Dept. of Zoology, Univ. of Alberta, Edmonton, Alberta, T6G 2E9 Canada.]—Danny J. Ingold.

ECOLOGY

(see also 5, 24)

16. Structure, seasonal dynamics and energetics of the avifauna in Macedonian oak forest. B. Micevski. 1994. *Larus* 44/45:49–63.—Avifauna structure and dynamics in the sub-mediterranean community of Macedonian oak (*Quercetum macedonicae*) forest was investigated. Species richness, homogeneity, diversity and dominance were determined, and the energy expenditure of birds was calculated by use of Poole's model and Walsberg's formula. Adult biomass was determined by catching and weighing the birds, as well as from literature. Based on census data, birds were either classified as certain breeders, probable breeders, or nonbreeders in the study area. Species composition and activity were found to be cyclic with the time of year. Avian species richness was found to peak during the spring breeding period, with the low occurring in late autumn and winter. Maximum homogeneity was found to occur during the breeding and postbreeding period, with minimums in all other periods of the year. Not surprisingly, this finding corresponds to the increased sociability that occurs during these nonbreeding portions of the year. The diversity index (which is actually a combination of the two previous measures) was found to be highest during the spring breeding and postbreeding seasons. The annual mean avian biomass (for two annual cycles) was calculated to be 2657 g/10 ha, with a corresponding annual average energy consumption value of 3,444,039 kJ/10 ha, or 23% of the ecosystem is net primary production. Maximum biomass value was found to occur in the winter when the number of avian species within the study area was greatest. Breeding birds (28 confirmed breeding species) were found to have a biomass of 2617.7 g/10 ha, with respect to their abundance in the bird community. Average daily energy expenditure of this group was calculated to be 7007.5 kJ/10 ha. Latitude was also found to be an important factor, as bird community density in the oak forest was found to vary (25 pairs/10 ha at 57°N to nearly 180 pairs/10 ha at 49°N). A slight decrease to the S was noted from previous work by same author in different oak forest. Overall, it was determined that the average age of the forest and its geographical position are very influential in determining forest bird community density. [Institute of Biology, Faculty of Science, Skopje 91000, Macedonia.]—Sue Bennett.

17. Avian communities of fragmented south-temperate rainforests in Chile. M. F. Willson, T. L. DeSanto, C. Sabag, and J. J. Armesto. 1994. *Conserv. Biol.* 8:508–520.—Temperate rainforests of South America are vulnerable to the effects of forest fragmentation that are occurring because of increased logging, charcoal production, and agricultural clearing. To examine the relationship of forest fragment size and bird diversity, avifauna were censused with point-counts from early November to mid-December, 1992, in the Valdivian rainforest on Isla Grande de Chiloe, in south-central Chile. Forest fragments were tiny (<0.5 ha, $n = 3$), small (2–6 ha, $n = 5$), or large (>10 ha, $n = 3$). The diversity and relative abundance of bird species decreased as the size of the habitat patch decreased. Ecological categories, including endemics, mutualists (pollinators or seed dispersers), understory species and species dependent on large trees, were not differentially sensitive to patch size. Nevertheless, most of the species with significant declines were endemic (6/7), covered nesters (6/7), or understory dwellers (5/7). Some mutualists and big-tree users were affected, too. These species losses will become more severe as clearing of the forest continues. Possible mitigation measures include leaving small stands of forest and corridors between habitat patches and in certain circumstances, alternative agricultural practices. [Forestry Sciences Laboratory, 2770 Sherwood Lane, Juneau, AK 99801, USA.]—Kristin E. Brugger.

POPULATION DYNAMICS

(see also 25)

18. Population estimates of breeding blackbirds in North Dakota, 1967, 1981–1982 and 1990. C. O. Nelms, W. J. Bleier, D. L. Otis, and G. M. Linz. 1994. *Am. Midl. Nat.* 132:256–263.—Breeding populations of Red-winged Blackbirds (*Agelaius phoeniceus*), Yellow-headed Blackbirds (*Xanthocephalus xanthocephalus*), and Common Grackles (*Quiscalus quiscula*) were censused in 129 quarter-sections throughout North Dakota during 1990. The statewide total of breeding blackbird pairs was estimated to be 2,302,000 (SE = 335,000), of which 1,143,000 were Red-winged Blackbirds, 768,000 Common Grackles, and 391,000 Yellow-headed Blackbirds. The proportion of the sample units containing blackbirds declined significantly across years from 1967 to 1990 ($P = 0.0001$); moreover, blackbird abundance was generally down. Numbers of Red-winged Blackbirds declined significantly from 1967 to 1981–1982, and again from 1981–1982 to 1990. Yellow-headed Blackbirds in 1990 were significantly fewer than in 1981–1982, but no significant difference was detected between their numbers in 1967 and 1990. Grackles were significantly more abundant in 1981–1982 than in 1967, but no difference was detected between 1990 and the two previous surveys. None of the blackbird species used habitat in proportion to its availability. Yellow-headed Blackbirds were most frequently observed in wetlands while Red-winged Blackbirds and Common Grackles were found in most habitats. Nonetheless, about half of the Red-winged Blackbirds were found in wetlands while most grackles were located near residences. [Dept. of Zoology, North Dakota State Univ., Fargo, ND 58105, USA.]—Danny J. Ingold.

ZOOGEOGRAPHY AND DISTRIBUTION

19. Nesting, behavior, distribution, and speciation of Patagonian and Andean Ground Tyrants (*Myiotheretes*, *Xolmis*, *Neoxolmis*, *Agriornis*, and *Muscisaxicola*). F. Vuilleumier. 1994. *Ornithologia Neotropical* 5:1–55.—The life history characteristics of six species of brush and ground tyrants are discussed: four Patagonian (*Xolmis pyrope*, *Neoxolmis rubetra*, *Neoxolmis rufiventris* and *Muscisaxicola capistrata*) and two Andean species (*Myiotheretes rufipennis* and *Agriornis andicola*). In this paper the author presents the results of his own investigations and those of other researchers on these species. Because these species are shy and elusive, little is known about them. The known information is summarized for each species and discussed in comparison with their congeners. [Dept. of Ornithology, American Museum of Natural History, Central Park West at 79th St., New York, NY 10024, USA.]—Robert C. Beason.

20. Observations on Mountain Plover (*Charadrium montanus*) breeding in Utah. K. S. Day. 1994. *Southwest. Nat.* 39:298–300.—Although Mountain Plovers have been reported in Utah since 1915 (considered rare transients or casual migrants), breeding plovers have never

been documented in the state. During the 1993 breeding season, the author reports finding three Mountain Plover nests with broods among the Pariette Bench oil and gas producing fields in Duchesne County about 13 km south of Myton. Adult plovers were first reported in late April by which time they were incubating eggs; two of the nests were located in flat areas with sparse low-growing grasses while the third was found in moderately dense black sagebrush (*Artemisia nova*). The author estimates having observed a total of 31 plovers around the three nest locations in 1993: 9 adults, 15 chicks in 8 broods, and 7 of undetermined age. Plovers were last observed on 26 July. [Utah Division of Wildl. Resources, 152 E. 100 N., Vernal, UT 84078, USA.]—Danny J. Ingold.

SYSTEMATICS AND PALEONTOLOGY

(see 19)

EVOLUTION AND GENETICS

(see 2)

PHYSIOLOGY AND DEVELOPMENT

(see 9)

PLUMAGES AND MOLTS

21. Moulting in relation to migration in birds—a review. N. Kjellen. 1994. *Ornis Svecica* 4:1–24.—The relationship between moulting and migration during a yearly cycle was examined. Three groups of birds were defined (raptors, waders and warblers) with various genera, species and populations of each being compared to determine which of six previously defined moulting strategies was utilized. In addition, migratory distance was analyzed to determine the influence its potential influence on the moulting strategy employed. Among raptors, short distance migrants were discovered to undertake the majority of their moulting on the breeding grounds. Medium distance migratory raptors moulted in both summer and winter quarters, while those raptors that migrate long distances undertook the majority of their moulting in their winter quarters. Wading birds differed in that migrants were found to exhibit a more rapid moulting when compared to resident populations, with the latter generally exhibiting a tendency to spread their moulting over as long a period of time as possible. Moulting duration and individual variation among waders was found to increase with decreasing latitude, possibly due to increased food source availability or stability. However, moulting among waders may ultimately depend on the commencement of breeding. Relatively few waders moult on the breeding grounds. Instead, they moult at stop-over or wintering sites. Six genera of Palearctic warblers were also examined and found to exhibit fairly diverse moulting strategies. Most Sylviidae demonstrate a complete summer moulting, regardless of migratory distance traveled. However, some species exhibit different strategies, including winter moulting, suspended moulting at various stages, and a split moulting, which is postulated to be a compromise between complete summer and winter moulting strategies. The author concludes that migratory distance appears to influence the particular moulting strategy undertaken; however, within species, different populations may demonstrate different moulting strategies. [Dept. of Ecology, Animal Ecology, Univ. of Lund, Ecology Building S-223, 62 Lund, Sweden.]—Sue Bennett.

PARASITES AND DISEASES

22. Mercury and cause of death of Great White Herons. M. Spaldina, R. Bjork, G. Powell, and S. Sundlof. 1994. *J. Wildl. Manage.* 58:735–739.—Mercury contamination was studied in Great White Herons (*Ardea herodias occidentalis*) as part of a study of effects of diseases and contaminants on reproductive success of wading birds in southern Florida. Sixty-four nestling and 23 adult herons were radio-tagged between March 1987 and June 1989. Twenty-two carcasses were recovered and analyzed. Birds were categorized based on suspected causes of death. Category A birds died acutely from known or presumed causes (poisoning, collision, etc.), and category C birds died from one or more chronic diseases. Category A birds had lower liver mercury concentrations than did category C birds. Juveniles that had dispersed to the mainland had higher mercury concentrations than did those that

did not migrate. More than one disease was most often the cause of death; these diseases included eustrongylidosis (4 birds), pyelonephritis (3), gout (3), severe intestinal parasitism (3), myopathy (2), and septicemia (2). The authors concluded that although mercury contamination is detrimental to the health of birds, it is more detrimental to their reproductive success, which can severely impact population demographics. They suggest that further monitoring of mercury contamination is necessary and more research is needed to determine the source of mercury in the aquatic food chain. [Dept. of Infectious Diseases, College of Vet. Medicine, Univ. of Florida, Gainesville, FL 32611, USA.]—Robin J. Densmore.

WILDLIFE MANAGEMENT AND ENVIRONMENTAL QUALITY

(see also 10, 12, 13, 17, 22)

23. Wading bird use of wastewater treatment wetlands in central Florida. P. C. Frederick and S. M. McGehee. 1994. *Colon. Waterbirds* 17:50–59.—The use of wastewater treatment wetlands (treated urban sewage), either as newly created or converted natural wetlands is likely to increase as human population density increases. These wetlands are potentially useful to long-legged wading birds as foraging and breeding sites. This study evaluated the use of Iron Bridge and Mulberry wastewater treatment sites in central Florida by Ciconiiformes for foraging and breeding, and compared their use to the St. Johns river marshes adjacent to the Iron Bridge site and to other natural wetlands in Florida and Nicaragua. Densities of birds were estimated from aerial surveys during October and December 1991, and February–May 1992, and breeding colonies were surveyed from March–May. Densities increased from October–February and then decreased. The St. Johns marshes had the highest densities of White Ibises (*Eudocimus albus*), Glossy Ibises (*Plegadis falcinellus*), and Wood Storks (*Mycteria americana*), presumably because the higher water levels of the treatment sites were less suitable for tactile feeders. The densities of Snowy Egrets (*Egretta thula*) and Great Egrets (*Casmerodius albus*) were similar in the three sites. All three sites had higher densities of waders than other natural sites in S Florida and Nicaragua. Both wastewater sites had breeding colonies, and many Snowy and Great Egrets, followed to foraging sites in fixed-wing aircraft, landed within the wastewater sites. Most birds from colonies outside the treatment sites foraged elsewhere. Although treatment sites are utilized for breeding colonies by herons and ibises, and for foraging by herons, the potential effects of accumulated contaminants, and the nematode parasite *Eustrongylides ignotus*, which is found at sites with elevated nutrients, have not been well researched and pose potential hazards to wading birds. [Dept. of Wildlife and Range Sciences, 118 Newins-Ziegler Hall, Univ. of Florida, Gainesville, FL 32611, USA.]—William E. Davis, Jr.

24. Sustainable use of the tropical rain forest: evidence from the avifauna in a shifting-cultivation habitat mosaic in the Colombian Amazon. G. I. Andrade and H. Rubio-Torgler. 1994. *Conserv. Biol.* 8:545–554.—In a 1-year study located in the terra firme forest at the Miriti-Parana river, the avifauna of regenerating crop fields (1-ha in size, 1–17 years after cultivation ceased) was compared to that of undisturbed understory sites. Few differences were observed in species richness or number of individuals captured in mist nets. However, the avifauna of old fields (13–17 yr since cultivation) was most similar to forest understory and avifauna of young fields (<10 yr) was least similar. The authors suggest that slash and burn agriculture is a high-intensity, low magnitude disturbance, with disturbance effects lasting about 10 years. This type of agriculture may mimic natural gap-phase dynamics, thus offering an example of a potentially sustainable use of tropical forests, from a standpoint of bird community management. [Fundacion Natura Colombia, A. A. 55402, Santafe de Bogota, D. C., Colombia.]—Kristin E. Brugger.

25. Decline of the Red-cockaded Woodpecker (*Picoides borealis*) in southeastern Oklahoma. J. F. Kelly, S. M. Pletschet, and D. M. Leslie, Jr. 1994. *Am. Midl. Nat.* 132:275–283.—The 4600 ha McCurtain County Wilderness Area (MCWA), Oklahoma, was surveyed during the 1989–1990 breeding seasons for Red-cockaded Woodpeckers in order to detect a potential population decline since a similar census was conducted in 1977. Since hardwoods currently comprise about 40% of the basal area on the MCWA, the authors also quantified foraging habitat variables and compared the spatial relationship among colony sites between

1977 and 1990. Eleven groups of Red-cockaded Woodpeckers used clusters of cavity trees within the 3795 ha where 29 active clans were found in 1977, a 62% decline. A total of 31 individuals were located on the MCWA in 1990, 22 of which were located on the resurveyed area, representing a 75% decline since 1977. A total of 35 active cavities were found, but 9 were abandoned during the study. Nests were located in 5 of 6 active clusters in 1989 and in 8 of 15 active clusters in 1990. All 13 of these nests produced nestlings but only 9 individuals ultimately fledged (0.69 fledglings/nest). Differences in the habitat structure of high versus low density woodpecker groups were minimal. However, values for pines tended to be at the low end and values for hardwoods tended to be at the high end of acceptable ranges recommended in the Red-cockaded Woodpecker Recovery Plan (USFWS, 1985). Nearest neighbor differences between clusters were significantly longer in 1977 compared to 1990. The productivity of Red-cockaded Woodpeckers on the MCWA in 1989 and 1990 was less than half of that for woodpeckers in South Carolina, North Carolina, and Florida. The data in this study show that numbers of Red-cockaded Woodpeckers declined despite being surrounded by foraging habitat that meets the Recovery Plan's recommendations. The authors suggest that these recommendations may thus be inadequate and that management techniques formulated for woodpeckers in secondary-growth forests may not suffice for woodpeckers that inhabit old-growth forests. [Oklahoma Coop. Fish & Wildl. Research Unit, U.S. National Biological Survey, Dept. of Zoology, Oklahoma State Univ., Stillwater, OK 74078, USA.]—Danny J. Ingold.

26. Effect of white-tailed deer on songbirds within managed forests in Pennsylvania. D. de Calesta. 1994. *J. Wildl. Manage.* 58:711–718.—The effect of white-tailed deer (*Odocoileus virginianus*) on species richness and abundance of songbirds was examined in northwestern Pennsylvania. Data were collected in and around Allegheny National Forest from 1980–1990. Four 65-ha study sites each contained four deer enclosures of 1 deer/26-ha, 1 deer/13-ha, 2 deer/13-ha, and 4 deer/13-ha, simulating deer densities of 4, 8, 16 and 31/km² respectively. Each enclosure was subdivided into three silvicultural treatments (clear-cut, thinned, and uncut). Point counts of birds were conducted 5 times per site from mid-May through July, 1991. Forty-eight species of songbirds (range 31 to 43) and 2912 individual songbirds (658–789/site) were recorded among the four sites. Percent ground cover was not affected by deer; however, increasing deer densities were associated with decreases in flowering plants and increases in ferns and grasses. Mean sapling height was reduced by deer on all treatment sites. Varying deer density had no effect on ground- or upper canopy-nesting songbirds, but species richness and abundance of intermediate canopy-nesting (ICN) songbirds declined 27% to 37% respectively between lowest and highest deer densities. Four ICN species were not observed at deer densities greater than 7.9/km² and two ICN species were not observed at densities greater than 14.9/km². In order to protect and maintain forest songbird populations, deer densities should be maintained at around 8/km² in intensely managed forests to less than or equal to 4/km² in less intensely managed forests. [U.S.F.S., Northeastern Forest Experiment Station, P.O. Box 928, Warren, PA 16365, USA.]—Robin J. Densmore.