J. Field Ornithol., 64(1):102–124

RECENT LITERATURE

Edited by John A. Smallwood

RESEARCH TECHNIQUES

(see also 29)

1. Netting and banding Florida Grasshopper Sparrows. M. F. Delany, D. R. Progulske, Jr., and S. D. Coltman. 1992. N. Am. Bird Bander 17:45–47.—The Florida Grasshopper Sparrow (*Ammodramus savannarum floridanus*) is endemic to the prairies of southcentral Florida, an area where much of the native grasslands have been altered by the management of "improved pastures" and by phosphate mining. As a result, this subspecies is federally listed as endangered. The authors initiated a banding study in 1989 in an effort to elucidate some of the fundamental life history aspects of these birds, such as movements, survival and habitat requirements, with the goal of formulating a management plan for this population. The study is being conducted on the U.S. Air Force Avon Park Bombing Range in Highlands and Polk counties, a 430-km^2 military installation which serves as a training range for fighter aircraft.

The authors designed a convenient, user-friendly mist net pole that does not require a pounder, ". . . a step insertion pole . . . consisting of a 305 cm (10 foot) length of 2 cm (¾ inch) diameter, galvanized electrical conduit. A 46 cm metal rod, 1.6 cm in diameter, was inserted 34 cm into the conduit and welded in place. The exposed 12 cm was sharpened to a point. One side (12 cm) of an L-shaped, 0.6 × 2.5 cm, flat metal bar was welded to the conduit to form a step 36 cm from the point. The cost per pole was $3.45 for materials and $8.50 for labor."

Captures were attempted by first locating singing male sparrows. A capture team consisted of two persons, each holding a pole, with the furled 18-m mist net already strung between the poles. One or two capture teams would then position their nets between the observed singing perches. Poles were easily driven into the ground by stepping on the horizontal bar, and no guy wires were required. Birds were then flushed into the nets. A total of 71 sparrows were banded during 86 netting attempts lasting 10–30 minutes each. This technique should be applicable for a wide range of target species. [Florida Game and Fresh Water Fish Comm., 4005 S. Main St., Gainesville, Fl 32601, USA.]—John A. Smallwood.

BEHAVIOR

2. An experimental study of male adornment in the Scarlet-tufted Malachite Sunbird: II. The role of elongated tail in mate choice and experimental evidence for a handicap. M. R. Evans and B. J. Hatchwell. 1992. Behav. Ecol. Sociobiol. 29:421–427.—Scarlet-tufted Malachite Sunbirds (*Nectarinia johnstoni*) are monogamous and territorial, breeding in the high altitude zones of the East African mountains. Males are bright iridescent green with elongated central tail feathers (males also possess an ornamental tuft) which make them ideal for examining the role of female choice in the development of secondary sex characteristics in males. During two breeding seasons on Mount Kenya in eastern Africa, the authors examined natural variation in the tail length of males to determine its role in mate choice. During the first season, tail length of paired males was significantly longer ($P < 0.05$) than that of unpaired males, which also defended a territory (during the second season all males were paired). A positive insignificant relationship was detected in male tail length and territory size, and with the number of plant inflorescences defended. Males with longer tails paired earlier than other males, thus enhancing their chances of raising two broods. When both members of a pair returned for the second breeding season they always paired with each other a second time. In addition to data collection associated with natural variation in tail length, tail feathers of paired males were externally manipulated (shortened or lengthened) to determine their effects on the time budget of breeding males. Males with shortened tails flew more frequently and displayed an increase in hawking efficiency relative to controls and males with lengthened tails. These data suggest that although longer-tailed males may be at an advantage when searching for a mate early in the season, such males may be suffering reduced flying and hawking efficiencies. Therefore, tail elongation may

be used by females as an honest assessment of male quality since it is indeed costly (relative to the ornamental tuft) and provides little opportunity for cheating. [Dept. of Zoology, Univ. of Cambridge, Downing St., Cambridge CB2 3EJ, United Kingdom.]—Danny J. Ingold.

3. Females prefer larger leks: field experiments with Ruffs (*Philomachus pugnax*). D. B. Lank and C. M. Smith. 1992. Behav. Ecol. Sociobiol. 30:323–329.—Female choice (and the inherent benefits associated with choosing) has been proposed as one of the major driving forces in the evolution of lekking behavior. Although numerous theories exist, no studies have yet tested whether female preference for mating at leks is strong enough to compensate males for intrinsic competition they incur from other males when joining a lek. The crucial criterion for determining this is to assess whether per male mating rate attributable to female choice increases with lek size. In order to address this question of female preferences for visiting different-sized groups of males when other factors were controlled, the authors performed a series of experiments with captive male Ruffs along the coast of Finland during two breeding seasons. Significantly more individual females and flocks preferred the larger of two adjacent groups of males such that males in the larger groups received about twice as many visits per capita as did individuals in the smaller groups. Visiting males also showed a significant preference for larger groups, but not at rates significantly higher than proportional visitation. These findings regarding female preference suggest that there would be a per capita mating advantage for males at larger leks, and thus would select for lekking by males. However, since leks of wild Ruffs are relatively small as a rule, factors other than female preference for larger leks must be influencing lek size. Perhaps male and female interests conflict, and the authors suggest that further carefully designed experiments are needed to determine how individual decisions influence the distribution of displaying males. [Dept. of Biology, Queen's Univ., Kingston, ON K7L 3N6, Canada.]—Danny J. Ingold.

4. Experimental evidence that bright coloration is not important for territory defense in Purple Martins. B. J. Stutchbury. 1992. Behav. Ecol. Sociobiol. 31:27–33.—Although numerous studies have demonstrated a correlation between plumage coloration in birds and nesting success, few have empirically tested whether manipulating a male's breeding plumage directly affects its competitive ability to defend its breeding territory. By altering the plumage color of male territorial Purple Martins (*Progne subis*) to mimic subadult males, the author tested the hypothesis that the bright plumage of male martins intimidates territorial intruders. The results demonstrate that lightened adult males did not suffer any increase in intruder pressure on their territories as a result of a loss in bright plumage coloration. Moreover, lightened and control males expended similar efforts on territorial defense, and maintained control of their territories with equal success. Plumage coloration was not linked to the aggressive response of territorial owners since adult and subadult male owners were equally likely to attack male subadult intruders. On the other hand, similar studies provide evidence that adult coloration is important in territorial acquisition by martins. The effectiveness of bright coloration in territorial defense and fighting ability in adult male martins is limited by the ability of intruders to assess these traits in owners. Explanations of the origin and maintenance of bright plumage in territorial martins and other species must take into account the diversity of competitive situations among owners and intruders. [Dept. of Biology, York Univ., North York, ON M3J 1P3, Canada.]—Danny J. Ingold.

5. A test on social behavior as a cause of dispersal of Spruce Grouse. D. M. Keppie and J. Towers. 1992. Behav. Ecol. Sociobiol. 30:343–346.—Intraspecific social interactions frequently have been postulated as a major reason for the dispersal of young in many species. To test this social behavior hypothesis in Spruce Grouse (*Dendragapus canadensis*), the authors removed all adults on test plots during two summers in central Ontario, Canada, and monitored the emigration of juveniles during autumn. Despite substantial reductions in social contact with adults on removal plots, juveniles of both sexes emigrated from brood ranges on such plots in proportions similar to those on control plots. Lone juveniles emigrated in the same proportions as juveniles with siblings. Data summarized from this and previous grouse studies demonstrate that density has little effect on emigration rates and that a female bias for dispersal almost always occurs. Thus, the findings of these

studies do not support the "Oedipus hypothesis," which predicts that in polygynous species, both sexes should disperse at equal rates since both parents face potential conflicts with their offspring for future reproduction. Ostensibly, the tendency for dispersal in this species remains highly fixed. [Dept. of Biology, Univ. of New Brunswick, Fredericton, NB E3B 6C2, Canada.]—Danny J. Ingold.

6. Socialization tactics of the Spectacled Parrotlet (*Forpus conspicillatis*). K. Ganetzke-Stollmann and D. Franck. 1991. Behaviour 119:1–30.—Spectacled Parrotlets have a complex social organization in which they engage group members: friendly associations, courtship and sexual behavior, hostile relations, and cooperative aggression. They live in monogamous pairs with females preferring to bond with high-ranking males. A parrotlet group generally synchronizes its activity; for example, all members forage in the early morning. The parrotlets (especially the juveniles) seem to be especially interested in their associate's activities. Most fledglings learn interactive skills from their siblings; their only interactions with their parents are feeding and protection. Later, after the parrotlets become independent (at about 30 days), they re-establish social contact with their parents.

Birds that fail to form exclusive pair bonds socialize poorly. Most often, these singles were rejected by their original sibling group. The most successful singles were those which joined another sibling group. Studying singles revealed two benefits of interacting with a sibling group: body contact and a safe place to learn sociality. Gametzke-Stollmann and Franck provide an in-depth description of complexities in the society of the Spectacled Parrotlet.—Elizabeth M. Martin.

7. Diving depths of the Yellow-eyed Penguin (*Megadyptes antipodes*). P. J. Seddon and Y. van Heezik. 1989. Emu 90:53–57.—In this study, 110 Yellow-eyed Penguins were tested for their maximum dive depths and diets. Capillary depth recorders were attached to the penguins. Of the 110 recorders attached, 43 had clear readings of maximum depth. The results showed no difference in dive depth among males, females, or mated pairs. Diet was monitored during incubation. All test penguins had consumed opalfish and half had consumed blue cod, both of which are bottom living fish, which means that the penguins were diving deeply. However, the fact that there was no indication of inshore fish in the penguins' diet suggested that they were not foraging close to shore. This is important because the areas where they were foraging perhaps were less stressful in terms of diving for their food and the risk of predators. Therefore, capturing their food in deep water could be the optimal strategy. [Percy FitzPatrick Inst. of African Ornithology, Univ. of Cape Town, Rondebosch 7700, South Africa.]—Chris Robles.

8. Predator avoidance in night-feeding Dunlins *Calidris alpina*: a matter of concealment. K. N. Mouritsen. 1992. Ornis Scand. 23:195–198.—Mouritsen observed foraging Dunlins around the clock in the Dutch Wadden Sea. The birds were much less vocal at night than during the day. Moreover, when disturbed by avian predators, they tended to freeze at night (≈40%) and flush during the day (≈95%). Mouritsen suggests that reduced vocalizations and freezing versus flushing are adaptations for night-feeding birds to avoid detection by owls. [Dept. of Ecology and Genetics, Univ. of Aarhus, DK-8000 Aarhus C, Denmark.]—Jeff Marks.

9. Differential responses to automobile horn sound in young and adult Tree Sparrows *Passer montanus*. S. Matsuoka. 1991. JPN. J. Ornithol. 39:111–120. (Japanese, English summary, tables, and figure captions.)—This study may win a prize for novelty, but my review of it is based solely on the summary, tables, and figures; thus its full import may not be realized. An automobile horn was sounded for 5 s at 5-min intervals at a feeding station frequented by adult and juvenile Eurasian Tree Sparrows. As might be expected, when the horn sounded, the birds immediately fled, but they quickly returned. If any bird remained at the feeder, the return of others was quicker than if all had fled. Adult sparrows fled more readily than juveniles. A few individuals were reported to habituate to the sound—apparently on a daily basis, since birds were more likely to remain at the feeder late in the day. I wonder if the greater reluctance to leave late in the day might also have been influenced by a greater need for food prior to going to the evening roost. Pity the neighbors! [Wildlife

Ecology Lab., Forest and Forest Products Research Inst., Ministry of Agriculture, Forestry and Fisheries, Kukizaki-machi, Ibaraki 305, Japan.]—Jerome A. Jackson.

FOOD AND FEEDING

(see also 7, 8, 37, 41, 44, 45, 46)

10. Diet and nesting success of Barn Owls breeding in western Nebraska. J. A. Gubanyi, R. M. Case, and G. Wingfield. 1992. Am. Midl. Nat. 127:224–232.—Common Barn-Owl (*Tyto alba*) diets were monitored for three years and nesting success was monitored for two years in Lincoln County, Nebraska. The authors identified 10,140 prey items and found that 99.3% of them represented 17 mammalian species. The remaining prey was avian. The authors' findings support the general consensus that Common Barn-Owls are opportunistic foragers that show a preference for one or two prey species, in this case voles (*Microtus ochrogaster*) and pocket mice (*Perognathus hispidus*). As is generally seen in Common Barn-Owl studies, *Microtus* was overrepresented in diets when compared to trapping results.

Nine and 12 nests were located and monitored within the same study area in 1985 and 1986, respectively. The increase in nests from 1985 to 1986 was accompanied by an increase in nesting success. The authors' data suggest that this increase was due to an increase in *Microtus*, but sample sizes were small and statistical significance was not found. Encouraging news for nest box enthusiasts: nesting success was higher in artificial nest sites (nest boxes and a 55-gallon drum) than in natural cavities. [Concordia College, Seward, NE 68434, USA.]—James P. Key.

11. Evidence for frugivory by birds in montane and lowland forest in southeast Australia. K. French. 1990. Emu 90:185–189.—In this study 30 species of birds were trapped in 1987 and 1988 and their feces were examined to check for the remains of fruits. Evidence of frugivory was found in 18 species, five species consumed large quantities of fruit during autumn, and 13 species consumed lesser quantities of fruit. In those 13 species where a small portion of the feces was fruit remains, fruit appeared to be a dietary supplement. Further examination of the feces showed that some seeds passed through the birds' digestive system undamaged whereas other seeds were badly damaged. This is important because birds that do not damage the seed help the distribution and growth of fruiting plants and select for a cooperative relationship between plants and birds. Birds, such as the Crimson Rossella (*Platycercus elegans*), are seed predators that select for improved defense mechanisms in the plants. [School of Biological Science, Macquarie Univ., Ryde, N.S.W. 2109, Australia.]—Chris Robles.

12. Functional analysis of mate-feeding in the Lesser Kestrel *Falco naumanni*. J. A. Donázar, J. J. Negro, and F. Hiraldo. 1992. Ornis Scand. 23:190–194.—Several functions for courtship feeding in birds have been suggested: (1) pair formation and pair bond maintenance, (2) copulation inducement, (3) evaluation of parental quality, and (4) enhancement of female body condition. To evaluate mate feeding in light of the above hypotheses, the authors studied a colony of Lesser Kestrels that nested in an old castle in southern Spain in 1989 and 1990.

The mate feeding period lasted an average of 23.7 days, beginning 16.5 days before the first egg was laid (n = 13 pairs). Mate feeding peaked at the beginning of egg laying, during which time males provided almost all of the food for their mates. Copulations began an average of 54 days before mate feedings, but the peak of the two behaviors coincided. In general, the earliest nests and the largest clutches occurred at sites where mate feeding began the earliest. Frequency of mate feeding and chick feeding were significantly positively correlated in the nine pairs that fledged young. Female body mass increased steadily from the start of mate feeding through egg laying and was significantly positively correlated with the frequency of mate feedings.

Because mate feeding began long after pair formation and copulation, the behavior did not function in pair formation or copulation inducement. Moreover, because virtually all territory holding males obtained mates, females that abandoned a male based on his provisioning ability would have had little opportunity to nest successfully with another male.

The positive relationship between mate feeding and female body mass, the almost total dependency of females on mate feeding at the time of egg laying, and the fact that mate feeding allowed females to lay earlier and larger clutches suggest that enhancement of female body condition was the most important function of mate feeding. [Estacíon Biológica de Doñana, 41080 Sevilla, Spain.]—Jeff Marks.

13. Feeding activity of the Grey Heron *Ardea cinerea* in tidal and non-tidal environments. 1990. Y. Sawara, N. Azuma, K. Hino, K. Fukui, G. Demachi, and M. Sakuyana. JPN. J. Ornithol. 39:45–52.—Foraging ecology of Great Grey Herons was studied at an estuary and at a reservoir, and the herons were found to forage most during low tides—day or night—at the estuary, but constantly during the day at the reservoir. Herons at the estuary tended to forage while wading around, whereas those at the reservoir adopted more "stand-and-wait" tactics. Prey capture rates appeared to be higher at the estuary (0.116–0.175 prey/minute) than at the reservoir (0.098 prey/minute), although methodology and weather conditions were not described, and data were collected on different dates at the two sites. Prey species are suggested for the estuary, but not for the reservoir. [Dept. of Biology, Faculty of General Education, Hirosaki Univ., Hirosaki 035, Japan.]—Jerome A. Jackson.

14. Diet of the House Sparrow in an intensively cultivated area. H. K. Saini and M. S. Dhindsa. 1991. JPN. J. Ornithol. 39:93–100.—This year-long study of *Passer domesticus* in the arid agricultural environment of Rajasthan, India, includes analysis of stomach contents of 96 birds collected throughout the year. Sample sizes per month ranged from four to 13; sex and age of birds are not identified. Major food items were seeds of the crops grown in the area (wheat, pearl millet, rice, corn). The authors note that the area is under intensive cultivation with few weed seeds available. Wheat was included in 30% of the guts and comprised 39% of gut contents by dry weight; millet was included in 20% of the guts and made up 30% of the contents by dry weight. Insects were found in 8% of guts and comprised 1.8% of gut contents by dry weight—but were recorded only during June, August, and December. Eggshell fragments were found in 26% of guts, comprised 2.5% by dry weight, and were noted every month but June. [All India Coordinated Research Project in Economic Ornithology, Dept. of Zoology, Punjab Agricultural Univ., Ludhiana 141 004, India.]—Jerome A. Jackson.

15. Predation of Heermann's Gull (*Larus heermanni*) chicks by Yellow-footed Gulls (*Larus livens*) in dense and scattered nesting sites. E. Velarde. 1992. Colon. Waterbirds 15:8–13.—Velarde begins with a well documented review of the advantages and disadvantages of colonial nesting as a defense strategy against predation. The paper reports on a study at Rasa Island, in the Gulf of California, where 95% of the world's population of Heerman's Gulls nest. These gulls nest in high density (valley) and low density (rocky hill) concentrations, with high nesting synchrony. Chicks are subject to predation by Yellow-footed Gulls during the first two weeks of life. The purpose of the study was to assess the impact of predation, determine any relationships between nesting density and predation, and any numerical relationships between prey and predators. During the 18 hours of observation at each of two study sites (low density and high), observers recorded predation attempts, success rates, and search flight times. Predator numbers increased as more chicks became available, and predators concentrated more on the high nest density areas. However, the ratio of predator events/total nests was lower in the high density area. Although the total number of chicks taken was high in the high density area, percentage of chicks taken was lower. The authors suggest that there is an anti-predator advantage for gulls nesting in high density, and an advantage in high nesting synchrony, since chicks are only available for a short time. [Inst. de Biologia, Apt. Postal 70 153, D.F. 04510, Mexico.]—William E. Davis, Jr.

16. Non-breeding season diet of Long-eared Owls in Massachusetts. D. W. Holt and N. N. Childs. 1991. J. Raptor Res. 25:23–24.—The nonbreeding diets of Long-eared Owls (*Asio otus*) from two locations in Massachusetts (Belmont and Nantucket Island) were compared. Pellets were collected between November 1984 and February 1985. Four species of mammals and two species of birds were identified, constituting 915 prey items. Meadow

voles (*Microtus pennsylvanicus*) were the most numerous prey by number and biomass. Diets were similar between the two locations; however, prey species proportions differed significantly. Nantucket and Belmont owls had higher proportions of white-footed mice (*Peromyscus leucopus*) and short-tailed shrews (*Balarina brevicauda*), respectively. Other prey species reported include meadow jumping mice (*Zapus hudsonius*), Blue Jays (*Cyanocitta cristata*), and Northern Flickers (*Colaptes auratus*). [Owl Research Inst., P.O. Box 8335, Missoula, MT 59807, USA.]—Robin J. Densmore.

17. Development of foraging behavior in the American Kestrel. D. E. Varland, E. E. Klass, and T. M. Loughlin. 1991. J. Raptor Res. 25:9–17.—The purpose of this study was to describe the development of American Kestrel (*Falco sparverius*) foraging behavior during the post-fledging phase and during the period of recent independence from parents. Data were collected on 12 sibling groups in central Iowa during 1988 and 1989. Kestrels showed a significant decrease in time spent perch-resting and significant increases in time spent perch hunting, eating self-captured prey, and flying. Young kestrels were not observed eating prey captured by their parents after the third week post-fledging. During the five-week post-fledging period, perch hunting constituted a greater percentage of foraging time than ground hunting. Perch hunting pounces, captures, and hunting success increased significantly with time, as did ground hunting success. The majority of prey items caught were grasshoppers. Some hover hunting and flycatching attempts were observed. A significant decrease in association and a significant increase in nonsocial behavior occurred with time. Social hunting was observed during 41% of the sessions in which hunting occurred (and was imitative rather than cooperative). Twenty percent of the social hunting observed was extra-familial. Social hunting among nonsibling groups occurred around the time of dispersal from the natal area. [U.S. Fish and Wildlife Service, Iowa Coop. Fish and Wildlife Research Unit, Iowa State Univ., Ames, IA 50011, USA.]—Robin J. Densmore.

SONGS AND VOCALIZATIONS

(see 40)

NESTING AND REPRODUCTION

(see also 5, 10, 12, 15, 27, 28, 30, 32, 41)

18. The importance of mate retention and experience on breeding success in Cassin's Auklet (*Ptychoramphus aleuticus*). S. D. Emslie, W. J. Sydeman, and P. Pyle. 1992. Behav. Ecol. 3:189–195.—Previous studies have shown that mate retention increases breeding success in long-lived species of birds. Age and experience also affect performance in seabirds, with success generally peaking just before senescence. The authors monitored nesting success of Cassin's Auklet on Southeast Farallon Island, California, to determine the relative effects of these variables on hatching and fledging success and weight at fledging. Data derived from observations of 44 to 114 banded pairs using nest boxes from 1985 to 1990 were analyzed using linear and logistic regression. Hatching success increased with experience in both sexes but reached an asymptote after four years for females and declined with advanced experience in males, perhaps due to senescence. There was a similar relationship with regard to sex between hatching success and mate retention. Fledging success and weight increased asymptotically with length of pair-bond for both sexes; weight increased with experience of females but not males. Fledging success was not correlated with experience in either sex. The authors conclude that mate retention has clear advantages in this species, while experience has little effect beyond the early stages of the nesting cycle. Mate retention does not seem to be an effect of site tenacity. [Point Reyes Bird Observatory, 4900 Shoreline Hwy., Stinson Beach, CA 94970, USA.]—Kenneth D. Meyer.

19. Common Loon, *Gavia immer*, productivity on a northern Wisconsin impoundment. J. L. Belant and R. K. Anderson. 1991. Can. Field-Nat. 105:29–33.—The range of the Common Loon has receded northward as shoreline development and recreational use of northern lakes has increased. Presumably, loons are intolerant of human activity (Sawyer 1979, pp. 81–99 *in* S. A. Sutcliffe, ed. *The Common Loon.* National Audubon Society, New York), but Belant and Anderson found that reproductive success of loons was

low in areas of infrequent human activity and improved as activity increased, where activity was measured by the number of boats passing hourly within 50 m of the nest. Few data and no statistics support this most interesting conclusion. The authors suggest that loons can adapt to the presence of humans. However, loons are site faithful and the results could be explained by older, reproductively experienced, and more successful parents returning to formerly occupied territories that are now close to human activity while young, reproductively inexperienced, and less successful loons (Croskery 1988, Can. Field-Nat. 102:264–265) retreat from human activity to raise their young. The conclusion of Belant and Anderson is supported by Heimberger, Euler, and Barr (1983, Wilson Bull. 95:431–439), but more careful study is needed before alternative explanations can be ruled out. I certainly hope that Belant and Anderson are correct and that we may look forward to more loons on more lakes. [Adirondack Ecological Center, State Univ. of New York, Newcomb, NY 12852, USA.]—Edward H. Burtt, Jr.

20. Common Loon, *Gavia immer*, nesting success and young survival in northwestern Ontario. P. R. Croskery. 1991. Can. Field-Nat. 105:45–48.—The wilderness study area included 40 lakes and 272 loon territories on 36 of those lakes. Each lake was surveyed every 10 days from May through September 1982–1986, and 20% of the territories were searched thoroughly each year. Overall, 58.5% of eggs hatched, but 64.1% of eggs in clutches of two eggs hatched compared to only 34.4% of eggs in single egg clutches. The difference may be due to young, inexperienced parents, which tend to lay single egg clutches. In nests that hatched two chicks (78), 38.4% (30/78) fledged both and 43.5% (34/78) fledged one chick. Croskery concludes that the second chick increased the vulnerability of the brood, but offers no supporting statistical analysis and the small difference does not support his conclusion. Ninety-four of the 156 chicks that hatched into nests where both chicks hatched fledged, which gives a survival rate of 0.6. Assuming an equal probability of survival for every chick, the probability of both chicks in a brood surviving is 0.6×0.6 or 0.36, which is almost exactly what Croskery observed. The probability of one chick surviving (0.6) and the other dying (0.4) is 0.24, but since either chick can survive or die the probability must be multiplied by two which gives 0.48 for the probability that one chick survives and one dies. Again, that is very close to the observed frequency (43.5%), which refutes Croskery's conclusion that the second chick increases the vulnerability of the brood. Chick mortality is 0.6 regardless of whether there are one or two chicks in the brood. Most of the chick mortality occurs in the first two weeks after hatching and results from the family unit splitting up. The finding that mortality of eggs and mortality of chicks was approximately equal was most interesting. [R.R.1, 50 Ridge Rd. W., Grimsby, ON L3M 4E7, Canada.]—Edward H. Burtt, Jr.

21. Polygyny and reproductive effort in the Malleefowl, *Leipoa ocellata*. W. Weathers, D. L. Weathers, and R. S. Seymour. 1990. Emu 90:1–6.—Their large parental effort seemed to support the conclusion that Malleefowl were monogamous. However, discovery of a polygamous male raises several questions: How common is polygyny in Malleefowl? Since population size commonly is estimated by the number of mounds, and more than one mound may represent an individual breeding male, how accurate are those population counts? How does polygyny affect avian mating systems? Three mounds, two of which belonged to the polygynous male, were observed for mating, egg laying, temperature regulation, and maintenance behavior. An abundant supply of food, increased rainfall, and an artificial source of drinking water may have reduced energy demands and allowed the male to successfully tend two mounds with normal clutch sizes. Although the authors fail to discuss it, evidence presented in the paper suggests that the first female tended the mound, while the second female did not. Although the male concentrated his work at the second mound, he worked considerably less than the first female. There were some problems with subject verb agreement, but this concise report of an unusual study is worth the time and effort to read. [Dept. of Avian Sciences, Univ. of California, Davis, CA 95616, USA.]—Lisa Sheppard.

22. From nest building to fledging of young in Great Grey Shrikes (*Lanius excubitor*) at Sede Boqer, Israel. R. Yosef. 1992. J. Ornithol. 133:279–285.—What is known as the Northern Shrike in North America is a holarctic species that is migratory

over much of its range, but in Israel it is a permanent resident. This three-year study involved 21 pairs and over 50 nest efforts. Yosef studied several aspects of shrike breeding ecology and this paper is a gold mine of basic quantitative data that will be useful for comparison with data from migrant populations. Territories of marked males averaged 62.5 ha. Most pairs were double-brooded; one had four broods in a season. Nesting was most prevalent from February–April, but extended into June. Clutch size averaged 5.8 eggs, and Yosef points out that this falls in line with a north–south cline of decreasing clutch size for the species. Incubation (lasting 14–18 days) began after laying of the third egg, resulting in asynchronous hatching and the opportunity for brood reduction during adverse weather. Young fledged after 16–19 days. Nesting success was 63%. [Mitrani Center for Desert Ecology, Dept. of Biology, Ben-Gurion Univ., Jacob Blaustein Inst. for Desert Research, Sede Boqer Campus, 84993, Israel.]—Jerome A. Jackson.

23. Motives for parental infanticide in White Storks *Ciconia ciconia*. F. S. Tortosa and T. Redondo. 1992. Ornis Scand. 23:185–189.—Most examples of avian brood reduction involve sibling aggression or passive starvation. In a few species, however, the parents take an active role in eliminating some offspring. The White Stork is one such species. Within 14 days after it hatched, parents killed their smallest chick in nine of 63 nests observed over a 3-year period. Infanticidal parents had larger broods (4.0 versus 2.75 chicks) than did non-infanticidal birds. The youngest nestlings in 4-chick broods typically grew slower and had lower survival than did their older siblings. Larger broods were potentially more costly to parents because the parents provisioned them more often and for longer nestling periods. The authors suggest that once the older siblings have hatched successfully, the cost of provisioning an "extra" chick until it is outcompeted by its siblings is greater than the expected payoff from allowing it to survive a little longer. If the young do not compete aggressively for food (as in White Storks), then selection would favor parents that kill the smallest chick. [Dept. de Biologia Animal, Univ. de Cordoba, E-14071 Cordoba, Spain.]—Jeff Marks.

24. Piping Plover nest site selection in New Brunswick and Nova Scotia. S. P. Flemming, R. D. Chiasson, and P. J. Auston-Smith. 1992. J. Wildl. Manage. 56:578–583.—The objectives of this study were to determine if Piping Plover (*Charadrius melodus*) nest site characteristics vary geographically and temporally, and which beach characteristics were used in nest site selection. Data were collected in New Brunswick during 1988 and 1989 and in Nova Scotia in 1983 and 1987. Three study areas examined included New Brunswick (flat beaches with strewn pebbles and stones), northern Nova Scotia (well developed dunes, pebbles/stones), and southern Nova Scotia (well developed dunes, sandy).

Nest site characteristics did not vary among beaches in eastern New Brunswick (NB) and northern Nova Scotia (NNS), but the number of stones and rocks varied at the southern Nova Scotia (SNS) site. SNS nest sites had more shoots of beach grass and fewer pebbles and stones than nest sites of the other study areas. NB nest sites had more pebbles and shell fragments than the other study areas. In comparison with random sites, NB nest sites had more pebbles, stones, rocks and shells, and NNS nest sites had more pebbles, stones, rocks, shoots of beach grass and sticks. SNS nest sites had a greater number only of beach grass shoots. Moreover, SNS nest sites were characterized by a temporal change in that there were more nests in grass (than in gravel) in 1987 than in 1983. Due to the differences in nest site selection among the study areas, the authors suggest that geographical variation be considered in Piping Plover habitat management. Furthermore, habitat manipulation should be implemented only if specific habitat data are available for the plover populations in question. [General Delivery, Sackville, NB EOA 3CO, Canada.]—Robin J. Densmore.

HABITAT USE AND TERRITORIALITY

(see also 24)

25. Movements and habitat use by Common Ravens from roost sites in southwestern Idaho. K. A. Engle and L. S. Young. 1992. J. Wildl. Manage. 56:596–602.—Habitat use and movements of Common Ravens (*Corvus corax*) from four communal roosts were studied during 1985–1987 in order to gain more information that could facilitate

management activities in human/raven conflicts. Season-specific and site-specific differences in the distances ravens traveled from their roosts, as well as season-specific and site-specific differences in habitat use, were examined. All roosts were located in towers along a 124-km segment of a 500-kv transmission line and are the largest known raven roosts in the world.

Extensive radio tracking efforts showed raven movement to be restricted to a single direction, whereupon they would remain in one area for the entire day. Daily distances traveled from roost sites averaged 6.9 km and were similar among seasons, but not among roosts. Ravens spent on average 54% of their time in agricultural habitats, followed by shrub (23%), grass (13%), and riparian (6%) habitats. Agricultural and riparian habitats were used in higher proportions relative to their availabilities. No seasonal differences in habitat use were shown and use of habitat relative to availability was similar among roosts.

Ravens demonstrated consistency in habitat use and exhibited habitat selectivity. Movement, habitat use, and roost locations all were associated with human related food sources. Rather than raven removal, the authors suggest manipulation of raven food supplies through the management of human activities which provide them. [Dept. of Wildlife Ecology, Univ. of Wisconsin, 226 Russel Lab., 1630 Linden Dr., Madison, WI 53706, USA.]—Robin J. Densmore.

26. Evaluation of nest box sites selected by Eastern Bluebirds, Tree Swallows, and House Wrens. S. G. Parren. 1992. Sialia 14:85–91.—Although quantitative analyses have provided some insight into the habitat features that surround nest boxes erected for Eastern Bluebirds (*Sialia sialis*), specific criteria for placing boxes in order to attract bluebirds remain ambiguous. By analyzing data from 221 nest boxes located in a variety of habitats in Vermont, the author attempted to quantify differences in 10 habitat components surrounding nest boxes used by bluebirds, Tree Swallows (*Tachycineta bicolor*), and House Wrens (*Troglodytes aedon*), as well as unused boxes, during two breeding seasons. With stepwise discriminant function and logistic regression analyses the author determined that bluebird sites were located significantly more often in larger areas of open habitat, farther from high perches, including woodland edge, and had significantly greater visibility from the nest box entrance than wren sites. Swallow nesting habitat was not clearly discriminated from bluebirds or wrens and appeared characteristically intermediate to the other two species. In order to encourage bluebirds and discourage wrens, the author recommends placing nest boxes at least 10 m from a high perch in open habitat (at least 0.4 ha) with a field of view from the nest box entrance of at least 10 m. Although these recommendations may not prevent swallows from using nest boxes, interactions may be alleviated by pairing nest boxes where swallows occur. [Vermont Fish and Wildlife Dept., 103 South Main St., Waterbury, VT 05676, USA.]—Danny J. Ingold.

27. Home range of breeding Common Ravens in coastal southern California. G. M. Linz, C. E. Knittle, and R. E. Johnson. 1992. Southwest. Nat. 37:199–202.—During May and June 1989 the authors determined the home ranges of radio-tagged Common Ravens (*Corvus corax*), and their proximity to a small colony of Least Terns (*Sterna antillarum browni*) at Camp Pendleton in San Diego Co., California. Only one of 14 nesting pairs had home ranges that encompassed the tern colony, although all other nests were located within 6.5 km of the colony (1 nest/4.7 km^2). The median home range size of nesting individuals was 1.2 km^2, and male and female range sizes did not differ significantly. The smaller home range sizes of nesting ravens in this region may have been related to the high nesting density along the southern California coast. The median home range size for non-nesting ravens was 8.2 km^2, and these birds were never detected within the primary study area near the tern colony. Although Common Ravens have been identified as a potentially serious predator on the eggs and nestlings of Least Terns, the paucity of tern nests in this area perhaps reduced its attractiveness as a food source. [Denver Wildlife Research Center, North Dakota Field Station, North Dakota State Univ., Fargo, ND 58105, USA.]—Danny J. Ingold.

28. Observations on soil requirements for nesting Bank Swallows *Riparia riparia*. R. J. John. 1991. Can. Field-Nat. 105:251–254.—Bank Swallows cluster their nests. Researchers have attributed the clustering to social factors and communal defense without considering the possibility that soil conditions may severely limit the availability of burrow

sites. John has developed a device that quantifies penetrability by measuring how much force is required to drive a 10-cm metal spike into the soil. Active Bank Swallow burrows were found in soil that required 6.8–11.8 kg/10 cm to drive the spike to its full length, whereas the remains of burrows were found in a slumped bank that required 3.6–9.1 kg/10 cm, and abandoned nests were found in soil that required only 1.8–3.6 kg/10 cm. (Readability of the table would be improved by specifying units.) These data point to physical, not social, forces leading to abandonment of former colony sites. This is not to say that social factors are unimportant, only that physical conditions must be acceptable for burrow construction before social forces come into play. [8 Aurora Crescent, Nepean, ON K26 027, Canada.]—Edward H. Burtt, Jr.

ECOLOGY

(see also 11, 47, 48)

29. Ptilochronology: wind and cold temperatures fail to slow induced feather growth in captive White-breasted Nuthatches *Sitta carolinenesis* maintained on *ad libitum* food. G. M. Zuberbier and T. C. Grubb, Jr. 1992. Ornis Scand. 23:139–142.—Grubb (1989, Auk 106:314–320) coined the term ptilochronology for the study of feather growth rates. By experimentally plucking a rectrix, daily growth bars of the incoming feather can serve as an index of a bird's nutritional status. Previously, Grubb showed that growth bars of Carolina Chickadee (*Parus carolinenesis*) rectrices were significantly narrower for birds kept on deficient diets. In this paper, Zuberbier and Grubb assess the effect of wind and cold on the growth of induced rectrices of White-breasted Nuthatches.

After an outer rectrix was plucked, birds were housed in wind-tunnel cages within freezers for 7–8 weeks while exposed to combinations of three different temperatures (+5, −5, and −15° C) and wind velocities (0.0, 0.5, and 1.0 $m \cdot s^{-1}$). The birds were kept on an 8:16 LD cycle, and food and water were provided *ad libitum*. There was no significant effect of wind or temperature on total length, mass, daily growth, or mean growth bar width of the induced rectrices. Presumably, the abundance of food allowed the nuthatches to compensate for any stress caused by weather conditions. Zuberbier and Grubb conclude that their results " . . . should enable researchers employing ptilochronology with small winter-acclimated birds to attribute more readily the direct causes of observed reductions in feather growth rate to factors other than cold temperature and wind." [2911 Emerald Rd., Upper Parkville, MD 21234, USA.]—Jeff Marks.

30. Flooding: mortality and habitat renewal for Least Terns and Piping Plovers. J. G. Sidle, D. E. Carlson, E. M. Kirsch, and J. J. Dinan. 1992. Colon. Waterbirds 15: 132–136.—Interior populations of Least Terns (*Sterna antillarum*) and Piping Plovers (*Charadrius melodus*) nesting on barren or sparsely vegetated sandbars along rivers experience mortality of eggs and young due to large water discharges from dams and natural flooding. Paradoxically, high river flow also scours vegetation from sandbars and islands, creating nesting habitat for the two species. The authors report on observations of mortality and nesting habitat formation during flooding along the Platte River in Nebraska in June and July 1990. Vegetation scour was assessed by examination of video tapes taken from aircraft before and after flooding in mid-June, and tern and plover nests were monitored and mortality recorded. Flooding mortality was 100% for both species in 1990, compared to 4% for terns in 1988 and 0% for plovers in 1987. The vegetation on 34 study sites was reduced 78% by flood scouring. U.S. Geological Survey data indicate that from 1949–1990 water levels were low enough for nest initiation to have occurred, and four floods comparable to the 1990 flood occurred during nesting seasons. Hence, periodic floods involving tern and plover chick mortality is a natural phenomenon, but also produces nesting habitat by scouring vegetation. The authors point out that the timing of flooding determines the extent of damage.

Most riverine nesting occurs on bars below reservoirs, and, as in the case of the Missouri River dams, "untimely" discharge from dams flood tern and plover nesting habitat, killing eggs and chicks. They suggest that an understanding of natural flooding phenomena should help in managing water discharge during nesting season to minimize plover and tern mortality. [U.S. Fish and Wildlife Service, 203 West 2nd St., Grand Island, NB 68801, USA.]—William E. Davis, Jr.

31. Effects of drought on American Coot, *Fulica americana*, reproduction in Saskatchewan Parklands. J. M. Sutherland. 1991. Can. Field-Nat. 105:267–273.—Nesting ponds chosen by coots have a border of flooded, emergent vegetation at least 3.5 m wide, and previous studies have suggested that coots are able to avoid ponds that may dry up. Sutherland found that during the drought of 1981–1982, 12 of 104 nests were located in ponds that dried up. Nests in dried-up ponds invariably failed because adults abandoned the young which could not be transported to neighboring ponds, because nests could be reached by predators, and because food was less available. Sutherland suggests that coots are less selective than previously thought. He further suggests that this may be the product of their 2–3 year life expectancy. With a short reproductive life the risk of using poor habitat may outweigh any advantage gained by deferring reproduction. [Dept. of Biology, Univ. of Saskatchewan, Saskatoon, SK S7N 0W0, Canada.]—Edward H. Burtt, Jr.

32. Conspecific nest parasitism in the European Starling. R. Pinxten, M. Eens, and R. F. Verheyen. 1991. Ardea 79:15–30.—Over a six-year period, 260 European Starling (*Sturnus vulgaris*) nests in Belgium were monitored for evidence of conspecific nest parasitism. On average, 15% of first clutches and 2% of second clutches were parasitized. Overall, 11% of all nests received at least one parasitic egg, and 85% of the nests parasited had only one parasitic egg. The rate of parasitism apparently was not related to a shortage of nest sites since the study was done in "colonies" of artificial nest boxes, some of which were unused. The authors reviewed the several hypotheses that might account for the parasitic trait in starlings, but drew no conclusions based on their study.—Clayton M. White.

POPULATION DYNAMICS

(see also 20, 50)

33. Thirteenth census of seabird populations in the sanctuaries of the north shore of the Gulf of St. Lawrence, 1982–1988. G. Chapdelaine and P. Brousseau. 1991. Can. Field-Nat. 105:60–66.—Populations increased in 13 of 15 species of water birds nesting in nine sanctuaries along the northern shore of the Gulf of St. Lawrence. Leach's Storm-Petrel (*Oceanodroma leucorhoa*) had the largest percentage increase (39.8%) and Common Murre (*Uria aalge*) had the largest numerical increase (11,434 individuals). Declines occurred only in the Great Cormorant (*Phalacrocorax carbo*; 134 [1982] to 86 [1988]) and Ring-billed Gull (*Larus delawarensis*; 391 [1982] to 288 [1988]). Improved enforcement of hunting restrictions and increased conservation education have contributed to the population increases. Six species increased by more than 10%, suggesting that immigration was a contributing factor to the increase. Furthermore, local fisheries have depleted the stock of large predatory fish, with a resultant increase in the number of small fish on which many of these birds feed. Unfortunately, that happy situation may soon end as plans are being laid to commercially fish these small species. [C.P. 10100, Ste-Foy, PQ G1V 4H5, Canada.]—Edward H. Burtt, Jr.

34. The expansion velocity of the Collared Dove *Streptopelia decaocto* population in Europe. R. Hengeveld and F. Bosch. 1991. Ardea 79:67–72.—The authors produce a model to account for the radial velocity of range expansion using *Streptopelia decaocto* data. Most models heretofore developed were said to have flaws. The current model fairly agreed with field observations but required three population statistics: (1) age-specific survival, (2) age-specific reproduction, and (3) dispersal of individuals. The latter, dispersal capacity, was probably least accurate and may have been the variable accounting for the greatest error in the model.—Clayton M. White.

35. Changes in the population of European Starlings (*Sturnus vulgaris*) wintering in Spain during 1960–1989. S. J. Peris. 1991. Sitta 5:19–26.—Over the Iberian Peninsula there has been a general decrease in numbers of wintering *Sturnus vulgaris* during the last couple of decades. Some of the study was based on banding recoveries at roost sites, but censuses suggest that some 10 million starlings still winter in Spain. Most decreases occurred in the southeastern portion of the peninsula. This decrease was thought to have resulted from the increasing tendency toward agricultural monoculture over the past 30 years.—Clayton M. White.

36. Differences in causes of death between Goshawk *Accipiter gentilis* and Sparrowhawk *A. nisus* in 1975–1989. [Verschillen in doodsoorzaken tussen Havik *Accipiter gentilis* en Speriver *A. nisus* in 1975–1989]. K. Smit, P. E. F. Zoun, and E. Colijn. 1991. Limosa 64:137–142. (Dutch, English summary.)—In all, 175 Goshawks and 325 Sparrowhawks were found dead in The Netherlands. Toxic substances were the major cause of death in Goshawks (24%) while mechanical violence (mainly collision with windows) were the main cause of death in Sparrowhawks (50%). Seven sources of death were identified. Among Goshawks, most deaths occurred in late winter and spring. Most Sparrowhawks were found in autumn and winter outside of the breeding range.—Clayton M. White.

37. Population dynamics of Lari in relation to food resources. A. L. Spaans, ed. 1992. Ardea 80:1–199.—As have many other issues of *Ardea,* this number also is devoted to the proceeding of an international workshop, which was organized by the Dutch and held in the Netherlands in September 1989. As with many such symposia there were both general introductory remarks to set the tone of the workshop and then concluding remarks that more or less summarized the major points of the presentations. These two sections were in addition to the papers formally presented in *Ardea.* The workshop dealt entirely with gulls and terns.

The symposium had three major topic areas: energetic requirements of annual processes (four papers), availability and exploitation of food resources (12 papers), and modelling seabird populations with implications for management (five papers). While papers were rather general and dealt with processes of wide application, others were species-specific studies. An example of the first type was the paper by Drent, Klaassen, and Zwaan that presented a predictive growth budget in gulls and terns using data from three tern species and one gull species.

Of the 21 papers, there was heavy weighting toward three species, the Common Tern (*Sterna hirundo*), Black-legged Kittiwake (*Rissa tridactyla*), and Herring Gull (*Larus argentatus*). The tern was the subject (totally or in part) of five papers, kittiwake of four papers, and gull of seven papers. The Arctic Tern (*S. paradisaea*) and Lesser Black-backed Gull (*L. fuscus*) also were subjects in a few papers collectively.

The entire collection is too extensive to review, but for anyone interested in larids, this certainly is a must.—Clayton M. White.

38. The decline to extinction of a population of Golden Plover in north-east Scotland. R. Parr. 1992. Ornis Scand. 23:152–158.—A population of Greater Golden-Plovers (*Pluvialis apricaria*) declined from about 115 birds in 1976 to zero in 1990. There were no detectable changes in the breeding habitat, and annual changes in numbers were not associated with nesting success. Instead, there was a strong correlation between annual numbers and winter mortality calculated from return rates of banded birds. Several major declines in numbers followed severe winters. Parr suggests that loss of winter habitat owing to agricultural practices heightened the effects of severe winters and was the ultimate cause of the population's demise. [Inst. of Terrestrial Ecology, Hill of Brathens, Banchory, AB31 4BY, Scotland.]—Jeff Marks.

39. Density of nesting Peregrine Falcons in Grand Canyon National Park, Arizona. B. T. Brown, G. S. Mills, R. L. Glinski, and S. W. Hoffman. 1992. Southwest. Nat. 37:188–193.—During the 1988 and 1989 breeding seasons, numbers of Peregrine Falcons (*Falco Peregrinus anatum*) were assessed along the Colorado River corridor as well as the North and South Rims of the Grand Canyon. Twenty-eight occupied breeding areas (OBA, each possessing two adult peregrines or one adult with at least one nestling or recently-fledged juvenile) were identified, and 37 sightings of single adult or second-year falcons were made in an area representing 15% of the park in 1988. In 1989, 58 OBAs were located and 67 sightings of single individuals were made in an area representing 24% of the park. Differences in the number of OBAs, single adults, and unoccupied breeding areas between years was significant ($P = 0.004$), but similar differences were not detected between years when the number of OBAs and single adults were combined and compared to the number of unoccupied breeding areas. Mean distances between the centers of occupied breeding areas on the South Rim, North Rim, and Colorado River corridor were 5.6, 8.0, and 6.8 km, respectively. The 71 OBAs identified in the Grand Canyon during this study

comprise nearly half (46%) of the 153 OBAs of Peregrine Falcons in Arizona, and exceed the numbers of known territories in Colorado, New Mexico, and Utah. Although these population increases should be interpreted cautiously, they seem to suggest that the endangered Peregrine Falcon is approaching full recovery in northwestern Arizona. [SWCA Environmental Consultants, 23 East Fine, Flagstaff, AZ 86001, USA.]—Danny J. Ingold.

ZOOGEOGRAPHY AND DISTRIBUTION

(see 19, 54)

SYSTEMATICS AND PALEONTOLOGY

(see also 42)

40. The *Parus caeruleus* complex revisited. J-L. Martin. 1991. Ardea 79:429–438.—In this study, 2352 specimens from across the entire Eurasian and Northern African range of the Blue Tit (*Parus caeruleus*)-Azure Tit (*P. cyanus*) species complex were analyzed using Standardized Principal Component Analysis. There is hybridization between the two currently recognized "species." In all, 13 mensural characters and nine plumage pattern traits were used in the analysis. The traits varied clinally and were most closely related to changes in vegetation and environmental conditions. Based on older analyses, two subspecific groups were recognized for each species. Studies on song and other isolating mechanisms in conjunction with the PCA analysis suggested to Martin that the complex should be considered a super-species consisting of at least four sister-species, the limits of which correspond to the ranges of previously recognized subspecific groups.—Clayton M. White.

EVOLUTION AND GENETICS

(see 2, 3, 23, 48)

PHYSIOLOGY AND DEVELOPMENT

41. Chick growth, fledging periods and adult mass loss of Atlantic Puffins *Fratercula arctica* during years of prolonged food stress. R. T. Barrett and F. Rikardsen. 1992. Colon. Waterbirds 15:24–32.—This paper presents a comparison of chick growth rates for Atlantic Puffins at Bleiksøy and Hornøy (previously published data) colonies, in northern Norway, among years when food supply differed. Chicks were weighed and measured at regular intervals, food samples taken, and feeding trips and body masses of adult birds recorded. At Bleiksøy growth rates for weight, culmen, and wing length were all lowest in 1986 when most chicks starved, and highest in 1982 when food was more available, particularly late in the breeding season. At Hornøy colony in 1981, where the growth rates were higher than at any year at Bleiksøy, chicks had faster growth rates, but adult birds at both colonies experienced similar weight loss rates, suggesting that adults may not work beyond optimal rates. Chicks grew more slowly at Bleiksøy compared to other colonies, fledging periods were up to twice the normal 38–44 days, and chicks failed to show the usual pre-fledging weight loss. Chicks were able to withstand both short and long periods of food shortage by reducing fat deposition and slowing growth rates. At fledging, mass and wing lengths were similar to chicks from other colonies. However, the chicks were in inferior condition (lower mass/wing or culmen length ratios). The authors suggest that retarded growth rates and extended fledging periods are made possible by burrow nesting, which protects chicks from weather and predation, and allows both parents to forage at the same time. [Zoology Dept., Tromsø Museum, N-9000 Tromsø, Norway.]—William E. Davis, Jr.

MORPHOLOGY AND ANATOMY

(see also 40)

42. Occurrence and expression of claws on fingers of recent birds. [Vorkommen und Ausbildung der Fingerkrallen bei rezenten Vögeln.] B. Stephan. 1992. J. Ornithol. 133:251–277. (German, English summary.)—Stephan looked for the presence of wing claws on specimens of all avian orders, most families, and representatives of about 350 species.

This paper includes the results of his studies and a systematic review of our knowledge of the presence of claws on the wings of birds. Claws are known from digit 1 from most or all orders and most families, from digit 2 in far fewer taxa, and from digit 3 only from the Ostrich (*Struthio camelus*). Stephan suggests that claws on the fingers provide protection for the tissues and that they are pushed out as a result of feather development. Although there is a tendency towards reduction in wing claws in advanced taxa, their occurrence is so widespread that there seem to be no patterns of taxonomic significance. [Zoologie Museum und Inst. für Spezielle Zoologie, Museum für Naturkunde an der Humboldt-Universität zu Berlin, Invalidenstr. 43, D O-1040, Berlin, Germany.]—Jerome A. Jackson.

PLUMAGES AND MOLTS

(see 2, 29, 40)

WILDLIFE MANAGEMENT AND ENVIRONMENTAL QUALITY

(see also 19, 24, 26, 38, 49, 54)

43. Eggshell thinning and organochlorine contaminants in western Washington waterbirds. S. M. Speich, J. Calambokidas, D. W. Shea, J. Peard, M. Witter, and D. M. Fry. 1992. Colon. Waterbirds 15:103–112.—To assess adverse effects from industrial and agricultural contaminants in the Puget Sound area, the authors determined DDT and PCB concentrations in eggs of Great Blue Herons (*Ardea herodias*) and Glaucous-winged Gulls (*Larus glaucescens*), and investigated eggshell thickness in these and three other waterbird species in 1984 compared to pre-1947 thicknesses. Samples were collected from 15 sites, including the Seattle-Tacoma-Olympia urban-industrial corridor where pollution was high. Heron eggs were significantly thinner than pre-1947 (pre-DDT) samples. DDT (including DDE) was correlated with eggshell thinning, and at four of five sites, gull eggs were significantly thinner, although thinning was not significantly correlated to DDT concentration. Two cormorant and a guillemot species showed no significant thinning. The DDT levels and eggshell thinning (up to 13%) were not as high as levels, recorded elsewhere, associated with reproductive failure. PCB levels were similar to those associated with reproductive failure elsewhere, but PCB-related mortality was not observed. High PCB concentrations were found near industrially developed areas. No reproductive problems were observed for gulls, although thinning at two sites marginally overlapped values elsewhere associated with egg breakage and flaking. There was evidence that gulls at the Seattle site were experiencing the effects of past exposure to DDT, perhaps related to the use of Kelthane, a source of small amounts of DDT.

The authors conclude that DDT and PCBs are widespread contaminants in western Washington, and that high levels in eggs occur mostly near urban-industrial areas, and to a lesser degree, agricultural areas. The eggshell thinning in herons and gulls is consistent with known areas of contamination and bird usage. [Cascadia Research Collective, 218.5 W. Fourth Ave., Olympia, WA 98501, USA.]—William E. Davis, Jr.

44. A fourteen-year survey of plastic ingestion by western North Atlantic seabirds. M. L. Moser and D. S. Lee. 1992. Colon. Waterbirds 15:83–94.—Plastic particle concentrations in oceans have increased in recent years, and plastic may kill seabirds by entanglement or ingestion. To assess the problems of plastic ingestion for birds in the North Atlantic, the authors examined the gut contents of 1033 individuals of 38 species (six families), shot off the coast of North Carolina from 1975–1989.

Plastic was found in 55% of seabird species, and was most common in procellariiforms, less so in charadriiforms, and none was found in pelecaniforms. Plastic concentrated in gizzards, and the highest concentrations were in "surface seizing" and "pattering" foragers, and/or birds feeding largely on crustaceans and squid. Seven of eight procellariiform species had a higher occurrence of plastic in birds shot during the last half of the study period. There were considerable interspecific differences in shape, size, and color of ingested plastic particles.

The authors conclude that plastic ingestion by seabirds has paralleled the increase in availability, and suggest possible explanations, in addition to feeding mode and dietary differences, for species-specific differences in plastic concentrations. Some species may mis-

take plastic particles for prey items. They conclude that there was no evidence suggesting that plastic ingestion is detrimental to the seabird populations sampled. [Center for Marine Science Research, 7205 Wrightsville Ave., Wilmington, NC 28403, USA.]—William E. Davis, Jr.

45. Managing artificial saltpans as a waterbird habitat: species' responses to water level manipulation. C. R. Velasquez. 1992. Colon. Waterbirds 15:43–55.—This paper examines how changes in water levels in commercial saltpans affect usage by waterbirds, the different responses of resident and migrant species, and the effects of differences in prey quality. This experimental study involved lowering the water level of an 11.3-ha saltpan in the Berg River estuary, South Africa, during summer when large numbers of migrant shorebirds supplemented resident shorebird populations. The water level was lowered in November 1988, and January and March 1989, until 7 ha of mudflats were exposed. An adjacent saltpan acted as a control plot, and invertebrates and salinity were monitored. Two other saltpans, one with high salinity and a largely fly larvae and amphipod macrofauna, the other low salinity with a diverse fauna similar to estuarine mudflats, were lowered simultaneously in February to test shorebird responses to prey type.

Migrant species showed either linear or exponential increases in numbers with reduced water levels, with only weak responses among resident shorebirds. The responses varied intraspecifically, e.g., Curlew Sandpiper (*Calidris ferruginea*) increased exponentially in November but linearly in January and March, and interspecifically, e.g., Little Stints (*C. minuta*) increased exponentially all three months. Pelicans, herons, and terns also utilized the low-water saltpan. Large shorebird species were less affected than small ones. In the two saltpans of different salinity, larger shorebirds favored the lower salinity, more diverse fauna, while the smaller shorebirds favored the higher salinity, more restricted fauna.

The authors suggest that the pattern of migrant shorebird response was related to energy needs on arrival from the north (November) when responses were dramatic and included nocturnal feeding, differing nutritional values, and type, abundance, and proximity to the surface of prey items. The authors conclude that shorebirds, particularly migrants, respond opportunistically to water level manipulation, and that proper management of artificial wetlands can be important in mitigating the effects of habitat loss. [Percy FitzPatrick Inst. of African Ornithology, Univ. of Cape Town, Rondebosch 7700, South Africa.]—William E. Davis, Jr.

46. Characteristics of corn rootworm insecticide granules and the grit used by cornfield birds: evaluating potential avian risks. L. B. Best. 1992. Am. Midl. Nat. 128: 126–138.—The physical characteristics of five granular insecticides, Counter 15G, Dyfonate 20G, Furadan 15G, Lorsban 15G, and Thimet 20G, were examined and compared with the grit found in the gizzards of birds that frequent cornfields. The granules of each insecticide were small ($\bar{x}$ = 0.5 or 0.6 mm), and the overlap in the size distributions of such granules with the grit found in cornfield birds tended to increase in smaller species such as Horned Larks (*Eremophila alpestris*) and Red-headed Woodpeckers (*Melanerpes erythrocephalus*), versus larger species such as American Crows (*Corvus brachyrhynchos*) and Ring-necked Pheasants (*Phasianus colchicus*). Granular shapes varied from mostly spherical in Furadan to mostly oblong in Dyfonate, and the similarities in shapes between the granules and the grit found in gizzards differed among the various species of cornfield birds. Furadan, which consisted of well-rounded, purplish-red, silica granules, differed noticeably in texture, color, and composition from the other insecticides, which consisted of angular, earth-tone colored granules composed of clay. Although the surface texture of granules of four of the insecticides (excluding Furadan) overlaped broadly with the grit found in most cornfield birds, only Furadan granules were composed of a material that birds normally consume as grit (quartz). Conversely, the grit found in bird gizzards was rarely composed of any bright colors such as red or purple. These findings begin to shed light on the various factors that may influence avain exposure to granular insecticides and should be considered in efforts to reduce hazards to birds. [Dept. of Animal Ecology, Iowa State Univ., Ames, IA 50011, USA.]—Danny J. Ingold.

47. Land-use changes in the Gulf Coast region: links to declines in midwestern Loggerhead Shrike populations. N. Lymn and S. A. Temple. 1991. Passenger Pigeon 53:

315–325.—The authors report that effects of habitat destruction may be more severely felt by midwestern Loggerhead Shrikes (*Lanius ludovicianus*) on their wintering grounds than on their breeding grounds. Past studies have suggested that the burden of marginal winter habitat is laid upon migrant shrikes as wintering residents defend the choicer foraging areas. Recent changes in land use and the spread of the imported fire ant (*Solenopsis invicta*) throughout the Gulf States region have reduced the amount of suitable habitat available to migrant shrikes.

The authors used Christmas Bird Count and Census of Agriculture data to quantify winter population trends and habitat availability. They found a significant positive correlation between the number of wintering shrikes in the Gulf States region and the amount of various "grasslands" available. Both of these showed an increase prior to 1969 but have declined severely as marginal land has been planted in pine or left fallow.

The authors also found a significant negative correlation between wintering shrike numbers and fire ant invasions. Fire ants adapt quickly to disturbed lands that make up the majority of gulf area shrike habitat. Several authors reported a link with faunal declines and attempted fire ant control earlier this century. The use of pesticides has been curtailed in recent years, but the authors report that direct competition for prey between shrikes and fire ants in the Gulf States may be partially responsible for recent declines. [Inst. for Environmental Studies, Univ. of Wisconsin, Madison, WI 53706, USA.]—James P. Key.

MISCELLANEOUS

48. Biodiversity and research on seabirds. D. C. Duffy. 1992. Colon. Waterbirds 15:155–158.—In this commentary Duffy suggests that biodiversity (number of species, intraspecific genetic variability, and diversity of ecological roles and processes) has not received sufficient attention from seabird biologists. Only 15% of seabird species are threatened or endangered, but more than 30% of the Procellariidae, Pelecanidae, and Fregetidae, and 50% of *Pterodroma* petrels are. Furthermore, it appears that threatened and endangered seabird species are not receiving adequate attention in research and conservation. Even if a species is not threatened or endangered, extirpation of colonies can eliminate demes and dangerously reduce genetic variability. Many seabirds, even if not threatened as a species, are ecologically endangered or extinct because they no longer fulfill their historic function in ecosystems because of their reduced numbers (e.g., boobies and cormorants on coastal Peru). Duffy suggests that we have little or no information about the genetic structure of most seabirds, and inadequate knowledge of the function of seabirds in marine and terrestrial ecosystems. Oceanic islands, which contribute greatly to biodiversity, are vulnerable, and monitoring seabird populations which are subject to anthropogenic perturbations would be a good way to assess the health of these systems. He concludes that researchers should, " . . . incorporate those topics of biodiversity that add to our understanding of seabirds or that use seabirds to increase our knowledge of ecosystems and all the species in them."

This paper should be read by anyone interested in seabirds or biodiversity. [I.C.B.P. Seabird Specialist Group, Box 1095, Shelter Island Heights, NY 11965, USA.]—William E. Davis, Jr.

49. Population biology and conservation of colonial wading birds. J. A. Kushlan. 1992. Colon. Waterbirds 15:1–7.—In this guest editorial Kushlan suggests that colonial herons, storks, ibises, and their relatives proved useful for studies of behavior, migration, reproduction, and population changes until the 1970s when emphasis shifted to waders as environmental indicators with attention shifting to contaminants and foraging ecology. The 1980s saw a shift to monographic studies and the development of an international focus.

Many unanswered questions remain relating to wading bird biology and conservation and this is due, in part, to technological constraints inherent in studying wading bird systems. There is a need for greater understanding of the ecological constraints on breeding success and the limits of adaptability to changing environmental factors. The difficulties in determining per capita lifetime reproductive success, or accurate assessments within seasons, limit our understanding of population dynamics. The degree to which investigator disturbance biases data is another problem. In foraging ecology, food choice variability is poorly known, as is the degree to which foraging opportunities constrain reproductive success. Kushlan

maintains that there is no reliable census technique for wading birds and that the question, "how many are there?" is rarely answerable or important. To be useful, even population estimating techniques must have known precision and accuracy. Most counts of wading birds are indices which can be used only for comparison purposes (not for determining population size). More attention should be given to mark-recapture analysis. Allozyme variation studies and other genetic variability measuring techniques offer hope for determining what constitutes a deme for wading bird species, and answering related conservation questions about appropriate management units. Kushlan suggests that wintering habitat for migrating waders in the Western Hemisphere is poorly known and should be addressed through banding and telemetry studies. He warns that for most species active management, including protection and manipulation of colony sites, feeding habitat, and wintering sites, will be necessary to insure long-term survival.

This is a provocative paper that should be read by anyone interested in colonial wading bird research or conservation. [Dept. of Biology, Univ. of Mississippi, University, MS 38677, USA.]—William E. Davis, Jr.

PHOTOGRAPHY AND RECORDINGS

(see 53)

BOOKS AND MONOGRAPHS

50. Birds in jeopardy: the imperiled and extinct birds of the United States and Canada, including Hawaii and Puerto Rico. P. R. Ehrlich, D. S. Dobkin, and D. Wheye. 1992. Stanford University Press, Stanford, California. 261 pp., illustrations by D. Wheye. $45.00, hardcover; $17.95, softcover.—Dr. Paul Ehrlich needs no introduction. Since the late 1960s he has been at the forefront of the fight to save what little is left of wilderness. Lately he has been under constant attack by those persons and institutions who profit from destroying the planet. However, he has steadfastly refused to give up on wildlife. With the publication in 1988 of *A birders handbook: a field guide to the natural history of North American birds* we found out that Dr. Ehrlich is also a proficient birder. *Birds in jeopardy* is by the same authors that brought us *A birders hand-book*, which has become very popular with everyone from amateur birders to full-time ornithologists.

When first opening *Birds in jeopardy* one is struck by the beauty of Wheye's paintings and the overall quality "feel" of the book. The book consists of accounts for 151 species of birds which are endangered, threatened or declining in numbers in the United States, Canada and Puerto Rico. The first section has 1–2 pages for each species or subspecies of birds listed by the U.S. Fish and Wildlife Service and the Canadian Wildlife Service as threatened or endangered. The book then covers 11 selected species not on the first lists but considered by many to be vulnerable. It goes on to treat 70 species and subspecies on the National Audubon Society's Blue List or auxiliary lists of special concern. It also has a quarter page each for the 33 species and subspecies that have gone extinct in the United States and Puerto Rico. The book ends with a brief review of major bird threats and a listing of species by region. The outline of each species account begins with a full-color illustration of the bird's head. Next is a short paragraph covering each of the following topics: food, range, wintering range, where in peril, notes, what caused jeopardization, federal listing, and recovery plan. The inclusion of subspecies is a welcome addition. For example, Audubon's Crested Caracara (*Polyborus plancus audubonii*) is the subspecies in Florida that is listed as category 2 (the Service needs more information before it is placed in category 1) by the U.S. Fish and Wildlife Service and therefore is treated under the threatened and endangered section. However, the overall U.S. population of the Crested Caracara is only on the National Audubon Society's Blue List, so it gets seperate coverage under the U.S. special concern section.

After poring over *Birds in jeopardy* for three weeks, I must state that I was disappointed with it. As someone who makes his living studying birds, I found little in this book that I did not already know. The species accounts are so general as to be almost useless to me. Although there is a bibliography, no references are given for statements made, so that one is unable to know where to go to get more detailed information. The nesting, food, and range sections for each species can be obtained from any field guide. The most important

paragraphs should be the locations of imperilment and the reasons for the decline of each species. However, I found these discussions to be too broad as a source of useful knowledge. For example, the Red-shouldered Hawk (*Buteo lineatus*) is listed as in peril in eastern North American with population numbers in the east down or at best stable. Without documentation, the same effect is achieved when one says "You know, I don't see as many Red-shouldered Hawks as I use to." We need more than that if we want to help a species. I wish the authors had gone further and listed specific sources for specific areas that document this species decline. A graduate student at the University of Florida came up to me when he learned I had a copy of this book. He wanted more information on the status of the Hairy Woodpecker (*Picoides villosus*) as he had heard that it may be declining in numbers. After reading the species account, he remarked that it told him there were reports of declines in certain areas, but without references, he was unable to get specifics. The addition of range maps, showing the areas of decline and stability, would have greatly enhanced the usefulness of this book.

I noticed only a few inaccuracies in the book. The Panther National Wildlife Refuge is actually called the Florida Panther National Wildlife Refuge. Harris' Hawks (*Parabuteo unicinctus*) is listed in jeopardy because of "destruction of riparian woodland and the taking of birds by falconers." Most falconers get their Harris' Hawks from captive-bred birds. A much more severe threat is from shooting by ranchers. The American Swallow-tailed Kite (*Elanoides forficatus forficatus*) gets one-sentence mention as a species removed from all lists because it was found to be "notably more abundant than previously thought." Since no reference is given I was unable to verify this. An ongoing study of swallow-tails in which I am participating is not finding this species to be more abundant than previously thought. However, since the data are still being gathered and has not been published, the authors could not have been aware of it. A lot of the information appears to have come from *American Birds*, but without volume and page numbers one is unable to cite this information in a form to address specific problems.

This book was probably not written with the full-time ornithologist in mind. It would have taken a lot more work to put together the necessary citations to make it helpful for biologists. The authors state that their aim was to put together for the first time a resource for managers, teachers, the birdering community, and others concerned with conservation of birds. For managers there is not enough meat in the species accounts to help in the formulation of management decisions. The endangered species list is available from the U.S. Fish and Wildlife Service and the Audubon Blue List is updated periodically in *American Birds*. Teachers, concerned citizens, and birders will probably get some new bits of information out of this book, but I fear the price ($17.95) is too steep for most of them. Perhaps if the authors had eliminated the expensive color drawings, condensed the printing to fill up all of the blank spaces, and utilized cheaper paper, an affordable book could have been produced at under $5, which would be within the reach of their target audience. I will keep my copy of *Birds in jeopardy*. The drawings are nice to look at and it makes for a light read. However, the high price and lack of documentation will limit its usefulness beyond the "we've got a problem" stage. Perhaps I just expected too much from such a distinguished group of authors.—Stephen M. McGehee.

51. Men and birds in South America. R. S. Rounds. 1990. Q. E. D. Press, Fort Bragg, California. 190 pp. $14.95.—Here is a rapid scan through the ornithological history of a continent that still retains some of its avian secrets. The book opens with the voyages of Columbus and Magellan to the New World, but then makes a sudden chronological and geographical detour to the early Greeks and the development of zoos before resuming an account of the early exploration of South America. The text proceeds chronologically until the end of the 18th century, and Rounds is careful to mention not only the men who explored the continent, but also those who catalogued their discoveries, for example Buffon, Illiger, and Latham among others. After 1800 the text is divided into three geographical regions: eastern South America, the mountain states, and the Caribbean coast. Each of these sections is dealt with chronologically from roughly 1800–1900. The story ends in 1900 with a glimpse of the changes the twentieth century would bring: introduction of the internal combustion engine, airplanes, exploding human populations, and destruction of the wilderness that challenged and excited the men and women described by Rounds.

Many explorers are mentioned in more than one context, but with no index, checking the several references to a single person is difficult. Some dates are in error. For example, Charles Darwin died in 1882, not 1892 as stated in the text, and Robert Oliver Cunningham did not live from 1940–1918! These errors cast doubt on other dates that are less easily checked. A few inconsistencies in place names (e.g., Tristan da Cuna and Tristan de Acuna) are annoying. Nonetheless, the book provides a fascinating summary history of South American ornithology, and Rounds' thumb-nail biographies are provacative, although he provides few leads for further information. Better documentation would have made this an invaluable introduction to the ornithological exploration of South America.—Edward H. Burtt, Jr.

52. My way to ornithology. O. S. Pettingill, Jr. 1992. University of Oklahoma Press, Norman, Oklahoma. 245 pp., 30 illustrations. $24.95, hardcover.—John James Audubon, Frank M. Chapman, David Lack, Margaret M. Nice, Roger T. Peterson, Alexander F. Skutch, and George M. Sutton: most any student of ornithology will recognize these names and could likely list each person's contributions to the field of ornithology. However, what do their professional accomplishments tells us about the person? Who is the person behind the name? What childhood experiences influenced their choice of a career? What about interests in related or disparate fields? What influence did their teachers have on them? What influence might their families' interests and professional occupations have had on these ornithologists? The recent publication of *My way to ornithology* gives us insight into the early development of another well-known ornithologist, Olin Sewall Pettingill, Jr.

In this autobiography, Dr. Pettingill tells of his many experiences and adventures from his childhood through his undergraduate and graduate school days. The book ends with him and his wife, Eleanor, travelling in September of 1936 to Carlton College in Northfield, Minnesota, to begin his career as a professional ornithologist. Thus, many of his accomplishments, including the publication of *Ornithology in laboratory and field* (5th ed., 1985, Academic Press, New York) and *A guide to bird finding east of the Mississippi* (2nd ed., 1977, Oxford University Press, New York), as well as his 35 years of teaching ornithology during summers at the University of Michigan Biological Station, are not within the scope of this book.

However, the book gives sufficient detail of Pettingill's early years to provide insight into the person behind his many contributions to ornithology. For example, in 1915 Pettingill's father became the superintendent of the Western Maine Sanatorium for the treatment of tuberculosis patients. He recounts fond memories of his father and him sleeping outdoors and being free to roam and play anywhere. He mentions being interested in the sanatorium's farm because of the constant activity, for instance, the mechanical milking machines which accomplished what his grandfather did with his hands. Interestingly, during his pre-teen years, Pettingill ignored birds with one exception—chickens. He recounts spending hours in the henhouse at his grandparent's farm watching and noting the different behaviors of the different chickens. This experience acquainted him with bird behavior which would be valuable in his later bird studies.

His college years at Bowdoin College provided Pettingill with many activities which would become important in his career as an ornithologist. He joined a fraternity where he learned social and organizational skills useful later while acting as director of the Cornell Laboratory of Ornithology. He took a staff position on the college's weekly newspaper, which sharpened his writing skills, and he developed his lecture skills by participating in the school's productions and fraternity performances. It was also during this time that he met Dr. Alfred O. Gross. For the school's newspaper he interviewed Dr. Gross about the New England Ruffed Grouse (*Bonasa umbellus*) investigation of which he was in charge. It was after this interview that Pettingill mentioned his growing interest in birds, and from that point on Dr. Gross became one of his supporters.

The later chapters in the book cover his many trips afield for bird study. These trips included visits to Great Duck Island to photograph a gull colony, a trip with George M. Sutton to Hudson Bay to find, photograph, and collect Harris' Sparrows (*Zonotricha querula*), and a trip to Machias Seal Island to photograph nesting Atlantic Puffins (*Fratercula arctica*).

Mixed in among the chapters concerning field trips are chapters relating his graduate school experiences at Cornell University. He recounts meeting and becoming good friends with George M. Sutton, with whom he shared an office. It was during his first year of

graduate school that Pettingill decided to study the American Woodcock (*Scolopax minor*). He also recounts attending his first American Ornithologists' Union meetings and being impressed with the variety of topics discussed.

I found this book to be well written and entertaining. Interspersed throughout the text are black-and-white photographs of family, friends, and (of course) birds. These photographs add to the overall quality of the book. Although a minor point, at times I felt the text was somewhat fragmented. Despite this minor problem, I would definitely recommend this book to anyone interested in getting to know the person behind the name Olin Sewall Pettingill, Jr.—Mark S. Woodrey.

53. Owls: their life and behavior. J. de la Torre. 1990. Crown Publishers, Inc., New York. 214 pp., 175 color photographs by A. Wolfe, eight illustrations by A. Sandstrom. $35.00, hard cover.—It often has been suggested that Art Wolfe's definitive work is his owl photography. These photographs are assembled here in a comprehensive portrait of the 19 North American owl species, from Snowy Owls (*Nyctea scandiaca*) on the Alaskan tundra to Barred Owls (*Strix varia*) in the tropical hammocks of the Florida Everglades. Wolfe receives top billing on the cover and frontispiece, making it clear that this volume was intended as a showcase for his talent for wildlife portraiture. His compositions are simple and uncluttered, his subjects elegantly captured doing what owls do—hunting, bringing food to their nestlings, preening, perching on snags, peering out of three cavities, and perching camouflaged in dense foliage.

The core of the book is a series of individual species accounts. Each account includes half a dozen photographs of the species at its nest and in typical habitat. Pictures which show the bird in a characteristic posture, or with important field marks easily visible, often are included (for example, the outstanding photographs of the large, black "false eyespots" on the nape of the Northern Pygmy-Owl, *Glaucidium gnoma*). Text by author Julio de la Torre complements the visual information. Each written account is divided into sections titled "Description," "Voice," "Similar species," "Range," "Habitat," "Nesting," "Migration," and "Prey," followed by more detailed discussions of the natural history of each species, drawn largely from the author's personal observations. Fortunately, even the rare owls are given equal treatment. Chapters covering owl folklore, evolution, anatomy, behavior, conservation, and where to find owls in the field also are included, as well as a bibliography of more than 200 scientific references.

Although its photography is the obvious draw of the book, de la Torre has contributed a wealth of information about the natural history of owls in an entertaining and very readable format. Controversial topics in ecology and evolution, including dichromatism in Eastern Screech-Owls (*Otus asio*), Snowy Owl irruptions, and the recent range expansion of Barred Owls, are all treated with his colorful and irreverent wit. Most of all, however, the text is a testament to the author's fascination with owls and his addiction to owl prowling. He has this to say about learning owl calls: "Records and cassettes do help a little. . . . However, most of them provide only brief samples of typical vocalizations. With owl calls, as with love, there is no substitute for the real thing." His detailed descriptions of the tonal qualities and phrasing of each species' calls is excellent. This type of information clearly can come only from thousands of hours of personal field experience.

I have a couple of minor criticisms of this otherwise beautiful and informative book. First, although story after story is told of harrowing encounters with agitated owls, it is not until the penultimate chapter that the author briefly cautions the reader on the practical and ethical downside of stirring up owls with tape recordings. Second, as with all "where to go" guides, the chapter "Where to find the birds: a travelogue" includes some inaccurate and outdated information. For example, the Burrowing Owl (*Athene cunicularia*) is described as a "regular winter visitor" to Everglades National Park, which is, at best, an exaggeration (not to mention that there are plenty of other places where one can easily see Burrowing Owls in south Florida). However, these oversights are few, and easily forgivable.

Although most readers will undoubtedly first appreciate this volume for its photographs, the text is an excellent primer on the natural history of owls, with especially helpful information for those who wish to find and observe owls. The well-researched, colorful writing of de la Torre, combined with the excellent close-up photography of Art Wolfe, make this a readable, contemporary introduction to North American owls.—Karl E. Miller.

54. Four neotropical rainforests. A. H. Gentry, ed. 1990. Yale University Press, New Haven, Connecticut. xii + 627 pp. $57.50.—This book represents the proceedings of a symposium, cosponsored by the Association for Tropical Biology, the American Institute of Biological Sciences, and the Organization for Tropical Studies at The Ohio State University, and held in Columbus, 10–12 Aug. 1987. Alwyn Gentry, curator at the Missouri Botanical Garden, has done a superb editorial job of collecting and editing this enormous collection of biological and ecological data and theories pertaining to neotropical forests.

The book represents a compilation of several long term research projects conducted by renowned students of neotropical biology and ecology. The 36 authors are from 28 institutions in six countries: Panama, Costa Rica, Peru, Brazil, the United States, and England. The four neotropical rain forests represented in this comparative work are: La Selva Biological Station, Costa Rica; Barro Colorado Island, Panama; Cocha Cashu Biological Station in Manu National Park, Peru; and the Minimum Critical Size of Ecosystem Project of Manaus, Brazil.

The chapters are organized into six main sections: "The sites," "Floristics," "Birds," "Mammals," "Reptiles and amphibians," and "Forest dynamics." The first section, "The sites," comprises four papers that concentrate on describing the study sites, particularly the history of the installations and research that has been done, as well as the climatology, topography, biodiversity, personal impressions of the researchers in the study areas, and the human interaction and manipulation of the forest from historic to modern times.

The "Floristics" section comprises five papers, the first four describing the floral characteristics of each study site and the fifth paper which is a review and comparison of the four rain forests. Overall, the Amazonian forest is richer in tree species than the Central American forests.

The third section, "Birds," perhaps the most interesting for the readers of this journal, includes four papers describing the avian communities of each site, and a fifth paper in which the authors describe the ecological similarities and dissimilarities among the four neotropical rain forests. In the first paper John Blake et al. describe the avian community from Las Selva Biological Station, Costa Rica, with a clearly presented synopsis of data on 410 species representing 19 orders and 52 families. The authors attribute the diverse and dynamic avifauna of La Selva to the great diversity of habitats, climate, and geographic position. In the second paper James Karr describes the avifauna of Barro Colorado Island (BCI) in Panama. He begins with: "BCI is arguably the most thoroughly studied tropical forest in the world." Ornithological studies in this forest began in the 1920s. It is estimated that this area is home to 444 bird species. Karr points out that a reliable assessment of the relative abundance of tropical forest birds is difficult. Mist net capture data yield a biased estimate of the relative abundance of these birds, underestimating the smaller and more sedentary species while overestimating larger and more mobile species. Scott Robinson and John Terborgh describe in the third paper the avian community of Cocha Cashu. The forest avifauna of western Amazonia is the richest in the world with approximately 500–550 bird species. This community is characterized not only by the high species richness, but also by rarity, spatial patchiness, and large breeding territories for most of the bird species. In the fourth paper, Richard Bierregrad describes the species composition and trophic organization of the understory bird community of Central Amazonian Terra Firme Forest, as studied in the forest of Manaus, Brazil. This paper represents one of the many avian studies conducted as part of the Minimum Critical Size of Ecosystems Project of Manaus. This long term—more than seven years—research banding project has generated an impressive data set of more than 24,957 captures of 14,026 individuals of 143 species during 136,000 net-hours. "Birds of four neotropical forests" is the fifth and last paper of this section. Here James Karr et al. discuss and review the similarities and differences among the four tropical forest avian communities. They state that "although much has been learned about neotropical birds in the past decade, our knowledge remains rudimentary."

In the fourth section, "Mammals," five papers review the biogeography, diversity, refugia, habitat use, diet, and ecological interactions such as competition and predation in the mammalian assemblages of the four neotropical forests.

The "Reptiles and amphibians" section presents herpetological data for approximately 131–185 species of these four neotropical regions. The papers include data on species

composition, historical faunal assemblages, and resource use. One paper includes data gathered from a fifth site, Santa Cecilia, Ecuador.

The last section, "Forest dynamics," is mainly a discussion of the ecology and dynamics of tree fall gaps in forests. These papers present data on tree mortality, recruitment, and formation of gaps. The section lacks information on the influences of pre- and post-Columbian human interactions with the forest structure and functions.

Two topics not covered in the symposium that could have been included are the ecology of butterflies and other insects, and studies focused principally on human interactions with these four rain forests and their implications for forest dynamics and conservation. Nevertheless, this volume presents an extraordinary compilation of biological data and conveys the true commitment of the authors for the conservation of these neotropical forests. The book will serve as an excellent introduction for beginners and a valuable reference for advanced students of tropical ecology.—Eduardo E. Iñigo-Elias.

55. The mountain and the migration: a guide to Hawk Mountain. J. J. Brett. 1991. Cornell University Press, Ithaca, New York. 114 pp., foreword by R. T. Peterson, numerous two-color illustrations by F. Fretz, 17 black-and-white raptor identification plates by F. W. Wetzel, 13 black-and-white photographs by J. Snook and others. $13.95, softcover.—This book is a "revised and expanded edition" of *Feathers in the wind: the mountain and the migration* (Brett and Nagy 1973, Kutztown Publishing Company, Kutztown, Pennsylvania), the story of a very special place, Hawk Mountain. Each autumn, as many as 40,727 migrating hawks are spotted from a rocky promontory of the Kittatiny ridge, the southeasternmost ridge of the Appalachian Mountains in Pennsylvania, and a comparable number of enthusiasts also migrate to the Mountain to enjoy the spectacle. Such was not always the case: prior to becoming the world's first sanctuary for birds of prey in 1934, Hawk Mountain (or "Blue Mountain," as it was known locally then) attracted hundreds of hunters who shot many thousands of hawks each year. Fortunately, for more than half a century now these raptors have been afforded a safe passage through this important migration bottleneck.

As one who has made the trip to Hawk Mountain a couple dozen times, I was particularly pleased to receive the new edition. The pages of my old copy of *Feathers in the wind* have long since become unbound, and although it has a certain amount of sentimental value (it's an autographed reminder of my first trip to the mountain—when it rained all weekend) the old booklet was really a modest first attempt that was rather amateurishly produced. The production of the new book, however, shows great improvement. The text is liberally illustrated with professionally done two-color (black and green) line drawings and halftones that relate to the current topics, the paper in the book meets ANSI standards, and it looks like the binding will last more than a few seasons on the mountain.

The book is organized into five chapters and three appendices. The first chapter, "Once upon a mountain," identified the succession of inhabitants of the region, from post-glacial (10,500 B.C.) immigrants to the present. Brett describes the settlement of the Pennsylvania Dutch in the area during the late 1700s and early 1800s, and gives an entertaining telling of the Civil War era story of "Schaumboch's Tavern," where innkeeper Mathias Schambacher is said to have murdered more than two dozen men. The building still stands today. Brett goes on to describe the local sandstone and bootlegging industries of the past, the yearly slaughter of migrating hawks by local gunners, the discovery and exposure of this carnage by environmentalists (most notably, Richard Pough), the purchase of the 1393-acre mountaintop for $3500 by Rosalie Edge in 1934, and the tenure of Maurice and Irma Broun as the first curators of the sanctuary.

The second chapter, "The lay of the land," is a primer on the geologic history of the unusual ridge and valley system that characterizes the Appalachian chain, as exemplified in eastern Pennsylvania. This is followed by "The living mountain," a synopsis of the floral and faunal characteristics of the sanctuary. The fourth chapter, "Out of the north," describes the topographical and meteorological conditions responsible for the remarkable concentrations of autumn migrants along this ridge.

The longest chapter, "Hawks aloft: identifying the raptors," begins with a very informative drawing illustrating hawk morphology and terminology. (This illustration actually is presented on the right-hand page preceding Chapter 5.) The chapter begins with a few tips

on optical aids, clothing, and what to expect during a day's visit to the mountain. Most of this chapter comprises the 18 species accounts, with the text on the page facing each corresponding black-and-white half-tone plate. Each species is presented, graphically and in the text, from several perspectives and in several postures. The text points out the diagnostic field marks, makes comparisons with similarly appearing species, and provides a few nuggets of information on the species behavior.

The first appendix is a table listing the months of "breeding" (this apparently refers to clutch initiation), clutch size, lengths of the incubation and nestling periods, age at independence, months of autumn migration, and age of maturity for the 18 species. Also included is a graphic representation of the types and proportions of prey species that make up each hawk species diet. Appendix 2 is a summary of the season totals for each raptor species spotted during fall migration, 1934–1990. The final appendix is an annotated list of common names and binomials of the plants, herps, mammals, and birds sighted on the sanctuary. The bird list includes a relative measure of abundance for spring, summer, winter, and fall.

Also included with the book is a folded insert, a photographic panorama of the upridge view from the North Lookout, covering about 180°. All the pertinent landmarks that hawk watchers use to describe a bird's location are labeled, and on the back side of the insert are illustrations of all the hawks drawn to scale, and a map of the sanctuary. Clearly, this insert will be a valuable guide to any newcomer to Hawk Mountain.

The organization of the book is very logical, the writing style is informative and enjoyable, and I did not detect any typographical errors. However, the book is not without a few minor blemishes. For example, the Osprey (*Pandion haliaetus*) is listed under the family Pandionidae, although that family is no longer recognized as valid (American Ornithologists' Union 1983, Checklist of North American birds, 6th ed., Allen Press, Lawrence, Kansas). The subheading "Position view" introduces the various viewing perspectives in each species account; perhaps this should read "Postures and views." The perpendicularly ventral view of a bird with maximally extended wings and tail is labeled "Full display," an unfortunate choice of terms since "display" means something else to students of animal behavior. The species accounts do not address the considerable size and color dimorphism between the sexes of the smaller accipiters. The American Kestrel (*Falco sparverius*) account also had a few shortcomings. Brett states that from below the immatures of both sexes resemble the adult female, which is not so. Although males in juvenal plumage often have some streaking on the breast, the streaks usually are very narrow and restricted to the upper breast, *vis-à-vis* the heavy streaks covering the females breast and belly. More importantly, the first prebasic molt normally occurs prior to migration, so by the time first-year male kestrels head south, the are already wearing the definitive basic body plumage, and thus are indistinguishable from adult males. Furthermore, the juvenal male remiges and rectrices, which are retained during the first prebasic molt, look just like adult male flight feathers. Finally, although most of the identification plates are admirable, this reader thought that the ventral views of the kestrel did not accurately depict the wing shape (wing length appears to be in the correct proportion to body length, but the aspect ratio is far too great). Since I work with kestrels on a daily basis, and therefore might be prone to be a bit too critical regarding this particular species, I asked two colleagues to review all plates, and without my prompting, both also remarked on the kestrel's wing shape ("too skinny" and "too pointed").

These few criticisms are very minor, however, and do not detract significantly from the book. It was a very pleasant book to read, and is sure to be enjoyed by everyone who has been to Hawk Mountain, everyone who plans to visit the mountain, and anyone who just enjoys watching hawks.—John A. Smallwood.