J. Field Ornithol., 70(3):436–454

RECENT LITERATURE

Edited by Danny J. Ingold

RESEARCH TECHNIQUES

(see also 8, 41)

1. **Pileated Woodpecker capture using a mist net and taped call.** D. L. York, J. E. Davis, Jr., J. L. Cummings, and E. A. Wilson. 1998. No. Amer. Bird Bander 23:81–82.—Cavity nesting birds are among the most difficult to capture, which has led to the invention of multiple trapping techniques, especially at the nest or roost hole. The paper describes the use of play back calls for capturing the Pileated Woodpecker (*Dryocopus pileatus*). Although this technique has been used extensively with songbirds, it has not been used for trapping this large woodpecker. The study was conducted in central Missouri in April–May 1997. Mist nets (2.6 m × 12 m, with 61 mm mesh) were placed within proper habitat (upland forest) or along the forest edge if the forest interior was too dense. The nets were anchored to extendible poles so that the bottom of the net was approximately 1.5 m from the ground. Calls and drums of this species were broadcast, at the loudest level, from a portable cassette player set either under the net or nearby. The woodpeckers usually responded within 10–60 minutes. After swooping near the net or perching nearby, the bird would fly into the net usually within ten min of approaching the net. Birds were netted in eight attempts, with no mortality. The authors concluded that this technique was safer for field workers, less stressful to the woodpeckers, and more cost and time efficient than capturing the birds in the nest or roost hole. [U.S. Dept. Agriculture, Animal and Plant Health Inspection Service, National Wildlife Research Center, 1716 Heath Pkwy., Ft. Collins, CO 80524]—James L. Ingold.

2. **The effect of patagial tags on breeding success in American Kestrels.** J. A. Smallwood and C. Natale. 1998. No. Amer. Bird Bander 23:73–80.—This paper describes a new method for attaching patagial tags and examines the effect of patagial tagging on reproductive success in the American Kestrel (*Falco sparverius*) in New Jersey. Patagial tags (16 × 40 mm with rounded corners) were made from rip-stop, fiber reinforced vinyl. Attachment was made with homemade rivet constructed from 80-lb test monofiliment fishing line. Heating the ends with a butane lighter and pressing against a hard surface widened the tips of the rivet. Hard washers, used to prevent the tag from slipping over the rivet, were constructed from milk jugs. To prevent the wing from abrasion, the hard washers were kept away from the wing by the patagial tag on the dorsal surface and by a soft washer made of the same material as the tag. Nesting birds were captured at the nest box and patagial tags were applied. Nests were monitored at four-week intervals during two breeding seasons (23 Mar.–13 Jul. 1997 and 29 Mar.–15 Jul. 1998). Nests were examined in order to determine completed clutch size, hatching date and brood size, and to capture the adults for marking. The last next check was completed when the chicks were 16–23 days old so that the chicks could be banded. Experimental nests were those that had patagial tagged females and control nests had no adults tagged. The authors were interested to see if tagging increased nest abandonment. Percentage of nesting attempts that did not progress to abandonment was used as an index of abandonment. Forty adults (39 pairs) were captured in boxes and marked with patagial tags (experimental) and 23 pairs were unmarked and served as controls. Overall success rate, for first nest attempts, was 76.0% (n = 25) in 1997 and 33.7% (n = 42) in 1998. No difference was seen between nests that progressed to hatching for experimental (53.8%) and control nests (47.8%; P = 0.78, two-tailed Fisher's exact test). No difference was seen between success rates for experimental (50.0%) and control nests (34.8; P = 0.39, two-tailed Fisher's exact test). Although the nesting success was much lower in 1998 than in 1997, the authors conclude that it might have been weather related (El Niño), since similar failures were noted in Pennsylvania, and not related to the presence of the patagial tags. [Dept. of Biology and Molecular Biology, Montclair State Univ., Upper Montclair, NJ 07043, U.S.A.]—James L. Ingold.

3. **Data from a constant-effort mist net station.** D. Muir and R. N. Roberts. 1998. No. Amer. Bird Bander 23:33–35.—The authors operated MAPS banding station on the shores of Lake Ontario, Cayuga Co., NY during seven breeding seasons (5/1990–8/1996) in order to provide long-term and demographic information on young and adult birds. The station

was operated (within MAPS protocols issued by the Institute of Bird Populations) for a 2554 net h. A capture rate of 97 birds/100 net h produced 2481 banded individuals of 62 species. Yellow Warbler (*Dendroica petechia*) was the most frequently banded species (34%) followed by Common Yellowthroat (*Geothylpis trichas*), Gray Catbird (*Dumetella carolinensis*), and Red-eyed Vireo (*Vireo olivaceous*). Seven species were retrapped in years other than the year in which they were originally banded. Red-eyed Vireos recaptured in subsequent years were at least six years of age, two were five years, and one was 4 years. Two Yellow Warblers proved to be at least four years old. The numbers for Yellow Warblers and Common Yellowthroats were similar for percent total banded as hatching year, percent of birds recaptured, and percent of recaptures banded as hatching year. The Red-eyed Vireo had lower productivity (measured as the proportion of birds banded as hatching year) and lower recruitment (measured as proportion of birds recaptured that were banded as hatching year) than the two warblers. At the same time the Red-eyed Vireo seemed to have a high breeding site fidelity based on the high recapture rate. The authors suggest that low productivity in Red-eyed Vireos may have been related to parasitism by the Brown-headed Cowbird (*Molothrus ater*), although no data on cowbird activity were collected except notation of their presence. The authors conclude that long-term, constant effort of mist net stations can provide data that produce a basis to measure population change and to identify species requiring attention. [7212 Fiddler Bay Lane, Chincoteague, VA 23336, U.S.A.]—James L. Ingold.

4. **Displays of bird movements on the WSR-88D: patterns and quantification.** S. A. Gauthreaux Jr. and C. G. Belser. 1998. Weather and Forecasting 13:453–464.—This paper will be of interest to ornithologists and meteorologists alike. The study uses the new Doppler weather surveillance radar, WSR-88D, to detect, monitor, and quantify bird movements. Also known as NEXRAD (Next Generation Radar), the WSR-88D and its use in this study is an excellent example of state-of-the-art technology being applied to ornithology. NEXRAD is a 10-cm wavelength radar which has the power and sensitivity necessary to detect flying insects, airborne dust, and even turbulent fluctuations in clear air. There is now a national network of 138 WSR-88Ds designed to provide nearly complete coverage across the U.S. for weather monitoring and accurate forecasting and warning of severe weather events. Although these radars were not designed for this purpose, the application to bird migration studies is a very fortuitous by-product whose potential has only begun to be exploited. This paper describes the appearance of birds in the fundamental radar data products. Because birds represent a relatively strong radar target, images of radar reflectivity indicate enhanced return echo strength when birds are present. This enhancement increases as the density of birds increases. Images of radial velocity indicate the motion of the birds relative to the radar. A time sequence of radar images of reflectivity is shown depicting migrating birds arriving on the north coast of the Gulf of Mexico in spring. Details of their movements can be determined such as when they arrive and depart, their direction and speed, their location and population distribution relative to the radar, their altitudinal distribution, and the general vicinity of their landing/stopover/feeding sites. The exodus of migrants from stopover areas is especially spectacular on the radar displays as the density of migrants aloft increases rapidly. From these data a calibration curve is determined that relates decibel values of reflectivity to bird migration traffic rates. Direct visual studies of migration aloft were made simultaneously to calibrate the reflectivity products of the radar. During spring migration, vertical observations were made in the daytime using a telescope or binoculars. During fall migration, when only nocturnal movements of birds were studied, the counting technique of moon-watching was used. Outside of the spring and fall migration seasons, the NEXRAD can readily detect birds and bats as they depart and return to roosting sites. The authors emphasize that the recognition of the presence of birds in the radar data is essential for accurate interpretation and for use in weather forecasting models. The NEXRAD weather products are contaminated when sufficient bird, bat, and insect activity is present. This can have a very deleterious effect on the weather measurements (of winds and precipitation) reported by these radars. This effect is covered more thoroughly in a companion paper entitled **Bird migration and bias of WSR-88D wind estimates** and is also reviewed here. The authors also stress the importance of the national NEXRAD network as a tool for biological studies. Due to the sensitivity, power, and resolution of these radars, they will play an important role in the detection, quantification, and monitoring of the flights of birds, bats, and insects. They can also save human

lives by warning pilots of hazardous concentrations of birds, thus reducing the likelihood of serious bird-aircraft collisions. [Dept. of Biological Sciences, Clemson Univ., 132 Long Hall, Box 341903, Clemson, SC 29634-1903; e-mail: sagth@clemson.edu.]—David B. Wuertz.

5. **Bird migration and bias of WSR-88D wind estimates.** S. A. Gauthreaux Jr., D. S. Mizrahi, and C. G. Belser. 1998. Weather and Forecasting 13:465–481.—This study documents how the presence of migrating birds can bias the wind measurements made by the new Doppler weather surveillance radar, WSR-88D. By comparing to simultaneous wind measurements made by a radiosonde (weather balloon), this study also examines how the bias changes as a function of migration density and altitude. Also known as NEXRAD (Next Generation Radar), the WSR-88D is a radar sensitive enough to detect the motion of clear-air turbulence. Therefore, it will naturally detect more reflective targets such as rain, but also airborne dust and flying insects, bats, and birds. The national NEXRAD network of 138 radars is designed to provide nearly complete coverage across the U.S. for weather monitoring and accurate forecasting and warning of severe weather events. However, in the presence of sufficient numbers of migrating birds, this paper reveals that the radar is more likely to report the speed and direction of the birds rather than that of the wind. This is great information for ornithologists, but a terrible nuisance to meteorologists. Migration magnitude (traffic rate) was classified into five levels (0–4), where 0 indicates no migration and 4 indicates heavy migration having a maximal spatial extent of bird targets within radar sampling range. Mean absolute differences in wind speed measurements between the radar and radiosonde in the presence of any migration (categories 1–4) was 9.82 m s^{-1} compared to 3.87 m s^{-1} when there was no migration. The maximum absolute difference observed was 12.9 m s^{-1} during heaviest migration periods (category 4). As the density of birds migrating over the radar sites increased, the wind speeds reported by the NEXRAD system became more biased. Radar measurements of wind directions are affected less often than wind speeds since migrating birds tend to fly in (and with) the direction of the prevailing winds. However, the authors describe situations when migrants fly against the wind. They document such a case showing the radar-measured winds are 128 degrees counter to the actual winds measured by the radiosonde. The authors stress that reflectivity echoes produced by bird targets have unique radar signatures that are easily distinguished from echoes produced by precipitation, ground clutter, or anomalous propagation. However, it is the understanding of this reviewer that automated, operational algorithms for recognizing these different radar reflectivity patterns do not exist at this time. This paper underscores the need for automated methods of recognizing biological targets in NEXRAD data. Such targets, particularly migrating birds, seriously bias the wind measurements and "fool" precipitation detection algorithms into reporting rain. Left uncorrected, these erroneous weather data are automatically fed into forecasting models which in turn give wildly inaccurate results. One can infer from this study that degradation of weather information due to the presence of migrating birds depends upon season and radar location. The percentage of contaminated weather data from all sites across the national network (138 radars) and over all seasons is beyond the scope of this paper and is most likely unknown. For ornithology, one can only hope that the ultimate solution to this "bird contamination" problem will not also lead to the abolition of valuable biological information. After all, it has been said that "one man's trash is another man's treasure." [Dept. of Biological Sciences, Clemson Univ., 132 Long Hall, Box 341903, Clemson, SC 29634-1903; e-mail: sagth@clemson.edu.]—David B. Wuertz.

6. **Playback tapes as an aid for mist-netting Regent Honeyeaters.** D. J. Geering. 1998. Corella 22:61–63.—The author describes a technique used to capture endangered Regent Honeyeaters (*Xanthomyza phrygia*) near their nesting sites in the Capertee Valley, New South Wales, Australia. Composites of previously recorded calls of nesting Regent Honeyeaters were played on a portable cassette player located under, or to the side of a single mistnet (most efficient configuration), or under multiple mistnets in several arrangements. During nesting season 59 individuals were captured and banded, and the technique was successful in 83% of attempts. Male honeyeaters were more responsive than females, and males responded in some way at all 78 nests where the technique was tried. Outside of breeding season birds did not respond as frequently or strongly. The author states that there was no evidence that the use of the tape to facilitate capture or the banding of the birds had any negative affect on nesting success. This technique may be widely applicable, and particularly useful, in studies

of individual species. [Dept. of Natural Resources and Environment, P.O. Box 500, East Melbourne, Victoria 3002, Australia.]—William E. Davis, Jr.

BEHAVIOR

(see also 1, 2, 4, 5, 6, 13, 15, 16, 19, 25, 29, 36)

7. **Testosterone and mate choice in the Dark-eyed Junco.** D. A. Enstrom, E. D. Ketterson, and V. Nolan, Jr. 1997. Anim. Behav. 54:1135–1146.—High testosterone levels increase song rates and home range area and decrease feeding frequency and effective defense of young in male Dark-eyed Juncos (*Junco hyemalis carolinesis*) of the Virginia Appalachians. Males with silastic tube implants containing crystalline testosterone, sang more long and short range song bouts than control males with empty implants. Experimental males were more active than control males before and during exposure to females. Testosterone levels in blood samples from the experimental group resembled levels Ketterson and Nolan (Am. Nat. 140:33–62, 1992) measured in free-living males during the peak of the mating season. In the control group, testosterone levels were similar to those of free-living males caring for young. Female Dark-eyed Juncos prefer males that perform longer, more intense courtship behavior. Females spent more time performing pre-copulatory displays near experimental males than control males. Initially, male position was not taken into consideration, and females preferred males in shady areas. In subsequent trials, both the control and testosterone males were placed in shady areas. Oestradiol from implants in females did not affect female preference of males. However, oestradiol females showed quickened brood patch development and an excessive decrease in ovary size when compared to control females at the end of the breeding season. Overall, testosterone appears to mediate all aspects of male reproductive behavior. Unlike testosterone, oestradiol does not provide a mechanism for reproductive behavior in females. Male position seems to affect female reproductive behavior more than oestradiol levels. Further studies might explore the relationship between male position and female choice. (Dept. of Biology and Center for Integrative Study of Animal Behavior, Indiana Univ., Bloomington, IN 47405, U.S.A.)—Elyse A. Glover.

8. **Predation of artificial ground nests on white-tailed prairie dog colonies.** B. W. Baker, T. R. Stanley, and J. A. Sedgwick. 1999. J. Wildl. Manage. 63:270–277.—Prairie dog (*Cynomys* spp.) colonies may support higher densities of predators than surrounding regions without prairie dogs. The authors tested the hypothesis that nest predation rates on white-tailed prairie dog (*Cynomys leucurus*) colonies were higher than on uncolonized sites near colonies. In 1997, the authors sampled 3 different prairie dog complexes and placed 1444 artificial ground nests on and off 74 colonies. Vegetation cover, bare ground, Robel cover (i.e., visual obscurity of vegetation), and density of active burrows were also measured. Predation was 14% higher on colonies than off colonies for a typical 14-day incubation period. While percent ground cover, Robel cover, and density of active burrows all differed significantly between on-colony sites and off-colony sites, none of the habitat variables was correlated with differences in predation rates. While prairie dogs have been reported as potential nest predators, predation rates recorded on colonies were not as high as would be expected if prairie dogs were regular predators on eggs. The authors note that research that identifies predators at nests is required to determine the predation impact of prairie dogs on eggs, and that results from this study may not apply to other prairie dog species. [U.S. Geological Survey, Midcontinent Ecological Science Center, 4512 McMurry Avenue, Fort Collins, CO 80525, U.S.A.; e-mail: bruce_baker@usgs.gov]—Kerri T. Vierling.

9. **A same-sex stepparent shortens a prebreeder's duration on the natal territory: tests of two hypotheses in Florida Scrub-jays.** J. M. Goldstein, G. E. Woolfenden, and J. P. Hailman. 1998. Behav. Ecol. Sociobiol. 44:15–22.—In many cooperatively breeding bird species, prebreeding individuals are faced with the evolutionary conundrum of whether to disperse from natal territories in an attempt to establish their own breeding territories, or to remain on their natal territories and assist their parents in raising the next generation of young, thus enhancing their indirect fitness. This dilemma becomes increasingly complicated when a stepparent replaces a parent, since now the genetic relatedness of prebreeders (potential helpers) to individuals in the next brood is reduced by one half. Woolfenden and Fitzpatrick (1980; *Int. Ornithol. Congr.* 2:886) found that fewer prebreeding scrub-jays remained in their

natal territories with a same-sex stepparent than with a stepparent of the opposite sex. In this study, the authors observed a color-banded population of Florida Scrub-jays (*Aphelocoma coerulescens*) in south-central Florida over a three year span in order to test two hypotheses . . . both of which attempt to explain sexual asymmetry in prebreeder dispersal in the presence of stepparents: (1) the "dominance hypothesis" predicts that newly arrived stepparents will consider unrelated prebreeders of the same sex as a potential competitive threat for mates. Subsequent aggression by the stepparent could result in prebreeders leaving the natal territory; (2) the "pair-formation" hypothesis suggests that prebreeders of the opposite sex of the stepparent will remain on their natal territory because of the possibility of pairing with the stepparent in the future. None of the data, based on 163 pairing opportunities including both one- and two-year old prebreeding scrub-jays, supported the pair-formation hypothesis. In fact, the authors state that no pairing by a prebreeder with a stepparent has ever occurred during over 25 years of research at this study site. Conversely, the results strongly supported the dominance hypothesis by demonstrating the presence of aggression toward prebreeders by same-sex stepparents, a shorter duration by one-year old male and female prebreeders and two-year old female prebreeders in their natal territories with a same sex stepparent versus a same-sex parent, and perhaps most critically, a shorter duration by prebreeders on natal territories with two stepparents versus only one. The authors suggest that the persistence of two-year old prebreeding males on their natal territories in the presence of aggressive same-sex stepparents can be explained by the possibility that these individuals realize a greater chance to eventually inherit their natal territory. [Institute of Ecology, Univ. of Georgia, Athens, GA 30602-2202, U.S.A.; e-mail: jillgold@arches.uga.edu.]—Danny J. Ingold.

10. **Brood sex ratio is dependent on female mating status in polygynous Great Reed Warblers.** I. Nishiumi. 1998. Behav. Ecol. Sociobiol. 44:9–14.—In birds, females capable of manipulating the sex ratio of their brood to take advantage of favorable environmental conditions or the male with whom they are mated that assists in feeding their offspring, should be at a selective advantage over those which cannot. In polygynous bird species, both nutritional and genetic factors should influence the number of mates a male attracts. If nutritional condition is important, females might modify their brood sex ratio based on their status in the harem, such that primary females whose young are preferentially fed by males produce more sons than secondary or tertiary females. If genetic components are more important, then harem size might be more influential and one would expect females mated to polygynous males to produce more sons versus females mated to monogamous individuals. In the polygynous Great Reed Warbler (*Acrocephalus arundinaceus*) females may benefit by producing larger numbers of strong sons, and by inducing the male to bring more food to their offspring. In this study the author used molecular techniques to examine the brood sex ratio of Great Reed Warblers just after hatching during a three year period in central Japan to determine the extent to which female mating status might influence brood sex ratio. Brood sex ratios were correlated with female mating status inasmuch as primary females produced significantly more sons ($P = 0.03$) than secondary or tertiary individuals. Broods produced by secondary females contained significantly more females ($P = 0.02$) than one would expect by chance alone. Nestling sex ratio was not correlated with the father's arrival date, but the father's harem size was significantly correlated with primary brood sex ratios ($P < 0.05$). Brood sex ratio was negatively correlated with clutch size in secondary broods, but no such correlation was detected in primary broods. These data suggest that female Great Reed Warblers can manipulate their brood sex ratio in order to produce healthy, well-fed sons (i.e., influenced by female mating status), and to a lesser extent, sons with good genes (i.e., influenced by mate quality). [Dept. of Zoology, National Science Museum, Hyakunin-cho, Shinjuku-ku, Tokyo 169-0073, Japan; e-mail: nishiumi@kahaku.go.jp.]—Danny J. Ingold.

11. **Aggression among Hooded Robins *Melanodryas cucullata* and other birds.** L. L. Fitri and H. A. Ford. 1998. Corella 22:24–29.—Loss of avian species diversity in fragmented landscapes has been attributed to exclusion of birds by aggressive honeyeaters, an increase in nest predators, and competition among ecologically similar species. The authors report on aggressive behavior by Hooded Robins (*Melanodryas cucullata*) and the frequency of interactions with honeyeaters, nest predators, and similar species in eucalypt woodlands near

Armidale, New South Wales, Australia. Aggressive behaviors included supplanting, chasing and pecking. Hooded Robins live in groups consisting of a pair which may have non-breeding helpers. Intraspecific aggression (2.5 acts/h) was more frequent within groups than between groups. Males were more often the aggressor, but males and females were equally the subjects of aggression, which was least frequent in summer.

In the study, Hooded Robins were observed in 267 aggressive interactions with 30 species of birds (3 acts/h), and were more often the aggressor (n = 154) than the recipient of aggression (n = 113). In interspecific aggression males were again more frequently involved, and aggressive interactions occurred most frequently in autumn and least frequently in spring. Of all aggressive interactions, 14% were with honeyeaters, 8% with potential nest predators, 64% with ecologically similar species (ground-foraging insectivores), and 14% with 'other' birds. The authors suggest that the low percentage of aggressive interactions with potential nest predators is a poor indication of nest predator importance, since nesting success is low in Hooded Robins and most nest failure is from predation. The authors further suggest that in their study area Hooded Robins are not experiencing excessive interference from honeyeaters, and that the hypothesis that population declines in some ground-foraging insectivores may have resulted from competitive interactions deserves further study. [Division of Zoology, Univ. of New England, Armidale, NSW 2351, Australia.]—William E. Davis, Jr.

FOOD AND FEEDING

(see 8, 39)

SONGS AND VOCALIZATIONS

(see 36)

NESTING AND REPRODUCTION

(see also 7, 9, 10, 29, 32)

12. **Breeding ecology of Greater Prairie-Chickens (*Tympanuchus cupido*) in relation to prairie landscape configuration.** M. Ryan, L. Burger, Jr., and D. P. Jones. 1998. Am. Midl. Nat. 140:111–121—The population decline of the Greater Prairie-Chicken has resulted from loss of native prairie. Ninety-nine percent of historic native tallgrass prairie east of the Missouri River and 85% west have been destroyed. Our understanding on how these birds use the remaining highly altered and fragmented prairie habitats is key to their continued existence. The authors studied the reproductive success of Greater Prairie-Chickens on two landscapes with similar habitat characteristics (14% native prairie, 36% agricultural fields, and 44% mixed native & exotic grasses or pastures), but different configurations in 1986 and 1987 in southwest Missouri. The first landscape, prairie mosaic, contained small and scattered native prairie tracts, whereas the second landscape, contiguous prairie, had 75% native prairie habitat in one tract. Results were obtained by census counts at booming grounds and tracking 102 females with radio transmitters. The Greater Prairie-Chicken population declined roughly 3% a year (1961–1987) on the prairie mosaic versus no overall decline on the contiguous prairie during the same period. The prairie mosaic was also associated with greater dispersions of nests from the leks, reduced use of native prairie for nesting, reduced nest success in one of two years, and greater movement of broods compared to birds on the contiguous prairie. In both landscapes nesting was not detected on prairie units with <65 ha. The author's findings are consistent with predictions based on landscape ecology theory and population trend data. Their results indicate that contiguous prairie blocks in landscapes with 20% managed prairie offers greater potential for long-term conservation of this species than a network of small, scattered tracts. Efforts should be made to preserve or restore remaining patches of native prairie to >65 ha. [U.S. Dept. Agriculture, Animal and Plant Health Insp., 6505 Belcrest Rd., Hyattsville, MD 20782, U.S.A.]—Tom Leiden.

13. **How densely can Common-Terns *Sterna hirundo* breed: extreme situations on rafts. [Wie dicht können Flußeeschwalben *Sterna hirundo* brüten? Extremsituationen auf Brutflossen.]** S. R. Sudmann. 1998. Vogelwelt 119:181–192. (German, English summary)—Breeding success of two Common Tern colonies on rafts in the lower Rhine River decreased with

increasing nest densities during 1991–1997. The greatest density observed was 2.13 nests/m^2. In the dense colonies up to 60% of the chicks were carried off and dropped into the water where they drown or were taken by predators. In years of high nest density, replacement clutches were more successful than first clutches because there was more small fish available to feed the young. The author recommends 1.25 m^2 per nest and providing shelters for the chicks so they can hide from adults. [Eickestall 5, D-47559 Kranenburg-Nütterden, Germany.]—Robert C. Beason.

14. **Common Terns *Sterna hirundo* nesting on rafts. [Ansiedlung von Flußeeschwalben *Sterna hirundo* auf Kunstinseln.]** J. Loose. 1998. Vogelwelt 119:253–258.—Floating rafts were used by Common Terns on a lake in Mecklenburg-Vorpommern. The highest density was 5.18 nests/m^2. Average clutch size was 2.82 eggs for first clutches and 2.30 eggs for replacement clutches with a hatching success of 65.7%. From 1989, when the raft was constructed, to 1993 almost 100% of the chicks fledged but the fledgling success decreased annually until it was 0% in 1997. Nestling mortality was mostly from predation. [Gorkiweg 3, D-18273 Güstrow, Germany.]—Robert C. Beason.

15. **Sexual conflict over fertilizations: female Bluethroats escape male paternity guards.** A. Johnsen, J. T. Lifjeld, P. A. Rohde, C. R. Primmer, and H. Ellegren. 1998. Behav. Ecol. Sociobiol. 43:401–408.—Increasingly among behavioral ornithologists, particularly with the refinement of genetic analyses, the role of extra-pair fertilizations in sexual selection in birds has become a primary research focus. One question that has been debated is whether extra-pair copulations occur primarily as a result of female mate preferences outside the mated pair, or whether males are simply attempting to enhance their reproductive output in the face of relative female indifference. In a previous study of Bluethroats (*Luscinis s. svecia*), a species known for intense male mate guarding and sperm competition, the authors (Johnsen and Lifjeld, *Ethology* 101:200) detected a negative relationship between the intensity of mate guarding and male ornamentation (the blue throats of some individuals were painted black). In this study, the authors examined Bluethroats during two years (1993 and 1996) in southern Norway to determine: (1) whether the behavioral responses described in the previous study could be replicated, (2) whether males with the artificially blackened throats suffer losses in fecundity, and (3) whether there was a relationship between mate-guarding intensity, degree of singing, and paternity within blackened males and controls. Thirty percent of all chicks (49/162) were fathered by males outside of the pair bond, and extra-pair young (EPY) occurred in 58% of all broods. Males with blackened throats spent significantly more time guarding their mates than did controls; on the other hand, control males spent significantly more time singing than did blackened males. Although the results obtained in 1996 reflected those from 1993, differences were not as pronounced and not always significant. When data from both years were combined, blackened males had significantly more EPY in their nests than controls ($P = 0.03$). Within the blackened male group, the data suggest that those individuals that guarded their mates more intensely had a lower proportion of EPY in their nests than those who guarded their mates with less intensity. All measures of mate guarding were highly negatively correlated with singing rates, and males who sang more frequently produced more EPY than did males that sang less. The authors suggest that female Bluethroats in this study (particularly those with unattractive mates) played an active role in choosing copulation partners. Experimental males likely responded to the threat of infidelity by stepping up the intensity of their mate guarding. [Zoological Museum, Univ. of Oslo, Sars gate 1, N-0562 Oslo, Norway; e-mail: arild.johnsen@toyen.uio.no.]—Danny J. Ingold.

16. **Mate guarding in the Magpie-lark**. V. Neill and A. Lil. 1998. Corella 22:80–86.—The Magpie-lark (*Grallina cyanoleuca*) is a monogamous species in which both parents tend the eggs and young. This study focused on 10 pairs which bred asynchronously on the Clayton campus of Monash University, Victoria, Australia during the 1995–1996 breeding season. The purpose of the study was to determine if the potential for sperm competition was reduced by mate guarding or other behaviors. The authors recorded such behavioral variables as intra-pair distances, pair-to-nest distances, calling rates, flights, and the response of the male to conspecific intruders, especially the proportion of intrusions that evoked a response from the male and the proportion followed by reduction of intra-pair distances. Intra-pair distances were significantly smaller during the fertile stage, as were pair-to-nest distances. The percentage of flights by one bird that elicited pursuit by the other was highest in the fertile

period and males were significantly more likely to be pursuers. In the fertile period males flew towards perched mates most often, females least often. Calling rates varied during the day but not by breeding stage or sex. Eighty-three percent of territorial intrusions by conspecifics produced aggressive responses by resident males but did not differ between pre-fertile and fertile stages. The tendency to reduce intra-pair distances after conspecific intrusion was, however, greatest in the fertile period. The authors suggest that Magpie-lark males employ a strategy of mate guarding to reduce potential promiscuity in their mates. The failure of males to increase their tendency to approach conspecific intruders during the fertile period may reflect incompatibility between territorial defense and mate guarding in large territories. Mate guarding in Magpie-larks may be facilitated by high visibility in their breeding habitat and the pair's ability to exploit the same, relatively stationary prey. This is a convincing study that should be of interest to students of avian breeding biology. [Depts. of Biological Sciences and Psychology, Monash Univ., Clayton, Victoria 3168, Australia.]—William E. Davis, Jr.

17. **Copulation rate and sperm use by female Bearded Tits, *Panurus biarmicus*.** A. Sax, H. Hoi, and T. R. Birkhead. 1998. Anim. Behav. 56:1199–1204.—Multiple within-pair copulation rates have been explained as a means of ensuring fertilization (fertilization hypothesis) and as a means by which females produce high quality offspring by allowing different males' sperm to compete for fertilization success (sperm competition hypothesis). The authors housed single pairs and groups (one pair plus two extra males) of Bearded Tits to determine the effect of copulation frequency on the number of sperm present in the reproductive tract of the female. The rate of loss of spermatozoa from the female's reproductive tract was determined by examining the number of spermatozoa in the perivitelline layer of the egg. Although females in group situations copulated at a higher rate than females with a single male, there was no difference in the total number of sperm present on the perivitelline layers between these two groups. The rate of sperm loss from the reproductive tract of the female was high, suggesting that in the absence of copulations during the egg-laying period females run the risk of laying one or more infertile eggs. Indeed, it was revealed that when separated from their mates after the first egg had been laid, one out of seven clutches contained infertile eggs. The authors also suggest this high rate of sperm loss may provide females with an opportunity to modify the paternity of their brood. [Lorenz Institut fur Vergleichende Verhaltensforschung, Savoyenstr. 1a, 1160 Vienna, Austria, e-mail: a.sax@klivv.oeaw.ac.at]—Jeffrey P. Duguay.

18. **Breeding biology of the Regent Honeyeater *Xanthomyza phrygia* in the Capertee Valley, New South Wales.** D. Geering and K. French. 1998. Emu 98:104–116.—Current low population levels of the Regent Honeyeater are of great concern in Eastern Australia given historical accounts of flocks of thousands. Fragmentation of eucalypt woodlands and dry open forest is thought to be a major cause of the decline. This study investigated the breeding behavior of the Regent Honeyeater over 3 seasons in the Capartee Valley in central New South Wales in two breeding habitats and measured changes in breeding success with time of breeding. The authors determined that breeding started in early July with peak egg laying in September. Early nests produced more fledglings per successful nest and usually coincided with the flowering of the mistletoe *Amyema cambagei* in a gallery forest of *Casuarina cunninghamiana*. Nectar from *Eucalyptus melliodora* and *E. sideroxylon* were also determined to be important in supporting nesting particularly later in the season. Mayfield reproductive success was 38.7% and the authors believed reproductive success was unlikely to be responsible for the population decrease, however severe drought may limit breeding attempts. The authors suggest that Regent Honeyeaters may be concentrated in areas of reliable nectar flow. [RMB, 2171 Fullerton Cove Road, Fullerton Cove, NSW 2318, Australia]—John C. Carlson.

19. **Breeding success and nest site selection of Regent Honeyeater *Xanthomyza phrygia* near Armidale, New South Wales.** D. L. Oliver, A. J. Ley, and B. Williams. 1998. Emu 98:97–103.—The Regent Honeyeater has suffered a decline in numbers and a contraction of range throughout eastern Australia and is now the subject of a national recovery effort. Little was known of the breeding biology of this species because of its patchy distribution across a large area and its semi-nomadic and unpredictable movements. The authors investigated the breeding success and nest site selection of Regent Honeyeaters from 1993 to 1997 in the

Bundarra-Barraba region of New South Wales. They found that the honeyeaters nested in box-ironbark woodlands. Fifty-one nests were found, with a mean height of 13.4 m in trees with rough bark which were over 18.6 m in height. Forty-one of the nests were in aggregations between 2 and 11 nests. Populations were found to be higher than previous estimates and Mayfield nesting success (38.3%) was relatively high compared to other common Australian honeyeaters. The authors believe that factors other than breeding success have resulted in current endangered status of the Regent Honeyeater and suggest that habitat clearance and fragmentation has changed the availability of resources at the landscape scale. [Division of Zoology, Univ. of New England, NSW 2351, Australia]—John C. Carlson.

20. **Comparative breeding ecology of Cooper's Hawks in urban and exurban areas of southeastern Arizona.** C. W. Boal and R. W. Mannan. 1999. J. Wildl. Manage. 63:77–84.—The authors compared the breeding ecology and productivity of Cooper's Hawks (*Accipiter cooperii*) in urban and exurban (i.e., undeveloped natural) areas. Between 1994–1996, 51 Cooper's Hawk territories were monitored in the Tucson study area (TSA) and 26 were monitored in the exurban study area (ESA). Clutches hatched earlier in the TSA, and clutch sizes were larger in the TSA. Overall nest failure rates in the TSA were greater than in the ESA (52.6% vs. 20.5%). Nest failures in the TSA were due to trichomoniasis, an avian disease caused by the protozoan *Trichomonas gallinae.* Approximately 80% of all nestling mortality in the TSA were due to trichomoniasis, while no nestlings died of trichomoniasis in the ESA. Urban nestlings may be infected through diseased prey (i.e., doves), and the authors suggest that treatment of trichomoniasis may be very difficult. Mortality of free-ranging Cooper's Hawks was due primarily to collisions with windows or vehicles in urban areas, and behavioral differences were noted between hawks in the TSA and in the ESA. The authors suggest that environmental education might be an important component in managing this species in an urban environment. [Minnesota Coop. Fish and Wildlife Research Unit, College of Natural Resources, Univ. of Minnesota, St. Paul, MN 55108, U.S.A.; e-mail: cwb@fw.umn.edu]—Kerri T. Vierling.

21. **Tree Swallow productivity near Saskatoon, Saskatchewan.** M. I. Houston and C. S. Houston. 1998. No. Amer. Bird Bander 23:42–44.—This study reports on the annual success and productivity for Tree Swallows (*Tachycineta bicolor*) nesting (1970–1997) on a 122 km bluebird nest box trail centered in Saskatoon, Saskatchewan. Nest boxes were placed on a fence post at densities of 1–6 per km with higher concentrations in the best habitats (sandy pastures). Boxes were visited every 10 days from last week of May through the first week in August. A total 12,760 nestling and 1590 adult females were banded in 28 consecutive seasons. There were 2617 successful nests, defined as one which at least 1 nestling departs. Nestling success, a measure of successful nests from available nest boxes used, varied from 27.7% in 1993 (cold, wet year) to 62.0% in 1988 (hot, dry year) to 89.6% in 1977 (mean success was 73.7%). There were 936 failed nests. Mean number of young per nest was 4.9 (range: 3.7–5.9). Nest success in this population was slightly lower than the 78.8% reported from the 10 mostly eastern populations reported in Robertson et al. (1992. Birds of North America, No. 11). Nestling success was slightly higher than the 4.57% reported by Robertson et al. (1992) for 8 populations. Tree Swallow nesting success was related to weather based on two extreme years. In 1988 egg mortality increased in the extreme heat and a 38% nest failure was recorded; in 1993, nestling mortality increased in cold, wet weather and nest failure was 72.3%. It was noted that high nest failures occurred in other years with out variable weather. Both Tree Swallows and Mountain Bluebirds (*Sialin currucoides*) increased their population numbers due to an increase in nest box availability. [863 Univ. Drive, Saskatoon, Saskatchewan, S7N OJ8 Canada.]—James L. Ingold.

22. **Double-clutching and double-brooding in Red-cockaded Woodpeckers in Florida.** L. F. Phillips, Jr., J. Tomcho, Jr., and J. R. Walters. 1998. Fla. Field Nat. 26:109–113.—This is the first report of successful double brooding by the Red-cockaded Woodpecker (*Picoides borealis*) in Florida. The authors describe in detail their observation of double brooding by a Red-cockaded Woodpecker cluster at Eglin Air Force Base in 1996. They also summarize recent unpublished data from sites throughout Florida and find that only 8 of 1771 (<1%) potential breeding groups double brooded. Double clutching and double brooding in the Red-cockaded Woodpecker previously has been documented in only two states, North Carolina and South Carolina, both in the northern portion of the species' range. The authors

confirm that the phenomenon does occur throughout the species' range and that it does not appear to be related to nesting effort or any other population-level indicator. Researchers should carefully monitor all Red-cockaded Woodpecker groups that successfully fledge young by 15 June for this rare, but apparently widespread, phenomenon. [Dept. of Biology, Va. Polytechnic Inst. and State Univ., Blacksburg, VA 24061, U.S.A.]—Karl E. Miller.

23. **Distribution and reproductive success of the Pied Flycatcher *Ficedula hypoleuca* in relation to forest patch size and vegetation characteristics: the effect of scale.** E. Huhta, J. Jokimäki, and P. Rahko. 1998. Ibis 140:214–222.—The authors studied habitat selection and reproductive success of the Pied Flycatcher in northern Finland at two hierarchical levels of forest habitat structure: forest patch size (macrohabitat) and vegetative structure within forest patches (microhabitat). Arrival date, pairing date, laying date, clutch size, and number of fledglings produced were measured in coniferous forest fragments of three sizes: large (>5 ha), medium (1.1–5 ha), and small (≤1 ha). Vegetation characteristics were measured and invertebrates were sampled both at macro- and microhabitat levels. In spring, both males and females settled preferentially in large and medium-sized forest stands. Smaller stands were occupied later and contained a greater proportion of unpaired males. However, neither the age of adult birds nor their reproductive success differed in forest patches of different size, suggesting that individuals have equivalent fitness in habitats of different quality. At the microhabitat level, the number of fledglings produced was positively correlated with the density of deciduous trees in the territory, probably because deciduous tree territories contained more invertebrate food than the pine-dominated territories. Higher-quality, invertebrate-rich territories also tended to be occupied by older males. Pied Flycatchers appear to respond differently to habitat parameters at each level of spatial scale studied; although deciduous trees and bushes were typically more numerous in small and medium-sized forest patches than in large ones, small patches were occupied later in spring and had fewer mated pairs. On the basis of settlement pattern, density, and reproductive success, the distribution of Pied Flycatchers across a fragmented forest landscape followed the ideal-free distribution model, whereas at the microhabitat level, age-related unequal distribution of males followed the ideal-despotic model of Fretwell and Lucas. This study demonstrates the importance of considering multiple scales in studies of habitat selection; if only one scale is used, important patterns may be missed. [Dept. of Biology, Univ. of Oulu, FIN-90570 Oulu, Finland.]—Karl E. Miller.

24. **Mountain Bluebird productivity near Saskatoon, Saskatchewan.** M. I. Houston and C. S. Houston. 1998. Sialia 20:123–125.—This paper reports on nest success of Mountain Bluebirds (*Sialia currucoides*) nesting along a 240-box bluebird trail near Saskatoon, Saskatchewan from 1969–1997. Nests boxes were placed from two to ten per mile and visited every 10 days from late May through the first week of August. Nesting of Mountain Bluebirds increased from three pairs in 1969 to a high of 94 pairs in 1976. A late May snowstorm in 1982 reduced the population to just 40 breeding pairs but the population rebounded to a high of 99 pairs in 1991. Nest success ranged from 52.5% to 86.7% over the report period with a mean of 76.8%. Productivity over the same period ranged from 3.6 to 6.0 young/nest and averaged 4.5. Other species using the boxes included House Sparrow (*Passer domesticus*), House Wren (*Troglodytes aedon*), Eastern Bluebird (*S. sialis*), and Tree Swallow (*Tachycineta bicolor*). The authors also report on a mixed species pair of a male Mountain Bluebird and a female Eastern Bluebird that raised five young in 1974. They also report on what they believe to be a hybrid female mated to a male Mountain Bluebird in 1987 that raised five young. The presumptive female hybrid was larger than a pure female Eastern Bluebird and had a red breast. The authors suggest that the bluebird trails may have allowed Mountain Bluebirds to move east and Eastern Bluebirds to expand their range west thus ending in the mixed species pairs and presumptive hybrids. [863 Univ. Drive, Saskatoon, Saskatchewan, S7N OJ8 Canada]—James L. Ingold.

MIGRATION, ORIENTATION, AND HOMING

(see also 4, 5, 40)

25. **Movement patterns of Great, Intermediate and Little Egrets from Australian breeding colonies.** D. J. Geering, M. Maddock, G. R. Cam, C. Ireland, S. A. Halse, and G. B.

Pearson. 1998. Corella 22:37–46.—The authors present the current state of knowledge on the movement of three egret species drawn from the literature, Project Egret Watch based in New South Wales, banding records from Western Australia, and unpublished reports.

Sightings by a network of observers throughout much of Australia and New Zealand of patagial tagged Great Egrets (*Egretta alba*), Intermediate Egrets (*E. intermedia*), and Little Egrets (*E. garzetta*), combined with recovery data, trace the long-distance movements of the three species. The longest recorded movement of each species was >3000 km by birds banded in Australia and recorded in New Guinea. The mean distance of movements of >50 km was 273 km for Great Egrets, 1020 for Intermediate Egrets, and 1502 for Little Egrets. Long distance movements of juveniles can occur soon after fledging, and for all three species can be in virtually any direction. Individuals of the three species have demonstrated natal site fidelity. Many juveniles of all three species forage and establish roosts on the floodplains surrounding their natal colonies, but none have been seen wintering in the area of the breeding colonies. Several Little Egrets tagged in southeastern Australia were observed in New Zealand. Shorter movements may predominate for birds in the more stable coastal marshes with longer movements for birds in the interior wetlands that experience more severe climatic fluctuations. The authors suggest that a seasonal migratory pattern, at least for some birds, may occur. The majority of the data used in this analysis was from sightings of patagial tagged birds, underscoring the efficiency of this method. [Shortland Wetlands Centre, P.O. Box 292 Wallsend, NSW 2287, Australia.]—William E. Davis, Jr.

HABITAT USE AND TERRITORIALITY

(see also 9, 12, 13, 14, 18, 19, 20, 23, 34, 35)

26. **Association of birds with fallen timber in box-ironbark forest of central Victoria.** N. H. Laven and R. Mac Nally. 1998. Corella 22:56–60.—In this experimental study, the purpose was to determine if birds were differentially associated with areas where piles of fallen timber were located. The study was made in box-ironbark remnant forest in Victoria, Australia. Twenty 4-ha sites were chosen, with 10 designated 'high' and 10 'low' availability of fallen logs and branches (the availability of debris was nearly 4 times as great in 'high' areas). Six sites were randomly chosen from each suite of 10, and 1 ha central squares from each site constituted the final study plots. Within each of the 'high' sites two triangular plots were established that had piles of fallen timber ('debris' plots), and two that lacked debris ('empty' plots), and in the 'low' plots two 'empty' triangles were chosen. Bird species, activity, and substrate used, were recorded in 1 h census periods at the 12 'debris' sites and 24 'empty' sites. Analysis indicated no significant differences in species richness between 'high' and 'low' sites, but significantly more species were found using 'debris' triangles than 'empty' ones. Use (perching and foraging acts) of 'debris' areas was nine times that of 'empty' areas, and species richness three times greater. The authors conclude that birds were preferentially associated with fallen timber (debris). The authors examined two hypotheses to explain the preferential use of debris areas, (1) greater food and/or foraging opportunities, and (2) shelter or refuge. Only minor differences in invertebrate abundance were detected between 'debris' and 'empty' areas suggesting that foraging opportunities do not play a major role. Some species may benefit in 'debris' areas from protection from diurnal predators, but the evidence from this study is limited. Thus the authors conclude that this study is a first step in evaluating the role of fallen timber (debris) in avian community composition, and suggest several experimental programs for future consideration. This was a carefully designed study with potentially important results. [Section of Ecology, Dept. of Biological Sciences, Monash Univ., Clayton, Victoria 3168, Australia.]—William E. Davis, Jr.

27. **Home range size and dispersion in the Helmeted Guineafowl (*Numida meleagris galeata* Pallas) of the Waza National Park, Cameroon.** H. L. Njiforti and K. H. Kortekaas. 1998. African Journal of Ecology 36:183–193.—The successful management of wildlife populations normally requires a sound ecological and behavioral knowledge of the species involved. Local variations in dispersal and distribution patterns within the same species often, however, dictate that site specific data be collected before any management decision is made. In this paper, the authors present the results of a three year study designed to determine home ranges and dispersal patterns of the Helmeted Guineafowl in the buffer zone (the site

of a guineafowl hunting project) surrounding the Waza National Park, Cameroon. In order to facilitate data collection, birds were captured and fitted with either leg-rings, leg-rings and neck-rings, or leg-rings and a necklace radio transmitter. Mean home range estimates varied seasonally with overall home range size being significantly larger during the dry season (3.6 ± 1.5 km^2) as compared to the wet season (3.1 ± 1.5 km^2). Variation in home range sizes were also recorded between different age groups, with young birds having larger ranges than those recorded for either male or female adult birds. Mean monthly group size was found to vary monthly, with the smallest group size (9 ± 5.1 birds) coinciding with the breeding season. Moreover, a highly significant correlation was found to exist between group size and the number of birds that emigrated from each group, with more young birds emigrating during the study period than either adult females or males. The authors point out that it is likely, therefore, that any off-take of guineafowl, through the hunting project in the buffer zone, will most likely be replaced by immigrating young birds. [Center for Environmental Studies and Development in Cameroon (C.E.D.C.), P.O. Box 410, Maroua, Cameroon]—Shirley J. Atkinson.

28. **Interseasonal changes in shorebird habitat specialization in Moreton Bay, Australia.** J. J. Thompson. 1998. Emu 98:117–126.—The habitat use of migrating shorebirds may be compared between times when the average internal state of the birds can be assumed to be different to assess changes in habitat use due to changes in internal energy states. This study examined habitat use of 21 species of shorebirds at 56 intertidal study sites at Moreton Bay, Australia to assess changes in habitat use between spring and fall migration. Four distinct intertidal habitats were sampled. Shorebirds were found to be more concentrated within preferred habitat during the northward migration and the size of the change in habitat use between northward and southward migrations was related to the degree of specialization of each species. The author suggests that the change between seasons may have been caused by the greater energy reserves of northward migrants or by an increase in the ability of first-year birds to locate suitable habitat. Thompson further states that beyond the theoretical interest, this study demonstrates the importance of protecting the full range of habitats in Moreton Bay for migrating shorebirds particularly during the southward migration. [Wildlife Planning Unit, Queensland Dept. of Environment, P.O. Box 155, Brisbane Albert Street, Qld 4002. Australia]—John C. Carlson.

29. **Henslow's Sparrows return to previous nest site in western Maryland.** C. S. Skipper. 1998. No. Amer. Bird Bander 23:36–41.—The purpose of this study was to determine whether adult Henslow's Sparrows (*Ammodramus henslowii*) return to a previous year's breeding site, whether juveniles return to natal areas as adults, and to determine the number of broods produced each season in Maryland. The study area was a 197-acre reclaimed strip mine near McHenry, Maryland. The area had been mined and reclaimed in stages over a 12-year period between 1976–1987. Site vegetation included grasses, legumes, and small trees. Singing males were mist-netted on their territories between 1994 and 1997. Optimum conditions for capture were determined to be a wind speed of "2" or less on the Beaufort Scale, low light, and fog. Eighty-seven Henslow's Sparrows were caught and banded along with 37 Grasshopper (*A. savannarum*) and 29 Savannah Sparrows (*Passerculus sandwichensis*). The breeding male population of Henslow's Sparrows ranged from 15 to 21. Five adult male Henslow's Sparrows returned to the banding site in subsequent years and were caught within 56–165 m from the original capture site. Weight and wing chord measurement data are present for all three sparrow species. Breeding site fidelity was shown for both Henslow's and Grasshopper sparrows. Males sing on territory from mid-May through mid-Aug. and breeding territories did not shift during the breeding season. No juvenile birds returned to their natal site. [293 Bray Hill Lane, Oakland, MD 21550, U.S.A.]—James L. Ingold.

30. **Powerline easements through forests: a case study of impacts on avifauna.** J. Baker, R. L. Goldingay, and R. J. Whelan. 1998. Pacific Conservation Biology 4:79–89.—The authors investigated the impact of powerline easements (40–60 m wide) on birds at three sites, 2 through dry forest and 1 through wet, in southeastern New South Wales, Australia. At each site 4 replicate 300 m transects, perpendicular to the powerline, were censused at six contiguous 50 m-diameter circles in the forest, plus 1 centered on the edge, and 1 in the easement. Statistical tests compared abundance and species richness data at forest "margin" (25–125 m from easement edge), "interior" (225–325 m), edge, and easement. Easement values for

abundance and richness were <20% of those for forest. Of 80 species reported from the study, 15 were common in both forest and easement, and 5 species were found only on the easement or edge. Of the 5, 4 species were considered "easement opportunists" e.g., Welcome Swallow (*Hirundo neoxena*), and the Southern Emu-wren (*Stipiturus malachurus*) that was entirely dependent on the easement, an "easement specialist." The authors concluded that since only 4 species probably could not cross the easement, there was not an important barrier effect from the fragmentation of the forest by the powerline. The abundance and species richness for the "margin" were significantly less than "interior" suggesting a significant edge effect. However, data for circles centered on the edge itself did not differ from that of forest, suggesting that detection was easier at the edge, that the edge may be a resting place for birds in transit, or that edge habitat may support more birds. The authors suggest that management of easements should include leaving dense shrub corridors across easements, and vegetation corridors in natural depressions. They recommend that future easement management should include assessment of potential benefits to uncommon or threatened species and ways of discouraging common non-forest and introduced species. [Dept. of Biological Sciences, Univ. of Wollongong, Wollongong, NSW 2522, Australia.]—William E. Davis, Jr.

ECOLOGY

(see also 8, 12, 20, 23, 27)

31. **Costs and benefits of nest cover for ptarmigan: changes within and between years.** K. L. Wiebe and K. Martin. 1998. Anim. Behav. 56:1137–1144.—Because of high predation rates on ground nesting birds, females may initiate several nesting attempts during a given breeding season. As a result, selection may favor the ability to learn characteristics of a good nest and to modify behavior based on past experience. Wiebe and Martin examined nest-site attributes at 331 White-tailed Ptarmigan (*Lagopus leucurus*) nests in 9 years to determine if females modified their selection of sites over time based on past experience with predators. The amount of cover around first and second nesting attempts was similar, as was the amount of cover between years. Also, nesting success did not improve with female age or nesting attempt. There were, however, marked seasonal patterns in nest-site choice. The authors suggest microclimate may be a more important selective pressure on nesting birds than is predation. [Dept. of Biology, Univ. of Saskatchewan, 112 Science Place, Saskatoon, Saskatchewan S7N 5E2, Canada, e-mail: Karen.wiebe@usask.ca]—Jeffrey P. Duguay.

32. **Dispersal of seeds as nest material by the Cactus Wren.** S. J. Milton, W. J. Dean, G. H. Kerley, and W. G. Whitford. 1998. Southwest. Nat. 43:449–452.—The authors examined 12 nests constructed by Cactus Wrens (*Campylorhynchus brunneicapillus*) in the southern Chihuahuan Desert to determine species composition of the plants that comprised the nests and identify the kinds of seeds found in the nest material. Thirty-four species of plants (including 10 monocots and 12 dicots) were incorporated into wren nests. The three most common species included *Muhlenbergia porteri, Boerhaavia spicata,* and the alien grass *Eragrostis lehmanniana.* The authors suggest that Cactus Wrens and other semi-arid desert bird species may serve as important agents of the dispersal of small dry seeds including those of exotic plant species. They also suggest that further work in the area of seed viability, nest longevity, seed predation and the overall efficiency of this form of seed dispersal is needed. [Percy FitzPatrick Institute of African Ornithology, Univ. of Cape Town, Rondebosch 7700 South Africa.]—Danny J. Ingold.

33. **The effects of fire on a population of Red-winged Fairy-wrens *Malurus elegans* in Karri forest in southwestern Australia.** E. Russell and I. Rowley. 1998. Pacific Conservation Biology 4:197–208.—The authors report on a natural experiment in which 1994 fires severely burned a 25 ha study-plot which was occupied by territorial groups of color-banded Red-winged Fairy-wrens. The birds, which live in family groups of 2–9, had been monitored since 1980, and the authors had reliable population estimates preceding the fires. The fires destroyed most of the undergrowth and litter layer, essentially eliminating preferred nest sites for several years. Following the fire the number of groups decreased from 32 to 31, and the number of individuals from 126 to 114. A year later the groups had decreased to 23 and the population to 73. Using pre-fire rates of survival, dispersal, and production of young, the

authors estimate that it would take at least 10 years to achieve pre-fire numbers. This was judged a conservative estimate, since in 1984, the population was still recovering after a 1968–1969 fire. Populations tend to decline after fires due to increased mortality and loss of nesting habitat, and Red-winged Fairy-wrens have small clutch sizes (mean 2.4) and a short breeding season, thus restricting their ability to recover rapidly from catastrophe. Habitat fragmentation further slows recovery by reducing immigration. The authors conclude that the 7–9 years cycle for prescribed burns to reduce forest fuel load are too short to allow population recovery of small passerines that live in lower forest levels; local populations will decline with each successive fire, eventually leading to local extinction. They recommend a minimum prescribed burning cycle of 10 years. The long-term monitoring of a marked population of birds made this remarkable study possible. It should be of interest to all conservation biologists. [53 Swan Street, Guildford, WA 6055, Australia.]—William E. Davis, Jr.

34. **The effects of isolation, habitat fragmentation and degradation by livestock grazing on the use by birds of patches of gimlet *Eucalyptus salubris* woodland in the wheatbelt of Western Australia.** G. W. Arnold and J. R. Weeldenburg. 1998. Pacific Conservation Biology 4:155–163.—This study was conducted in the central wheatbelt, a sheep and wheat farming area, about 200 km east of Perth, Western Australia. The native vegetation is severely fragmented. A single plot of 100 m × 100 m was established in twenty-four small (<25 ha) grazed remnants of gimlet woodland, and 5 plots were established in two large, ungrazed remnants. Each plot was assessed for a variety of structural variables (e.g., numbers of live trees of several size classes) and censused 18 times for birds using an area search technique. Biogeographic variables were also computed (e.g., area of remnant, area of native vegetation in remnants within 5 km). Regression analysis was based on the frequency of a species' presence in the 18 censuses, not on the numbers of individual birds counted. There was little difference in canopy cover between plots in large and small remnants, but most small patches had been cut 60–80 years before and had regrowth of smaller but more numerous trees. Grazed remnants has weed cover of up to 94%. Thirty-eight species of birds were recorded with a 11.6 average for large remnant sites and 9.6 for small. The small remnant sites had fewer small passerines, but frequency was higher when there were more linear strips of vegetation attached to the remnant. Few small passerines were found in remnants of less than 7 ha, and the area effect may include an edge effect. The most common small passerine, the Striated Pardalote (*Pardalotus striatus*), was affected by distance to the nearest remnant patch, and apparently included several remnant patches in their home range. Large, ubiquitous species that utilize farmland as well as native vegetation, e.g., Port Lincoln Parrot (*Platycerus zonarius*), and Galah (*Cacatua roseicapilla*), were found in all remnants and used the native vegetation for roosting and nesting, while foraging in surrounding farmland. The authors conclude that degraded small gimlet remnants have little value to small passerines, and that management should include increasing size of patches to reduce edge effect, linking remnant patches with vegetation corridors, and fencing patches to eliminate grazing. Remnants within 100–200 m of other native vegetation should be given priority. [Div. of Wildlife and Ecology, CSIRO, LMB No. 4, Midland, WA 6056, Australia.]—William E. Davis, Jr.

35. **Birds in patches of old-growth ash forest, in a matrix of younger forest.** R. H. Loyn. 1998. Pacific Conservation Biology 4:111–121.—This study investigated the effects of patch size and a suite of habitat variables on bird abundance in patches of old-growth forest in a matrix of younger forest. About 70% of forests of mountain ash (*Eucalyptus regnans*) and alpine ash (*E. delegatensis*) in the Central Highlands of Victoria, Australia, were burned in 1939, leaving remnant patches of old-growth forest. Old-growth patches are currently protected from logging, and plans are being made to protect stands of 1939 regrowth forest to development future old-growth forest. This 1995–1996 study was conducted at 49 sites in old-growth patches and 8 sites in 1939 regrowth forest. Area-search techniques were used to establish bird abundance, and species were grouped for analysis by habitat use for nesting and feeding (e.g., insectivores, frugivores, nectivores, carnivores, hole-nesters, brood parasites, summer migrants, uncommon birds). Abundance of each species group was regressed against habitat (e.g., canopy height) and context (e.g., patch size) variables using generalized linear modeling. Bird abundance was greater in old-growth but not significantly so, but patch size was a significant explanatory variable for bark-foragers and uncommon birds (large patches), and fruit-eaters (small patches). Honeyeaters, fruit-eaters, and uncommon birds

preferred patches near other old-growth patches. Shrub-foragers preferred gullies over mid-slopes or ridges. Forest structure provided explanatory variables for 4 groups of birds. The results have implications for forest management. Since small old-growth patches did not differ in abundance for most bird groups from large ones, and since it appears that populations in old-growth patches are unlikely to be isolated from each other, protection of even small patches of old-growth forest is justified. Small old-growth surrounded by regrowth did not show the loss of bird density that characterizes small forest patches isolated by farmland. There is some suggestion that patches preserved for future old-growth should be close to each other, with a range of patch sizes across the landscape, but there is no clear evidence to support either the many-small or few-large reserve design. This study has important conservation implications and should be of interest to forest managers. [Arthur Rylah Institute, Dept. of Natural Resources and Environment, 123 Brown St., Heidelberg, Victoria 3084, Australia]—William E. Davis, Jr.

36. **Influence of the Noisy Miner *Manorina melanocephala* on avian diversity and abundance in remnant grey box woodland.** M. J. Grey, M. F. Clarke, and R. H. Loyn. 1998. Pacific Conservation Biology 4:55–69.—Noisy Miners are large, communally breeding honeyeaters that aggressively exclude small insectivorous birds and honeyeaters that eat defoliating insects, and thus may exacerbate tree dieback in woodland remnants. In this study in Victoria, Australia, Noisy Miner abundance was reduced (35–71%) by mist-netting and removal (after banding) and by shooting, in 4 experimental plots that were paired with similar control plots where miners were not removed. All plots were grey box (*Eucalyptus microcarpa*) woodland remnants. Censuses were conducted prior to and after removal in experimental and control plots ranging from 0.8–4.0 ha, using area search methods. The purposes of the study were to see if removal of miners from grey box woodland affected the abundance and diversity of small birds as had previous removals from box-ironbark woodland, whether changes in the bird communities were sustainable, and to monitor any reinvasion by Noisy Miners. At 3 of the 4 experimental sites removal of Noisy Miners was followed by major changes in bird community composition, including significant increases in the abundance of small insectivorous birds. Two of the 4 plots experienced reinvasion by unbanded Noisy Miners, mostly from roadside corridors. From comparisons with previous removal studies the authors concluded that the presence of flowering trees accelerated the colonization by nectivorous birds, and isolation from large remnants slowed colonization. They concluded that small woodland remnants could be valuable for bird conservation, but that Noisy Miners limited this value. However, they point out that removal of miners is labor-intensive and expensive but may be appropriate for protection for threatened species or patches of rare and important habitat. Restoration of woodland understory vegetation may reduce the Noisy Miner problem. [School of Zoology, La Trobe Univ., Bundoora, Victoria 3083, Australia.]—William E. Davis, Jr.

POPULATION DYNAMICS

(see 13, 25, 29, 33, 35)

ZOOGEOGRAPHY AND DISTRIBUTION

see also 23, 25, 27, 28)

37. **Two feathered dinosaurs from northeastern China.** J. Qiang, P. J. Currie, M. A. Norell, and J. Shu-An. 1998. Nature 393:753–761.—Since 1973, when J. H. Ostrom published a paper on "The ancestry of birds" (Nature 242:136), a debate has raged on whether birds evolved from theropod dinosaurs or earlier reptiles. A major stumbling block to widespread acceptance of the theropod dinosaur-bird link was the lack of feathered dinosaurs. Qiang et al. report on the discovery of two feathered dinosaurs, *Protarchaeopteryx robusta* and *Caudipteryx zoui* from the Upper Jurassic/Lower Cretaceous of China. The specimens have symmetrical plumulaceous and downy feathers that cover their entire bodies, furcula, semiluminate carpals, short arms compared to birds, and long legs. It is doubtful that they could fly. Phylogenetic analysis revealed that both specimens lie outside of Aves and are theropod dinosaurs. Several people have already suggested that these specimens represent flightless birds. For example, *C. zoui* had gizzard stones. However, if further phylogenetic analysis supports the authors' claim that these organisms are dinosaurs, the discovery will represent

the most conclusive evidence yet that birds evolved from theropod dinosaurs, and that feathers evolved initially for a function other than flight. [Royal Tyrrell Museum of Palaeontology, Box 7500, Drumheller, Alberta T0J 0Y0, Canada; e-mail: pcurrie@mcd.gov.ab.ca]—David J. Horn.

38. **GIS-based representation of the distribution of songbirds in the Swiss National Park. [GIS-gestützte Darstellung der Verbreitung von Singvögeln im Schweizerischen Nationalpark.]** F. Filli, A. Schuster, and K. Robin. 1998. Ornithol. Beob. 95:249–258. (German, English summary).—The authors compared their census data based on transects along 80 km of hiking trails in 1992–1994 to the breeding bird atlas data for the same area. They recorded 49 species with good agreement overall with the atlas data. Combining elevation and vegetation type into a model, they could accurately predict the distribution for species whose habitat was described by the model, but not species that had narrow habitats. Two of the most common species, Coal Tit (*Parus ater*) and Black Redstart (*Phoenicurus ochruros*) appear to segregate by altitude and habitat. Coal Tits were most common 1650–2000 m in fir forest and redstarts were most common 2100–2300 m in rocky cliffs. [Parc Naziunal Svizzer, CH-7530 Zernez, Switzerland.]—Robert C. Beason.

39. **Abundance and seasonal variation of Western Sandpipers (*Calidris mauri*) in Baja California Sur, Mexico.** G. Fernandez, R. Carmona, and H. Cueva. 1998. Southwest. Nat. 43(1):57–61.—Mexico's Pacific coast is an important wintering area for the Western Sandpiper but little is known about the year-round population dynamics of these birds. Chametla Beach in southeastern Baja California Sur, Mexico was chosen as the site to census the population of Western Sandpipers from January 1992 to January 1993. The study area was comprised of two major habitat types: marsh and mudflats. The authors observed two waves of southbound migrants, one from July to September and the other from October to December. During August 2500 birds were observed mainly in alternate plumage, while 7000 birds were observed in November in basic plumage. Wintering populations were stable, and no major spring migration peak was noted. This supports evidence that the Baja California area is used both as a site for fall migration and as a wintering stopover destination. The sandpipers foraged mainly on the mudflats versus the marshes except for a short period between September and October. The extensive mudflats at Chametla Beach are important for the foraging and roosting of the Western Sandpiper and other shorebirds, which likely warrants its protection. [Centro de Investigacion Cientifica y de Educacion Superior de Ensenada, Km. 107 Carretera Tijuana-Ensenada, Ensenada, B.C., Mexico (U.S. mailing address P.O. Box 434844, San Diego, CA 92143)]—Tom Leiden.

40. **First Neotropic Cormorant, *Phalacrocorax brasilianus* (Aves: Phalacrocoracidae), breeding records for Arkansas.** M. K. Coldren, C. L. Coldren, K. G. Smith, and S. S. Lacy. 1998. Southwest. Nat. 43(4):496–498.—Since 1970, the Neotropic Cormorant's population has been increasing in the United States through the establishment of more colonies along the Texas and Louisiana coasts, and by moving inland. While conducting survey work for the Arkansas Breeding Bird Atlas during the summer of 1996, the authors came across a Neotropic Cormorant nesting in a herony in northern Lafayette County. This is the first nesting record for this state. The nest, containing two nestlings, was part of a huge colony composed mainly of Cattle Egret (*Bubulcus ibis*) nests. [Dept. Biol. Sciences, Univ. Arkansas, Fayetteville, AR 72701]—Tom Leiden.

41. **Distribution and derivation of Mallard band recoveries from the upper Mississippi River, 1961–1989.** L. A. Powell, W. R. Clark, and E. E. Klass. 1998. No. Amer. Bird Bander 23:2–12.—Banding data have been very useful in studying migration patterns and monitoring population trends in birds, especially waterfowl. The authors used banding and recovery data to determine the breeding and banding localities of Mallards (*Anas platyrhynchos*) that were recovered during the non-breeding season in the Upper Mississippi River. The area studied encompassed the 10′ latitude/longitude blocks that include the river from St. Paul, MN to Cairo, IL. There were two main objectives to this study: (1) to examine the importance of the Upper Mississippi to migrating Mallards, especially those that breed in SW Saskatchewan, SE Saskatchewan, SW Manitoba, and the Missouri River Basin; (2) to use banding data on a smaller regional scale, to determine the "derivation" of the harvest. Banding records of normal, wild Mallards banded during July-September, 1961–1989, and shot or found dead between October and June were used. Temporal trends were analyzed by using only those

banding areas that contributed at least 5% each of the total recoveries. Fifteen banding areas contribute Mallards to the Upper Mississippi River during the non breeding season and five of those contribute more than 5% each: SW Saskatchewan, SE Saskatchewan, SW Manitoba, the Missouri River Basin, and the Great Lakes Basin. Banding areas closest to the study site provided the most individuals. The contribution of birds using the Upper Mississippi River from the Great Lakes Basin and the Missouri River Basin declined during the study period (1961–1989) and there was a concomitant increase from SW Saskatchewan, SE Saskatchewan, and SW Manitoba during the same period. The analysis did not provide any indication that Mallard use of the study area had decreased during the time period (1961–1989) even though aerial surveys showed small declines during the 1980s. The authors conclude that this sort of analysis may not be able to detect the effects of habitat degradation on Mallard populations. [Dept. Animal Ecology, Iowa State Univ., Ames, IA 50011, U.S.A.]—James L. Ingold.

SYSTEMATICS AND PALEONTOLOGY

(see 42)

EVOLUTION AND GENETICS

42. **The origin and early evolution of birds.** K. Padian and L. M. Chiappe. 1998. Biol. Rev. 73:1–42.—The authors provide an excellent synthesis of the literature pertaining to the origin and evolution of birds during the Mesozoic Era. They summarize controversies regarding the origin of birds and flight; describe the first bird, Archaeopteryx; report on fossil discoveries in the Cretaceous Period including those of a recently discovered subclass of birds, Enantiornithes; and review the evidence regarding the proposed mass-extinction of birds at the Cretaceous-Tertiary boundary. Some of their conclusions include that birds are most closely related to theropod dinosaurs, flight most likely evolved from the ground-up rather than the trees-down, and that the fossil and molecular evidence do not support a mass extinction of birds at the Cretaceous-Tertiary boundary. One section of the paper that did not include all of the essential references was the origin of feathers, and many of the controversies the authors discussed have not been resolved to the extent they would have you believe. Overall, the paper was well written and I would recommend it to anyone that is interested in contemporary topics on the origin and evolution of birds. [Dept. of Integrative Biology and Museum of Paleontology, Univ. of California, Berkeley, CA 91730, U.S.A.]—David J. Horn.

PARASITES AND DISEASE

43. **Environmental characteristics associated with the occurrence of avian botulism in wetlands of a northern California refuge.** R. E. Rocke, N. H. Euliss, Jr., and M. D. Samuel. 1999. J. Wildl. Manage. 63:358–368.—Type C avian botulism affects many species of North American waterbirds and may cause the deaths of millions of birds in a single outbreak. The authors examined environmental characteristics of wetlands where outbreaks occurred with environmental characteristics in non-outbreak wetlands between 1987–1989. The occurrence of avian botulism was monitored in sentinel Mallards (*Anas platyrhynchos*) placed in 4 wetland enclosures, and data from the water column and the sediments of each wetland were collected at 10–14 day intervals. The authors included 7 factors for statistical analyses after performing a multivariate analysis on 22 environmental variables. They found that redox potential was lower in outbreak wetlands than in non-outbreak wetlands. Within outbreak wetlands, the probability of botulism increased with higher temperature, increased invertebrate abundance, and lower turbidity. The authors also noted that botulism outbreaks were not associated with shallow water or dissolved oxygen amounts. Since temperature, invertebrate abundance, and turbidity were not consistently different between outbreak and non-outbreak wetlands, the authors suggest that these factors have a more proximate effect in outbreak initiation. Due to low sample sizes and a narrow geographic range, the authors suggest that additional studies are needed to determine how mortality rates from botulism vary with environmental conditions. [U.S. Geological Survey, Biological Resources Div., National Wildlife Health Center, 6006 Schroeder Road, Madison, WI 53711, U.S.A.; e-mail: tonie_rocke@usgs.gov]—Kerri T. Vierling.

WILDLIFE MANAGEMENT AND ENVIRONMENTAL QUALITY

(see also 28, 34, 39)

44. **Quo vadis *Sterna hirundo*? Implications for the conservation of the Common Tern in Germany. [Auo vadis *Sterna hirundo*? Schlussfolgerungen für den Schutz der Flußeeschwalbe in Deutschland.]** P. H. Becker and S. R. Sudmann. 1998. Vogelwelt 119:293–304.—The authors summarize a symposium (Vogelwelt 119:121–304) on the Common Tern held in Wilhelmshaven, Germany in October 1997. The population in 1996 was 8500 pairs, about double what it had been in 1980. The increase in inland populations was the result of conservation measures, especially rafts and artificial islands constructed for tern breeding. On the other hand, human degradation of habitats and pollution were the most detrimental factors on the terns. The future existence of this species is dependent on human management, especially of the habitat. [Institut für Vogelforschung "Vogelwarte Helgoland," An der Vogelwarte 21, D-26386 Wilhelmshaven, Germany.]—Robert C. Beason.

BOOKS AND MONOGRAPHS

45. **A birder's guide to The Bahama Islands (Including Turks and Caicos).** Anthony W. White, American Birding Association, 1998. 302 pp., $26.95. This latest in the series of ABA bird-finding guides is the first outside the U.S. and one of the best. The first section is the obligatory discussion of climate, transportation, and other general advice, plus two useful tables concerning finding specialty birds and endemics. Each major island and virtually all of the smaller birdable islands in this archipelago are covered, an astounding accomplishment. The politically separate Turks and Caicos are covered due to their proximity. Every section has a list of "Recommended Readings" which seems quite extensive. There are maps throughout, with a few line drawings and photos sprinkled through the text. In another departure for ABA, there is a color section of photos in the middle of the book showcasing all of the species of interest. Following the site sections are an Annotated List for Bahamas specialties and a Checklist broken down into 19 major islands or island groups. This checklist uses ABA Birding Codes from 1–6 to assign a level of difficulty to a visitor's chances of finding each species. The checklist section ends with checklists for other major groups such as mammals, herps, and insects including butterflies and dragonflies. Three appendices cover Reporting Seabird Colonies, a Glossary, and a Common Name cross-reference. Last but not least is an 18-page bibliography with every reference a reader could ever want.

This book is obviously exhaustively researched, well written and extremely useful. It contains the only major published information about status and distribution for the Bahamas, and is an absolute requirement for any birder visiting. The quick and dirty "Finding Bahama Specialty Birds" on the inside front cover is a fast way to see what you are likely to find in any given area, although any writer's worst nightmare occurred here when an entire set of abundance codes was left out of the table. Fortunately, my copy came with a corrected table to be placed over the original. The formal Checklist on p. 230 covers the whole list, not just specialties, and is very complete. The Bahamas are not only a great place to see Caribbean birds including the three endemics (and one waiting in the wings, the Bahama race of Yellow-throated Warbler, *Dendroica dominica flavescens*), but offer great fall birding for North American migrants as well. Two of the endemics, Bahama Woodstar (*Calliphlox evelynae*) and Bahama Swallow (*Tachycineta cyaneoviridis*), have already occurred in Florida and the last will probably be found there sometime (Bahama Yellowthroat, *Geothlypis rostrata*). The Annotated Checklist section covers these and other species in good detail. For many of the islands, the only maps you will find are in this book, a feature that alone justifies its purchase. If you do visit here, check your rental vehicle's odometer for accuracy as they are wildly variable. Each section is well written, with clear directions and discussion of local items of interest. The photos are stunning, and cover many of the differences among local subspecies. Basically, this is an excellent book, and sets a high standard for site guides indeed. It is highly recommended, even if you may not ever make it there but are interested in Caribbean avifauna.—Giff Beaton.

46. **Bird sounds of Bolivia.** 1.0. CD-ROM for Windows 3.1 or Windows 95. 1996. Sjoerd Mayer, Bird Songs International B. V., The Netherlands. No list price available.—This CD contains the songs and calls of 538 species, and has more than seven hours of recordings of

Bolivian birds. Many species are extremely rare and a few have never before been recorded. Installing the CD is fairly easy, and once you figure out how to listen to a particular selection it is easy to use. Users can choose between English or Spanish language text. The index is broken up into 56 families, and within each family is a list of all the members of that family on the CD. To access this listing, you click on the "plus" sign next to the family name. Plus signs are used throughout to indicate where new levels of information are available. After accessing the family list, a click on the plus sign next to each species produces a list of selections for that species, with a letter grade from A–E to indicate the quality of the recording. A click on a "play" symbol starts the recording, and you can also listen to any portion of the recording you want. Below the symbol for the length of the recording is another plus sign which will give the details about the recording, such as location, date, elevation, name and address of the recorder, and names of other species in the background of that recording. A small outline of Bolivia here will show the location of the recording within Bolivia if you click on it. Once you get used to the system, it is very easy to quickly go to any species, in any order. Access time is very fast, a matter of seconds on both machines I tried (a desktop Pentium 233 and a laptop Pentium 150). There are also a couple of useful options, such as listing families by English name or by Latin name, and there is a quick search capability. The main list is so fast; I don't see how this would be used much. Ease of access and completeness should make this a wonderful tool for anyone wishing to study South American bird sounds, and it is highly recommended in that regard.

However, this CD is not without its drawbacks. First of all, the instructions are extremely weak. The help icon provides only minimal information. For instance, the map symbol only shows if you select the details about the recording, but you can hit "Ctrl+M" to get the map anytime a selection is playing. This tidbit is buried under Screen Elements, but is pretty useful. The letter grade for sound quality per recording is somewhat inconsistent. Most recordings identified with an "A" are pretty clear and loud, but some species with "C" grades are harder to hear or fuzzier than species with "D" or "E" grades. Additionally, there are sometimes many species listed as occurring in the background of the recording, without regard for how loud or how often they occur. All of the recordings on the tape are also given a "certainty" rating, which is 100% if not listed. Some species not seen during recording are given ratings as low as 50%, which reduces their value in terms of study. Lastly, some species which are common elsewhere but difficult to find in Bolivia are represented only by poor quality recordings. While obtaining all of the recordings locally is a worthwhile goal, I wonder if the user might have gotten more benefit out of a better recording of the same subspecies made elsewhere?

Overall, this CD has a remarkable amount of information in an easily accessible format, and would make a great study tool. Buyers with little computer experience might be initially frustrated while trying to learn how to use the CD, but the sheer wealth of songs and calls should make that initial frustration worthwhile.—Giff Beaton.