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RECENT LITERATURE

Edited by Robert C. Beason

RESEARCH TECHNIQUES

1. The effects of blood sampling on the behavior and survival of the endangered Chatham Island Black Robin (*Petroica traversi*). S. L. Ardern, I. G. McLean, S. Anderson, R. Maloney and D. M. Lambert. 1994. Conserv. Biol. 8:857–862.—The research need for frequent blood sampling of a small (~20–25 g), highly inbred (~130 birds derived from 1 pair in 1980), endangered passerine set the stage for a methods evaluation. Any deleterious effects of blood sampling on the behavior or survival of even a few individuals would be given serious consideration. Ten experimental birds were captured and bled by wing venipuncture of the right brachial vein using a 13-mm, 27-guage needle. Blood volumes ≤1% body mass were collected passively in hematocrit tubes. After bleeding, pressure was applied to the puncture with a guaze swab to ensure clotting and birds were fed glucose water as an energy supplement and to alleviate stress. Average handling time was 12.7 min. Compared to ten control birds, no significant differences were found in behavior or survival pre- or posttreatment. The authors caution that these results are species- and context-specific. Prior to undertaking blood sampling on other species, preliminary work is needed to identify any potential problems associated with temporal (e.g., breeding season), life history (uniparental vs. biparental care), or behavioral traits. [Centre for Conservation Biology, University of Auckland, Private Bag 92019, Auckland, NZ.]—Kristin E. Brugger.

2. Effects of harness-attached transmitters on premigration-reproduction of Brant. D. Ward and P. Flint. 1995. J. Wildl. Manage. 59:39–46.—Backpack transmitters were attached to nesting Brant (*Branta bernicla nigricans*) to evaluate brood survival and movements after hatching and to determine the timing of migration and movements of radio-tagged birds. Data were collected at the Tutakoke River colony, Alaska, during breeding seasons 1987–1989. Mean change in body mass did not differ between radio-tagged and control females. Arrival and departure dates of radio-tagged females were similar to those of the entire Izembek Lagoon population in 1987. However, the mean arrival date (19 September) of females with 35 g transmitters and ribbon harnesses was later than that of females with 32 g and 26 g transmitters and plastic-coated wire harnesses (3 September). Mean departure dates did not differ among females of all three harness types. More radio-tagged females were observed at high-tide roosts than control females, and nearly all radio-tagged females were unpaired and without juveniles. Return rates of radio-tagged females in subsequent breeding seasons were lower than control females. Ninety percent of the returning control females nested in subsequent breeding seasons, while the only one returning radio-tagged bird did not breed. Four radio-tagged females returned without their transmitters and bred. The authors conclude that harness-attached radio transmitters can negatively affect long-term reproduction and perhaps survival in Brant. They encourage further research in the area of transmitters and pair-bond formation and breakdown, and caution against attachment with plastic ribbon if harness-attached transmitters are necessary. [Nat. Biological Survey, 1011 E. Tudor Road, Anchorage, AK 99503, USA.]—Robin J. Densmore.

BEHAVIOR

(see also 6, 10, 11)

3. Attraction of kestrels to vole scent marks visible in ultraviolet light. J. Viitala, E. Korpimäki, P. Palokangas, and M. Koivula. 1995. Nature 373:425–427.—In northern latitudes, numbers of several species of raptors fluctuate synchronously with microtine populations. The mechanism by which raptors track changes in vole numbers has remained a mystery. Using both laboratory and field experiments, Viitala et al. offer a novel explanation for this phenomenon. Voles mark their runways with urine and feces, and the marks are visible in ultraviolet (UV) light. Reasoning that raptors might be sensitive to UV light, Viitala et al. presented captive Eurasian Kestrels (*Falco tinnunculus*) with a choice of four adjacent arenas: (1) vole trails and UV light, (2) vole trails and "visible" light, (3) no vole trails and UV light, and (4) no vole trails and visible light. In both time spent above arenas and number of scans,

kestrels consistently preferred arenas with vole trails and UV light and avoided those illuminated by UV light but with no vole trails. Interest in the two arenas illuminated by visible light was intermediate, presumably because the kestrels could not distinguish whether the arenas contained vole sign. In a field experiment using artificial runways, Viitala et al. made good use of the fact that kestrels readily nest in boxes. During a vole crash year when no natural runways were available, 45 boxes that had a history of kestrel use were randomly placed into one of three treatments: (1) artificial runways lined with vole urine and feces, (2) artificial runways without urine and feces, and (3) a control with no runways. Artificial runways were created near the boxes in early spring before the arrival of kestrels. "Treated" runways were lined with straw taken from the cages of captive male voles. Beginning during the arrival period, each box was observed for a total of 6–7 hours over 24 mornings. Consistent with results from the laboratory experiments, kestrels hunted preferentially near boxes surrounded by artificial runways lined with vole urine and feces. Although falconiform eyes have not been tested for sensitivity to UV light, most other birds studied to date have proved to be UV-sensitive. The logical conclusion from Viitala et al.'s ingenious experiments is that kestrels (and perhaps other diurnal raptors) flying over an area can see vole scent marks and use them to assess vole densities. In this way, they can rapidly scan large areas with relatively little effort and settle where the availability of voles is highest. [EK: Dept. of Biology, Univ. of Turku, FIN-20500 Turku, Finland.]—Jeff Marks.

4. Family structure influences mate choice in White-fronted Bee-eaters. P. H. Wrege and S. T. Emlen. 1994. Behav. Ecol. Sociobiol. 35:185–191.—White-fronted Bee-eaters (*Merops bullockoides*) are a colonial, cooperative breeding species that lives in family groups ranging from 2 to 17 individuals. Females are generally the dispersing sex while males typically remain within the family groups in which they were raised. For males, social structure and family composition are powerful predictors of their reproductive success (RS), and thus should have a profound influence on mate choice by dispersing females. Females, on the other hand, must make a choice between potential fitness payoffs obtained by helping raise offspring in her own family versus dispersing and pairing with a male of another family unit. The authors developed a set of algebraic equations that included all environmental, social, and demographic factors known to affect White-fronted Bee-eater RS, to create a payoff matrix of expected fitness (current and future) for females who mate with males of different ages and kinship ties. These matrices led to three predictions that were subsequently supported by data: (1) females with close family kin (particularly both parents) remained single and acted as helpers within their families, (2) older males with only distant kin were favored by females over young males with older close relatives, since the latter were more likely to be "recruited" by dominant family members to be helpers, and (3) females paired more frequently with males that had helpers of their own (typically their own offspring). However, since the univariate tests used to confirm these predictions were limited in terms of examining year to year availability of females and males of certain quality, simulation models were incorporated to further examine the pairing decisions of females. The results from these models which classified each observed or simulated pairing decision as "correct" or "incorrect," support the hypotheses that females make decisions that are correlated with expected RS, and contrast expected payoffs of the pairing versus helping options. This assessment appears to be quite complex and involves multiple information sources including relatedness to other breeders, age, and group size, none of which when considered alone provided sufficient information for this decision. From these data, the authors strongly suggest that in socially breeding species, not only is female choice for a mate influenced by such factors as ability to care for young, control of resources, and "good genes," but also profoundly by favorable social position of males within their groups. [Section Of Neurobiology and Behavior, Cornell Univ., Ithaca, NY 14853-2702, USA.]—Danny J. Ingold.

FOOD AND FEEDING

(see also 20)

5. Effects of individual foraging strategies of Common Terns (*Sterna hirundo*) on their presence at the colony site. [Auswirkungen individueller Ernährungsstrategien von Flußseechwalben (*Sterna hirundo*) auf die Anwesenheit am Koloniestandort.] H. Wendeln,

S. Michstein and P. H. Becker. 194. 37:290–303. (German with English summary.)—Individual foraging techniques of Common Terns were studied at the colony in Wilhelmshaven, Germany in 1992. Some individuals preferred marine food, mostly smelt (*Osmerus eperlanus*), and fed predominately during low tide. Other species fed on freshwater fish, mostly three-spined sticklebacks (*Gasterosteus aculeatus*) taken during high tide and flood conditions. There was a strong correlation within pairs for the type of food preferred and foraging strategy used. In the week before egg laying, females were more numerous on the colony than males because males spent more time foraging and bringing food to the females. Males more frequently brought sticklebacks (0.8 trips/hour) to the females than marine fish species (0.3 trips/hour). [Inst. Vogelforschung, Vogelwarte Helgoland, An der Vogelwarte 21, D-26386 Wilhelmshaven, Germany.]—Robert C. Beason.

SONGS AND VOCALIZATIONS

6. Vocalizations of the Tree Swallow (*Tachycineta bicolor*) during the prelaying period: a structural and contextual analysis. M. Y. Sharman, R. J. Robertson, and L. M. Ratcliffe. 1994. Am. Midl. Nat. 132:264–274.—Vocalizations of Tree Swallows were distinguished and named using structural characteristics rather than contextual information, in a population of swallows in Ontario from late April through late May 1991. In addition, different vocalizations were quantified relative to their occurrence within different behavioral contexts, and individual variation in call structure was examined. The authors identified five different call types and one song type in both male and female swallows, although males gave the ticking call and song significantly more often than females. The examination of five structural parameters revealed no significant differences between the calls and song of males versus females. Moreover, with the exception of the chirp call, there were no significant sexual differences in the behavioral context in which calls were made. Call variation among individuals was most notably detectable in the maximum and minimum frequency of calls, and only slightly detectable in such temporal parameters as call and figure duration. These data thus suggest that the frequency of calls may play a more important role in individual recognition than various temporal parameters. [Dept. of Biology, Queen's Univ., Kingston, ON K7L 3N6, Canada.]—Danny J. Ingold.

NESTING AND REPRODUCTION

(see also 2, 3, 4, 5, 15, 16)

7. Factors affecting nest re-use in the Rufous Turtle Dove *Streptopelia orientalis*. T. Wada. 1994. Japanese J. Ornithol. 42:41–51.—Of 192 Rufous Turtle Dove nesting efforts in Kyoto, Japan, 47.4% were in newly constructed nests, 10.9% in old but not previously used nests, and 14.1% were in old previously used nests. The remainder were of unknown status. Some nests were used up to 7 times. In two successive uses of a nest, 37.7% of the time at least one member of the pair was the same; in 34.8%, both pair members were different. Nest reuse was least from April through June and greatest October to March. Distance between successive nests for a pair was greater following nest failure. [Dep. of Zoology, Faculty of Sciences, Kyoto University, Sakyo-ku, Kyoto 606, Japan.]—Jerome A. Jackson.

8. Nest-site characteristics in the Black-billed Magpies *Pica pica sericea*. M. Takeishi and K Eguchi. 1994. Japanese J. Ornithol. 42:53–59.—Conclusions drawn from this study of Black-billed Magpie nests south of Saga City, Japan, between 1979 and 1983 include: (1) nest density was higher (0.85 nests/ha) in residential areas than in croplands (0.04 nests/ha), although no preference was shown for nesting near human habitation; (2) 46% of nests were on utility poles; (3) most tree nests were in tall trees and in the top 30% of those trees; (4) most available tree species were used as nest sites; and (5) early nests tended to be in taller trees than later nests. Potential nest sites were less available in the cropland. Presentation of the data is not always clear. For example, Table 2 includes data for 407 nests built between 1979 and 1981, while the text indicates that during the five years from 1979 to 1983, 121 active nests were found. Apparently the latter were from an undefined core "subset" of the larger study area. Nesting success varied significantly with the vegetation substrate, being lowest (52%) in persimmon (*Diospyros* spp.) and highest (82%) in hackberry (*Celtis* spp.).

The lower nest success in persimmon trees is suggested to be a result of these trees being shorter and more accessible to predators. [Kitakyushu Museum of Natural History, Kitakyushu, 805, Japan.]—Jerome A. Jackson.

9. The good, the bad and the ugly: Lack's brood reduction hypothesis and experimental design. L. S. Forbes. 1994. J. Avian Biol. 25:338–343.—Lack's brood reduction hypothesis (BRH) provides a framework for understanding the adaptive significance of hatching asynchrony in birds. Accordingly, it has become the standard by which competing hypotheses are evaluated. Forbes contends that most tests of Lack's hypothesis are inadequate largely because they fail to distinguish between "good" and "bad" years. Here, he describes the problem and provides what he considers to be the appropriate experimental design for tests of the BRH. In purported tests of the BRH, researchers typically manipulate hatching synchrony of clutches without properly assessing "year quality." Because year quality likely varies along a continuum, it is essential that investigators define where the threshold for brood reduction lies. Forbes thus defines a "bad" year as one in which a synchronous clutch of n eggs would be outperformed by a clutch of n-1 eggs. Conversely, a "good" year is one in which a synchronous clutch of n eggs would outperform one of n-1 eggs. Under Lack's BRH, an asynchronous clutch of n eggs would outperform a synchronous clutch of the same size in a bad year but not necessarily in a good year. These definitions of good and bad years require experimental manipulation of clutches, which leads Forbes to outline three steps needed to test the BRH. First, year quality (as defined above) is assessed by experimental creation of synchronous clutches. Second, the relative success of synchronous versus asynchronous clutches is compared. In step 2, the only conclusive prediction is that an asynchronous clutch of n will outperform a synchronous clutch of n in a bad year. Third (and most difficult), the frequency of bad years must be measured to determine whether brood reduction bestows a net long-term benefit. Adoption of Forbes's methods should allow researchers to conduct much stronger tests of Lack's BRH. [Dept. of Biology, Univ. of Winnipeg, Winnipeg, MB R3B 2E9, Canada.]—Jeff Marks.

10. Genetic evidence for monogamy in the cooperatively breeding Red-cockaded Woodpecker. S. M. Haig, J. R. Walters, and J. H. Plissner. 1994. Behav. Ecol. Sociobiol. 34: 295–303.—Among the many potential payoffs for helpers at the nest in a cooperatively-breeding bird species is the opportunity for direct reproduction with the breeding female in the case of males, and egg-dumping in the case of females. The authors used DNA profiles to compare the relatedness of putative parents and offspring with and without helpers in 224 Red-cockaded Woodpeckers (*Picoides borealis*) in the Sandhills region of south-central North Carolina. They then compared these relatedness values to those obtained from a pedigree for 3,823 Red-cockaded Woodpeckers studied in the Sandhills population from 1979 to 1992. Calculation of relatedness among all sampled birds resulted in 20 categories of relatedness ranging from $r = 0$ to 0.75. A significant correlation between relatedness and DNA band similarity was detected in the sample group ($P < 0.001$). Among the 28 families in which parents raised nestings without helpers, no instances of nonparental bands were found. Of 16 groups in which helpers assisted the putative parents, only one clear indication of nonparental bands was detected. In this instance the chick was reared in a brood that had been assisted by a cousin (the putative father's nephew). DNA band similarity values for full siblings, putative mother-offspring comparisons, and putative father-offspring comparisons did not differ, suggesting that extra-pair matings involving male helpers and intraspecific brood parasitism involving female helpers was rare or absent. The relatedness values obtained were essentially consistent with the pedigree values developed over a 13-year period, and seem to indicate that reproductive opportunities for helpers in Red-cockaded Woodpeckers are not a major force in the maintenance of cooperative breeding in this species. Further, the authors discuss some of the possible mechanisms that prevent breeding between helpers and breeding females; in addition, they suggest that estimates of effective populations' sizes for this species be based on the assumption that the species is monogamous. [National Biological Survey, 3200 S.W. Jefferson Way, Oregon State Univ., Corvallis, OR 97331, USA.]—Danny J. Ingold.

11. How reliable are behavioral cues for assessment of male mating status in polyterritorial Wood Warblers, *Phylloscopus sibilatrix*? H. Temrin and S. Stenius. 1994. Behav. Ecol.

Sociobiol. 35:147–152.—The argument has been raised that polyterritoriality in birds, i.e., mated males defending two spatially separated territories, could deceive females into pairing with already-mated males, which could then result in a reduction in female fitness. In Wood Warblers, for example, secondary females receive significantly less male assistance compared to females of monogamous males. This deception hypothesis has been challenged, however, since behavioral differences between mated males on secondary territories and unmated males on primary territories should be perceptible by unmated females arriving on the breeding grounds. In this study, the authors set out to determine the reliability of singing behavior and the amount of time spent on territories by unmated versus mated males, as a mechanism for female Wood Warblers to assess male mating status. The study was conducted near Stockholm, Sweden during eight years between 1982 and 1994. No significant difference was detected in singing activity between mated males on secondary territories and unmated males in the morning. Unmated males did sing significantly more on their territories than mated males did on secondary territories in the afternoon. Mated males on secondary territories spent significantly less time on their territories both in the morning and afternoon, than did unmated males. Although no difference was detected in the average length of time that mated males spent away from their secondary territories compared to unmated males, mated males left their secondary territories significantly more often than unmated males. However, a significant proportion of unmated males (62%), and a significantly smaller proportion of mated males on secondary territories (32%), never left their territories. Ostensibly, whether or not males leave their territories should serve as a fairly reliable indicator to females of their mating status. Moreover, this indicator should become more reliable with the progression of time since unmated males stayed on their territories increasingly more as the season progressed compared to mated males. The most important factor affecting the probability of finding an unmated male, however, was the proportion of unmated males compared to mated males on secondary territories at any given time. This proportion varied noticably between years and likely makes it difficult for females to know when to spend time trying to assess male mating status. Thus these data seem to suggest that using territory presence as a cue to assess male mating status is not a highly reliable predictor of male mating status in polyterritorial Wood Warblers. [Division of Ethology, Dept. of Zoology, Stockholm Univ., S-106 91 Stockholm, Sweden.]—Danny J. Ingold.

12. Breeding bird response to pine-grassland community restoration for Red-cockaded Woodpeckers. C. W. Wilson, R. E. Masters, and G. A. Bukenhofer. 1995. J. Wildl. Manage. 59:56–67.—Habitat restoration plans for the endangered Red-cockaded Woodpecker (*Picoides borealis*) which inhabits fire-dependent, pine-grassland communities, typically involve the thinning of midstory and codominant trees (WSI), as well as prescribed fire. This management strategy often results in a conversion from closed-canopy pine-hardwood forests to more open pine-grassland woodlands. The objective in this study was to determine how pine-bluestem (*Pinus* spp. & *Andropogon* spp.) habitat restoration would affect the breeding bird community in the Ouachita Mountains in west-central Arkansas. The authors quantified relative bird abundance and frequency during two breeding seasons on untreated pine-hardwood stands, as well as on treated stands after WSI and up to three breeding seasons post-WSI and prescribed fire. Highest total breeding bird densities occurred in WSI-second year post burn (WSI-B2) plots and the lowest in untreated plots; species richness did not differ among plots. Midstory removal and prescribed fire did reduce densities of some species that require closed-canopy hardwood habitats, such as the Whip-poor-will (*Caprimulgus vociferus*), Ovenbird (*Seiurus aurocapillus*) and Black-and-white Warbler (*Mniotilta varia*). Conversely, the densities of species associated with forest edges including the Carolina Wren (*Thryothorus ludovicianus*), Northern Cardinal (*Cardnalis cardnalis*), American Goldfinch (*Carduelis tristis*) and Brown-headed Cowbird (*Molothrus ater*) increased on treated plots. Ten pine-grassland species that are reported to be undergoing population declines, including the Red-headed Woodpecker (*Melanerpes erythrocephalus*), Brown-headed Nuthatch (*Sitta pusilla*), Eastern Wood Pewee (*Contopus virens*), and Prairie Warbler (*Dendroica discolor*), all increased in abundance or frequency on postburned treated plots. Densities of ground, shrub, bole, and aerial foraging species, as well as shrub and canopy-nesting species also increased on stands following WSI and burning. Only some ground-nesting species (mainly Black-and-White Warblers and Ovenbirds) decreased after WSI and remained low after burning; how-

ever, the frequency of occurrence of Wild Turkeys (*Meleagris gallopavo*) and Northern Bobwhites (*Colinus virginianus*) increased on treated plots, indicating that not all ground-nesting species were adversely affected by WSI and fire. These data suggest that some species of neotropical migrants (Ovenbird, Black-and-White Warbler) will decline on pine-bluestem restoration plots while others more dependent on early successional or open forest habitats (i.e., Eastern Wood Peewee; Prairie Warbler; Indigo Bunting [*Passerina cyanea*]) will benefit. Dept. of Forestry, Oklahoma State Univ., Stillwater, OK 74078, USA.]—Danny J. Ingold.

MIGRATION, ORIENTATION, AND HOMING

(see 2, 21)

HABITAT USE AND TERRITORIALITY

(see also 8, 12, 21, 24)

13. Gray Partridge winter home range and use of habitat in North Dakota. J. P. Carroll, R. D. Crawford, and J. W. Schultz. 1995. J. Wildl. Manage. 59:98–103.—The objective of this study was to determine Gray Partridge (*Perdix perdix*) habitat use compared with habitat availability. One hundred Gray Partridges from 17 coveys were radio tagged during winters from 1985–1987 in Pierce County, North Dakota. Mean convex polygon home-range size was 116 ha and mean movement per day was 256 m. Cereal grain was the most frequently used habitat followed by sunflower; together they accounted for more than 80% of partridge habitat used. Proportions of habitats within home ranges were not different from proportions available in the study area. Proportions of individual radio locations were different from proportions of habitats occurring in each home range. Analysis of individual habitats showed that sunflowers and cereal grains had the most relative use, while idle/wetland and hay/pasture habitats were least used. The authors suggest that the introduction of sunflowers provides an important new wintering habitat for Gray Partridges. [Dept. of Biology, Box 8238, Univ. of North Dakota, Grand Forks, ND 58202, USA.]—Danny J. Ingold.

14. Nongame bird use of habitat in central Appalachian riparian forests. N. L. Murray and D. F. Stauffer. 1995. J. Wildl. Manage. 59:78–87—Most research has demonstrated that avian species richness and abundance are greater in riparian habitats than in adjacent habitats, particularly when there are pronounced structural differences between them resulting in an edge effect. The goal of the authors in this study was to compare avain assemblages along a gradient from riparian zones to upland zones in hardwood and hemlock forests in southwestern Virginia. Species richness and total relative abundance of 62 bird species were not affected by distance from streams. Acadian Flycatchers (*Empidonax virescens*), Louisiana Waterthrushes (*Seiurus motacilla*), and American Robins (*Turdus migratorius*), however, were found in significantly greater numbers near streams, while numbers of Eastern Wood Pewees (*Contopus virens*), Black-and-white Warblers (*Mniotilta varia*), Pine Warblers (*Dendroica pinus*), Worm-eating Warblers (*Helmintheros vermivorus*), and Scarlet Tanagers (*Piranga olivacea*) increased with distance from streams. Ruby-throated Hummingbirds (*Archilochus colubris*), Great-crested Flycatchers (*Myiarchus crinitus*), and White-breasted Nuthatches (*Sitta carolinensis*) were most abundant in deciduous riparian zones versus Black-and-white Warblers and Wood Thrushes (*Hylocichla mustelina*) which were most abundant in hemlock (*Tsuga canadensis*) riparian habitat. A cluster analysis based on relative abundances at 69 sampling sites identified five groups of species assemblages along a gradient of five habitat types from riparian to upland forests. The assemblage comprising Acadian Flycatchers and Louisiana Waterthrushes was distinct from the other four assemblages. These data suggest that the protection of riparian habitats isn't necessarily essential to maintain high avian species abundance and diversity. However, since Acadian Flycatchers and Louisiana Waterthrushes (both neotropical migrants) were dependent on riparian habitat, the retention of buffer strips around such habitats should benefit them from the effects of timber harvest. [Dept. of Fisheries and Wildl. Science, Virginia Polytechnic Institute and State Univ., Blacksburg, VA 24061-0321, USA.]—Danny J. Ingold.

15. Relationships between vegetation structure and predation of artificial Sage Grouse nests. A. DeLong, J. Crawford, and D. DeLong, Jr. 1995. J. Wildl. Manage. 59:88–92.—Arti-

ficial nests were used to assess effects of shrub, forb, grass cover and height on predation of Sage Grouse (*Centrocercus urophasianus*) during April–June 1991–1992 in Lake County, Oregon. Of 330 artificial nests, 233 were depredated. Greater amounts of both tall grass cover and medium shrub cover were associated collectively with reduced probabilities of nest predation. In order to increase Sage Grouse productivity, the authors suggest the use of management practices that increase cover and height of native grasses in sagebrush communities with medium height shrubs. Some of the management practices suggested include the monitoring of livestock grazing and the removal of livestock when minimum levels for successful nesting are reached. [Dept. of Fisheries and Wildl., Oregon State Univ., Corvallis, OR 97331-3803, USA.]—Robin J. Densmore.

16. Characteristics of Spotted Owl nest trees in the Wenatchee National Forest. J. Buchanan, L. Irwin, and E. McCutchen. 1993. J. Raptor Res. 27:1–7.—Eighty-five Spotted Owl (*Strix occidentalis*) nests were examined on the east slope of the Cascade Mountains in Washington during 1988–1990. With seven exceptions, Spotted Owls nested exclusively in Douglas fir (*Pseudotsuga menziesii*) trees. Most nest trees were dominant or codominant in the canopy, ranged from 66–700 yr of age (median 137 yr), and were significantly older than randomly selected trees. Nest trees were also significantly larger (66.5 cm mean dbh) than random trees (53.1 cm mean dbh); however, nest tree height was not significantly different than the height of random trees. Mean nest height was 16.9 m, and most nests were either on or immediately adjacent to the trunk. Fifty-five percent of nests were abandoned accipter nests, 25% were within mistletoe (*Arceuthobium douglasii*) brooms, 10.6% in cavities, 5.9% on broken tops, and 3.5% on large branches. The mean angle of nest exposure relative to the trunk was southeast. The authors conclude that Spotted Owl use of younger and smaller nest trees in this study compared to others is a result of fire and logging on this particular region. Moreover, the authors state that mistletoe clumps and accipiter nests may facilitate Spotted Owl use of younger stands. [Washington Dept. of Wildl., Wildl. Manage. Div., 600 Capitol Way North, Olympia, WA 98501, USA.]—Robin J. Densmore.

POPULATION DYNAMICS

(see also 2, 9)

17. Response of Northern Pintail breeding populations to drought, 1961–92. J. B. Hestbeck. 1995. J. Wildl. Manage. 59:9–15.—Data collected from 1959–1968 indicate that Northern Pintails (*Anas acuta*) fly north of the Canadian prairies of Alberta and Saskatchewan to breed when the number of May ponds on these more southern breeding grounds drecreases, resulting in declines in Pintail production. The author used these and additional data collected from 1969–1992 to reexamine the effects of drought on Pintail overflight and production levels. A ratio of the number of Pintails in the North (from Alaska to northern Alberta) to the number of Pintails in the South (southern Alberta and Saskatchewan) was used as an index of pintail overflight (North/South ratio); the visibility-adjusted total number of May ponds in the south was used as an indicator of available breeding habitat. The relationship between the total number of May ponds and the number of northern versus southern Pintails changed over time. The expected inverse relationship between a decreased number of May ponds in the South and the number of Pintails flying north was detected from 1961–1968 and 1980–1992, but not during the 1970s (a period with more May ponds in the South). In addition, an inverse relationship between overall Pintail production, measured as harvest-age ratio, and numbers of Pintails in the North was detected for 1961–1968, but not for the 1970–1992. The declining relationship between harvest-age ratio and North-South ratio from 1970–1992 is likely the result of lower age ratios for years when large numbers of Pintails were on the southern prairies (e.g., 1980s). These data suggest that Pintail production in southern prairie-pothole regions have declined and may be nearing the production in northern regions. [National Biological Survey, Patuxent Environ. Science Center, Laurel, MD 20708, USA.]—Danny J. Ingold.

ZOOGEOGRAPHY AND DISTRIBUTION

(see also 17, 24)

18. Prehistoric extinctions of Pacific island birds: biodiversity meets zooarchaeology. D. W. Steadman. 1995. Science 267:1123–1131.—Humans began inhabiting Micronesia and Polynesia about 3500 years ago and colonized almost all of Oceania by 1000 years before present. Most of the birds of this region were extremely tame, having evolved in the virtual absence of predators. As a result, humans and the mammals they brought with them (e.g., dogs and rats) caused widespread extirpations and extinctions in Oceania. In this paper, Steadman provides a thorough review of the fossil and subfossil record of birds on Pacific islands. He then uses these data to estimate the total number of bird species lost to the activities of humans. The result is both staggering and depressing, with an estimated "2000 species that would have been alive today had people not colonized Oceania." Most of them were flightless rails. As Steadman clearly points out, extinction is the rule and survival the exception when humans arrive on remote islands. Sadly, it appears that the extinction vortex that began when humans spread across the globe will continue into the future. [New York State Museum, 3140 Cultural Education Center, Albany, NY 12230, USA.]—Jeff Marks.

19. Remains of land birds from Lisianski Island, with observations on the terrestrial avifauna of the Northwestern Hawaiian Islands. S. L. Olson and A. C. Ziegler. 1995. Pac. Sci. 49:111–125.—Laysan Island is well known for its nesting seabirds and its populations of two so-called endemics, the Laysan Duck (*Anas laysanensis*) and Laysan Finch (*Telespiza cantans*). James and Olson (1991, Ornithol. Monogr. 46) documented recently that the Laysan Finch is well represented in fossil deposits on the main islands of Oahu and Molokai. In this paper, Olson and Ziegler report results of the latter's expedition to Lisianski Island in 1990. Lisianski is a small coral island located 225 km WNW of Laysan. Visitors to the island during the early nineteenth century reported ducks and rails, but neither taxon was present during the first scientific expedition to Lisianski in 1891. Ziegler's excavations uncovered numerous bones of Laysan Ducks but no other land bird remains except for a single rail bone that probably came from one of the Laysan Rails (*Porzana palmeri*) introduced unsuccessfully to Lisianski in 1913. Olson and James recently recovered duck bones that are "indistinguishable from those of the Laysan Duck" on the main islands of Maui and Hawaii. Thus, the fossil record shows that two species long considered to be Laysan endemics were in fact fairly widespread prior to human occupation of the Hawaiian Islands. These findings strongly suggest that both the duck and the finch evolved on the main Hawaiian Islands and subsequently colonized the remote Northwestern chain, where they flourished in the absence of humans. [Dept. of Vertebrate Zoology, Smithsonian Institution, Washington, DC 20560, USA.]—Jeff Marks.

20. The summer distribution of Procellariiformes in the central North Atlantic Ocean. H. Skov, J. Durnick, F. Danielsen and D. Bloch. 1994. Vogelwarte 37:270–289.—Seven species of petrels were common enough over the 9000 km of transects traversed in 1987 and 1989 to analyze for the influence of physical factors on their distribution. All seven species were clumped in distribution, with the greatest concentrations along the edges of the continental shelves and over oceanic ridges. The abundances of most species were negatively correlated with water temperature. The exception was the Fulmar (*Fulmarus glacialis*) which was most common in cold waters. The species segregated by the distance they foraged from the colony. Fulmars and Manx Shearwaters (*Puffinus puffinus*) foraged the farthest, up to 1000 km, although Manx Shearwaters were most common within 600 km of land. Leach's Storm-petrel (*Oceanodroma leucorhoa*) foraged the closest (within 100 km) and the British Storm-petrel (*Hydrobates pelagicus*) was intermediate (400 km). Great Shearwater (*Puffinus gravis*), Sooty Shearwater (*Puffinus griseus*) and Cory's Shearwater (*Calonectris diomedea*) overlapped in their distributions with the other species. Great, Sooty and Cory's Shearwaters were significantly associated with each other and common in the Charlie Gibbs Fracture Zone at the south end of the Reykianes Ridge between Island and Greenland. No other species were negatively or positively associated. One of the greatest problems with interpreting the results of this study is determining whether the birds observed, especially those far from the colony,

were breeding or nonbreeding individuals. [Ornis Consult Ltd., Vesterbrogade 140, 1620 Copenhagen V, Denmark.]—Robert C. Beason.

21. The international importance of the French coastline for waders in winter. [Valeur internationale du littoral français pour les limicoles en hivernage.] R. Mahéo. 1992. Alauda. 60:227–234. (French with English summary.)—The French coastline has proven to be important internationally for the survival and migration of European shorebirds. Approximately 12% of all European shorebirds (400,000 birds) migrate down the French coastline each year. The author examined the migration patterns of 12 species of shorebirds. The examination of *Haematopus ostralegus* (Oystercatcher), *Recurvirostra avosetta* (Avocet), *Charadrius hiaticula* (Ringed Plover), *Pluvier squatarola* (Grey Plover), *Calidris alba* (Sanderling), *C. alpina* (Dunlin), *Limosa lapponica* (Bar-tailed Godwit), *Numenius arquata* (Curlew), *Tringa totanus* (Redshank) and *Arenaria interpres* (Turnstone) revealed the importance of the French coastline for the ecology of the entire European shorebird population. It is especially important and used by the Avocet (46.4% of the populations), Grey Plover (27.7%), Dunlin (21.1%), Bar-tailed Godwit (14.3%) and the Ringed Plover (14.1%). The author indicated that there are six areas that are especially important–the Baie du Mont Saint Michel, Baie de Morlaix/Penze, Golfe du Morbihan, Baie de Bourgneuf, Baie de l'Aiguillon/Arcay, and the Baie de Moeze/Oleron. The Ramsar Convention determined the international importance of the habitat of shorebirds. To be considered an internationally important site such as these six areas, 1% of the known total number of a shorebird's species and/or population must be geographically located there. The French coastline is integral for many of the European birds. Many of the previously mentioned areas have not been notified and therefore are unaware of their importance. Consequently, they are not able to take protective measures to ensure the survival of the shorebirds. In conclusion, the author stresses the need for localities to impose regulatory measures for the coastal species to assure French coastal survival. [Station Biologique de Baileron, 56860, Sene, France.]—Tracy Danga.

SYSTEMATICS AND PALEONTOLOGY

(see 18, 19)

EVOLUTION AND GENETICS

(see 10, 19)

PHYSIOLOGY AND DEVELOPMENT

(see also 3)

22. A review of lead poisoning in swans. L. J. Blus. 1994. Comp. Biochem. Physiol. 108C:259–267.—Lethal lead poisoning has been documented in tens of thousands of swans since the first record by Grinnell in 1894. Plumbosis, or lead toxicosis, results from ingestion of lead artifacts (primarily shotgun pellets and fishing weights; secondarily environmental lead from mining or smelting) and subsequent adverse effects on all organ systems. Deaths have been documented in 14 swan species. Incidents for 6 species are reviewed in an extensive table, including number of swans killed, presence of lead shot or fishing weights, and lead concentrations in liver or kidney. Diagnostic evidence of lead toxicosis is described, such as lower lethal concentrations in liver (4 to 13 μg/g tissue) and kidney (~31 μg/g) and findings at necropsy (enlarged gall bladder filled with green viscous bile, emaciation, impacted proventriculus and esophagus, lead artifacts in gut). Lead poisoning of swans is expected in areas with significant concentrations of available lead. Lead toxicosis can reduce local populations, as occurred for Mute Swans (*Cygnus olor*) in the Thames River with populations experiencing up to 30% annual decline in the 1970s and 1980s. Legislation to ban lead fishing weights in the UK and to promote steel shot in the USA and Denmark provide optimism that the incidence of lead poisoning will decline in these areas. [National Biological Survey, Patuxent Wildlife Research Center, 3080 E. Clearwater Drive, Corvallis OR 97333, USA.]—Kristin E. Brugger.

23. Fasting endurance and cold resistance without hypothermia in a small predatory

bird: the metabolic strategy of Tengmalm's owl, *Aegolius funereus*. E. Hohtola, A. Pyörnilä, and H. Rintamäki. 1994. J. Comp. Physiol. B. 164:430–437.—For birds living in temperate climates, the challenge of balancing energy input with energy expenditure is complicated by cold temperatures and unpredictable food supplies. This problem is further exacerbated by small body size and its resultant high surface-to-volume ratio, which promotes heat loss and rapid energetic turnover. Recent research suggests that many birds conserve energy during periods of energetic stress by utilizing torpor, a reversible, shallow depression of metabolic rate and body temperature lasting several hours. Tengmalm's Owl (*Aegolius funereus*) is a small, boreal forest-dwelling owl that preys primarily on voles, the populations of which fluctuate cyclically. In light of these energetic pressures, the authors examined this species to determine its energetic strategies. Owls were captured in western Finland and brought to the lab where they were exposed to conditions of low ambient temperature and food deprivation. Metabolic rate, body temperature, evaporative water loss, and plasma triiodothyronine concentration were recorded. The results indicate that in contrast to other small birds, Tengmalm's Owl does not enter torpor. Instead, it conserves energy by maintaining a lower mass-specific basal metabolic rate than other nonpasserine bird species. It also relies on ample insulation and an ability to accumulate substantial fat stores. The authors suggest that because owls do not drink free water, but rely instead on metabolic water, reducing the metabolic rate to enter torpor would upset the water balance resulting in dehydration. [Dept. of Zoology, Univ. of Oulu, P.O. Box 400, FIN-90571, Oulu, Finland.]—Scott W. Gillihan.

WILDLIFE MANAGEMENT AND ENVIRONMENTAL QUALITY

(see also 1, 12, 15, 22)

24. Effects of habitat area on the distribution of grassland birds in Maine. P. D. Vickery, M. L. Hunter, Jr., and S. M. Melvin. 1994. Conserv. Biol. 8:1087–1097.—The breeding-area requirements of 10 bird species were evaluated at 90 grassland barren sites in coastal Maine (a state with ~90% forest cover). Circular plots were censused twice each for 5 min from 1 June to 18 July in either 1989 or 1990. An unbiased conservative estimator, 50% incidence (I50) was used in analyses. Upland Sandpipers (*Bartramia longicauda*) were infrequent at sites <50 ha and reached I50 at sites ~200 ha. Grasshopper Sparrows (*Ammodramus savannarum*) reached I50 at ~100 ha, Vesper Sparrows (*Pooecetes gramineus*) at ~20 ha and Savannah Sparrows (*Passerculus sandwichensis*) at ~10 ha. Incidence of three edge species (Brown Thrasher [*Taxostoma rufum*], Common Yellowthroat [*Geothlypis trichas*], and Song Sparrow [*Melospiza melodia*]) was negatively correlated with area, and incidence for Field Sparrows (*Spizella pusilla*) was not strongly influenced by grassland size. The authors suggest that a diverse grassland bird fauna would require grasslands ~200 ha in area, but only 1% of hayfields and 8% of grassland-barrens in Maine were >64 ha. Airports may offer the last extensive patches of grassland habitat in the Northeast, thus land management efforts at these sites will become important to maintaining grassland birds. [Wildlife Department, University of Maine, Orono, ME 04469, USA.]—Kristin E. Brugger.

25. Methyl Anthranilate as a rice seed treatment to deter birds. M. L. Avery, D. G. Decker, J. H. Humphrey, E. Aronov, S. D. Linscombe, and M. O. Way. 1995. J. Wildl. Manage. 59:50–56.—Blackbird seed depredation in rice fields may result in millions of dollars of losses annually. One approach to deterring birds from rice fields is by treating plants with varying doses of nonleathal chemical repellents such as methyl anthranilate (MA). In this study, the authors tested the repellency power of a derivative of MA (ReJeX-iT AG-36) on captive Red-winged Blackbirds (*Agelaius phoeniceus*); in addition, controlled tests under natural field conditions were conducted in coastal rice fields in Louisiana and Texas. When presented with MA-treated rice and a commercial nonrice alternative, captive blackbirds persistently feed on the rice up to the 2.5% MA before switching. Alternatively, when captive birds were presented with untreated rice as an alternative, the treated rice was an effective deterrent at 1% MA. Overall seed loss in 0.7% and 1.7% MA-treated field plots was 51% and 34% respectively while overall seed loss in control field plots was 74%. These findings seem to suggest that Red-winged Blackbirds will tolerate MA at relatively high levels if an alternative food is absent or undesirable; however, Red-wings were very selective and were deterred by MA levels as low as 0.5% when the alternative food was untreated rice. The authors suggest

that MA treatment of rice alone may not represent a satisfactory solution to blackbird-rice depradation. However, MA treatment has potential if it is considered as one of several alternatives to blackbird repellancy, particularly since MA residues on rice declined linearly within days after being treated. [U.S. Dept. of Agriculture, Denver Wildl. Research Center, Florida Field Station, 2820 E. Univ. Av., Gainesville, FL 32601, USA.]—Danny J. Ingold.