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RECENT LITERATURE

Edited by Danny J. Ingold

BEHAVIOR

(see also 8, 10, 11, 12, 15, 17, 19, 20, 25, 29, 34)

1. Movements, space use and social organization of radio-tracked Common Cuckoos during the breeding season in Japan. H. Nakamura and Y. Miyazawa. 1997. Japanese J. Ornithol. 46:23–54.—This study of the brood parasitic Common Cuckoo (*Cuculus canorus*) included observations of 333 cuckoos that were captured and marked with wing tags or wing ribbons. Of these, 81 were also fitted with radio transmitters. Although the authors cite 10 years of study (1984–1993) most of the data presented are from 1984–1985 breeding seasons. Both sexes tended to maintain separate "breeding" and "feeding" areas, the breeding areas being in a riparian area where potential hosts were common, the feeding areas being most frequently in nearby montane forest. Identification of the "feeding" areas as sites where the birds found food is circumstantial, but probable. The understory vegetation was dense and feeding observations were rarely made. Distance between breeding and feeding areas ranged from <2 km to nearly 5 km. Birds made more trips between areas that were closer and stayed longer at sites that were more distant. Some females seemed to be traumatized by the transmitters, staying away from the breeding area for about two days. Early in the season, breeding territory of males (defended by song) was large, but as the density of cuckoos increased, territories were reduced dramatically (e.g., from >25 ha to <4 ha). Broad-leafed trees were favored over conifers as roost sites. Several comparisons are made with Brown-headed Cowbirds (*Molothrus ater*). This is an interesting study. [Faculty of Education, Shinshu University, Nishi-nagano, Nagano 380 Japan.]—Jerome A. Jackson.

2. Partnerships and mechanisms of divorce in the Great Skua. P. Catry, N. Ratcliffe, and R. W. Furness. 1997. Anim. Behav. 54:1475–1482.—Divorce in birds is not clearly understood. Two theories attempting to explain divorce as an adaptive decision for at least one of the members of the pair are the 'incompatibility hypothesis' and 'better option hypothesis'. The 'incompatibility hypothesis' proposes that birds separate because they are unsuccessful breeders as a pair and both members of the pair should benefit from the divorce. The 'better option hypothesis' suggests that divorce is usually initiated by one of the birds (the 'chooser') in search of a 'higher quality' partner (or territory) (the 'victim'). In contrast to the 'choosers', 'victims' of the divorce are not expected to improve their breeding performance after mate change. Breeding behavior of Great Skuas (*Catharacta skua*) was monitored from 1991 until 1996. Annual divorce rates were low (6.4%) and were independent of age. Three types of divorces were identified. In 6 cases, females appeared to abandon their partners; on 1 occasion a female was forced from her territory by another female; and 1 case of territory take-over was observed, the female of this pair acquired a new mate after the take-over. Birds involved in divorce were less likely to breed (39% did not breed the same year) following the divorce than were birds that lost a mate due to death (18% of birds losing a mate to death did not breed the same year). Following a divorce males were less likely to breed than females. However, there were no differences between the sexes in the probability of re-pairing after a mate died. The authors suggest the 'better option hypothesis' supports their data but the 'incompatibility hypothesis' does not. [R. Furness, Applied Ornithology Unit, IBLS, Univ. of Glasgow, Glasgow G12 8QQ, U.K.]—Jeffrey P. Duguay.

3. Host selection, attack rates and success rates for Black-headed Gull kleptoparasitism of terns. N. Ratcliffe, D. Richardson, R. L. Scott, P. J. Bond, C. Westlake, and S. Stennett. 1997. Colon. Waterbirds 20:227–234.—This paper reports on kleptoparasitism of terns by Black-headed Gulls (*Larus ridibundus*) at Coquet Island, United Kingdom, during 170 hours of observation from 1992–1994. The island has 3000–4000 pairs of nesting gulls, and nearly as many pairs of terns. Black-headed Gulls attacked 14.7% of 6329 terns returning to the island carrying fish, but only 3.6% of terns lost fish. The gull success rate was higher when larger numbers of gulls attacked a tern. The probability of attack significantly increased with the size of the fish carried by a tern and for those terns carrying two fish. The probability of attack was higher for Sandwich Terns (*Sterna sandvicensis*) than for Common Terns (*S.*

hirundo) or Arctic Terns (*S. paradisaea*), probably because they nest closer to the gulls. Probability of attack declined during the nesting season, and attacks were more frequent during morning and evening—peak periods of tern foraging activity. Variation between years in levels of kleptoparisitism may be related to availability of other food sources. The authors conclude that gull kleptoparasitism probably does not pose a serious threat to tern productivity. This is a well-written and informative paper. [Royal Society for the Protection of Birds, The Lodge, Sandy, Bedfordshire SG19 2DL, UK; E-mail: Norman.Ratcliffe@rspb.org.uk]—William E. Davis, Jr.

4. Anting by a Scissor-tailed Flycatcher. M. S. Husak and J. F. Husak. 1997. Southwest. Nat. 42:351.—The authors observed a female Scissor-tailed Flycatcher (*Tyrannus forficatus*) passively collect ants by sitting in a harvester ant (*Pogonomyrex barbatus*) bed, wings and tail spread, for 30 seconds before flying. The author's point out that Scissor-tailed Flycatchers are seldom observed perching on the ground. This apparently represents the first record of anting by this species, and only one other flycatcher, the Sharp-billed Flycatcher (*Pipromorpha oleaginea*) has been reported to engage in this behavior. [Dept. of Biology, Angelo State Univ., San Angelo, TX 76909, USA.]—Danny J. Ingold.

5. An experimental test of interspecific competition for Red-cockaded Woodpecker cavities. S. C. Loeb and R. G. Hooper. 1997. J. Wildl. Manage. 61:1268–1280.—Red-cockaded Woodpecker (*Picoides borealis*) populations may be limited in part by interspecific competition for nest cavities. The authors examined the effectiveness of nest boxes in reducing use of Red-cockaded woodpecker (RCW) cavities by other species. Pre-treatment data on RCW reproductive activities were gathered in 1990 in the Francis Marion National Forest in coastal South Carolina prior to Hurricane Hugo; the hurricane destroyed 87% of the active cavities used by RCWs in the forest. Following the hurricane, 62 experimental clusters were designated, and the authors placed 3 nest boxes in each cluster, approximately 20–50 m from a RCW cavity tree. No nest boxes were placed in the 61 control clusters. The authors found that Eastern Bluebirds (*Sialia sialis*) and southern flying squirrels (*Glaucomys volans*) used nest boxes and RCW cavities more frequently than any other species. Bluebirds occupied nest boxes in both 1991 and 1992, while southern flying squirrels occupied the boxes only in 1992. Pre-treatment monitoring (1990) showed no significant differences in RCW reproductive activities between control and experimental clusters, but post-treatment comparisons indicated that more groups of RCWs successfully initiated nests in experimental clusters, and that experimental clusters were more likely to fledge >1 young. There were no significant differences in mean clutch size, number of hatchlings, or number of fledglings between control and experimental clusters. The results of this study suggest that interspecific competition for RCW cavities occurred; when the number of available cavities increased due to the addition of nest boxes, there was a significant increase in RCW nest initiation rates and fledgling success. The authors suggest that nest boxes are a useful technique with which to examine cavity competition, and that nest boxes may provide an effective management tool to reduce competition for RCW cavities, especially when the number of cavities is limited. [USDA Forest Service, Southern Research Station, Dept. of Forest Resources, Clemson Univ., Clemson, SC 29634-1003.]—Kerri Vierling.

6. Anthropogenic effects on winter behavior of Ferruginous Hawks. D. L. Plumpton, D. E. Andersen. 1998. J. Wildl. Manage. 62:340–346.—During 3 winter seasons in Colorado, the authors examined aspects of the winter ecology of Ferruginous Hawks (*Buteo regalis*) in grasslands situated away from human habitations (the Rocky Mountain Arsenal National Wildlife Refuge; RMANWR) and near adjacent suburbs. Relative abundance was directly influenced by the presence of black-tailed prairie dog (*Cynomys ludovicianus*) colonies. During the winter of 1993–1994, relative hawk abundance did not differ significantly between sites. In the following year, Ferruginous Hawks were twice as common in suburban sites. The authors attribute this difference to the absence of prairie dogs (as a result of sylvatic plague) at the RMANWR during the following winter. In addition to examining relative abundance of the hawks between treatment sites, the authors radiotagged 38 individuals to determine home ranges, perch sites, and time budgets. Home range size did not differ significantly between the RMANWR site and the suburban sites. RMANWR hawks used poles and ground perches more frequently than hawks in suburban sites, and suburban hawks preferred roost-

ing in deciduous trees. Diurnal activity levels of the birds at both sites were similar. However, suburban hawks spent significantly more time at their roosts than did RMANWR hawks. Prey acquisition by hawks did not differ between the RMANWR and suburban sites. The results of this study suggest that anthropogenic influences do not strongly impact spatial requirements or activity levels of these birds. Differences in perch and roost sites may be due to the level of human presence; the probability of human presence was much lower at RMANWR where pole and ground perches were preferred. The authors conclude that Ferruginous Hawks appear to modify their behavior in the suburban sites, but that the impacts of further fragmentation and loss of black-tailed prairie dog colonies may cause local extirpation. [H. T. Harvey and Associates Ecological Consultants, 906 Elizabeth Street, Box 1180, Alviso, CA 95002, USA].—Kerri Vierling.

FOOD AND FEEDING

(see also 3, 20, 21, 31, 33)

7. Prey diversity and selectivity of the African fish eagle: data from a roost in northern Kenya. K. M. Stewart, D. P. Matthiensen, L. Leblanc and J. West. 1997. African J. of Ecology. 35:133–145.—Although earlier studies have been undertaken regarding the prey and diet of the African Fish Eagle (*Haliaeetus vocifer*), the majority are based on field observations. In this study, the authors collected almost 2000 bones that had accumulated over time, under a fish eagle nest, on Lake Turkana, in northern Kenya. The bones were identified and quantified to determine prey diversity and selectivity. In addition, the remains of the taxa recovered were also classified according to habitat preference and size of prey in order to gain insight into fish eagle feeding strategies. In concurrence with other studies, fish were by far the dominant prey group, accounting for approximately 67% of the total number of individuals represented and 91% of the total prey by weight. Selectivity played an important role in the selection of fish by this species with the catfishes *Synodontis* and *Clarias* being represented in far greater proportions in roost debris than their natural availability in the lake. In contrast, other species were either consumed in proportion to their availability in the lake (cichlids and *Hydrocynus*) or appeared to be avoided. Furthermore, these eagles appeared to be size and habitat selective, preying on littoral-inhabiting species rather than pelagic species. Non-fish predation comprised the remainder of the diet, with birds forming a much larger proportion of the fish eagle's diet (18% of individuals) than previously thought. It is suggested that non-fish predation may represent both occasional opportunistic feeding strategies employed when lake conditions are unfavorable for fishing, and attacks on predators that threaten their nests. A further study to determine the impact of fish eagle predation on the *Clarias lazera* population is suggested. [Canadian Museum of Nature, P.O. Box 3443, Stn. D, Ottawa K1P 6P4, Canada.]—Shirley J. Atkinson.

8. Feeding chases and food allocation in Adelie penguins, *Pygoscelis adeliae*. P. D. Boersma and L. S. Davis. 1997. Anim. Behav. 54:1047–1052.—The function of feeding chases in Adelie Penguins (*Pygoscelis adeliae*) is not completely understood. Boersma and Davis observed feeding behavior of 65 adult Adelie Penguins (59 meals; 27 involving single-chick broods and 32 involving two-chick broods) to determine the function of feeding chases in this species. Feeding chases were longer for two-chick than one-chick broods and were more likely to occur outside the breeding colony for two-chick than one-chick broods. Feeding chases were more likely when siblings were <0.5 m apart and which chick was fed was more likely to switch during a meal after a feeding chase than without a feeding chase. The authors suggest that feeding chases may be a mechanism by which adults prevent one offspring from out-competing another. [Dept. of Zoology, Box 351800, Univ. of Washington, Seattle, WA 98195-1800; E-mail: boersma@u.washington.edu.]—Jeffrey P. Duguay.

9. Wetland feeding site use by White Ibises (*Eudocimus albus*) breeding in coastal South Carolina. T. L. De Santo, J. W. Johnston, and K. L. Bildstein. 1997. Colon. Waterbirds 20: 167–176.—Although the feeding ecology of coastal breeding White Ibises has been studied at the population level, little is known about the feeding ecology of individual birds. The authors report on habitat use by radiotagged parental White Ibises prior to and during nesting, the distances traveled to foraging habitats, and associated energetic costs. Five ra-

diotagged birds, tracked from the ground and fixed-wing aircraft, continued to return to their nests until young had fledged and were observed for at least 3 weeks thereafter. While feeding young, 76% of foraging ibis observations were in freshwater habitats (rice fields, swamps, impoundments, ponds), the rest in saltmarshes. After fledging, the use of saltmarsh doubled, and use of freshwater swamps and rice fields virtually ceased. Fecal and regurgitant samples from nestlings of radiotagged birds did not contain fiddler crabs which are common in the saltmarshes. Following fledging, adults foraged closer to the colony. Nestling ibises which are fed fiddler crabs have slower growth and higher mortality, probably related to the high salt content. The authors suggest that when young have fledged or a nest fails, the adults are no longer constrained by the freshwater food requirements of the young and forage closer to the colony in saltmarshes with abundant fiddler crabs. The energetic costs to fly to the freshwater site farthest from the colony (32 km) is estimated to be 13 times as high as to the nearest salt marsh (2 km). This is an interesting paper that illustrates the advantages of studying individually marked birds. [Institute of Ecology, Univ. of Georgia, Athens, GA 30602, USA.]—William E. Davis, Jr.

10. Begging affects parental effort in the Pied Flycatcher, (*Ficedula hypoleuca*). U. Ottosson, J. Backman, and H. G. Smith. 1997. Behav. Ecol. Sociobiol. 41:381–384.—One explanation for begging by bird nestlings is that it may serve as a mechanism to manipulate parents into providing more food than is in their interest, perhaps at the expense of the begging individual's current or future siblings. On the other hand, begging may serve as a truthful indicator of nestling nutritional needs. In either case, few studies have addressed whether the intensity of begging sounds is associated with parental feeding efforts. In this study, the authors attached a loudspeaker, tape recorder and data logger to the backs of 13 Pied Flycatcher nests with nestlings to test the hypothesis that parents will alter their provisioning rates in response to experimentally generated begging sounds. Parents were marked with microchips so that the begging sounds were activated when one of the parents visited the nest. Two experimental nests were not included in the results due to technical problems, thus leaving a relatively small sample size. The result, however, was a significant division of labor between males and females that lasted throughout most of the season, resulting from increased feeding levels by males in trials that were manipulated versus males in trials in which females were manipulated. These data suggest that begging intensity in nestlings may be one of the proximate mechanisms that regulates parental division of labor. [Dept. of Animal Ecology, Lund Univ., S–223 62 Lund, Sweden.]—Danny J. Ingold.

11. Convenience stores: repeated use of some cache sites by Clark's Nutcrackers (*Nucifraga columbiana*). R. P. Balda, A. C. Kamil, J. P. Carder, and C. L. Racz. 1997. Ethology 103:1024–1031.—Clark's Nutcrackers regularly cache seeds and laboratory studies have shown that a large percentage of these caches are recovered. This study examined the extent to which individuals preferred specific cache sites and the extent to which such sites were reused. Three of the five subjects were observed to reuse some cache sites more frequently than would be expected at random. However, these preferences were not associated with greater quantities of food cached at those sites or with increased accuracy of recovery. Furthermore, these "preferred" cache sites were not revisited more frequently than "less preferred" sites. The most frequently re-used caches tended to be closest to the centrally located feeding station. Birds that showed the strongest habitual use of cache sites did not seem to accrue any of the suggested advantages or disadvantages associated with such behavior (e.g., higher recovery rate, higher rate of theft from competitors). [Dept. of Biological Sciences, Box 5640, Northern Arizona Univ., Flagstaff, AZ 86011, U.S.A.; E-mail: Russell.Balda@nau.edu]—Jeffrey G. Kopachena.

12. Food availability as a determinant of pairing behaviour in the European Robin. J. Tobias. 1997. J. Anim. Ecol. 66:629–639.—This study uses an experimental approach (supplemental feeding) to evaluate the relationship between food availability and reproductive behaviour, specifically territoriality and pair formation. In this species, males and females defend separate territories during the winter and defend joint territories during the breeding season. Early pairing appears to be beneficial, especially for males, because males were more likely to obtain mates if they paired early and because males that paired early expended less energy in advertisement. However, pairing and, hence, joint territoriality is associated with a

cost that stems from sharing relatively scarce food resources early in the breeding season. Males that had extra food provided to them spent more time repelling intruders, but advertised for mates earlier and paired earlier than males without food supplements. When supplemental food was withdrawn, pairs spent less time consorting than did pairs that did not receive extra food. These data appear to support the idea that joint territoriality and the onset of pair formation are closely tied to food supply in this species. [Dept. of Zoology, Univ. of Cambridge, Downing Street, Cambridge, CB2 3EJ, U.K.]—Jeffrey G. Kopachena.

13. Nestling diet and development of Dippers *Cinclus cinclus* in relation to the food supply in the Saanenland (Swiss Northern Alps). [Nestlingsnahrung und Jungenentwicklung der Wasseramsel Cinclus cinclus in Abhängigkeit vom Nahrungsangebot im Saanenland (Berner Oberland)]. C. Breitenmoser-Würsten. 1997. Ornithol. Beob. 94:295–330.—Five broods of nestling Dippers were studied. The primary sources of food were Ephemeroptera (48.6%), Trichoptera (24.0%), Diptera (18.6%), and Plecoptera (7.7%). Mayfly (Ephemeroptera) and caddisfy (Trichoptera) larvae accounted for over 70% of the food items eaten by the nestling Dippers. The rate of nestling growth was influenced by the quality and quantity of food they received. Larger food items were correlated with more rapid growth of the young. The availability of food was detrimentally affected by the turbidity and flow rate of the water. Snow melt and heavy rains (as well as human activities) resulted in the adults being less successful in foraging. [Villettengässli 4, CH–3074 Muri b. Bern, Switzerland.]—Robert C. Beason.

SONGS AND VOCALIZATIONS

(see also 10, 12)

14. Sound levels in 3 Ring-billed Gull colonies of different size. H. Blokpoel and J. Neuman. 1997. Colon. Waterbirds 20:221–226.—The authors discuss the possibility of temporary or permanent hearing loss resulting from exposure to high sound levels for extended periods of time in noisy colonial waterbird colonies. They recorded sound levels in Lake Ontario Ring-billed Gull (*Larus delawarensis*) colonies of 18,000, 2000, and 200 breeding pairs in undisturbed ("background") situations and during periods of investigator disturbance. As expected, background sound levels and levels during investigator disturbance were greater in larger colonies with decibel readings averaging about 80 dB for undisturbed, and about 101 dB during investigator disturbance for the largest colony (a jack hammer produces about 100 dB). The U.S. Occupational Safety and Health Administration recommends a maximum steady noise exposure of 8 h/d for 90 dB, 4 h/d for 95 dB, and 2 h/d at 100 dB. Thus the authors conclude that workers in colonies with only background sounds probably do not risk hearing loss, but may exceed noise limits during periods of investigator disturbance such as making nest checks or walking to and from blinds. They should thus restrict exposure to these higher sound levels to suggested duration limits or wear ear plugs. [Canadian Wildlife Service, 49 Camelot Drive, Nepean, Ontario K1A OH3, Canada.]—William E. Davis, Jr.

15. Responses of male and female Black Grouse to male vocal display. M. Hovi, R. V. Alatalo, M. Halonen, and A. Lundberg. 1997. Ethology 103:1032–1041.—Among the various hypotheses used to explain the evolution of leks is the "female preference" hypothesis which suggests that females may favor males that have aggregated. This hypothesis has recieved some recent empirical support. However, a predicted outcome of this hypothesis is that less attractive, low quality males, might also be attracted to such aggregations ("hotshot" hypothesis), thereby potentially gaining greater access to females. This study tests whether female Black Grouse (*Tetrao tetrix*) are attracted to the vocal displays emmitted by males on leks and whether other males are also attracted to these displays. To do so, some (experimental) leks had the vocal displays of males supplemented by playbacks, while other (control) leks did not. Experimental leks attracted more of both males and females. It was noted that the males attracted to experimental leks tended to be mobile, first-year individuals. Aviary playback experiments were also conducted wherein females were provided a choice of a single male vocalization or multiple male vocalizations. Females showed a preference for vocalizations of multiple males over that of a single male. These results are interpreted to

support both the "females preference" and the "hotshot" hypotheses. [Dept. of Biological and Environmental Science, Box 35, SF-40351, Univ. of Jyvaskyla, Finland.]—Jeffrey G. Kopachena.

NESTING AND REPRODUCTION

(see also 1, 2, 10, 13, 15, 34, 35, 39, 40, 44)

16. The effect of nestling condition on risk-taking in Meadow Pipits. S. Bures and V. Pavel. 1997. Anim. Behav. 54:1531–1534.—A trade-off exists between parental investment in current offspring and future reproduction. The harm-to-offspring hypothesis predicts that parental investment should be related to the harm that offspring without parental care would suffer. Thus, parents should take greater risks when young are at greater risk of harm. The authors, using body temperature as an indicator of nestling condition, measured both the cloacal temperature and air temperature near the nest to test this hypothesis. A stuffed European weasel (*Mustela nivalis*) was placed 5 m from the nest of Meadow Pipits (*Anthus pratensis*) while the adults were off the nest. When both parents noticed the weasel, the weasel was removed and the time of parental entry into the nest was recorded. To limit possible confounding factors, paired trials were conducted at each of 7 nests during "good" nestling condition (when nestling cloacal temperature was normal) and "poor" nestling condition (when nestling cloacal temperature was low) on the same day. For all trials, females entered the nest sooner when nestling condition was poor than when it was good. The authors suggest that the changing physiological vulnerability of offspring influenced parental behavior, supporting the harm-to-offspring hypothesis. It should be noted that this assumes brooding by the female parent after an apparent predator is costly in some way (i.e., increased risk of predation) or that females invested more in young in poor condition. However, amount of time spent brooding after females returned to the nest was not examined. [Laboratory of Ornithology, Palacky Univ., tr. Svobody 26, 771 46 Olomouc, Czech Republic; E-mail: bures@risc.upol.cz.]—Jeffrey P. Duguay.

17. Reproductive synchrony and extra-pair mating strategy in a socially monogamous bird, *Dendroica petechia*. S. M. Yezerinac and P. J. Weatherhead. 1997. Anim. Behav. 54:1393–1403.—The effect of reproductive synchrony on extra-pair mating varies both between species and between individuals of the same sex. The authors used a combination of observational (including captures in mist nets set up on territories) data, manipulations (egg removal to alter reproductive synchrony), and DNA analysis to assess paternity to determine how reproductive synchrony influences extra-pair paternity in Yellow Warblers (*Dendroica petechia*). More male than female Yellow Warblers made territorial intrusions, indicating that males initiated extra-pair mating. Increased synchrony resulted in males making fewer extra-territorial forays, while extra-pair males sired more offspring when the female nested asynchronously with that of the sire's mate. However, population-wide synchrony and synchrony with neighbors were not good predictors of the identity of the sire or the incidence of extra-pair young, suggesting that factors other than synchrony were important. The effect of synchrony on extra-pair matings differed between males according to size and plumage characteristics, leading the authors to suggest that there is a trade-off between extra-pair and within-pair reproduction, and this affects sexual selection. [Div. of Botany and Zoology, Australian National Univ., Canberra, ACT 0200, Australia; E-mail: smy656@anu.edu.au.]—Jeffrey P. Duguay.

18. Body mass of female Common Terns (*Sterna hirundo*) during courtship: relationships to male quality, egg mass, diet, laying date and age. H. Wendeln. 1997. Colon. Waterbirds 20:235–243.—The author reports on a study of individually marked Common Terns at a 90–100 pair colony in a brackish lake on the Waden Sea coast of Germany. Birds were weighed without capturing on electric balances placed at roosting sites. The mass of female terns was significantly correlated to male mass but not size (bill and primary length), suggesting that mass correlations were not the result of size-specific mate selection. Female mass was significantly correlated with total egg mass but not with the size of the female. Although high energy intake by females during courtship was not related to body mass, it correlated with early laying dates and proportionally high intake of marine fish that have higher energy

content than brackish water sticklebacks available near the colony. Older birds nested earlier than younger ones. The author suggests that the correlation between female and male body mass and egg mass supports the hypothesis that egg mass is a useful measure of parental quality, and that male quality is an important factor in determining egg mass. Further, the high male and female masses may indicate that these males are more successful at self-provisioning. In late-laying pairs males delivered less high energy (marine) prey and birds were younger. Variation in laying dates may be related to age or parental quality, and variation in the use of higher quality marine prey, despite longer foraging-trip distances, may be age related. This study once again demonstrates the advantages of studying individually marked birds. [Institut Vogelforschung "Vogelwarte Helgoland," An der Vogelwarte 21, D–26386 Wilhelmshaven, Germany.]—William E. Davis, Jr.

19. Is helping a beneficial learning experience for Red-cockaded Woodpecker (*Picoides borealis*) helpers? M. Z. Khan and J. R. Walters. Behav. Ecol. Sociobiol. 41:69–73.—There are numerous hypotheses that explain the evolution of cooperative breeding in birds including those that assert indirect fitness benefits as well as those with current or future direct benefits. Khan and Walters tested the skills hypothesis for cooperative breeding in Red-cockaded Woodpeckers in a large color-banded population in south-central North Carolina. This hypothesis predicts that offspring with helping skills will produce more offspring in their initial breeding attempt than those individuals without comparable helping skills. Khan and Walters found, using two measures (number of fledglings produced and number of fledglings that survived 1 year), that previous helping experience had no affect on 2-year old Red-cockaded Woodpeckers during their first breeding attempt. Although there was no significant interaction between the effects of group size and helping experience on reproductive success, the trend was for experienced birds in groups of 3 to produce more offspring than inexperienced groups of 3 or either group 2 category. Nonetheless, these data eliminate the possibility that cooperative breeding in Red-cockaded Woodpeckers has evolved as a result of enhanced fecundity resulting from previously acquired helping experience alone. The authors suggest that the most viable explanations for helping in Red-cockaded Woodpeckers are tied to indirect fitness benefits as well as pseudoreciprocation by individuals who received previous help and are in essence returning the favor. These hypotheses, however, lack substantial supporting data for this species. [Biology Dept., Virginia Polytechnical Inst. and State Univ., Blacksburg, VA 24061-0406, USA; E-mail: mekhan@vt.edu.]—Danny J. Ingold.

20. Begging signals and biparental care: nestling choice between parental feeding locations. M. Kolliker, H. Richner, I. Werner, and P. Heeb. 1998. Anim. Behav. 55:215–222.—Parents face a trade-off between maximizing lifetime reproductive success and investment in any one breeding attempt. This conflict may be resolved by honest signalling of 'need' by offspring and parental investment in relation to signalling level. Growing evidence indicates that parents may preferentially feed certain nestlings. The authors experimentally created within-brood variation in chick 'need' by food deprivation and hand-feeding Great Tit (*Parus major*) nestlings (65 broods) for 2 hours and then monitored (1) chick position relative to the feeding location of each parent, (2) chick begging intensity, and (3) parental food allocation. Nestling hunger level influenced both male and female food allocation, with deprived nestlings receiving the greatest proportion of food and hand-fed nestlings the smallest proportion. Food-deprived nestlings were positioned closer to (parents fed from different locations in the nest) and begged at a higher intensity from the female than male parent. Hand-fed nestlings were further away from the female than male parent, but neither fed nor unmanipulated nestlings begged at different intensities towards the parents. It was concluded that Great Tit nestlings do indeed provide an honest signal concerning 'need' (hunger) and that parents respond to this 'need' (begging intensity). The authors suggest that food-deprived chicks may have approached the female rather than the male feeding location because hungry chicks should try harder to obtain food at the lowest possible cost; males waited longer than females before feeding nestlings and also fed nestlings begging at a higher intensity level than did females. [Dept. of Zoology, Univ. of Bern, CH-3032 Hinterkappelen, Bern, Switzerland; E-mail: mathias.koelliker@esh.unibe.ch.]—Jeffrey P. Duguay.

21. Experimental manipulation of brood reduction and parental care in cooperatively breeding White-winged Choughs. C. R. J. Boland, R. Heinsohn, and A. Cockburn. 1997. J.

Anim. Ecol. 66:683–691.—White-winged Choughs (*Corcorax melanorhamphos*) are cooperative breeders that also practice facultative brood reduction through hatching asynchrony. In this species both cooperative breeding and brood reduction appear to be related to the ability of the group to provide adequate amounts of food to the young. Thus, large groups suffer less brood reduction and, therefore, raise more young than do small groups. While several earlier studies provide indirect support for these conclusions, direct experimental evidence has been lacking. This study was aimed at testing the hypothesis that brood reduction occurs as a response to the amount of food provided to the young. Thus it was predicted that groups of choughs that were supplemented with food (a cheese and amino acid mixture) would incur less brood division than would unsupplemented groups. Consistent with this prediction, supplemented groups did fledge more young than did unsupplemented groups. Furthermore, whereas unsupplemented groups preferentially fed larger nestlings, supplemented groups preferentially fed smaller nestlings. Thus, group members manipulated brood reduction so as to maximize nesting success relative to food availability. These results are interpreted as supporting earlier conclusions as to the role of resource availability in the evolution of brood reduction and cooperative breeding and brood reduction in this species. Furthermore, the data are viewed as supporting Lack's hypothesis for hatching asynchrony. [Evolutionary Ecology Group, Div. of Botany and Zoology, Australian National Univ., Canberra, ACT 0200, Australia.]—Jeffrey G. Kopachena.

22. Nest-site characteristics, duration of use and breeding success in the Guillemot *Uria aalge*. M. P. Harris, S. Wanless, T. R. Barton, and D. A. Elston. 1997. Ibis 139:468–476.—The authors recorded the fate of eggs laid by Guillemots at 994 nest sites in seven study areas on the Isle of May, Scotland, during 12 consecutive seasons. Hatching success and fledging success at each site were determined with visual checks made from permanent blinds. Characteristics measured at each site included ledge width and length, slope of the ledge, number of walls adjacent to the site, vertical position on the cliff, number of conspecific neighbors, and availability of suitable habitat (i.e., rock crevices) for ticks. Stepwise regression analysis demonstrated that number of neighbors, number of walls, type of site, slope of the ledge, and distance from the top of the cliff all had significant effects on hatching success and fledging success. Taken as a whole, this study and previous work by other authors indicate that the two most important factors influencing Guillemot nesting success are the number of neighbors and the number of walls at a site. The presence of neighbors and the protection of vertical walls reduce the chance of eggs rolling off the site and possibly reduce the likelihood of predation. However, much of the variation in nesting success in the present study remained unexplained by these models. Long-term trends in site occupancy were assessed in part of the study area using photographs of the cliffs taken in 1936 and 1977 and records of site occupancy in 1984–1995. The most successful sites also tended to be those which had the longest history of use. Because Guillemot pairs remain together on average only a few years, the consistently high success of certain sites over the long-term suggests that these sites were occupied by a succession of high-quality individuals. [Inst. of Terrestrial Ecology, Banchory Research Station, Hill of Brathens, Banchory, Kincardineshire AB31 4BY, UK.]—Karl E. Miller.

23. Postfledging nest dependence period for Bald Eagles in Florida. P. B. Wood, M. W. Collopy, and C. M. Sekerak. 1998. J. Wildl. Manage. 62:333–339.—The postfledging period for many raptors is an important period in the life cycle. The authors examined aspects of postfledging behavior of 44 fledgling Bald Eagles (*Haliaeetus leucocephalus*) in Florida during 1987–1991. During the study period, nestling Bald Eagles were fitted either with a radiotransmitter ($n = 40$) or were marked patagially ($n = 4$). Bald Eagle nestlings remained dependent upon adult feeding for 4–11 weeks after fledging. Fledglings were observed within 229 m of the nest for 82% of all observations, regardless of the sex, the number of fledglings, or the time of fledging. Fledglings spent the majority of time (88%) perched in the nest tree during the dependency period; none was observed hunting on their own during this time. The primary protection zone for nesting Bald Eagles in the southeastern U.S. is 229 m, and the results of postfledging behavior indicate that this protection zone is sufficient to protect fledgling Bald Eagles in this region. However, the results also suggest that the period of protection should be extended to include the postfledging period because of the close as-

sociation of fledglings with the nest site and their dependency on their parents during this time. [West Virginia Coop. Fish and Wildlife Research Unit, Biological Resources Div., West Virginia Univ., Div. of Forestry, Morgantown, WV 26506, USA; E-mail: pbwood@wvn.vm.wvnet.edu]—Kerri Vierling.

24. Breeding group size, nest position, and breeding success in the Chinstrap Penguin. A. Barbosa, J. Moreno, J. Potti, and S. Merino. 1997. Polar Biol. 18:410–414.—Does the breeding group size and nest position of Chinstrap Penguins (*Pygoscelis antarctica*) influence breeding success? The authors studied 12 nests in each of 15 large (>400 nests) and 12 small (<50 nests) colonies. Six nests in each of the large colonies were located at the edge and six nests were located in the center. Each nest was weighed to determine if there were nest quality differences between large and small colonies and central and peripheral nests. Nests in smaller colonies were heavier than those in larger colonies and chick mortality was higher in smaller colonies. Fledging success was higher in larger colonies irrespective of the position of the nest. No difference between central and peripheral nests was noted. Differences in geometry of the colonies, hatching date and nest quality did not influence breeding success; however, the authors were unable to determine if decreased fledging success in smaller colonies was due to increased predation rates, or if age related factors were involved. Skua predation was thought to be the most likely factor affecting fledging success. [Laboratoire d'Ecologie. Univ. Pierre et Marie Curie Bat. A 7e etage. 7, Quai Saint Bernard, Case 237. F-75252 Paris Cedex 05. France; E-mail: abarbosa@snv.jussieu.fr.]—John C. Carlson.

25. Extrapair paternity in the Blue Tit (*Parus caeruleus*): female choice, male characteristics, and offspring quality. B. Kempenaers, G. R. Verheyen, and A. A. Dhondt. 1997. Behav. Ecol. 8:481–492.—Extra pair fertilizations occurred in 31–47% of all nests and results in the production of 11–14% of the offspring produced. Males that fathered extrapair offspring rarely suffered from extrapair fertilizations at their own nests. Males that fathered extrapair offspring had longer tarsi and sang longer strophes during the dawn chorus. Successful males survived the nestling stage better and their extrapair offspring, in turn, were more likely to survive than offspring fathered by the within pair male. Extrapair males were usually older than the within pair male they cuckolded, but age did not appear to be closely tied to a males' probability of being cuckolded. The results of this study are consistent with the hypothesis that female Blue Tits select extrapair males to copulate with in order to obtain "good genes" for their offspring. [KLIVV, Savoyenstr. 1a, A-1160 Vienna, Austria.]—Robert C. Beason.

26. Nest site selection and present status of the Sand Martin, *Riparia riparia* (L. 1758), in the province of Ourense (NW Spain). [Nidotopica y situacion actual del avion zapador, Riparia riparia (L. 1758), en la Provincia de Ourense (No España)]. S. Gonzalez and A. Villarino. 1997. Ardeola 44:41–49. [Spanish, English abstract, table and figure legends].—Colonies of the Sand Martin (our Bank Swallow) most often faced north, were in alluvial soils, and at lower elevations, although colonies were found at an altitude of 1305 m above sea level. Nest tunnels averaged 78.1 cm in length and most entrances were 25–125 cm from the top of the bank and 2–8 m from the bottom. Most colonies included about 40 nesting pairs (range: 2–120). No comparisons are made with North American populations. [S.G.H.N.–Ourense, Apartado 212, E–32080 Ourense, Spain.]—Jerome A. Jackson.

MIGRATION, ORIENTATION, AND HOMING

(see also 36)

27. Cattle Egret migration, satellite telemetry and weather in south–eastern Australia. H. A. Bridgman, M. Maddock, and D. Geering. 1997. Corella 21:69–76.—In a pilot study, patagial tags and 28-g transmitters were attached to two Cattle Egrets (*Ardeola ibis*). Their movements during migration were monitored by ground observation and tracking using the French polar-orbiting Argos satellite system on a cycle of 8 h on and 40 h off to extend battery life. The goal of gathering more detailed information about the southerly autumn and early winter movements of Cattle Egrets from New South Wales to Victoria was accomplished. Visual verifications of satellite data were made on the ground by a network of volunteers. The signal of one bird was lost after 5 weeks, the second after 11. The second egret

was recorded flying south at night at an average ground speed of 43 km/h. A general migration pattern of short flights followed by rest periods, and flights occurring during periods of high pressure and light north-westerly airflow, were consistent with, but more detailed than, information previously obtained from ground observations alone. The authors conclude that satellite telemetry is a potentially valuable tool in migration studies of egrets and other birds smaller than have been previously studied utilizing this technique. [Dept. of Geography, Univ. of Newcastle, NSW 2308, Australia.]—William E. Davis, Jr.

28. An analysis of clock-shift experiments: is scatter increased and deflection reduced in clock-shifted homing pigeons? J. Chappell. 1997. J. Exp. Biol. 200:2269–2277.—Clock-shift experiments were first used to confirm and later investigate the mechanisms of the sun compass used by homing pigeons (*Columba livia*) and other animals to navigate for their daily activities as well as for longer distance orientation tasks. The author analyzed the data from 55 clock-shift published and unpublished experiments from 4 countries over 21 years. She confirmed previous suspicions that clock-shifted birds, as a group, had more variation (i.e., greater scatter in their headings) than controls groups released with them and the deflection in mean direction of the group of clock-shifted birds was less than predicted. Whether or not the birds were released at a site they have visited previously did not significantly affect either phenomenon. Chappell divides possible causes of these clock-shift effects into three groups: product of shifting the internal clock, incomplete compensation, and conflict with other navigational information. She rules out the first two and concludes that the most likely explanation is that the birds perceive a conflict of information between the shifted sun compass and visual landmarks (at a familiar site) or the magnetic compass (at all sites). Neither of these ideas is completely supported by the experimental data, however. Clearly, more research is needed to clarify the causes of these effects as well as to understand how the clock-shifted sun compass operates. [Dept. of Zoology, Univ. of Oxford, South Parks Rd., Oxford OX1 3PS, UK; E-mail: jackie.chappell@zoology.ox.ac.uk.]—Robert C. Beason.

HABITAT USE AND TERRITORIALITY

(see also 1, 6, 9, 11, 22, 26, 33, 34, 36)

29. Western Screech-Owls diurnally roosting in a cave. T. N. Abeloe and P. C. Hardy. 1997. Southwest Nat. 42:349–351.—Three Western Screech-Owls (*Otus kennicottii*), one adult and two fledglings, were found roosting in a small, caliche cave (38 cm high × 28 cm wide × 64 cm deep) in southwestern Arizona. The authors speculate that heat stress (ambient temperature outside cave was 42 C) may have forced these birds to seek shelter in this unusual but completely shaded location. This appears to be the first documentation of Western Screech-Owls taking advantage of this seemingly favorable microclimate (although the temperature inside the cave was not reported). In addition, there is no documentation that Eastern Screech-Owls (*O. asio*) roost in caves.[Univ. of Arizona School of Renewable Natural Resources, East Tucson, AZ 85721, USA.]—Danny J. Ingold.

30. Differential habitat selection by immature and adult Grey Eagle-buzzards *Geranoaetus melanoleucus*. J. Bustamante, J. A. Donázar, F. Hiraldo, O. Ceballos, and A. Travaini. 1997. Ibis 139:322–330.—Adult and immature Grey Eagle-buzzards exhibit different spatial distributions during the breeding season in the Argentinean Patagonia. Adults are more common in rugged topography while immatures are more common in flat, open areas. The authors proposed three models to explain this spatial distribution: (1) adults have limited access to flat areas because they are central foragers and stay near cliffs where they nest, (2) immatures are restricted to flat areas far from cliffs because they are excluded from adults' breeding territories in an ideal "despotic" distribution, and (3) adults and immatures select different habitats because of different prey selectivity or different foraging behavior. To test these models, the authors established 24 survey points for Grey Eagle-buzzards in a 4400 km^2 area using a three-factor design: proximity to active nests (close or far), topography (rugged or flat), and estimated prey abundance (rich or poor). Prey abundance was the only significant factor explaining the distribution of immature eagles. In contrast, proximity to nests and topography were the only significant factors explaining the distribution of adult eagles. The first hypothesis (central place foraging) was rejected because adults preferred rugged

topography even when proximity to nest was taken into account; i.e., adults selected slopes even when they were observed in predominantly flat regions. The second hypothesis (ideal despotic distribution) was rejected for several reasons. Immatures did not avoid areas close to active nests, nor were they driven away, typically, when they did encounter adults. Furthermore, neither adults nor their nests were associated with areas of higher prey abundance. The third hypothesis (differential habitat selection) is the only one supported by the data. Prey surveys and food habit analysis indicated that both adults and immatures fed preferentially on European hares (*Lepus europaeus*), but only immatures selected habitats with high hare density. The authors concluded that different foraging strategies and not different prey preferences bring about differential habitat selection. Behavioral observations indicated that adults exhibited lower wing-flapping frequency than immatures, especially when flying over slopes. Different morphologies may afford adults more economic flight behavior and greater foraging efficiency on slopes. Thus, adult Grey Eagle-buzzards select habitats based on their topographic relief, whereas immatures select habitats based on prey densities, particularly that of the European hare. [Estación Biológica de Doñana, CSIC, Pabellón del Perú, Avda. María Luisa s/n, 41013 Sevilla, Spain.]—Karl E. Miller.

31. Effects of silvicultural treatments on wintering bird communities in the Oregon Coast Range. C. L. Chambers and W. C. McComb. 1997. Northwest Science 71:298–304.—Habitat needs of nonmigratory birds may differ by season. Resource managers need to be familiar with those seasonal needs in order to provide habitat for resident species year-round. This study examined bird use in winter of forested areas with 4 silvicultural treatments: modified clearcut, thinned, small-patch group selection, and uncut (control). Total number of birds and species richness were highest in the small-patch treatment, and lowest in the clearcut treatment. Species-specific responses were evident. Golden-crowned Kinglets (*Regulus satrapa*), for example, were most abundant in the uncut and small-patch areas; Spotted Towhees (*Pipilo maculatus*) most abundant in thinned and clearcut areas. Most species did not exhibit a seasonal shift in habitat use, i.e., they used similar habitat in winter and summer, although the authors cite other research that did document seasonal shifts. The authors point out the need for maintaining a variety of forest seral stages to meet the needs of all species throughout the year. [School of Forestry, College of Ecosystem Science and Management, Northern Arizona Univ., Flagstaff, AZ 86011-0001, USA; E-mail: carol.chambers@nau.edu]—Scott W. Gillihan.

32. The diversity of cloud forest birds on the eastern and western slopes of the Ecuadorian Andes: a latitudinal and comparative analysis with implications for conservation. B. O. Poulsen and N. Krabbe. 1997. Ecography 20:475–482.—The authors collected data from 5 locations in the cloud forest on the eastern slope of the Andes during the Jan.–Feb. main breeding season and compared their results with the literature for the western slope. On the eastern slope species richness and diversity remained constant along an altitudinal gradient between 3000–3350 m elevation (530 km long), but there was much species turnover along the gradient. Compared to the western slope data, the number of species was significantly greater on the eastern slope; probably because of historical differences in colonization from adjacent sources. However, when species richness was compared at census points, there was no significant difference. This apparent discrepancy is the result of greater species turnover on the eastern slope. Additionally, the species composition differed greatly between the two slopes. The species richness of the montane cloud forests are similar to those of tropical forests not temperate forests as had been previously supposed. The species richness of the eastern Andean slope near the equator in Equador is one of the largest in the world for that altitude. [Sect. of Ornithology, Zoological Museum, Univ. of Copenhagen, Universitetsparken 15, DK-2100 Copenhagen O, Denmark; E-mail: bopoulsen@zmuc.ku.dk.]—Robert C. Beason.

ECOLOGY

(see also 1, 30, 31, 32, 37, 42)

33. Seasonal changes in the pollen sampled from nectarivorous birds visiting an open forest at Menai, New South Wales. K. H. Egan. 1997. Corella 21:83–87.—Pollen samples were taken from mist-netted birds by rubbing a sticky gelatine cube on their bill and forehead.

Sufficient data were collected from six of 12 nectar-eating species captured to allow diet analysis. The purpose of the study was to determine what flowering plants were used by each species and to assess seasonal changes. New Holland Honeyeaters (*Phylidonyris novaehollandiae*), Eastern Spinebills (*Ancanthorhychus tenuirostris*), and Little Wattlebirds (*Anthochaera chrysoptera*) were present at the 1.5 ha site near Sydney, Australia, throughout the year. Red Wattlebirds (*A. carunculata*) and Noisy Friarbirds (*Philemon corniculatus*) were irregular winter visitors, and Yellow-faced Honeyeaters (*Lichenostomus chrysops*) and Silvereyes (*Zosterops lateralis*) were regular winter visitors. *Eucalyptus* spp. were sporadically in flower for most of the year, but *Banksia* spp. were the most abundant and commonly utilized plant species. *B. ericifolia* and *B. marginata* flowered during the winter and were the main staple of Silvereyes and Yellow-faced Honeyeaters. Eastern Spinebills foraged on a wide variety of plants and may have been partially excluded from the more popular *Banksia* spp. by larger honeyeaters. New Holland Honeyeaters had a varied diet dominated by *Banksia* spp. The results suggest that Silvereyes, Noisy Friarbirds, Yellow-faced Honeyeaters, Little and Red Wattlebirds all show distinct preferences among multiple available resources, while Eastern Spinebills and New Holland Honeyeaters feed more evenly on available resources. [1 Bowman St., Mortdale, NSW 2223, Australia.]—William E. Davis, Jr.

34. Communal breeding in tropical Guira Cuckoos Guira guira: sociality in the absence of a saturated habitat. R. H. Macedo and C. A. Bianchi. 1997. J. Avian Biol. 28:207–215.—Guira Cuckoos are communal breeders in which up to 13 adults, including several laying females, participate in each breeding effort. Both sexes incubate eggs and feed nestlings, and egg ejection and infanticide appear to be rampant. Thus, both cooperative and competitive tactics exist within groups. DNA fingerprinting has revealed that nest mates may be sired by different adults, and that some group members are excluded from breeding. Accordingly, one might expect some group members (especially those excluded from breeding) to disperse if suitable habitat is available. Communal breeding in birds often is thought to result from habitat saturation. In such cases, the absence of suitable breeding habitat selects for individuals that remain in their natal territory and help raise their parents' offspring until a breeding vacancy becomes available. Here, Macedo and Bianchi test the habitat-saturation hypothesis (HSH) by comparing ecological characteristics of occupied cuckoo territories with adjacent empty but apparently suitable areas. Contrary to predictions of the HSH, occupied territories and empty sites were very similar in vegetation characteristics, nest-tree availability, and water availability. Moreover, occupancy of sites varied considerably, with some sites being occupied in one year and vacant the next. The only significant difference between occupied and empty sites was in food abundance. Surprisingly, empty sites tended to have more food, suggesting that cuckoos reduced the numbers of their insect prey. On balance, then, the quality of empty sites was not lower than that of occupied sites (indeed, it may have been higher), and the habitat did not appear to be saturated. The lack of support for the HSH in Guira Cuckoos is similar to findings for some populations of communally breeding Acorn Woodpeckers (*Melanerpes formicivorus*) and Stripe-backed Wrens (*Campylorhynchus nuchalis*). In these species, communal breeding may stem from intrinsic advantages of group living and the existence of an optimal group size independent of habitat quality. [Dept. of Zoology, Univ. of Brasilia, Brasilia 70910-900, Brazil; E-mail: rhmacedo@guarany.cpd.unb.br]—Jeff Marks

35. The cost of polygyny—definitions and applications. S. Bensch. 1997. J. Avian Biol. 28:345–352.—Searcy and Yasukawa (1989, Am. Nat. 134:323-343) devised a hierarchical classification procedure for testing alternative explanations for territorial polygyny. In this "Forum" piece, Bensch points out that the ways in which various models are organized under the Searcy-Yasukawa (S–Y) system can influence which explanation a set of observations supports. Bensch illustrates the problem with a major dichotomy in the S–Y system, i.e., whether there is a cost of polygyny. Problems arise in confusing *component costs of polygyny* (e.g., decreased parental care by males) with the true *cost of polygyny* (i.e., the net cost after all benefits and component costs are summed). That is, demonstration that reduced assistance by males at secondary nests lowers reproductive success at these nests is not proof of a cost of polygyny unless all component benefits have been examined and found to be lower than the cost of reduced male assistance. Additional confusion exists over the term *compen-*

sation for costs of polygyny. This is because some researchers have assumed that the payback is measured on the territory where a female breeds. Instead, compensation should be measured relative to adjacent territories. The cost of polygyny is a within-territory parameter, and *compensation* is a between-territory parameter. Bensch suggests that the term *cost of polygyny* be reserved for the net difference in fitness between settling on the same territory with and without the presence of another female. The *component costs of polygyny* should be termed *costs of sharing*. If you are having as much difficulty understanding what I am saying as I am in trying to write this review, relax. It's my fault. Bensch's ideas will become clearer when you see the figures that accompany his text. Anyone with a strong interest in avian mating systems should obtain and read this important paper. [Dept. of Animal Ecology, Lund Univ., S-223 62 Lund, Sweden; E-mail: staffan.bensch@zooekol.lu.se]—Jeff Marks.

36. Heterospecific attraction affects community structure and migrant abundances in northern breeding bird communities. M. Mönkkönen, P. Helle, G. J. Niemi, and K. Montgomery. 1997. Can. J. Zool. 75:2077–2083.—In areas with seasonal environments, breeding bird communities include mixes of migrants and residents. As migrants arrive on the breeding grounds in the spring, they encounter residents already present. How does the presence of residents affect the migrants' decisions regarding where to settle? The authors tested the heterospecific attraction hypothesis, which suggests that the presence of residents makes a site more attractive to arriving migrants. They manipulated the number of residents present in late winter on small islands by attracting additional individuals with supplemental food on 3 islands, and by removing individuals from 4 other islands. The opposite treatment was applied to each island in the second year of the study. Numerical responses of migrants were determined by territory mapping during the breeding season. Migrants responded positively to the artificial increases in numbers of residents, although the difference was significant only for the arboreal insectivore guild, to which the manipulated residents belonged. The presence of heterospecific residents, especially those of the same feeding guild, may offer cues of higher quality habitat to newly-arrived migrants. Specifically, the migrants might benefit from increased information about food supply or enhanced protection from predators. [Dept. of Biology, Univ. of Oulu, P.O. Box 333, FIN-90571, Oulu, Finland; E-mail: mmonkkon@cc.oulu.fi]—Scott W. Gillihan.

POPULATION DYNAMICS

(see also 36, 43)

ZOOGEOGRAPHY AND DISTRIBUTION

(see also 27, 30, 32, 43)

37. Geographic variation in breeding parameters of the Pied Flycatcher *Ficedula hypoleuca*. J. Jose Sanz. 1997. Ibis 139:107–114.—The Pied Flycatcher has an extensive breeding range extending from northern Africa to northern Eurasia. Previous analyses of geographic variation in breeding parameters of the Pied Flycatcher have reached conflicting conclusions. The author identifies several problems with previous analyses, including (1) incomplete data sets, with little or no data from the southern part of the species' range, and (2) analysis of only one or two variables at a time. In this paper, the author analyzes variation in laying date, clutch size, and number of fledglings in the Pied Flycatcher in relation to altitude, latitude, and habitat using multiple linear regression on a large data set with an extensive latitudinal range. Data are presented from 99 study sites ranging from 34° to nearly 70° North Latitude, including the author's published and unpublished data. Mean number of years per study site was 7.5, and mean number of clutches monitored per study site was 278. Laying date increased with altitude and clutch-size decreased with altitude, suggesting that breeding conditions in montane habitats are less favorable. Clutch size and number of fledglings were higher in deciduous habitats than in coniferous habitats. Most importantly, when the effects of altitude and habitat were controlled, mean laying date, clutch size, and number of fledglings each showed quadratic relationships with latitude. Pied Flycatchers at mid-latitudes had earlier laying dates, larger clutches, and fledged more young, whereas Pied Flycatchers at northern and southern latitudes had later laying dates, smaller clutches, and fledged fewer young. The author acknowledges that subspecific differences could potentially be responsible

for some of these patterns. Nevertheless, quadratic relationships suggest that environmental conditions at the fringe of the breeding range are suboptimal relative to those in the central part of the breeding range. The interesting latitudinal patterns documented in this comprehensive study warrant further investigation of the latitudinal patterns in breeding parameters for other passerine species with wide geographic ranges. [Zoological Laboratory, Univ. of Groningen, P.O. Box 14, 9750AA Haren, The Netherlands.]—Karl E. Miller.

38. Compilation of observations of rare birds in Austria 1991–1995. [Nachweise seltener und bemerkenswerter Vogelarten in Österreich 1991–1995.] J. Laber and A. Ranner. 1997. Egretta 40:1–44.—This is the second compilation by the Avifaunistic Commission of BirdLife Austria and covers the period 1991–1995. It includes all the properly documented observations during the period. Seven species were recorded for the first time in Austria during those five years. Seven other species were recorded for the first time and two for the third time. This paper will be useful to those tracking the changes in geographic distribution of avian species. The observations are categorized as to accepted records, known or suspected escapes from captivity, and unaccented and undocumented records. [Avifaunistische Kommission, Birdlife Österreich, Museumsplatz 1/10/8, A-1070 Vienna, Austria.]—Robert C. Beason.

EVOLUTION AND GENETICS

(see also 17)

39. Low frequency of extra-pair fertilizations in the Great Tit *Parus major* revealed by DNA fingerprinting. N. Verboven and A. C. Mateman. 1997. J. Avian Biol. 28:231–239.—Especially among socially monogamous passerines, genetic monogamy seems to be the exception rather than the rule. In this study, DNA fingerprinting of Great Tit families from an island in the Dutch Wadden Sea revealed that only 9 of 507 offspring (1.8%) were extrapair young (EPY). Pairs that were experimentally induced to renest (which should have increased the incidence of EPY) were no more likely to have EPY in their nests than were non-manipulated pairs. Studies of mainland Great Tits have revealed higher percentages of EPY in nests (14 to 18%). In contrast to the mainland populations, the density of Great Tits was much lower on the island. Because the incidence of extrapair copulations tends to be positively correlated with population density, the low incidence of EPY on the island was not surprising. This study demonstrates that the occurrence of EPY can vary considerably among populations of the same species. Studies of genetic parentage in different populations of conspecifics may prove useful in identifying factors that are related to the occurrence of EPY, such as breeding synchrony, nesting density, and amount of genetic variation. [Netherlands Institute of Ecology, P.O. Box 40, 6666 ZG Heteren, The Netherlands; E-mail: nanette@cto.nioo.knaw.nl]—Jeff Marks.

40. Plumage brightness as an indicator of parental care in Northern Cardinals. S. U. Linville, R. Breitwisch, and A. J. Schilling. 1998. Anim. Behav. 55:119–127.—Females mated to males with exaggerated characteristics may obtain direct benefits (the good parent model) or indirect benefits (the differential allocation model). According to the good parent model, the expression of the trait reflects parenting ability. Thus, highly ornamented males should invest more in parental care than would other mates. The differential allocation model assumes that females choose males for indirect benefits, such as good genes, and predicts a negative relationship between parental care and ornamentation. To test these models, the authors examined plumage brightness of both male and female Northern Cardinals (*Cardinalis cardinalis*) to determine if it signaled parental care. Plumage brightness did not serve as a predictor of parental care for male cardinals but did for females. Also, females mated to bright males fed nestlings at a lower rate than did females mated to dull males. Therefore, the proportion of a pair's total feedings provided by the male was positively correlated with male breast color. The authors conclude that an individual's ornamentation predicts relative parental care effort, supporting the good parent model. [R. Breitwisch, Dept. of Biology, Univ. of Dayton, Dayton, OH 45469-2320, USA, E-mail: breit@neelix.udayton.edu]—Jeffrey P. Duguay.

PHYSIOLOGY AND DEVELOPMENT

(see also 42)

41. Relationships between body mass and size in mates of Common Terns (*Sterna hirundo*). [Beziehyngen zwischen Korpermasse und Korpergrosse bei Paarpartnern der Flussseeschwalbe (Sterna hirundo).]. W. Von Helmut, P. H. Becker, and M. Wagner. 1997. Vogelwarte 39:141–148. (German, English abstract, figure and table captions.)—There were none. Sample sizes for various analyses varied, but in general the study included about 40 pairs. Body mass varied independent of bill, wing, and tail length. Bill length of males averaged longer than that of females ($P < 0.005$) and pair members tended to be of similar body condition. [Institut fur Vogelforschung, Vogelwarte Helgoland', An der Vogelwarte 21, D-26386 Wilhelmshaven, Germany.]—Jerome A. Jackson.

PLUMAGES AND MOLT

(see also 42)

PARASITES AND DISEASE

42. Feather mites on group–living Red-billed Choughs: a non-parasitic interaction? G. Blanco, J. L. Tella, and J. Potti. 1997. J. Avian Biol. 28:197–206.—This paper could have been subtitled "Feather mites might not be parasites." Red-billed Choughs (*Pyrrhocorax pyrrhocorax*) are highly social corvids. Young birds begin accumulating feather mites (*Gabucinia delibata*) on their flight feathers after joining communal roosts at 1–5 months of age. The number of feather mites increases with age in nonbreeding choughs but decreases after they reach breeding age at 3 years. Mite abundance was positively correlated with a body-condition index in adults, and adults with mites tended to be in better condition than adults without mites. In addition, mite abundance did not differ between choughs with normal bills ($n = 151$) and those with deformed bills ($n = 17$), suggesting that choughs do not preen mites from their feathers. Thus, the association between feather mites and choughs could be commensal or even mutualistic. A possible benefit of feather mites is improved feather condition if mites remove old uropygial gland secretions and associated microorganisms, or if they compete for resources with bacteria and fungi that degrade feathers. Previous studies of feather mites have assumed that mites are parasitic to birds. The results reported here cast doubt on this assumption. Clearly, the door is open for experimental manipulations of mite numbers coupled with assessments of body condition in birds. [Dept. of Animal Biology, Univ. of Alcal, E-28871 Alcal de Henares, Spain; E-mail: bnjps@bioani.alcala.es]—Jeff Marks.

WILDLIFE MANAGEMENT AND ENVIRONMENTAL QUALITY

(see also 6, 9, 14, 31, 32)

43. Beached bird surveys in Portugal 1990–1996. J. P. Granadeiro, M. A. Silva, C. Fernandes, and A. Reis. 1997. Ardeola 44:9–17.—During winter (October–March) between 1990 and 1996, 5330 km of beaches were walked, revealing 2660 identifiable dead seabirds. Most were found along the central coast which faces northwest and is adjacent to a rich area of upwelling. In order of abundance, these included: Razorbill (*Alca torda,* 768 birds) and Gannet (*Morus bassanus,* 433). Yellow-legged Gull (*Larus cachinnans*), and Lesser Black-backed Gull (*L. fuscus*) were next in abundance, but distinction between these species was not always possible; together they accounted for 759 individuals. References to earlier surveys suggest reduced mortality due to entanglement in fishing gear. Oil contamination was low. Most (53.3%) were first-year birds, 37.8% were classified as adults, and 8.9% as immatures. Peak mortality was in December; least was in March. [CEMPA, Instituto da Conservacao da Natureza, Rua Filipe Folque 46, 3o, P–1050, Lisboa, Portugal.]—Jerome A. Jackson.

BOOKS AND MONOGRAPHS

44. A guide to the nests, eggs, and nestlings of North American birds. Second edition. P. J. Baicich, and C. J. O. Harrison. 1997. Academic Press, San Diego. 347 pp.—With the many field guides to birds currently available, one might wonder if there is room for yet

another newcomer. The answer is a resounding yes. Baicich and Harrison have produced an excellent guide to the nesting habits of more than 665 species that breed in the contiguous United States, Alaska, Canada, and Greenland. It is an outstanding contribution that is sure to become an essential companion for every American and Canadian field ornithologist.

The first section of the book comprises four introductory chapters. These early chapters give a broad but informative overview of such familiar topics as nest-building behavior, clutch size variation, egg shapes, eggshell pigments, incubation rates, hatching sequence, and development and behavior of precocial and altricial-nestlings. Also included are guidelines for finding and monitoring nests drawn from the classic paper by Martin and Geupel (1993, J. Field Ornithol. 64:507–519). Three identification keys, one each for nests, eggs, and young, help the user to narrow down the number of possibilities before searching through individual species accounts. The keys distinguish among 18 nest types, 17 egg colors and markings, and 21 types of nestling appearance. Entries in each key are cross-referenced to other keys.

The second section comprises the species accounts and illustrations. Species accounts are grouped by family, with general characteristics described under each family heading. Each species account begins with a description of breeding habitat and nest-site characteristics (no subheading), followed by six subheadings: Nest, Breeding season, Eggs, Incubation, Nestling, Nestling period. Species names and subheadings are given in large bold font, making it easy to find information quickly. The physical descriptions of nests, eggs, and young in Baicich and Harrison are more detailed than in the popular guide by Ehrlich et al. (1988, The birder's handbook: a field guide to the natural history of North American birds, Simon & Schuster, Inc., New York). Coverage of various nesting ecology topics, including timing of the breeding season, is also more complete in Baicich and Harrison. However, the species accounts in Ehrlich et al. include additional information about natural history and conservation issues for each species, topics which are outside the more narrow scope of Baicich and Harrison. Most readers will find that where these books overlap, Baicich and Harrison's guide is often more informative.

The illustrations are outstanding. Sixty-four color plates feature egg photographs by F. Greenaway and C. Sumida and paintings of nestlings and chicks by P. Burton. Black-and-white drawings of nests by A. Burton and T. O'Nele (as well as drawings of the dorsal patterns of many gamebirds and shorebirds) are included throughout the text of the species accounts. The egg plates are stunning and most photographs are life size or nearly so. Unfortunately, 71 species (11%) lack egg photographs—many of these species are rare breeders at the extreme limits of the region covered, yet others are widely distributed, familiar species (e.g., Willow Flycatcher, *Empidonax traillii*; Black-throated Blue Warbler, *Dendroica caerulescens*) or species local to Florida (e.g., Mottled Duck, *Anas fulvigula*; Short-tailed Hawk, *Buteo brachyurus*). Thirty-eight species have more than one egg illustrated to portray the variation in eggshell coloration and markings found in the species.

I have only minor criticisms of this book. Drawings of nests are shown for only about 10% of all species, and several groups are underrepresented (e.g., *Melanerpes uropygialis* is the only cavity-nesting species shown). More nests could have been shown without adding significantly to the size of the book. Because so few nests are illustrated, photographs in older references such as Harrison (1975, A field guide to birds' nests of 285 species found breeding in the United States east of the Mississippi River, Houghton Mifflin Co., Boston) will continue to be very useful. There is also occasionally some imprecision in the family treatments (e.g., under Picidae, Baicich and Harrison state that, "The young are mainly fed on regurgitated food."). Finally, the authors' title does not accurately describe the geographical scope of the book (i.e., "North American birds" would encompass Mexican species north of the Isthmus of Tehuantepec).

In conclusion, this is a detailed, thorough treatment of a topic that is currently the focus of much ornithological research. Anyone engaged in nest monitoring studies would benefit from owning this book. It is easy-to-use, with a readable font, bold subheadings, and a single index combining common and scientific names. The illustrations are excellent, and the volume is remarkably clean of errors. The plastic, water-resistant coating on the cover suggests it can handle moderate field use. It is difficult to imagine a better deal for a publication of this quality—at only $23, it is a must-have reference for all field ornithologists in the U.S. and Canada.—Karl E. Miller.

45. Birds of North America and **Birders Diary** are multimedia CD-ROM versions 2.0.1 and 2.0.2, for Windows 3.1 or and Windows 95. 1997. Thayer Birding Software, Cincinnati, OH. List price $65.00 and $125.00 respectively.—This software is recommended for persons with access to an IBM-compatible 486 or higher computer having at least a 2X CD-ROM drive, 8 MB of RAM, a sound card and a hard drive space of 9 MB for *Birds of North America* or 30 MB for *Birders Diary*. A review of previous versions of these titles appeared in J. Field Ornithol. 67:350–351, 1996.

The Birds of North America disk includes all 917 species in the U.S. and Canada (excluding Hawaii) and 315 species from other continents, and has over 2800 high quality photos (from VIERO and other sources), and the capability to contrast any two photos side by side and to zoom in for closer examination. Many species include photos of female and juvenile plumages. Songs and calls of 695 species are from the Cornell Laboratory of Ornithology, and the user can display detailed sonograms that show those songs while they play. Sound quality is excellent, even at high frequencies. Some of the species are included in 121 action videos from Maslowski Photo, illustrating special behavior. To help users determine the identification of a bird seen in the field, one section can limit the choices to species having a given color or colors, size, habitat, family or several families (if known) and state or province, then show the photos of each of the remaining species as a collage or individually. Simple annotations can be stored with each species, but they are not integrated with sightings or notes entered in *Birders Diary* (see below).

To make this program much more informative than just species identification, the user can get the range map (as found in many field guides) and the summer and winter abundance maps derived from the Breeding Bird Surveys and Christmas Bird Counts. To see printed details of the species' natural history and related essays, a simple click brings up the appropriate entry in the CD version of *Birder's Handbook* (very similar to the printed edition by Ehrlich, Dobkin and Wheye, 1988) which is included on the disk.

In addition to the above species-specific information in the program, there is a wealth of additional information of interest to birders. The "Joy of Birding" section includes checklists for each of the states and Canadian provinces and several other countries (those checklists are printable, but can not be marked on the computer), addresses of nearly 1200 bird clubs, Rare Bird Alert phone numbers, descriptions of birding hot spots, web sites on the internet, and advice on attracting birds and shopping for birding equipment. The program also contains a large selection of bird identification quizzes, adjustable for degree of difficulty and types of cues (sight, sound, distribution), and the user can design quizzes covering just selected species if *Birders Diary* is installed. The "Avian Jukebox" section is designed to play bird songs as background music or as a learning tool.

The *Birders Diary* disk is a great convenience for recording and managing sightings. Computer-markable checklists include those of the American Birding Association (ABA; 910 species), the American Ornithologists' Union (AOU; 1993 species), and the entire world list (9946 species) according to both the traditional (Wetmore) system and the Sibley-Ahlquist-Monro system. Species names, splits and lumps are current to 1996. The publisher intends to have free updates of the lists available each year. Since a species may have different names in those different lists (*Anthus rubescens* is American Pipit in the ABA, AOU and Sibley lists but is Buff-bellied Pipit in the traditional list), the program provides a "Rosetta Stone" button to show the names of a bird in each of these lists. Similarly, it includes aliases for some species (e.g., Sparrow Hawk = American Kestrel), and any other names can be put into a search and cross referenced to the equivalent names in other lists.

Checklists can be easily printed for any state, Canadian province, or for any of 225 different countries, or the entire world. If requested, a country list can show which species are endemic to that country and which of the birds on the country list appear on the user's life list. Similarly, the country list can be limited to only those species that the user has not yet seen in that country, even though they may appear on the user's life list from other places. These features should be quite useful to birders traveling to a foreign destination. For any one species, the list of states or countries where it occurs can be shown.

We found a few errors in the country list section, apparently resulting from recent taxonomic splits. For example, the Water Pipit (*Anthus spinoletta*) was recently split into *A. spinoletta* in the Old World, and *A. rebescens* in North America. While the traditional USA list

correctly contains only *A. rubescens,* the traditional Mexico list incorrectly shows both species. And while the Arizona list correctly contains the Western Scrub-jay (*Aphelocoma californica,* the desert form of what was previously called the Scrub Jay), the Mexico list incorrectly does not include either Scrub Jay or Western Scrub-jay.

Users can record life lists, country lists, trip lists, yearly or daily lists, back-yard lists, etc., and lists for many different observers can be kept. When several observers have seen similar but not identical lists of birds on a single trip, it is easy to fill out a checklist for one person, then make the few additions subtractions and enter the modified list for a second person, without having to re-enter the species that both saw. When checking off birds on the computer screen from any trip, the species that are already on the user's life list are shown in boldface type.

Any of the sightings lists can be printed out, in several different formats, including any notes made with each sighting or trip. The notes, or the checklists' bird names, can be easily searched for any specified words. Birds can be arranged by dates observed, location, taxonomic order, or alphabetically by first or last name. Lists or reports can show all the birds the user has seen at a particular time or place, or all the times and places that a particular species was seen, if those data had been entered with each occurrence.

For users who want to pinpoint the exact location of a sighting in the USA, the program in integrated with a 1996 U.S. street mapping CD-ROM disk by Checkpoint Technologies (included in the package) so that very precise coordinates can be saved with the sighting information, in latitude-longitude coordinates, and as a colored spot applied to a local map. Then at any future time, the user can bring up that particular bird sighting and see the local map with the colored dot that was applied previously.

The program is also integrated with *Birds of North America* and *Birder's Handbook* (see above) and with Sibley's *Birds of the World v. 1.x* (1994) or *v.* 2 (1996) (on floppy disks, see review on version 1.5 in J. Field Ornithol. 67:351) so that it is very easy to switch from a species in *Birders Diary* to the same species in any of those. It is compatible with the previous versions of *Birders Diary* (and user lists in other popular bird-listing programs can soon be converted with Thayer software), so that users who have filled in extensive lists on older versions do not need to re-enter their lists on this new version. In cases where species have been split or lumped in the interim, the details of the revision are presented (complete with references) so that the user can determine which tail of a split is applicable to his/her own sightings.

A user's list totals for the 20 ABA regions and for each state and province can be automatically put onto an ABA listing report form. Christmas Bird Counts can be complied and arranged in taxonomic or abundance order.

Thayer has been correcting glitches as they are found, to incorporate into new release versions, and makes tips and fixes available on the internet at http://www.birding.com.

We found these programs to be of high quality and high in information and capabilities. On the down side, they require a computer with high capacity, and we experienced occasional computer crashes or freeze-ups while using both of them.—Edwin and Evelyn Franks.

46. The hummingbirds of North America: second edition. P. A. Johnsgard. 1997. Smithsonian Institution Press, Washington D.C. 278 pps., 24 color plates, numerous range maps and line drawings. ISBN 1–56098–708–1. $45.00 (cloth).—This book is a substantial revision of the 1983 first edition since it includes life history information on 25 species of Mexican hummingbirds not included in the first edition. Part One of the book (61 pages) is comprised of six chapters on the comparative biology of hummingbirds. Chapter 1 deals with classification and distribution, Chapter 2 with evolution and speciation, and the remaining chapters are on comparative anatomy and physiology, ecology, behavior, and reproductive biology. Part Two consists of 47 hummingbird species accounts. Each account includes headings: other names, range, North American subspecies, measurements, weights, description, identification, habitats, movements, foraging behavior and floral ecology, breeding biology, and evolutionary and ecological relationships. Range maps and line drawings accompany each account. The 22 accounts from the first edition have been updated with new material and references where appropriate, and the range maps have been revised for Mexican species, relying heavily on the range maps from Howell and Webb (*A Guide to the Birds of Mexico and Northern Central America,* 1995, Oxford University Press, U.K.). The 16 first edition color

plates by James McClelland have been supplemented by 4 plates by Mark Marcuson that depict males of newly included species, and the 4 hummingbird plates by Sophie Webb from the Howell and Webb field guide. The latter plates illustrate a number of species not covered in this book. Appendices include keys for North American and Mexican hummingbirds, a glossary, and a section on the origins of Latin names of the hummingbirds described in the book.

The 6 chapters of Part One are substantially the same, having undergone only minor revision consisting of a few added references and paragraphs. The major changes in this second edition are the addition of the new species accounts and color plates, and bringing the bibliography up to date. Not included in the second edition are short accounts of each genus, and appendices which dealt with a synopsis of the family Trochilidae, a synoptic identification guide to hummingbirds of the world, a reference list to hummingbird illustrations in other books, and hummingbird-adapted plants of North America—all eliminated presumably to make room for the new species accounts.

The text brings together a broad literature on hummingbird biology and is presented in a very readable manner. The addition of the Mexican species, which is the heart of the new edition, has, in essence, redefined North America to include Mexico south to the Isthmus of Tehuantepec, which may strike some readers as odd. Including these Mexican species, however, has made the book more representational of a family of birds that is largely tropical in distribution.

This is an attractive and well written book that is substantially expanded from the first edition, and hence should be part of any academic library and the personal library of at least those with a special interest in hummingbirds.—William E. Davis, Jr.

ERRATUM

In the paper "Large-scale mapping of Purple Martin pre-migratory roosts using WSR-88D weather surveillance radar" by K. R. Russell, D. S. Mizrahi, and S. A. Gauthreaux, Jr., published in JFO 69(1):316–325, the following errors in Table 1 should be corrected. The descriptions of sites 14 and 15 should be switched, and the text following Lake Livingston for site 33 should be omitted.