J. Field Ornithol., 66(1):159–171

RECENT LITERATURE

Edited by Robert C. Beason

RESEARCH TECHNIQUES

(see 12)

BEHAVIOR

(see also 4, 6, 7, 18)

1. Experimental evidence for helping and hindering by previous offspring in the cooperative-breeding Seychelles Warbler *Acrocephalus schellensis*. J. Komdeur. 1994. Behav. Ecol. Sociobiol. 34:175–198.—Seychelles Warblers, which number somewhat over 500 worldwide, are a cooperatively breeding species in which first year helpers may remain on their natal territories and delay breeding for several years. Although the presence of such prebreeding helpers (alloparents) should enhance the reproductive success of their parents, some evidence suggests that such cooperative breeding could reduce the fecundity of the parents in the wake of extra-pair copulations and joint-nesting. The purpose of this study was to examine the causes by which the presence of alloparents can affect the reproductive success of their parents, independent of the effects of correlated variables such as territorial quality, group size, and parental quality. To this end, the author examined color-marked Seychelles Warblers during five breeding seasons on Cousin Island in the Scychelles. In addition to quantifying the reproductive output of warblers of different breeding group sizes, the author performed removal experiments to determine the affect of one or more alloparents on the reproductive success of their parents. One alloparent added to a pair occupying low-, medium-, and high-quality territory substantially increased the number of fledglings and yearlings produced by the breeding group versus unassisted pairs. Conversely, a second alloparent reduced the reproductive success of the group on low- and medium-quality territories, while a third alloparent reduced group fecundity on all territories. Female alloparents contributed significantly to nest building rates and the percentage of time when eggs were being incubated. Conversely, no correlation existed in the number of alloparents and hatching success. Although the presence of one alloparent improved hatching success, more than one alloparent appeared to be a detriment. Similarly feeding rate was positively correlated with an increasing number of alloparents, but with increasing brood size, individuals were fed significantly less because food had to be shared. Fledglings from broods of one with three feeders received more food and were significantly more likely to reach independence than fledglings from groups with multiple alloparents. Experiments in which the only alloparent was removed from groups of three (leaving only the breeding pair) resulted in a reduction in fecundity of such groups versus control groups. On the other hand, when groups with two or three alloparents and a breeding pair were reduced to one alloparent and a breeding pair, such groups produced significantly more fledglings than multiple control groups. The removal of alloparents did not have any significant affect on breeder survival, number of nest-building attempts, hatchability, or number of nests containing a clutch or nestlings. Thus, these data suggest that the increase in offspring production in the presence of one alloparent is completely the result of helping; moreover, the presence of alloparents seems to have a substantial effect on the alloparents indirect inclusive fitness. [Dept. of Zoology, University of Cambridge, Cambridge CB2 3EJ, UK.]—Danny J. Ingold.

FOOD AND FEEDING

2. Does the Scops Owl *Otus scops* show sexual segregation in prey selection? [Existe-t-il une ségrégation sexuelle de la prédation chez le hibou petit-duc *Otus scops*?] R. Arlettaz and J. Fournier. 1993. Alauda 61:257–263. [French, English summary, figure, and table captions.]—Perhaps. Photographs of 683 prey items brought to young of two broods (apparently the same adults) in the Valais Alps, Switzerland, suggest that there is a difference between the sexes. The female brought in more great green (*Tettigonia viridissima*) and dark (*Pholidoptera griseoptera*) bush-crickets, while the male brought more grey bush-crickets (*Platycleis albopunctata*) and adult noctuid (Noctuidae) moths. The authors suggest that the female hunted in denser vegetation and the male in more open areas. The only statistically signifi-

cant difference in comparison of mean daily prey they demonstrate is that the females brought more *Pholidoptera*—for the other prey, they point to "trends." Tests of differences in the combined samples demonstrated significant ($P < 0.05$) differences between the sexes in several prey, including those mentioned and in the numbers of rodents (*Apodemus* and *Microtus*) brought to the nest (females brought relatively more rodents). As the authors suggest, this is an interesting data set, but a larger sample size of owls studied is needed before we can draw any conclusions. The authors recommend studies of habitat use of radio-tagged individuals. [Institut de Zoologie et Ecologie Animale, Bâtiment de Biologie, CH–1015 Lausanne, Switzerland.]—Jerome A. Jackson.

3. Underwater feeding of three shearwaters: Pale-footed (*Puffinus carneipes*), Sooty (*Puffinus griseus*) and Streaked (*Calonectris leucomelas*) shearwaters. N. Oka. 1994. J. Yamashina Inst. Ornithol. 26:81–84.—The author collected data and photographs from divers in Japanese coastal waters documenting Pale-footed Shearwaters taking snake mackerels (*Promethichthyes prometheus*) from nets at 27 m depth, and pursuit diving. They held their primaries half spread and propelled themselves with alternate kicks of their webbed feet. Sooty Shearwaters were observed tearing strips of green seaweed from a rocky bottom at 7–8 m. They dived down in a zigzag pattern interpreted as reducing buoyancy. Other Sooty Shearwaters were observed diving to depths > 10 m. Streaked Shearwaters were observed plunge diving to a depth of 5 m to retrieve pieces of fish offered to them. Underwater photos of *P. carneipes* and *P. griseus* appear as frontispieces to this issue of the journal. [Yamashina Institute for Ornithology, Konoyama, Abiko City, Chiba Prefecture, 270–11 Japan.]—Jerome A. Jackson.

4. Food exploitation by a winter flock of Greylag Geese: behavioral dynamics, competition and social status. K. Kotrschal, J. Hemetsberger, and J. Dittami. 1993. Behav. Ecol. Sociobiol. 33:289–295.—Foraging animals have to balance their time in a way that enables them to maximize their energy intake while they concomitantly minimize their risk of predation. In order to understand the influences of intraspecific competition and to examine the behavioral dynamics of patch exploitation in the winter flock, 140 semi-domestic Greylag Geese (*Anser anser*) were studied during a four-month period. The geese were fed low, intermediate, and high densities of barley (1600; 3300; and 11,500 grains/m^2 respectively), and various behaviors including peck rates (for food), frequency of agonistic encounters, and alert postures were quantified. Geese began leaving low and intermediate density patches after 4 and 6 min respectively when the food density reached about 900 grains/m^2. In high density patches geese remained longer and after 30 min the density of grains still remained high (>1500/m^2); moreover, geese leaving the patches had extended esophagi suggesting that they were satiated. Mean peck rates decreased significantly under low and intermediate food densities, but remained relatively unchanged under high densities. Family ganders had the lowest peck rates while unmated individuals (singles) had the highest peck rates. Agonistic interactions were initially low at all feeding levels but increased in the low-density experiments when grain density reached 900 grains/m^2. Family ganders were the most aggressive while paired females were the least aggressive. The proportion of alert (head-up posture) geese was low during the initial feeding period on the low and intermediate plots but increased significantly as the plots were depleted after 3 to 5 min respectively. Alert postures on high density plots remained low during the first 20 min. Family ganders spent significantly more time in the alert posture than any other social category. These data demonstrate that food density affects behavior in a feeding flock and that a switch from scramble to interference competition is apparent at a set food density of about 900 grains/m^2. Although increasing aggression probably results from decreasing food density, increasing vigilance is likely linked with goose density rather than food density. Low-ranking individuals (mainly singles) were most successful in patches with food densities above the scramble/interference threshold (900 grains/m^2), but were frequently displaced below the threshold. [Konrad-Lorenz-Forschungsstelle für Ethologie, A–4645 Gruau 11, Austria.]—Danny J. Ingold.

5. Prey remains at Osprey nest in Tayside and Grampian, 1987–1993. D. N. Carss and K. Brockie. 1994. Scottish Birds 17:132–145.—An investigation into the diet of the Osprey (*Pandion haliaetus*) in Scotland was conducted. Prey remains were collected and analyzed

from 23 nests for a total of 104 records. The presence of identifiable material such as fins, scales, bones and skin, as well as cranial keybones led to the determination of species consumed. While some difficulty was encountered in differentiating salmonid species, (brown vs. rainbow trout) this family comprised the largest proportion of identified prey remains. Other prey species found to be consumed included cyprinids and piscivores. Interestingly, neither of these groups had been previously documented in the diets of Osprey in this area. The distribution of cyprinids is known to be patchy in this region in general and could explain why it was not documented earlier in Scotland. Grayling has never been documented as Osprey prey anywhere, and the authors offer the possibility that this could be the result of an increase in either or both species. In general, the species recorded from prey remains was consistent with what was expected, given the respective distribution and abundance of the fish species in Osprey nesting areas. [Inst. of Terrestrial Ecology, Hill of Brathens, Glassel, Banchory, Kincardineshire, AB31 4BY, Scotland.]—Sue Bennett.

SONGS AND VOCALIZATIONS

6. Character release in bird song: a test of the acoustic competition hypothesis using American Tree Sparrows *Spizella arborea*. C. T. Naugler and L. Ratcliffe. 1994. J. Avian Biol. 25:142–148.—In some bird species, populations inhabiting areas with few other species have more variable songs than populations inhabiting areas with a richer diversity of species. One explanation for this phenomenon, the "acoustic competition hypothesis" (ACH), is that song variability within species is a function of interspecific competition for acoustic space. That is, in acoustically simple environments (i.e, few other species), there is little selection for conspecifics to sing the same song type, whereas in acoustically complex environments (i.e., many different species), the need for conspecific recognition in the presence of many competing signals selects for intraspecific convergence in song types. The authors tested the ACH in American Tree Sparrows nesting near Churchill, Manitoba in 1991. Songs of 140 different males were recorded, 10 each from 14 10-ha blocks. At the same time, the number of passerine species singing within each block was counted. Individual male Tree Sparrows sang a single song type, but song structure varied among males. Most of the males (92%) sang one of five different song types, and 13 males (8%) sang unique songs. The statistics of interest for each block were song type richness and sympatric species richness. The former could range from 1–6, with the unique songs lumped into a single song type (e.g., a block would receive a score of 1 if all 10 males sang the same song, and a score of 6 if all five song types plus at least one unique song occurred among the 10 males). The number of other passerine species in the blocks ranged from 3–8. In agreement with the ACH, there was a significant negative relationship between Tree Sparrow song type richness and species richness at the same sites ($r = -0.92$, $P < 0.0005$). Naugler and Ratcliffe suggest that this pattern stems from male Tree Sparrows selecting territories where their song type is "most effective." The discussion includes a well-balanced evaluation of the assumptions of the hypothesis and a caveat that the interpretation of the results is tentative. Clearly, the door is now open for additional work on the relationship between song variability and complexity of the acoustic environment. [Dept. of Biology, Queen's Univ., Kingston, ON K7L 3N6, Canada.]—Jeff Marks.

7. Differential responses of territorial Tawny Owls (*Strix aluco*) to the hooting of neighbors and strangers. P. Galeotti and G. Pavan. 1993. Ibis 135:300–304.—Field playback experiments were made in Pavia, Italy to compare the abilities of Tawny Owls to discriminate between hooting calls made by neighbors and strangers, and determine if they calibrate the intensity of their response based on the discrimination. Twelve pairs of owls were tested using recordings of neighbor and stranger male hoots collected the year before. The recordings were directed to the center of the territory of the pair under study and their responses recorded. Eight of the twelve pairs of owls studied responded. Results indicate a significantly greater aggressiveness in response from both members of the pair towards stranger's hoots than towards those of neighbors, but the intensity of aggressive response to strangers decreased with repeated playback. These findings support previous studies suggesting that Tawny Owls learn to recognize the hoots of neighbor owls, and react more quickly and more aggressively to strangers. Repeated hoots from strangers decrease the in-

tensity of response of the pairs under study, as the strangers cease to be a threat and the owls habituate to the new call. The results provide evidence for excellent memory in Tawny Owls, and ability to discriminate between individual owls.—Maria Luisa Sanchez.

NESTING AND REPRODUCTION

(see also 1, 2, 25)

8. The nesting of Shelduck *Tadorna tadorna* on Chausey archipelago (the Department of Manche, north-west France): the problem posed by the early disappearance of families. [La reproduction de tadorne de belon *Tadorna tadorna* dans l'archipel de Chausey (Manche, France): problèms posés par la disparition précoce des familles.] G. Debout and P. Leneveu. 1993. Alauda 61:209–213. [French, English summary, table, and figure captions.]—Each year about 30 pairs of Shelduck nest on the Chausey Islands of Normandy in southwest France, but they disappear with their broods within a few days of hatching. Predation by rats or gulls was suspected, but following of adults with broods demonstrated that young were taken to brackish mudflats along the mainland to feed. [Groupe Ornithologique Normand, Université, 14032 Caen cedex, France.]—Jerome A. Jackson.

9. Extended sperm competition: intra-sexual selection and the evolution of avian social behavior. K. Ueda. 1994. J. Yamashina Inst. Ornithol. 26:1–46. (Japanese, English summary.)—This very extensive review of literature associated with the phenomenon of sperm competition is, unfortunately almost entirely in Japanese. An English abstract suggests that sperm competition is "an essential process of intrasexual selection which influences not only the characteristics of reproductive organ and mating behaviour, but also the mating system, social organization and life history strategy of birds." The literature cited includes more than 300 citations—most of which are in English, providing an outstanding bibliographic resource. [Laboratory of Biology, Rikkyo Univ., Ikebukuro, Tokyo, 171 Japan.]—Jerome A. Jackson.

10. Breeding biology of the Coot *Fulica atra* on Lake Teganuma, Chiba. N. Kitajima. 1994. J. Yamashina Inst. Ornithol. 26:47–58. (Japanese, English summary and figure captions.)—This one-year study of the breeding ecology of the Coot in central Japan provides considerable quantitative data from up to 43 nests. Nest building required 2–7 days during April–mid-July and most nests (86%) were in cattails (*Typha angustata*). Clutch size ranged from 3–8 eggs (mean = 5.2); both sexes incubated for intervals averaging 51 min and incubation periods of 21–25 days; 32% of eggs hatched. Data are also presented on frequency of adult visits to the nest with nest material per time of day during nest building, incubation, and chick feeding. [Wakatsuki Primary School, 810 Wakatsuki Higasijo, Nagano City, 381 Japan.]—Jerome A. Jackson.

11. Effects of Short-eared Owls on Common Tern colony desertion, reproduction, and mortality. D. W. Holt. 1994. Colon. Waterbirds 17:1–6.—The objectives of this study were to determine the causes of tern mortality and night nest desertion in the context of reproductive success in a Common Tern (*Sterna hirundo*) colony on North Island of Monomoy National Wildlife Refuge, Chatham, Massachusetts. The author evaluated predation during the breeding seasons of 1982–1984, and monitored tern reproduction success in 1983–1984. Short-eared Owl (*Asio flammeus*) predation was monitored by direct observation in twilight, at night using a military night vision scope, and prey carcasses and pellet analysis. Night searches of nests for broken eggs and missing chicks was made in the area of the colony where Black-crowned Night-herons (*Nycticorax nycticorax*) were active. Short-eared Owls were responsible for about 23% of tern chick mortality by known predators in 1983–1984, but their impact was much greater, because owls foraging in the colony at dusk caused adult terns to desert nests until dawn, thus exposing eggs and chicks to weather effects and predation, especially by night-herons. The nocturnal desertion also prolonged the incubation period by about a week. Nearly half of the eggs were predated, abandoned, or otherwise destroyed. Of 1254 eggs laid in 1983–1984, only about a dozen produced fledged young. In 1985 much of the colony was abandoned. The author did not evaluate the possible impact of investigator disturbance from daily visits to the colony.

Although the direct and indirect effects of Short-eared Owl predation were well docu-

mented, the author concludes with a cautionary statement regarding predator control. [Owl Research Institute, P.O. Box 8335, Missoula, MT 59807, USA.]—William E. Davis, Jr.

12. The influence of investigator disturbance on the breeding success of Ring-billed Gulls (*Larus delawarensis*). K. M. Brown and R. D. Morris. 1994. Colon. Waterbirds 17:7–17.—This paper is a review of the literature on investigator disturbance of colonial nesting birds, particularly gulls, and the authors suggest that investigator disturbance raises concerns about the reliability of data on breeding success and raise ethical questions. Few studies have supplied quantitative evidence that the investigators have *not* influenced the study animals or results. This paper reports that investigator disturbance had no significant effect on clutch size distribution, hatching or fledging success at two colonies of Ring-billed Gulls studied in 1989–1991, near Port Colborne, Ontario, Canada. Study plots of similar nest density, vegetation, and cover, were established prior to egg laying and subjected to 5 different levels of disturbance, which varied in frequency and duration of visits. Visits were in morning or evening and usually a second observer monitored from a blind gull responses to the disturbance. All pairwise statistical comparisons were within-year and within-colony to eliminate year and colony variables. Comparisons among disturbance levels were made for the egg laying, incubation, and hatching periods, but there was no investigator disturbance during the brooding period, and hatching and fledging successes were monitored from a blind. The authors suggest that the lack of impact on nesting success, compared to previous studies, resulted from differences in methodology (e.g., analysis, experimental protocol) and ecological differences, primarily in the availability of cover for chicks. A major factor in disturbance protocol was the cessation of visits before the brooding phase, because conspecific predation and infanticide often lead to nest failure in gulls, and during the brooding phase chicks are most mobile and vulnerable. Avoiding disturbance during mid-day may have reduced thermal stress on eggs and chicks. This paper should be of interest to anyone studying the breeding biology of colonial nesting birds. [Dept. of Biological Sciences, Brock Univ., St. Catharines, Ontario, L2S 3A1, Canada.]—William E. Davis, Jr.

13. Breeding of the Greater Flamingo in western Venezuela. C. L. Casler, E. E. Esté, and H. M. Pardo. 1994. Colon. Waterbirds 17:28–34.—Greater Flamingos (*Phoenicopterus ruber*) have been declining in numbers in the Caribbean area and breeding is restricted to 5 sites. Hence, the discovery of a major mainland breeding colony at Ciénaga de Los Olivitos, a 20,000 ha coastal lagoon at the mouth of the Lake Maracaibo Basin, is encouraging. There have been no known breeding colonies in Venezuela since 1952. In 1987 3000 young were seen in the crèche and 4015 nests were counted after the breeding season. In 1988 nesting success was reduced because of disturbance from a television news reporter aerial survey and storm tides. A crèche of >1000 young was observed in 1989 and 1105 nests counted. Drought conditions prevailed from 1990–1992 and no breeding was observed. The breeding season is February–July, and birds may renest after nest failure. In 1989 two distinct flocks nested in succession. The authors estimate that >5000 young fledged from 1987–1989. The nesting area is now a wildlife refuge, but some hunting and egging occurs. Storm tides and dry conditions are a greater threat, however, and the authors suggest a management program in which water levels are regulated. [Centro de Investigaciones Biológicas, Facultad de Humanidades y Educación, Universidad de Zulia, Apartado 526, Maracaibo 4001–A, Estado Zulia, Venezuela.]—William E. Davis, Jr.

14. Factors affecting kleptoparasitism and predation rates upon a colony of Audouin's gull (*Larus audouinii*) by Yellow-legged Gulls (*Larus cachinnans*) in Spain. D. Oro and A. Martinez-Vilalta. 1994. Colon. Waterbirds 17:35–41.—Audouin's Gull is an endangered species and about 60% (ca. 7000 pairs) of the world's population nests in a colony at Elbro Delta, NE Spain, on the same peninsula with 1100 pairs of Yellow-legged Gulls. The purpose of this study was to evaluate the impact of Yellow-legged Gull kleptoparasitic behavior, and predation on eggs and chicks, on Audouin's Gull reproductive success. Thirty-seven days of observation, totalling 333 hours, 111 each in April, May, and June, 1992, included all stages of the breeding cycle for Audouin's Gull. Only 2 of 8 predation attempts were successful, but 41% of 213 kleptoparasitic attacks succeeded, and 7 Audouin's Gulls were killed. Attacks were most frequent early and late in the day, and during a moratorium season for the fishing fleet, which coincided with peak food demands for Yellow-legged Gulls. Success rates of

kleptoparasitic attacks increased with both duration of chase and group size of gulls involved in the chase. The authors conclude that the rates of predation and kleptoparasitism were low, and probably had a low negative impact on Audouin's Gull reproductive success. [Universitat de Barcelona, Facultat de Biologia, Dept. Biologia Animal (Vertebrats), Avda. Diagonal 645, 08028 Barcelona, Spain.]—William E. Davis, Jr.

15. Nest site selection by Herring Gulls in an urban estuary. A. D. Maccarone, J. N. Brzorad, and K. C. Parsons. 1993. Colon. Waterbirds 16:216–220.—This study examines factors influencing nest site selection in Herring Gulls (*Larus argentatus*) on north-south oriented Prall's Island in the Arthur Kill tidal strait between New Jersey and Staten Island, New York. Factors include slope differences caused by dredged material deposition, and distribution of human refuse ("garbage-wrack"). On 1 km sections along the west shore (WS) and east shore (ES) nests (about 500/year) were censused in May 1987–1989, and number of eggs/nest, egg size, and shoreline parameters, including slope, were recorded. More than 75% of active nests were on the WS. Steep slope and garbage-wrack (including automobile tires and lumber) provided protection against tidal, storm, and ship-wake flooding on the WS, so gulls could nest close to the water's edge, perhaps facilitating chick escape from predators by swimming. On the ES low slope increases the danger of flooding although garbage-wrack provides some protection from wind-driven rains and tides. In addition to fewer nests, there were significantly more 0-egg nests on the ES in all years (some may have been "dummy nests"), and fewer 3-egg nests in 1987 and 1989, suggesting that birds with lower competitive ability may nest later on the less desirable ES. In 1989 a decline on the ES to 17% of active nests may reflect unusually wet, stormy weather, and reduced garbage-wrack, making the ES even less desirable nesting habitat. [Biology Dept., Friends Univ., Wichita, KS 67212, USA.]—William E. Davis, Jr.

16. Certainty of paternity covaries with paternal care in birds. A. P. Møller and T. R. Birkhead. 1993. Behav. Ecol. Sociobiol. 33:261–268.—Because it is costly for males to invest energy providing parental care for nonkin, the evolution of parental care should be directly related to the certainty of paternity. While some theoretical models suggest that this is the case, other models suggest that there is no direct relationship between the two. In this study the relationship between various measures of paternal care in birds including nest building, courtship feeding, incubation, and feeding of offspring, and the certainty of paternity were examined in 52 species. Data were obtained from literature reports and personal communications, and the phylogeny of bird species was based on Sibley and Ahlquist's recent classification of birds. The degree of paternal care during feeding of offspring was negatively related to extra-pair paternity across species. Conversely, no such relationship was detected between male parental care and certainty of paternity during nest building, courtship feeding, and incubation, probably because paternal care is relatively cheap early in the breeding cycle. Paternal care during the nestling stage was positively related to the certainty of paternity even when controlling for the confounding effects of developmental mode (altricial vs. precocial species) and degree of polygyny statistically. Moreover, this postive relationship did not appear to be affected by the availability of extra-pair (copulation) partners. These data suggest that the degree of paternal care has been influenced by certainty of paternity which perhaps is a biproduct of sperm competition. The authors discuss some of the implications of this relationship that are associated with the evolution of reproductive strategies and sex roles. [Dept. of Zoology, Uppsala Univ., Villavagen 9, S–752 36 Uppsala, Sweden.]—Danny J. Ingold.

17. European Starling—Eastern Bluebird nest-site competition. V. P.A. Zerhusen. 1994. Sialia 16:89–93.—The author provides data on nest-site competition between European Starlings (*Sturnus vulgaris*) and Eastern Bluebirds (*Sialia sialis*) at a single nest box over seven nesting seasons from 1984–1993. During the study 406 starlings (80% adults) were trapped in the nest box from February through August and disposed of. Forty-four percent of these were captured during April when bluebirds were also initiating nesting. Although the average annual number of starlings captured was 58 during the entire period, it declined by 30.1% during the three most recent breeding seasons. These data suggest that trapping and disposing of starlings in areas of nest overlap with bluebirds may reduce nest-site competition between the two species for nest sites with a large enough opening to accommodate both.

However, because of the narrow scope of this study (one nest box observed) the results should be considered quite tentative at least until further data are collected in other areas. [School of Biological Sciences, Univ. of Kentucky, Lexington, KY 40506, USA.]—Danny J. Ingold.

18. Sex-role reversal in Willow Tit nest defence. S. Rytkonen, M. Orell, and K. Koivula. 1993. Behav. Ecol. Sociobiol. 33:275–282.—The cost/benefit model of parental investment theory makes several predictions which may explain sexual differences in nest defense intensity. In light of these predictions the authors examined nest defense behavior in Willow Tits (*Parus montanus*) at 181 nests in northern Finland in 1988-1990. The role of the sexes in nest defense behavior was found to shift during the breeding cycle. Preliminary DNA-fingerprinting studies showed that extra-pair fertilizations among tits in this population were rare suggesting that male confidence of parenthood should be relatively high; moreover, correlations between mates in all nest defense variables were highly significant throughout the breeding cycle. Both of these findings suggest that sexual differences in nest defense behavior are likley the result of differences in costs, not benefits. Early in the nesting cycle females defended their nests significantly more vigorously than males, a phenomenon that was limited to the time when renesting was still possible. This suggests that the cost of renesting for females is higher than for males. In this northern population of tits, the opportunity for renesting was rather short (never lasted beyond hatching of the first clutch), and once renesting was no longer possible, males were compelled to invest mostly in the current nest. By the end of the breeding cycle a higher level of male nest defense was evident and was likely a consequence of sexual difference in size and body condition (males were larger and in better condition) versus dissimilar costs in the nest effort. These data suggest that clear sexual differences in parental investment were evident only during the period when renesting was possible; otherwise the observations support the idea that both parents are necessary when raising young in monogamous species of passerines. [Dept. of Zoology, Univ. of Oulu, Linnanmaa, SF-90570 Oulu, Finland.]—Danny J. Ingold.

19. Reproductive performance of the nominate Lesser Black-backed Gull under the pressure of Herring Gull predation. M. Hario. 1994. Ornis Fennica 71:1–10.—The influence of Herring Gull (*Larus argentatus*) predatory pressure on the nominate race of the Lesser Black-backed Gull (*Larus fuscus fuscus*) was investigated. A species now considered endangered in the study area, *L. fuscus* fledging rates have decreased significantly over the 14 years the site has been monitored. Predation by Herring Gulls has been found to be responsible for 17% of *L. fuscus* chick mortality, a fact that has been verified by the discovery of missing chicks bands in Herring Gull colonies. To counter the effect of the Herring Gull predation, a culling project was initiated in neighboring Herring Gull colonies. This successfully eased the predation pressure, and fledging rates of the nominate race of *L. fuscus* rose for the duration of the culling project. Once the project ended, predation pressure increased and the *L. fuscus* fledging rate concurrently decreased. Selective removal of predators is not deemed an effective solution to the problem because Herring Gulls from colonies up to 1 km away were also predating the *L. fuscus* colony. Other possibilities for chick mortality, including intraspecific predation, were ruled out. The author notes that *L. fuscus* does not demonstrate the aggressive behaviors usually observed in larger gulls, instead it behaves similarly to smaller, inoffensive gull species. Predation by Herring Gulls has been found to be particularly detrimental to *L. fuscus* because whereas disease will kill the weak individuals, predation targets the "best growing" chicks, which are the potential recruits for the colony and the species' population as a whole. [Finnish Game and Fisheries Research Inst., Game Div., P.O. Box 202, FIN-00151 Helsinki, Finland.]—Sue Bennett.

MIGRATION, ORIENTATION, AND HOMING

(see also 24, 35)

20. Spring migration of the Knot *Calidris c. canutus* over southern Scandinavia, as recorded by radar. G. A. Gudmundsson. 1994. J. Avian Biol. 25:15–26.—The author used long-range surveillance radar to monitor spring migration through southern Sweden from 1986–1991. Observations were restricted to early and mid-June to ensure that most of the

echoes were from Red Knots known to migrate across southern Sweden en route to breeding grounds on the Taymyr Peninsula in Siberia. On average, more than 2000 echoes were counted each year. Much of the information was taken from 505 tracks (consecutive echoes from same flock) with the strongest and most persistent echoes. In 30 cases, unbroken tracks were plotted across 5° of longitude (about 400 km). Mean track directions varied from 55–67° each year; average groundspeeds were about 25 m/s (range 19–29 m/s). Airspeed estimates indicated that flocks often flew with tailwinds, gaining on average 6.1 to 7.6 m/s wind assistance. Directions for the 30 long tracks were generally ENE shifting to NE. These course changes indicated that the birds were not orienting using the sun, stars, or geomagnetic field. Instead, Gudmundsson suggests that the knots used topographic cues to maintain association with coastal areas. [Icelandic Museum of Natural History, P.O. Box 5320, IS–125 Reykjavik, Iceland.]—Jeff Marks.

21. Initial orientation of homing pigeons under the influence of a short-wave radio transmitter. [Anfangsorientierung von Brieftauben im Einflussbereich eines Kurzwellensenders.] A. Boldt and B. Bruderer. 1994. Ornithol. Beob. 91:111–123. (German, English summary.)—The influence of a transmitting antenna radiating 150 kW between 7.4–21.8 MHz on the homing abilities of Homing Pigeons (*Columba livia*) was investigated. The release sites were located such that the birds had to fly either over or away from the antenna to get to their home lofts. The distance to home varied between 24–96 km, depending on the loft; with all birds being released from 1 of 2 locations near the antenna. There was no difference in vanishing directions, vanishing times, homing success, or homing speed between the birds that flew when the antenna was in the homeward direction versus away from home. The authors anticipated that there might be an interaction of the high frequency radio signal and the magnetic orientation mechanisms used by pigeons to home and went to some lengths to explain why there was no observable response. The most obvious explanation is either that there is no influence or the influence is the same regardless of the direction the birds flew. This could be tested by releasing the birds when the antenna is transmitting versus when it is not (controls). [Oberdorfstrasse 2, CH–5223 Riniken, Switzerland.]—Robert C. Beason.

HABITAT USE AND TERRITORIALITY

(see also 7, 15, 26, 35)

22. Interference asymmetries among age-sex classes of Rufous Hummingbirds during migratory stopovers. F. L. Carpenter, M. A. Hixon, R. W. Russell, D. C. Paton, and E. J. Temeles. 1993. Behav. Ecol. Sociobiol. 33:279–304.—Different sex and age classes of migrant Rufous Hummingbirds (*Selasphorus rufus*) temporarily overlap at a stopover site in the California Sierra Nevada. Sexual and age differences in dominance and territorial defense in hummingbirds is thought to result from differences in coloration and wing disc loading (WDL; ratio of body mass to area swept out by the wings). Based on differences in WDL and plumage coloration, the authors examined differences in the abilities of three sex-age classes (immature males, mature females, immature females) of Rufous Hummingbirds to acquire and maintain territories. Data were collected from color-marked hummingbirds during 11 summers at a migratory stopover site in the Sierra Nevada Range in California. Immature males, which had the highest WDL and plumage coloration similar to adult females, acquired territories with higher resource densities in less time than females and were more successful at expanding their territorial boundaries after resource reductions than females. Immature females defended territories with the lowest resource densities and were never successful in displacing immature males or adult females from territories. The dominance position of adult females appeared to vary between immature males and immature females. This intermediate position, as well as the absence of an affect from color-marking, suggests that WDL is more important than coloration in determining dominance. Conversely, adult females were able to acquire a disproportionate number of territories during at least one resource-limited year and seemed to be superior to males in detecting and pursuing intruders. Thus, experience associated with age may be another factor that influences territorial dynamics in Rufous Hummingbirds. The authors discuss further implications of these results for understanding intraspecific variation in resource defense in migratory hummingbird species.

[Dept. of Ecology and Evol. Biology, Univ. of California, Irvine, CA 92717, USA.]—Danny J. Ingold.

23. Exploitative compensation by subordinate age-sex classes of migrant Rufous Hummingbirds. F. L. Carpenter, M. A. Hixon, E. J. Temeles, R. W. Russell, and D. C. Paton. 1993. Behav. Ecol. Sociobiol. 33:305–312.—The three sex-age classes of Rufous Hummingbirds (*Selasphorus rufus*) that concomitantly share migratory stopover sites in the California Sierra Nevadas possess differing interference abilities for resource exploitation. In previous work the authors determined that immature male Rufous Hummingbirds were more likely to obtain high flower density territories than mature females, which in turn were at an interference advantage over immature females. In spite of this interference asymmetry, adult and immature female hummingbirds occasionally surpassed males in some measures of territorial ability. In this study, the authors considered an alternative explanation, the "exploitation hypothesis" to account for the fact that some females held territories in the presence of dominant immature males. This hypothesis argues that sex-age classes differ in their abilities to acquire resources based on differences in net energy intake per unit time spent foraging which generally results from differences in body size, morphology, and/or experience. Rufous Hummingbirds were examined at a migratory stopover site on the east slope of the Sierra Nevada near Bishop, California from 1980 to 1986. Despite defending more sparsely vegetated territories with lower nectar standing crops, immature females gained weight at the same rate and in the same pattern as adult females and immature males. Moreover, significantly more nonterritorial females maintained a constant body mass than nonterritorial males suggesting that they are superior at nonaggressive exploitation. On rich male-owned territories, immature male intruders were detected and chased significantly more quickly than adults females and particularly immature females. These results suggest that female Rufous Hummingbirds are somehow able to compensate for their inability to acquire high-quality territories by exploitative means. In particular the authors suggest that females most likely benefited from a lower wing disc loading than males, which reduces the cost of hovering and forward flight; in addition, females were more effective at thievery resulting from coloration differences and other factors. [Dept. of Ecology and Evol. Biology, Univ. of California, Irvine, CA 92717, USA.]—Danny J. Ingold.

24. Wintering curlews *Numenius arquata* at 70° N in North Norway. K.-B. Strann. 1994. Wader Study Group Bull. 71:32–33.—Eurasian Curlews that breed at Tromso in northern Norway migrate south in August and early September. In late September and October, a different set of curlews arrives from parts unknown. They remain at Tromso throughout the winter, leaving in March and April to breed elsewhere. Maximum numbers in January and February ranged from 19–27 birds between 1975 and 1992. As might be expected, winter weather at Tromso is severe (to say nothing of the limited amount of daylight). Owing to strong currents of warm Atlantic water, however, the mudflats are never covered with ice. The stable number of curlews that has wintered at Tromso over the past 20 years suggests that these birds are regular winter residents rather than doomed stragglers. The Purple Sandpiper (*Calidris maritima*), which has the northernmost winter range of any shorebird, is the only other wader that winters in the area. [Tromso Museum, N–9008 Tromso, Norway.]—Jeff Marks.

ECOLOGY

(see 4, 5, 17, 22, 23, 31)

POPULATION DYNAMICS

(see also 11, 17, 19, 24, 34)

25. Effects of weather on Hazel Grouse reproduction: an allometric perspective. J. E. Swenson, L. Saari, and Z. Bonczar. 1994. J. Avian Biol. 25:8–14.—In a previous study in Sweden, Swenson documented that prelaying Hazel Grouse (*Bonasa bonasia*) feed selectively on newly sprouted forbs and that timing of laying varies directly with plant phenology. It has also been shown that ovarian development is delayed during "late" springs. It thus appears that weather can have profound effects on Hazel Grouse reproduction. In this paper, Swen-

son et al. use existing data from Finland and Poland to further evaluate the effects of weather on Hazel Grouse reproduction. Indices of reproductive success were based on 14 years of transect data from Finland (number of birds observed in autumn minus the number observed the previous spring) and 6 years of shooting data from Poland (proportion of juveniles in samples of collected birds). In both areas, stepwise multiple regression indicated that reproductive success was most strongly correlated with weather during the prelaying period (March and April). Specifically, success was highest when the prelaying period was warm and relatively dry. Swenson et al. thus suggest that Hazel Grouse reproductive success is determined largely by foraging conditions for the female prior to laying. Data from similar studies indicate that this is also true for other small species of grouse. Compared with large species, small species lay clutches of larger relative mass and carry smaller energy reserves during winter and early spring. Small species are thus strongly dependent on exogenous energy for egg production. In contrast, large grouse species carry greater endogenous reserves and invest relatively less energy in egg production. The literature indicates that their reproductive success is most strongly affected by weather soon after hatching. Swenson et al. suggest that the chicks of larger species of grouse are especially susceptible to inclement weather owing to their more rapid growth rates and higher energy requirements. [Norwegian Institute for Nature Research, Tungasletta 2, N–7005 Trondheim, Norway.]—Jeff Marks.

26. A re-evaluation of the numbers of migrant Semipalmated Sandpipers, *Calidris pusilla* in the Bay of Fundy during fall migration. K. Mawhinney, P. W. Hicklin, and J. S. Boates. 1993. Can. Field-Nat. 107:19–23.—Fluorescent orange 1 m^2 quadrats of 0.5 cm plastic tubing were placed at roosting sites above the high tide line on Evangeline Beach, Kings County, Nova Scotia. Sandpipers were photographed as they stood in and around the quadrats. The photographic slides were projected and the birds roosting within the quadrats were counted. The size of the roost was estimated from the photograph and the number of sandpipers was calculated by multiplying the number of birds/quadrat by the number of m^2 occupied by roosting birds. The results suggest that 1,122,000–2,200,000 Semipalmated Sandpipers roost on Evangeline Beach during the autumn migration. The new estimates are 37–67% higher than previous, less operational estimates and emphasize the importance of beaches at the head of the Bay of Fundy as stop over sanctuaries for migrating Semipalmated Sandpipers.—Edward H. Burtt, Jr.

ZOOGEOGRAPHY AND DISTRIBUTION

(see 13, 27)

SYSTEMATICS AND PALEONTOLOGY

(see also 28)

27. The French distribution and taxonomic status of the Mediterranean Great Grey Shrike *Lanius elegans meridionalis*. [L'aire de distribution Française et le statue taxonomique de la pie-grièche grise méridionale *Lanius elegans meridionalis*.] P. Isenmann and M.-A. Bouchet. 1993. Alauda 61:223–227. (French, English summary.)—Isenmann and Bouchet argue that the shrike population nesting in southern France along the Gulf of Lion is a subspecies of the Southern Great Grey Shrike (*L. elegans meridionalis*) rather than being associated with the Northern Great Grey Shrike (*Lanius excubitor*). They provide data suggesting that this population is parapatric with *L. excubitor* and differs morphologically (lacks sexual dimorphism in rectrix color) and in habitat preferences (*L. excubitor* favors grassland with trees, *L. elegans meridionalis* favors dry grassy bushland). No hybridization between the forms is known. [Centre d'Écologie Fonctionnelle et Évolutive (CNRS), BP 5051–F–34033 Montpellier cedex, France.]—Jerome A. Jackson.

EVOLUTION AND GENETICS

(see also 6, 9, 11, 16, 33)

28. Dark-morph individuals of *Egretta* spp. in Israel. S. Ashkenazi. 1993. Colon. Waterbirds 16:202–207.—In this paper Ashkenazi reviews the occurrence of dark-morph individuals of the Little Egret (*Egretta garzetta*) and Western Reef Heron (*E. gularis*) in the

Palearctic region, especially in Israel, and considers their original source, the taxonomic problems associated with them (some authors consider the two "species" as members of a single polytypic species), possible hybridization, and the need for genetic studies in order to more clearly define taxonomic relationships. The study is based on published records, museum specimens, and substantial field work in Israel, including marked individual herons. Little Egrets began breeding in Israel in the 1950s, possibly because of displacement related to drainage projects in Turkey; dark-morph individuals have bred since the 1970s (only about 0.2% are dark-morphs). The suggested source of increased Little Egret numbers in the 1970s, including dark-morph birds, is disturbed or destroyed African wetlands. Dark-morph Western Reef Herons were not reported in the Palearctic until the 1970s, and may have originated from escaped birds imported into Germany or established vagrants. A population breeding in the Sinai has produced about 10% dark-morph individuals. Because the breeding population of Little Egrets in central and northern Israel and Western Reef Herons in the Sinai are 500 km apart, and the dark-morph "types" differ morphologically, the author doubts the suggestion that dark-morph *Egretta* spp. in Israel originated by interbreeding of white-morph Little Egrets with dark-morph Western Reef Herons. The author prefers the traditional taxonomy that considers the Little Egret and Western Reef Heron as separate species, but stresses the need for genetic studies to elucidate taxonomic relationships in dark-morph *Egretta* spp., and the dynamics of egret populations in general. This paper should be of interest to anyone interested in heron taxonomy or in plumage polymorphism. [Ecology and Nature Conservation, P.O. Box 1057, Rosh Pina 12000, Israel.]—William E. Davis, Jr.

PHYSIOLOGY AND DEVELOPMENT

(see also 23, 33)

29. Testicular responsiveness of a wild passerine bird, *Lonchura malabarica*, to the oral administration of quinalphos, an organophosphorous pesticide. S. K. Maitra and R. Sarker. 1994. J. Yamashina Inst. Ornithol. 26:59–67.—White-throated Munias (*Lonchura malabarica*), small, grass-seed-eating Ploceids, were given varying oral doses of quinalphos (0 to 20 μg/100 g body weight/day) for intervals of 1, 5, and 10 days. No mortality, no behavioral changes, and no significant changes in body weight were observed following treatment. However, significant decreases in testis weight and significant histological changes were observed in testicular tissues, suggesting an inhibiting influence of quinalphos on bird testes. [Reproductive and Endocrine Physiology Laboratory, Dept. of Zoology, Univ. of Burdwan, Golapbag, Burdwan–713 104, India.]—Jerome A. Jackson.

30. Bird blood—an allometric review of its components. [Vogelblut—eine allometrische Übersicht der Bestandteile.] R. Prinzinger and A. Misovic. 1994. J. für Ornithol. 135: 133–165. (German, English abstract, table and figure captions.)—This excellent review includes a description of the physical and chemical properties of avian blood and how these vary taxonomically, seasonally, between the sexes, among age groups, and with varying states of exogenous (such as temperature, altitude, and diurnal cycles) and endogenous (such as hormonal balance) factors. The authors note that avian blood differs from mammalian blood only in having nucleated erythrocytes, twice the blood glucose level (to fuel the higher metabolic rate), lower plasma protein content, and thrombocytes as big as other leucocytes. Although much of our knowledge of avian blood comes from studies of poultry, the authors present tables comparing blood parameters among avian Orders. Sample sizes (numbers of species examined) in this table are good for some Orders (e.g., Accipitriformes, Phasianiformes [=Galliformes], Passeriformes) but poor for many (e.g., Procellariiformes, Piciformes, Lariformes [=Charadriiformes]). The value given for erythrocyte width of Coliiformes (17.1 μm) seems to be a typographical error, since the maximum value for all birds is given as 10.2 μm. Good drawings illustrate blood cell types, and a series of figures illustrates the relationships between various blood parameters and avian body mass. [AK Stoffwechselphysiologie, Fachbereich Biologie, Universität Frankfurt, Siesmayerstr. 70, D–60323 Frankfurt am Main, Germany.]—Jerome A. Jackson.

31. Life in extreme dryness and heat: a telemetric study of the behaviour of the Diamond Dove *Geopelia cuneata* in its natural habitat. E. Schleucher. 1993. Emu 93:252–258.—

Many physiological studies have been done on Diamond Dove (*Geopelia cuneata*) heat tolerance. However, little field work has been done to correlate lab data with behavior. Using radio transmitters attached to the tails of 4 Diamond Doves, Schleurer located and observed flocks of the Doves. Ambient temperature was taken each day for thirty days using a thermohygrograph. The microclimate temperature for the birds was monitored by a thermosensor on the radio transmitter, and verified by a second temperature reading made manually after the birds flew away. The results showed the Diamond Doves' microclimate was at a consistently higher temperature than the ambient temperature. Diamond Doves showed no marked drop in activity as was found in raptors and Zebra Finches (*Taeniopygia guttata*). Further, Diamond Doves showed no signs of heat stress while active at temperatures ranging from 43–65° C, while Zebra Finches at rest panted and spread their wings. Diamond Dove heat tolerance allows occupation of a temporal niche that Zebra Finches can't occupy. The study shows that raptors are not active in this same temporal niche. However, there was no indication of the number of raptor sightings that provided the bases for these conclusions. As raptors are typically solitary birds, low sample size may be a problem in estimating activity levels, especially during only a 30 day study. Even if the raptor data are inadequate, lack of competition by the finches indicates temporal niches need not be as simple as night and day.—Stephen E.T. Kacir.

PLUMAGES AND MOLTS

(see also 28)

32. Relative masses of primary feathers in waders. L. G. Underhill and R. W. Summers. 1994. Wader Study Group Bull. 71:29–31.—For species that have primaries of unequal length (i.e., outer primaries longer than inner ones), molt scores increase more slowly toward the end of molt. Because such molt scores do not increase linearly with time, they cannot be used directly to estimate molt duration. Instead, molt scores must be converted to "percentage of feather mass grown" (PFMG) and the resulting index entered into the model developed by Underhill and Zucchini (1988, Ibis 130:358–372). In order to calculate PFMG, one must know the relative mass of each primary for the species of question. In this note, Underhill and Summers tabulate relative masses of primaries for 13 species of shorebirds. They also outline a standard procedure for obtaining primary mass data and clarify the method for calculating PFMG. As it turns out, variation in relative mass of shorebird primaries is small enough "... to suggest that a set of average values might suffice for all (or at least most) wader species." The authors present these average values and call for data from additional species so that estimates of relative primary masses can be refined. [Avian Demography Unit, Dept. of Statistical Sciences, Univ. of Cape Town, Rondebosch 7700, South Africa.]—Jeff Marks.

33. Variation in the developmental timing of flight-feather growth in nestling birds. C. P. F. Redfern. 1994. Ibis 136:72–78.—Open nesters start primary-feather growth earlier in development and fledge at lower relative body weights than protected nesters which start primary-feather growth later in development and fledge at body-weights closer to adult values. Although the article required careful reading, this research supports the view that earlier development of flight is an adaptive strategy for species whose open nests are relatively accessible to predators. However, the variation in fledging weights of open nesters weakens the conclusion. Redfern suggests that open-nesting altricial birds begin growing flight feathers as soon as possible, but this process is influenced by the metabolic capacity of the nestling and the time required to complete growth of the flight feathers. These findings support the advantage of protected nesting sites for small altricial species.—Carrie Lippert.

WILDLIFE MANAGEMENT AND ENVIRONMENTAL QUALITY

(see also 13, 17, 19, 29)

34. Whooping Crane, *Grus Americana*, home range and breeding range expansion in Wood Buffalo National Park, 1970–1991. E. Kuyt. 1993. Can. Field-Nat. 107: 1–13.—In 1970 15 pairs of Whooping Cranes bred in Wood Buffalo National Park along the Sass and Nyarling rivers in southern Northwest Territories, Canada. Twenty-one years later in 1991 33 pairs

bred in the park, the population having occupied the Klewi River basin and extended its range south into Alberta along the Little Buffalo River. Although aerial census techniques have improved since 1970 and the area covered has increased, the range occupied by the cranes remained about 400 km^2 for many years before increasing recently to 500 km^2. The small breeding range within the area censused suggests that the population growth is real and not a function of better techniques or the larger area covered. If the breeding habitat remains undisturbed and the population is able to commute to and overwinter successfully in Aransas National Refuge, Texas, United States, the Whooping Crane population should continue to expand and will probably extend its range further south into northeastern Alberta.—Edward H. Burtt, Jr.

35. Toward conservation of midcontinental shorebird migrations. S. K. Skagen and F. L. Knopf. 1993. Conservation Biology 7:533–541.—Shorebirds migrating between breeding grounds in the arctic and wintering grounds in Central and South America use stopover points in the Great Plains and intermountain west of the United States and Canada. The authors compiled migration reports from American Birds from 1979 to 1990 and sent questionnaires to wildlife refuges in 1990 to detect patterns in regional species composition and abundance. In the questionnaires the authors asked refuge employees to estimate numbers and body sizes of birds using their refuges in fall and spring of 1990, as well as to describe the habitat available. Although the information gathered was not based on scientific surveys, the authors felt that overall patterns were revealed. Small birds and species that migrate long distances used wetlands in the plains, while larger species and those that migrate short distances used the intermountain areas. The authors conclude that this pattern is a result of tighter constraints on small-bodies birds, but do not clearly explain the differences between intermountain and plains wetlands. Some refuge employees reported an unusually high or low number of migrants in 1990, and attributed it to changes in habitat. The authors propose that because wetland habitat is extremely variable, migrating birds use them opportunistically, in contrast to coastal migrants that use predictable areas each season. This conclusion could be strengthened by sending questionnaires to the same refuges during several consecutive years. The variability of midcontinental migrations needs to be considered when planning land use along these migration routes.—Jennifer Fussman.

BOOKS AND MONOGRAPHS

36. Gosse Bird Club Broadsheet, Nos. 1–60, 1963–1993 Cumulative Index by Author, Species & Subject. C. Levy. 1993. Gosse Bird Club, Kingston 6, Jamaica, West Indies. (Price not available.)—For those interested in birds of the West Indies and those of Jamaica in particular, here is a most useful tool. Introductory pages describe how the indices were prepared and how to use them. Two separate indices are included: author, and species/subject. Species are indexed by generic common names (e.g., finch, woodpecker) rather than by scientific name—more useful for the largely amateur audience that the Broadsheet serves. The Gosse Bird Club Broadsheet is the "journal" of this organization and includes useful data and articles relating to the distribution, ecology, and behavior of regional birds. Those who prepare such good indices provide a service that requires hours of tedious work that is too often unrecognized. Thanks Catherine!—Jerome A. Jackson.