

RECENT LITERATURE

Edited by Robert C. Beason

RESEARCH TECHNIQUES

1. Effects of patagial tags on Cattle Egrets. M. N. Maddock and D. J. Geering. 1994. *Corella* 18:1-7.—Patagial tags are highly visible and especially useful for marking birds which are difficult to recapture, but have had adverse effects in some species. The authors evaluate their effects on Cattle Egrets (*Ardeola ibis*). From 1985-1992 patagial tags were placed on both wings of 3265 nestling Cattle Egrets at 7 colonies in northern New South Wales and southern Queensland. Observations of tagged and untagged birds were conducted at the breeding colonies, and in southeastern Australia and New Zealand at wintering grounds. Survival rates of first year birds varied significantly between years and between colonies in the same year (14% to 41%), with a pooled average of 26%. Adult survival rate was roughly 50%. The breeding success of pairs with at least one tagged adult did not differ significantly from pairs without tags, nor did the fledging rate of tagged nestlings differ from untagged. One tag was lost by 3% of chicks, one chick lost both tags, and 21% of returning first-year birds had lost a tag. Sightings of tagged birds were reported from virtually their entire wintering range. They usually returned to their natal colony, and many demonstrated winter site fidelity. This study suggests that patagial tags do not adversely affect Cattle Egret breeding success, and do facilitate migration and natal and winter site fidelity studies. [Department of Education, University of Newcastle, NSW 2308, Australia.]—William E. Davis, Jr.

2. Oceanic flights of the Northern Royal Albatross *Diomedea epomophora sanfordi* using satellite telemetry. D. G. Nicholls, M. D. Murray, and C. J. R. Robertson. 1994. *Corella* 18:50-52.—This note is a report on the use of the ARGOS satellite system to monitor the flights of two nesting albatrosses carrying PTT radio transmitters near Dunedin, New Zealand. The tracking transmitters also carried a barometer, and thermistor to record the temperature of the barometer. Two flights on a female bird were monitored, the first of 5 days and 593 km. In the second flight the transmitter failed when the bird was 713 km from her nest. Three flights of a male bird of 3 (398 km), 2 (287 km) and 6 (739 km) days were monitored. Maximum speed of the female was 33 km/hr, 57 for the male. Most flights were between or along the 500 and 1000 m depth contours, which suggests that these waters along the continental shelf are an important feeding zone. Barometric readings from the incubating male matched closely those from a nearby weather station, and hence the barometric sensor should provide reliable data during oceanic flights. The data allow comparisons of foraging flights of the Northern Royal Albatross and Wandering Albatross (*D. exulans*). The latter are faster and of longer duration early in the nesting season (Nicholls et al. 1992. *Corella* 16:134-136). The use of satellite telemetry is a promising method for tracking the movements of individual birds and has the potential for the collection of a wide range of data. [Frankston College of TAFE, Fletcher Road, Frankston, Vic. 3199, Australia.]—William E. Davis, Jr.

BEHAVIOR

(see also 2, 7, 8, 10, 12, 19, 23)

3. Determinants of parental effort: a behavioural study in the Eurasian Kestrel, *Falco tinnunculus*. P. Tolonen and E. Korpimäki. 1994. *Behav. Ecol. Sociobiol.* 35:355-362.—In order to test several predictions of parental investment theory, the authors collected behavioral data on breeding Eurasian Kestrels in western Finland during one vole (*Microtus* sp.) cycle (1988-1992). Parental effort (PE) in males was measured as the proportion of time spent in flight-hunting (i.e., hunting effort). The authors determined that unlike in males, the hunting ability of females varies only minimally among individuals; therefore, female PE was measured in terms of prey delivery rate. In contrast to parental investment theory, no correlation was detected in clutch or brood size and male hunting effort, or in clutch or brood size and female prey delivery rate. Males tending larger clutches or broods had a significantly higher prey delivery rate than males tending smaller clutches or broods. However, when the data were partitioned between early and late breeders, this trend remained

detectable only in early-breeding males. Females invested about equally in broods of different sizes, irrespective of male hunting effort or prey delivery rate. In data pooled among all years, hunting effort and prey delivery rate by males increased from courtship to the early nestling stage, but showed no significant increases in any of the subsequent stages in the nesting effort. According to parental investment theory, early nesting pairs should invest more in breeding than late ones, because of the higher value of early offspring. This was found to be true for early males during the early nestling stage only, and for early females during the late nestling stage only. Although bright-colored males were significantly better breeders (i.e., bred earlier, sired larger clutches, raised more young) than dull-colored males, females mated to bright males did not invest more in offspring than females mated to dull males. This supports the notion that the PE of an individual is determined independently of its mate's PE. Moreover, the authors suggest that parental investment decisions are based largely on the cost-benefit estimates of residual reproductive value, rather than current investment indicators such as clutch or brood size. Such a strategy might be beneficial in highly variable environments in which the survival prospects of offspring fluctuate markedly with among-year variation in the abundance of microtine rodents. [Dept. of Zoology, Univ. of Oulu, FIN-90570 Oulu, Finland.]—Danny J. Ingold.

4. Mate choice in the Yellow-shouldered Widowbird: correlates of male attractiveness.

U. M. Savalli. 1994. *Behav. Ecol. Sociobiol.* 35:227–234.—Some studies have been conducted to experimentally demonstrate the effects of extravagant male ornaments on female choice in birds (i.e., Long-tailed Widowbird, *Euplectes progne*), but few have attempted to concomitantly examine the importance of other characteristics such as territory and nest quality on female choice. In this study, several correlates of female choice, in addition to male plumage, were examined in 42 male Yellow-shouldered Widowbirds (*E. macrourus*) in an attempt to elucidate what other potential cues may influence females during mate selection. Although females were shown to exhibit some choice when selecting male territories for nesting, few significant variables were found to explain this choice. None of the male morphological characteristics, including tail length and attractiveness, were positively correlated with female choice. There was a significant positive correlation between the number of male wing-tail flicks and the number of lined nests during one year (of the two-year study), while mean grass height was negatively correlated with the number of lined nests during the second year. The only consistent result was the number of cock's nests (the coarse frame of a nest that males build and females eventually line) on male territories, which was significantly positively correlated with the number of lined nests. Few significant intercorrelations among male behavioral, territorial, and phenotypic variables were detected in either year, suggesting that the effects of the variables were independent of one another. These data imply that the presence of cock's nests is the best predictor of female choice in Yellow-shouldered Widowbirds. However, it is not clear whether females choose territories based on the number of cock's nests present, or whether a large number of cock's nests increases a female's chance of finding a suitable nest on a particular territory. Other predictors of female choice such as grass height and wing-tail flicking, that varied between years, suggest that the needs of females may also differ between years. The author concludes by discussing the possible function of conspicuous male plumage in this species, which played no significant role in attracting females in this study. [Dept. of Integrative Biology, Univ. of California, Berkeley, CA 94720, USA.]—Danny J. Ingold.

FOOD AND FEEDING

(see also 2, 18, 28)

5. Changes in the relative abundance of raptors and house mice in western New South Wales.

L. E. Twigg and B. J. Kay. 1994. *Corella* 18:83–86.—This paper contains the results of a survey of house mice (*Mus domesticus*), and diurnal raptors which prey on them, in farmlands over three agricultural seasons. About 30,000 trap nights resulted in the capture of over 3500 mice at least once. The raptors were surveyed along a permanent riparian transect through irrigated croplands. Changes in the relative abundance of mice were plotted against: (1) numbers of diurnal raptors which prey heavily on mice, (2) raptors which do not, and

(3) Laughing Kookaburras (*Dacelo novaeguinea*), an "out group." Of 10 species of raptors recorded, the two most common were Australian Kestrel (*Falco cenchroides*) (48%), and Black-shouldered Kite (*Elanus notatus*) (32%), both of which prey heavily on mice. The abundance of mice was significantly correlated to abundance of mouse-eating raptors, but not to other diurnal raptors or kookaburras, suggesting that mouse-eating raptors are responding to changes in mouse abundance. The authors suggest that because of increasing concerns about the use of pesticides, the idea of capitalizing on raptors as natural control agents for mice is very appealing. [Agricultural Research and Veterinary Centre, NSW Agriculture, Forest Road, Orange, NSW 2800, Australia.]—William E. Davis, Jr.

6. Food and feeding ecology of seabirds off the north-east Australian coast. G. C. Smith. 1993. *Corella* 17:131–134.—In this editorial the author briefly reviews the current state of knowledge of the ecology of more than one million seabirds that breed on islands off the coast of Queensland on the Great Barrier Reef and the Gulf of Carpentaria, and on islands in the Coral Sea. He addresses the questions of where, what, and how much birds eat (including food derived from human activities), and emphasizes how little is known. This is the second 1993 issue of *Corella* which was dedicated to a marine biologist lost at sea (in separate accidents) while attempting to answer these questions (*Corella* 17(3) was dedicated to Brian King, and this issue to Terriss A. Walker). This issue includes papers that deal primarily with the distribution of seabirds of this region. A table summarizes information on the foraging ecology of 22 species of seabirds, and the text emphasizes what is not known and what should be known about seasonality or prey species for proper wildlife management of the area. The current understanding of foraging strategies, diet, and availability of prey are presented and the need for more information on upwelling systems which provide ephemeral feeding sites, and the possibilities of using satellite imagery techniques are highlighted. This review paper should have important heuristic effects. [Fauna Conservation and Ecology Section, DPI Forest Service, 80 Meiers Road, Indooroopilly, Qld 4068, Australia.]—William E. Davis, Jr.

SONGS AND VOCALIZATIONS

7. Variation in the calls of migratory and sedentary subspecies of Silvereye. P. J. Slater. 1994. *Corella* 18:14–20.—This paper contains a comparison of a variety of calls of a migratory population of Silvereye (*Zosterops lateralis familiaris*) near Brisbane, Queensland, Australia, with a sedentary population (*Z. l. chlorocephala*) from Heron Island. Calls were recorded under a variety of aviary and field conditions. The sedentary birds were of known age and sex. Calls of juvenile birds did not differ in general structure from adults. The Variable Call, a loud contact call, used only by males, was very similar among Brisbane (migratory) birds of the same flock, while Variable Calls among Heron Island (sedentary) birds were dissimilar. This suggests that the need for a call important in flock cohesion may be greater in migratory populations. This pattern was not as distinct in a second loud contact call, the Linear Call, and there was no distinct difference between subspecies in a soft contact call, the Soft Call. The various contact calls may play a role in mate recognition. The high variability in the calls of the sedentary birds may facilitate individual recognition. The author also describes and discusses courtship, alarm, and agonistic calls in the sedentary population. The analysis in this paper was greatly facilitated by the availability of marked birds of known age and sex. [Zoology Department, University of Queensland, Brisbane 4072, Queensland, Australia.]—William E. Davis, Jr.

8. A comparison of perch use by vocalizing Eastern and Western Meadowlarks. K. A. Kinstler and T. A. Sordahl. 1994. *Prairie Nat.* 26:195–200.—Eastern (*Sturnella magna*) and Western Meadowlarks (*S. neglecta*) are believed to have evolved from a common ancestor, with speciation a result of geographic isolation during the Pleistocene. Because habitat helps mold a species, and because these two species evolved in different habitats (more wooded in the East, more open in the West), they might be expected to differ in their use of habitat features. The authors of this study hypothesized that the two species might exhibit differential

use of habitat for delivering vocalizations, i.e., the Eastern Meadowlark might sing and call more frequently from perches, while the Western Meadowlark might vocalize more frequently from the ground or while in flight. The authors tested this hypothesis in an area where the two species are sympatric, recording the number of vocalizations given by each species from the ground, from a perch, and in flight, with songs and calls tallied separately. Although both species strongly preferred perches for delivering vocalizations, the Eastern Meadowlarks used perches significantly more often for both songs and calls than Westerns, while the Westerns gave calls from the ground significantly more often than Easterns. Songs and calls given in flight were uncommon for both species. It is advantageous for an open-country bird to vocalize from a perch or while in flight, as the sound will carry for a greater distance than if given from the ground. But because flight carries a high energetic cost, the use of a perch is a more desirable option. The authors conclude that the abundance of available perch sites (powerlines and fences) on the study site explains the low incidence of in-flight vocalizations. The authors further conclude that, since perch sites are equally available to both species on this site, their results support the hypothesis that differential perch site availability during evolution has resulted in differential use of habitat for delivering vocalizations. [Dept. of Biology, Luther College, Decorah, IA 52101-1045, USA.]—Scott W. Gillihan.

NESTING AND REPRODUCTION

(see also 1, 3, 4, 21, 27, 29, 30)

9. Extra-pair paternity in Tree Swallows: why do females mate with more than one male? P. O. Dunn, R. J. Robertson, D. Michaud-Freeman, and P. T. Boag. 1994. *Behav. Ecol. Sociobiol.* 35:273–281.—Although many avian studies have documented that females engage in copulations with individuals other than their social mate, the proportion of broods in Tree Swallows (*Tachycineta bicolor*) with extra-pair offspring is greater than in other species and appears to vary more between years. Two hypotheses suggest how female Tree Swallows may benefit from extra-pair copulations: (1) by producing offspring with a variety of genes from several males, which could benefit the offspring, particularly in a variable environment, and (2) by producing offspring with higher-quality genes from the fittest males only, which would also enhance the survival and subsequent reproductive success of the offspring. In this study, the authors measured several behavioral and morphological characteristics of 23 male Tree Swallows nesting in a grid of nest-boxes in Ontario, to determine why females choose to engage in extra-pair matings with the particular males they do. With the aid of DNA fingerprinting, it was determined that 53% of all swallow nestlings were fathered by extra-pair males, and extra-pair offspring were found in 20 of 23 nests. Interestingly, none of the 28 variables tested were correlated with the proportion of extra-pair offspring found in males' nests. Moreover, males with extra-pair young did not differ significantly in any of the variables from males without extra-pair young. At 10 of 23 nests (44%), broods were sired by three or more fathers; however, the reverse trend held true in some instances, and at one nest, 83% of the young were sired by one extra-pair male. There were no significant morphological or behavioral associations detected among the different numbers of extra-pair males at given nests. Unlike many previous bird studies, neighboring males did not play an important role in extra-pair copulations. DNA tests turned up extra-pair fathers for only 21% of all extra-pair young on the grid. No morphological or behavioral characteristics separated extra-pair males from pair-bond males. These data support the "variable gene" hypothesis fairly strongly, but the "good genes" hypothesis only weakly (although females could be obtaining better quality genes from a variety of males). The authors suggest that although no morphological or behavioral traits differentiated extra-pair from pair-bond males, females could still be choosing extra-pair males for their good genes. Our perspective of the characteristics they are selecting for though may be confounded by annual demographic and ecological changes. [Dept. of Botany and Zoology, Australian Nat. University, Canberra 0200, Australia.]—Danny J. Ingold.

10. Nestling growth and mating system in four *Acrocephalus* species. A. Dyrez, M. Borowiec and A. Czapulak. 1994. *Vogelwarte* 37:179–182.—The daily rate of nestling growth was significantly different for each of the four species and reflected differences in mating system and male emancipation. The fastest rate of growth occurred in the monogamous

Sedge Warbler (*A. schoenobaenus*), followed by the Reed Warbler (*A. scirpaceus*), which is also monogamous. In both species males provide a similar amount of parental care as did the females. The Aquatic Warbler (*A. paludicola*), with the slowest rate of growth and the longest nestling period, is quasipromiscuous with the males providing no parental care. The Great Reed Warbler (*A. arundinaceus*) is intermediate in its rate of growth and has a facultative polygynous mating system with the male providing some parental care, but less than the female. [Dept. of Avian Ecology, Wrocław Univ., Sienkiewicza 21, 50-335 Wrocław, Poland.]—Robert C. Beason.

11. Higher rate of nest loss among primary than secondary females: infanticide in the Great Reed Warbler? S. Bensch and D. Hasselquist. 1994. *Behav. Ecol. Sociobiol.* 35:309–317.—A color-banded population of Great Reed Warblers (*Acrocephalus arundinaceus*) was studied from 1984–1991 in south-central Sweden in order to examine the male's food contribution to nests of monogamous versus polygamous females. The authors predicted that males with more than one nesting female on their territory would invest more in females with clutches that hatched first (primary females) versus later-nesting females (secondary females). Accordingly, a secondary female may raise more young if the nesting effort of a primary female fails since the male will then reallocate his energy into the secondary female's nesting effort. Thus, there could be a strong selection pressure on secondary females to obtain exclusive male assistance. One of the potentially obvious outcomes resulting from such pressure could be the destruction of the primary female's nests by secondary females. In order to test this hypothesis, the authors conducted an experiment with dummy reed warbler eggs that revealed bill-peck markings. Males at monogamous nests fed young in the same proportion as females, whereas males contributed proportionally less at primary and secondary nests. In instances in which the primary nest failed, males assisted secondary females more than former primary females. Male feeding rate was influenced by nest status only, whereas female feeding rate increased with brood size and nestling age, but decreased with male feeding rate. Although the overall rate of nest loss did not differ between years or between first clutches and replacement clutches, the rate of nest loss among primary nests during the egg-laying period was three times higher than that of monogamous or secondary nests. Conversely, monogamous and secondary nests were significantly more vulnerable during the nestling period ($P < 0.05$). Of a total of 121 nest losses, most (73%) showed little evidence of overt destruction; rather, in most cases, the eggs were simply missing. In five of 22 experimental nests with dummy eggs, small peck marks that closely resembled those obtained from the tip of the bill of Great Reed Warblers were detected. In addition, most nests were located high in reeds above deep water, reducing the chances of interspecific predators. Thus these data support the hypothesis that secondary female reed warblers are at least one of the main culprits responsible for primary nest destruction during incubation. [Dept. of Ecol., Animal Ecol., Univ. of Lund, Ecology Building, S-223 62 Lund, Sweden.]—Danny J. Ingold.

12. Polygyny in the Pied Flycatcher (*Ficedula hypoleuca*) in the Braunschweig region. [Polygynie des Trauerschnäppers (*Ficedula hypoleuca*) im Braunschweiger Raum.] W. Winkel. 1994. *Vogelwarte* 37:199–205. [German with English and German summaries.]—Based on data collected between 1963–1993, less than 2% of the male Pied Flycatchers paired with 2 females. Primary females were significantly older than secondary females (2.24 yr versus 2.12 yr), and had significantly larger clutches (6.3 eggs versus 5.9 eggs). Clutches of secondary females hatched an average of 7 days later than those of primary females. Primary females were more successful, fledging an average of 5.3 young/nest compared to 4.0 young/nest of the secondary females. The nest holes of 32% of the bigamists were within 40 m, but one male fed young at nests separated by 1750 m. [Institut für Vogelforschung "Vogelwarte Helgoland", Außenstation Braunschweig, Bauernstr. 14, D-38162 Cremlingen-Weddel, Germany.]—Robert C. Beason.

13. Sexual selection and cuckoldry in a monogamous songbird: implications for sexual selection theory. G. E. Hill, R. Montgomerie, C. Roeder, and P. Boag. 1994. *Behav. Ecol. Sociobiol.* 35:193–199.—The House Finch (*Carpodacus mexicanus*) is one of many sexually dimorphic, monogamous passerine species in which there appears to be relatively low variance among male reproductive success. Recently though it has been suggested that male

ornamentation in this and other monogamous species could be linked to enhanced male reproductive success through extra-pair fertilizations (EPFs), thereby intensifying the level of sexual selection. The authors used DNA fingerprinting in House Finches during four breeding seasons (1988–1991) in Michigan to test two hypotheses: (1) that extra-pair copulations (EPCs) in this species compose a significant and previously undetected source of male reproductive success, and (2) that the expression of male plumage reflects genotypic quality and is correlated with the probability of a male being cuckolded. Of 119 nestlings from 35 nests, 10 nestlings in five different nests were identified as illegitimate with respect to the putative father. On the other hand, all 80 nestlings (from 22 nests) associated with females from which blood was obtained, were identified as the offspring of that female. No significant difference was detected between plumage brightness scores of cuckolded and noncuckolded males, or in male wing length, minimum male age, female plumage coloration, clutch initiation date, or clutch size and the incidence of cuckoldry. The only variable that was determined to be significantly related to cuckoldry was nest dispersion ($P = 0.04$), in which all five nests with illegitimate offspring were clumped within 10 m of another House Finch nest. The results of this study provides no evidence that female House Finches mated to less-ornamented males are any more likely to obtain EPFs from neighboring males, thereby reducing the fecundity of less-ornamented males. Rather, the data suggest that nesting density is more responsible for the variation in male reproductive success in this population. Cuckoldry, therefore, does not appear to be a major force influencing sexual selection in this population of finches. The authors alternatively suggest that a sex-ratio strongly biased in favor of males and nesting asynchrony in females are more likely the forces that have resulted in the evolution of conspicuous male ornamentation in this species. [Dept. of Zoology and Wildl. Science, Auburn Univ., Auburn, AL 36849, USA.]—Danny J. Ingold.

14. Long-distance breeding dispersal of Snowy Plovers in western North America. L. E. Stenzel, J. C. Warriner, J. S. Warriner, K. S. Wilson, F. C. Bidstrup, and G. W. Page. 1994. *J. Anim. Ecol.* 63:887–902.—Snowy Plovers (*Charadrius alexandrinus*) display a wide variety of dispersal behavior during the breeding season. During a six-year study at two coastal sites in California, 41% of females and 16% of males that regularly bred at the sites were absent either for part of one breeding season or between seasons. Some of these birds were found breeding at alternate sites from 50 km to 1140 km distant, mostly to the north. Some also went east (inland) and south. Alternate-site nesting was documented for 16 females and seven males. Snowy Plovers typically are monogamous for only one breeding cycle and the males brood the young (Warriner et al., 1986, *Wilson Bull.* 98:15-37), and therefore males have less opportunity than females to disperse to new breeding areas. Most observations of extra-site breeding were at wintering areas, and occurred when the resident plovers at the wintering area began breeding earlier than usual, or continued breeding later than usual. Only 39% of female and 49% of male Snowy Plovers leave their breeding areas to winter elsewhere (either north or south along the coast). Although breeding dispersal has been reported among many species, Stenzel et al.'s findings are significant because the dispersal occurs when resources are plentiful. They hypothesize that this behavior is useful during years when environmental conditions are sub-optimum.—Oliver Komar.

15. Variation in the laying intervals of the Pied Flycatcher and the Redstart. E. Pulliainen, P. Jussila, and P. Tunkkari. 1994. *Ornis Fennica* 71:109–114.—A comparison of egg-laying patterns of the Pied Flycatcher (*Ficedula hypoleuca*) and the Redstart (*Phoenicurus phoenicurus*) was conducted in a forested region in Finnish Lapland. The typically short summer in the Arctic and subarctic regions dictates that breeding birds begin egg-laying as early as possible to ensure successful rearing before autumn's arrival. Breeding birds of the area are known to respond to cold spells during their laying periods by adopting one of three strategies: no interruption in egg-laying, interrupting the egg-laying process, or abandoning the whole clutch. In order to analyze the effects that temperature variation may have on egg-laying, the responses of a cold spell on a subarctic breeding bird (the Redstart) were compared to those of a species that has expanded its breeding range into the area only relatively recently (the Pied Flycatcher). The authors found that during exceptionally cold temperatures the Redstart did not demonstrate the gaps or interruptions in egg-laying that were observed in the flycatcher, which was found to have egg-laying gaps of up to 11 days.

The Redstarts were found to commence egg-laying earlier than the flycatchers, and had a higher fledgeling production rate from the eggs laid (68.2% vs. 29.5%). Overall, the redstarts bred more successfully than the flycatcher in this and other subarctic sites. The authors suggest that this difference in success may be the result of foraging differences. Redstarts are ground feeders, whereas flycatchers need flying insects, a food source that is highly dependent on prevailing weather conditions. Consequently, during unfavorable weather conditions, the flycatchers may be unable to compensate for the loss of protein rich food. [Värriö Subarctic Research Station, University of Helsinki, Linnanmaa, FIN-90570 Finland.]—Sue Bennett.

16. Northern Flickers nest successfully in a nest box in Michigan. A. Bower. 1995. *Sialia* 17:7–11.—The use of nest boxes for nesting by Northern Flickers (*Colaptes auratus*) has been documented only occasionally throughout their range, in part because flickers, like many woodpeckers, prefer to excavate their own nest cavities (or use old nest cavities) in dead or dying tree trunks or limbs. In this report, the author describes erecting a specially-designed nest box for flickers (46 cm deep with a cavity entrance of 8.3 cm high and 5.7 cm wide) 5.5 m high on a dead limb just above an old, previously-used flicker cavity. By filling the box to the top with cedar shavings, European Starlings (*Sturnus vulgaris*) and House Sparrows (*Passer domesticus*) were initially deterred from usurping the box. A pair of flickers attempted to use the box during the first of three nesting seasons, but was harassed by starlings after they had removed a sufficient amount of wood shavings to allow Starling entry. The flickers subsequently abandoned the nest box for the remainder of the season; however, another flicker pair (or perhaps the same pair) returned during each of the next two breeding seasons and successfully fledged young from the box in both years. This was apparently the first record ever of flickers nesting successfully in a nest box in Michigan. Success didn't come easily though as the author was forced to shoot or trap numerous starlings that attempted to usurp the box in both years. Nonetheless, the successful nesting efforts described in this report represent an encouraging breakthrough, and suggest that nest boxes may be used to help alleviate Starling competition in areas where nest cavities are limiting. [213 N. Main St., Britton, MI 49229, USA.]—Danny J. Ingold.

17. Nesting activity on a box-paired trail. D. P. Palahniuk and E. B. Bakko. 1995. *Sialia* 17:3–6.—The authors monitored a trail consisting of 21 paired bluebird nest boxes during the 1993 breeding season in Rice County, Minnesota. The goal was to examine intra- and interspecific relationships among Eastern Bluebirds (*Sialia sialis*), Tree Swallows (*Tachycineta bicolor*), and House Wrens (*Troglodytes aedon*) competing for nest boxes. Each pair of nest boxes included one Peterson-style box and one Kentucky-slot box. Nest-box use was greatest among House Wrens, which laid at least one egg in each of 25 nest boxes, even though they initiated nesting a few weeks later than both bluebirds and Tree Swallows. While wrens showed no strong preference for either box type (68% of wren nests were in slot boxes), both bluebirds and Tree Swallows nested significantly more often in Peterson boxes (9 out of 9 bluebird pairs, and 10 out of 11 swallow pairs). House Wrens also showed the greatest proclivity for nesting in unoccupied boxes next to boxes with established nests. When wrens nested next to wrens, in no cases were both pairs successful. However, when wrens nested next to Tree Swallows, both pairs fledged young in four of six instances. Tree Swallows attempted nesting next to wrens twice and bluebirds once. They fledged young in one attempt (next to wrens), and had no adverse effects on the nesting success of their neighbors. Bluebirds never attempted to nest in a box paired with an occupied box. Five nest-box usurpations were recorded, all of which involved wrens taking boxes from other wrens or Tree Swallows. These data are similar to those presented in previous studies, and suggest that bluebirds are at a disadvantage on paired-box trails since they seem unwilling to attempt nesting next to any other nesting pair (whether it be bluebirds or another species). On the other hand, the tendency for Tree Swallows and House Wrens to nest successfully side by side may help to free up other nest boxes for bluebirds. [Biology Dept., St. Olaf College, 1520 St. Olaf Avenue, Northfield, MN 55057-1098, USA.]—Danny J. Ingold.

18. The distribution of breeding Merlins *Falco columbarius* in relation to food and nest sites. C. G. Wiklund and B. L. Larsson. 1994. *Ornis Svecica* 4:113–122.—Nest site selection and food availability were examined as determinants of breeding density of Merlins. It has

been suggested from prior studies that nest availability and prey abundance may be limiting factors in raptor breeding areas. The study was conducted in two Swedish national parks from 1977–1992, where Merlins have bred regularly for over a decade. The preferred nesting site for Merlins was determined to be old Hooded Crow (*Corvus corone cornix*) nests that were less than two years old; 79% of the Merlins were found to occupy nests that were determined to be less than three years old. Furthermore, Merlins are known to exhibit very low nest site fidelity, and rarely used old Merlin nests, either because the parasitic load was greater, or because the nest cup was usually destroyed. An intact nest cup provides a somewhat protective hollow for the young. Hooded Crow nests were believed to be the nest of choice possibly because they were usually well concealed when compared to other nests available to the Merlins. This is thought to be an adaptation that would reduce avian predation pressures. Artificial nests that met these requirements were placed in a study area where natural nest site availability was low. Point counts of passerines were conducted in order to estimate food abundance in this area and in a control area where up to 15 pairs of Merlins could breed. The results were that the number of Merlin territories did not increase as a function of the number of nests provided. The authors suggest one possible reason might be the amount of snow cover and depth in the experimental area, which was greater in both respects when compared to the control area. The abundance of prey was negatively correlated with snow cover. The authors conclude that the Merlins in this study were limited more by the availability of food than nesting sites. [Department of Zoology, University of Göteborg, Medicinargatan 18,413 90 Göteborg, Sweden.]—Sue Bennett.

19. Which characteristics might selection favour as cues of female choice of mate in Red-winged Blackbirds? M. L. Milks and J. Picman. 1994. *Can. J. Zool.* 72:1616–1624.—A number of studies have supported the hypothesis that selection of mates by female Red-winged Blackbirds (*Agelaius phoeniceus*) is nonrandom, i.e., that females select mates based on an assessment of variables related to male fitness and territory quality. The purpose of this study was to attempt to determine which characteristics females might be using in their assessment. In order to influence the evolution of mate selection, a characteristic should meet three criteria: it should affect female reproductive success, it should be available for evaluation by the female prior to mating, and it should exhibit variation among breeding seasons, habitats, populations, and/or individuals. During three field seasons, the authors measured 17 characteristics of male redwings and their territories that met those criteria, and they monitored nest success (a successful nest being one that fledged at least one young). Included in the measured characteristics were nest height, vegetation height and density, water depth, distance to the edge of the marsh, distance to the nearest nesting conspecific, distance to the nearest active Marsh Wren (*Cistothorus palustris*) nest (redwings and Marsh Wrens breed in similar habitat, and the wrens are known to destroy eggs and young in nearby nests), male age, body mass, wing, bill, and tarsus length, and intensity of male nest defense during the nest building, egg-laying, incubation, and nestling periods. Using univariate and multivariate regressions to explore the relationship of these characteristics with nesting success, four emerged as good predictors: vegetation height, distance to nearest redwing nest, distance to nearest wren nest, and male nest defense during the nesting stage. Of these, distance to a wren nest appeared to be the best predictor, and also was the characteristic that best met the three natural selection criteria. These results suggest that the proximity of nesting Marsh Wrens, and perhaps other characteristics, influence female mate selection in redwings; the authors propose experimental manipulation of the characteristics to further tease out which cues the females are using. [Dept. of Biology, Univ. of Ottawa, Ottawa, ON K1N 6N5, Canada.]—Scott W. Gillihan.

MIGRATION, ORIENTATION, AND HOMING

(see also 24)

20. Autumn migration of Northern and Alpine Ring Ouzels (*Turdus torquatus torquatus* and *T. t. alpestris*) in Switzerland. [Herbstzug nordischer und alpiner Ringdrosseln (*Turdus torquatus torquatus* and *T. t. alpestris*) in der Schwiez.] L. Jenni. 1994. *Ornithol. Beob.* 91: 153–161.—The migration strategies of the northern and alpine subspecies of the Ring Ouzel, which are distinguishable based on winglength and outer primaries, were compared at the

banding station in the alpine pass Col de Bretolet. Both subspecies are thought to winter in the North Africa highlands. The northern subspecies follows the main passage of the alpine population by about 2 weeks. Northern Ring Ouzels had a smaller body mass but larger fat stores than individuals of the alpine subspecies. This difference may be because the northern birds were rapidly passing through Europe and the alpine birds were just beginning their migration. [Schweizerische Vogelwarte, CH-6204 Sempach, Switzerland.]—Robert C. Beason.

HABITAT USE AND TERRITORIALITY

(see also 23, 31, 32)

21. Does competition with residents affect the distribution of migrant territories? S. Timonen, M. Mönkkönen, and M. Orell. 1994. *Ornis Fennica* 71:55–60.—The spatial relationship between migrants and residents in northern Finland was examined. Territorial competition between resident titmice (*Parus montanus*, and *P. major*) and two migrant species, the Chaffinch (*Fringilla coelebs*) and the Willow Warbler (*Phylloscopus trochilii*), was examined by evaluating their responses to the playback of calls. These are the four most numerous species in the area, and all belong to the same guild of foliage gleaning insectivores. The study was conducted during the breeding season for two consecutive years (1989 and 1990) in 13 and 17 total nest plots respectively. The study area was divided into three study plots: Tit-nest plots (active tit nests), control plots (sites tits had bred the preceding year or where a nest was destroyed prior to the experiment), and random plots. The minimum distance between plots was 100 m. Recordings of the migrant chaffinch and willow warbler were played for 2 minutes at the center of each plot. Bird response was graded as positive if a male came within 5 m of the loudspeaker and acted as if on territory (wing vibrations, eager singing). The results from 1989 indicate a tendency for migrants to prefer the vicinity of tit-nests, leading the authors to conclude that the migrants may use residents as cues for “good” breeding sites (heterospecific attraction). While this attraction was not observed in 1990, the authors point out that there was a difference in overall occupancy between years. These changes in population density may have resulted in the lack of attraction in the second year. Overall, populations of both resident species involved in this study were found to be low the second year. The authors offer the suggestion that the results observed in 1989 could have occurred as the result of the higher population density, leading to the presence of a surplus of young, naive birds. [Department of Zoology, University of Oulu, Linnanmaa, FIN-90570 Oulu, Finland.]—Sue Bennett.

22. Habitat quality for raptors: a field experiment. P. Widén. 1994. *J. Avian Biol.* 25: 219–223.—Intensive forest management in Scandinavian boreal forests has resulted in numerous clearcuts that have high densities of rodents but few perches for raptors. To assess the effect of perch availability on raptor use of clearcuts, Widén made systematic observations at 22 clearcuts in southern Sweden in 1987 and 1988. The cuts varied in size from 3.7–19.9 ha and lacked natural perches. Thus, artificial perches were erected at 11 clearcuts while the other 11 served as controls. For 8–10 pairs of Common Buzzards (*Buteo buteo*) that nested in the study area, sites were chosen so that at least one experimental and one control clearcut occurred in each territory. In the second year, all perches were moved so that the control and experimental clearcuts were reversed. In the first year, raptors (mostly buzzards but also Eurasian Kestrels [*Falco tinnunculus*]) used experimental cuts significantly more than control cuts, even though vole densities were higher in the control cuts. Vole densities declined at both treatments in the second year. Raptors again used experimental cuts more than control cuts, but the difference was not quite significant. Nonetheless, the data suggested that raptors responded positively to the presence of hunting perches. Because raptors have large home ranges, it is unlikely that reserves of undisturbed habitat would be large enough to protect viable populations of birds. Widén suggests that research should focus on determining which components of a habitat are the most important to raptors so that conservation efforts can be directed toward improving unsuitable habitats. As demonstrated in this study, the availability of hunting perches may be an important attribute in maintaining raptor populations in man-altered landscapes. [Dept. of Natural Sciences, Univ. of Karlstad, Box 9501, S-650 09 Karlstad, Sweden.]—Jeff Marks.

ECOLOGY

(see also 6, 21, 31)

23. Interspecific aggressive behaviour between robins and other birds in eucalypt forest. D. Robinson. 1993. *Corella* 17:107–110.—Aggressive interactions between 28 species of birds and color-banded Flame Robins (*Petroica phoenicea*) or Scarlet Robins (*P. multicolor*) were recorded in open eucalypt forest and grassland, on the Southern Tablelands of New South Wales, Australia. Where robins were the aggressor, 80% of interactions were with ground foraging species, mostly with Jacky Winters (*Microeca leucophaea*), which forage in much the same way as Flame and Scarlet robins by pouncing or snatching prey close to the ground. Jacky Winters were the most frequent attackers of Flame and Scarlet robins among the 9 species of ground foraging species which were aggressors. The author, after discussing several possible explanations, suggests that competition for food is the most likely cause of this interspecific aggression. Only 6% of robin attacks were on honeyeaters, but honeyeaters were responsible for 57% of the attacks on robins, and were observed to chase them up 40 m. Honeyeaters are well known for their aggressive exclusion of other species from their foraging space, even when foraging niche overlap is small. The authors suggest that some Australian insectivorous birds aggressively displace birds with similar foraging behaviors or that feed in the same areas. [Department of Ecology and Evolutionary Biology, Monash Univ., Clayton, Victoria 3168, Australia.]—William E. Davis, Jr.

POPULATION DYNAMICS

(see also 1, 5, 14, 32)

24. Age and sex structure, mortality and spatial winter distribution of Siskins (*Carduelis spinus*) migrating through eastern Baltic area. V. A. Payevsky. 1994. *Vogelwarte* 37:190–198.—Between 1957 and 1991 a total of 149,378 Siskins were banded at the station on the Courish Spit of the Baltic Sea. Only 1156 (0.77%) were recovered. Based on the banding recoveries, there were no sex or age differences in the distance or direction of the recovery site from the banding station. In social interactions males dominate females, and adults dominate juveniles; but there was no difference in the distance of migration based on sex or age. Males were more common as adults (59.7%) and immatures (52.2%), but there were no significant differences in survival rates between sexes. These results are inconsistent with the prevailing dogma that males migrate the shortest distance and suffer the lowest mortality compared to females and juveniles, with females doing better than juveniles. The author speculates the Siskin may differ from other species because it is highly gregarious and flock members are exposed to similar hazards. However, the author does not present any data to indicate that these flocks are a mixture of males and females, and adults and juveniles. [Biological Station Rybachy, Zoological Institute Acad. Sci., 199034 St. Petersburg, Russia.]—Robert C. Beason.

25. Population dynamics of the Bridled Tern *Sterna anaethetus* colony on Penguin Island, south-western Australia. J. N. Dunlop, and J. Jenkins. 1994. *Corella* 18:33–36.—Bridled Terns have expanded their range to nest on Penguin Island, and currently 1000 to 1200 pairs nest in several sub-colonies. Banding of adults and young occurred in 1982/1983, and again from 1986/1987 through 1992/1993. The northern sub-colony has expanded and a southern sub-colony has developed since 1989/1990. Of 603 young birds banded 44, aged 1 to 7 years, have been recovered (recaptured in a subsequent year). Few recovered birds were 1 or 2 years old, but a marked influx of 3-year-olds occurred; 4-year old birds were proportionally less important in the established northern subcolony, but very important in the new southern subcolony. These data suggest that terns return to their natal colony at age 3 but most do not breed until age 4, and that a partial emigration occurred of breeding-age birds from the northern subcolony to the new southern subcolony. The dominant age classes in the northern subcolony were 6 and 7 years. The oldest known birds were 13 years old. Recoveries from the 1438 birds banded as adults provided a conservative estimate of an 82% adult survival rate, and figures for the 1982/1983 cohort suggest a survival to recruitment of 37%. Hence it appears that average lifetime reproductive rate is above replacement level, which may account for the expanding breeding population. This paper illustrates the advan-

tages of having a study population of marked birds. [P.O. Box 518, Karratha, Western Australia 6714, Australia.]—William E. Davis, Jr.

EVOLUTION AND GENETICS

(see 3, 4, 8, 9, 13)

ZOOGEOGRAPHY AND DISTRIBUTION

(see also 6, 15, 20, 24)

26. **Golden Eagles *Aquila chrysaetos* breeding in the foothills of the Swiss Alps: range expansion and ecological background.** [Der Steinadler *Aquila chrysaetos* als Brutvogel im schweizerischen Alpenvorland: Ausbreitungstendenzen und ihre populationsökologischen Grundlagen.] H. Haller. 1994. Ornithol. Beob. 91:237–254.—During the past 30 yr Golden Eagles have established territories in the foothills of the Alps in the canton of Berne and, several years later, in eastern Switzerland. Their primary food included hares, domestic cats, fox cubs, and ungluate fawns. The breeding success in the foothills was higher than in the alpine areas, with young birds selecting breeding sites in their natal areas. The greater population density in the canton of Berne is probably responsible of the dispersal of the eagles into the foothills several years before they moved into the foothills in eastern Switzerland. However, suitable habitat in the Jural Mountains on the Swiss-French boarder remains unoccupied. [Naturmuseum, CH-9000 St. Gallen, Switzerland.]—Robert C. Beason.

MORPHOLOGY AND ANATOMY

27. **Cycle of colour changes in Cattle Egrets *Ardeola ibis* (*coromandus*) in Australia determined from field observations of marked birds.** M. Maddock. 1993. Corella 17:93–99.—This detailed study of color changes in Cattle Egrets was conducted at breeding colonies in the Hunter Valley of New South Wales. It was based on observations of over 1000 nestlings, 982 of which were marked with patagial tags, 161 adult marked birds which had returned to nest, and observations of migrating and roosting winter birds. The report contains details of changes in beak color from hatching to fledging; plumage, beak, and tarsus colors in winter (nonbreeding) adult birds; and the stages (11) outlining the progression of changes through the breeding cycle including the transition into and out of breeding colors. Color changes in beak, facial skin, skin of head and neck, tarsus, and plumage are detailed. The data included observations of some birds through 5 breeding seasons. Wide variation in timing and variation in color changes is documented. For example, the “magenta courting phase,” during which the facial skin and beak turn strong magenta red, varied in duration from 9–27 days, occurred later in the season with younger birds, and after nest failure the colors sometimes returned. The author also considers postbreeding color alterations, and the time scale for breeding changes.

This is an interesting and informative paper, which illustrates the importance of studying populations of marked birds, and the advantages of large sample sizes. [Department of Education, University of Newcastle, NSW 2308, Australia.]—William E. Davis, Jr.

PLUMAGES AND MOLTS

(see also 13)

28. **Are bright birds distasteful? A re-analysis of H. B. Cott's data on the edibility of birds.** F. Götmark. 1994. J. Avian Biol. 25:184–197.—Beginning in the 1940s, H. B. Cott determined experimentally that some brightly colored birds are distasteful to hornets, cats, and people. Cott's suggestion that birds are aposematic has received support from Dumbacher et al.'s (1992, Science 258:799–801) recent discovery in New Guinea of a brightly colored, poisonous bird in the genus *Pitohui*. One criticism of Cott's work is that natural predators (such as raptors) were not used in the experiments. In an experiment with live mounts, Götmark (1994, Auk 111:251–262) demonstrated that the conspicuous plumage of male Pied Flycatchers (*Ficedula hypoleuca*) reduced the risk of predation by migrating Sparrowhawks (*Accipiter nisus*). Other criticisms are that Cott used a single set of scores to esti-

mate conspicuousness and considered only the females of dichromatic species. In this paper, Götmark reanalyses Cott's data using several independent scores of plumage conspicuousness and quantifying conspicuousness of both sexes for dichromatic species. He also attempts to control for phylogeny using a simplified version of Felsenstein's method of independent contrasts. Cott used two data sets, one from European birds and the other from South African birds. Götmark's reanalysis of the European sample revealed a consistent negative correlation between plumage conspicuousness and edibility. The small sample size (30 passerine species) precluded controls for phylogeny. Similarly, plumage conspicuousness and edibility were negatively correlated for 87 nonpasserines from Africa, including analyses of matched pairs of closely related species. For African passerines (105 species), however, the correlation between plumage conspicuousness and edibility was significantly negative only for females. An obvious conclusion is that sexual selection may have been an overriding factor in plumage brightness among male passerines in the African sample.

Götmark's results suggest that plumage conspicuousness may indeed signal the profitability of prey to predators, but that it does not do so for all prey species. Götmark's research is important because it brings Cott's work to the attention of ornithologists, many of whom have heretofore been unaware of it (myself included). Götmark also points out additional problems with Cott's method that need to be addressed in future studies. Prominent among these is the fact that birds of prey have not been used to assess the edibility of prey species. Regardless of any shortcomings of Cott's work, Götmark has shown clearly that Cott's ideas deserve serious attention from ornithologists. [Dept. of Zoology, Univ. of Göteborg, Medicinaregatan 18, S-413 90 Göteborg, Sweden.]—Jeff Marks.

WILDLIFE MANAGEMENT AND ENVIRONMENTAL QUALITY

(see also 5, 16, 17, 18, 22, 26)

29. Set-back distances to protect nesting bird colonies from human disturbance in Florida. J. A. Rodgers, Jr., and H. T. Smith. 1995. *Conserv. Biol.* 9:89–99.—To develop guidelines for protective buffer zones or set backs around colonial bird breeding sites that might be disturbed by human activities, an experiment was conducted at 8 wading bird and 9 seabird nesting sites. Flushing distances were quantified in response to 3 types of disturbance: walking, canoeing, or motor boating. Differences in flight responses were revealed among disturbance activity and species; motor boats were the most disturbing to Brown Pelican (*Pelecanus occidentalis*), Double-crested Cormorant (*Phalacrocorax auritus*), Great Blue Heron (*Ardea herodias*), Tricolored Heron (*Hydranessa tricolor*), but walking was most disturbing to Bald Eagle (*Haliaeetus leucocephalus*). No differences were observed in flushing distance among nesting stages. A formula was presented to calculate recommended set back distances (RS), based on the mean and standard deviation of observed flushing distance for individuals. The most sensitive species' flushing distance should be used when calculating RS for multispecies colonies. [Wildlife Research Lab, Florida Game and Fresh Water Fish Commission, 4005 South Main Street, Gainesville, FL 32601 USA.]—Kristin E. Brugger.

30. The effect of revegetation on Silver Gull and Sacred Ibis populations at Winter Swamp, Ballarat. B. Kentish. 1994. *Corella* 18:71–76.—This is an interesting report on the effects of wetlands enhancement management on the breeding populations of Silver Gulls (*Larus novaehollandiae*) and Sacred Ibises (*Threskiornis aethiopicus*) at the 30 ha Winter Swamp in Victoria, Australia. Five small islands were created in 1982 to encourage breeding birds, and by 1987 about 700 pairs of Silver Gulls bred there. Gulls foraging at the local garbage dump produced sufficient problems for the local airport that control measures were suggested. As a first attempt at control of nesting gulls at Winter Swamp, brush was piled on part of one island. But, after initial success, the brush proved to be enhanced breeding habitat for Silver Gulls. Further study demonstrated that shrub and brush habitat favored gull nesting, while closed canopy trees, especially those with low sweeping branches, reduced the density of nests. As revegetation progressed the gull population declined. The growth of vegetation, however, produced enhanced nesting habitat for Sacred Ibises, and the number of nests increased from 3 in 1988 to 170 in 1992. Excreta from the ibises, however, caused the death of some trees, and if the nesting population continues to increase, the survival of nest trees is problematical. The authors suggest that future plans for population control for

both gulls and ibises must include improved refuse management, particularly the rapid burial of garbage, since both species utilize this foraging resource. This paper illustrates potential problems in resource enhancement and should be of interest to conservationists and land managers. [School of Biological and Chemical Sciences, Univ. of Ballarat, P.O. Box 663, Ballarat, Vic. 3353, Australia.]—William E. Davis, Jr.

31. Defining forest fragmentation by corridor width: the influence of narrow forest-dividing corridors on forest-nesting birds in southern New Jersey. A. C. Rich, D. S. Dobkin, and L. J. Niles. 1994. *Conserv. Biol.* 8:1109–1121.—How do you define a forest fragment? The answer is likely scale-dependent on the biological events of interest. Breeding bird surveys (fixed-radius [100 m] point counts) were conducted in oak-pine forests of southern New Jersey to determine the effects of corridor width on abundance and community composition of forest-nesting birds. Sampling locations were distributed equally among corridor edge, forest margin (100 m into forest), and forest interior (300 m into forest). Three rights-of-way (unpaved roads, 8 m width; paved roads, 16 m; and transmission lines, 23 m) were compared. Relative abundances of forest-interior species were reduced at the edge of 16- and 23-m corridors, but not in forest margin or interior. Relative abundance of Brown-headed Cowbirds (*Molothrus ater*) was increased at the edge of 8-m corridors. The authors suggested that the edge sites may serve as ecological traps for forest-nesting birds, thus the biological impact of an 8-m unpaved road was equivalent to fragmentation of the larger oak-pine forests. [Department of Biology, Rutgers University, Camden, NJ 08102 USA.]—Kristin E. Brugger.

32. Potential effects of a forest management plan on Bachman's Sparrows (*Aimophila aestivalis*): linking a spatially explicit model with GIS. L. Jianguo, J. B. Dunning, Jr., and H. R. Pulliam. 1995. *Conserv. Biol.* 9:62–75.—A geographic information system (GIS) model called ECOLECON (based on the predecessor BACHMAP) was used to estimate long-term effects of forest management strategies on population sizes of a potentially threatened species, Bachman's Sparrow, in the piney woods of the Savannah River Site (SRS). Three forest management scenarios were evaluated with 100 runs of the individual-based model: (1) random harvest, (2) harvest of oldest stands first, and (3) harvest of adjacent-stand clusters. Population assumptions included adult and juvenile survivorship at 60% and 40%, respectively, and a goal of 1110 breeding pairs on the entire SRS. Habitat suitability assumptions included preference for open young- and old-aged pine forests. Simulations for the 50-yr duration of the current SRS Operation Plan (OP) revealed an initial dip in population sizes (below the minimum goal for breeding pairs) for each scenario, with a long-term recovery after ~40 yrs to the minimum goal for scenarios 2 and 3, but not for scenario 1. It is suggested that modest changes in the OP, which focuses on endangered woodpeckers, could improve the long-term population viability of other species, such as Bachman's Sparrow. [Institute of Ecology, Univ. Georgia, Athens, GA 30602 USA.]—Kristin E. Brugger.

33. Evaluation of ReJeX-iT AG-36 as a Canada Goose grazing repellent. J. Cummings, P. Pochop, J. Davis, Jr., and H. Krupa. 1995. *J. Wildl. Manage.* 59:47–50.—In an effort to find a more effective and less expensive Canada Goose (*Branta canadensis*) grazing deterrent, a new product, ReJeX-iT AG-36 was studied under simulated field conditions in 1993 at the Denver Federal Center, Colorado. Test results showed that prior to treatment, and after day four post treatment, there were no difference in the numbers of geese on treated and control plots. During posttreatment days 1–4 however, significantly fewer geese were observed on treatment plots than control plots. Thus ReJeX-iT AG-36 demonstrated limited effectiveness in reducing goose activity. The authors recommend the exploration of the impact of a high pressure sprayer on the thin wall encapsulation matrix. With modification of the encapsulation process and increased application rates, ReJeX-iT could be more effective in reducing damage caused by grazing geese. [U.S. Dept. of Agriculture, Animal and Plant Health Inspection Service, Denver Wildl. Research Center, Denver Federal Center, Bld. 16, Denver, CO 80225-0266 USA.]—Robin J. Densmore.