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RECENT LITERATURE

Edited by John A. Smallwood

MISCELLANEOUS

1. **Use of methoxyflurane to reduce nest abandonment of Mallards.** J. Rotella and J. Ratti. 1990. J. Wildl. Manage. 54:627-628.—Methoxyflurane was used to anesthetize incubating female Mallards (*Anus platyrhynchos*) in order to reduce nest abandonment after the attachment of radio transmitters. Only two of the 80 females trapped and anesthetized abandoned their nests. Thus the use of methoxyflurane was advantageous in the reduction of nest abandonments. However, the authors warn against anesthetization during cold and wet conditions due to susceptibility of recovering birds to hypothermia. Additionally, responses to methoxyflurane differ among species, therefore experiments with captive birds to determine species specific responses and requirements are suggested, prior to use in the field. [Dept. of Fish and Wildlife Resources, Univ. of Idaho, Moscow, ID 83843 USA.]—Robin J. Densmore.

BANDING AND LONGEVITY

(see also 1, 21, 25, 31, 44)

2. **Neck-band retention for Canada Geese in the Mississippi flyway.** M. Samuel, N. Weiss, D. Rusch, S. Craven, R. Trost, and F. Caswell. 1990. J. Wildl. Manage. 54: 612-621.—The purpose of this study was to describe neck-band retention rates in the Mississippi flyway and to identify factors that significantly influence neck-band retention. Data were collected during a 14-year period, from 1975 to 1988. There have been several studies conducted on this subject, but this study was different in that its data set was much larger (>2000 records) and statistical methods based on survival analysis were employed. The survival methods allowed for the analysis of data when the exact time of neck-band loss was unknown or when the neck-band retention times were censored. Banding dates, harvest or recapture dates, absence or presence of neck-band at time of harvest or recapture, and date last observed in the field prior to harvest or recapture were used to estimate neck-band retention rates. Other factors evaluated included: sex, age of bird at banding, neck-band type (thick or thin), riveted bands or nonriveted bands, neck-band color, and sampling method (shot or recaptured). A Weibull model with stepwise regression techniques was used to identify covariates that significantly influenced neck-band retention rates. Sex, age of bird at banding, rivet use, and neck-band type were identified as the significant covariates. The authors recommend the use of large sample sizes and observational data (resightings) in future retention studies. [U.S. Fish and Wildlife Service, National Health Research Center, 6006 Shroeder Rd., Madison, WI 53711 USA.]—Robin J. Densmore.

3. **A floating-fish snare for capturing Bald Eagles.** S. Cain and J. Hodges. 1989. J. Raptor Res. 23:10-13.—An effective floating fish snare for the capture of Bald Eagles (*Haliaeetus leucocephalus*) is described in detail. It is based on Robard's (unpublished) technique and modified to increase ease of use, versatility, and safety to the target animal. Fish (20-24 cm) are inserted with buoyant plugs and affixed with four monofilament snares. The fish is attached to a floating log (3.5 kg) by monofilament and a shock chord. When an eagle strikes the fish, monofilament loops tighten around the bird's legs. The shock chord and log provide resistance which slowly force the bird into the water when attempting to fly away. Capture success was approximately 50%. This open water trap eliminates the problem of capturing non-target terrestrial species and offers the advantage of placement in an aquatic habitat where Bald Eagles forage most frequently. [U.S. Fish and Wildlife Service, P.O. Box 021287, Juneau, AK 99802 USA.]—Robin J. Densmore.

4. **Early longevity and breeding records of Curassows (Cracidae).** H. Schifter. 1989. Riv. Italiana Ornitol. 59:70-74.—This paper includes the following longevity records from the Imperial Zoo of Schonbrunn, Vienna, Austria: Razor-billed Curassow (*Crax mitu tuberosa*), male, >20 years (D. Bruning also is cited giving a previously unpublished record of >23 years for the species at the Bronx Zoo, New York); Crestless Curassow (*Crax*

tomentosa), >10 years; Wattled Curassow (*Crax globulosa*), >20 years; Black Curassow (*Crax nigra*), female >8 years; and Great Curassow (*Crax rubra*), >17 years. Some of these records obviously are longer, since the birds were acquired as adults. Also given is a longevity record for a Crested Guan (*Penelope purpurascens*) that lived at the zoo for >6 years. [Naturhistorisches Museum Wien, Postfach 417, A-1014, Wien, Austria.]—Jerome A. Jackson.

5. **Analysis of banding and recovery data for Sharp-shinned Hawks at Whitefish Point, Michigan, 1984–1987.** T. W. Carpenter, A. L. Carpenter, and W. A. Lamb. 1990. N. Am. Bird Bander 15:125–129.—This paper serves as an update to an earlier account (Devereux et al. 1985, J. Field Ornithol. 56:346–355) of hawks banded during spring migration between 1956 and 1983. By the end of 1987, a total of 12,882 Sharp-shinned Hawks (*Accipiter striatus*) had been banded at this station on the southeast shore of Lake Superior. As of May 1988, 86 hawks had been encountered elsewhere, for an overall encounter rate of 0.67%. This rate, although similar to that reported for Duluth, Minnesota (also along Lake Superior), is lower than that of most other fall raptor banding stations (e.g., 0.98% for Hawk Cliff, Ontario; 1.5% for Cape May Point, New Jersey; 3.0% for Cedar Grove, Wisconsin). The authors suggest two contributing factors. First, the mortality rate for Sharp-shinned Hawks, and birds in general, is highest during the first few months of independence. A large proportion of hawks banded in the fall are HY birds; many of these die and are recovered during the following winter. The Whitefish Point birds are banded after this period of severe mortality "and thus probably have a lower likelihood of being recovered." This reviewer would point out, however, that the effect of a lower mortality rate would be a time lag in recoveries, not an overall reduction in recoveries (mortality eventually will reach 100% for all birds banded). Sharp-shinned Hawks that survive the first winter probably have a life expectancy of four to seven years of age (K. D. Meyer, pers. comm.; the maximum longevity record for the species was nine years and 10 months, Clapp et al. 1982, J. Field Ornithol. 53:81–208). Therefore, the effect of lower mortality on recovery rates would become negligible after perhaps five or six years post-banding. The authors did not specify year of banding for the recovered birds; it would be interesting to see the recovery rate for each banded cohort.

The second factor contributing to the relatively low recovery rate is that, compared to birds banded at fall banding stations (mostly south of Whitefish Point), a greater proportion of birds in the present study winter south of the United States, where bands are less frequently reported when encountered.

About 80% of the Sharp-shinned Hawks captured at the station were females. The authors suggest that the use of European Starlings (*Sturnus vulgaris*) for lures may bias the capture ratio toward the larger gender. However, more females also were captured in mist nets. Whether females are more susceptible to capture or more females actually migrate past Whitefish Point remains a puzzle. [Dept. of Biological Sciences, Bowling Green State Univ., Bowling Green, OH 43402 USA.]—John A. Smallwood.

6. **Banded North American birds encountered in Europe: an update.** J. V. Dennis. 1990. N. Am. Bird Bander 15:130–133.—A total of 76 encounters were known to have occurred "at this writing." The 28 species represented include three procellariiforms, Northern Gannet (*Sula bassanus*), two herons, eight ducks, Peregrine Falcon (*Falco peregrinus*), American Coot (*Fulica americana*), four shorebirds, seven gulls and terns, and one passerine. The most commonly encountered species was Blue-winged Teal (*Anas discors*), with 12 individuals. Brant (*Branta bernicla*) were omitted from the list as they are banded in Greenland and undergo a regular migration from northern Canada to Europe. The only passerine species was represented by a single Snow Bunting (*Plectrophenax nivalis*) banded in New York and encountered off the coast of Iceland. [P.O. Box 578, Princess Anne, MD 21853 USA.]—John A. Smallwood.

7. **Band opening and removal by House Finches.** S. J. Stedman. 1990. N. Am. Bird Bander 15:136–138.—In order to estimate the frequency of band removal by House Finches (*Carpodacus mexicanus*), the author clipped the outermost right rectrix of 2315 finches during winter banding operations in Tennessee. Of the 230 birds recaptured prior to the next flight feather molt, 31.3% wore bands that had been opened to some degree.

Surprisingly, only one (0.4%) clipped bird had lost the band entirely. The author concludes that the frequency of band removal in this species is minimal, and probably has a negligible effect on banding analyses. [Dept. of English, Tennessee Technical Univ., P.O. Box 5053, Cookeville, TN 38505 USA.]—John A. Smallwood.

MIGRATION, ORIENTATION, AND HOMING

(see also 6, 31)

8. Homing behavior of hippocampus and parahippocampus lesioned pigeons following short-distance releases. V. P. Bingman and J. A. Mench. 1990. Behav. Brain Res. 40:227–238.—The ability of domestic Rock Doves (*Columba livia*) to home following hippocampal or parahippocampal lesions was greatly impaired compared to control birds released at the same sites 10 km from their loft. Lesioned birds showed more direction changes and poorer orientation towards the loft during homing compared to controls. These results are interpreted to mean that these regions of the brain are involved in the birds recognizing landmarks in the vicinity of the loft. [Dept. of Psychology, Bowling Green State Univ., Bowling Green, OH 43403 USA.]—Robert C. Beason.

9. Studies on the direction of nocturnal migration in southern Germany and the Swiss lowlands and the influence of wind. [Richtungsverhalten nachtziehender Vögel in Süddeutschland und der Schweiz unter besonderer Berücksichtigung des Windeinflusses.] B. Bruderer and F. Liechti. 1990. Ornithol. Beob. 87:271–293.—Nocturnal bird migration was monitored during the autumn of 1987 using two tracking radars at Nuremberg and Payerne, while the third radar moved to four sites between the first two. Wind direction was monitored at each site using weather balloons. Light winds (<5 km/h) caused little deviation of the birds' tracks from their headings, with lower migrants (under 1000 m) heading 230° and higher migrants heading 215° to 220° in southern Germany. There was no difference between low-flying and high-flying migrants at Payerne in the Swiss lowlands, perhaps because of the orientation of the local mountains (230°). Changes in direction that occurred during the autumn migration could be attributed to changes in wind direction, rather than any seasonal shifts in species composition. Most (80%) of the birds tracked were small passerines, and only 10% were large passerines that had a more westerly heading. The authors conclude that the direction and intensity of the wind modified the heading of the migrants: there did not appear to be any compensation for weak winds, but stronger winds were associated with changes in heading that partially compensated for wind drift. There was no clear evidence that leading-lines were used under any wind conditions, except in the Swiss lowlands where sidewinds were partially compensated. [Schweizerische Vogelwarte, CH-6204 Sempach, Switzerland.]—Robert C. Beason.

10. Operant detection of extremely low frequency magnetic fields by the Domestic Pigeon *Columba livia*. C. G. Blomme, G. H. Parker, and M. A. Persinger. 1990. Bird Behav. 8:73–78.—Four pigeons were conditioned to respond to the presence or absence of an alternating magnetic field (45 Hz) that modified the ambient magnetic field (0.045 nT) by 0.05 nT. Experiments were conducted in the dark or in a room illuminated by fluorescent lighting. Only one bird showed relatively clear indication of discriminating between the presence or absence of the rotating magnetic field, and that in the dark. The other birds showed periods in which learning appeared to occur, but was later reversed. These results indicate that if learning was occurring, it was weak and easily disrupted. The weak response of the pigeons to the presence of the modified magnetic field makes it difficult to accept the authors' conclusions that learning occurred. A paradigm that is less difficult than the double disc discrimination task should be used to more clearly answer the question. [Dept. of Biology, Laurentian Univ., Sudbury, ON P3E 2C6, Canada.]—Robert C. Beason.

POPULATION DYNAMICS

(see also 39, 47, 50, 54)

11. Herring Gulls, *Larus argentatus*, nesting on Sandusky Bay, Lake Erie, 1989. R. Dolbeer, P. Woronecki, T. Seamans, B. Buckingham, and E. Cleary. 1990. Ohio J. Sci.

90:87–89.—A survey of Herring Gull colonies within Sandusky Bay of western Lake Erie produced an estimated 4250 nesting pairs. The large colonies on Turning Point Island and the breakwalls bordering the Cedar Point Marina comprised more than 90% of this total. When compared with estimates of 878–983 nesting pairs in this bay during 1976–1977, this population experienced an average annual increase of 11.9% during the 13-year period. As these large colonies became saturated, small satellite colonies developed on the roofs of two nearby buildings, the first reported roof-nesting behavior in Ohio. These estimates indicate Sandusky Bay currently hosts one of the largest populations of nesting Herring Gulls on the Great Lakes. [U.S.D.A., Denver Wildlife Research Center, 6100 Columbus Ave., Sandusky, OH 44870 USA.]—Bruce G. Peterjohn.

NESTING AND REPRODUCTION

(see also 11, 23, 25, 26, 27, 28, 30, 35, 39, 40, 53, 54)

12. Joint laying in *Bucephala* ducks—"parasitism" or nest-site competition? A. J. Erskine. 1990. Ornis Scandinavica 21:52–56.—Erskine argues that for cavity-nesting ducks (e.g., *Bucephala* spp.), the presence of eggs from two or more females in one nest may result from competition for nest sites rather than from deliberate attempts at nest parasitism. Suitable nesting cavities often are in short supply, and a female able to incubate eggs probably would not benefit by leaving a suitable site vacant while laying eggs in other nests that might not be attended by an incubating duck. Erskine hypothesizes that joint laying occurs even though both females start laying with the intent to incubate. The first female to complete laying winds up incubating the joint clutch; the excluded female may continue laying elsewhere and incubate a partial clutch or another joint clutch, or may again be excluded from a joint clutch. As a last resort, twice-excluded females may "dump" (i.e., lay parasitically) one or two eggs that cannot be resorbed. [Canadian Wildlife Service, P.O. Box 1590, Sackville, NB E0A 3C0, Canada.]—Jeff Marks.

13. Temporal increase in nest defense intensity of the Willow Tit (*Parus montanus*): parental investment or methodological artifact? S. Rytkonen, K. Koivula, and M. Orell. 1990. Behav. Ecol. Sociobiol. 27:283–286.—Responses in nest defense were studied in Willow Tits during the 1988–1989 breeding seasons in northern Finland. Nest defense trials were conducted at all stages of the breeding cycle on experimentally naive birds as well as revisited birds to test two hypotheses: (1) whether temporal increases in parental nest defense are associated strictly with increased parental investment (i.e., Trivers' parental investment hypothesis), or (2) whether such increases result from positive reinforcement and loss of fear associated with multiple visits to nests. Naive birds decreased their average and minimum approach distance to a model predator, and increased their rate of alarm calling as the season progressed. The number of previous trials did not significantly affect the intensity of nest defense at any stage in the breeding cycle of revisited birds. These data support the predictions of the parental investment hypothesis, and suggest that a temporal increase in Willow Tit nest defense is not a methodological artifact of positive reinforcement or loss of fear. The authors discuss some methodological shortcomings that possibly confuse the results of avain nest-defense studies rather than elucidate them. [Dept. of Zoology, Univ. of Oulu, Linnanmaa A, SF-90570 Oulu, Finland.]—Danny J. Ingold.

14. Sexual conflict in the House Sparrow: interference between polygynously mated females versus asymmetric male investment. J. P. Veiga. 1990. Behav. Ecol. Sociobiol. 27:345–350.—The reproductive success in polygynous birds results in part from a trade-off between the parental care provided by males and their ability to attract additional mates. One hypothesis for the evolution of monogamy in birds is that aggression between polygynously mated females may be a strategy to counter the polygynous tendencies of males. The author tested this hypothesis, that intraharem aggression among females could redirect male attention toward a single female, in nesting House Sparrows (*Passer domesticus*) in central Spain. Feeding frequencies between monogamous and polygynous male sparrows did not differ significantly, although polygynous males fed nestlings of "preferred" females (females who laid their clutches earliest) significantly more often ($P < 0.001$) than "nonpreferred" females. Consequently, the quantity and quality of nestlings produced by "preferred" females was similar to those of monogamous females, and significantly greater than those of "nonpreferred" females. However, the proportion of nests with eggs or nestlings that were destroyed by other sparrows was significantly greater in polygynous females ($P < 0.02$). Moreover, harem females that initiated egg-laying first (i.e., "preferred" females) suffered the greatest losses. These data support the hypothesis that the purpose of intraharem aggression among females is to redirect male attention. The number of reproductive attempts per season was significantly smaller for all polygynous females than for monogamous individuals. Thus, monogamy seems to be the optimal reproductive strategy for females. Conversely, among males, polygynous individuals were involved in more breeding attempts per season and raised more offspring per year than did monogamous individuals (although a significant reduction was detected in the number of fledglings produced by polygynous males compared to monogamous males that undertook the same number of breeding attempts). Therefore, the data suggest that polygyny is the optimal strategy for male sparrows in spite of interference between harem females which reduced their maximum expected success. [Museo Nacional de Ciencias Naturales C.S.I.C., Jose Gutierrez Abascal 2, E-28006-Madrid, Spain.]—Danny J. Ingold.

15. Nesting biology of Hooded Mergansers using nest boxes. M. C. Zicus. 1990. J. Wildl. Manage. 54:637–643.—The purpose of this study was to gain information on the nesting biology of Hooded Mergansers (*Lophodytes cucullatus*) and to examine the influence of nest box distribution on the nesting parameters of this species. Data were collected in Hubbard County, Minnesota, during 1981 to 1985. This study differs from previous merganser studies in that nest box placement was widely scattered rather than clustered, and they were placed in areas which previously had never contained nest boxes. The median box density was 0.8 boxes per km^2 and the median nest density was 0.4 nests per km^2. Hooded Mergansers used almost 50% of the available boxes, and they accounted for 90% of all cavity-nesting waterfowl use of the boxes. An average of 77.5% of the nests containing Hooded Merganser eggs were incubated by mergansers, 17.3% were not incubated by any species, and 5.2% were incubated by Wood Ducks (*Aix sponsa*) and Common Goldeneyes (*Bucephala clangula*). Hooded Merganser eggs comprised 12.3% and 20% of the eggs incubated by Wood Ducks and Common Goldeneyes, respectively. Mean Hooded Merganser clutch size was 13 eggs. Forty-five percent of the Hooded Merganser nests contained more than 13 eggs. Average clutch sizes reported in the literature were 9 to 11 eggs, thus there was a high occurrence of intraspecific laying found in this study. First eggs were laid during the last week of March and the first week of April. The mean initiation date for incubation was 13 May and the mean hatching date was 13 June. An average of 78.2% of incubated eggs hatched. Female Hooded Mergansers often moved more than 1.0 km to new nest sites even though successful in previous sites. Common nest predators were raccoons (*Procyon lotor*) and black bears (*Ursus americanus*). Less than 2% of the merganser ducklings came from nests incubated by other species. The author suggests that intraspecific laying probably was more related to Hooded Merganser abundance rather than to nest box density and distribution. [Minnesota Dept. of Natural Resources, Wetland Wildlife Population and Research Group, 102 23rd St., Bemidji, MN 56601 USA.]—Robin J. Densmore.

16. Changes in the site of avian breeding territories in relation to the nesting cycle. A. P. Møller. 1990. Anim. Behav. 40:1070–1079.—This study investigated the cause of territory size changes during the breeding season in 39 species. The author lists five factors which potentially influence territory size: food availability, nest site availability, competition with others seeking territories, female choice, and reduction of cuckoldry.

The reduction of cuckoldry was most strongly supported as the driving force of territory size, and thus maintenance of a large territory was viewed as a mate-guarding behavior. For most species, territory size peaked during the female's fertile period rather than during the period of highest food demand or during periods in which competition or female choice would be acting most strongly. This pattern held whether the territory was primarily a nest site and not used for feeding (Type A) or whether it contained some or most of the food needed by the pair (Types B and C). Also, in the seven double-brooded species considered, territory size decreased after the female's first fertile period and then peaked again during her second fertile period.

The author does not claim to have ruled out all other explanations of territory size, and in my opinion, the evidence is particularly weak in ruling out the importance of female choice for large territories. Nonetheless, this article suggests some interesting questions which can be addressed with well-planned field studies. [Dept. of Zoology, Uppsala Univ., Box 561, S-751 22 Uppsala, Sweden.]—Susan L. Earnst.

17. Effects of brood size on inter-clutch intervals, offspring development and male-female interactions in the Ring Dove *Streptopelia risoria*. C. Ten Cate and J. Hilbers. 1991. Anim. Behav. 41:27–36.—This study investigated the relationship between brood size, inter-clutch intervals, and social behavior in the Ringed Turtle-Dove. Ringed Turtle-Doves have a fixed clutch size of two and, like other Columbids, they raise several partially overlapping broods during one season. The authors made behavioral observations on six captive pairs of doves which each raised 3–6 normal broods of two and 3–6 experimentally reduced broods of one. Each of the pairs had significantly shorter inter-clutch intervals after raising reduced broods than after raising normal broods.

Brood reduction was associated with a decrease in time spent feeding offspring by males and females, potentially allowing females to reallocate resources to the next clutch. More importantly, brood reduction was most strongly associated with an increase in male courtship activity, which provided females with a stronger social stimulation for ovulation (known to be important in ring doves).

This study was carefully thought out, and it calls attention to the importance of male behavior in the timing of inter-clutch intervals, and more generally, to the timing of egg laying. [Zoological Lab., Univ. of Groningen, P.O. Box 14, 9750 AA Haren, The Netherlands.]—Susan L. Earnst.

18. Females of the lek-breeding Great Snipe, *Gallinago media*, prefer males with white tails. J. Hoglund, M. Eriksson, and L. E. Lindell. 1990. Anim. Behav. 40:23–32.—In the lek-breeding Great Snipe, a male's mating success is positively correlated with display frequency, nearness to the lek center, and amount of white on the tail feathers (which are exposed during courtship displays). In this study, the authors tested (1) whether males with more white on their tail feathers were more successful in male-male competition and (2) whether the amount of white on tail feathers functioned as a cue in female mate choice. The authors experimentally increased the amount of white on the tail feathers of a random sample of 18 of the 36 males comprising two leks.

There was no evidence that experimental males won more male-male encounters than did control males. The authors conclude that white tail feathers alone did not increase a male's success in male-male competition. On the other hand, there was evidence that the amount of white on tail feathers functioned as a cue in female mate choice. Although females visited both control and experimental males, four experimental males performed 16 of the 17 copulations observed ($\chi^2 = 14.48$, $P < 0.001$). While 33% of experimental males obtained a mating, only 7% of control males did so ($P < 0.12$).

The study would have been strengthened by an experimental design which controlled for the males' position in the lek, age, display frequency, and mating success before the manipulation. [Dept. of Zoology, Uppsala Univ., Box 561, S-751 22 Uppsala, Sweden.]—Susan L. Earnst.

19. Nestbox microclimate and its effects on starling (*Sturnus vulgaris*) nestlings. [Das Mikroklima im Nistkasten und seine Auswirkungen auf die Nestlinge beim Star (*Sturnus vulgaris*).] C. Erbelding-Denk, and F. Trillmich. 1990. J. Ornithol. 131:73–84. (German, English summary and captions.)—The authors examined the microclimate inside nest boxes occupied by active European Starling nests with comparable broods and found that smaller boxes (154 cm^2) were consistently hotter and had higher ammonia levels (which increased with temperature) than did larger boxes (361 cm^2). Oxygen and carbon dioxide levels did not vary significantly with box size. Smaller boxes tended to become very dirty and this build-up of excrement and resultant elevated ammonia levels (to 1000 ppm) are linked by the authors to the higher chick mortality in smaller boxes. The authors suggest that effects of microclimate differences would be more negative on second broods. This is a paper that nest-box manufacturers and users need to see and one which should stimulate similar research with such popular species as Purple Martins (*Progne subis*) and Eastern

Bluebirds (*Sialia sialis*). [Max-Planck Inst. für Verhaltenphysiologie, Abt. Wickler, D-8131 Seewiesen, Germany.]—Jerome A. Jackson.

20. Nesting habitat and territoriality in the Goshawk (*Accipiter gentilis*) and Red Kite (*Milvus milvus*). [Brutbiotop und Territorialität bei Habicht (*Accipiter gentilis*) und Rotmilan (*Milvus milvus*).] G. Dobler. 1990. J. Ornithol. 131:85–93. (German, English summary and captions.)—Over a period of four years, the author located 13 breeding pairs of Goshawks and 20 breeding pairs of Red Kites in forested areas of southern Germany. Greater regularity of nest spacing suggests intraspecific territoriality, but lesser regularity of spacing suggests that interspecific territoriality was not occurring. Also, there was no demonstrable relationship between kite reproductive success and distance to nearest Goshawk nest. Goshawks tended to nest more in the forest interior, whereas Red Kites nested nearer the forest edge. Mean nest heights for both species were greater than those reported elsewhere, perhaps reflecting greater maturity and height of nest trees. [Inst. für Verhaltenphysiologie, Univ. of Tübingen, Beim Kupferhammer 8, D-7400 Tübingen, Germany.]—Jerome A. Jackson.

21. Intermediate clutches in the Starling (*Sturnus vulgaris*): replacement clutches, additional clutches of polygynous males or late first clutches? R. Pinxten, M. Eens, and R. F. Verheyen. 1990. J. Ornithol. 131:141–150.—Within a population, the European Starling is well known to nest synchronously, often with two peaks of nesting per season. When starlings initiate nests between these peaks, the efforts sometimes are assumed to be renestings of birds that lost their first clutch. Pinxten and colleagues studied two color-banded populations in Belgium and found that renestings represented a minority of these intermediate nestings. Over a three-year period, as many as 71% of the intermediate clutches were laid by females paired with late-arriving males, 23% were additional clutches of polygynous males, and only 6% were replacement clutches of birds known to have lost their first clutch. Both yearling and older males and females were represented among early and intermediate nesting birds. This is a nicely done study and a well-written paper [Dept. of Biology, Univ. of Antwerp, U.I.A. Universiteitsplein 1, 2610 Wilrijk, Belgium.]—Jerome A. Jackson.

22. Breeding biology of the Grasshopper Warbler in Britain. D. Glue. 1990. Br. Birds 83:131–145.—Grasshopper Warblers (*Locustella naevia*) are widely distributed summer residents on the British Isles, but are relatively secretive and their breeding biology is poorly understood. This study used data from the British Trust for Ornithology's nest record scheme and unpublished data from the author and other individuals to establish their breeding biology in Great Britain.

This warbler occupied a wide variety of wet and dry habitats from sea level to an elevation of approximately 300 m, but preferred shrub-stage successional habitats, farmland with dense hedgerows, the brushy margins of wetlands, and young woods with shrubby thickets. Their nests were placed on the ground or at heights up to 30 cm, primarily in dense grasses and sedges. Pairs regularly raise two broods annually. Egg dates extended between 24 April and 1 August, with the majority of clutches occurring during May and June. Mean clutch size was 5.6 eggs through mid-May, but was reduced to 4.9 during July. The incubation period was 13 days and most young fledged at 12–13 days. The average size of successful broods was 4.88 young. Their success rate was 60% with most losses due to wind damage, flooding, and predation by mammals and Black-billed Magpies (*Pica pica*). Most aspects of their breeding biology were similar to that reported for this species in continental Europe. [British Trust for Ornithology, Beech Grove, Tring, Hertfordshire HP23 5NR, United Kingdom.]—Bruce G. Peterjohn.

BEHAVIOR

(see also 10, 13, 14, 16, 17, 18, 37, 38, 49, 53, 54)

23. Extra-pair copulation and extra-range movements in Flammulated Owls. R. T. Reynolds and B. D. Linkhart. 1990. Ornis Scandinavica 21:74–77.—Because owls are so difficult to observe, very little is known about their social habits. Reynolds and Linkhart studied Flammulated Owls (*Otus flammeolus*) for eight consecutive breeding seasons in the

Colorado Rockies, during which they noted one instance of extra-pair copulation (the first case known for a strigiform) and 21 cases of extra-range movements.

During one 3-hour period, a banded female copulated four times with a banded territorial male and twice with an unidentified intruder while the resident male was absent. The banded pair remained on the territory, but no nest was found. All but two of the extra-range movements were made into adjacent occupied home ranges. Intruders were secretive and typically perched near the residents' nests for up to 30 minutes while observing nesting activities. Males visited other territories throughout the nesting period, whereas females did so only after their own young had fledged ($n = 2$). The authors suggest that males leave their territories to seek extra-pair copulations and to evaluate resources and the status of males in other areas, whereas females do so to assess the quality of potential mates. [Rocky Mountain Forest and Range Experiment Station, 222 S. 22nd St., Laramie, WY 82070 USA.]—Jeff Marks.

24. A suggested antipredator function for snow-roosting behaviour in the Black Grouse *Tetrao tetrix*. A. Marjakangas. 1990. Ornis Scandinavica 21:77–78.—Most species of grouse roost in snow burrows during winter. Owing to the well-known insulative properties of snow, many authors have assumed that grouse roost in snow burrows to reduce heat loss. Marjakangas suggests that the primary function of snow-roosting is predator avoidance, with heat conservation being a secondary benefit (see also Bergerud and Gratson 1988, Adaptive strategies and population ecology of northern grouse, Univ. Minnesota Press. He supports his contention with data from Black Grouse, which frequently roost in snow burrows in mild weather when thermal constraints are relaxed. [Dept. of Zoology, Univ. of Oulu, Linnanmaa, SF-90570 Oulu, Finland.]—Jeff Marks.

25. Natal dispersal in the Collared Flycatcher: possible causes and reproductive consequences. T. Pärt. 1990. Ornis Scandinavica 21:83–88.—Natal dispersal has been a hot topic among avian and mammalian ecologists for more than a decade. Although most studies have assumed that dispersal entails costs, the relationship between dispersal and fitness is largely unknown. Pärt studied Collared Flycatchers (*Ficedula albicollis*) that used nest boxes on the island of Gotland, Sweden, from 1980–1987. This long-term study of hundreds of marked birds enabled him to examine the effects of natal conditions and breeding density on dispersal distance and to determine whether dispersal distance influences future reproductive success.

Natal dispersal in Collared Flycatchers fits the general avian pattern in which females disperse farther than males. However, dispersal distances overlapped considerably between sexes, and most individuals settled <1 km from their natal nest. There was no relationship between dispersal distance and an individual's body size, body mass, body condition, or hatching date. Indeed, the only factor related to natal conditions that influenced dispersal distance was brood size; females fledged from smaller broods dispersed farther than females from larger ones. There was no relationship between population density (of Collared Flycatchers or of other hole-nesters) and dispersal distance.

Reproductive success of females, and survival of males, decreased with increasing natal dispersal distance, but only for birds hatched late in the season. Because Collared Flycatchers migrate thousands of kilometers between the breeding and wintering grounds, it is unlikely that these costs resulted from dispersal distance alone. Instead, Pärt suggests that longer dispersal distances were associated with settlement in unfamiliar areas, which reduced reproductive success and/or survival. To test this hypothesis, data are needed on ". . . what individuals really do following fledging and what they do when arriving at the breeding grounds the next year." [Dept. of Zoology, Uppsala Univ., P.O. Box 561, S-751 22 Uppsala, Sweden.]—Jeff Marks.

26. Male choice and sperm competition as constraints on polyandry in the Red-necked Phalarope *Phalaropus lobatus*. D. P. Whitfield. 1990. Behav. Ecol. Sociobiol. 27: 247–254.—The mating system of Red-necked Phalaropes is classified as polyandrous, although numerous studies indicate that females frequently remain monogamous. On average, male Red-necked Phalaropes arrive at the breeding grounds later than females, and many do not arrive until some females have already completed laying a clutch for early-arriving males. Polyandry appears to be constrained by late-arriving males which usually do not mate with females who have already laid a clutch that season (C1 females). Rather, late-arriving males usually choose to mate with females that have not laid a clutch yet that season (C0 females). The author conducted a study on Red-necked Phalaropes during two breeding seasons in northeast Iceland (and examined the literature on phalaropes) in order to test the validity of five hypotheses that attempt to explain the constraints on polyandry. Of these hypotheses, four argue that for female Red-necked Phalaropes, laying a clutch has adverse energetic affects on their capacity or competitive ability to lay a second clutch. The fifth proposes that males prefer C0 females to C1 females because C1 females having previously copulated with another male, may be storing sperm to use to fertilize a subsequent clutch of eggs. Thus, by pairing with a female that has not yet laid a clutch, a male would be more certain of his paternity.

The author found little evidence to suggest that female Red-necked Phalaropes were under energetic stress as a result of laying a clutch. Additionally, the results of a series of experiments using a male phalarope model suggest that the female that first starts associating with a male is the one that is most successful at holding the male against other females. Females that laid initial clutches did not appear to be at an inherent agonistic disadvantage, but rather supported the observation that females that obtain a second male are those that are freed first from their first male. Thus, the results suggest that the most likely explanation of the constraint on polyandry in this species is that males prefer not to nest with females that have already laid a clutch fathered by another male because of the uncertainty of their paternity. This hypothesis is supported by data in which a significantly greater number of copulations and attempted copulations were directed by males toward C1 females than toward CO females. High copulation rates are common in birds which tend to be polyandrous, and in which sperm competition is likely to be greater. [Nature Conservancy Council, 12 Hope Terrace, Edinburgh EH9 2AS, United Kingdom.]—Danny J. Ingold.

27. Female choice and the quality of parental care in the Great Tit *Parus major*. K. J. Norris. 1990. Behav. Ecol. Sociobiol. 27:275–281.—In previous work with Great Tits, the author found that female mate choice was more likely based on the phenotypic characteristics of males rather than on territorial quality of males. Here the author examined breeding Great Tits during three breeding seasons (1986–1988) near Oxford, England. The objective was to determine whether females were deriving any short-term benefits, particularly in terms of parental care, by choosing to pair with males with a large breast stripe. Males with larger stripes were found more often in the vicinity of their nests, and were thus more likely to defend their broods than individuals with smaller stripes (although the difference was significant during only one of two years). Nestlings of males with larger stripes were consistently heavier throughout the nestling period than males with smaller stripes, which was likely the result of more rapid nestling growth early in the season. These data suggest that the relationship between male stripe size, nestling growth and fledging mass reflect differences in the parental quality of males. Therefore, since nestling mass at fledging influences subsequent survival, and nest defense by males may influence nest predation, female Great Tits could improve their reproductive success by pairing with males with large stripes. [Edward Grey Inst., Dept. of Zoology, South Parks Road, Oxford, OX1, 3PS, United Kingdom.]—Danny J. Ingold.

28. Behavior of alcids with tail-mounted radio transmitters. S. Wanless, M. P. Harris, and J. A. Morris. 1989. Colon. Waterbirds 12:158–163.—This paper reports the effects of tail-mounted radio transmitters on nest attendance behavior in Common Murres (*Uria aalge*) and Razorbills (*Alca torda*) on the Isle of May, Firth of Forth, Scotland, during the summer of 1988. The behavior of one male and two female murres, and three male and two female Razorbills with transmitters was compared to the behavior of control birds without transmitters. The 7.0-g transmitters were mounted on the upper side of the tail and the whip antenna protruded 15–20 cm beyond the tail tip. The behaviors recorded were (1) the number of times a bird was absent from the colony during the day, (2) the duration of feeding trips, and (3) the number of arrivals at the nest with and without fish. The birds with transmitters tended to make fewer feeding trips, fewer short feeding trips, and arrive more often without fish than the control birds. The authors suspect that the attendance behavior was disrupted more for males than females. The results of this study were similar to the results of previous studies of murres and Razorbills with back-mounted, external aerial transmitters. Birds with back-mounted transmitters with internal aerials in previous studies showed no significant differences in attendance behavior. Back-mounted transmitters remained attached longer than tail-mounted ones, and gave better signals from birds on the water. The authors conclude that either back or tail-mounted transmitters will affect the energetic and/or foraging behavior of alcids. [Inst. of Terrestrial Ecology, Hill of Brathens, Banchory, Kincardineshire AB3 4BY, United Kingdom]—William E. Davis, Jr.

29. Seasonal shifts in odor acuity by Starlings. L. Clark and C. A. Smeraski. 1990. J. Exp. Zool. 255:22–29.—The European Starling (*Sturnus vulgaris*) showed a seasonal variation in sensitivity to odors when tested with cardiac conditioning. The threshold to detect cyclohexanone during the non-breeding season was 30 times higher than during the breeding season. The evolutionary significance of this seasonal fluctuation in odor sensitivity may be associated with the starlings' use of aromatic green plants to reduce ectoparasite and pathogen loads. [Monell Chemical Senses Center, Philadelphia, PA 19104 USA.]—Robert C. Beason.

30. Mate-choice criteria of Ipswich Sparrows: the importance of variability. M. L. Reid and P. J. Weatherhead. 1990. Anim. Behav. 40:538–544.—This study investigated whether female Ipswich Sparrows (*Passerculus sandwichensis princeps*) chose mates on the basis of territory size or singing rate during each of two years. Pairing date was used as the measure of mate choice.

In 1984, males ($n = 7$) with larger territories paired earlier ($r = -0.806$), and male singing rate was not significantly correlated with pairing date. In 1985, males ($n = 12$) with higher singing rates paired earlier (partial $r = -0.603$) and territory size was not significantly correlated with pairing date. In both cases, the cue apparently used by females was the one exhibiting the most variation (expressed as the SD divided by the mean).

The authors suggest that females may have used the more variable trait either because differences among males were more difficult to detect when variability was low or because differences among males were less reliable when the variability was low. Another interpretation, in my opinion, is that females used both cues in both years but the effect was only statistically detectable, given the small sample sizes, when the trait was more variable. Despite the small samples, this study highlights the potentially complex rules by which females may choose mates. [Dept. of Biological Sciences, Simon Fraser Univ., Burnaby, British Columbia V5A 1S6, Canada.]—Susan L. Earnst.

31. Roost site tenacity in Gambel's White-crowned Sparrows. C. D. Barrentine. 1990. N. Am. Bird Bander 15:134–135.—In order to compare the tendencies of adult and immature Gambel's White-crowned Sparrows (*Zonotrichia leucophrys*) toward roost site tenacity, a total of 119 birds were captured between 01 December 1989 and 23 February 1990 at one roost (the home roost) and displaced 3.7 km east to a second roost (the new roost). Birds recaptured at least six days after displacement were included in the analysis. Of 47 immatures displaced, all 13 recaptures occurred at the new roost site. For 72 adults displaced, 14 were recaptured at the home roost and 13 at the new roost. Thus, adults appear to exhibit greater roost site tenacity than do immatures. The author presents data from a similar study involving displacement from feeding areas, and concludes that both age classes exhibit greater tenacity to feeding areas than to roost sites. [Dept. of Biology, California State Univ., Bakersfield, CA 93311 USA.]—John A. Smallwood.

32. Observations on cooperative mobbing of a Bald Eagle. R. C. Humphrey. 1990. J. Raptor Res. 23:48.—In this paper the author provides an informative introduction to mobbing behavior in birds, and then describes an unusual mobbing incident observed at Monomoy National Wildlife Refuge, Massachusetts. Over 1000 Herring (*Larus argentatus*) and Great Black-backed Gulls (*L. marinus*) were flying and giving distress calls while a juvenile Bald Eagle (*Haliaeetus leucocephalus*) soared in the center of the flock. Also within the flock, a juvenile Peregrine Falcon (*Falco peregrinus*), five American Crows (*Corvus brachyrhynchos*), a female Northern Harrier (*Circus cyaneus*), two Short-eared Owls (*Asio flammeus*), and at least 50 gulls and 75 Red-winged Blackbirds (*Agelaius phoeniceus*) were mobbing the eagle. The author describes the spatial stratification of the mobbing species relative to the eagle. [198 Topsfield Rd., Wenham, MA 01984 USA.]—John A. Smallwood.

ECOLOGY

(see also 5, 12, 13, 14, 16, 18, 20, 22, 23, 26, 30, 40, 46, 50, 51, 53, 54)

33. What do carnivorous predators cue in on: size or abundance of mammalian prey? A crucial test in California, Chile, and Spain. F. M. Jaksic. 1989. Rev. Chilena Hist. Nat. 62:237–249.—Studies of avian predators that consume mammalian prey (which include many species in the Falconiformes and Strigiformes) often have demonstrated functional responses of the raptors to changes in the profile of abundance and size of their prey. Researchers disagree on whether the functional responses observed relate to opportunistic or selective behavior of the raptors with respect to their prey. Reanalyzing data reported by Jaksic et al. (1981, Oecologia 49:21–28) on small mammal predation by raptors in central Chile, Bozinovic and Medel (1988, Oecologia 75:456–458) challenged conclusions therein that raptors opportunistically take the most abundant prey, and showed instead that they appear to selectively take the most profitable prey as scaled to their own energy requirements. In this paper, Jaksic proposes a statistical test (nonparametric partial correlation analysis) of these two competing hypotheses and applied it to comparable data sets from California, Chile, and Spain. Results were inconclusive in Chile, but raptors in the other two localities appeared to cue in on prey size rather than on prey abundance. Jaksic redefines the terms "opportunistic" and "selective," indicating the type of statistical results expected from realization of either of these two predatory modes. He also discusses the relationship between this dichotomy and those represented by the terms "generalist" versus "specialist," and "time-minimizer" versus "energy-maximizer." [Dept. Ecologia, Univ. Catolica de Chile, Casilla 114-D, Santiago, Chile.]—Fabian M. Jaksic.

34. Winter and spring habitat use of Gray Partridge in New York. K. E. Church and W. F. Porter. 1990. J. Wildl. Manage. 54:653–657.—The authors compared winter and spring habitat use and home range size in established (1982) and translocated (1982–1983) radio-tagged Gray Partridge (*Perdix perdix*) in northern and central New York, respectively. The use of grain stubble by winter coveys at both locations was significantly greater than expected ($P < 0.05$). Additionally, during the winter months (15 January–15 March), individuals of the established population made use of farmsteads more often than expected ($P < 0.05$). During early spring, birds from both populations still selected grain stubble, although individuals on the translocated range also selected idle uplands and hay in 1983. Home range sizes were variable, and no seasonal differences were detected among the pooled data. These results suggest that a lack of suitable grain stubble may limit partridge populations during the winter. The authors also suggest that individuals on the translocated range may be limited by a lack of nesting cover. [College of Environmental Science and Forestry, State Univ. of New York, Syracuse, NY 13210 USA.]—Danny J. Ingold.

35. An analysis of the interspecific competition of Eastern Bluebirds, Tree Swallows, and House Wrens in Delaware State Park, Delaware, Ohio, 1979–1986. R. M. Tuttle. 1991. Sialia 13:3–13.—Competitive interactions among Eastern Bluebirds (*Sialia sialis*), Tree Swallows (*Tachycineta bicolor*), and House Wrens (*Troglodytes aedon*) were quantified during eight nesting seasons on a bluebird trail consisting of 66 to 115 nest boxes. During this period, bluebirds lost nine active nest boxes to swallows (3% of nests with clutches) from mid-April to mid-May, but usurped 11 boxes from swallows (2.3% of nests with clutches) from late May to early June. Tests for correlation revealed that neither species adversely affected the reproductive success of the other ($P > 0.05$), and, in fact, both populations grew during the study period. However, in addition, nesting House Wrens usurped 23 bluebird nests (8% of nests with clutches) and 46 swallow nests (9.5% of nests with clutches), mostly in late May through June (the period when wrens initiated their nesting efforts). A significant negative correlation was detected ($P < 0.02$) between wren interference and swallow nesting success, but not between wren interference and bluebird nesting success ($P > 0.05$). The data suggest that although bluebirds and swallows may not pose a significant competitive threat to each other, both are potentially vulnerable to competing House Wrens. Moreover, the author presents a strong argument that Tree Swallows may be inadvertently enhancing the reproductive success of bluebirds by defending groups of nest boxes within their territories from the later nesting wrens. [311 West Central Ave., Delaware, OH 43015 USA.]—Danny J. Ingold.

36. Winter and spring survival of radio-tagged Gray Partridge in North Dakota. J. P. Carrol. 1990. J. Wildl. Manage. 54:657–662.—The survival rates of 100 radio-tagged Gray Partridge (*Perdix perdix*) were assessed from winter to the beginning of spring during 1985–1987 in Pierce County, North Dakota. Thirteen percent of the birds died on the day they were captured, and an additional 21% died during the first week postrelease, suggesting that radio transmitters adversely affected survival. Predation, mostly by Great-horned Owls (*Bubo virginianus*) and Snowy Owls (*Nyctea scandiaca*), accounted for 34.5% of partridge mortality among individuals that survived for at least eight days. A Coxes proportional hazards analysis revealed that partridge survival was linked significantly to both body mass ($P = 0.003$) and sex ($P = 0.009$). Birds weighing more than 400 g had a significantly higher survival rate ($P = 0.005$) than lighter individuals, and females survived at a significantly higher rate ($P = 0.04$) than males. Although partridge in this study were subjected to more severe winter weather, overall mortality rates were not higher than in other areas of the United States. [Dept. of Biology, Box 8238, Univ. of North Dakota, Grand Forks, ND 58202 USA.]—Danny J. Ingold.

37. Habitat of Slender-billed Curlews in Morocco. A. van den Berg. 1990. Br. Birds 83:1–7.—The endangered Slender-billed Curlew (*Numenius tenuirostris*) is one of Europe's least known birds. A few wintering individuals recently have been discovered near the Merja Zerga lagoon on the Atlantic coast of Morocco, providing an opportunity to study the habitat preferences and behavior of these wintering curlews. They foraged primarily within overgrazed freshwater meadows bordered by extensive brackish and saline mudflats. They roosted on these mudflats. Wintering curlews were not restricted to these habitats, however, and also fed in upland farmlands adjacent to the freshwater meadows.

Even though Merja Zerga is designated as a biological reserve, these habitats and the wintering curlews still are subjected to numerous threats. The conversion of wet meadows into cultivated fields is eliminating much of their remaining suitable wintering habitats. Poaching by local residents and hunting by "foreign shooting parties" is a direct threat while disturbance from tourists poses a less severe threat. Appropriate protection measures are urgently needed to preserve these few curlews. [Duinlustparkweg 98, 2082 EG Santpoort-Zuid, The Netherlands.]—Bruce G. Peterjohn.

WILDLIFE MANAGEMENT AND ECONOMIC ORNITHOLOGY

(see also 19, 39, 54)

38. Work of a live decoy duck (Rabota podsadnoi utki). S. Fokin. 1990. Okhota Okhotnich'e Khoziaistvo 5:10–11. (In Russian.)—Now that spring hunting of Mallard (*Anas platyrhyncos*) drakes has been accepted as not harming waterfowl reproduction potential, it is resuming in the USSR's Russian Republic after about 20 years, often using live lure ducks. Ducks vary in their ability to entice passing drakes to land, but few hunters these days know how to evaluate and enhance this. This article describes the vocal and behavior characteristics of effective lures.

An effective "femme fatale" gives her "attraction" or "location" call (a string of 10–25 even quacks) at least 75% of the time she is "on duty" in front of the blind (this can be determined by tape-recording and analyzing several half-hour "practice sessions"). She should average 30–40 quacks/minute, with no more than a half minute between calls. A clear, carrying, mellow quacking voice is most effective.

When the lure duck hears a drake's voice or his wings, or sees him, she gives her "landing" or "greeting" call (a quick series of 3–4 successively shorter quacks, with the first or second quack stressed). A business-like lure does not give this call to other birds such as crows or gulls, nor without seeing or hearing a drake. A slight pause between the attraction and the landing call elicits a prompter response from the drake than seguing directly to the landing call. If a duck gives few attraction calls but does have a clear landing call, she still can be useful when there are many waterfowl in the vicinity.

Ducks selected for good calls should be isolated from both the sight and the sound of drakes for 2–3 weeks before hunting begins. Although they should not be allowed to mate during hunting season, they usually cannot be prevented from eventually starting to lay unfertilized eggs, at which point they nearly cease drake-calling and are of little use for the rest of that season.

To keep the lure duck from becoming discouraged if no drakes answer her when she is tethered near the blind, the author recommends using more than one lure, preferably pen-mates; they will call back and forth (but should not be able to see each other, or they may fight). Artificial decoys can help too, if they are good-quality wooden ones, for the lure duck soon will recognize cheap plastic decoys as fakes unless they are anchored far away. In the 19th century, hunters tethered a live drake nearby to stimulate the lure duck to call; for today's gadget-conscious hunter, a cooperative in Odessa makes a mechanical, quacking drake decoy.—Elizabeth C. Anderson.

CONSERVATION AND ENVIRONMENTAL QUALITY

(see also 19, 37, 48)

39. Environmental contaminants, human disturbance and nesting of Double-crested Cormorants in northwestern Washington. C. J. Henny, L. J. Blus, S. P. Thompson, and U. W. Wilson. 1989. Colon. Waterbirds 12:198–206.—The authors suggest that human disturbance has been responsible for the abandonment of all nesting colonies of Double-crested Cormorants (*Phalacrocorax auritus*) in the San Juan Islands of Washington state since 1984. The colonies apparently have moved to Protection and Smith Islands to the south, where protection from human disturbance has increased. In 1984, eggs were collected from a San Juan Islands colony and from Protection Island, and tested for DDE, PCBs, mercury and selenium concentrations. Nesting failure occurred at two of the three San Juan Islands colonies monitored, and production was poor at the third (0.29 young/occupied nest). Protection Island birds had larger clutch sizes and greater productivity (1.64 young/occupied nest). DDE residues from both the San Juan Islands and Protection Island colonies were the lowest reported in the Pacific Northwest in recent years, and PCB levels were similar to others reported from the region. Mercury and selenium concentrations from eggs at both colonies also were similar and below levels associated with nesting failure. Since the levels of contaminants were similar for both colonies, and all were below levels associated with reproductive failure, the authors concluded that other factors were responsible for differences in nesting success. In 1984, the San Juan Islands colonies had a total of 322 nests, but none by 1987, while at Protection and Smith Islands the total nests increased from 30 in 1984 to 517 in 1988. Protection Island became a National Wildlife Refuge in 1985, and the manned light station at Smith Island was abandoned in 1976, both factors reducing human disturbance. The San Juan Islands experienced an increase in human disturbance due to rapid population growth and increased recreational boating.

This is a convincing study of the effects of human disturbance on a breeding bird population. [U.S. Fish and Wildlife Service, Patuxent Wildlife Research Center, 480 SW Airport Rd., Corvallis, OR 97333 USA.]—William E. Davis, Jr.

PARASITES AND DISEASES

(see 54)

PHYSIOLOGY

(see also 8, 24, 43, 45)

40. Body mass of breeding Tengmalm's Owls *Aegolius funereus*: seasonal, between-year, site and age-related variation. E. Korpimäki. 1990. Ornis Scandinavica 21: 169–178.—Based on 11 years of studying Tengmalm's (Boreal) Owls in Finland, Korpimäki examines whether (1) seasonal changes in body mass parallel those of other raptor species, (2) the vole cycle influences yearly changes in body mass of breeding owls, (3) body mass is related to territory quality, and (4) body mass of females influences clutch size and fledging success.

Breeding-season changes in body mass were similar to those reported for other raptors. Females were heaviest just before laying, maintained constant mass during incubation, and lost mass steadily during brood rearing. Mass of males was relatively constant from late incubation until the young were ready to fledge. Females were heavier in peak vole years and on "good" territories (based on the number of breeding attempts in 10 years), but these relationships were absent in males. Body mass of females was significantly positively correlated with clutch size and fledgling production, which was no surprise considering that both are related to vole numbers.

Intersexual differences in body mass changes probably are related to differences in parental duties. As seems to be the case for all species of owls, male Tengmalm's Owls do not incubate or brood but provide almost all of the food from just before egg laying until the young are about half-grown. The decrease in mass of females after laying probably was caused by gonadal regression and by use of fat and protein stores for egg production. Males do not take on food stores during the breeding season, perhaps because these reserves would increase flight costs and thus reduce the efficiency of nest provisioning. [kp. 4, SF-62200 Kauhava, Finland.]—Jeff Marks.

41. Lesions of HVc block the developmental masculinizing effects of estradiol in the female Zebra Finch song system. K. Herrmann and A. P. Arnold. 1991. J. Neurobiol. 22:29–39.—The large degree of sexual dimorphism in the volume of song control centers of the Zebra Finch (*Poephila guttata*) can be permanently countered through the administration of estradiol to the females within one month after hatching. The treatment results in the development of masculine song control areas: the caudal nucleus of the ventral hyperstriatum (HVc), robust nucleus of the archistriatum (RA), lateral magnocellular nucleus of the neostriatum (1MAN), and Area X. Lesions in HVc blocked the masculining effects of the estradiol treatment on RA and Area X on the same side as the lesion indicating that the development of song control nuclei depend on the intact presence of HVc. [Dept. of Neurobiology, Stanford Univ. School of Medicine, Stanford, CA 94305 USA.]—Robert C. Beason.

MORPHOLOGY AND ANATOMY

42. Unusual leg injury in a nestling Bald Eagle. R. Yates and B. McClelland. 1989. J. Raptor Res. 23:14–16.—A tarsometatarsal joint dislocation of a nestling Bald Eagle (*Haliaeetus leucocephalus*), an injury uncommon in raptors, is reported. The injury was discovered on 10 July 1985 at the time of banding. The tarsometatarsus and toes were rotated 90 degrees with the hallux pointed medially. Swelling of the joint was evident. The toes and talons were unable to grasp and perch. Possible causes of the injury are discussed, including the distressed behavior of the parents following a sonic boom. The eaglet fledged at 15 weeks but was unable to care for itself. It was captured for the purpose of medical treatment, but its injury could not be corrected and the bird was euthanized. [Wildlife Biology Program, School of Forestry, Univ. of Montana, Missoula, MT 59812 USA.]—Robin J. Densmore.

43. Avulsion of the brachial plexus in a Great Horned Owl. M. Moore, E. Stauber, and N. Thomas. 1989. J. Raptor Res. 23:3–9.—An injured adult male Great Horned Owl (*Bubo virginianus*) was found with an avulsion of the brachial plexus and a fractured scapula. Extensive nerve damage was discovered. Use of electromyography and motor nerve conduction velocity is described in detail. [Dept. of Veterinary and Clinical Medicine and Surgery, College of Veterinary Medicine, Washington State Univ., Pullman, WA 99164 USA.]—Robin J. Densmore.

44. Determining age and sex of nestling Gyrfalcons. K. G. Poole. 1990. J. Raptor Res. 23:45–47.—The author examined 11 male and nine female nestling Gyrfalcons (*Falco rusticolus*) of known age in an arctic study area in central Northwest Territories, Canada. Data were collected at intervals ranging from 2–7 days. Weight gain followed a typical sigmoidal pattern, with variability increasing with age, and there was a close correlation between age and 7th primary length. There was only minimal overlap between males and females in a plot of weight over 7th primary length. However, these results should be interpreted with caution because repeated measurements from individual birds were treated as independent samples in the statistical analyses, artificially inflating the sample size. The authors suggest that additional data would be needed to determine the applicability of these age and sex criteria for Gyrfalcons in other regions. [Wildlife Management Div., NWT Dept. of Renewable Resources, Yellowknife, NT X1A 2L9, Canada.]—John A. Smallwood.

PLUMAGES AND MOLTS

(see also 18, 44, 54)

45. Moult and autumn colony attendance of auks. M. Harris and S. Wanless. 1990. Br. Birds 83:55–66.—Basic-plumaged Common Murres (*Uria aalge*) returned to their Scottish colony during October and initiated their pre-alternate molt shortly after their arrival. By mid-December, approximately 50% of all murres obtained their alternate plumage while most other murres had started to molt. Not every adult murre followed this pattern and a few individuals were always very late initiating this molt. Observations at other colonies on the British Isles and adjacent European mainland suggest this early pre-alternate molt is a fairly widespread phenomenon. However, it is not universal since murres at more northerly colonies retain their basic plumage into late winter. This early molt has become more frequent since the 1940s, perhaps a result of more intense competition for nest sites within these colonies.

The timing of the pre-alternate molt in these adult murres is different than the molt pattern exhibited by Razorbills (*Alca torda*) and related species that normally retain their basic plumage well into winter. The factors causing this early molt have not been definitively established, although the authors theorize that visiting the breeding sites and contacts with mates and neighbors triggers the hormonal response initiating this molt. [Inst. of Terrestrial Ecology, Hill of Brathens, Banchory, Kincardineshire AB3 4B4, United Kingdom.]—Bruce G. Peterjohn.

ZOOGEOGRAPHY AND DISTRIBUTION

(see also 11, 54)

46. Biogeography of forest relics in the mountains of northwestern Argentina. M. Nores and M. M. Cerana. 1990. Rev. Chilena Hist. Nat. 63:37–46.—The Quaternary in South America was a period of major climatic changes owing to a succession of glaciations. During interglacial periods, when precipitation and humidity was higher than today, the forests occupied large areas of what now are semiarid regions. Their retreat as the climate became more arid toward the present left behind many isolated forest patches in areas where the humidity was higher because of high topographical relief (thus producing a milder microclimate) or the presence of streams. Nores and Cerana studied the avifauna in six isolated forest patches (relics) in the neighboring provinces of La Rioja, Catamarca, and Santiago del Estero in northwestern Argentina. They provide a list of the species present in each of these patches and categorize the birds as being either obligatory forest dwellers, or nonobligatory. Between zero and 10 obligatory forest bird species were recorded in six forest relics. Nores and Cerana also provide a description of the coloration of five obligatory forest bird species in three different forest relics, and show that they differ markedly in features such as color of forecrown, eyebrow, throat, chest, shoulder, back, upperparts, underparts, belly, or wings. The authors propose that these differences have evolved as a consequence of vicariance drift, wherein no bird dispersal occurs from these forest relics, and consequently no gene exchange occurs between conspecifics in these relics. Nores and Cerana, based on other authors' estimates, dated these forest relics and their associated avifauna as having become isolated between 10,000 and 7500 YBP. They suggest that these forest relics may be considered as present day refugia for obligatory forest birds. [Centro de Zoologia Aplicada, Casilla 122, 5000 Cordoba, Argentina.]—Fabian M. Jaksic.

47. Status and distribution of Corn Crakes in Britain in 1988. A. Hudson, T. Stowe, and S. Aspinall. 1990. Br. Birds 83:173–187.—The British population of Corn

Crakes (*Crex crex*) has been declining since the 1850s. A national survey in 1978–1979 recorded 700–746 singing males, but their numbers have declined during subsequent years. This population was surveyed again in 1988 to determine the distribution of remaining summering individuals.

The 1988 survey detected 551–596 singing males. The majority (54%) were observed on the Outer Hebrides while most other crakes were found on the Inner Hebrides, Orkneys, and the Scottish mainland. Fewer than 20 males were found in England and Wales. These numbers represented a decline of 15–26% since the 1978–1979 survey, with the largest decreases occurring in mainland Scotland, Orkney, and England (65–77%). The only apparent increase was on the Outer Hebrides (14–21%), but this increase was attributed to more thorough coverage.

This recent survey indicates that the downward trend in Corn Crake populations continues and their prospects for the future remain bleak. Similar declines (30%) have been apparent in Ireland during the same period, where an estimated 903–930 males were tallied in a recent survey. Despite these declines, the populations in Great Britain and Ireland still represent a substantial component of the estimated 6000 pairs remaining in western Europe. [Royal Society for the Protection of Birds, The Lodge, Sandy, Bedfordshire SG19 2DL, United Kingdom.]—Bruce G. Peterjohn.

48. Neotropical raptors and deforestation: notes on diurnal raptors at Finca El Faro, Quetzaltenango, Guatemala. J. P. Vannini. 1989. J. Raptor Res. 23:27–38.—Finca El Faro is a 670-ha privately owned plantation on the southwestern slopes of Volcanes Santa Maria and Santiaguito. About one half of the property is managed as a wildlife refuge. Observations were made between March 1987 and March 1989. The author presents information on the status, seasonal abundance, and behavior of 21 species observed directly, and 11 additional species of possible occurrence within the study area. These include three cathartids, Osprey (*Pandion haliaetus*), three accipiters, seven buteos, Common Black-Hawk (*Buteogallus anthracinus*), Black Crane Hawk (*Geranospiza nigra*), one harrier, three kites, Solitary Eagle (*Harpyhaliaetus solitarius*), White Hawk (*Leucopternis albicollis*), two hawk-eagles (*Spizaetus* spp.), and eight falconids. [Fundación Interamericana de Investigación Tropical, Avenida La Reforma 8-60, Oficina 1104, Zona 9, Guatemala City, Guatemala.]—John A. Smallwood.

SYSTEMATICS AND PALEONTOLOGY

(see 46, 54)

EVOLUTION AND GENETICS

(see 18, 46, 53)

FOOD AND FEEDING

(see also 33)

49. Predation of Bald Eagles on American Coots. B. Brattstrom. 1989. J. Raptor Res. 23:16–17.—Bald Eagle (*Haliaeetus leucocephalus*) predation on American Coots (*Fulica americana*) is reported. Observations took place between 13 and 22 January, 1978, in Lake County, Montana. Aggregation behavior of prey is discussed. [Dept. of Biological Sciences, California State Univ., Fullerton, CA 92634 USA.]—Robin J. Densmore.

50. Is the Barn Owl (*Tyto alba*) a good model for studying population biology? [La chouette effraie (*Tyto alba*) est-elle un bon modele d'etude en biologie des populations?] P. Giraudoux, D. Michelat, and M. Habert. 1990. Alauda 58:17–20. (French, English summary and captions.)—The authors review several studies of Common Barn-owl populations conducted in Europe and conclude that although most authors relate fluctuations in barn-owl population dynamics to their rodent prey, most of the studies provide no data on prey availability. A summary of these studies suggests that barn-owl populations in Europe fluctuate somewhat synchronously over a wide area. However, available data on arvicoline rodents, important prey of the owls, suggest that rodent abundance fluctuates on a local scale. Thus, something other than prey abundance (or at least arvicoline rodent prey abundance) seems to be involved in regulating barn-owl populations. The authors suggest further study, including broad evaluation of comparative ecology, eco-ethology, and eco-physiology, is needed. [I.N.R.A., Faune Sauvage, 78350 Jouy-en-Josas, France.]—Jerome A. Jackson.

51. The fruit diet of Ring-Ouzels (*Turdus torquatus*) wintering in the Sierra Nevada (south-east Spain). R. Zamora. 1990. Alauda 58:67–70.—Zamora collected 446 droppings (presumably of *Turdus torquatus,* no other thrushes were present) from favored perch sites on rocks during October–November 1984 and February–March 1985. The montane habitat was dominated by *Juniperus communis* and it is not surprising that the fruit of this juniper made up 86.8 to 99.7% of the birds' diet by volume. The only other items identified were seeds from the fruit of the barberry, *Berberis vulgaris,* and arthropod remains. Zamora's discussion dwells on the codependence of this thrush and the juniper in this particular region. [Dept. de Biologia Animal, Ecologia y Genetica, Facultad de Ciencias, Univ. de Granada, 18001 Granada, Spain.]—Jerome A. Jackson.

52. Diets of breeding and nonbreeding California Spotted Owls. J. Thrailkill and M. A. Bias. 1990. J. Raptor Res. 23:39–41.—The authors studied the food habits of 14 California Spotted Owl (*Strix occidentalis occidentalis*) pairs by examining their pellets. Five pairs were considered breeding (here defined as having produced at least one fledgling) while nine pairs were considered nonbreeding. Pellets were collected beneath adult roosts from May to August, 1986 and 1987. Mammalian prey species were categorized as small ($<$100 g) or large. Prey weights were estimated from museum specimens and records. Avian and insect prey together accounted for about 24% by number or about 13% by weight of the diet, and did not differ between breeding and nonbreeding pairs. Breeding pairs, however, ate more large mammals and less small mammals, both by number and weight, than did nonbreeders. The authors suggest that "breeding success was correlated to the greater relative proportion of large mammal prey within the diet" of these birds. However, this hypothesis was not tested: pairs (number unspecified) which attempted to reproduce but did not fledge at least one young (here fitting the authors' definition for "nonbreeding") were not compared to "breeding" pairs. Lack of information about prey availability precluded any inferences concerning prey selectivity. [Dept. of Wildlife, Humboldt State Univ., Arcata, CA 95521 USA.]—John A. Smallwood.

SONGS AND VOCALIZATIONS

(see 30, 38, 41, 54)

BOOKS AND MONOGRAPHS

53. Cooperative breeding in birds: long-term studies of ecology and behavior. P. B. Stacey and W. D. Koenig, eds. 1990. Cambridge University Press, New York, New York. $28.00, softcover.—Cooperative breeding, or helping-at-the-nest, is a phenomenon where more than just a breeding pair of birds attend and feed young at a single nest. The topic has generated considerable interest over the last 25 years because of its implications for "altruism," and a number of long-term studies on cooperatively breeding bird species have been conducted. As the editors state in their introduction, these studies have generated a large number of papers, but the literature for most species has been highly fragmented. This book represents the laudable attempt by the editors to combine in one volume comparable data on behavior and general biology from the (arguably) most important studies. Their goal was to gather the data together in one place to facilitate comparisons among the studies and suggest future directions for research. Numerous authors in the volume state that comparative studies are important for understanding cooperative breeding, and this book is a commendable contribution toward that goal. The data presented here will be of interest not only to those studying cooperative breeding, but also to anyone interested in population biology, behavioral ecology, breeding biology, or general ornithology. Because helping behavior affects (and is affected by) all aspects of a species's biology, these studies have produced, in the editors' words, "some of the most detailed portraits of free-ranging animal populations now available."

The book begins with an introduction by the editors detailing the phenomenon and giving a succinct history of its study. Next come 18 chapters by various authors describing, in varying detail, the biology of their study organisms. Because of the importance of demography in shaping helping behavior, an emphasis was made on the inclusion of long-term studies, with a few exceptions necessary to include examples of extreme diversity. Described species cover the breadth of the phylogenetic and behavioral diversity of birds showing helping. They range from species with few, infrequent helpers (Pinyon Jays, Chapter 7), to primarily polyandrous groups (Galapagos Hawks, Chapter 12), to "typical" helpers with young staying home and helping parents (e.g., Florida Scrub Jays, Chapter 8), to extremely complicated systems that nearly defy description (e.g., Acorn Woodpeckers, Chapter 14, and Noisy Miners, Chapter 18). In the interests of standardization, the editors gave each author a list of potential topics to be included, but because of the different focuses of the studies, no chapter includes all the suggested topics. A final chapter written by J. N. M. Smith, a self-described student of "typical" birds with "no biases" gained by working on a cooperatively-breeding species, summarizes the studies. Smith reviews the general questions asked, how well they have been answered in the book, and points out directions for future work.

Beyond just presenting data, several of the authors use their chapters to advance their own general explanatory theories. Chapter 13 by Craig and Jamieson is partially a critique of how the basic questions have been asked in the first place. They opt for a nonselective explanation, quite at odds with most interpretations of helping. In response to previously published critiques by Jamieson and Craig, many of the other authors have included their own rebuttals to these ideas. Craig and Jamieson argue persuasively for the examination of cooperative breeding in the light of all four of Tinbergen's areas of the study of behavior (causation, development, function, and evolution). However, one also could add that an explanation on one level does not explain or preclude an explanation at a different level. They themselves seem guilty of this error, arguing that a evolutionary explanation of the occurrence (the novel juxtaposition of the normal behavior of feeding young brought into contact with nonoffspring because of demographic factors) is sufficient to explain the phenomenon, with no need of recourse to functional explanations. This conclusion was made despite the fact that the maintenance of the behavior in the light of negative selective forces (see especially the demonstrated costs of helping in Pied Kingfishers [Chapter 17] and Stripe-backed Wrens [Chapter 6]) would appear to require some explanation. Data presented in this volume on the nonrandom distribution of aid provided also argue against the nonselective explanation.

Not surprisingly, given the diversity of systems described and the different tacks taken to investigate them, no single theory emerges as the one answer to why cooperative breeding has arisen. Access to reproduction opportunities, inclusive fitness benefits, and "making the best of a bad job" all are offered as explanations. Given the data presented, they all are likely correct in different situations. Although helping is relatively rare in birds (approximately 220 out of 9000 species), the extreme variability in ecological and demographic characteristics shown by cooperative breeding species, coupled with the broad phylogenetic distribution of the behavior, suggests that cooperative breeding may be a solution to many problems. Undoubtedly, it easily evolved independently in various groups, probably because of its strong developmental connection with normal parental behavior, as argued in Chapter 13. However, as Smith points out in the summary, although many of the ecological arguments for cooperative breeding seem logical, many noncooperative species face the same resource limitations and social constraints. Perhaps more detailed comparative studies of cooperative and noncooperative species in the same habitats will provide as much insight as comparisons of cooperative species in different habitats.

Many of the studies indicate that further work is in progress to examine by biochemical means the actual genetic contributions of each group member to the offspring raised. Only N. Davies in Chapter 15, reporting the studies of DNA fingerprinting of Dunnocks, includes such data here. Any results conflicting with the presumed parentage could open up any or all of these systems to reinterpretation. In fact, an addendum added in proof to the story of Splendid Fairy-wrens (subsequently published in Brooker et al. 1990, Behavioral Ecology and Sociobiology) reported that, far from the monogamy with close inbreeding suspected, near promiscuity reigned in the population. One might *almost* wish that this project had waited another several years until a number of these studies were finished.

Overall, this book is an excellent summary of what is currently known about cooperative breeding, and offers more information to the reader than a review of the topic with only selected examples given to support specific points. Indeed, with all of the information included, it is a good reference source for general and population biology of birds, quite aside from any questions concerning cooperative breeding. I highly recommend this book to anyone interested in behavioral ecology, population biology, or even just the intricacies of the lives of birds.—Kevin J. McGowan.

54. Proceedings of the 1988 North American Wood Duck Symposium. L. H. Fredrickson, G. V. Burger, S. P. Havera, D. A. Graber, R. E. Kirby, and T. S. Taylor, eds. 1990. North Am. Wood Duck Symp., St. Louis, Missouri. 390 pp. $15, softcover. (Order from and checks payable to Gaylord Memorial Lab., Univ. of Missouri, Puxico, MO 63960 USA.)—This volume of selected papers from the symposium held in St. Louis, Missouri, on 20–22 February 1988, includes 54 refereed papers arranged under eight topical headings. Each of the sections is preceded by a general summary of the nature of papers included. I will consider each section in the paragraphs below.

Historical perspectives.—H. M. Reeves presents an historical review of Wood Ducks, including discussion of the paleontological (earliest record from the late Pleistocene) and archaeological records, descriptions of early naturalists and travellers, taxonomic history, a compilation of some native names for Wood Ducks, propagation efforts, market hunting, and the place of Wood Ducks in human cultures. The extensive bibliography associated with this paper will be of use to anyone interested in early American natural history. The chapter by F. C. Bellrose details the history of Wood Duck management efforts, including propagation efforts, development of nest box programs, and population changes.

Biology: a review.—The papers in this section provide an outstanding review of Wood Duck biology and should be required reading for any waterfowl student. Most have excellent literature reviews and make recommendations for future research—a gold mine for graduate students looking for Wood Duck related projects. R. E. Kirby reviews Wood Duck systematics, hybridization, and the role of systematics in Wood Duck management. Kirby and L. H. Fredrickson review Wood Duck molt and plumage literature, summarize some of the problems associated with waterfowl molt and plumage studies, and point out the need for studies that will allow the correct interpretation of pattern and process of molting and identification of relationships between the demands of molting and specific habitat needs. Fredrickson reviews Wood Duck behavior from fall courtship through egg laying. He provides very useful tables of known displays and vocalizations and their functions. Some of the displays are illustrated. Mnemonic interpretations of vocalizations are provided, but sound spectrographs are not. G. M. Haramis reviews Wood Duck breeding ecology and R. E. Kirby reviews non-breeding ecology—both emphasize habitat associations. R. D. Drobney reviews the nutritional ecology of breeding Wood Ducks and relates nutritional needs to wetland management. J. D. Nichols and F. A. Johnson summarize our knowledge of Wood Duck population dynamics.

Regional status.—This section brings us up to date on the status of Wood Ducks in each of the major management regions: Atlantic flyway (J. R. Serie and G. G. Chasko), Mississippi flyway (K. E. Gamble), Central flyway (W. N. Ladd, Jr.), Pacific flyway (J. C. Bartonek, J. T. Beall, and J. E. Cornely), and Canada (D. G. Dennis). These are all brief papers with some discussion of habitat, hunting, regulations, and management efforts.

Natural history.—Here is a pot pourri of reviews and local studies, most related to reproductive ecology. Topics include abundance and habitat use on the Mingo Swamp in southeastern Missouri (M. E. Heitmeyer and L. H. Fredrickson), a review of nest-cavity characteristics (G. J. Soulliere), nest boxes and brood parasitism (B. Semel, P. W. Sherman, and S. M. Byers), characteristics of second clutches in California (S. C. Thompson and S. B. Simmons), female and juvenile survival and movements in Indiana (J. R. Robb and T. A. Bookhout), postfledging survival in Minnesota (R. E. Kirby), and nest success, survival, and habitat selection in Tennessee (S. D. Cottrell, H. H. Prince, and P. I. Padding).

Census and survey.—The five papers in this section are devoted to description and evaluation of techniques for monitoring populations. They include a review of current monitoring techniques (D. H. Brakhage), evaluation of productivity through brood surveys (T. J. Moser and D. A. Graber), brood survey techniques (J. R. Robb and T. A. Bookhout), ground count transects (B. R. Bacon), comparison of survey techniques (S. D. Cottrell and H. H. Prince), and population trends revealed through the North American Breeding Bird Survey (J. R. Sauer and S. Droege).

Nest box management.—Thirteen papers describe nest box programs, their successes, management, and problems across North America. Among these are studies of nest box height preferences (of three levels offered, the lowest, 1.98 m, was selected most often; E. F. Bowers and J. S. Atkins), effect of heat in plastic boxes (lethally hot in full sun in Mississippi; D. R. Hartley and E. P. Hill), rat snake predation (J. L. Hansen and L. H. Fredrickson), techniques for monitoring boxes (J. L. Henne and E. P. Hill), and several papers dealing with regional programs.

Population and harvest dynamics.—Nine papers detail aspects of hunting pressure on populations, such as bag limits (H. W. Heusmann), variable seasons, and analysis of band returns. J. E. Thul and T. O'Brien, and Thul in a second paper, examined the incidence of blood parasites in various populations and suggest the use of blood parasites as naturally occurring biological tags that could be used to evaluate Wood Duck harvest parameters in a manner similar to band return data.

Current problems and future directions in wood duck management.—Three summary papers discuss the development of hunting regulation strategies for Wood Ducks (R. D. Sparrowe), research needs (S. P. Havera and R. E. Kirby), and habitat ecology and management (L. H. Fredrickson and D. A. Graber).

Many of the papers in this volume deserve much more elaborate review because of their relevance to other species. Editing of the volume seems exceptional and geared to the user. Each article begins with a good abstract and list of key words, and the volume is indexed, albeit the index could have been more detailed. In short, this is a volume that should be in every waterfowl biologist's library. Unfortunately, copies may be limited—get yours while they're hot!—Jerome A. Jackson.