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RECENT LITERATURE

Edited by Robert C. Beason

RESEARCH TECHNIQUES

(see also 14)

1. A review of the methods used to study the anatomy of avian sperm storage. J. V. Briskie and T. R. Birkhead. 1993. Ornis Scand. 24:323–329.—Briskie and Birkhead describe a technique for studying sperm storage that "... even the most field-oriented ornithologists might use readily." The procedure involves removing a segment of the oviduct that includes the utero-vaginal junction, within which sperm storage occurs. The segment is then incised longitudinally and pinned flat. The oviductal folds that are exposed are removed one by one and placed onto a glass slide and covered with a few drops of phosphate buffered saline and a coverslip. If present, sperm storage tubules (SSTs) will be visible at low magnification (40×) under a compound microscope. At higher magnification (100× or 400×), individual sperm may be visible and counted. An estimate of the number of SSTs is obtained by counting and averaging them for 3–5 folds and then multiplying the average by the total number of folds counted. The dimension of SSTs (length, width, lumen diameter) is measured with an ocular micrometer. If samples cannot be processed fresh, they may be preserved in 10% buffered formalin. SSTs are easily observed in tissue fixed in formalin, but their widths shrink by about 12%. Thus, measurements must be corrected for comparison with fresh samples. SSTs are difficult to detect in tissue fixed in alcohol. To better understand life-history correlates of avian sperm storage, curators should preserve oviducts from as many species as possible throughout different stages of the breeding cycle. Because alcoholic specimens will be inadequate for examination of SSTs, oviducts should be preserved in formalin alone. [Dept. of Biology, Queen's Univ., Kingston, ON K7L 3N6, Canada.]—Jeff Marks.

2. Attachment of radio-transmitters to sandpipers: review and methods. N. Warnock and S. Warnock. 1993. Wader Study Group Bull. 70:28–30.—This note (1) compiles citations of studies that have used radio telemetry on shorebirds, and (2) presents a method for attaching transmitters to small sandpipers.

Using epoxy, small transmitters were glued to an area of clipped feathers on the back. The radios weighed < 1.5 g and had a battery life of 28–37 days. Signals were received from up to 2.5 km on level ground and 9 km from a hilltop. The method was used successfully on Dunlins (*Calidris alpina*) and Western Sandpipers (*C. mauri*) in California. [Wildlife and Fisheries Biology, Univ. of California, Davis, CA 95616, USA.]—Jeff Marks.

3. Tree branch bluebird box. F. A. Zuern. 1994. Sialia 16:13–19.—During the 1993 breeding season the author monitored a trail with 86 horizontal nest boxes with hopes of attracting Eastern Bluebirds (*Sialia sialis*). This prototype bluebird box with floor dimensions of 8.9 cm × 40.0 cm is only 8.9 cm deep from the center of the cavity entrance, and is designed to mimic natural cavities in broken-off, hollow tree limbs. Eastern Bluebirds successfully fledged 85 offspring from 27 boxes, while Tree Swallows (*Tachycineta bicolor*) fledged 136 offspring from 34 boxes. House Sparrows (*Passer domesticus*) nested in 7% of the boxes suggesting that they are not pest proof. On the other hand there are several apparent advantages to horizontal boxes versus the more traditional vertical boxes: (1) the small front offers no effective foothold for predators, and indeed only one nest was preyed upon, (2) the distance from the entrance to the front of the nest area is beyond the reach of potential predators; moreover, a small wooden "predator baffle" placed about halfway back in the box further deters predators from snagging nests built behind the baffle, (3) such boxes may be placed in any direction without concern for the weather; in addition, in this study they remained dry on the inside even in the heaviest rains, (4) the box is easy to build and provides more than adequate ventilation; it may also readily be monitored through the door at the rear. [1040 Maricopa Drive, Oshkosh, WI 54904, USA.]—Danny J. Ingold.

BEHAVIOR

(see also 6, 9, 10, 16, 20, 26, 27)

4. Does nest-hole quality, poor breeding success or food depletion drive the breeding dispersal of Tengmalm's Owls? E. Korpimäki. 1993. J. Anim. Ecol. 62:606–613.—Tengmalm's Owls (*Aegolius funereus*) are hole nesters that feed primarily on voles. In Fennoscandia, most of the Tengmalm's Owl nests are in boxes. Several long-term studies of these nest-box populations have shown that adult males tend to be philopatric (although they may change holes between breeding attempts), whereas adult females are often nomadic (dispersing up to 580 km between breeding sites). Four hypotheses have been proposed to explain breeding dispersal in Tengmalm's Owl. Owls may shift locations because (1) the quality of the nest box deteriorates with time (i.e., the *nest hole quality hypothesis* [HQH]), (2) risk of predation increases with time (i.e., the *predation risk hypothesis* [PRH]), (3) reproductive success in a site is poor (i.e., the *breeding success hypothesis* [BSH]), or (4) owls reduce vole densities around nest boxes (i.e., the *food depletion hypothesis* [FDH]). Korpimäki tested these hypotheses with data from 162 nest boxes that had been in place in western Finland for 10–20 years. In 1986 and 1987, boxes were randomly placed into one of four categories: (1) 28 boxes were replaced by new boxes at the exact same location; (2) 28 boxes were moved 40–100 m within the same habitat and put on the original tree species and at the same height; (3) 27 boxes were replaced by new boxes and moved 40–100 m within the same habitat; and (4) 79 old boxes were left in place as controls. Boxes were then checked for 5 years to determine occupancy and breeding success. Because vole populations are highly cyclic in Finland, Korpimäki monitored their numbers by intensive snap-trapping in May and September of each year.

In contrast to predictions of the HQH and PRH, occupancy did not increase following renewal or relocation of boxes. One hundred and five owls (74 males, 31 females) were recaught as breeders one year later. Median dispersal distance was 1.3 km for males and 5.5 km for females. Dispersal distance was not correlated with number of eggs or young produced in the preceding year, and nest failure did not appear to increase dispersal. Thus, there was no support for the BSH. Dispersal seemed to be related to food availability. Median dispersal distance was 0.8 km during the increase phase of the vole cycle, 1.5 km during the decrease phase, and 1.3 km during the low phase. In the increase phase, 51% (22 of 43) of the males bred in the same box two years in a row. This figure decreased to 31% (5 of 16) and 13% (2 of 15) during the low and decrease phases, respectively. Moreover, most females moved outside the study area during the decrease and low phases of the vole cycle.

These results are consistent with the FDH. Korpimäki posits that during the decrease phase, Tengmalm's Owls contribute to the crash in vole numbers, which further reduces food availability in the vicinity of occupied nest boxes. It therefore becomes adaptive for males to disperse to sites that were not occupied in the previous year. The BSH could not be ruled out completely, however, because owls that failed early may have dispersed before they could be captured. [Dept. of Biology, Univ. of Turku, SF-20500 Turku, Finland.]—Jeff Marks.

5. Prior residency as a key determinant of social dominance in the Willow Tit (*Parus montanus*). K. Koivula, K. Lahti, M. Orell, and S. Rytkonen. 1993. Behav. Ecol. Sociobiol. 33: 283–287.—The authors examined the effects of body size, age, and prior residency on dominance in captive Willow Tits during three winters. The effects of each variable were tested in unisexual two-bird trials in which all variables except the one being tested were held the same. Larger birds of both sexes were significantly dominant over smaller birds ($P = 0.01$). Conversely, age had no effect in birds of the same sex, body size, and status of residency. When birds were matched for all variables except prior residency, the first-established birds were clearly dominant over the newcomers ($P = 0.01$). Moreover, the advantage of residency was not overridden by the effect of age or large body size. These data suggest that age had no effect on rank; in addition, large body size seemingly had only a secondary effect since larger birds were dominant over smaller birds, except when the smaller birds were prior residents in the contested areas. The results seem to further suggest that the reason why adult Willow Tits in the wild dominate over juveniles, is not their age but residency associated with adulthood. Resource value differences between territories apparently play a more im-

portant role in shaping dominance in Willow Tits than resource holding potential, the latter of which is frequently correlated with age and body size. [Dept. of Zoology, Univ. of Oulu, Linnanmaa, SF-90570 Oulu, Finland.]—Danny J. Ingold.

FOOD AND FEEDING

(see also 4, 21, 22)

6. Benefits of foraging in mixed-species wader aggregations in a southern New Jersey saltmarsh. T. L. Master, M. Frankel, and M. Russell. 1993. Colon. Waterbirds 16:149–157.—The authors present evidence that individual herons gain a combination of benefits from participation in mixed species foraging aggregations, and that the benefits differ among species. The authors studied the foraging of 20 species in foraging aggregations at a 2500 ha marsh at Stone Harbor, New Jersey. Major participants were Snowy (*Egretta thula*) and Great (*E. alba*) egrets, Little Blue (*E. caerulea*) and Tricolored (*E. tricolor*) herons. Data on solitary and aggregation foragers included captures/strike (capture efficiency), captures/min (capture rate), strikes/min, steps/min, and foot stirs/min. Fish populations in pools were censused before and after spring tide replenishment. Snowy and Great egrets were concentrated near the center of the aggregations, the others on the periphery. Snowy Egrets had significantly higher captures/min and captures/strike, and lower capture efficiency variance when in aggregations, and their energy intake was estimated at nearly 2.5 × the daily energy requirement. Steps/min significantly declined in all but the Tricolored Heron when foraging in aggregations, suggesting a decrease in energy expended foraging. Foot stirring/min decreases may indicate increased prey availability in aggregations that is due to a "beater" effect of the foraging flock. Great Egrets and Little Blue Herons are more sedentary feeders and did not show increased capture rates and efficiencies in aggregations, but had reduced step rates suggesting enhanced prey availability. Tricolored Herons had minimal benefits from foraging in aggregations, possibility because they foraged on the periphery of aggregations. Aggregate formation in June coincided with maximum energy demands of nestlings. The authors suggest that Snowy Egrets may be obligate aggregation foragers during the nesting season. [Dept. Biological Sciences, East Stroudsburg Univ., East Stroudsburg, PA 18301, USA.]—William E. Davis, Jr.

7. Foraging habits, hunting and breeding success of Lanner Falcons in Israel. R. Yosef. 1991. J. Raptor Res. 25:77–81.—Data were collected on 2 breeding pairs of Lanner Falcons (*Falco biarmicus*) at Sede Boqer in the Negev Desert highlands of Israel during 1987–1989. Foraging observations included 332 capture attempts on birds, mammals and insects, of which 163 (49.1%) were successful. Prey was caught in flight in 82.9% of the observations, while in 15.5% and 1.6% cases prey were caught by walking (gathering invertebrates) and from a perch (pouncing on rodents), respectively. Birds, mammals and invertebrates constituted 78.5%, 5.4% and 16.1% of the Lanner diets, respectively. Chukars (*Alectoris chukar*) were the most prevalent avian prey species. Falcon pairs hunted cooperatively during courtship and during the fledging period. The male supplied all the food while the female was incubating and brooding. Females were more successful at hunting than males. Females were also more successful when cooperatively hunting with their young than males were.

At the nest, Lanners attacked and drove away only larger species of raptors such as Golden Eagles (*Aquila chrysaetos*) and Rough-legged Hawks (*Buteo lagopus*), while other falcons and kestrels in the area were not attacked. Average clutch size was 4.2 and hatching success over 5 years was 95.2%. Fledging success was 78.3%.

Based on the availability of nest-sites, the author does not believe that nest-site availability limits nesting density. [Mitrani Center for Desert Ecology, Blaustein Institute, Ben-Gurion Univ., Sede Boqer Campus 84993, Israel.]—Robin J. Densmore.

8. The diet of Chesapeake Bay Ospreys and their impact on the local fishery. P. McLean and M. Byrd. 1991. J. Raptor Res. 25:109–112.—Data were collected on the diets of 7 pairs of Ospreys (*Pandion haliaetus*) in the southwestern Chesapeake Bay area, Virginia, to gain information on Osprey food habits and to determine if Ospreys were competing with the local commercial fishery. Between 21 May and 25 July 1985, 378 fish were delivered in 642 h of observation, giving an average of 54 fish per nest, or 5.4 fish per nest per day.

Fifteen species of fish were recorded, and Atlantic Menhaden (*Brevoortia tyrannus*) constituted nearly 75% of the diet. Other species included White Perch (*Morone americana*), Atlantic Croaker (*Micropogonias undulatus*), Oyster Toadfish (*Opsanus tau*), and American Eel (*Anguilla rostrata*). The mean weight of the fish delivered was 156.9 g. Given an estimate of 3000 pairs of Ospreys on the Chesapeake Bay, the authors determined that fish harvest by Ospreys on the bay represents 0.004% of the annual commercial harvest. Therefore, they concluded that the Ospreys' influence on the Chesapeake Bay fishery is negligible. [Dept. of Biology, College of William and Mary, Williamsburg, VA 23185, USA.]—Robin J. Densmore.

9. Use of mutually exclusive foraging areas by adjacent colonies of Blue-eyed Shags (*Phalacrocorax atriceps*) at South Georgia. S. Wanless and M. P. Harris. 1993. Colon. Waterbirds 16:176–182.—In this paper the authors present data on diet, feeding area, and diving behavior in Blue-eyed Shags (*Phalacrocorax atriceps*) that test predictions of Cairns' hinterland model for regulation of seabird colony size: (1) birds from neighboring colonies should forage in non-overlapping areas, and (2) colony size should correlate with available foraging area. Two colonies, 2.5 km apart, on Bird Island, South Georgia, were monitored for breeding success and similar numbers of males and females were radio-tagged. Diving times and feeding locations were inferred from telemetry data, while maximum diving depths were measured by capillary-tube gages attached to tail feathers. Diet was inferred from regurgitated pellets. Dive times were highly variable, and feeding sites varied in water depth, turbidity, and currents. Birds fed predominately on bottom-living fish, but also ate crustaceans, polychaetes, and octopuses. Although there were significant differences in diet, dive depth, and frequency distribution of dive durations, there were no differences in breeding performance (32 nests for one colony, 11 for the other). There was no overlap in foraging areas between colonies, and most birds foraged within 1 km of their colony. An analysis of all breeding colonies on Bird Island showed a significant correlation between colony size and feeding habitat available. Hence, the results of this study are consistent with Cairns' hinterland model. [Institute of Terrestrial Ecology, Banchory Research Station, Hill of Brathens, Banchory, Kincardineshire AB31 4BY, UK.]—William E. Davis, Jr.

SONGS AND VOCALIZATIONS

10. Echolocation in free-flying Atiu Swiftlets (*Aerodramus sawtelli*). J. H. Fullard, R. M. R. Barclay, and D. W. Thomas. 1993. Biotropica 25:334–339.—The echolocation calls of Atiu Swiftlets as they leave and enter their roosting cave resemble those of other species of *Aerodramsus*. The calls are short (1–3 ms), with peak frequencies from 6–7 kHz, and broad bandwidths (3–10 kHz). Unlike other species, Atiu Swiftlet calls are single clicks instead of double or multiple clicks. The birds call more frequently as they enter the cave and less frequently as they leave. The calling is very rapid as they land in the cave, similar to that produced by an echolocating bat approaching a prey. The changes in the rates of calling appear to be in response to changing light levels and the chance of collision. [Dept. Zoology, Erindale Coll., Univ. Toronto, Mississauga, Ontario L5L 1C6, Canada.]—Robert C. Beason.

NESTING AND REPRODUCTION

(see also 1, 3, 4, 7, 22, 27, 32)

11. Brood patches of American Kestrels: an ecological and evolutionary perspective. K. L. Wiebe and G. R. Bortolotti. 1993. Ornis Scand. 24:197–204.—Incubating American Kestrels (*Falco sparverius*) have three brood patches, one beneath each wing on the breast and a third on the abdomen. Based on 133 females and 81 males captured in northern Saskatchewan, the authors examined variation in the size of brood patches relative to sex, age, body size, and several attributes of the clutch.

Both sexes developed patches, although females tended to have larger ones than males. In addition, yearling males were more likely than older males to lack the abdominal patch. Based on PCA, there was no relationship between brood-patch area and body size for either sex, although patch area was correlated with body mass during incubation for females. There also was no relationship within sexes between brood-patch area and (1) clutch size, (2) egg size, (3) clutch volume, (4) laying date, or (5) hatching success. The brood patch appeared

to be inadequate to cover the entire clutch simultaneously for most individuals. Moreover, hatching success was unusually poor during a wet year (when nest material and eggs sometimes became damp). The authors conclude that "kestrels potentially have difficulty heating all their eggs simultaneously" and call for data on the relationships among clutch size, patch size, and incubation efficiency in species with discrete brood patches. [Dept. of Biology, Univ. of Saskatchewan, Saskatoon, SK S7N 0W0, Canada.]—Jeff Marks.

12. Colonial and noncolonial Great Crested Grebes (*Podiceps cristatus*) at Lake Luknajno: nest site characteristics, clutch size and egg biometry. M. Bukacinska, D. Bukacinski, and P. Jablonski. 1993. Colon. Waterbirds 16:111–118.—In this paper the authors compare colonial and noncolonial nesting Great Crested Grebes (*Podiceps cristatus*) at Lake Luknajno, Poland in 1984. In emergent vegetation which bordered the lake 128 pairs nested, of which 76 were in 4 colonies (nearest neighbor distance < 5 m). Colonial nests were in less dense vegetation, and hence these birds had greater visibility. Colonial birds initiated nesting earlier and had larger clutches, suggesting that they were older birds. During the breeding season clutch size and total clutch volume decreased in noncolonial nests but increased in colonial nests, suggesting that changes (e.g., age composition) occurred within groups through the season. The differences in egg biometery between colonially and noncolonially nesting grebes suggest that the groups may differ in age, condition, or both. [Institute of Ecology PAS, 05-092 Lomianki, Poland.]—William E. Davis, Jr.

13. Mate change by Kentish Plovers *Charadrius alexandrinus*. T. Székely and C. M. Lessells. 1993. Ornis Scand. 24:317–322.—Both polygyny and polyandry occur in Kentish [Snowy] Plovers. One parent usually deserts the brood about a week after the chicks hatch, and both parents may attempt a second nesting with a different partner. Because the frequency of polygamy and renesting vary geographically, the authors initiated a study of an inland population of plovers in Hungary for comparison with data sets from coastal populations in Europe and from North America.

From 1988–1991, 73 breeding pairs were marked and monitored for mate change within seasons. Fifty-nine pairs (81%) did not renest, nine renested with their respective partners, two renested but their partners were not identified, and only three individuals (two males and one female) were known to have switched mates. One male abandoned his brood at 13 days (the female attended until the young fledged), and the other male switched mates after two failed breeding attempts. The female was found with a new mate and clutch 61 days after her first nest was destroyed by a predator. Both members of nine pairs were known to have survived in consecutive years. Only one of these pairs reunited the second year; the other eight nested with new mates. Some pairs moved long distances between breeding attempts within seasons: three of nine pairs that produced replacement clutches together moved a mean distance of 11.8 km between nests (range = 5–21 km). The other six pairs renested on their original sites. The three birds that changed mates within a season moved 10–24 km between nesting attempts. In addition, one female was seen at sites 170 km apart during the breeding season, but nesting was confirmed at only one of them.

Kentish Plovers appear to change mates less frequently than do Snowy Plovers in North America. The authors suggest that this difference is an artifact of the large distances that Kentish Plovers move between successive nesting attempts. High rates of breeding dispersal in Europe presumably are due to the ephemeral nature of nesting sites. Plovers prefer to nest on alkaline flats or dry mud. These habitats become unsuitable for plover use following flooding or increases in vegetative cover. [Dept. of Animal and Plant Sciences, Sheffield Univ., Sheffield S10 2UQ, United Kingdom.]—Jeff Marks.

14. Nesting biology and predation of Pigeon Guillemots in the Queen Charlotte Islands, British Columbia. K. Vermeer, K. H. Morgan, and G. E. J. Smith. 1993. Colon. Waterbirds 16:119–129.—The purpose of this study was to monitor nesting Pigeon Guillemots (*Cepphus columba*) on 12 islands at Skidegate Inlet in the Queen Charlotte Islands, and to assess the effects of predation. An estimate of 1000–1100 pairs was made from counts of birds near colonies. Egg laying began in the third week of May and peaked in the second week in June; chicks fledged from the end of July through early September. Of 87 1- or 2-egg clutches, 26 were deserted and the authors conclude that this was probably caused by their investigator disturbance. Of 61 nests followed, 45% of the eggs hatched and 58% of these

chicks fledged (0.41 fledglings/pair). Predation caused 71% of egg loss and 59% of chick loss, presumably mostly by Northwestern Crows (*Corvus caurinus*) and raccoons (*Procyon lotor*). Earlier surveys suggested that raccoons were a major factor in reproductive failure on some islands. Fish made up the entire chick diet. Second chicks weighed significantly less than first and single chicks and suffered higher mortality rates, and growth rates for all chicks combined were generally lower than those reported from other northwestern Pacific colonies. This suggests suboptimal food availability. The authors recommend further studies of raccoon predation on nesting marine bird populations to determine if control measures are warranted. [Canadian Wildlife Service, c/o Institute of Ocean Sciences, P.O. Box 6000, Sidney, B.C., V8L 4B2, Canada.]—William E. Davis, Jr.

15. Reduced predation by nest box relocation: differential effect on Tengmalm's Owl nests and artificial nests. G. A. Sonerud. 1993. Ornis Scand. 24:249–253.—Sonerud's long-term study of Tengmalm's Owls (*Aegolius funereus*) in Norway has revealed how risk of nest predation influences nest-site selection. In a previous experiment, he randomly relocated half of his nest boxes that had been in place for 12 years (1989, Anim. Behav. 37:332–334). Owls that used unmoved boxes suffered significantly higher nest predation than those that used relocated boxes. Higher predation at unmoved boxes presumably resulted from nest predators (in this case pine martens [*Martes martes*]) revisiting cavities that had contained owl nests in the past. Here, Sonerud replicates a test of the hypothesis that nest predation increases with cavity age owing to long-term memory of predators. He also evaluates whether artificial nests provide realistic estimates of nest predation in cavities.

Four years after first moving boxes, Sonerud reversed the experiment by relocating the previously unmoved boxes (16 years in the same place). Again, nest depredations were higher in unmoved boxes. Overall, 22% of owl nests were depredated in relocated boxes versus 83% at unmoved boxes. Tengmalm's Owls nested only during microtine rodent peaks. Midway between successive microtine peaks, Sonerud relocated the same boxes that had been moved the first time. He then placed an artificial clutch of quail or bantam chicken eggs in each box for two years in a row. Compared with owl nests in the same boxes before the first relocation, predation of artificial clutches was lower in relocated boxes but not in unmoved boxes. Considering only artificial clutches, however, there was no difference in predation at relocated and unmoved boxes (54% versus 58%).

These results indicate that artificial nests may not provide accurate estimates of nest predation in tree cavities. One explanation is that egg predators that are unable to drive off incubating owls destroy artificial clutches independent of nest box age. The Great Spotted Woodpecker (*Dendrocopus major*), which commonly preys upon eggs and nestlings in cavities, is a likely candidate to have taken the artificial clutches. [Dept. of Biology and Nature Conservation, Agricultural Univ. of Norway, P.O. Box 14, N-1432 Ås, Norway.]—Jeff Marks.

16. The attendance and absence of adult Kittiwakes *Rissa tridectyla* from the nest site during the chick stage. J. C. Coulson and M. P. Johnson. 1993. Ibis 135:372–378.—Chicks of the Black-legged Kittiwake were left alone for the first time at ages 9–40 days. This was after thermoregulation had developed. The wide variance occurred despite high reproductive success and rapid growth rates and may reflect a sample of only ten pairs. The small sample was necessitated by the use of radioactive tags that allowed the authors to monitor parental attendance continuously and to differentiate male and female. Spot checks were less likely to detect parental absences, but the authors present correction factors based on comparison of spot checks and continuous monitoring of the same pairs. Males and females are equally likely to be the first to leave the chick unattended. Parents at later nests leave their young unattended at younger ages than parents at earlier nests. This difference may reflect the tendency for experienced parents to breed earlier. These data were collected from 1968 through 1974 and provide an important behavioral standard against which to compare colony attendance in recent years when food shortages and parental nonattendance have led to widespread failure among kittiwakes of the North Sea. [Department of Biological Sciences, University of Durham, South Road, Durham City DH1, 3LE, UK.]—Edward H. Burtt, Jr.

17. The pursuit of extra-pair copulations by female birds: a new hypothesis of colony formation. R. H. Wagner. 1993. J. Theor. Biol 163:333–346.—The author presents an additional/alternate explanation for the evolution of colonality in birds. The pursuit of extra-

pair copulations (EPC) by females in monogamous species would result in selection pressures similar to those resulting in the formation of leks in polygynous species. The proposed mechanism differs from other mechanisms (food finding, predation reduction) proposed for coloniality in that it occurs prior to egg laying rather than after. One requirement of this model is that the female seek EPCs, which is supported by an increasing number of reports in many species. It is assumed that the benefit from EPCs to females outweigh the costs. The distribution of individuals within a colony reflect the distribution of males in a lek: more superior individuals occupy central locations. If females seek nest locations near a superior quality male in order to have access to him for mating, then the result is a colonial breeding aggregation. Thus, the pursuit of copulations by females can select for male clustering in a diversity of mating systems. [Dept. Zool. Research, Nat. Zool. Park, Smithsonian Inst., Washington, DC 20008, USA.]—Robert C. Beason.

MIGRATION, ORIENTATION, AND HOMING

18. Clock-shift experiments with migratory Yellow-faced Honeyeaters, *Lichenostomus chrysops* (Meliphagidae), an Australian day-migrating bird. U. Munro and R. Wiltschko. 1993. J. Exp. Biol. 191:233–244.—The results of orientation experiments with the Yellow-faced Honeyeaters indicate that they do not use a sun compass in the same manner as Homing Pigeons (*Columbia livia*). Birds whose photoperiod was phase advanced by 4 h showed a larger than expected deviation (94° instead of 60°) in the anticipated direction for the first 2 tests, but the deflection declined until by the fifth test it was the same as the controls. Birds treated with a 4 h phase delayed photoperiod were randomly oriented for the first 2 tests, had a mean orientation 167° in the wrong direction during tests 3 and 4, and were oriented in the expected direction (64°) during tests 5 and 6. The only clear conclusions that can be drawn from these experiments is that if the Yellow-faced Honeyeater is using a sun compass (and the data only provide weak support for such a conclusion), then the mechanism is very different from that used by any other species that has been studied. The authors conclude that the sun is involved in navigation because the orientation of clock-shifted birds is affected by the treatment, but there does not appear to be any time compensation. They propose that the birds are using the sun as a "celestial landmark" because the migratory directions of the honeyeater are towards (autumn) or away from (spring) the rising sun. The disorientation results from conflicting information from the birds' magnetic and visual orientation cues. These results indicate a need for further investigation into the roles of the orientation mechanisms for this species. [R. Wiltschko, FB Biologie Univ., Zool., Siesmayerstr. 70, D-6000 Frankfurt, Germany.]—Robert C. Beason.

19. Speed of migration and migratory flight lengths of passerine birds ringed during autumn migration in Sweden. H. Ellegren. 1993. Ornis Scand. 24:220–228.—Based on 2212 recoveries of birds banded in Sweden from 1960–1990, and employing fairly rigorous criteria for choosing records to analyze, Ellegren estimated migration speed and length of migratory flight for 62 species. Average migration speed ranged from 13 km/day (Great Tit, *Parus major*) to 82 km/day (Chiffchaff, *Phylloscopus collybita*) and was slowest for short-distance migrants (28 km/day) and fastest for long-distance migrants (60 km/day). Maximum individual speeds of about 180 km/day were recorded for the Chiffchaff and Yellow Wagtail (*Motacilla flava*). Comparisons within species suggested that later migrants travelled faster than earlier migrants (10 of 10 species with adequate data) and that adults migrated faster than juveniles (8 of 9 species). For individuals recovered one day after banding, flight distances ranged from 50–444 km and varied considerably within species. For individuals recovered 1–3 days after banding, average flight length was longer for nocturnal (177 km) than for diurnal migrants (111 km). By dividing estimated flight distances by estimated flight speeds, Ellegren calculated that both diurnal and nocturnal migrants flew for an average of less than half of their respective daily activity periods. [Dept. of Animal Breeding and Genetics, Swedish Univ. of Agricultural Sciences, Box 7055, S-750 07 Uppsala, Sweden.]—Jeff Marks.

20. Wind-influenced juvenile dispersal of Spanish Imperial Eagles. M. Ferrer. 1993. Ornis Scand. 24:330–333.—Twenty-one Spanish Imperial Eagles (*Aquila adalberti*) were equipped with radio transmitters at the end of the nestling period in southwestern Spain

from 1986–1988. Initial departures from the natal area were correlated significantly with wind direction on the day of departure. Subsequent movements away from the natal area were always in the same direction as the initial movements, regardless of wind speed or direction. Because siblings did not disperse at the same time, there was no tendency for them to disperse in the same direction.

During their first 3 years of life, young Imperial Eagles occasionally revisit their natal area. However, they always return to the "dispersal area" that they first occupied upon leaving their natal area. These results suggest that, at least for some species, environmental factors override genetic factors in determining dispersal direction and settlement areas. [Estación Biológica de Doñana CSIC, Avd. Maria Luisa, Pabellón del Perú, 41013 Sevilla, Spain.]—Jeff Marks.

HABITAT USE AND TERRITORIALITY

(see also 12, 29, 31, 32)

21. Post-breeding territoriality and foraging behavior in Costa's Hummingbird (*Calypte costae*). M. L. Avery and C. van Riper III. 1993. Southwest. Nat. 38:374–377.—Costa's Hummingbirds were observed between late May and late June 1985–1986 at Pinnacles National Monument in central California on the northern edge of the species' breeding range. During this period, 49 Costa's were mistnetted, and 67% were determined to be juveniles. In 1986, territorial males spent 63–93% of their time perched within their territories; adults spent more time chasing intruders and less time foraging than did juveniles. Territories of three adult males averaged 10.4 m^2 and the area covered by *Trichostema lanatum* (Labiatae) was significantly correlated with the percent time spent chasing intruders. No territorial females were observed. Adult male Costa's left the area before juveniles possibly in response to declining flower abundance. Although males were observed displaying, nesting was unrecorded and the authors suggest that the birds observed were post-breeding transients from southwestern California deserts. The authors also describe how the territorial behavior of nonbreeding Costa's Hummingbirds closely resembles that of Anna's Hummingbirds (*Calypte anna*). [U.S. Dept. of Agriculture, Denver Wildl. Research Center, Florida Field Station, 2820 E. Univ. Avenue, Gainesville, FL 32601, USA.]—Danny J. Ingold.

ECOLOGY

(see also 28, 32)

22. Seabird associations with marine turtles in the eastern Pacific Ocean. R. L. Pitman. 1993. Colon. Waterbirds 16:194–201.—This study describes associations of seabirds in the eastern tropical Pacific Ocean with marine turtles, particularly the Olive Ridley Turtle (*Lepidochelys olivacea*), which are common and regularly bask at the surface. The author discusses the reasons for the associations and their ecological significance. The study area was ocean from California to Peru, west to the longitude of Hawaii. In 1800 days, 176 of 3032 turtles sighted had a total of 412 associated birds. Boobies were the most commonly associated birds, comprising 63% of the total, and were present at 91% of turtles with birds. Most other birds were terns, shearwaters, or frigatebirds. Birds were more numerous when turtles were accompanied by flotsam and/or predatory fish. Bait fish often schooled near or under turtles, and birds exploited this resource. Hence turtles act as "passive fish aggregators." Single birds were usually roosting on the turtle's back, perhaps for protection against sharks. When flotsam and predatory fish were present the association of birds and turtles may have been coincidental. The author suggests that the abundance of Olive Ridley Turtles may make them "of more than passing importance" for seabirds, and suggests that recent cessation of turtle harvest in Mexico and Ecuador may benefit both turtles and birds. [Southwest Fisheries Science Center, P.O. Box 271, La Jolla, CA 92038 USA.]—William E. Davis, Jr.

POPULATION DYNAMICS

(see 13, 14, 17, 29, 30, 31)

ZOOGEOGRAPHY AND DISTRIBUTION

23. Breeding distribution of Black-bellied Whistling Ducks in Texas. J. P. Schneider, T. C. Tacha, and D. Lobpries. 1993. Southwest. Nat. 38:383–385.—Data from the Texas Parks

and Wildlife Department (TPWD; collected between 1984 and 1989) and the Texas Breeding Bird Atlas Project (Atlas; collected between 1987 and 1992) were examined in order to determine whether Black-bellied Whistling Ducks (*Dendrocygna autumnalis*) are expanding their breeding range in Texas. The Atlas data revealed a larger breeding range than the TPWD data, and are probably more representative since they encompass a nearly compete survey of all accessible areas in the state. These data show that the breeding distribution has expanded well beyond the Lake Corpus Christi area, and now encompasses nearly all counties south of a line from Del Rio to Austin to Houston and some counties between Austin and Dallas–Fort Worth. The authors suggest that this range expansion could be related to the formation of freshwater impoundments. [Caesar Kleberg Wildl. Research Institute, Campus Box 218, Texas A&I Univ., Kingsville, TX 78363, USA.]—Danny J. Ingold.

SYSTEMATICS AND PALEONTOLOGY

24. Birdlike characters in the Triassic Archosaur *Megalancosaurus*. A. Feduccia and R. Wild. 1993. Naturwissenschaften 80:564–566.—Feduccia and Wild provide the first reconstruction of *Megalancosaurus*, a small, birdlike archosaur of the late Triassic. Similarities to modern birds include: 1. an extremely expanded braincase; 2. a large, birdlike orbit; 3. a beaklike snout with large, oval, preorbital fenestrae; 4. a premaxilla with reduced dentition; 5. a foramen magnum located posteroventrally; 6. highly flexible neck and elongated cervical vertebrae; 7. forelimbs, minus hand, that are longer than the hindlimbs, minus foot, a relationship characteristic of modern birds and *Archaeopteryx*, but unknown among theropods; 8. a straplike scapular that lies parallel to the thoracic vertebrae, a position necessary for flight that occurs in modern birds and *Archaeopteryx*, but not in theropods. These features strongly suggest that *Megalancosaurus* together with other birdlike archosaurs (e.g., *Longisquama* and *Scleromochlus*) from the late Triassic are close to the ancestral origin of birds. Such an origin predates the rise of the Cretaceous theropod dinosaurs (e.g., cpelurosaurs) and suggests that they are not the progenitors of birds. Furthermore, the small size of *Megalancosaurus*, its somewhat opposable digits, and its sharply curved claws suggest a climbing, arboreal existence and an arboreal origin for birds and avian flight. [Department of Biology, University of North Carolina, Chapel Hill, NC 27599, USA.]—Edward H. Burtt, Jr.

EVOLUTION AND GENETICS

(see 20, 24, 26)

PHYSIOLOGY AND DEVELOPMENT

(see also 11)

25. Odor thresholds in passerines. L. Clark, K. V. Avilova, and N. J. Bean. 1993. Comp. Biochem. Physiol. 104:305–312.—The responses of eight passerine species to the chemical odorant cyclohexanone were tested using cardiac conditioning. Song Sparrows (*Melospiza melodia*) and American Goldfinches (*Spinus tristis*) failed to accommodate to captivity and could not be accurately tested. Northern Mockingbirds (*Mimus polyglottos*) required a long time to acclimate, but did not demonstrate sensitivity to the odorant. Gray Catbird (*Dumetella carolinensis*), Eastern Phoebe (*Sayornis phoebe*), European Goldfinch (*Carduelis carduelis*), Black-capped Chickadee (*Parus atricapillus*) and Great Tit (*Parus major*) demonstrated detection thresholds for cyclohexanone from 0.3–0.7 ppm. This sensitivity is similar to that reported for other avian species. Although cyclohexanone has no known ecological relevance, these sensitivities clearly indicate that birds are not without a sense of smell as common lore would indicate. [Monell Chemical Senses Center, 3500 Market St., Philadelphia, PA 19104, USA.]—Robert C. Beason.

MORPHOLOGY AND ANATOMY

(see also 24)

26. Evidence from claw geometry indicating arboreal habits of *Archaeopteryx*. A. Feduccia. 1993. Science 259:790–793.—Feduccia measured the curvature of the claw on digit III

in 400 birds. From these he selected ten species each of ground dwelling, perching, and trunk-climbing birds. Ground-dwelling species had a mean claw arc of 64.3°, perching species had a mean arc of 116.5°, and climbing species had a mean arc of 148.7°. Digit III could be measured on three specimens of *Archaeopteryx*. The mean arc of the claw on the foot was 120°, which is similar to that of modern perching birds, and the mean arch of the claw on the hand was 147.3°, which is similar to that of modern climbing birds. Based on its claw geometry *Archaeopteryx* appears to have been capable of perching and climbing in trees. Feduccia provides a concise review of the evidence that *Archaeopteryx* actively flew. Based on his review and the new data on claw geometry, he concludes that *Archaeopteryx* was arboreal, aerodynamically advanced, and probably capable of flapping flight. If these conclusions are correct, *Archaeopteryx* is too far from the origin of birds and flight to help us understand their early evolution. [Department of Biology, University of North Carolina, Chapel Hill, NC 27599, USA.]—Edward H. Burtt, Jr.

PLUMAGES AND MOLTS

27. Delayed maturation in plumage colour: evidence for the female-mimicry hypothesis in the Kestrel. H. Hakkaraienen, E. Korpimaki, E. Huhta, and P. Palokangas. 1993. Behav. Ecol. Sociobiol. 33:247–251.—In sexually dichromatic bird species, females often prefer to mate with males that have extravagant plumage because plumage characteristics may indicate male quality; however, in many species yearling males with female-like plumage also breed regularly. Two hypotheses, the female-mimicry hypothesis (FMH) and the status-signaling hypothesis (SSH), both predict that young males with female-like plumage will establish their territories close to high-quality males and experience greater breeding success as a result of reduced competition from adult males. However, only the FMH predicts that adult males will be unable to distinguish between adult females and female-like males. During a seven year study in the Kauhava region of western Finland, the authors set out to test the FMH and the SSH in the European Kestrel (*Falco tinnunculus*) by measuring the distances between the nests of young males and the closest adult males and comparing them with the distances between the same adult males and the nearest adult male. In addition, the authors experimentally examined the ability of sexually active adult males to differentiate between adult females and female-like yearling males.

The distance between the nests of young males and adult males was significantly shorter ($P < 0.05$) than the distance between the same adult male and the nearest adult male. Young males that mated with adult females tended to be nearer the nests of adult males than yearling/yearling pairs (although not significantly so), and had significantly larger clutches than yearling/yearling pairs.

During experimental trials in an aviary half of the adult males chose young males for mates rather than adult females, demonstrating that adult males were unable to identify the sex of their partners. Females, on the other hand, were able to distinguish between adult and young males when given the choice.

These data support the FMH, and suggest that female-like plumage in young males is not a status-related character as the SSH suggests. The advantage of female-like plumage to young male kestrels was that they were able to settle close to high-quality territories of adult males and thus often attract adult females with which to breed. The authors suggest that there are more benefits than costs to males with female-like plumage during their first year of life. [Laboratory of Ecol. Zoology, Dept. of Biology, Univ. of Turku, SF-20500 Turku 50, Finland.]—Danny J. Ingold.

WILDLIFE MANAGEMENT AND ENVIRONMENTAL QUALITY

(see also 8)

28. Colonial waterbirds as bioindicators of environmental change. J. A. Kushlan. 1993. Colon. Waterbirds 16:223–251.—In this review the author assesses the potential usefulness of colonial waterbirds as bioindicators of ecological change in ecosystems, and the theoretical basis for bioindicator use (climax, ecosystem, systems, and hierarchy theories). The author makes an analogy between bioindicators and economic indicators, but suggests that specific bioindicators thus far have had neither as "well appreciated" a theoretical base as economic

indicators nor the same level of agreement that they work. Approaches to bioindicator use include using animal populations for assessing habitat conditions, and the use of biochemistry to assess adverse response to some environmental variable (stress). For practical reasons bioindicators should reflect human values and be economically and logistically feasible to measure. Colonial waterbirds should make good bioindicators because they are at the top of food chains, frequent human-dominated and polluted environments, have wide geographic ranges that promote comparisons among sites, and are colonial breeders which facilitates sampling all age classes. Also, good baseline data are available. Kushlan evaluates the current and potential use of many facets of colonial waterbird biology as bioindicators: genotoxicity, a variety of chemical systems including mixed function oxidases and metallothioneins, contaminant accumulation of pesticides, metals, and PCBs, egg shell thinning, hematological studies, teratological defects, growth and condition, behavior, reproductive performance, mortality, presence/absence data, distribution, population indices, and community and ecosystem bioindicators. In evaluating the strengths and weaknesses of different bioindicators Kushlan discusses the differences between suborganismal (SO) level and population-community-ecosystem (PCE) level bioindicators. The former (SO) are often prospective (demonstrate exposure prior to failure of the system), the latter (PCE) tend to be retrospective (measure environmental effects after they occur). SO bioindicators associated with contaminant accumulation and reproduction show particular promise. Kushlan recommends utilizing suites of overlapping biomonitoring variables such as contaminants and blood samples, together with breeding season and population indices, as well as monitoring support system variables such as food supply and water quality.

This review, with nearly 300 references, contains careful analyses of the weaknesses and constraints on, as well as the advantages of, using colonial waterbirds as bioindicators. It is a timely review because ecosystem management is of increasing importance, and should be read by anyone interested in colonial waterbirds or conservation issues. [Dept. of Biology, Univ. of Mississippi, University, MS 38677, USA.]—William E. Davis, Jr.

29. Spatial models and Spotted Owls: exploring some biological issues behind recent events. S. Harrison, A. Stahl, and D. Doak. 1993. Conserv. Biol. 7:950–953.—The authors, expert witnesses for litigants, provide their perspective on legal and biological issues pertaining to Northern Spotted Owl population management. The Thomas Strategy, a multi-agency commission report detailed methods to coordinate plans for managing the owl, relied on quantitative spatial models to project how populations might change in 50 to 100 years. Assumptions of the models were that owl demography is linked to forest fragmentation through juvenile dispersal. A threshold for extinction was placed at 20% of landscape in old growth forest, coincidentally the current level. Since publication, the Thomas Strategy faced problems. The US Forest Service was blocked from selling timber under this plan: a judge ruled that the plan carried significant and unacknowledged risks to the owl and that other species inhabiting old growth forests were neglected. Critics took issue with assumptions of computer simulation models, suggesting that sensitive parameters (search behavior of juvenile owls and habitat geometry) were not well characterized, thus overestimating the viability of owl populations in Oregon and California. Whether the owl could survive 50–100 years transition until the forest reached the planned age and structure was not known. Whether estimates of survival and fecundity were accurate was not known. Whether adaptive management (provisions in the plan for monitoring and modification) would work was questioned because of lags between the breakdown in demographic structure and its measurement.

Two fundamental issues emerged from the legal debate concerning population management of the Northern Spotted Owl. First is the burden of proof: how does one prove the consequence of the plan? Second is the role of science in the legal and decision making process. The authors suggest that "even if science is never value free in practice, our aim in cases such as this should be to provide an accurate assessment of biological risks. Weighing these against other concerns and reaching compromises is the job of decision makers." [Div. Environmental Studies, Univ. California, Davis, CA 95616, USA.]—Kristin E. Brugger.

30. Survival and movements of released rehabilitated Bald Eagles. M. Martell, P. Redig, J. Nibe, G. Buhl and D. Frenzel. 1991. J. Raptor Res. 25:72–76.—In order to document the success of released rehabilitated raptors and thus assess the value of rehabilitation to con-

servation, the survival, movements and breeding attempts of released rehabilitated Bald Eagles (*Haliaeetus leucocephalus*) were monitored. Nineteen eagles rehabilitated at the Raptor Center, University of Minnesota, were radio-tagged and released between November and February, 1987–1990. Rehabilitated injuries included wing fractures, starvation, and toe damage or loss from leg-hold traps. Rehabilitation time ranged from 23 to 522 days.

A total of 356 radio relocations were obtained from 18 eagles during the 3 year study. Fifteen eagles survived for at least 10 d post-release, and 13 survived over 6 wk post-release. One female nested for 3 years following her release and fledged one chick in 1989 and 1990. Three released eagles died, one due to a severe leg-hold injury, one due to poisoning, and one from unknown causes, and signals were lost on 3 other eagles within 10 d of release. The distance eagles were radiotracked from release sites ranged from 2–610 km ($\bar{x}$ = 107, N = 14).

The authors conclude that rehabilitated Bald Eagles can survive and reproduce. Because of the tendency of eagles to remain in the release area for several days, the authors suggest that the release site should be chosen with great consideration. They also discuss the need for further research concerning the success rates associated with particular injuries, diseases and poisoning. [The Raptor Center, Univ. of Minn., St. Paul, MN 55103, USA.]—Robin J. Densmore.

31. The conservation reserve program and grassland birds. D. H. Johnson and M. D. Schwartz. 1993. Conserv. Biol. 7:934–937.—Recent declines in abundance of temperate grassland bird species may be related to habitat loss, primarily the conversion of perennial grasslands to annually tilled crops in North America. This possibility was evaluated by comparing the field use by breeding birds of croplands registered under the US Department of Agriculture Conservation Reserve Program (CRP) during 1990 and 1991 with data from a 1972 survey of North Dakota croplands and with Breeding Bird Survey (BBS) trends from 1966–1990. Fields were located in nine counties in eastern Montana, North Dakota, South Dakota and western Minnesota. Surveys of CRP fields were conducted once per year by one or two observers on foot in 240 fields during 1990 and 335 fields in 1991. A subset of 190 fields was common to both years' surveys. Seventy-three species were recorded from CRP fields; total breeding bird densities (pairs/100 ha) were 123.5 in 1990 and 123.6 in 1991. Lark Buntings (*Calamospiza melanocorys*), Grasshopper Sparrows (*Ammodramus savannarum*) and Red-winged Blackbirds (*Agelaius phoeniceus*) were the first through third most common species in CRP fields. Of sixteen species in common, four occurred more densely in 1972 cropland surveys than recent CRP surveys (Horned Lark [*Eremophila alpestris*], Chestnut-collared Longspur [*Calcarius ornatus*], Vesper Sparrow [*Pooecetes gramineus*], and Killdeer [*Charadrius vociferus*]), but showed a flat trend in BBS surveys. Six species that were more common in CRP than crop fields had significant decreasing trends in BBS surveys. The CRP program in the northern Great Plains of North America appears to yield breeding habitat for several grassland species, and may result in reversing downward trends in abundance, if the program is continued. [U.S. Fish and Wildlife Service, Northern Prairie Wildlife Research Center, Jamestown, ND 58401, USA.]—Kristin E. Brugger.

BOOKS AND MONOGRAPHS

32. Ecology of Boreal Owls in the northern Rocky Mountains, U.S.A. G. D. Hayward, P. H. Hayward, and E. O. Garton. 1993. Wildl. Monogr. No. 124. 59 pp. $4.75, softcover.—Work in the early 1980s—much of it by the Haywards—revealed the surprising fact that Boreal Owls (*Aegolius funereus*) were relatively common residents in Rocky Mountain spruce–fir forests from Colorado to the Canadian border. Focusing on the Frank Church River of No Return Wilderness (RNRW) in Idaho, Hayward et al. studied Boreal Owls from January/February through August/September, 1984–1988. Their main goals were to gather data on habitat use, movements, diet, and population characteristics. They also instituted a survey of potential Boreal Owl habitat that was conducted by numerous agency biologists (using tape-recorded songs) in parts of Montana, Idaho, Utah, and Wyoming.

At the regional scale, 49 nests or singing males were located on 130 surveys that covered nearly 1300 km of transects. The owls were confined largely to the subalpine fir (*Abies lasiocarpa*) life zone from 1300–3100 m elevation. Within this zone, owls occurred mostly in stands

of multilayered, old-age forest. Twenty-three nests were found within the RNRW, 19 in natural sites (Pileated Woodpecker [*Dryocopus pileatus*] holes) and four in nest boxes. As found elsewhere, nests were restricted to stands of mature and old multilayered forest. Home ranges of radio-tagged adults averaged 1451 ha in winter (n = 13) and 1182 ha in summer (n = 15). The owls fed on a wide variety of small mammals, with Red-backed Voles (*Clethrionomys gapperi*) being the most frequent prey of both sexes year-round. In winter, Flying Squirrels (*Glaucomys sabrinus*) were important prey for females but not for males. Survivorship of radio-tagged adults was below 50%, and productivity and nesting success were low compared with Boreal Owls in Eurasia. Based on Leslie matrix projections, the population appeared to be declining.

Considering the daunting logistics of monitoring an owl population in a remote wilderness, this study must have been very difficult to conduct. The authors recognize that they followed a small sample of owls for a relatively short period of time. Thus, their conclusions on the demographics and status of the population are tentative. This study has documented clearly that Boreal Owls occupy a narrow, patchily distributed life zone in the northern Rockies. Conservation of Boreal Owls in the West will require maintenance of mature and old-growth stands of spruce–fir forest. Additional data on productivity, survivorship, and dispersal are needed to monitor population status. [Rocky Mountain Forest and Range Experiment Station, 222 South 22nd St., Laramie, WY 82070, USA.]—Jeff Marks.

J. Field Ornithol., 65(3):425–432

MINUTES OF THE ASSOCIATION OF FIELD ORNITHOLOGISTS COUNCIL MEETING
Broadmoor Wildlife Sanctuary, Natick, Massachusetts
6 March 1994

Present: Jim Berry, Greg Butcher, Jed Burtt, George Gale, Lise Hanners, Brian Harrington, Elissa Landre, Jim Lowe, George Mock, Debra Miller, Ken Rosenberg, Peter Vickery

Absent: Margaret Brittingham, Paul Buckley, Alan Poole, Nathaniel Wheelwright, Joe Wunderle, Martha Steele, David Westneat, Ken Yasukawa, John Smallwood

Call to Order: 9:30 AM by President Greg Butcher

Minutes from 10 Sep. 1993: Accepted

Secretary's Report—George Gale

George stated he would send out a revised list of addresses and phone numbers of all councilors, and a list of committee assignments with a copy of the minutes. He asked councilors to also forward any address changes to him. Also, new stationery and envelopes will be mailed with the minutes.

Treasurer's Report—George Mock

1. *Expenses/Budget*

George noted that journal operations showed a $38,719 surplus for 1993. This figure reflects printing charges for only three issues of the Journal. However, even if the fourth issue were charged, and the Charles Blake Trust income excluded, there would remain a substantial surplus of income over expenses for the year. This has been the fourth consecutive year AFO has been in the black. George also noted that Mrs. Bergstrom donated $1000 to the Bergstrom Fund for the fourteenth consecutive year. The journal balance sheets showed a small surplus due to 27% of the authors being able to pay full page charges. An additional