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RECENT LITERATURE

Edited by Danny J. Ingold

RESEARCH TECHNIQUES

(see also 24)

1. **Suggestions for measuring external characters of birds.** K. Winker. 1998. Ornithol. Neotropical 9:23–30.—The author reviews and critiques numerous techniques and approaches to measuring external body components and mass of birds. Recording lengths to 0.01 mm is never justified because it is not repeatable; 0.1 mm is usually the most reliable resolution with calipers and 0.5 mm with a ruler. Vernier calipers are less susceptible to slippage and incorrect readings than dial calipers. The author provides numerous suggestions and cautions for individuals making field and museum measurements on birds. This paper is an excellent starting point for a student or beginning researcher. It also contains some important admonishments on the misuse of morphometric data. [Univ. of Alaska Museum, 907 Yukon Dr., Fairbanks, AL 99775.]—Robert C. Beason.

2. **Evaluation of a plasticine-filled leg band for day-old ducklings.** P. Blums, J. B. Davis, S. E. Stephens, A. Mednis, and D. M. Richardson. 1999. J. Wildl. Manage. 63:656–663.—While plasticine-filled leg bands have been used extensively in Europe, biologists in North America have been slow to adopt this marking technique. The objectives of this study were to (1) examine whether survival rates differed between ducklings marked with plasticine-filled leg bands and those marked with web tags, and (2) to evaluate the retention and use of plasticine bands for marking various duck species in the United States. Between 1993–1998 in Kentucky, Mississippi, and Missouri, the authors banded Wood Duck (*Aix sponsa*) ducklings with a plasticine band on the left tarsus and a web tag on the right foot. A second cohort was double webtagged. The authors double-marked 7172 day-old Wood Ducks and later recaptured or recovered 7% of the double-marked birds. Survival rates did not differ between ducks marked with plasticine–filled bands and those marked with only web tags. High retention rates of plasticine bands were noted in Missouri (98.6%) and Mississippi (97.3%). Because ambient temperatures will influence the viscosity of the band, researchers are encouraged to note ambient temperatures at their study sites. The authors encourage the use of this technique for a variety of ducks, coots, and grebes. The benefits of these bands include the high retention rate, the low mass of the band (approximately 2.5–3.6% the mass of a day-old duckling), and the ease of detection by hunters and researchers. [Gaylord Memorial Laboratory, The School of Natural Resources, Univ. of Missouri–Columbia, Puxico, MO 63960, USA; e-mail: gaylord3@sheltonbbs.com]—Kerri T. Vierling.

3. **An aerial sightability model for estimating Ferruginous Hawk population size.** L. W. Ayers and S. H. Anderson. 1999. J. Wildl. Manage. 63:85–97.—This study provides a method for determining more accurate population estimates of Ferruginous Hawks (*Buteo regalis*) from aerial surveys. The authors used 18 observers with different levels of experience with Ferruginous Hawks to determine the detection rate of hawk nests. Observers were flown in a Maule fixed-wing aircraft over a known population of nests, and nests within 300 m of the transect were noted. A number of variables were recorded for each flight and a multiple linear regression identified nest substrate type, distance to the nest and the observer experience level as significant predictors of detection rates. The overall model was significant and model predictions, with 90% confidence intervals, captured the true population in 2 validation surveys. This study provides a method to quantify bias in aerial surveys to better make conclusions about raptor population levels and trends. [U.S. Geological Survey, Wyoming Coop. Fish and Wildlife Research Unit, Univ. of Wyoming, Laramie WY 82071 USA; e-mail: layers@uwyo.edu]—John C. Carlson.

4. **Is penguin banding harmless?** G. Froget, M. Gautier-Clere, Y. Le Maho and Y. Handrich. 1998. Polar Biology 20:409–413.—The authors explored the impact of banding, the subject of much recent concern, on a colony of King Penguins (*Aptenodytes patagonicus*) at Possesion Island, Crozet Archipeligo. They banded 195 established breeders with single Lam-

bourne steel bands and 190 birds were double banded, one on each flipper. The birds were banded in 1995 and return rates were estimated for the following 2 breeding seasons. Observations of the banded birds were made with binoculars and scopes to minimize potential observer impacts. In addition, as part of another study 633 birds were also fitted with internal transponders and were double banded. These birds were monitored over a 5 yr period from early 1991. Band loss was estimated to be less than 6% regardless of the method of estimation. Double-banded birds returned at a lower rate (45%) than single-banded birds (76%) in the year following banding and double-banded birds bred significantly later than single-banded birds. There was no evidence of mortality directly induced by bands during molt or evidence of flipper injury. The authors felt that delayed breeding by banded birds was possibly due to increased energy expenditure by traveling and foraging birds. This study shows an adverse effect of banding but cannot precisely estimate the effect on single-banded birds. The authors call for additional studies on the effects of banding on penguin survival and behavior and emphasize the need for alternative marking techniques to monitor penguin populations and behavior. [Centre d'Ecologie et Physiologie Energetiques, Center National de la Recherche Scientifique, 23, Rue Becquerel, F-67087 Strasbourg, France; e-mail: g.froget@bham.ac.uk]—John C. Carlson.

5. **Comparison of the tarsal widths of Song Sparrows and Puget Sound White-crowned Sparrows: The use of band size 1.** L. Michalak. 1998. North Am. Bird Bander 23:124–127.—Bird banders are familiar with the classic band sizes recommended for most birds. Size 1B bands are recommended for White-crowned Sparrows (*Zonotrichia leucophrys*), and White-throated Sparrows (*Z. albicollis*), and either size 1B or size 1 is recommended for Song Sparrows (*Melospiza melodia*). Based on personal experience, the author suggests that the Puget Sound White-crowned Sparrow (*Z. l. pugetensis*) could also be banded with a size 1 band. This study was conducted on Iona Island in Richmond, British Columbia. The anterior-posterior tarsal width (APTW) and lateral tarsal width (LTW) of 110 Song Sparrows and Puget Sound White-crowned Sparrows were measured and size 1 bands were placed on the tarsi. Puget Sound White-crowned Sparrows were more variable in their APTW (range 1.29–2.32 mm) than were Song Sparrows (range 1.85–2.35 mm). No statistically significant differences were seen in the variance within the APTW or the means for the two sparrows. Eleven birds were recaptured and none showed problems associated with the use of a smaller band size. The author suggests that a size 1 band is acceptable for either of these two species. [8031 Lucas Road, Richmond, BC, Canada V6Y 1G2]—James L. Ingold.

6. **Duck trapping success and mortality using four trap designs.** J. O. Evrard and B. R. Bacon. 1998. North Am. Bird Bander 23:110–114.—This study examined the efficacy of four trapping designs and protocols on trapping success and mortality of ducks in northwestern Wisconsin. The four traps included swim-in bait traps, swim-in bait traps with decoys, floating bait traps, and decoy traps. Decoys were live Mallard (*Anas platyrhynchos*) hens. Live Blue-winged Teal (*A. discors*) of both sexes were initially used as decoys but abandoned due to high stress related mortality. Between 1982–1990, 760 ducks were captured and the mean number of ducks captured per season was greater in spring (64.9, range 32–97, $n = 9$) than in fall (29.7, range 19–48, $n = 6$). Mallards (60%), Blue-winged Teal (19%), and Wood Ducks (*Aix sponsa*) (18%) were the most commonly captured species. Breeding waterfowl counts showed that Blue-winged Teal were more abundant than Mallards but Mallards were more likely to be trapped. Seasonal differences were apparent as more Wood Ducks were captured in fall than either Mallards or Blue-winged Teal. Fall captures were mostly young birds for Mallards and Blue-winged Teal while Wood Duck adults and young were captured in almost equal numbers. During spring trapping, floating bait traps showed limited success while the three other designs had similar results. Trap mortality was similar for the three most common species, Mallard (5.1%, $n = 19$), Blue-winged Teal (3.9%, $n = 6$), and Wood Duck (4.4%, $n = 5$). Known causes of death for 21 ducks included mink (*Mustela vision*, 9), raccoon (*Procyon lotor*, 6), trap related injuries and accidents (5), and snapping turtle (*Chelydra serpentina*, 1) [Dept. Nat. Res., Box 367, Grantsburg, WI 54840]—James L. Ingold.

BEHAVIOR

(see also 10, 11, 12, 15, 17, 22, 23, 26, 28, 29)

7. **Parent Blue-footed Boobies suppress siblicidal behavior of offspring.** L. W. Lougheed and D. J. Anderson. 1999. Behav. Ecol. Sociobiol. 45:11–18.—Competition between or among siblings within a brood directly effects parental fitness so that one might expect that pre- and post-hatching parental regulatory mechanisms be favored by natural selection. Siblicide in nestlings, which represents perhaps the most extreme means by which one or more nestlings reduce sibling competition, may result in a conflict of interest between parents and offspring. The authors performed cross-fostering experiments with Blue-footed (*Sula nebouxii*) and Masked (*S. dactylatra*) boobies during two breeding seasons on Isla Espanola, Galapagos Islands to examine the effects of sibling aggression. Siblicide almost always occurs between the nestlings of Masked Boobies within a few days of hatching; conversely, it rarely occurs within the first 10 days after hatching in Blue-footed Boobies. Specifically, the authors were interested in discerning whether (1) interspecific differences in siblicidal behavior of nestlings can, by themselves, account for the interspecific difference between siblicide systems, or (2) whether interspecific differences in parental regulatory tendencies can, by themselves, account for the interspecific difference between siblicide systems, or (3) whether interspecific differences in both parents and nestlings are necessary to explain the interspecific difference between siblicide systems. Partial brood loss (PBL; usually when the B-chick fails to survive) did not occur in any of the 20 cross-fostered Blue-footed Booby broods; conversely, PBL occurred in all 22 of the cross-fostered Masked Booby broods. All PBL was a result of B-chicks dying . . . and all PBL was attributed to siblicide. B-chicks appeared particularly vulnerable if they had Masked Booby caregivers and a Masked Booby nestmate. Interestingly, at Masked Booby nestsites, siblicide occurred at significantly higher rates among Masked Booby nestlings versus Blue-footed Booby nestlings. This suggests that interspecific parental regulatory and behavioral differences, cannot by themselves, explain the natural differences in siblicide systems in these species. When Masked Booby nestlings were taken care of by Masked Booby adults, siblicide was a significantly more likely outcome than if they had Blue-footed Booby caregivers. These observations allow the authors to reject the notion that interspecific differences in nestling behavior, can by themselves, explain the differences in siblicide systems. The authors carefully ruled out a few alternative hypotheses that might explain these findings, and conclude that both parents and offspring influence the degree to which siblicide occurs in these species. These data seem to support the genetic parent–offspring conflict hypothesis that is thought to occur in siblicidal members of this taxa. [Dept. of Biology, Wake Forest Univ., Winston-Salem, NC 27109, USA; e-mail: da@wfu.edu.]—Danny J. Ingold.

FOOD AND FEEDING

(see also 26)

8. **Complex patterns of food allocation in asynchronously hatching broods of Crimson Rosellas.** E. A. Krebs, R. B. Cunningham, and C. F. Donnelly. 1999. Anim. Behav. 57:753–763.—Asynchronous hatching in birds often results in differential growth rates of chicks. Whether it is selective feeding of nestlings by parents or low competitive ability of later hatched chicks that accounts for this differential growth rate is unclear. In this study, the authors used video equipment to monitor food allocation within broods of Crimson Rosellas (*Platycercus elegans*). Male and female rosellas differed in their distribution of food to chicks of differing ranks. Male rosellas fed first-hatched chicks more often, whereas females fed all chicks equally. The authors suggest males may feed chicks based on the outcome of competition between chicks or they may selectively feed large chicks. Females, in contrast, may invest more in current reproduction than males because of higher mortality rates for females than males. Females may therefore spend more energy to ensure that all nestlings are fed. Differences in food distribution according to nestling sex were also detected; male parents fed early-hatched male nestlings more than other nestlings. The authors suggest male nestlings are fed more than female nestlings because of their higher energy requirements. [Div. of Botany and Zoology, The Australian National Univ., Canberra 0200, A.C.T., Australia; e-mail: elsie.krebs@anu.edu.au.]—Jeffrey P. Duguay.

9. **Characteristics of foraging trees selected by Pileated Woodpeckers in New Brunswick.** S. P. Flemming, G. L. Holloway, E. J. Watts, and P. S. Lawrance. 1999. J. Wildl. Manage. 63:461–469.—The objectives of this study were (1) to determine the tree characteristics that influence foraging by Pileated Woodpeckers (*Dryocopus pileatus*), and (2) to determine the use of foraging trees in fragmented forest and contiguous forest landscapes. Between 1993–1995, the authors examined foraging tree characteristics and compared those with trees selected randomly. Pileated Woodpeckers tended to forage on trees that were larger in diameter, shorter, and more decayed than random trees. Use of trees differed between contiguous and fragmented forests, but tree characteristics did not differ between these forests. In contiguous forests, Pileated Woodpeckers used coniferous trees (such as red spruce, *Picea rubens* and balsam fir, *Abies balsamea*) more frequently than deciduous trees. In contrast, deciduous trees were used more in fragmented forests. Foraging patterns also differed; more foraging occurred in the bottom 66% and at higher portions of the tree trunk in fragmented forests as compared to the contiguous forests. The authors suggest that current management regimes in this forested area may limit suitable foraging habitat for Pileated Woodpeckers, and that habitat objectives should include providing over-mature coniferous and deciduous stands in addition to returning the tree community to a more natural state. [Gros Morne National Park, P.O. Box 130, Rocky Harbour, NF A0K4N0, Canada; e-mail: stephen_flemming@pch.gc.ca]—Kerri T. Vierling.

10. **Diet and foraging effort of Adelie Penguins in ralation to pack-ice conditions in the southern Ross Sea.** D. G. Ainley, P. R. Wilson, K. J. Barton, G. Ballard, N. Nur, and B. Karl. 1998. Polar Biology 20:311–319.—The diet and aspects of foraging ecology of Adelie Penguins (*Pygoscelis adeliae*) were investigated during 3 austral summers from 1994 through 1997 at 3 colonies on Ross Island in the southwestern Ross Sea during the chick provisioning period. Diet sampling was accomplished through the water offloading technique and 15 birds at each colony were fitted with a radio transmitter to determine foraging trip duration. During the last summer (1996–1997) a computerized scale at one sub-colony in each of the colonies was used to determine weights of penguins entering and leaving the colony. Measurements of sea ice conditions were derived from satellite imagery. The authors sought to explore the effects of mesoscale spatial and temporal differences in ice cover on aspects of Adelie Penguin foraging behavior. They found that the diet of the penguins was dominated by the fish *Pleurogramma antarcticum* and the krill *Euphausia crystallorophias,* and krill were more prevalent in the diet in a year of heavier ice cover as expected. However, the predominance of fish in the diets of the penguins during these years was unexpected. Most colonies had 50% or greater fish in their diet each year which contrasts with earlier studies in the region where fish were a minor component of the diet. The prevalence of fish in the diets of penguins in all colonies increased with time during each season. They also determined that the penguins at the colony located furthest from pack ice (Cape Crozier) were foraging longer in duration and fed their chick less food than at the other colonies. More research is needed to determine why pack ice is so important as foraging habitat for Adelie penguins. [H.T. Harvey & Associates, P.O. Box 1180, Alviso, CA 95002, USA; e-mail: harveyecology@worldnet.att.net]—John C. Carlson.

SONGS AND VOCALIZATIONS

11. **The functions of song in the Serin.** P. G. Mota. 1999. Ethology 105:137–148.—This study describes singing behaviors in the Serin (*Serinus serinus*). The purpose of the study was to evaluate the extent to which male songs might play a role in stimulating female reproductive behaviors and to examine the extent to which song might be involved in mate guarding by the male. Male singing time was found to correlate with female nest building; males that sang more had females that built their nests more actively. Singing time, song flights, and nest building all peaked at about 4 days prior to egg laying and, therefore, seemed to correspond to the onset of rapid follicular development. It is suggested that male song might play a role in stimulating follicular development as has been demonstrated in the closely related Canary (*S. canaria*). In contrast to some other species, male song in the Serin did not appear to be involved in the stimulation of copulation solicitation by females. Lastly, there was a negative correlation between extra-pair copulation attempts and song flights, suggesting that song flights may play a role in mate guarding. [Departamento de

Antropologia, Universidade de Coimbra, 3000 Coimbra, Portugal; e-mail: pgmota@ci.uc.pt]—Jeffrey G. Kopachena.

12. **Song tutor choice in polyandrous Dunnocks.** N. E. Langmore. 1999. Ethology 105: 125–136.—This three-year study examines the choice of song tutors by young male Dunnocks (*Prunella modularis*) living in a population with a polyandrous mating system. These males typically settled as subordinates onto the territories of other males. Because they originated from outside the local population, but did not bring new song types with them, it was concluded that these males did not learn their songs from their fathers or their natal population. In fact, the yearlings learned their songs from their co-males and territorial neighbors. There was a high degree of song phrase sharing among neighbors, hence, learning the songs of the co-male provides a shortcut means by which yearling males can learn the song types of every neighbor. [Zoology Dept., Univ. of Cambridge, Downing St., Cambridge, CB2 3EJ, UK; e-mail: nel10@hermes.cam.ac.uk]—Jeffrey G. Kopachena.

13. **Individual and species differences in quail calls (*Coturnix c. japonica, C. c. coturnix* and a hybrid.** S. A. Collins and A. R. Goldsmith. 1998. Ethology 104:977–990.—European Quail (*Coturnix coturnix coturnix*) and Japanese Quail (*Coturnix coturnix japonica*) have similar stereotypic calls. This study evaluates the call structure of these two subspecies and their hybrids for features that may be important for individual and subspecies recognition. Evaluation of sonograms indicated that subspecies differed primarily in terms of peak frequency, the duration of notes, and the duration of gaps between notes. Hybrids tended to have call structures that reflected a mixture of parental call types, but which most closely resembled the call structure of the male parental subspecies. When the responses of European and Japanese quails were observed toward playbacks of European, Japanese, and hybrid quail calls, individuals responded most strongly to the calls of their own subspecies, most weakly toward calls of the other subspecies, and responded with intermediate intensity toward hybrid calls. Calls varied among individuals, particularly among individual Japanese Quail. A discriminant functions analysis was able to correctly identify the calls of over 95% of all individuals, regardless of whether they were European, Japanese, or hybrid quail. This result suggests that individual calls varied sufficiently to enable individual recognition. [Section of Ethology, Leiden Univ., P.O. Box 9516, 2300 R.A., Leiden, The Netherlands]—Jeffrey G. Kopachena.

NESTING AND REPRODUCTION

(see also 4, 7, 29, 31, 38)

14. **Copulation rate and sperm use by female Bearded Tits, *Panurus biarmicus*.** A. Sax, H. Hoi, and T. R. Birkhead. 1998. Anim. Behav. 56:1199–1204.—Multiple within-pair copulation rates have been explained as a means of ensuring fertilization (fertilization hypothesis) and as a means by which females produce high quality offspring by allowing different males' sperm to compete for fertilization success (sperm competition hypothesis). The authors housed single pairs and groups (one pair plus two extra males) of Bearded Tits to determine the effect of copulation frequency on the number of sperm present in the reproductive tract of the female. The rate of loss of spermatozoa from the female's reproductive tract was determined by examining the number of spermatozoa in the perivitelline layer of the egg. Although females in group situations copulated at a higher rate than females with a single male, there was no difference in the total number of sperm present in the perivitelline layers between these two groups. The rate of loss of sperm from the reproductive tract of the female was high, suggesting that in the absence of copulations during the egg-laying period females run the risk of laying one or more infertile eggs. Indeed, it was revealed that when separated from their mates after the first egg had been laid, one out of seven clutches contained infertile eggs. The authors also suggest this high rate of sperm loss may provide females with an opportunity to modify the paternity of their brood. [Lorenz Institut fur Vergleichende Verhaltensforschung, Savoyenstr. 1a, 1160 Vienna, Austria; e-mail: a.sax@klivv.oeaw.ac.at.]—Jeffrey P. Duguay.

15. **Nest predation in relation to nest placement in the Greater Ani (*Crotophaga major*).** P. Lau, C. Bosque, and S. D. Strahl. 1998. Ornithol. Neotropical 9:87–92.—Nest placement

of Greater Anis greatly influenced the success of that nest. Nest success during the incubation phase was higher for nests placed in isolated woods than in the contiguous forest. The authors postulated that egg predation is by capuchin monkeys (*Cebus olivaceus*) and rodents. The monkeys do not swim and cannot cross water to isolated woods but do move through trees in the contiguous forest. This finding is rather interesting in that it is counter to the "common wisdom" regarding predation in Nearctic forest fragments. [Univ. Simon Bolivar, Depto. de Biologia de Organismos, Apartado 89,000, Caracas 1080A, Venezuela.]—Robert C. Beason.

16. **One-parent nesting in Cinnamon-vented Pihas (*Lipaugus lanioides*, Cotinginae, Tyrannidae).** E. O. Willis and Y. Oniki. 1998. Ornithol. Neotropical 9:129–159.—Unlike most passerines, the Cinnamon-vented Piha is not monogamous and the male provides no assistance to the female in incubation or rearing the young. The species eats large insects and fruits and feed insects to its young. The males are not territorial (fruit is unpredictable in location) and the male does not guard his mate (she is cryptic in the dark forest). Consequently, males have little ability to prevent extra-pair copulations. Furthermore, the female defends the area around the nest from males (perhaps to reduce competition). The nest is small and contains only one egg. This probably helps it avoid detection by predators. Long incubation and nestling periods reduce the number of trips the female makes to and from the nest. The female attracts marmosets and potential avian predators. Thus, predation and the inability of the male to prevent extra-pair copulations probably prevent monogamy in this species. [Depto. de Zoologia, UNESP, 13506-900 Rio Claro, S. Paulo, Brazil.]—Robert C. Beason.

17. **Natural-cavity use by nesting Wood Ducks in Illinois.** A. P. Yetter, S. P. Havera, and C. S. Hine. 1999. J. Wildl. Manage. 63:630–638.—The availability of suitable nesting cavities may limit populations of many secondary cavity-nesting birds. Cavity availability and cavity use by Wood Ducks (*Aix sponsa*) was examined in palustrine forested wetlands in Illinois during 1994 and 1995. There were 103 suitable cavities in the 97 0.5-ha plots, and these cavities occurred primarily in silver maple (*Acer saccharinum*). There was no significant difference in the species of tree used by nesting Wood Ducks. However, nesting Wood Ducks preferred nesting in cavities that were excavated by Pileated Woodpeckers (*Dryocopus pileatus*); these cavities typically had entrances that were smaller than entrances of cavities that were not used. The primary predator of Wood Duck nests was the raccoon (*Procyon lotor*), and nest cavities with small entrances may have provided some protection from predators. Reproductive success was 21%, and the authors suggest that Wood Duck populations may be limited more by predation than by cavity availability. Wood Duck populations might benefit by increasing the quantity of large maples and other water-tolerant species. In addition, the authors suggest that forest management should encourage Pileated Woodpecker populations since Wood Ducks prefer using cavities excavated by these woodpeckers. [Illinois Natural History Survey, Forbes Biological Station, Frank C. Bellrose Waterfowl Research Center, 17500 East CR 1950 North, P.O. Box 590, Havana, IL 62644, USA.]—Kerri T. Vierling.

18. **Effects of southern flying squirrels on nest success of Red-cockaded Woodpeckers.** L. R. Mitchell, L. D. Carlile, and C. R. Chandler. 1999. J. Wildl. Manage. 63:538–545.—Southern flying squirrels (*Glaucomys volans*) may negatively impact Red-cockaded Woodpecker (*Picoides borealis*) reproductive activities through predation or nest-cavity competition. While management efforts for the Red-cockaded Woodpecker often included management of southern flying squirrel populations, few studies have demonstrated direct benefits of squirrel management on woodpecker nesting success. In 1996 and 1997, the authors examined Red-cockaded Woodpecker nesting activities in (1) cavity tree clusters where flying squirrels were removed, (2) cavity tree clusters where flying squirrels were excluded from cavities, and (3) cavity tree clusters where no flying squirrel management occurred. Management of flying squirrel populations did not affect the likelihood of nest initiation, or the date of nest initiation. Reproductive success was significantly higher in clusters where flying squirrels were removed in 1996, but not in 1997. Despite the increase in reproductive success, partial loss of nest contents was higher in clusters where flying squirrels were removed. Due to the decreased productivity, the number of eggs, nestlings, and fledglings did not differ among the treatments. Because squirrel management activities did not have significant im-

pact on the overall productivity of Red-cockaded Woodpeckers, the authors suggest that routine control of flying squirrels is not necessary in healthy populations of woodpeckers. However, they suggest that flying squirrel control may still be an effective management tool in regions with smaller woodpecker populations or in regions where suitable cavities are limited. [Natural Resources Conservation Service, Route 1, Box 1B, Milan, MO 63556, USA.]—Kerri T. Vierling.

19. **Nest predation in suburban and rural woodlots of northern Ohio.** M. N. Melampy, E. L. Kershner, and M. A. Jones. 1999. Am. Midl. Nat. 141:284–292.—The authors studied the effects of nest predation in three different woodlot regions in northern Ohio during July and August of 1991. Fifteen woodlots ranging from 7.4 to 690 ha were selected and were classified as one of the following: (1) suburban with high population density surrounded mainly by housing and commercial developments, (2) rural with low population density mainly surrounded by 60% crops and 15% forest, and (3) transition with medium population density surrounded by 38% crops and 22% forest. Open, cup-shaped nests containing three quail eggs were placed in various locations in trees or on the ground in all of the woodlots. After one week, the sites were revisited noting if eggs were present or absent, and the shape of the nest. Eggs were removed from 257 (73%) of the 354 artificial nests. Predation rates were similar for all woodlot sites regardless of size. These results are contrary to previous studies which have shown a lower predation rate for rural woodlots. The authors believe that the higher than expected predation rate was due to a higher density of mammalian predators, which in turn likely resulted from a high ratio of surrounding cropland to forest. This is supported by the data which show that ground nests were predated more frequently than tree nests (85–92% versus 52–60% respectively). With a sufficiently high density of mammals, the interior of large woodlots may also be subject to predation. This study illustrates that relative predation rates change as a consequence of changes in forest cover and surrounding land use. [Dept. of Biology, Baldwin-Wallace College, Berea, OH 44017, USA.]—Tom Leiden.

20. **Early body condition and hatching success in the Snow Petrel *Pagodroma nivea*.** C. Barbraud and O. Chastel. 1999. Polar Biology 21:1–4.—Variation in reproductive success can be attributed to stochastic environmental effects or individual quality. Large scale environmental effects have been shown to influence reproductive success in the Snow Petrel. This study attempted to evaluate the importance of individual variation in reproductive success. Prebreeding body mass was corrected for body size in 42 female and 51 male petrels during the 1993–1994 austral summer, and the relationship between body mass, hatching success and laying date was examined with a logistic regression. Male Snow Petrels were found to have significantly higher prebreeding body mass than females, and females that successfully hatched eggs were in better prebreeding condition than females that were unsuccessful. There was a significant effect of laying date on hatching success. The authors suggest that prebreeding body condition for females was important for successful incubation due to the demands of egg formation and that females in poor condition would more rapidly reach a threshold mass where abandonment would occur. They also suggested that males had a greater ability to fast due to their larger size, and female body condition may be more important for this species' reproductive success than other Procellariiformes. Heavy snowfall during the laying period may have resulted in the strong effect of female body condition on reproductive success and probably resulted in the relationship between laying date and reproductive success. [Centre d'Etudes Biologiques de Chize, Centre National de la Recherche Scientifique, F-79360 Villiers en Bois, France; e-mail: petrel@cebc.cnrs.fr]—John C. Carlson.

21. **Effect of predation by skuas on breeding success of the Cape Petrel *Daption capense* at Nelson Island, Antarctica.** K. Weidinger. 1998. Polar Biology 20:170–177.—This study focuses on the consequences of nest-site selection and timing of breeding of Cape Petrels to individual predation risk within the colony. Weidinger investigated the effect of skua predation on the breeding success of a Cape Petrel colony at Nelson Island, Antarctica during the 1991–1992 austral summer. The author monitored the breeding performance of 1080 nests distributed across 4 colonies and measured 440 eggs throughout the colonies. Colonies were categorized by size and disturbance. Physical nest site characteristics were obtained for all nests, and nest density was determined. Weidinger found low reproductive success (29%) at these colonies, and found predation by skuas to be the major determinant of breeding

success. Skua predation increased with colony size but decreased with greater local nest density within colonies. Nest sites varied in quality with respect to predation risk, as nests accessible only or most easily from the air suffered significantly less predation. Also, predation was higher on nests containing narrower eggs, independent of lay date and nest site characteristics. This suggests that parental quality also influenced breeding success, as younger females tend to lay narrower eggs. Breeding success was also greater for early nests. Weidinger surmised that high breeding synchrony is a consequence of selection for early breeding in a highly seasonal environment with a short breeding season, and is not a result of a predator swamping strategy. [Laboratory of Ornithology, Palacky Univ. tr. Svobody 26, 771 46 Olmouc, Czech Republic; e-mail: weiding@prfnw.upol.cz]—John C. Carlson.

MIGRATION, ORIENTATION, AND HOMING

22. **The influence of repeated releases on the homing behaviour of Sand Martins (*Riparia riparia*).** D. Giunchi, E. Mongini and N. E. Baldaccini. 1999. Ethology 105:111–124.—For logistic reasons, many experimental protocols used in studies of homing behavior and orientation require repeated use of the same birds in different trials. However, previous experience can influence the homing ability of individuals and this effect needs to be accounted for when interpreting the results of such studies. Unfortunately the precise effect of prior experience on homing ability is poorly documented, and what information is available is based on data collected only from homing pigeons. This study examines the effect of prior experience on homing ability in a wild species, the Sand Martin. Data collected from birds repeatedly released from the same site show that previous experience significantly improved initial orientation and reduced homing speed and, therefore, were in general agreement with previous studies using homing pigeons. However, when experienced birds were released from a new site located the same distance from the previous site, but in the opposite direction from the nesting colony, their directional preference did not change and their homing times did not differ from those of naïve birds. The authors explain these results to be, in part, a result of habituation to handling and a form of directional training. [Dipartimento di Etologia, Ecologia ed Evoluzione, Universita di Pisa, via A. Volta 6, I-56126 Pisa, Italy; e-mail: bedini@discau.unipi.it]—Jeffrey G. Kopachena.

23. **The orientation behaviour of Chaffinches, *Fringilla coelebs*, caught during active migratory flight, in relation to the sun.** R. Muheim, L. Jenni, and P. Weindler. 1999. Ethology 105:97–110.—Orientation studies typically use birds caught during stopovers or use hand-reared birds as test subjects. This study used Chaffinches (*Fringilla coelebs*) caught during active migratory flight to test the hypothesis that such birds should show stronger, appropriate directional orientation in Emlen funnels than birds caught during resting periods. However, the experiments failed to support this hypothesis, since the birds did not orient in the appropriate migratory direction. When tested under "sunlit" conditions, the birds tended to orient toward the sun. When tested under "overcast" conditions, the birds tended to orient toward the northwest, a direction that was deemed by the authors to be "nonsense orientation." It is concluded that freshly captured birds are too stressed to show appropriate orientation behavior when tested soon after capture. [Dept. of Animal Ecology, Lund Univ., Ecology Bld., S-223 62 Lund, Sweden; e-mail: rachel@zool.unizh.ch]—Jeffrey G. Kopachena.

24. **The direction of celestial rotation affects the development of migratory orientation in Pied Flycatchers, *Ficedula hypoleuca*.** P. Weindler, V. Liepa, and W. Wiltschko. 1998. Ethology 104:905–915.—Migratory orientation in young passerine migrants is based on innate information that uses the geomagnetic field and celestial rotation as references. This study was designed to test the role that celestial rotation plays in establishing migration direction. Three groups of juvenile Pied Flycatchers were used; one exposed to no celestial rotation, one exposed to normal celestial rotation at a normal speed, and one exposed to reversed celestial rotation at normal speed. Natural geomagnetic fields were used for all groups. As has been documented previously, Pied Flycatchers exposed to a normal geomagnetic field but deprived of any exposure to celestial rotation showed a bimodal distribution of orientation directions, which corresponded to a southwest to northeast axis. Birds exposed to a normal geomagnetic field and normal celestial rotation showed a unimodal distribution of orientation directions corresponding to the normal southwesterly migration direction of this

species from Latvia (where the birds originated). Birds exposed to a normal geomagnetic field with reversed celestial rotation showed a bimodal pattern that was similar to that of birds deprived of exposure to celestial rotation. The results indicate that the geomagnetic field is important in establishing the axis of migration direction, but that normal celestial rotation is necessary for the birds to be able to choose the appropriate end of the axis to orient towards. [Fachbereich Biologie der J. W. Goethe-Universitat, Zoologie, Siesmayer-straBe 70, D-60054 Frankfurt a.M., Germany; e-mail: wiltschko@zoology.uni-frankfurt.d400.de]—Jeffrey G. Kopachena.

25. **Wintering Ovenbird from Belize recovered on Pennsylvania breeding ground.** B. A. Dowell and C. S. Robbins. 1998. North Am. Bird Bander 23:109.—The authors report on the first of 9350 migrant passerines banded in Belize in winter to be recovered on the breeding grounds. A first winter Ovenbird (*Seiurus aurocapillus*) was banded on a cacao plantation in central Belize on 8 February 1997. It was subsequently found dead on the deck of a home in Saegertown, Crawford Co., PA on 28 June 1998. This bird also tied the record for the oldest known Ovenbird at 9 yr, 0 months. [Biol. Resources Div., U.S. Geol. Surv., Patuxent Wild. Res. Cent., 11410 American Holly Dr., Laurel, MD 20708-4015, USA.]—James L. Ingold.

26. **Fall stopover behavior of Willow Flycatchers using a riparian corridor in central California.** C. D. Otahal. 1998. North Am. Bird Bander 23:115–123.—The migratory stopover patterns of Willow Flycatchers (*Empidonax traillii*) were studied by mist netting at the Coyote Creek Riparian Station, Alviso, CA. Birds were netted in the fall (1 August–29 October) from 1886 through 1995. Four migratory behaviors were analyzed: timing of migration, percentage of resting birds, minimum stopover length, and total and rate of change of body mass. During the study, 340 individuals were banded and 38 were recaptured for a total mist netting effort of 91,962 net hours. Willow Flycatchers began migration through the study area by 5 August and were usually gone by early October, with the peak migration occurring in early September. Mean stopover time was found to be six days (range 2–19 days, SD = 3.7, $n = 35$) and mean mass change was 0.7 g (range 1.8–3.0 g, SD = 1.1, $n = 35$) which was significant ($P < 0.01$). A positive linear relationship between length of stay and change in body mass was noted ($P < 0.01$, $R^2 = 0.55$, $n = 35$). Rates of change in body mass ranged from −0.6 to 0.5 g/day (mean = 0.1, SD = 0.3, $n = 35$). Since change in mass was greater for transient birds than for resting birds (those staying longer on the study area) the author concludes that less fat individuals may be using the area for a multi-day refueling stop than heavier individuals. He also suggests that a resting bird, by increasing its mass could increase its potential flight range by 158 km.[21 Vineyard Ct., Hollister, CA 95023, USA.]—James L. Ingold.

HABITAT USE AND TERRITORIALITY

(see also 17, 19, 31, 32, 38)

27. **Home ranges, habitat selection and mortality of Ring-necked Pheasants (*Phasianus colchicus*) in north-central Maryland.** S. A. Smith, N. J. Stewart and J. Edward Gates. 1999. Am. Midl. Nat. 141:185–197.—During the 1970s and early 1980s, the Ring-necked Pheasant population in Maryland, a state that represents the southern edge of this species' range in the northeastern United States, declined significantly. In this study the authors monitored 26 radiotagged pheasants (16 female, 10 male) from early January 1988 through mid-December 1988 in order to examine their movements, habitat use, seasonal and core home ranges and causes of adult mortality. Ultimately they aimed to address the larger question of why pheasant populations in this region were slumping so rapidly. Although the home ranges of both sexes were only slightly but not significantly larger during the nesting season than in the winter months, the core ranges were significantly larger during nesting compared with the winter and post-nesting seasons. Both during the nesting and winter months, the proportion of habitats used by pheasants (both sexes) differed significantly from the habitats that were available on the 2002 ha study area. Pheasants spent significantly more time in shrublands (first) and wetlands (second) during the nesting season than they did in developed lands, croplands, grasslands and forests. They spent more time in wetlands, croplands

and shrublands respectively than in the other habitats during the winter months. No difference was detected in the habitat preferences of the sexes during either the nesting season or winter. Additionally, no differences were detected between males and females when comparing the distances they moved during the winter-to-nesting period and the nesting-to-post-nesting periods. Only 4 of the 26 radiotagged pheasants survived until the end of the study. Sixty-one percent of the deaths (significantly more than all other causes of mortality combined) were the result of predation (foxes = 28%; raptors = 33%). Most pheasants that were preyed upon inhabited vegetation that was tall and dense enough to conceal them compared to more open habitats. Based on these data the authors suggest that pheasant populations in Maryland are declining as a result of changes in land-use patterns (including frequent haying) and reductions in adequate nesting habitat. Their management recommendations include providing incentives to landowners to maintain more shrub- and wetlands . . . the preferred nesting and wintering pheasant habitat in this study. Unfortunately, these data (collected over 10 years ago) are likely antiquated and probably do not provide a clear picture of the status of the Ring-necked Pheasant population in Maryland today.[Heritage and Biodiversity Conservation Programs, Maryland Dept. of Nat. Resources, P.O. Box 68, Main St., Wye Mills, MD 21679, USA.]—Danny J. Ingold.

28. **Response of Northern Harriers and Short-eared Owls to grassland management in Illinois.** J. R. Herkert, S. A. Simpson, R. L. Westemeier, T. L. Esker, and J. W. Walk. 1999. J. Wildl. Manage. 63:517–523.—The authors studied nest-site selection by Northern Harriers (*Circus cyaneus*) and Short-eared Owls (*Asio flammeus*) to determine the influence of grassland management on breeding habitat preference. Between 1990–1994, the authors examined nest placement on 2 grassland complexes. Grassland complexes were comprised of grassland tracts of various sizes and management regimes. Twenty-nine Northern Harrier nests were found primarily in fields that had not been disturbed by recent management activities in the previous 12 months. In contrast, all Short-eared Owl nests were located in fields disturbed by management activities within the last 12 months. There was no relationship between the size of the grassland tract and Northern Harrier nesting activities, despite the widespread belief that Northern Harriers are area-sensitive. In addition, there was no relationship between the vegetation composition (nonnative vs. native grasses) and nest placement for either species. In order to provide suitable nesting habitat for these two species, the authors suggest that a mix of managed and idle grasslands be provided. [Illinois Endangered Species Protection Board, Springfield, IL 62701, USA; e-mail: jherkert@dnrmail.state.il.us]—Kerri T. Vierling.

29. **Wood Duck brood movements and habitat use on prairie rivers in South Dakota.** D. A. Granfors and L. D. Flake. 1999. J. Wildl. Manage. 63(2):639–649.—The author was investigating 4 specific objectives: (1) comparing distances traveled to brood rearing areas and the frequency of secondary moves, (2) effect of water conditions and brood age on secondary moves, (3) to determine if wetland habitat use was random, and (4) to examine annual and seasonal variation in habitat use. The project compared the movements and habitat use of radio-marked female Wood Ducks (*Aix sponsa*) with broods in South Dakota on the contrasting landscapes of the Big Sioux River (broad floodplain and riparian forest) and the intermittent Maple River (emergent vegetation) from 1992–1994. The author had 102 radio-marked broods and 2333 locations to use in data analysis of movements and habitat use. The author found that movements between nest sites and brood rearing areas were greater on the Maple River than on the Big Sioux. Primary moves of Wood Duck broods observed in this study were quite long, up to >10 km were necessary to find suitable habitat. Broods used semipermanent wetlands and tributaries outside the flood plain during dry years on the Big Sioux River and forested wetlands along the river during wet years. The broods used emergent vegetation along the river channel on the Maple River during the entire study. Isolated wetlands were avoided probably due to the increased risk of predation and broods rarely traveled overland. The rivers provided excellent travel corridors and the riparian habitat was sufficient for brood rearing. Females appeared to use brood areas that were familiar either because they had been reared in that area or because they had successfully reared a brood there in a previous year. There were frequent secondary moves (>50% of broods), which could be partially explained by variations in water condition. The author

stated that weekly changes in water levels could influence brood movements by altering food availability. It was recommended that landowners retain riparian vegetation on perennial rivers and emergent vegetation along intermittent streams to provide habitat during the wet and dry cycles. [Dept. of Wildlife and Fisheries Sciences, South Dakota State Univ., Brookings, SD 57007, USA.]—David Olson.

30. **Effects of habitat area on the occurrence of grassland birds in Illinois.** J. W. Walk and R. E. Warner. 1999. Am. Midl. Nat. 141:339–344.—The authors surveyed nine grassland tracts ranging in size from 7 to 120 ha (totalling 489 ha) for 12 species of grassland birds in Prairie Ridge State Natural Area, Jasper Co., Illinois from 1994 through 1997. Species richness was significantly correlated with tract area; seven species were found on the smallest tract and all twelve were confirmed on the largest tract. Minimum area requirements were 55 ha for Northern Harriers (*Circus cyaneus*), 65 ha for Greater Prairie-Chickens (*Tympanuchus cupido*) and Upland Sandpipers (*Bartramia longicauda*), and 75 ha for Savannah (*Passerculus sandwichensis*) and Henslow's sparrows (*Ammodramus henslowii*). A positive correlation in these five species between grassland tract area and frequency of occurrence was also detected. The authors determined that about 60 ha appears to be the minimum grassland area necessary to attract 9 of the 12 birds surveyed. They propose that the management and acquisition of grassland tracts be increased to between 40 and 200+ ha with nearby grasslands within 1 km. While certain species, such as Northern Harriers and Greater Prairie-Chickens, can move easily between smaller grassland tracts in order to forage, supporting the scattered-pattern approach, many species are less able to disperse requiring larger tracts of habitat. [Dept. Nat. Resources and Environ. Sciences, Univ. of Illinois, Urbana, 61801, USA.]—Tom Leiden.

ECOLOGY

(see also 7, 8, 9, 15, 17, 18, 19, 21, 27, 28, 30, 33, 34, 38)

31. **Costs and benefits of nest cover for ptarmigan: changes within and between years.** K. L. Wiebe and K. Martin. 1998. Anim. Behav. 56:1137–1144.—Because of high predation rates on ground nesting birds, females may initiate several nesting attempts during a given breeding season. As a result, selection may favor the ability to learn characteristics of a good nest and to modify behavior based on past experience. Wiebe and Martin examined nest-site attributes at 331 White-tailed Ptarmigan (*Lagopus leucurus*) nests in 9 years to determine if females modified their selection of sites over time based on past experience with predators. The amount of cover around first and second nesting attempts was similar, as was the amount of cover between years. Also, nesting success did not improve with female age or nesting attempt. There were, however, marked seasonal patterns in nest-site choice. The authors suggest microclimate may be a more important selective pressure on nesting birds than is predation. [Dept. of Biology, Univ. of Saskatchewan, 112 Science Place, Saskatoon, Saskatchewan S7N 5E2, Canada; e-mail: karen.wiebe@usask.ca.]—Jeffrey P. Duguay.

32. **Effects of habitat and landscape characteristics on avian breeding distribution in Colorado foothills shrub.** M. E. Berry and C. E. Bock. 1998. Southwestern Nat. 43:453–461.—The distribution of birds in the foothills shrub of the Colorado Front Range were studied by the authors from 16 May to 30 June in 1996 and 1997. Eighty-four study points were established and surveyed three times a year. Habitat and landscape variables (12 and 3 respectively) at each study site were also quantified. The authors recorded 59 bird species in which 34 were considered breeding resident birds. Study plots were highly variable in shrub species composition and structure. Avian species richness increased with two habitat variables: percent shrub cover and horizontal heterogeneity (patchiness). There was no correlation between species richness and landscape occurrence of shrub, conifer or grassland habitat. Five of the eight most common species did reveal an association between at least some habitat variables and species occurrence. The avian community evolved with the occurrence of foothill shrub patches regardless of the natural landscape. The authors did express concern when these landscapes are altered by human intervention. [Dept. Environmental, Population, and Organismic Biology, Univ. Colorado, Boulder, CO 80309-0334.]—Tom Leiden.

POPULATION DYNAMICS

(see 3, 32, 38)

33. **An estimate of the Plumed Frogmouth *Podargus ocellatus plumiferus* population size in the Conondale Ranges.** G. C. Smith, B. J. Hamley, and N. Lees. 1998. Pacific Conservation Biology 4:215–226.—One of Australia's rarest bird species, the Marbled Frogmouth (*P. ocellatus*), occupies a restricted range in two areas of northeastern Australia, and is listed as Vulnerable under the Queensland Nature Conservation Act. The southern sub-species, the Plumed Frogmouth, is found only in south-eastern Queensland and northern New South Wales. The Conondale Ranges are a stronghold for this cryptic and nocturnal bird, but active logging in the area has produced a situation analogous to the Spotted Owl (*Strix occidentalis caurina*) controversies in North America. This study was designed to obtain ecological data about primary habitat utilization, distribution, and home range for the Conondale Ranges population. From 1993–1995 14 birds were fitted with radio transmitters and 9 were tracked for up to 69 days. Nesting and roosting sites were located. In addition, taped call-playback methods were employed to survey the entire population area. Birds were recorded 59% of the time in rainforest, 29% in wet sclerophyll, and 11% in open forest, and concentrated activities along creek and drainage lines. Of 545 sites surveyed 34% had no responding birds, 25% a single bird and 41% 2–8 birds. Home range estimates for these sedentary birds ranged from about 5 to 19 ha. Males and females within pairs had different but largely overlapping home ranges. A conservative population estimate was 755–858 pairs. A Minimum Viable Population estimate of 700 pairs suggests little margin for error. Intensive logging has removed over 7000 ha of rainforest and wet sclerophyll forest in the Conondale Ranges since 1950 with an estimated frogmouth population reduction of more than half. The authors recommend that logging of core habitat be minimized until further research can more accurately estimate current population levels in the Conondale Ranges. [Resource Science Centre, Dept. of Natural Resources, 80 Meiers Road, Indooropilly, Queensland 4068, Australia.]—William E. Davis, Jr.

34. **Status of the interior population of Least Tern.** E. M. Kirsch and J. G. Sidle. 1999. J. Wildl. Manage. 63:470–483.—The authors examined population trends and fledging success of the interior population of the endangered Least Tern (*Sterna antillarum*). They examined population trends between 1986–1995 at the local scale (e.g., river reaches), drainage scale (Missouri River, Platte River, and Lower Mississippi River basins), and for the entire population. Of the 31 local areas surveyed, population trends in 7 local areas were significant; 5 of the areas showed a positive trend and the remaining 2 areas showed a negative trend. Only the Lower Mississippi River drainage showed a significant positive trend, and population trends for the entire population were positive. Using a value of 0.51 fledglings/pair as a minimum estimate needed for population maintenance, most breeding areas have not reached the desired productivity levels. While the population has reached the recovery goal of 7000 birds, most of this was due to the increase in the Lower Mississippi River. Immigration from the Gulf Coast population may be primarily responsible for the population increase noted on the Lower Mississippi River. To more effectively assess the status of Least Terns, the authors suggest that improved and standardized methods of rangewide monitoring of populations and reproduction be implemented. In addition, preservation of the Gulf Coast Least Tern population should be included to further evaluate its importance to the population dynamics of the interior Least Tern. [U.S. Geological Survey, Upper Midwest Environmental Sciences Center, P.O. Box 818, La Crosse, WI 54603, USA.]—Kerri T. Vierling.

ZOOGEOGRAPHY AND DISTRIBUTION

(see 25, 28, 34)

SYSTEMATICS AND PALEONTOLOGY

(see also 36)

35. **Is the Greater Antillean Nightjar, *Caprimulgus cubanensis* (Aves: Caprimulgidae), a composite species?** O. H. Garrido and G. B. Reynard. 1009. Ornithol. Neotropical 9:1–12.—Based on differences in vocalization and plumage, the authors propose that the Greater

Antillean Nightjar is composed of two distinct species: the Hispaniolan Nightjar (*C. eckmani*) and the Cuban Nightjar (*C. cubanensis*). The song of the Cuban birds is 4–5 notes and the Hispaniolan birds has 3 notes. The notes of the Cuban birds slur downward in pitch but those of the Hispanolian birds ascend. The authors do not appear to have conducted any playback experiments to assess the response of the birds to both vocalizations. Morphological measurements are similar for the two birds although the Hispaniolan birds have a longer tail. The Hispaniolan birds have a larger beige patch on the rectrices, wider blackish streaks on the crown and hind neck, and unstreaked vent covers (streaked in the Cuban birds). The proposed split follows a pattern that many island taxa are species rather than subspecies or populations. [Museo Nacional de Historia Natural, La Habana, Cuba.]—Robert C. Beason.

EVOLUTION AND GENETICS

36. **Pulmonary function and metabolic physiology of theropod dinosaurs.** J. A. Ruben, C. Dal Sasso, N. R. Geist, W. J. Hillenius, T. D. Jones, and M. Signore. 1999. Science 283: 514–516—One of the unique features of birds is their respiratory system. If birds and dinosaurs were found to have similar respiratory systems that would provide compelling new evidence that birds and dinosaurs are closely related. Ultraviolet light was used to analyze the placement of internal organs in a fossil of a theropod dinosaur, *Scipionyx samniticus*. The authors found that the arrangement of internal organs, such as the intestines and liver, was similar to the arrangement found in crocodilians. Similarities to the crocodilian pelvis were also found in the specimen. This led the authors to conclude that *Scipionyx samniticus* and other theropod dinosaurs possessed a lung similar to that of crocodilians, which is aided by a hepatic piston. Furthermore, the position of organs in the abdomen makes it unlikely that these dinosaurs had abdominal air sacs. Opponents of the theory that birds evolved from theropod dinosaurs argue that the breathing system in *Scipionyx samniticus* is too advanced to have given rise to the complex breathing system of birds. Supporters of the theropod theory of bird evolution point out that crocodilians that possess the hepatic piston diaphragm are more sluggish than theropod dinosaurs are believed to have been, but a lower aerobic capacity in crocodilians may be a derived trait. Some crocodylomorphs from the Triassic may have had higher aerobic capacities than extant crocodilians. This new evidence of the internal organs of a dinosaur may not completely discredit the theropod theory of bird evolution, but it raises some interesting questions on when the avian style of breathing evolved if birds came from theropod dinosaurs. [Zoology Dept., Oregon State Univ., Corvallis, OR 97331, USA.]—Will Fields.

PHYSIOLOGY AND DEVELOPMENT

(see 36)

PARASITES AND DISEASE

(see 37)

WILDLIFE MANAGEMENT AND ENVIRONMENTAL QUALITY

(see also 3, 28, 30, 32, 33, 34)

37. **Determination of the presence of *Mycobacterium avium* on Guam as a precursor to reintroduction of indigenous bird species.** I. Silva-Krott, M. K. Brock, and R. E. Junge. 1998. Pacific Conservation Biology 4:227–231.—The disastrous effects of the introduction of the brown tree snake (*Boiga irregularis*) to the island of Guam in the Mariana islands, has been well documented with 8 of 11 forest birds extirpated. Two species that no longer exist in the wild, the endemic Guam Rail (*Gallirallus owstoni*) and the endemic subspecies of the Micronesian Kingfisher (*Halcyon cinnamomia cinnamomina*), have been the subjects of captive breeding programs, the rail on Guam and in United States zoos, and the kingfisher in United States zoos. The captive population of kingfishers increased from 29 to 65 and then decreased to a plateau of about 50 birds, with part of the decline due to avian tuberculosis (*Microbacterium avium*) (ATB) to which they were exposed by avian collections at zoos. ATB can not be diagnosed except by necropsy and no effective treatment is available, making it an insidious disease and difficult to control in captive populations. Quarantine has proved effective but its long duration removes birds for long periods from the reproductive pool.

There was concern that reintroduction of kingfishers might introduce ATP to the ecosystem if it did not already exist there. Hence, a search for ATB on Guam was conducted, with 21 fecal samples from a variety of wild and caged birds analyzed. ATB was found in samples from a backyard chicken and a fighting cock, indicating that ATB was already present in the Guam ecosystem. Control of brown tree snakes and habitat protection now make reintroduction of kingfishers to Guam a possibility, and the first step would be the transfer of kingfishers to the captive bird facility on Guam. Concern remains that kingfishers might infect the captive Guam Rail population, so that stringent quarantine measures are needed to ensure that only non-infected birds are returned to Guam. [College of Arts and Science, Univ. of Guam, Mangilao 96923, Guam.]—William E. Davis, Jr.

38. **Twenty-eight years of monitoring a breeding population of Carnaby's Cockatoo.** D. A. Saunders and J. A. Ingram. 1998. Pacific Conservation Biology 4:261–270.—From 1969–1996 Carnaby's Cockatoos (Short-billed Black-Cockatoo) (*Calyptorhynchus latirostris*) were studied at Coomallo Creek in the northern wheatbelt, 200 km north of Perth, Western Australia. In 1959 the study area consisted of 8% wandoo eucaylpt (*Eucalyptus wandoo*) woodland surrounded by 82% Kwongon (sandheath) and 10% cleared agricultural land. The cockatoos nested in tree hollows in the woodland and were dependent on the Kwongan for food. By 1982 native vegetation had been reduced to 34% of the study area, and by 1996 to 25%. The authors report breeding biology data, including the number of clutches started each month, number of nest hollows with two nestlings, number of nesting attempts, health of nestlings, and relative breeding success. A major population decline from 1975–1978 was blamed on the loss of native vegetation and mortality associated with stainless steel wing tags. Predation of wing-tagged cockatoos by Wedge-tailed Eagles (*Aquila audax*) was a major cause of mortality. Sufficient nesting hollows are currently available but may not be in the future due to degrading of woodlands and lack of regeneration. The configuration of remaining woodland is long and narrow, and hence mostly "edge" with extensive weed invasions. The extensive clearing of Kwongan vegetation has reduced available food resources substantially, and thus been a major factor in population declines. The authors suggest that unless remaining patches of native vegetation, on both private and public land, are afforded conservation protection and management, the outlook for the Carnaby's Cockatoo is bleak. This is a remarkable long-term study which documents the effects of habitat destruction. It should be of interest to conservationists and land managers. [CSIRO Wildlife and Ecology, G.P.O. Box 284, Canberra, ACT 2601, Australia.]—William E. Davis, Jr.