

RECENT LITERATURE

Edited by John A. Smallwood

RESEARCH TECHNIQUES

(see 21)

BEHAVIOR

1. **Embryonic and neonatal vocal elicitation of parental brooding and feeding responses in American White Pelicans.** R. M. Evans. 1992. *Anim. Behav.* 44:667-675.—Embryonic and neonatal American White Pelicans (*Pelecanus erythrorhynchos*) squawk when cold or hot and neonatal white pelicans beg when hungry. Parents respond to squawks with brooding and to prolonged bouts of begging with a characteristic feeding posture and regurgitation of food. Parents responded to playback of the squawk call with brooding behavior and to playback of begging calls with the feeding posture, but did not regurgitate food. Responsiveness was similar whether the nest contained two unpipped eggs, a pipped and an unpipped egg, a chick and an unpipped egg, a chick and a pipped egg, or two chicks. These results indicate that vocal communication facilitates adjustment of parental behavior to the needs of late-stage embryos and newly hatched chicks, but that feeding also depends on optical communication between chick and parent. [Dept. of Zoology, Univ. of Manitoba, Winnipeg, MB R3T 2N2, Canada.]—Edward H. Burtt, Jr.

FOOD AND FEEDING

(see also 1, 5, 6, 19, 27, 28)

2. **Optimal foraging and timing processes in the starling, *Sturnus vulgaris*: effect of inter-capture interval.** D. Brunner, A. Kacelnik, and J. Gibbon. 1992. *Anim. Behav.* 44:597-613.—How does a foraging bird decide that a food patch is exhausted and the time has come to look for a new patch? Researchers have assumed that birds measure time, but Brunner et al.'s behavioral analysis of starlings is the first rigorous, manipulative test of that assumption. Six starlings were trained individually to perform a complex foraging task that required 20 flights in 3.5 min between two perches. If the flights were completed within the allotted time, a key at a food hopper was illuminated and a peck at the key might deliver food after a fixed interval. Over the course of the experiment six different intervals were used. Each interval was used for 12 days and, when the interval was changed, birds were given a day to adapt to the new interval. Birds encountered 60 or more patches daily. Half the patches had no food. The others had 1-4 food rewards, but always ended with an unrewarded trial. The duration of pecking and the time at which travel resumed were measured on the unrewarded trial of each patch.

Starlings learned the task and were able to adjust to changes in the fixed interval. Pecks/s were maximal at the time of food delivery, leading to the conclusion that starlings could accurately estimate time. As the interval between the first peck and food delivery increased from 0.8 s to 25.6 s, the time at which all pecking ceased (giving-in time) increased as a constant proportion of the delivery delay. In all cases cessation of pecking occurred after food should have been delivered. Thus starlings used a conservative giving-up rule that ensured they had exhausted the patch before they travelled to a new patch. What is most notable about the results is that starlings did not resume travel immediately after the last peck, but paused up to 27 min before resuming flights between perches. Foraging theorists have assumed that animals maximize their rate of consumption. Rate maximization predicts that patches are abandoned to move to another patch, but starlings in this experiment abandoned the patch (i.e., stopped pecking) well before they moved to the next patch. The authors emphasize this point, but offer no functional explanation for this striking violation of the assumption of rate maximization. Clearly, there is a need for field and laboratory studies of the functional significance of the time between giving-up and the time of moving on. [New York State Psychiatric Inst., Box 50, 722 W 168 St., New York, NY 10032, USA.]—Edward H. Burtt, Jr.

3. **Frugivory on *Bursera microphylla* (Burseraceae) by wintering Gray Vireos (*Vireo vicinior*, Vireonidae) in the coastal deserts of Sonora, Mexico.** J. M. Bates. 1992.

Southwest. Nat. 37:252-258.—In the coastal desert regions of Sonora, Mexico, two species of elephant trees (genus *Bursera*) produce avian-dispersed aril-covered seeds during the winter months. The fruits of *B. hindsiana* are large (mean diameter = 5.5 mm) and are consumed by several bird species; the fruits of *B. microphylla* are much smaller and consumed primarily by Gray Vireos and Ash-throated Flycatchers (*Myiarchus cinerascens*). Gray Vireos are one of the few seasonally frugivorous birds that defend a territory throughout winter, and the author reports from this two-year study that they feed almost exclusively on *B. microphylla*. These data suggest that Gray Vireos, and to a lesser extent, Ash-throated Flycatchers, are very dependent on the fruit of *B. microphylla* for up to seven months each year. Given the absence of diversity of possible seed dispersers for *B. microphylla*, this interaction may be strong enough for each species to exert reciprocal selection pressure on one another, resulting perhaps in an obligatory mutualistic relationship. [Dept. of Zoology and Physiology, Louisiana State Univ., Baton Rouge, LA 70803, USA.]—Danny J. Ingold.

SONGS AND VOCALIZATIONS

(see 1, 28, 30)

NESTING AND REPRODUCTION

(see also 9, 12, 15, 18, 28)

4. Observations on habitat use, breeding chronology and parental care in Bristle-thighed Curlews on the Seward Peninsula, Alaska. R. E. Gill, R. B. Lanctot, J. D. Mason, and C. M. Handel. 1991. Wader Study Group Bull. 61:28-36.—With only two known nesting areas in western Alaska, the Bristle-thighed Curlew (*Numenius tahitiensis*) is one of the rarest shorebirds in North America. Based on fieldwork conducted in 1989, this paper presents the first data from the northern nesting area on the Seward Peninsula.

Point counts along transects revealed that "shrub meadow tundra" and "low shrub/tussock" habitats were used by curlews throughout the breeding season, with increased use of "sedge wet meadows" during brood-rearing. Aerial displays were seen as early as 18 May, and three copulations were observed between 27 and 30 May. Although no nests were found, estimated ages of broods indicated that egg laying began in late May and hatching in late June. Seventeen adults (nine males, eight females) were captured and marked. Females attended broods for shorter periods than did their mates, with most (83%) abandoning their broods before the young could fly. Several broods formed groups attended by 1-5 adults that usually were males. At least two chicks joined groups that were not attended by their parents; consequently, these brood groups were similar to creches. The authors suggest several mechanisms that might lead to creche formation, including (1) improved efficiency in mobbing predators, (2) convergence of broods around limited food resources, (3) improved efficiency in vigilance, and (4) enhanced survival of kin via a selfish-herd mechanism. [Alaska Fish and Wildlife Research Center, 1011 E Tudor Rd., Anchorage, AK 99503, USA.]—Jeff Marks.

5. An experimental study of competition for food between male and female nestlings of the Red-winged Blackbird. K. L. Teather. 1992. Behav. Ecol. Sociobiol. 31: 81-87.—Ten experimental broods of Red-winged Blackbirds (*Agelaius phoeniceus*) consisting of two males and two females were observed from April to July 1991 in order to determine whether (a) nestling height, distance from the feeding parent, and begging sequence influences nestling success in obtaining food, and (b) heavier male nestlings differ from females in any of these characteristics. In every nest, nestlings that reached higher during feeding bouts were significantly more likely to be fed ($P < 0.0001$); on the other hand, distance from the parent and nest position did not influence whether or not a nestling was offered food. The importance of begging sequence was difficult to interpret since in seven nests it appeared to influence which nestlings were fed, while in three others, no correlation was detected. Size and sex were influential in determining which nestlings were fed. Male nestlings were 28.8% heavier than females and were able to reach consistently higher during feeding bouts; moreover, they begged significantly more often ($P = 0.019$), were offered significantly more food ($P = 0.011$), and were subsequently fed significantly more often ($P = 0.005$) than females. Transferred males were offered and received less food than natal

males, while no difference was detected between transferred and natal females. These data, as the author suggests, seemingly present a paradox, since the larger size of males enables them to acquire more food more efficiently than their sisters, and yet females are more likely to survive when food is limited. The author poses several scenarios that help to resolve this paradox and that explain differences in fledging ratios observed in many sexually dimorphic species. [Dept. of Zoology, Univ. of Cambridge, Downing St., Cambridge CB2 3EJ, United Kingdom.]—Danny J. Ingold.

6. Effects of nestling age and brood size on nestling care in the Bachman's Sparrow (*Aimophila aestivalis*). T. M. Haggerty. 1992. *Am. Midl. Nat.* 128:115–125.—The effects of nestling age and brood size on food delivery rates, nestling diet, and nest attentive time were examined in Bachman's Sparrows in Hot Spring Co., Arkansas, from 1983–1985. Both male and female parents delivered a significantly greater food mass ($P < 0.05$) to 3–5 and 6–9 day old nestlings than to 0–2 day olds. Nestling age also affected the number of food items per nestling delivered by females, which was significantly greater ($P < 0.05$) for 6–9 day olds than 0–2 day olds. Nestling age had no effect on the number of food items per trip delivered by either males or females, but 0–2 day old nestlings did receive significantly fewer total feeding trips ($P < 0.05$) than 6–9 day olds. Young nestlings (0–2 day olds) received smaller food items than older nestlings, but received significantly more female attentive time ($P < 0.05$).

Parents increased food mass delivery (although not significantly), the number of food items delivered ($P < 0.04$), and the total number of feeding trips ($P < 0.03$) to large broods versus small broods. However, brood size had no effect on the number of food items per trip delivered by parents of either sex. Males delivered significantly more food to nestlings than did females ($P < 0.01$), and delivered a greater percentage of lepidopteran larvae to 0–2 day old nestlings than to older nestlings. Although no difference was detected in the number of feeding trips made by either sex during the entire period, females spent significantly more time ($P < 0.0004$) at the nest than males. [Dept. of Zoology, Univ. of Arkansas, Fayetteville, AR 72701, USA.]—Danny J. Ingold.

MIGRATION, ORIENTATION, AND HOMING

(see also 16)

7. Calibration of the sun compass by sunset polarized light patterns in a migratory bird. J. B. Phillips and F. R. Moore. 1992. *Behav. Ecol. Sociobiol.* 31:189–193.—Nocturnal migrants use a variety of compass systems to obtain directional information, including the sun, stars, geomagnetic fields, and polarized light. In this experiment, Yellow-rumped Warblers (*Dendroica coronata*) were exposed to a polarization axis rotated at different angles at sunset, in order to determine whether polarized light patterns provide the primary reference system used to calibrate other compass systems. Warblers exposed to such shifted axes oriented themselves bimodally along the new axes, confirming the results of an earlier study, indicating that warblers orient with respect to an artificial light pattern in preference to the position of the setting sun and the alignment of the geomagnetic field. When artificial polarization axes were removed (after three nights), warblers continued to exhibit bimodal orientation coinciding with the former axes. These data suggest that polarized light is indeed used by Yellow-rumped Warblers to recalibrate one or more of the other compass systems (most likely the sun compass) during migration. [Dept. of Biology, Indiana Univ., Bloomington, IN 47405, USA.]—Danny J. Ingold.

8. Timing of songbird migration in the St. Croix River Valley, Minnesota, 1984–1986. K. Winker, D. W. Warner, and A. R. Weisbrod. 1992. *Loon* 64:131–137.—Birds were mist-netted in five wooded habitats near Afton, Washington Co., from late April to late May and mid-August to late September, in order to determine their temporal distributions during migration. The median dates of passage for all 68 captured species (97% passerines) occurred on 14 May and 31 August. Four species, the Yellow-bellied Flycatcher (*Empidonax flaviventris*), Least Flycatcher (*E. minimus*), Canada Warbler (*Wilsonia canadensis*), and Indigo Bunting (*Passerina cyanea*), showed a difference between spring and autumn median dates of 95 days or less, while 18 other species showed a difference of 105

days or less. Of the species that were adequately sampled, 53% spend about 70% of each year on neotropical wintering grounds and in migration. [Conservation and Research Center, National Zoological Park, Front Royal, VA 22630, USA.]—Danny J. Ingold.

HABITAT USE AND TERRITORIALITY

(see also 4, 13, 20)

9. Nest-site selection by Golden Eagles in Scotland. J. Watson and R. H. Dennis. 1992. *Br. Birds* 85:469–481.—A survey of the entire Golden Eagle (*Aquila chrysaetos*) breeding population in Great Britain indicated that more than 98% of the pairs resided in the Scottish highlands and islands. More than 95% of these pairs occupied cliff nests while the remainder used large trees. The majority of nests were oriented between NW and E. Nesting success was not related to distance from public roads, although the more accessible nests generally produced fewer young. Nest site selection in Scotland was similar to that of studies from various localities in continental Europe. [Scottish Natural Heritage, 9 Culduthel Rd., Inverness IV2 4AG, Scotland.]—Bruce G. Peterjohn.

10. Surplus territory contenders in male Red-winged Blackbirds: where are the desperados? D. Shutler and P. J. Weatherhead. 1992. *Behav. Ecol. Sociobiol.* 31:97–106.—During three breeding seasons in southeastern Ontario (1988–1990), the authors tested whether payoff asymmetries related to occupancy time, familiarity with neighbors, and reproductive investment may explain site dominance in Red-winged Blackbirds (*Agelaius phoeniceus*). These currencies of payoff asymmetries were tested by removing territorial male “owners” and allowing floater replacements to claim the vacant territories, after which owners were released and allowed to compete for their territories. The combined effect of occupancy time and the number of males removed had no significant effect on a final replacement’s success at retaining territories. In fact, increased occupancy time by final replacements resulted in quicker usurpation by released owners; moreover, released owners that spent longer time in captivity were faster at reclaiming their territories. No significant relationship was detected between the time required for successful owners to reclaim their territories and the number of neighbors they had. Additionally, the time successful owners needed to reclaim their territories was unaffected by previous investment in offspring. These data demonstrate that although only the original owners were successful at reclaiming their territories, they were only successful about 50% of the time; furthermore, payoff asymmetries do not appear to explain site dominance in this population of Red-winged Blackbirds. These results contradict those of a few similar studies, and suggest that territory competition and the “desperado strategy” (escalated contests by floaters for territory ownership) is of less importance to male red-wings than are the stern requirements of surviving to adulthood, locating a vacancy, and maintaining the minimum attributes necessary to hold a territory. [Dept. of Biology, Carleton Univ., Ottawa ON K1S 5B6, Canada.]—Danny J. Ingold.

11. Roost trees used by Pileated Woodpeckers in northeastern Oregon. E. Bull, R. Holthausen, and M. Henjum. 1992. *J. Wildl. Manage.* 56:786–793.—The objectives of this study were to determine which trees were being selected by Pileated Woodpeckers (*Dryocopus pileatus*) for roosting, if roost tree characteristics were similar to that of nest trees, and to develop roost site management guidelines. Data were collected in 1989 and 1990 in Union, Baker, and Umatilla counties, Oregon, using 27 radio-tagged adults and nine radio-tagged juveniles.

Adults were always found roosting in cavities at night, usually alone, and averaged seven roost trees/bird (range = 7–11) over a 3- to 10-month period. Roost trees were typically large-diameter live or dead trees with a hollow interior, created most often by decay. Forty-six percent were in live grand fir (*Abies grandis*), 22% were in ponderosa pine (*Pinus ponderosa*), 15% in dead grand fir, and 13% in dead western larch (*Larix occidentalis*). Conks of Indian paint fungus (*Echinodontium tinctorium*) were found on 92% of the roost trees in grand fir, and 80% of the live roost trees had some type of injury above the roost hole. Average dbh and height of roost trees were 71 cm and 22 m, respectively. Pileateds excavated an average 2.7 (range 1–16) entrances to the hollow interior, which had an average diameter and length of 28 cm and 4.3 m, respectively.

Forest type and successional stage surrounding roost trees significantly differed from randomly selected trees; roost trees were predominantly surrounded by old growth stands of grand fir that had little or no logging. Pileated nesting trees differed from roosting trees. Nesting trees were all dead, had solid interiors and fewer entrances, consisted of 81% ponderosa pine, 11% western larch, and 8% grand fir, and differed in slope position. However, successional stage, logging activity, and canopy closure did not differ.

The authors recommend leaving old growth stands of grand fir with at least 60% canopy closure with no logging or high-grading of old trees. More specific management suggestions are discussed, including a roost tree formula designed to determine the number of trees to leave as roosts within each management area. [U.S. Forest Service, 1401 Gekeler Ln., La Grande, OR 97850, USA.]—Robin J. Densmore.

ECOLOGY

(see also 3, 10, 19)

12. Gopher snake attraction to birds' nests. M. W. Eichholz and W. D. Koenig. 1992. *Southwest. Nat.* 37:293–298.—Snake predation on Western Bluebirds (*Sialia mexicana*) in nestboxes was examined in central coastal California during five breeding seasons to determine whether gopher snakes (*Pituophis catenifer*) differentially investigate trees associated with active birds' nests. During the first three seasons, before snakes were captured with netting placed around the bases of trees, 21% of all nests (and 35.4% of all nest failures) failed apparently because of gopher snakes. During the last two seasons when snakes were captured, significantly more snakes were caught at trees with active nests than trees with inactive nest boxes ($P < 0.05$), or at control trees without boxes ($P < 0.01$). Moreover, gopher snakes were captured at nest boxes with nestlings (13 of 54) significantly more often than at nests with eggs (0 of 51, $P < 0.05$). These data strongly support the notion that gopher snakes do not randomly climb trees in search of bluebirds; rather, they preferentially climb trees with nest boxes containing older nestlings. The authors suggest that of the three possible cues that snakes may use to locate nests (odor, nestling begging calls, adult feeding visits), odor is the most likely source guiding snakes to trees. This observation is supported at least weakly by the fact that one gopher snake was captured in a nest box after the young had fledged. [Hastings Reservation, Univ. of California, 38601 E Carmel Valley Rd., Carmel Valley, CA 93924, USA.]—Danny J. Ingold.

POPULATION DYNAMICS

(see also 27)

13. Territorial dynamics in an isolated White-Backed Woodpecker (*Dendrocopos [Picoides] leucotos* population. A. Carlson and G. Aulen. 1992. *Conserv. Biol.* 6:450–454.—White-backed Woodpeckers require old growth and late successional stages of deciduous forest, which may always have been distributed patchily in the taiga forest. Thus, White-backed Woodpeckers may have a shifting mosaic type of population dynamics that enable persistence of the metapopulation. To characterize rates of extinction, colonization, and persistence, one of the three known breeding populations in Sweden was censused regularly since 1971 to identify locations and number of occupied territories and the gender and number of adult birds present. A core of high-density territories was surrounded sparsely by other territories. Upon vacancy, high-density territories were most likely to be recolonized by one male or a pair; low-density territories were colonized infrequently. Despite a male biased sex ratio, females often remained unpaired. The observed population did not behave as predicted by a colonization-extinction equilibrium model. Perhaps population fragmentation and habitat degradation increase the susceptibility of White-backed Woodpeckers to extinction. [Dept. of Wildlife Ecology, Swedish Univ. of Agricultural Sciences, Box 7002, S-750 07 Uppsala, Sweden.]—Kristin E. Brugger.

14. Breeding-range and population changes of waders in the former Soviet Union. P. S. Tomkovich. 1992. *Br. Birds* 85:344–365.—This study documented changes in the distributions and abundances of breeding shorebirds in the former Soviet Union,

comparing recent information with published accounts from the 1950s and 1960s. Range expansions were described for Northern Lapwing (*Vanellus vanellus*), Greater Golden-Plover (*Pluvialis apricaria*), White-tailed Plover (*V. leucurus*), Black-winged Stilt (*Himantopus himantopus*), Terek Sandpiper (*Xenus cinereus*), Little Whimbrel [Curlew] (*Numenius minutus*), Ruff (*Philomachus pugnax*), and Long-billed Dowitcher (*Limnodromus scolopaceus*). Both Collared Pratincole (*Glareola pratincola*) and Marsh Sandpiper (*Tringa stagnatilis*) have expanded in portions of their ranges and declined elsewhere. Declining populations were evident for Sociable Plover (*V. gregarius*), Black-winged Pratincole (*Glareola nordmanni*), Slender-billed Curlew (*N. tenuirostris*), and Great Snipe (*Gallinago media*). The population declines are probably real, since similar trends have been reported for these four species elsewhere in their ranges. Whether the range expansions are the result of the availability of better distributional information or actual population increases could not be established for the other species. [Dept. of Ornithology, Zoology Museum, Moscow State Univ., Herzen St. 6, 103009 Moscow, Russia.]—Bruce G. Peterjohn.

15. Dispersal and age of first breeding of Buzzards in central Wales. P. E. Davis and J. E. Davis. 1992. Br. Birds 85:578-587.—This study of the dispersal of common Buzzards (*Buteo buteo*) in western Great Britain was based on data obtained from 234 juveniles banded during a 4-year period. Most juveniles were relatively sedentary, moving less than 40 km from their breeding sites. However, a few wandered as far as 200 km from their nests. Dispersal occurred throughout their first winter, apparently in random directions. Very little movement occurred after the first winter. One buzzard established a territory and nested at two years of age, although the average age of first breeding for this population was 3.5 years. [Wildlife Surveys, Felindre, Aberarth, Aberaeron, Dyfed SA46 0LP, United Kingdom.]—Bruce G. Peterjohn.

ZOOGEOGRAPHY AND DISTRIBUTION

(see also 14, 31, 32)

16. Patterns of winter distribution and abundance of Lesser Kestrels in Spain. J. Negro, M. De La Riva, and J. Bustamante. 1991. J. Raptor Res. 25:30-35.—The objectives of this study were to identify the wintering locations of Lesser Kestrels (*Falco naumanni*) in Spain, estimate ages and sex ratios, and determine the phenology of the migratory subpopulation. Data were collected in 1988 and 1989 in southern Spain.

Thirty-eight colonies were searched, and kestrels were found in the 24 colonies located along a river valley in farmland areas of central and southwest Andalusia. Average altitude was significantly lower in colonies with wintering kestrels (172 m, $n = 24$) than those without (369 m, $n = 14$). Sixty percent of the birds that could be sexed were adult males and 40% were females of unknown age. No juveniles were observed. The number of kestrels remained stable throughout the winter and ranged from 6 to 88% of the breeding numbers. Adult males from African wintering grounds were the first to arrive in spring, between 4 and 12 February, while first year males and females arrived during March and April.

Possible factors influencing Lesser Kestrel distribution and abundance are discussed, including temperature and food availability. [Estacion Biologica de Donana, Pabellon del Peru, Avda. Maria Luisa s/n, 41013 Sevilla, Spain.]—Robin J. Densmore.

SYSTEMATICS AND PALEONTOLOGY

(see also 22)

17. A new species of *Phylloscopus* warbler from central China. P. Alström, U. Olsson, and P. R. Colston. 1992. Ibis 134:329-334.—This paper describes the Chinese Leaf Warbler (Sylviidae: *Phylloscopus sichuanensis*, sp. nov.). The specific nomen refers to the mountainous Sichuan Province, where the authors first observed this species in April and June, 1986. At that time at least 17 individuals were encountered in the wild, but no individual could be trapped (Alström et al. 1990, Bull. Br. Ornithol. Club 110:38-43). During June 1990, 20 singing males were observed in Wolong Nature Preserve, and for the two that were paired with females, the nests were located. Three individuals (one male and two females) were caught, measured, photographed, and blood sampled before being

released. Collection was not permitted. The holotype is a specimen originally labeled as *P. proregulus chloronotus*, but now considered to belong to the new species (Zoological Inst., Academia Sinica, Beijing China No. 43548, collected in Shanxi Province, 18 May 1962). In addition to a very thorough description of morphological characteristics, the authors also provide information on vocalizations, distribution and status, habitat, breeding, and response to interspecific song playback. [Kungsgaton 3, S-462 33 Vänersborg, Sweden.]—John A. Smallwood.

EVOLUTION AND GENETICS

18. Hybridization between a Peregrine Falcon and a Prairie Falcon in the wild.

L. Oliphant. 1991. *J. Raptor Res.* 25:36–39.—A female Prairie Falcon (*Falco mexicanus*) and a male Peregrine Falcon (*F. peregrinus*) paired and produced two male offspring in southern Saskatchewan in 1985. Both falcons were observed sharing nest defense and incubation duties and making food transfers at the eyrie. The offspring were removed, given to a falconer, and replaced with captive-bred peregrine chicks, which the pair raised successfully. The hybrid offspring were larger than typical Prairie Falcons, and after the first molt showed blue backs, spotted breasts, chestnut napes, and wide malar stripes. The rarity of interspecific breeding between members of the order Falconiformes in the wild is discussed. [Dept. of Veterinary Anatomy, Univ. of Saskatchewan, Saskatoon, SK S7N 0W0, Canada.]—Robin J. Densmore.

PHYSIOLOGY AND DEVELOPMENT

(see also 22, 23, 24)

19. Energetics and adaptations to cold in ptarmigan in winter. K.-A. Stokkan.

1992. *Ornis Scand.* 23:366–370.—This brief review paper discusses some of the ways in which ptarmigan deal with severe winter conditions at high latitudes. The birds roost in snow to escape severe cold and have full crops when they cease feeding activity for the night. Concomitant with a shift from high protein foods in autumn to low protein, high fiber foods in winter, the cecae enlarge substantially. Aside from promoting camouflage, the barbules of the unpigmented feathers of Willow (*Lagopus lagopus*) and Rock (*L. mutus*) ptarmigan contain air-filled cavities that presumably enhance insulation. Svalbard Ptarmigan (*L. m. hyperboreus*) take on huge fat stores (35% of body mass) in late autumn as a hedge against severe winter weather, when feeding is nearly impossible. Using their large pectoral muscles, ptarmigan shiver in bursts to increase heat production. Keeping their large crop full also enables continuous digestion that contributes additional heat production. Finally, the birds reduce their resting metabolic rate in winter such that their lower critical temperature is close to that which they experience in snow burrows. [Dept. of Arctic Biology, Univ. of Tromsø, N-9000 Tromsø, Norway.]—Jeff Marks.

20. The hormonal control of territorial aggression in tropical birds. R. N. Levin

and J. C. Wingfield. 1992. *Ornis Scand.* 23:284–291.—The role of testosterone in controlling territorial aggression has been well documented for male birds during the breeding season. However, because studies have focused on temperate species in which only the males defend breeding territories, little is known about the control of territorial aggression during the nonbreeding season or in females. In contrast to most temperate species, both males and females of many tropical species defend territories year-round. Accordingly, Levin and Wingfield studied Bay Wrens (*Thryothorus nigricapillus*) in Panama and White-browed Sparrow Weavers (*Plocepasser mahali*) in Zambia to assess hormonal control of aggression outside of the breeding season and in females.

In sparrow weavers, circulating levels of testosterone were extremely low, even for males during the breeding season (maximum level = 0.4 ng/ml). This occurred despite the fact that testosterone content in sparrow-weaver testes was comparable to that of temperate White-crowned Sparrows (*Zonotrichia leucophrys*) and House Sparrows (*Passer domesticus*). Moreover, there was no rise in testosterone in males or females that responded aggressively to song playbacks or to experimental introductions of “replacement” males into flocks. Thus, there was no direct association of testosterone and territoriality in White-browed Sparrow

Weavers. Similarly, testosterone levels in male Bay Wrens were very low (0.3 ng/ml), and experimentally induced aggression in both sexes occurred without a concomitant rise in circulating levels of sex steroids. Moreover, gonadectomized Bay Wrens of both sexes displayed normal aggressive responses during natural territorial encounters and during simulated territorial intrusions. Interestingly, in both species at least one sex exhibited increased levels of luteinizing hormone (LH) in response to induced aggressiveness.

Levin and Wingfield conclude that testosterone has little effect on aggressiveness, even during the breeding season. Thus, territorial aggression in these two tropical species either is independent of control by steroid hormones or is mediated by a non-gonadal hormone (e.g., LH). Coupled with data from several other tropical species, these results suggest that the relationship between testosterone and territorial aggression applies only to temperate species. [Dept. of Biology, Pomona College, Claremont, CA 91711, USA.]-Jeff Marks.

21. Further observations on the timing of skull pneumatization in the Pine Siskin. R. P. Yunick. 1992. *N. Am. Bird Bander* 17:93-96.—Eastern New York state experienced winter invasions of Pine Siskins (*Carduelis pinus*) in 1975-1976 and 1986-1987. During these two winters the author was able to capture a total of 1486 siskins and examine the status of skull pneumatization. Skulls were classified as either completely (SCP) or incompletely pneumatized (SIP). For the analyses, capture dates were pooled into the first, middle, and last third of each month, mid-November through early February. The percentage of SIP birds in each trimonthly sample was regressed over date, and a very tight linear relationship was revealed ($n = 1486$, $r^2 = 0.9868$, $P < 0.00001$). A second regression analysis was performed on only the HY/SY birds, which could be identified by their pointed rectrices, and again a significant linear relationship was revealed ($n = 531$, $r^2 = 0.8175$, $P < 0.00001$). For both analyses the author extrapolated a date (1-10 March, the 95% confidence limit of the x-axis intercept) for completion of skull pneumatization by all siskins.

Interpretation of the first regression is complicated by the fact that a higher mortality rate for the HY/SY birds (which seems likely) also would decrease the percentage of SIP birds in the capture samples, affecting the slope negatively. The second analysis, which included only HY/SY birds, more directly focused on the rate of pneumatization. The conclusion that all siskins complete pneumatization by 1-10 March should be viewed with a bit of caution, however, since the regression line was extrapolated well beyond the range of actual data (the last HY/SY birds were captured in late January) with the implicit assumption that the true relationship was strictly linear. [1527 Myron St., Schenectady, NY 12309, USA.]-John A. Smallwood.

MORPHOLOGY AND ANATOMY

22. Structure, function, and variation in the hindlimb muscles of the Margarornis assemblage (Aves: Passeriformes: Furnariidae.) D. W. Rudge and R. J. Raikow. 1992. *Ann. Carnegie Mus.* 61:207-237.—The authors dissected the hindlimb muscles of 20 specimens of five species of furnariids (*Margarornis*, *Premnornis*, *Premnoplex*, *Roraimia*). These genera, collectively known as "treerunners" and "barbtails," are found in forest habitats of central and northern South America, where they characteristically forage over tree surfaces, occasionally using the tail as a prop. In general, the hindlimb muscles of these groups are not as specialized as are those of the woodcreepers. Three hindlimb muscle conditions found in the group provide further evidence of the monophyly of Passeriformes. This is a well-written, well-illustrated anatomical paper. [Dept. of Biological Sciences, Univ. of Pittsburgh, Pittsburgh, PA 15260, USA.]-Jerome A. Jackson.

PLUMAGES AND MOLTS

(see also 18, 28)

23. How to molt while fasting in the cold: the metabolic and hormonal adaptations of Emperor and King penguins. R. Groscolas and Y. Cherel. 1992. *Ornis Scand.* 23:328-334.—Emperor (*Aptenodytes forsteri*) and King (*A. patagonica*) penguins fast for 32-35 days while undergoing a complete molt. During this time they lose about 45% of their body mass, exhausting virtually all of their fat stores and up to 50% of their body protein!

Even more remarkably, some penguins extend their fast for several days to two weeks beyond the molting period, existing solely on their remaining body protein. Whereas a 30–50% loss of body protein normally is considered lethal for most birds, some postmolting penguins survive 60–70% loss of body protein! Plasma concentrations of corticosterone and glucagon rise abruptly during the last quarter of the fasting phase, suggesting that they play a role in protein catabolism and gluconeogenesis from amino acids, respectively. Levels of thyroxine increase during the synthesis of new feathers, suggesting that this hormone triggers the onset of molt. [Centre d'Ecologie et Physiologie Energétiques, Centre National de la Recherche Scientifique, 23 rue Becquerel, 67087 Strasbourg, France.]—Jeff Marks.

24. Adjustments of the prebasic molt schedule in birds. T. P. Hahn, J. Swingle, J. C. Wingfield, and M. Ramenofsky. 1992. *Ornis Scand.* 23:314–321.—This paper reviews how environmental factors might influence the timing of prebasic molt, including a discussion of possible endocrine mechanisms based largely on the previous work of Wingfield and his colleagues.

The authors suggest a scheme in which potential environmental cues are classified according to their general function; four such classifications are identified. Cues involved with *initial predictive information* determine the broad time window during which molt can occur, allowing for behavioral, physiological, and hormonal preparation in advance of the molt. The seasonal change in photoperiod is a typical example. *Supplementary information* provides short-term cues that fine tune the initiation and rate of molt to local phenology. Examples include food availability and temperature, both of which could influence molt either directly (via neuroendocrine pathways) or indirectly (affecting energy and nutrient balance). Social cues are classified as *synchronizing and integrating information*. Although they are important in synchronizing reproduction between pair members, their influence on molt is not well understood. Supportive data come from experiments with Song Sparrows (*Melospiza melodia*) in which mates of estradiol-implanted females delayed the onset of molt compared with males mated to females that were given empty implants. The experimental males had elevated levels of testosterone, a hormone known to delay prebasic molt. Presumably, the prolonged sexual behavior of implanted females stimulated males to maintain high levels of testosterone at a time when testosterone normally would be declining in preparation for the prebasic molt. Lastly, *modifying information* includes events that alter a process already underway. For example, an unpredictable crash in food supply could slow or terminate molt.

Although “virtually nothing” is known about the central pathways that control molt, hormones secreted by the peripheral endocrine glands, particularly thyroxine and testosterone, are known to influence the timing of prebasic molt. Evidence suggests that these hormones act antagonistically, with testosterone inhibiting molt by suppressing the secretion of thyroxine. This mechanism is understood reasonably well in species that molt after breeding. Less well understood is how these hormones interact in species that overlap molt and breed extensively. The authors end with a plea for additional experimental work, both in the lab and in the field, that attempts to identify the precise nature and mechanisms of environmental cues that fine tune the regulation of prebasic molt schedules. [Dept. of Zoology, Univ. of Washington, Seattle, WA 98195, USA.]—Jeff Marks.

25. Aberrant plumages in a pair of Peregrines in north Scotland. G. G. Bates. 1992. *Scott. Birds* 16:219.—The author observed a breeding pair of Peregrine Falcons (*Falco peregrinus*) at a coastal site in North Sutherland, Scotland, during 1991. Of the three eggs observed, one was a typical reddish coloration, another significantly paler, and the third nearly white. The adult female was “unusually dark, almost sooty black without a hint of the normal grey or blue upperparts . . . the underparts were of a dull mid to dark grey shade, with barring of a slightly darker shade just discernible. The ‘moustache’ was not clearly defined on the dark face.” The adult male also was unusual, with a dull blue-grey dorsum and pale, barred underparts. The male had a typical malar stripe, but had a light patch on the right shoulder.

It was particularly noteworthy that not one but both adults had obviously aberrant plumage. There was no opportunity to examine plumage characteristics of the young since the eggs failed to hatch.—[105 Strathy Point, Strathy, Sutherland KW14 7RY, Scotland.]—John A. Smallwood.

WILDLIFE MANAGEMENT AND ENVIRONMENTAL QUALITY

(see also 11, 31, 32)

26. **Availability and ingestion of lead shot by Mourning Doves (*Zenaida macroura*) in southeastern New Mexico.** T. L. Best, T. E. Garrison, and C. G. Schmitt. 1992. *Southwest. Nat.* 37:287-292.—Soil samples were taken near a heavily hunted stock-tank in Eddy County in August (pre-hunting season) and October (post-hunting season), 1987. Sixty-five of 120 (54%) August samples contained one or more lead shot for an estimated total of 167,593 lead shot/ha in the upper 1.3 cm of soil (\bar{x} = 1.5 shot/sample), while 82 of 120 (68%) October samples contained one or more lead shot for a total of 860,185 lead shot/ha (\bar{x} = 7.7 shot/sample). However, when one October soil sample with 688 shot was excluded, no significant difference was detected in the variances of the August versus October samples. Examination of gizzards of 420 doves collected in 1985-1987, revealed that only one dove (0.24%) had definitely ingested lead shot. Nine of 250 livers (3.6%) contained lead concentrations >7 ppm, and 20 of 250 (8.0%) contained lead concentrations \geq 3 ppm. Although the availability of lead shot was enormous, the data suggest that relatively little was actually ingested by doves. However, the authors caution that low incidence of lead in doves that were collected may be partially the result of higher mortality among doves that ingested lead shot. [Dept. of Zoology and Wildlife Science, Auburn Univ., AL 36849, USA.]—Danny J. Ingold.

27. **The importance of water conservation areas in the Everglades to the endangered Wood Stork (*Mycteria americana*).** G. T. Bancroft, W. Hoffman, R. J. Sawicki, and J. C. Ogden. 1992. *Conserv. Biol.* 6:392-398.—The Everglades water conservation areas (WCAs) appear to be critical foraging habitat for wintering Wood Storks, especially during drought years when most of south Florida is dry. Comparison of five years of Everglades colony survey data with projected southeastern United States breeding population size (modeled from limited survey and demographic data) revealed that large numbers of nonbreeding storks use the WCAs in late winter. Wood Storks depend on receding water levels to concentrate prey; in drought years, formerly deep sloughs may be the only feeding areas available. Changes in the management of these areas could significantly affect the status of storks throughout the southeastern United States. [National Audubon Society, 115 Indian Mound Tr., Tavernier, FL 33070, USA.]—Kristin E. Brugger.

BOOKS AND MONOGRAPHS

28. **On the biology of five species of swifts (Apodidae, Cypseloidinae) in Costa Rica.** M. Marin A. and F. G. Stiles. 1992. *Proc. West. Found. Vertebr. Zool.* 4:287-351. Softcover \$15.—This monograph includes detailed life histories of the White-collared (*Streptoprocne zonaris*), White-chinned (*Cypseloides cryptus*), Spot-fronted (*C. cherriei*), Chestnut-collared (*C. rutilus*) and Black (*Nephoecetes niger*) Swifts studied in the canyon of the Rio Tiribi on the southwestern slope of Volcan Irazu in central Costa Rica between 1984 and 1987. Absolute and relative physical measurements are presented for all species. Sample sizes are modest for these data, with by far the most data being from the Chestnut-collared Swift (maximum n = 139) and the least being from the Spot-fronted Swift (maximum n = 11). Detailed data and discussion are presented for foraging ecology, social behavior, flight characteristics, plumages, molt, vocalizations, nest construction, and various parameters of breeding biology.

I was truly impressed by the magnitude of effort put into this study and by the depth of understanding shown of the basic ecology of the region. This monograph is not only a must for swift biologists, but a gold mine for anyone interested in the natural history of the region, and a superb model for anyone doing comprehensive life history studies. The monograph includes figures showing annual variation in rain and temperature (related to nesting phenology), a list of the mosses and liverworts (>30 species; used in nest construction) with descriptions of their characteristics and habitats, a discussion of other vegetation in the canyon, and comments on other birds and mammals. A list of birds seen in the area is available from the authors. [Western Foundation of Vertebrate Zoology, 1100 Glendon Ave., Los Angeles, CA 90024, USA.]—Jerome A. Jackson.

29. A dictionary of scientific bird names. J. A. Jobling. 1991. Oxford University Press, Oxford. 272 pp. \$29.95, hardcover.—Who among us can read scientific names such as *Upupa epops* (for the Hoopoe) or *Synthliboramphus wumizusume* (for the Japanese or Crested Murrelet) without wondering what they mean? If the answer to the above question is “not me, that’s for sure,” then this book is for you. From *aalge* to *Zosterops*, Jobling’s dictionary contains the derivation and meaning of the genus and specific epithet for each of the extant and recently extinct birds in the world—approximately 8500 entries covering all living birds described between January 1758 and June 1990. For the nontaxonomist, the introduction includes information on the codes of nomenclature, grammar and gender, and a categorical analysis of names (e.g., eponyms, toponyms, and names based on appearance, habitat, behavior, voice, etc.).

How complete is the treatment, and how accurate are the etymologies? I have looked up perhaps 300 names of species from throughout the world, and I have yet to be disappointed. Although I am not qualified to evaluate the etymologies, I suspect that those who are will find no more than a few points of contention. This scholarly and thoroughly enjoyable work should be a welcome addition to the library of anyone interested in birds.—Jeff Marks.

30. Sound communication of the Anu Branco. [A comunicação sonora do Anu Branco.] H. F. Mariño. 1989. Editora Da Universidade Estadual de Campinas (UNICAP), São Paulo, Brazil. 302 pp., appendices with 26 sonograms and 17 maps. (Portuguese.) No price given, softcover.—This publication is a result of a Master in Sciences (Biology) thesis at the Instituto de Biologia, Universidade Estadual de Campinas, Brazil. The book is an elaborate description of the life history of the Anu Branco [Guira Cuckoo] (*Guira guira*), a bird of the family Cuculidae. The main goal of the book was to gain an understanding of the species communication, by studying its vocalizations, as a means to elucidate the structure of its social organization.

The book is organized into five chapters that follow a thesis format. In the first chapter the author describes the vocalizations of the species as an elaborate system of communication signals. He then briefly addresses the ecological and environmental factors that select such vocalizations, including the acoustical characteristics of its habitat and biotic factors. He also describes how he developed the design of his study, and the rationale for observing wild and captive individuals.

In the second chapter the author describes the methodology he used. He comments on the species vocal repertoire and its biological consequences. He continues by describing the facilities used for captive specimens, the individuals studied, the methods used to record behavior, and the making of acoustical recordings. He then describes the analysis and classification of vocalizations and the use of sonograms.

In Chapter 3 he presents his results. He examines in detail the functional units of bird vocalizations, such as notes and phrases, and categorizes calls (e.g., calls with definite rhythms versus undefined rhythms). He also comments on the behavioral contexts of these vocalizations. The antagonistic behavior among three groups of Anu Branco that he observed in the wild on the campus of the Universidade Estadual de Campinas is presented in detail. For the individuals studied in captivity, the social interactions (e.g., hierarchical categories) among the flock of five to six birds are described briefly. Also examined are several categories of calls, such as recognition calls used in congregations, hostile calls, and calls associated with breeding behavior.

The discussion and conclusions are presented in Chapter 4. First, the author summarizes the various vocalizations and their functions. The author then presents a discussion on how communication signals are affected by the acoustical characteristics of the environment. The propagation efficiency from a source of sound (the bird) depends not only on the sound energy produced but also on certain atmospheric gradients. From the structural point of view, calls are organized temporally, and they acquire biological connotations. The author suggests that animals which produce multiple and specialized signals tend to form very complex societies. Finally, he discusses the characteristics of social organization in the Anu Branco, including feeding behavior and social aggregations in roosts. The final chapter is the bibliography.

Although the study was descriptive in nature, this volume presents an extraordinary compilation of behavioral data. I think the book would have been more useful if social

behavior had been compared quantitatively between the captive and wild individuals observed during his study; statistical analyses are almost totally lacking. Nevertheless, the book could be an excellent source of data for those specializing in avian ethology and bioacoustics.—Eduardo Iñigo-Elias.

31. Proceedings of the first Mesoamerican workshop on the conservation and management of macaws. J. Clinton-Eitniear, ed. 1991. Misc. Publication No. 1, Center for the Study of Tropical Birds, Inc., 218 Conway Drive, San Antonio, Texas 78209-1716. 73 pp. No price given, softcover.—This publication is based on a symposium organized by the Center for the Study of Tropical Birds, Inc., held in Tegucigalpa City, Honduras, 4–7 January, 1991.

Jack Clinton-Eitniear, director of the CSTB, organized this macaw symposium and edited the proceedings. This volume includes 10 papers on the natural history and captive breeding biology of the species of macaws that occur in Central America. In addition, three papers present information on the biology and ecology of several macaws in Venezuela, Brazil, and southern Peru, even though these countries are not included within the focus region of the symposium. A total of eight *Ara* and *Anodorhynchus* species are discussed in the proceedings.

Two papers focus on the conservation and status of the Scarlet Macaw (*Ara macao*) in Belize, and a third paper deals with the status in Guatemala. Two more papers present information on the species in Honduras; one on its status and the other on the use of macaw designs in pre-Columbian Art. A sixth paper describes the distribution and conservation efforts related to two species, the Scarlet Macaw and the Great Green Macaw (*A. ambigua*) in Nicaragua. Next are two papers on the Scarlet Macaw in Costa Rica; the first concentrates on its ecology and management while the second is an economic analysis of the role of ecotourism in the conservation of this species. Another paper covers the status of three macaws, the Green-winged Macaw [Red and Green Macaw] (*A. chloroptera*), the Military Macaw (*A. militaris*), and the Chestnut-fronted Macaw (*A. severa*) in Venezuela. The potential for sustainable use of Scarlet Macaws, Red and Green Macaws, and Blue and Yellow Macaws (*A. ararauna*) in southern Peru is discussed in another paper. Conservation of the Lear's Macaw (*Anodorhynchus leari*) in Brazil is the focus of another paper. Finally, two papers discuss captive breeding biology of six species: Blue and Yellow Macaws, Scarlet Macaws, Military Macaws, Buffon's [Great Green] Macaws, Green-winged Macaws, and Hyacinth Macaws (*Anodorhynchus hyacinthinus*).

Most of the information presented in this monograph is related to the natural history of macaws, including geographical distribution, food habits, current status, and conservation problems within the region. The majority of the papers present data almost exclusively on one species, the Scarlet Macaw. This information is very valuable to the design of future research efforts to protect and manage the species. Nevertheless, very few quantitative and comparative data are presented in these papers. This book's contribution to neotropical ornithology would have been enhanced if greater attention had been paid to the editorial work, including better graphics and tables, and better documentation (e.g., literature citations). The last two papers on captive breeding contain numerous tables of important biological information for six macaw species, but they lack completely any references.

My main criticism of this publication relates to the last section, a set of 25 utilitarian resolutions and recommendations. These are grouped by topic, including ecotourism, ranching and captive breeding, nest boxes/habitat management, education, introduction and release, and trade/regulation and law enforcement. In my opinion, there is far too little emphasis on the basic efforts required to conserve this species in a natural state in the wild. Much more needs to be done simply to understand the biology and ecology of these species and their functional role in the neotropics.—Eduardo Iñigo-Elias.

32. Putting biodiversity on the map: priority areas for global conservation. C. J. Bibby, N. J. Collar, M. J. Crosby, M. F. Heath, Ch. Imboden, T. H. Johnson, A. J. Long, A. J. Stattersfield, and S. J. Thirgood. 1992. International Council for Bird Preservation, Cambridge, United Kingdom. 90 pp., 36 figures, 22 tables, numerous color photographs, five appendices. \$23.50, softcover.—Bibby et al. have done a splendid job in compiling and editing an enormous collection of biological and ecological data on the distribution of biological diversity around the world. This book also has an excellent design

with impressive color graphics that clearly illustrate points being made, and beautiful color pictures that enhance the presentation.

The first section of the book, the introduction, deals with the concept of biodiversity, defined as "the total variety of life on earth." The authors also examine why it is important to study and conserve biodiversity, not only from the economic point of view but from an ethical one as well. They also explore how and where to conserve biodiversity. They present data which illustrate the uneven spatial distribution of biodiversity. Seventy percent of the world's threatened birds are located in just 12 countries. These countries are located mainly in the tropics and are known as "megadiversity countries." The authors also present evidence as to why birds are good indicators of biodiversity. Of the many different life forms on our planet, birds are among the most well studied.

In the second section of the book the authors describe the different methods followed by the biodiversity project to compile all this information. The authors developed a computerized database list of over 2,600 birds. This information was compiled from distributional data in maps and published references, as well as through consultation with local experts in each country or region. This list includes data such as species, common names, habitat, altitude, status, and codes for the Endemic Bird Areas (EBAs, see below). Data from range maps for each species were digitized into a Geographical Information System (GIS). The primary goal of this analysis was to identify those areas with concentrations of restricted-range species. They considered areas of primary importance those where two or more species of restricted distribution occur; these areas are known as Endemic Bird Areas (EBAs).

In the third section a global overview of avian data is presented. The authors found that more than 25% of all land birds ($n = 2,609$) have breeding distributions less than 50,000 km². Bird families such as Alcedinidae and Zosteropidae have more than 70% of their species exhibiting significantly restricted ranges. Countries such as Mexico and five other South American nations have over 100 restricted-range birds occurring within their borders. The five countries with the highest number of EBAs are Indonesia (24), Peru (18), Brazil (17), Mexico (14), and Colombia (14). Comparisons are made between island and continental EBAs, and the authors discuss the relationship between numbers of restricted-range bird species and the size of EBAs. Countries such as Indonesia, Brazil, Colombia, Peru, and Ecuador have the highest numbers of threatened restricted-range bird species. More than 60% of all threatened restricted-range species are threatened because of habitat destruction.

In the fourth section on regional accounts of EBAs, the authors identify six main regions: North and Middle America (including the Caribbean islands), South America, Africa, Europe and the Middle East, Asia, South-East Asian Islands (including New Guinea and Australia), and Pacific Islands. The areas with the greatest and lowest restricted-range bird species are South America with 27% (709 species) and Asia with 8% (201). The areas with the most and least EBAs are South America with 26% and Asia with 12%.

The fifth section focuses on patterns of endemism in animals and plants. Here the authors look for other patterns of endemism in the flora and fauna of the six regions. Within the North and Middle America and South America regions they found a similar pattern of endemism with reptiles and amphibians, insects, butterflies, and trees.

In the sixth section the authors evaluate the priorities for action to ensure the survival of at least 20% of all land birds by actions on just 2% of the earth's land area. The most obvious way to evaluate EBAs would be in terms of the numbers of restricted-range bird species they contain. These EBAs have been graded according to the taxonomic uniqueness of all the restricted-range bird species occurring in them. These EBAs also have been classified on the basis of existing knowledge of endemic plants and other animals.

In the seventh section the authors present the conclusions. Two hundred and twenty-one EBAs have been identified where 26% of all land birds are restricted. Most of these areas are also important for other organisms such as plants and invertebrates. The future of all these EBAs is critical for global biodiversity conservation. In the appendices the authors present several tables with data covering EBA data by region, comparison of endemism between birds and other animals and plants, and priority listings of EBAs.

This brief volume is an excellent and highly original effort that will make ornithologists, conservationists, and decision makers aware of the broader context of biodiversity, and the role birds play in conservation biology. I highly recommend this book.—Eduardo Inigo-Elias.