

RECENT LITERATURE

Edited by Edward H. Burtt, Jr.

BANDING AND LONGEVITY

(see also 35, 62)

1. Yellow birds stand out in a crowd. C. M. Handel and R. E. Gill, Jr. 1983. N. Am. Bird Bander 8:6-9.—This study reports the effectiveness of supplementing the banding or color-banding of Western Sandpipers (*Calidris mauri*) and Dunlins (*Calidris alpina*) with staining of the light breast, abdomen, and flank feathers with picric acid. Between 1977 and 1981 postbreeding Western Sandpipers (2804) and Dunlins (3122) were netted on the Alaska Peninsula (56°00'N, 161°10'W) and on the Yukon-Kuskokwim River Delta (61°15'N, 165°35'W). Ninety-four percent were banded with U.S.F.&W. and colored leg bands; 91% were dyed. The dyed birds were held 1-2 h until their feathers dried and were then released. Comparison of numbers of birds with both dyed feathers and leg bands versus those seen that were dyed only suggested that "of the 185 birds sighted that were estimated to have been marked with both dye and colored leg bands, 70 (38%) were reported to have only dye, and thus represented a group of birds that would have gone undetected if they had not been dyed."—Richard J. Clark.

2. A banding study of North Island Brown Kiwis in an exotic forest. R. Colbourne and R. Kleinpaste. 1983. Notornis 30:109-124.—Kiwis are among the most fascinating of birds but, because of their nocturnal habits, are surprisingly little known. This study of the ecology of wild birds is very welcome. The authors banded 84 kiwis and coded them with reflective tape, so that their movements could be more easily detected in the beam of a flashlight. Among the more interesting findings are: (1) Dry periods in summer reduce food available to kiwis; this is partly compensated for by high subcutaneous fat reserves. (2) Territory size averages 5 ha. Each territory has many burrows which may be used for shelter. (3) Birds may feed in one area for a prolonged period, then shift to a new section of the territory, changing burrows at the same time. (4) Juveniles and young chicks are regularly found wandering alone, with no evidence of parental presence. (5) Logging practices dry out the soil, reducing the amount of invertebrate food. However, if replanting efforts are prompt there seems to be little effect on the birds. (6) It has often been thought that kiwis are polyandrous. This idea is based on reversed size dimorphism (females average 16.5% heavier and have 24% longer bills), and on the knowledge that polyandry is common in most ratites. The authors noted that the expected disproportionate sex ratios in favor of males did not seem to exist, as would be expected in a polyandrous species. Furthermore, in two cases kiwi pairs used the same territory for over a year, suggesting a prolonged pair bond. On the other hand, several females "strayed," and one seemed to commute between areas more than 1000 m apart. (Was she looking for the male in review 23?)

This paper is full of interesting information, gathered under difficult conditions, and is an important contribution to the biology of kiwis.—J. R. Jehl, Jr.

MIGRATION, ORIENTATION, AND HOMING

3. Sun orientation in birds. [Die Sonnenorientierung der Vögel.] R. Wiltshko. 1980. J. Ornithol. 121:121-143, 1981. J. Ornithol. 122:1-22. (German, English summary.)—This two-part paper reviews the use of the sun as a navigation cue by migratory birds and homing pigeons. There is little or no support for the use of the sun for true (bi-coordinate) navigation, but many species exhibit a sun compass for maintaining a selected heading. Individuals can compensate for the apparent movement of the sun, based only on the bird's internal clock. They appear to compensate correctly for the different rates of change of the sun's azimuth during the day. The mechanisms of this ability are unknown. For homing pigeons the sun compass appears to be learned early in life and learning requires exposure to the sun throughout the day. If individuals can view the sun only during part of the day during development, they are unable to extrapolate the sun's movement during the remainder of the day.—Robert C. Beason.

4. **Migratory restlessness in caged Bramblings *Fringilla montifringilla* in northern Sweden.** P. Lundberg. 1981. J. Ornithol. 122:65-72.—Captive birds under natural (northern Sweden) photoperiod showed a well-defined period of migratory restlessness which coincided with the time free-moving conspecifics were migrating. The autumnal activity extended longer in the caged birds and the onset of spring activity was delayed compared to free-flying conspecifics. These discrepancies were attributed to the abnormal photoperiods the captive birds experienced. The captive Bramblings showed an increase in diurnal activity in addition to nocturnal activity during the migratory seasons, reflecting the combined diurnal and nocturnal migratory behavior of this species. The timing of migratory restlessness appears to be under the combined influences of photoperiod and an endogenous rhythm.—Robert C. Beason.

5. **An analysis of the orientation behavior of the Blackcap (*Sylvia atricapilla*) and the European Robin (*Erithacus rubecula*).** (Eine Analyse des Orientierungsverhaltens von Mönchsgrasmücken (*Sylvia atricapilla*) und Rotkehlchen (*Erithacus rubecula*.) W. Viehman. 1982. J. Ornithol. 123:217-218. (German.)—The orientation of these species was analyzed using the Merkel-Wiltschko cages in the natural geomagnetic field. For both species the overall mean seasonal vector length was larger in autumn than spring, but the average nightly vector length was larger in spring than in autumn. Viehman interprets these results to indicate that the birds are under more pressure, perhaps from food shortages, to make direct flights to their wintering grounds in autumn; while in spring they can leisurely move north behind the retreating winter weather. This interpretation is highly speculative and not supported by references to the behavior of the birds in the field.—Robert C. Beason.

6. **An analysis of the orientation behavior of night migrating birds in Merkel-Wiltschko cages.** (Eine Analyse des Orientierungsverhaltens nachziehender Vögel im Merkel-Wiltschko-Käfig). W. Viehmann. 1983. J. Ornithol. 124:259-269. (German, English summary.)—Three species of European migrants were used in this study: Robin (*Erithacus rubecula*), Blackcap (*Sylvia atricapilla*), and Lesser Whitethroat (*S. curruca*). The results generally support previous experiments of the Frankfurt group regarding the relative significance of the geomagnetic field and stellar cues, but also provides some interesting insight into the behavior of the birds in the "Merkel-Wiltschko" cages. The birds circle within the cages during the testing and this behavior greatly reduces the length of the mean vector and is probably responsible for the large amount of scatter in the results of this type of experiment. Birds that were tested in artificial magnetic fields exhibited more circling behavior, perhaps as a reaction to stress. The greater activity did not affect the preferred heading. One robin experiment was done with artificial magnetic fields and a stationary (planetarium?) sky. These results support the experiment by Wiltschko and Wiltschko (Z. Tierpsychol. 39:265-278, 1975) that the robin uses both stellar and magnetic information while the warblers rely primarily on magnetic cues.—Robert C. Beason.

POPULATION DYNAMICS

(see also 10, 14, 36)

7. **Seasonal variation in the numbers and condition of Gannets *Sula bassana* (sic) dying on Ailsa Craig, Scotland.** S. Wanless. 1983. Bird Study 30:102-108.—During 3 breeding seasons, adult and immature Gannets (*Morus bassanus*) that fell from cliffs were collected and their sex and condition recorded. The effects of hatching date on the number, age, and condition of chicks that fell were investigated. Condition of birds was determined from bill and wing lengths and weight. Annual losses for adults and immatures were about .5%. Highest numbers of corpses were found during July and August, coinciding with the maximum abundance of birds at the breeding colony. The ratio of males to females was essentially equal; adult females were significantly heavier than males. About 6% of the chicks that hatched were found dead or injured. Chick mortality was lower in chicks that hatched during the first half of the hatching period and higher during the last quartile. Fallen chicks were significantly lighter than chicks in nests, but most had

good subcutaneous and perivisceral fat reserves. Less than 5% had food in their crops suggesting that the chicks that had not been fed recently were more active and susceptible to falling. Higher chick mortality later in the season may indicate later breeding by inexperienced parents.—Lise A. Hanners.

8. Use of age-classes in monitoring population stability of Brown Pelicans. R. W. Schreiber and E. A. Schreiber. 1983. *J. Wildl. Manage.* 47:105–111.—The authors present 8 years of census data on *Pelecanus occidentalis* from the west coast of Florida. In addition to assessing population stability, they examined whether an extensive population could be cheaply monitored on a long-term basis without causing disturbance to nesting colonies. All birds seen were classified as adults, subadults, or immatures on the basis of plumage characteristics observed under field conditions (from a small boat). A general pattern of fluctuations in abundance and age-class ratios emerged. The total population was more stable during the nesting season, when adult birds were most common. Large population fluctuations occurred in the fall when birds moved in and out of the region. Movements of birds following breeding were related to weather patterns, but data on fish populations are needed to evaluate fluctuations in pelican abundance relative to food availability. Their method of total counts, with division of individuals into easily-distinguished age-classes, can be used to inexpensively assess population stability with little disturbance to the birds. However, large areas must be covered in order to gain accuracy. Census techniques for accurate data-gathering are described.—Richard A. Lent.

NESTING AND REPRODUCTION

(see also 7, 20, 21, 22, 27, 30, 38, 64)

9. Reproductive output of eiders *Somateria m. mollissima* on the southern border of its breeding range. C. Swennen. 1983. *Ardea* 71:245–254.—The mean clutch size of the eider was 4.74 eggs (over 12 years) at the southern edge of its breeding range in The Netherlands. This clutch size did not differ significantly from clutch sizes in the center of its breeding range. Hatching success was high (90%). However, duckling mortality, while variable, was usually high with a mean survival of .29 duckling per female. The author concludes that high duckling mortality may be a key factor determining the southern edge of the breeding range in Europe.—Clayton M. White.

10. The diet and feeding ecology of breeding Kittiwakes *Rissa tridactyla*. H. Galbraith. 1983. *Bird Study* 30:109–120.—The effects of brood size on parental activity and rates of provisioning young were determined for broods of 1, 2, and 3 at the Isle of May Kittiwake colony. Provisioning rates increased significantly with chick age, but large broods were not fed more frequently than small broods of the same age. Adults apparently were able to increase their rate of provisioning young with food in the latter half of the nesting period by abandoning their young at night and by spending the night at sea, presumably on the feeding grounds. Young that were abandoned at night were fed earlier the following morning than young that were not abandoned. Broods of 2 and 3 were abandoned more frequently at night than broods of one.

Total food weight provided to chicks increased to about 40 g for broods of 2 and 3 during the nesting season, but leveled out at this weight regardless of brood biomass. Parents of 2 and 3 chick broods weighed significantly less than parents of one chick broods during the latter half of the nesting season. Galbraith suggests that this difference is a consequence of the smaller proportion of a food load retained by parents of the larger broods. These results support the notion that the rate of provisioning food to young is limited by the amount of time needed by parents to obtain a full food load.—Stephen R. Patton.

11. Breeding habitat selection in the Swallow *Hirundo rustica*. A. P. Møller. 1983. *Bird Study* 30:134–142.—Most “colonies” (75%) of Barn Swallows in Jutland, Denmark included only one or two pairs, but colonies with more than 10 pairs (9%) contained 44% of all Swallows nesting in the study area. Among colonies with more than 3 pairs, more persisted than not in successive years. The opposite tendency occurred among colonies with 3 or fewer pairs. The size of a population at a colony was positively correlated with

the size of the farm (stable area). Farms without cattle or pigs did not support swallow colonies. Most swallow nests were placed close to ceilings, near entrances, near neighboring nests, and away from walls.

The importance of the colonial environment to swallow nesting is addressed, but not adequately resolved. The large number of sites with solitary pairs suggests that colonies of this species may be passive aggregations of birds that are limited spatially by the availability of nesting sites.—Stephen R. Patton.

12. Energetic consequences of sexual size dimorphism in nestling Red-winged Blackbirds. K. L. Fiala and J. D. Congdon. 1983. *Ecology* 64:642–647.—With this study, Fiala and Congdon set a new standard of accuracy in measuring metabolic rates for nestlings in the field. They use doubly labeled water ($^3\text{HH}^{18}\text{O}$) to get field metabolic rates of mL CO_2 produced $\cdot \text{g}^{-1} \cdot \text{h}^{-1}$. These measurements take into account nestling activity that is ignored in earlier studies using standard metabolic rates. As one might expect, their estimated metabolic costs are, therefore, higher than those given in earlier studies, and their estimates of the feeding rates required to meet these metabolic needs are also higher than earlier corresponding estimates. Energy requirements for nestling male Red-winged Blackbirds (*Agelaius phoeniceus*) are greater than for females, although not as much greater as their differences in body mass. A greater cumulative cost for raising a male than a female nestling should, according to sex ratio theory, lead to an adjustment in the sex ratio of the eggs laid. No such adjustment is seen, so as Fiala and Congdon point out, sex ratio theory has a new challenge: explaining why not.—A. John Gatz, Jr.

13. A comparison of nesting-ledges used by seabirds on St. George Island. R. C. Squibb and G. L. Hunt, Jr. 1983. *Ecology* 64:727–734.—Squibb and Hunt quantitatively studied the physical characteristics of 288 nest sites for 6 species of seabirds (Northern Fulmars (*Fulmarus glacialis*), Red-faced Cormorants (*Phalacrocorax urile*), Black-legged Kittiwakes (*Rissa tridactyla*), Red-legged Kittiwakes (*R. brevirostris*), Common Murres (*Uria aalge*), and Thick-billed Murres (*U. lomvia*)) nesting on one of the Pribilof Islands, Alaska. Of these species, only Northern Fulmars nest where there is soil over the bedrock ledges and on ledges with partially enclosed ends. Common Murres are unusual in nesting in high densities—up to 92 nests on a single, large ledge. Discriminant function analysis of the measurements for the nest-ledges for the other 4 species led to 65% accuracy in classifying ledges as to species of occupation. Ledge-depth, ledge-slope, and amount of overhanging cover are the most critical characteristics distinguishing nesting locations. Only nest-building species tend to nest on seaward sloping ledges. Both species of kittiwakes nest on shallow ledges, but only Red-legged Kittiwakes choose ledges overhung by rocks. Red-faced Cormorants nest on deep ledges that may slope, but are seldom overhung by rocks. Thick-billed Murres nest on nearly horizontal ledges of intermediate depth and low overhang. The authors appropriately caution their readers that these preferences may well vary according both to what nest sites are available on a given island and what other species are present, i.e., habitat niche shifts are certainly possible. A study of nest-site exchanges between species amplifies this point. Although overall exchange rate was very low, ca. 3%, exchanges between 4 species pairs occurred at significantly non-random rates, including 3 cases in which exchanges occurred more often than expected by chance alone. Squibb and Hunt interpret these results to mean habitat segregation is incomplete on St. George Island and that competition for nest sites exists.—A. John Gatz, Jr.

14. A multivariate study of the relationship of parental age to reproductive success in California Gulls. B. H. Pugsek and K. L. Diem. 1983. *Ecology* 64:829–839.—Previous work has shown that reproductive success is correlated with age in colonially-nesting seabirds and that at least part of this enhanced success in older birds is due to changes in clutch size and egg size with age. The goal of this research was to determine if selection of superior nest sites by older, experienced gulls also contributes to the higher reproductive success in older birds. Pugsek and Diem conclude it does not. Nest sites were characterized according to location within the breeding colony, amount, height, and position of vegetative cover within 1 m of the nest, and the number of other nests within a 2 m radius of the nest. Reproductive success was monitored at 4 different stages: number of eggs hatching and number of chicks surviving 7 d, 14 d, and ≥ 5 wk. Although most

of these measures of reproductive success were linear functions of the nest-site variables, multivariate analyses suggest that these univariate relationships exist because of changes in nest-site location with age, not because of inherent superiority of certain nest sites. For example, older birds used nests near the center of the colony, a behavior that had no influence on offspring mortality rate as the gulls apparently repulsed predators equally well from any portion of this colony. Older birds also nested in areas of high nest density, a factor that actually decreased reproductive success primarily due to cannibalism. Finally, older gulls used nest sites with more vegetative cover than younger gulls, a difference that made no difference in offspring mortality within age groups. Apparently older gulls have higher reproductive success than younger gulls in this population because older gulls lay more eggs and have lower offspring mortality. This latter difference is likely due to higher offspring feeding and defense rates by older gulls than by younger gulls. Pugsek and Diem caution that these interpretations might be altered with more years of data, but also note that the initially hypothesized selection of superior nest sites by older birds is not the only viable explanation for the non-random use of nest sites with age. Their alternative hypotheses are worthy of the investigation they suggest.—A. John Gatz, Jr.

15. Energy costs of incubation in the Wandering Albatross *Diomedea exulans*. J. P. Croxall and C. Ricketts. 1983. *Ibis* 125:33–39.—This study attempts to evaluate the energetics costs of incubation in the Wandering Albatross, a highly sexually dimorphic species. During the 78-day incubation period, males incubated for significantly longer periods than did females. Both sexes lost approximately 17% of their body mass during each incubation bout, but all or most of the loss of body mass appeared to be restored during each subsequent foraging bout. Several methodological and conceptual problems are apparent in this paper; some are highlighted here in hopes that future researchers will not use this paper as a model for their own studies. The allometric equation of Zar was used to estimate metabolic rate; this was refuted years ago and has not been used since by workers in the field. The attempts to determine “energy costs of incubation” are hindered by lack of appropriate measurements. For instance, the relevant literature (none of which is cited) indicates that incubation of eggs may not require additional energetic expenditure above maintenance costs, depending on bird size, egg size, clutch size, ambient temperature, and nest insulation. Since no data are given regarding nest conditions, ambient temperatures, and egg size, it is impossible to separate costs of maintenance and costs of incubation per se. Based on the size of these birds, it is likely that the loss of mass was simply associated with fasting during rest; similar values could be obtained whether the birds were incubating or not.—Cynthia Carey.

16. Productivity of Sandhill Cranes in south central Florida. J. N. Layne. 1983. *J. Wildl. Manage.* 47:178–185.—Data are presented on selected reproductive characteristics of 365 pairs and 202 young of *Grus canadensis pratensis* observed from July–December 1973–1979. The mean proportion of pairs with young for all years was 38.9%, mean clutch size for 7 nests was 1.86, and mean brood size was 1.42. The number of juveniles per 100 adults ranged from 18.6 to 56.5 with a mean of 27.7. A multiple regression analysis suggested that most of the variation in percentage of pairs with young was explained by the amount of rainfall the previous winter and spring. Winter rainfall seemed to increase reproductive success (through improved nesting habitat and food supplies), while high rainfall in early spring reduced productivity (possibly through loss of eggs and young to flooding and predation). Drainage and destruction of south Florida wetlands for the last 50 years probably is a major factor in the long-term decline of this species, since adequate water levels are critical to its reproductive success.—Richard A. Lent.

17. Intraspecific nest parasitism in the White-throated Munia. M. S. Dhindsa. 1983. *Notornis* 30:87–92.—*Lonchura malabarica* nests in abandoned nests of weaverbirds (*Ploceus* spp.). Evidently the number of available nests is a limiting factor so that female munias may parasitize others of their species. This conduct may be the first step in the evolution of interspecific parasitism.—J. R. Jehl, Jr.

18. Ecology of incubation of the Whooper Swan (*Cygnus cygnus*) at the extreme north-east of its range. A. V. Krechmar. 1982. *Zool. Zh.* 61:1385–1395. (Russian, English

summary.)—Along the Anadyr River in northern Siberia, Whooper Swans have only a very short time to raise a brood between spring thaw and fall freeze-up. A one-month incubation period (rather short for such large birds) and maintenance of an almost constant nest temperature (\pm only 2.7°C daily) enable them to nest under these conditions. Data discussed here were collected during 7 field seasons, using an automatic camera developed by the author and dummy eggs containing temperature sensors. Seven nests were studied.

The nest temperature's constancy is due both to the relatively large mass of the eggs (which means they lose heat slowly), and to the behavior of the incubating female. She spends 86.6% of the incubation period on the eggs, leaving them 1–12 times each 24-h period. The frequency and duration of her absences are determined by the ambient temperature, but wind and rain (regardless of air temperature) also influence them. (Yet another factor functions on the few days when flies hatch in swarms: then the swan prefers to sit on her eggs all day, rather than to expose her brood patch to their bites.) As incubation progresses the temperature in the nest increases from the heat given off by the developing embryos and by the decaying nest substrate, and this may prompt the more frequent absences that were observed as the month went on. On warmer days, the mother sits "lightly" on her clutch; on colder days she may settle herself so closely that her back hardly shows above the nest rim. When it rains she flattens herself out on the nest and partially spreads her wings so that her body shields not only the eggs, but the entire nest cup. Usually she carefully pulls nest material over the eggs whenever she leaves them (sometimes returning almost at once to adjust the covering), but on clear, windless days the eggs may be left bare, to be warmed by the sun.

These self-regulating features of the nest temperature mean that the eggs do not receive a severe chilling when the parent returns with a cold, wet underside, and that Whooper Swan nests (which contain very little down and feather matter) need not be so well insulated as those of other waterfowl.—Elizabeth C. Anderson.

19. Socially conditioned mortality in colonies of the Great Black-headed Gull (*Larus ichthyaetus*). 2. Dynamics and range of juvenile mortality in colonies with different spatial structure. E. N. Panov and L. Yu. Zykova. 1982. Zool Zh. 61:1396–1412. (Russian, English summary.)—Mean clutch size, hatching success, and range of juvenile mortality were compared in 12 colonies of *Larus ichthyaetus* from the Kara-Bogaz-Gol Gulf on the eastern shore of the Caspian Sea and from Lake Tenghiz in northern Kazakhstan, USSR. There are 2 main types of colonies: principal and satellite. Principal colonies are characterized by earlier nesting, greater breeding number and density, greater clutch size, and low loss of young during incubation and hatching. Broods and their parents from the satellite colonies come to join the principal colonies and at least some of the chicks (both "aboriginal" and "immigrants") go into a creche. Leaving the nest for the creche occurs at a later, stronger stage in the development of chicks from the principal colonies; hence, mortality during this transition is less for them. However, in principal colonies, juvenile mortality increases as numbers and density increase, due at least in part to adults killing the young. Juvenile mortality in satellites appears not to be density-dependent, but its causes need to be researched further. Nevertheless, the final nesting success is greater in the main colonies because of greater percentages of fertile eggs, greater stimulation to incubate by observing others doing so, and greater protection from terrestrial predators. The authors postulate that there may be a level of density and numbers above which the disadvantages of large, dense colonies outweigh the advantages for reproductive success.—Elizabeth C. Anderson.

BEHAVIOR

(see also 2, 10, 11, 18, 19, 36, 46, 48, 50, 51, 54, 55)

20. Incubation behaviour of the Arctic Tern *Sterna paradisaea*, in relation to time of day and stage of incubation. K. Skipnes. 1983. Ardea 41:211–215.—The proportion of birds asleep during incubation was greatest during the day and least in the evening, whereas "quiet incubation" was greatest in the evening. Frequencies in "egg-shifting" or "re-settling" behavior patterns did not change during the day. Less time was spent on

the nest during the middle of the day than in either morning or evening, but the time spent on the nest averaged 98.8% and did not change through the incubation period.—Clayton M. White.

21. Polygyny and breeding ecology of the Cetti's Warbler *Cettia cetti*. C. J. Bibby. 1982. *Ibis* 124:288–301.—Cetti's Warblers differ from other European warblers in that: (1) they winter as far north as Britain, (2) they sing year-round, and (3) they are strongly sexually dimorphic. This latter distinction prompted this study to test whether the size dimorphism was associated with polygynous breeding behavior. Males generally breed with more than one female, the exact number depending on the size of the male. The female incubates and cares for the young alone. Polygyny favored larger clutches than monogamy. The author hypothesizes that this type of unusual breeding behavior for an insectivorous bird evolved due to male-male competition for the lush and productive breeding sites in marshes and due to female ability to choose productive nest sites irrespective of male status.—Cynthia Carey.

22. Investigations on the territoriality of the Nightingale (*Luscinia* (sic) *megarhynchos*). (Untersuchungen über das Revier der Nachtigall (*Luscinia megarhynchos*)) A. Grüll. 1981. *J. Ornithol.* 122:259–285. (German, English summary.)—Song activity and territorial behavior were studied in 81 individually-marked Nightingales (*Erithacus megarhynchos*). The average territory size was .67 ha, with a positive linear relationship between area and the amount of habitat providing food. As population density increased, territory size decreased before individuals began occupying suboptimal habitat. Suboptimal habitat was primarily occupied by first-year, unmated males. High levels of song activity and nocturnal singing were associated with pair formation rather than the establishment of territories. During the breeding season, territories were abandoned only after the loss of a mate or brood. Males had a higher site fidelity between years than females. Almost half returned to the same areas in successive years and 76% of these occupied the same or a contiguous territory. Shifts in territories usually occurred when 2-year-old birds moved from suboptimal areas.—Robert C. Beason.

23. The nesting behavior of a kiwi. B. Drent. 1983. *Notornis* 30:135–136.—A male North Island Brown Kiwi (*Apteryx australis mantelli*) was encountered asleep atop a $\frac{2}{3}$ filled, partly-buried, bottle of beer. Whether this represents incubation behavior, as the author suggests, or an advanced form of cacheing, is debatable. The behavior was witnessed repeatedly, leading the author to wonder whether the bird was having trouble giving up the bottle.—J. R. Jehl, Jr.

24. On the function of warning colours: response of young Starlings to wasp-like black and yellow coloured dummies. (Zur Funktion von Warnfarben: Die Reaktion junger Stare auf wespenähnlich schwarz-gelbe Attrappen.) W. Schuler. 1982. *Z. Tierpsychol.* 58:66–78. (German, English summary.)—Hand-reared Starlings (*Sturnus vulgaris*) rejected black-and-yellow banded models at a slightly higher rate than other colors when 6 weeks of age, although 13-week-old birds showed no such differential response. As there was no control over the brightness of the colored stimuli or the degree of contrast they showed, the stimulus-basis for the reputed discrimination remains unknown. If an initial discrimination exists, one cannot argue with the conclusion that “. . . must be supplemented by unpleasant experience” in order for the warning coloration to work in nature.—Jack P. Hailman.

25. Owl recognition and anti-predator behaviour of Sharp-shinned Hawks. P. Kerlinger and P. H. Lehrer. 1982. *Z. Tierpsychol.* 58:163–173.—Migrating Sharp-shinned Hawks (*Accipiter striatus*) were exposed to a variety of models to test for optical characteristics eliciting mobbing, but the choice of models was so intuitive and unsystematic that I wonder how useful these experiments are. For example, dimensionality was tested using a cylinder with eyes and flat plywood models with eyes. However, the cylinder's eyes were themselves 3-dimensional while those of the boards were painted on; the cylinder when seen straight-on is rectangular in shape, whereas the boards were oval; the cylinder appears quite dark in the photo, providing good contrast with the yellow iris of the eye, whereas

the boards are so light that the iris does not show in the photograph of one; the ratio of iris-diameter to pupil-diameter differs in the 2 kinds of model; and so on. This is a study in confounding variables.—Jack P. Hailman.

26. Sexual displays of the Great Argus Pheasant *Argusianus argus*. G. W. H. Davison. 1982. *Z. Tierpsychol.* 58:185–202.—The Great Argus Pheasant has attracted the eyes of biologists ever since Charles Darwin drew attention to the multitude of eye-like marks (ocelli) on its magnificent tail. Until Davison's field studies in West Malaysia, however, we knew this bird primarily from observations in captivity. The solitary male cleans a display ground with 4 action patterns mainly derived from foraging, and gives 11 different displays in the presence of a female. Perhaps most interesting of the displays is "Body Shaking" which appears to focus attention on the bird as display begins (as in certain displays of the Mallard *Anas platyrhynchos*), and the "Frontal Movement," in which the fanned tail is held at close range to the female, displaying the ocelli which radiate out from the male's true eye. "A parallel can be drawn between the displays of many ♂♂ at a lek, of which the ♀ chooses to mate with a central ♂, and the display of the solitary Great Argus ♂ in which the ♀ is presented with a central, maximally stimulating position within the plumage of a single bird" (p. 200). As wild as this hypothesis sounds, I think that Davison might really have solved the century-old puzzle of this bird's incredible super-normal stimulus.—Jack P. Hailman.

ECOLOGY

(see also 2, 13, 32, 39, 64, 65)

27. Influence of the lake shore on the reproduction of the Pied Flycatcher *Ficedula hypoleuca* and the Redstart *Phoenicurus phoenicurus* in Finnish Lapland. A Järvinen. 1982. *Ann. Zool. Fenn.* 19:171–174.—Pied Flycatchers nesting within 200 m of the shore of Lake Kilpisjärvi (37 km²) laid 2 d later than those nesting more than 200 m from the shore, apparently due to the cooling effect of melting ice and the cold water. Unlike the Pied Flycatcher, which colonized the area in the 1950s, the indigenous Redstart showed no effect of proximity to the water. Hatching success in both species was better close to the lake, probably due to the abundance of emerging insects that provided food for incubating females, but fledging success was unaffected by proximity to the lake. The data provide an interesting example of local climatic effects.—Edward H. Burtt, Jr.

28. Habitat selection attributes of an avian community: A discriminant analysis investigation. J. Rice, R. D. Ohmart, and B. W. Anderson. 1983. *Ecol. Monogr.* 53:263–290.—Enough data, analyses, and variety of results are presented here to provide at least one example supporting just about any existing theory of habitat selection or community organization. Three censuses per month over a 2 yr period on each of 72 transects throughout the lower Colorado River valley provide the data on birds. Foliage densities at 3 height intervals, foliage height diversity (FHD), and proportions of trees in each of 8 categories are sampled along these same transects to provide the data on habitat conditions. Discriminant function analysis is the primary analytical tool, and, when employed with supplemental analyses, yields a variety of generalizations about the bases for habitat selection among either the entire set of bird species in the area or various subsets thereof. For example, in late summer just a few habitat features are selected quite narrowly to give high habitat specificity, whereas in winter lower selectivity is seen on more features of the habitat. Both structure (FHD) and composition (especially abundance of cottonwood, willow, or honey mesquite) of the vegetation matters in habitat selection. In late summer, habitat selection by one species is independent of other species (i.e., there is no evidence for a competitively-structured community), but in fall, winter, and spring this is no longer true. Species that enter the area just to breed show higher habitat specificity than longer-term residents; granivores and insectivores show no differences in degree of habitat specificity. These are just examples; the analyses go on and on, both in this monograph and in several other papers cited herein. All in all, the authors are quite convincing in arguing for large-scale, long-term studies of community organization since anything less would miss many of the patterns they report.—A. John Gatz, Jr.

29. Foraging patterns of nesting Gila Woodpeckers. S. Martindale. 1983. *Ecology* 64:888–898.—Martindale presents a thoughtful and well-analyzed account of the foraging ecology of Gila Woodpeckers (*Melanerpes uropygialis*) nesting in the Saguaro National Monument. He finds that visits to different substrate types (saguaros, paloverde, ironwood, and others) are not proportional to capture rates on these substrates as expected based on optimal search theory. Some deviations are caused by combining foraging and other activities, such as guarding, into single trips. Other deviations apparently stem from physiological needs for shade and water and result in more frequent visits to saguaro cacti than expected based on the energetic value of foods obtained there. At the same time, a number of foraging patterns are as expected based on central place foraging theory. For example, when at greater distances from the nest, the birds are more substrate selective, exert more foraging effort, and obtain larger loads than when nearer the nest. However, Martindale is not complacent about these results as he points out a quite plausible alternative explanation for some of the patterns involving local depletion of resources about the nest. Moreover, at least one further result—the pattern of moving away from the nest, not toward it while foraging—is contrary to this same body of foraging theory. The point that the overall foraging behavior of these birds represents an apparent compromise among several sets of selective forces should come as no surprise, but it is just these deviations, recognizable thanks to the existence of optimization models, that make the basic biology reported here all the more interesting.—A. John Gatz, Jr.

30. Ecological aspects of the reproductive biology of Eastern Kingbirds: geographic comparisons. M. T. Murphy. 1983. *Ecology* 64:914–928.—Murphy studied the reproductive biology of Eastern Kingbirds (*Tyrannus tyrannus*) in western New York (NY) in 1979 and in eastern Kansas (KS) in 1980. His primary goals were to make comparisons both intraspecifically (KS vs NY) and interfamily (tyrannid flycatcher vs previously studied swallows), and he interprets his data in these contexts. The overall breeding pattern seen for the Eastern Kingbird was production of a single small clutch, slow growth of the brood, and prolonged postfledging dependency, i.e., a pattern not unlike that seen in swallows and other aerial foragers. Few intraspecific differences were found. Egg mass averaged greater in NY than in KS, and only in NY did egg mass increase with egg order within the clutch. Both these differences are what one should expect theoretically if NY offers a harsher climate for kingbirds than does KS. New York's lower average temperatures and higher average precipitation support this supposition since prolonged cold, wet weather greatly reduces insect availability. More direct support comes from kingbirds from NY showing twice the starvation rate (8.3% vs 3.7%) as the birds from KS. A further intraspecific variation was the earlier development and faster growth of the ninth primary in KS than NY. Murphy interprets this difference as an adaptation for earlier fledging in KS than NY. Because nestling mortality from predators was nearly 3 times higher in KS than NY (30.9% vs 10.7%), even one less day in the nest could be especially advantageous for birds from KS. As Murphy realizes, the amount that can be concluded with certainty is quite limited in an observational study like this one—especially one of limited duration. Nonetheless, the data corroborate miscellaneous hypotheses on the evolution of life histories.—A. John Gatz, Jr.

31. Foraging ecology of temperate zone and tropical woodpeckers. R. A. Askins. 1983. *Ecology* 64:945–956.—The seasonal stability hypothesis, one of many hypotheses for the latitudinal gradient in species diversity (Pianka, *Am. Nat.* 100:33–46, 1966), predicts greater species richness in regions of greater seasonal stability. Woodpeckers are a reported exception to this pattern, and Askins reasons that this could be due to the high seasonal stability of their food resource of wood-boring larvae and ants. The combination of these ideas leads to the prediction that woodpeckers at all latitudes should be equally specialized in foraging techniques, so Askins compares niche breadths for excavating woodpeckers from Guatemala, Maryland, and Minnesota. His results show one of the initial premises was wrong: There are twice as many species that spend >50% of their foraging time excavating in Guatemala as at the temperate sites. The predicted similarity in degree of specialization in foraging behavior of these birds was found, however, so a new question surfaces. If the niches are the same size, i.e., the birds equally specialized,

then why are there twice the number of species of woodpeckers in the tropics? Askins' data show that it is not a matter of increased niche overlap in the tropics, but rather the use by tropical woodpeckers of resource space not available to temperate woodpeckers that accounts for the difference in species richness. Askins' initial motivation for comparing specialization in temperate and tropical woodpeckers may have vanished with his discovery of the actual number of species in both locations, but his results still contribute to the overall question of what causes latitudinal patterns in species abundance.—A. John Gatz, Jr.

WILDLIFE MANAGEMENT AND ECONOMIC ORNITHOLOGY

(see also 8, 37)

32. Edge effect on forest bird densities on offshore islands in the northern Gulf of Bothnia. E. Helle and P. Helle. 1982. *Ann. Zool. Fenn.* 19:165–169.—The number and diversity of species are greater at the center of the forest than at its edge. However, the density of birds is less at the center than at the edge of the forest with the highest density of birds being 50–100 m from the forest edge. The authors recommend caution in establishing transects for long-term quantitative ecological study particularly in fragmented habitats.—Edward H. Burtt, Jr.

33. Arctic Fox, *Alopex lagopus*, predation on nesting Common Eiders, *Somateria mollissima*, at Icy Cape, Alaska. S. E. Quinlan and W. A. Lehnhausen. 1982. *Can. Field-Nat.* 96:462–466.—An arctic fox crossed a tidal flat and swam a short distance to reach Amaulik Island where it devastated a Common Eider colony. Incubating females usually flushed when the fox was about 2 m away, but one female who flushed when the fox was only .5 m away was captured and eaten by the fox. The foul-smelling excrement deposited on the eggs by departing females did not deter the fox, although it buried all 498 eggs without eating any. Foxes readily recover cached eggs (Tinbergen, *Z. Tierpsychol.* 22: 119–149, 1965). Foxes appear to be a significant factor in the eider's choice of relatively inaccessible barrier islands for nesting colonies. Thus the building of causeways by oil and gas developers may pose a real threat to breeding eiders.—Edward H. Burtt, Jr.

34. Survival of female Black Ducks, *Anas rubripes*, during the breeding season. J. K. Ringelman and J. R. Longcore. 1983. *Can. Field-Nat.* 97:62–65.—Black Ducks with radio transmitters mounted on their backs fly and behave normally, maintain normal weight for at least a year, and experience normal feather wear under and around the transmitter. The transmitters enabled researchers to monitor reproductive biology with minimal disturbance to the females. However, estimates of mortality must be considered speculative despite the authors' emphasis on this aspect of their study. Only 19 females were radio-tagged and only 3 died. The data and discussion are interesting, but more data on natural mortality are needed before management decisions can realistically account for both hunting and natural mortality.—Edward H. Burtt, Jr.

35. Responses of Ring-billed Gulls to cannon-netting and wing-tagging. L. K. Southern and W. E. Southern. 1983. *J. Wildl. Manage.* 47:234–237.—In Michigan, 337 cannon-netted and wing-tagged individuals of *Larus delawarensis* had slightly lower brood sizes than unnetted, untagged birds. Tagged birds tended to preen the tagged wing more often, suggesting sensitivity to the tags. The resighting rate for the first 100 birds removed from the net was significantly higher than that for birds processed later. These last-handled birds apparently had a greater tendency to desert their nests. Researchers should carefully evaluate their use of cannon-netting and wing-tagging to avoid harm to colonially nesting birds, and if these techniques are used, birds should be processed carefully and quickly.—Richard A. Lent.

36. Effects of controlling Crows *Corvus corone* and Jackdaw *C. monedula* on numbers. A. L. Spaans and T. A. Renssen. 1983. *Limosa* 56:37–44. (Dutch, English summary).—Between November 1981 and November 1982 some 337 Crows and 223 Jackdaws were trapped on the study area, transported 61 km, and released. Only two of the displaced birds were retrapped on the study area, suggesting an effective removal program. During

this high removal program, the numbers of both species remained stable, indicating rapid replacement of removed individuals from nearby populations. At the end of the study there were nearly twice as many crows as before removal and the authors suggest that these newcomers were predominantly low-ranking, wandering birds. Being low-ranking, they were less capable of keeping out conspecifics than were the high-ranking birds that were removed.—Clayton M. White.

CONSERVATION AND ENVIRONMENTAL QUALITY

(see also 16, 33, 49)

37. First records of chlordane-related mortality in wild birds. L. J. Blus, O. H. Pattee, C. J. Henny, and R. M. Prouty. 1983. *J. Wildl. Manage.* 47:196–198.—This short note provides the first firm evidence of the lethal effects of the insecticide chlordane on wild birds. Two adult male Red-shouldered Hawks (*Buteo lineatus*) and an adult female Great Horned Owl (*Bubo virginianus*) were found in Maryland, Alabama, and Oregon respectively. The hawks were found dead; the owl was alive when found, but died the next morning. Necropsies failed to pinpoint cause of death, but severe emaciation of the specimens suggested organochlorine insecticide poisoning. Residue analyses were performed on brains and carcasses of the 3 birds. Levels of heptachlor epoxide and oxy-chlordane in all 3 brains were within lethal ranges established in experimental studies. These 2 chlordane metabolites have killed birds fed an experimental diet containing chlordane. The authors conclude that "chlordane was primarily responsible for the deaths of the 3 raptors." Thus chlordane can accumulate in the environment to levels dangerous to raptors.—Richard A. Lent.

PHYSIOLOGY

(see also 4, 12, 15, 46, 54)

38. The role of muscle development in the transition to endothermy in nestling Bank Swallows, *Riparia riparia*. R. L. Marsh and S. J. Wickler. 1982. *J. Comp. Physiol.* 149:99–105.—The ontogeny of thermoregulation in altricial birds has been studied intensively for years, but the mechanisms underlying the transition from ectothermy to endothermy have never been fully elucidated. This study correlated the onset of thermogenic capacity in nestling Bank Swallows with ontogenetic changes in masses, protein contents, and activities of citrate synthase and myofibrillar ATP-ases of pectoralis and leg muscles. The masses, protein contents, and enzyme activities of leg muscles increased linearly with age and showed no direct correlation with the abrupt increase in thermogenic capacity evident in nestlings between 12–16 g. Pectoralis muscle mass increased exponentially with age; myofibrillar ATPase of this muscle doubled at the same age as the chicks began to thermoregulate. The increase in activity presumably reflects the transition from slow-twitch to fast-twitch fibers and may be one of the principle factors responsible for the development of thermogenic capacity in birds.—Cynthia Carey.

39. Torpor in Red-backed Mousebirds *Colius castanotus*. (Der Torpor beim Rorückenmausvogel *Colius castanotus*.) R. Prinzing, R. Göppel, and A. Lorenz. 1981. *J. Ornithol.* 122:379–392. (German, English summary.)—Captive birds under forced-fasting conditions lost up to 35% of their body weight. At night these birds entered torpor and lowered their metabolic rate to 33% of basal level on the average, with one bird dropping to 5%. There was no spontaneous arousal of the bird if its body temperature fell below 18°C. When maintained on a minimum diet, the mousebirds went into torpor on 16 consecutive nights without difficulty. The ability to enter torpor is thought to be an adaptation to an herbivorous diet which has low energy value. Torpor would reduce nocturnal energy loss.—Robert C. Beason.

MORPHOLOGY AND ANATOMY

(see 42, 46)

PLUMAGES AND MOLT

(see also 26, 46)

40. The moult of the osprey *Pandion haliaetus*. Y. Prevost. 1983. *Ardea* 71:199–209.—The study was based on wild-trapped birds (120) and museum skins (76). Essential features of primary feather molt are that it is continuous from initiation until the first return to the breeding grounds at age 20 or 32 months. Those returning at 20 months have only one complete molt, while those at 32 months had two complete molts. Primary molt began with number 1 and moved outward to number 10. It was interrupted before spring migration, but about half of the adults were replacing one or two primaries in each wing during the breeding season. On returning to the wintering grounds, molt started again with the feather distal to the last one shed. The pattern of secondary molt was lost within a few months and even symmetry between wings was lost. The secondary molt was continuous until the first return migration to the breeding grounds at either age 20 or 32 months. A discussion of the evolution of the molt in large falconiform species follows in which the author concludes that annual replacement of primary feathers is inversely related to wing length and wing loading, with some vultures and large eagles replacing feathers only every 2–3 years.—Clayton M. White.

41. The effects of methods on estimates of primary moult duration in the Redshank *Tringa totanus*. R. W. Summers, R. L. Swann, and M. Nicoll. 1983. *Bird Study* 30: 149–156.—Different methods of molt analysis yielded estimates of molt duration ranging from 72 to 109 days. Primary growth in the Redshank was not constant and consequently, linear models did not fit the data. Linear models also predicted early dates for the start and completion of molt. Non-linear methods of analysis based on the mass of feathers replaced during molt yielded the most satisfactory results. Conversion of molt scores to the percent mass of feather replacement may be a more meaningful method of analyzing the progression and energetics of primary molt in birds. This is especially true for species with long pointed wings (e.g., gulls and terns) whose outer primaries may be 2 to 3 times as long as the inner primaries. This method of molt analysis deserves further attention from ornithologists studying the patterns and energetics of primary molt.—Stephen R. Patton.

42. Weight variation of Dunlins *Calidris alpina* during post-nuptial moult, after application of weight data transformations. A. A. Goede and E. Nieboer. 1983. *Bird Study* 30:157–163.—Three factors that may obscure the relationship of weight variation to post-nuptial molt were investigated. These were: the time between capture of the bird and weighing, the size of the bird, and possible differences in weight between birds caught before and after high-tide roosting. Dunlins were mist-netted, weighed, and their bill lengths measured. Molt scores were obtained from adult birds in the same stage of molt. During the first hours of captivity, weight decreased logarithmically. Weight data recorded 2–6 h after capture were transformed into weights birds would have had after 2 h. A correlation between the transformed weight data and bill length for birds with the same primary molt scores was highly significant. The weights of all Dunlins were then transformed into those appropriate for 33 mm bill length. There was no significant difference in weight before and after high tide during primary molt; no transformations were made on this factor. Using the transformed weight data and examining the relationship to molt, the authors conclude that weight is kept low and more or less constant during molts. They suggest that the weight is kept low to offset the reduced flight efficiency during the period of primary molt.—Lise A. Hanners.

ZOOGEOGRAPHY AND DISTRIBUTION

(see also 9, 30, 31, 63, 64)

43. Origin, status, and ecology of the owls in Galapagos. R. S. De Groat. 1983. *Ardea* 71:167–182.—The Barn Owl (*Tyto alba*) occurred only on the 5 largest islands, while the Short-eared Owl (*Asio flammeus*) was found on 19 major islands. An estimated 8500 pairs of the former and 9000 pairs of the latter occur in the Galapagos. The Barn Owl was nocturnal and the Short-eared diurnal and crepuscular. The Barn Owl ate mainly mammals (85%) and insects (12%) while the Short-eared ate birds (51%) and mammals (47%). Nests of both species were found in all months of the year, but the concentration of nests was from November to June (the rainy season). Both species are smaller and darker-colored than subspecies from South America. While the Barn Owl was less sexually dimorphic than adjacent continental forms, the Short-eared appeared to be more sexually dimorphic. The author suggests that the Short-eared on the Galapagos has increased its range of prey (competitive release?) over the mainland, while the Barn Owl has retained a range of prey that is similar to the species elsewhere. The clutch sizes are smaller and development of young slower for both species compared to mainland birds. Farmers killed about 35% of the breeding population of Short-eared Owls in one year. Conservation aspects are discussed.—Clayton M. White.

SYSTEMATICS AND PALEONTOLOGY

(see also 48, 63)

44. Phylogenetic relationships and transantarctic biogeography of some gruiform birds. J. Cracraft. 1982. *Geobion* (Lyon) 6:393–402.—A cladistic analysis of the skeletal anatomy of some gruiform families leads Cracraft to propose that the South American Sunbittern (*Eurypyga helias*) is related to the New Caledonian Kagu (*Rhynchotos jubatus*) and that both are the sister group of trumpeters and related birds. Some of these birds are flightless, others are nearly so; Cracraft concludes that the cladogram and this flightlessness support a Cretaceous (Gondwanaland breakup) origin for these families. If he is correct, and these monophyletic families of non-passerines represent vicariant representatives (geographic remnants) of widespread Gondwanaland birds, then other Gruiform taxa, such as cranes and rails, must be older still.—George F. Barrowclough.

45. The relationships of the Accentors (*Prunella*) as indicated by DNA-DNA hybridization. C. G. Sibley and J. E. Ahlquist. 1981. *J. Ornithol.* 122:369–378.—This is one of a series of papers by these authors on taxonomic relationships based on DNA-DNA hybridization. They conclude that the *Prunella* are most closely related to the Ploceinae, and then to the other fringillids.—Robert C. Beason.

EVOLUTION AND GENETICS

(see also 12, 17, 58)

46. Avian genetics. P. A. Buckley. 1982. Pp. 21–110, in *Diseases of Cage and Aviary Birds, 2nd ed.*, M. Petrak (ed.), Lea & Febiger, Philadelphia.—This massive, competent review of avian genetics is likely to be missed by many ornithologists because it appeared in a book on diseases of domesticated birds, but it is well worth the effort required to find it. Buckley begins with a section on the avian cytogenetic system, showing that birds have large (macrochromosomes) and small (microchromosomes) chromosomes, with the sex chromosomes (ZZ for males and ZW for females) being numbers IV, V, or VI in most cases (macrochromosomes are numbered by size, the largest being I). Birds have a large diploid count of chromosomes, the greatest number known being 126 for the Hoopoe (*Upupa epops*), with more than three-quarters of studied species having between 52 and 94 chromosomes. There is an extensive discussion of normal karyotypes, polyploidy, chromosomal polymorphism, and other important issues from which several conclusions appear to be warranted. For example, speciation seems correlated with a reduction in genome size through loss of sections of repetitive DNA. Non-repetitive DNA characterizes

microchromosomes, but no active genes have been identified to date on these small chromosomes. It is becoming clear that sex determination in birds is wholly unlike that of mammals (where possession of the Y chromosome produces a male); the situation appears to be more analogous with *Drosophila* where the ratio of a sex chromosome to the number of autosomes is important in determining sex.

A second major section on inheritance patterns, terminology, and concepts reviews much basic genetics. I disagree that selection can work only on characters having a genetic basis, but the author is merely voicing accepted dogma. (If one defines evolution by change in gene frequency, then of course the assertion is true by nature of being a tautology.) There is a useful discussion of heritability concepts, but I cannot accept the 1978 study of Boag and Grant on Galapagos finches as showing high heritability, in that their experiments were set up so as to exclude environmental components of character-variance. I like Buckley's inclusion of penetrance, expressivity, pleiotropy, and epistasis.

The third section, Genetic Variability, also contains some gems. Example (p. 45): "... a linkage map based on crossover frequency has been generated for only *one* of the 8600+ species of birds, domestic fowl." Particularly useful is the discussion of how polymorphism is maintained in populations: heterozygote superiority, assortative mating, disassortative mating, ecological mosaicism, apostatic selection, or frequency-dependent selection.

The fourth section, Plumage and Pigmentation, would have been a valuable review paper in and of itself, and is especially likely to be missed by workers interested in the subject, as coloration can be studied apart from its genetic basis. There is a review of the basis of avian colors and color-modifiers, followed by an important section on abnormal coloration in which Buckley goes a long way toward straightening out a terribly twisted literature, confusions in which have been exacerbated by separate terminologies among poultry workers, aviculturalists, and ornithologists. Buckley likens a "partially albino" bird to a "partially pregnant" mammal, and not only tries, but succeeds in correcting a lot of the descriptive errors in the literature.

The fifth section is on hybrids, inheritance, evolution, and ancestry. Beginning with morphological patterns, the text moves usefully to behavioral patterns, which, despite the small literature, have never before been reviewed. He then considers vocalizations in particular, an active area in which surely much more will be learned in the coming years.

The paper concludes, most usefully I think, with a sixth section on environment-experience interactions with genotypes. Instructively, the section begins with Dobzhansky's 4 generalizations, often forgotten by researchers: (1) every trait results from both genes and the environments in which they are expressed, (2) every trait is ultimately polygenically controlled, (3) most genes probably affect many characters, and (4) modifying genes are extremely important in heredity. Buckley picks his difficult way through an inadequate and sometimes conflicting literature in making the best sense possible of this difficult subject.

There are very few papers that are "must" reading for nearly any ornithologist. This monograph-length review touches on so many important phases of avian biology, including physiology and other topics not mentioned above, that no active researcher should be unaware of its contents. If Buckley were to make no other contribution than this review (and he has already made many through his own empirical research), he would still secure a respected place among peers. Read this work.—Jack P. Hailman.

47. Rate of karyotypic evolution and speciation in birds. H. Tegelstrom, T. Ebenhard, and H. Rytman. 1983. *Hereditas* 98:235–239.—Karyotypic data from 238 species of birds, representing most orders, were used in conjunction with estimates of the age of several families, based on first fossil appearance in Brodkorb's surveys, to calculate rates of karyotypic evolution in 12 avian lineages. The rate of karyotypic evolution in passerine birds was found to average about 10 times faster than in non-passerines. Speciation rates, again based on first appearances in the fossil record, also were found to be considerably greater in passerines than in non-passerines. Nevertheless, no significant correlation between speciation rate and rate of karyotypic evolution was found at the familial level. These results are at variance with the hypothesis of Bush and others (*Proc. Natl. Acad. Sci. USA* 74:3942–3946, 1977) that these 2 rates are causally linked through social struc-

turing of populations. This suggests that although karyotypic change may lead to speciation in some taxa, other modes of speciation are dominant in birds (see review 48).—George F. Barrowclough.

48. Birds, behavior, and anatomical evolution. J. S. Wyles, J. G. Kunkel, and A. C. Wilson. 1983. Proc. Natl. Acad. Sci. USA. 80:4394–4397.—Eight skeletal measurements from each of 239 species (26 orders) were used to compute “morphological distances” among birds. These morphological distances were then compared to the results of similar analyses, using the same set of 8 measurements, from other classes of vertebrates. The results indicate that birds are as morphologically diverse as are these other classes, contra Romer, Simpson, and others. The authors of this paper also believe, on the basis of molecular evidence and the fossil record, that modern avian orders are the result of recent evolution (last 65 million years or less). Thus, if it is both true that birds are as morphologically diverse as other vertebrates, and are also younger than other vertebrates, then rates of anatomical evolution in birds must have been greater than rates in, for example, frogs, lizards, and salamanders (see review 47). The authors propose that behavior drives anatomical evolution through social transmission of new skills creating new selection pressures on morphology. Birds and some mammals have sufficiently complex social structuring that this process could lead to rapid and accelerating evolution. The authors cite the rapid spread of opening of milk bottles by British tits as an example; this habit would lead to selection pressure for the rapid evolution of an efficient enzyme for lactose digestion.

This scenario is clever and thought-provoking. The present report, however, leaves several loose ends. Without an actual list of the species of birds, mammals, and other vertebrates measured, it is hard to evaluate the claim of comparable morphological diversity in these classes. Also, the robustness of the results to different sets of skeletal measurements needs to be investigated. That modern bird taxa are recent compared to other vertebrates requires documentation with more evidence than amino acid sequence data.—George F. Barrowclough.

FOOD AND FEEDING

(see also 29, 43)

49. The diet of the Peregrine *Falco peregrinus* in south Scotland during the breeding season. R. Mearns. 1983. Bird Study 30:81–90.—The diet of Peregrines during 1975–80 consisted of 74 different bird species. Transient species made up about ½ of all items recorded and about ¾ of the total weight of food at inland eyries. The proportion of the diet that was formed by each prey group varied by less than 10% between years. There was little difference in diet of male and female Peregrines, although a greater proportion of larger prey was brought to broods of 3–4 young than 1–2 young. In all years, regardless of the different habitats in which the eyries were found, domestic pigeons formed the greater part of the diet, both by numbers and weight. Because of the importance of pigeons in the diet and because Peregrines hunt over a wide range of habitats, diet differences among habitats were minor. These factors have minimized the effect of habitat change by afforestation on Peregrines in Scotland.—Lise A. Hanners.

50. Joint hunting of Hobbies *Falco subbuteo*. B. Ens. 1983. Limosa 56:59. (Dutch, English summary.)—Two immature Hobbies awaited passerines on the ground. Each hunt started with one Hobby leaving the ground from below the intended prey; the second took over as soon as the victim escaped the first attack. If the victim escaped an attack from below, the Hobbies switched to an attack from above. Three out of 14 hunts were successful. Because of the abundance of prey, the Hobbies likely gave up the attack quickly as it was not profitable to continue chasing once the surprise attack failed.—Clayton M. White.

51. The spacing of stored food by Marsh Tits. D. Sherry, M. Avery, and A. Stevens. 1982. Z. Tierpsychol. 58:153–162.—Sunflower seeds were stored in Wytham Wood near Oxford, where studies of the Marsh Tit (*Parus palustris*) have continued for many years.

In general, the closer the seeds to one another and the closer they were to the ground, the greater the percentage that were taken (probably mostly by tree squirrels and other rodents). More surprisingly, when the tits themselves stored seeds, they first took them to greater distances from the feeder and only later stored them nearby.—Jack P. Hailman.

52. Foraging strategies of Rooks (*Corvus frugilegus*): a simulation. D. F. Chantrey. 1982. *Z. Tierpsychol.* 59:157–171.—“A computer simulation was used to test a hypothesis that local enhancement behaviour increases rooks’ food-finding efficiency.” I would have been happier to see “increases” replaced by “could increase.” Indeed, the author asks at the end of the paper “. . . whether the simulation is a valid tool in the study of the feeding behaviour of real rooks.” The answer is, of course, affirmative (otherwise why bother to publish the simulation?), and in support are cited 2 references: an oral paper given at a meeting in Vancouver in 1979 and an unpublished manuscript by another author. Enough said?—Jack P. Hailman.

53. Selectivity in insect consumption by Rooks (*Corvus frugilegus*). Iu. R. Anokhina. 1982. *Zool. Zh.* 61:1442–1444. (Russian, English summary.)—Rooks are known to eat 200 species of insects, but it has never been established whether they had preferences among these 200. In May and June 1977, while Rooks in a colony in an agricultural area were feeding their young, their food selections were sampled with the aid of neck ligatures on nestlings aged 3–14 days. At the same time Barber’s soil traps were used to determine the kinds and abundance of insects available in the study area. The results showed that Rooks indeed are selective.

Sixty insect species were trapped. Beetles (Coleoptera) predominated. Ten species were considered very common and 9 were common. Not surprisingly, the Rooks fed primarily on the insects which were caught in the traps most frequently. These were also the most active and therefore most noticeable insects. Of the 60 available species, the Rooks took only 20; phytophages and saprophages were the most numerous in the food samples.

Of the 10 very common insect species, 4 species were frequently met in the food samples, and of the 9 common species, 3. Of some groups represented by 2 or 3 closely related species, the birds would take only one species. Three other species, either very common or common on the fields where the Rooks foraged, were never consumed, not even the most numerous species (*Tentyria nomas*), although others in its family are eaten by Rooks. No reason for this selectivity is presented. Again not surprisingly, species of insects with defense mechanisms, such as the distasteful secretions of the Carabidae, very rarely turned up in the food samples regardless of their abundance, and presumably were taken by chance or accident.

Conversely, the Rooks showed a distinct positive reaction to three species: *Cataglyphis cursor aenescens* Nyl. (Formicidae), larvae of *Dermestes lanarius* Ill. (Dermestidae), and *Dorcadion glycyrrhizae* Pall. (Cerambycidae). This last species was frequently discovered in the food samples but rarely found in the traps. Apparently the traps were not representative or the Rooks actively sought *D. glycyrrhizae*.—Elizabeth C. Anderson.

SONGS AND VOCALIZATIONS

(see also 61)

54. Birds react to playback of recorded songs by heart rate alteration. U. E. Zimmer. 1982. *Z. Tierpsychol.* 58:25–30.—The electrocardiogram of Chiffchaffs (*Phylloscopus collybita*) was measured between electrodes in the neck and pectoral muscles, using 24 male and 12 female hand-reared (isolated) birds and 8 wild-caught males. All 44 birds showed an increase in heart rate of 3–12% when the song of central European Chiffchaffs was played to them, none responded to songs of birds from Spain or the Canary Islands; all hand-reared birds responded to songs of hand-reared Chiffchaffs, but no wild birds did. This study stands in stark contrast to others measuring avian heart rate in other contexts, where the responses were often subtle and usually quite variable. The author does not comment on the unusually clear-cut results.—Jack P. Hailman.

55. Song mimesis within colonies of *Cacicus c. cela* (Icteridae, Aves). A colonial password? F. Feekes. 1982. *Z. Tierpsychol.* 58:119–152.—This is a 3-year study in Surinam of breeding biology with emphasis on song of *Cacicus c. cela*, called the Yellow-rumped Cacique in the new (sixth edition) of the *A.O.U. Checklist*. (Some authorities refer the form reaching Central America, *Cacicus cela vitellinus*, to a separate species; the form studied nests in mixed colonies with another species, *Cacicus haemorrhous*.) Males apparently have no territories, but may establish a dominance hierarchy at somewhat lek-like breeding locales, where an apparently promiscuous mating system occurs with females building the nests, incubating the eggs, and feeding the young. Some males remain at the colony, however, where they act as sentinels and challenge intruders. The males of a given colony have very similar “*cela*” vocalizations, which in broad form are species-specific and in detail are specific to individual colonies breeding at the same time. (The nesting season is protracted in these tropical birds.) Feekes believes the “*cela*-song” works both as classical advertisement and also as an “all-safe” signal to females once potential danger is past. The song changes at the start of a new breeding season, sometimes when a new group of birds moves in, and gradually during a period of occupation; from the dynamics of such changes and the fact that males imitate other vocalization, Feekes believes the colony-specific aspects of the “*cela*-song” are learned. Several possible advantages of this “colonial password” are discussed.—Jack P. Hailman.

56. Variation in the response of freelifving Blackbirds *Turdus merula* to playback of song: I. Effect of continuous stimulation and predictability of the response. T. Dabelsteen. 1982. *Z. Tierpsychol.* 58:311–328.—Playback of full song for 24-min sessions elicited a range of responses, which is broken into 3 general types. The author makes important recommendations for designing playback experiments so as to achieve representative responses.—Jack P. Hailman.

57. Acoustic communication in the Guinea Fowl (*Numida meleagris*): structure and use of vocalizations, and the principles of message coding. V. Maier. 1982. *Z. Tierpsychol.* 59:29–83.—This is a massive, data-laden study in which 5 acoustical variables are extracted as information-carriers: (1) slow frequency modulation (as in “peep” calls) signal general activity; (2) rapid, pulsed frequency modulation (“trill” calls) signal attention to external referents; (3) harmonic spectra with low fundamentals (“noisy” calls) signal aggressiveness; (4) similar calls with formants (“squeal” calls) signal defensiveness; and (5) harmonic spectra with high fundamentals and also amplitude modulation (“harmonic” calls) signal social tendencies. Each class contains identifiably different calls, and there is much grading from one call-type to another, so that combined with contextual settings an incredible amount of information can be encoded. This is an extremely important contribution that should be read by anyone interested in acoustical communication.—Jack P. Hailman.

58. Song splitting in the evolution of dueting. W. Wicker and U. Seibt. 1982. *Z. Tierpsychol.* 59:127–140.—An evolutionary sequence is proposed that begins with solo singing (usually males alone), proceeds through song-merging of 2 individuals and copying of each other’s songs, to song-splitting where parts are divided between the singers. The sequence is illustrated from species of shrikes (*Laniidae*) and barbets (*Capitonidae*), with comments on other birds and even some orthopteran insects.—Jack P. Hailman.

59. Ventriloquial and locatable vocalizations in birds. C. H. Brown. 1982. *Z. Tierpsychol.* 59:338–350.—In a now-classic short paper, Marler (*Nature* 176:6–8, 1955) noted that high-pitched pure-tones were used by many passerines as alarm calls, and argued that the acoustical properties of such calls made them difficult to localize in space. Brown played back such calls, and also the theoretically localizable mobbing calls (pulsed with frequency modulation and harmonic structure), to Red-tailed Hawks (*Buteo jamaicensis*) and Great Horned Owls (*Bubo virginianus*), recording their orientation on video tape. The mean orientational error to mobbing calls was about 52° and that to alarm calls a whopping 125°. Brown preliminarily attributes the ventriloquial effect of the latter to “pressure-gradient characteristics of the raptor auditory system,” which means that the 2 ears are connected by air passages and under certain conditions a sound may be louder in the

contralateral ear than it is in the ear nearest the sound-source. A most interesting study.—
Jack P. Hailman.

MISCELLANEOUS

60. Size-illusion. P. J. Grant. 1983. *Br. Birds* 76:327–334.—Whenever binoculars or telescopes are used, illusory relative sizes and perspective angles are created resulting in the false impression that objects farther away are larger than they really are in comparison to nearer objects. Such size illusion can readily bias the accuracy of field identification of birds. Grant's study demonstrates size-illusion and reports the magnitude of error in perception of size, distance, and relative size of test objects for 2 groups of experienced bird watchers.—Patricia Adair Gowaty.

PHOTOGRAPHY AND RECORDINGS

61. Bird Voices of Lahemaa (*Lahemaa lindude häälid*). F. Jussi. 1982. *Melodia Records*. (No price given.)—This record presents vocalizations of 24 bird species from the national park of Lahemaa, on the north coast of Estonia, USSR. This area of coastal lowland includes marshes and forest. The selected birds are usually widespread species (e.g., Chiffchaff *Phylloscopus collybitus*), Nightingale (*Erithacus megarhynchos*), and Pied Flycatcher (*Ficedula hypoleuca*). The songs and calls (all recorded between 1976 and 1980) are of high quality, and with adequate repetition (average playing time/species almost 2 min). Particularly exciting are the owls (Ural, *Strix uralensis*; Tengmalm's, *Aegolius funereus*; and Eagle-Owl, *Bubo bubo*), including some nest warnings and territorial cries. The record is accompanied by an 8-page booklet that describes, in detail, the recordings for each species including the behavioral circumstances of the bird (unfortunately the booklet is only in Estonian and Russian). The record jacket provides a brief English introduction and chronological list of species, but the name translations are sometimes vague or incorrect (e.g., "Egyptian Nightjar" on record is actually *Caprimulgus europaeus*, the common European Nightjar). The small number of species will make this record of limited appeal to some, but it provides a well done and esthetically evocative presentation of Lahemaa's birdlife.—Charles F. Leck.

BOOKS AND MONOGRAPHS

62. Ornithological observatories in Europe. (Ornithologische Beringungsstationen in Europa.) H. Bub. 1983. *Dachverbandes Deutscher Avifaunisten Nr. 7*, 190 p. (German, English summaries and figure captions, 20 DDM.)—This paperback book gives a brief summary of the location, environs and work of 48 private bird-banding stations in Europe. The various observatories are found in Norway, Sweden (6), Finland (5), U.S.S.R. (including Estonia (4), Latvia, Bulgaria, and Russia), Great Britain and Ireland (13), Denmark, The Netherlands, Belgium (3), France, Switzerland, East Germany and West Germany (3). The reports were provided, for the most part (43 original reports), by directors of the observatories. Addresses are given along with general times of operation and some literature that resulted from the station research. Numerous photographs are useful for giving the reader an idea of the observatory environs, trapping or special facilities. It also has a binomial/German/English directory of birds discussed in the text. This book does a good job of presenting information in both German and English and does it efficiently.—Richard J. Clark.

63. Species limits in the indigobirds (Ploceidae, *Vidua*) of West Africa: mouth mimicry, song mimicry, and description of new species. R. B. Payne. 1982. *Museum of Zoology, Univ. of Michigan, Ann Arbor*. 96 p. \$3.75.—In this monograph Payne continues his studies of geographic distribution, species status, and mimicry in the indigobirds of Africa. These small, sexually dimorphic finches are all nest parasites. The 5 species treated here, from West Africa, are largely morphologically indistinguishable as adults. However, Payne has found that breeding adult males imitate the songs of their hosts, and the mouth patterns of the nestlings mimic the species-specific mouth patterns of their host finch. Because each species of indigobird apparently has a different specific host, these obser-

vations allowed Payne to determine species identification and limits by recording songs of the males and of their hosts. Unfortunately, however, this means that the diagnostic features of each species are its soft part (mouth) morphology while a nestling, and its song as an adult. This makes museum specimens without such associated data of marginal value. Thus, Payne was forced to designate new type specimens in several cases (specimens for which he had recordings), because the original types could not be unambiguously assigned to any particular biological species.

This short monograph will be of interest to students of mimicry as well as to taxonomists and those interested in the African avifauna.—George F. Barrowclough.

64. Birds of southern California's Deep Canyon. W. W. Weathers. 1983. Univ. of California Press, Berkeley. 266 p. \$35.00.—Wesley Weathers, who is well known for his studies of avian energetics, has written a delightful account of his field work at the Philip L. Boyd Deep Canyon Desert Research Center during 1977–1980. His is the fifth in a series of books dealing with the biota of the Deep Canyon Transect, an area that includes part of the Colorado Desert and adjacent Santa Rosa Mountains of southern California. The elevation of the transect rises 2600 m in a linear distance of only 18 km. As a result of this sharp elevational (and moisture) gradient, most of the habitats found in inland areas of southern California occur here and are sharply delineated vegetational belts on the face of the mountains. Each habitat—valley floor, alluvial plain, rocky slopes, lower plateau, piñon-juniper woodland, chaparral, coniferous forest, and streamside—is subject to different climatic conditions and has a distinct vegetation and avifauna. The abundance, diversity, and natural history of the latter are the focus of Weather's study.

According to the book's jacket, he emphasizes the "energetic impact of birds as important trophic influences on the habitats, season by season." Indeed, he does estimate the daily and annual energy expenditure of groups of birds and individual species in each habitat. This permits us to compare their *relative* energetic requirements, but it doesn't really tell us much about their trophic impact on communities in which they are present. For this, we need information about the trophic energy available in each habitat, information that Weathers by-and-large does not include.

The text is supplemented with numerous maps, graphs, line drawings, photographs, and color plates, all (except the maps) of uniformly fine quality. (However, the line drawing of a Hooded Oriole [*Icterus cucullatus*] appears to me to have the bird's legs and feet facing in the wrong direction.)

Weathers begins with general information about the topography, climate, communities, and life zones in the Deep Canyon Transect. Seasonal variations in the abundance and species diversity of birds throughout the transect mirror variations in weather and food availability. Birds, for example, vacate the desert floor during summer and fall when it is hot and dry, and the coniferous forest during winter when it is cold and snow-bound. Many seasonal variations are apparently movements of species from one community to another within the canyon. Migrants inflate the abundance and diversity values of some habitats in the spring, when they sweep through the desert washes (alluvial plain) and rocky slopes, and in the fall when they pass through the chaparral and coniferous forest.

Next Weathers systematically describes the terrain, climate, flora, and then the avifauna in each of the communities in Deep Canyon. He shows seasonal variations in the abundance and daily energy expenditure (DEE) of the birds in each habitat by group, i.e., the energy used by resident species, visitors, and migrants. He then lists the species in these groups, together with their individual abundance and DEE. He also commonly presents differences in the abundance of one bird in several habitats either from season to season or within a particular season.

His profiles of the Deep Canyon's communities are based on 684 censuses that were done in a period of 2 years, i.e., one census every 2½ to 8½ days, depending on the community. It is difficult to summarize their contents succinctly, but perhaps a few words about each community will illustrate what is in this part of the book.

The valley floor is the habitat that has been most disturbed by humans. Water hazards on golf courses and other bodies of standing water have markedly increased the abundance of waterfowl and shorebirds there and the success of European Starlings (*Sturnus vulgaris*) and House Finches (*Carpodacus mexicanus*), its 2 most abundant resident species.

The rocky slopes at the base of the Santa Rosa Mountains, with their sparse stunted vegetation, inhospitable summer temperatures, poor soil, and lack of water, support fewer birds than any other habitat in Deep Canyon. Yet, at least 20 species of migrants take advantage of their flowering plants and invertebrate fauna while moving north in the spring.

A lower plateau at 800 m elevation is an ecotone between the low desert and high mountain communities of Deep Canyon. House Finches and Black-throated Sparrows (*Amphispiza bilineata*) nest here in profusion and represent 72% of its residents. It hosts few visitors or migrants.

The plateau is superseded by a piñon-juniper woodland which boasts the largest number (26) of resident species, probably because of its high vegetative diversity. Nonetheless, 3 of them (the Mourning Dove [*Zenaida macroura*], Common Raven [*Corvus corax*], and Scrub Jay [*Aphelocoma coerulescens*]) account for 56% of the residents and 85% of their DEE. Winter visitors (9 species) are numerous, but summer visitors (3) and migrants (2) are not.

Above the woodland is a vegetatively senescent chaparral in which plant diversity and productivity are notably low, as is avian abundance; but curiously, more species (36) of birds breed here than anywhere else in Deep Canyon. Summer (10 species) and winter (6) visitors are numerous enough to rival residents both in abundance and DEE.

The summits of the Santa Rosa Mountains feature coniferous forest dominated by Jeffrey pine and a distinct avifauna that includes the White-headed Woodpecker (*Picoides albolarvatus*), Pygmy Nuthatch (*Sitta pygmaea*), and Stellar's Jay (*Cyanocitta stelleri*). Eighty-two species occur here, but only 12 are residents. The cool, moderate conditions of the forest in spring and summer attract 35 visiting species, many of which nest here, outstripping residents both in abundance and DEE. Few birds overwinter in the forest.

A riparian habitat, consisting of brooks shaded by cottonwoods, willows, alders, and ash, runs down-mountain through the other communities. It supports more species (114) than any other community in Deep Canyon, but only eight of them nest there.

In the second half of the book, Weathers examines each of the 112 species that breed in the Deep Canyon Transect; provides a list of the 217 species observed in the canyon, the habitats in which they were seen, and the month(s) of the year when they were present; and concludes with references and subject index.

The species accounts in this half of the book vary considerably (almost whimsically!) in subject matter. Not only does Weathers include the usual information about the birds—their vernacular and alternate names, weights, and ranges—but in most cases he also provides some commentary about them, of which the following are samples. Hummingbirds don't have an unusually high visual sensitivity to red, but prefer red flowers because they associate the red color with a nectar reward. Insectivorous woodpeckers have tongues with spearlike tips, but sap-feeding ones have tongues with brushlike tips. Many fringillids have a bony hump on the roof of the mouth that acts as a gizzard. The small size of kestrels is responsible for their short life expectancy. Quail don't breed in dry years because the desert plants on which they feed contain phytoestrogens. Verdins (*Auriparus flaviceps*) build enormous nests of up to 109 g. Scrub Jays depend heavily on acorns for food and their distribution coincides nicely with that of scrub oak. Cactus Wrens (*Campylorhynchus brunneicapillus*) nest in cholla cactus, even though their feet are commonly punctured by its spines. Rock Wrens (*Salpinctes obsoletus*) pave the entrances to their nest burrows with stones. Phainopepla (*Phainopepla nitens*) utters the "keeer-r-r" cry of the Red-tailed Hawk (*Buteo jamaicensis*) when harassed by shrikes and this is probably adaptive since these hawks prey on birds of the shrike's size. The hoots of a Screech Owl (*Otus asio*) sound "something like a dropped Ping-Pong ball" (p. 130).

However, Weathers is at his best in these accounts when addressing the energetics and water balance of Deep Canyon's birds; again, a few examples. Many insectivorous birds living in deserts require no source of water other than their food. Roadrunners (*Geococcyx californiana*) have functional salt glands and obtain some water by eating the fecal sacs of their young. Perhaps White-throated Swifts (*Aeronautes saxatilis*) drink water because they fly with their mouths open and consequently experience excessive evaporative water loss. The black plumage of large desert birds is not maladaptive because it keeps heat away from the skin where it can be dissipated by convection. Verdins conserve body

water on hot days by severely limiting their foraging activity. Water turnover in Phainopepla sometimes approaches 95% of the body mass per day—perhaps this is why those in the chaparral nest near water. Gambel's Quail (*Lophortyx gambelii*) are less adversely affected by salt loading and dehydration than California Quail (*L. californica*), and also produce a more concentrated urine—perhaps this is why they inhabit the desert floor, whereas California Quail are restricted to more mesic upland areas of Deep Canyon.

Birds of Southern California's Deep Canyon is well written and almost error-free. It will appeal to interested laymen and professional ornithologists alike. Indeed, the enormous amount of previously unpublished information about Deep Canyon's avifauna should be immensely useful to desert ecologists. I found the book informative, authoritative, comprehensive, and at the same time enjoyable reading.—Michael Kern.

65. Effects of Goshawk (*Accipiter gentilis*) predation on prey populations. (Untersuchungen zum Einfluss des Habichts (*Accipiter gentilis*) auf Populationen seiner Beutetiere) F. Ziesemer. 1983. Staatliche Vogelschutz. Schleswig-Holstein, Beit. Wildl. 2, 127 p. (German, English summary, available for 20 DDM from G. Hartmann, Kopperpähler Allee 151, D-2300 Kronshagen, West Germany.)—The population of Goshawks was monitored from 1968 to 1981. Major prey populations were also measured with special attention being given to game species, e.g., pheasants, partridge, rabbits, and Wood pigeons. Goshawks were studied most intensively in a 513 ha field and forest area (Grönwohld) and a 3100 ha open field and hedgerow area (Börm) using radio telemetry. The fact that females molted their primaries near the nest and were consistent in their differences enabled the author to identify individual birds and trace their breeding history. An estimated 22% of 148 Goshawks bred in their first year, 27% in their second, and 51% in their third year. The 2 oldest birds were nearly 15 years old.

Pheasants were an important prey species in Grönwohld where 90% were released birds and in Börm where only 15% were released. Domestic pigeons taken at dovescotes were taken by the smaller, more agile males, while full grown rabbits and hares of the same size were taken by the larger females.

Populations of prey species important to the Goshawk declined in mainland Schleswig-Holstein as well as on the Frisian Island of Föhr where Goshawks rarely occur. This, coupled with the evidence that the Goshawk population has remained stable, suggests that Goshawks were not the cause for the population decline for their prey species.—Richard J. Clark.

66. Woodpeckers of the world. L. L. Short. 1982. Delaware Museum of Natural History, Monograph Series Number 4. Greenville, Delaware. 676 p. \$99.95.—This handsome volume, complete with a wood-grained cover and 101 color plates of the world's woodpeckers is the first monographic coverage of the entire family since Malherbe's work of 1861–1862. Certainly if I were asked to name an individual who could prepare such a monograph, Lester Short would be my first choice. Short's earlier work with so many of the world's 200+ woodpecker species has provided him with systematic insight for the Picidae that is likely unequalled. His insight and intimate knowledge of some species comes through again and again. The book begins with an introduction to terminology, and chapters on plumage and structure; behavior; zoogeography, evolution, and systematics. These 56 pages are followed by 479 pages of species accounts and 101 color plates. The species accounts include a brief synopsis of range, morphology, taxonomy, habitat, foraging, voice, displays, interspecific interactions, breeding, and a few references. For simple lack of information, not all of the above topics are treated for each species, and there is extensive coverage of some with minimal coverage of others.

In spite of the obviously tremendous value of this book to "Piciphiles" and the importance of assuring its place in university libraries, *Woodpeckers of the World* does have some serious limitations. In the introduction Short states that "This book is based upon my own researches, coupled with an attempt to summarize from the literature the significant information on all aspects of woodpeckers." Two major shortcomings of the book are an excessive reliance on Short's own ideas and frequent lack of mention of published opposing points of view. In part this may be due to problems associated with the mechanics of publication, but certainly not all of the problem-rests there. An examination of the

years of publication of references cited reveals the appalling fact that of the approximately 410 references cited, only 16 were published in the 6 years prior to publication of Short's book—and 6 of those 16 citations are to Short's own papers! In the same 6 years, in only the 4 major North American journals (Auk, Condor, Wilson Bulletin, Bird-Banding/Journal of Field Ornithology), 67 papers or notes mentioning woodpeckers in the title were published. [Incidentally, the Wilson Bulletin, with 26 woodpecker titles, was the most "woodpecker oriented" journal.] Obviously *Woodpeckers of the World* does not reflect our current knowledge of many species.

The result of reliance on his own studies and older literature rather than recently published work of others results in an incomplete picture of what we know. For example, Williams (Wilson Bull. 92:506–508, 1980) described the nest, eggs, nestling, and some nesting ecology of *Campyphilus gyaquilensis*—Short (p. 444) states "Behavior. Unknown." With regard to Red-cockaded Woodpeckers, a species I have studied for several years, Short perpetuates a number of errors: He mentions (p. 309) that juvenile "females closely resemble males, but have little or even no red in the center of the crown (very red-crowned females indistinguishable from less red-crowned males)." I have banded and recaptured several hundred juvenile Red-cockaded Woodpeckers and have only found one female that had as much as a single red feather as a juvenile. The presence of red on the crown of juvenile females is important to a thesis of "aggressiveness" in woodpeckers which Short returns to throughout the book—a thesis which Kilham (Auk 100:511–514, 1983) disagreed with. It sometimes appears that Short may be trying to generalize from his studies of flickers to all woodpeckers—and that the generalization doesn't fit. Ligon (Auk 85:203–215, 1968) found sexual differences in the foraging behavior of Red-cockaded Woodpeckers, but Morse (Auk 89:429–435, 1972) did not. Short accepts Morse's findings, suggesting that their lack of differences in foraging behavior of the sexes "probably is the usual situation most of the year, in most places . . ." Unfortunately, Morse was not observing marked birds and we now know that Red-cockaded Woodpeckers cannot be reliably sexed in the field unless they are marked. The red cockades of the males are typically hidden by black feathers on the crown. Since Morse, sexual differences in foraging behavior of red-cockaded Woodpeckers have been demonstrated in Mississippi and South Carolina (Ramey, M.S. thesis, Mississippi State Univ., 1980) and such differences appear to be the rule rather than the exception. Short's statement (p. 312) that a pair of Red-cockaded Woodpeckers "requires 35 to 50 acres of pinewoods for a territory" could set back conservation efforts for this species whose territories or home ranges have been repeatedly documented to range from 100 to over 200 acres in the past 10 years. Certainly foresters would much prefer to use Short's figures!

Some undocumented statements appear to have come from Bent and may be further proliferation of unwarranted assumptions. For example, Short states that in Red-headed Woodpeckers "Two broods are regularly raised," yet no documentation for that statement is given and although I have worked with banded populations of Red-headed Woodpeckers for several years, I have found no evidence for double-broodedness. The only mention of double-broodedness in the species I have found appears, similarly undocumented, in Bent (U.S. Natl. Mus. Bull. 174:196): "Two broods are often raised in a season and sometimes in the same cavity." Red-headed Woodpeckers are late to begin nesting activities, and they do have a long nesting season, but I have been unable to find published records of marked birds raising two broods in a season. Certainly this is a question that deserves further attention and should not be passed off as a well-established fact.

The plates by George Sandstrom illustrate not only the species, but also many of the races and a few hybrids among the world's woodpeckers. Many of the plates are fine pieces of art as well as adequate illustration for a scientific volume. Imagine the monotony of painting 100+ different dead tree trunks as woodpecker substrates! For species with specific habitat requirements, an attempt was made to provide an appropriate perch; for others dead stubs with the same non-descript green leaves appear again and again. While the overall quality is good, *Picoides* species are all portrayed with the sloping forehead of a Melanerpine species rather than the abrupt forehead that results from the infolding of the nasofrontal hinge. Other obvious problems with plates include the size and position of the eye of many of the birds, characteristics which are not apparent on the study skins

the artist had to work from. The eyes of most seem too small and too far forward on the head, although some are beautifully done. Most plates include only males and few include the often distinctive juvenile plumage. Few of the plates show nest/roost cavities, but where these are included, they are sometimes in illogical and unnatural positions—those in plates 21, 24, 31, and 78 open upwards and would soon fill with water!

While *Woodpeckers of the World* is not the complete Baedeker that it could have been, it was a tremendous undertaking and will represent a reasonable starting place for woodpecker biologists for years to come. The price is high, but the demand for such a specialized treatise will likely be low and the presence of 101 color plates make me suspect that the book is a bargain.—Jerome A. Jackson.