RECENT LITERATURE

Edited by Edward H. Burtt, Jr.

BANDING AND LONGEVITY

1. **Age determination and first breeding of British Puffins.** M. J. Harris. 1981. Br. Birds. 74:246–256.—In my formative scientific years I was fortunate to watch mandrills (*Mandrillus sphinx*); carnival colored animals fascinate me as did this article on the growth and development of Puffins (*Fratercula arctica*). A young Puffin has a small, dark-colored beak at fledging; at first breeding several years later, the adult Puffin is much larger and has a big, brightly colored beak. In both populations reported on here, the number of grooves in the bill increased with age in Puffins up to the fifth year with great individual variation in how quickly individuals attained their grooves. The author concluded that it seems impossible to age any individual Puffin with a high degree of confidence, but the more grooves a Puffin has, the older it is likely to be.—Patricia Adair Gowaty.

2. **Bird-Banding at Powdermill, 1979: with Ligonier Valley field notes.** R. C. Leberman and M. H. Clench. 1980. Carnegie Mus., Powdermill Nat. Res. Research Rep. No. 40. 34 pp.—Longevity records for 1979 included the following: (for the station) Spotted Sandpiper (*Actitis macularia*), probable minimum age (years-months) (4-11); Cardinal (*Cardinalis cardinalis*), (10-6); Purple Finch (*Carpodacus purpureus*), (7-7); and White-throated Sparrow (*Zonotrichia albicollis*), (3-8); (and for the species) Yellow Warbler (*Dendroica petechia*), (8-11) and Common Yellowthroat (*Geothlypis trichas*), (9-3).—Richard J. Clark.

3. **Recoveries.** In: **Long Point Bird Observatory: 1977 Annual Report.** D. J. T. Hussell. 1979. Port Rowan (Ontario). 24 pp.—There were 18 recoveries reported for the year. Of note were the following longevity records for the station: Blue-winged Teal (*Anas discors*), probable minimum age (years-months) (11-5); Redhead (*Aythya americana*), (12-6); and Piping Plover (*Charadrius melodus*), (7-11). A Cedar Waxwing (*Bombycilla cedrorum*) and Rose-breasted Grosbeak (*Pheucticus ludovicianus*) were recovered in Guatemala and a Cape May Warbler (*Dendroica tigrina*) was recovered in Jamaica.—Richard J. Clark.

4. **Recoveries.** D. J. T. Hussell. 1981. Ont. Bird Banding 12:6–8. (Publication is also titled **Long Point Bird Observatory: 1978 Annual Report**).—Longevity records established for the station during the year were: Blue-winged Teal (*Anas discors*), probable minimum age (years-months) (14-10); Ring-billed Gull (*Larus delawarensis*), (7-10); and Blue Jay (*Cyanocitta cristata*), (7-10). Single Blue-winged Teal were recovered in Surinam and Haiti. A Swainson's Thrush (*Catharus ustulatus*) banded and released at 0610 on 27 May 1978 and netted at the Prince Edward Point Observatory (310 km northeast) the following day is also noteworthy.—Richard J. Clark.

5. **Survival and longevity among tropical land birds.** C. H. Fry. 1980. Proc. IV Pan-Afr. Ornithol. Congr.:333–343.—Band recoveries indicate that small land birds of the tropics and subtropics attain advanced ages rarely found among the more intensively studied, small land birds of temperate regions (see reviews **2**, **3**, **4**). Life-tables indicate a similar trend toward increased adult survival among small land birds of low latitudes. However, there are notable exceptions (e.g., *Halcyon chloris*) and the data are too few for statistical comparison among species at different latitudes. Nonetheless the trend is supported by estimates of fecundity and annual recruitment which are so low among tropical land birds that adult survival must be high to maintain stable populations. Although none of the evidence mentioned by Fry is conclusive, longevity records, life-tables, and productivity studies all suggest increased survival of adult land birds at low latitudes. Unhappily, the data suggest high mortality during adolescence, lower mortality during maturity, and increasing mortality with senescence. Hence, the traditional assumption of constant mortality throughout adulthood may lead to serious errors in life-tables.—Edward H. Burtt, Jr.

MIGRATION, ORIENTATION, AND HOMING

(see also 43)

6. Circannual changes in migratory orientation of the Garden Warbler, *Sylvia borin*. E. Gwinner and W. Wiltschko. 1980. Behav. Ecol. Sociobiol. 7:73–78.—In the third of a series of papers examining the migratory orientation of hand-reared Garden Warblers, the authors test the hypothesis that the reversal of migratory orientation from autumn to spring is primarily due to seasonal changes in the birds' internal physiological state which is controlled by an endogenous circannual rhythm that persists in the absence of temporal information from environmental zeitgebers or clocks. Eleven hand-reared Garden Warblers were maintained under a natural photoperiod until the beginning of the autumn migration period when they were permanently moved to a chamber and exposed to a 12 h photoperiod and constant temperature. Orientation tests took place indoors where the birds were presumably relying on their magnetic compass for direction finding. Although the birds were exposed to constant conditions beginning at the start of their first migration, they continued to show seasonal variations in migratory disposition and molt, mimicking those of free-living conspecifics. In addition, the birds displayed a significant southerly directional preference in "autumn" and a northerly directional preference in "spring." These results support the hypothesis that the between season reversal of migratory direction is, at least in the absence of environmental zeitgebers, controlled by an endogenous circannual clock.

The results of this study coupled with the authors' previous papers (see review **15**, Bird-Banding 50:172, 1979) suggest that the migratory behavior of young Garden Warblers is determined by strong, experience-independent factors. But . . . .—Verner P. Bingman.

7. Nocturnal activity and orientation behavior during spring migration and early summer in the Indigo Bunting *Passerina cyanea*. W. Wiltschko, R. Wiltschko, S. Emlen, and N. J. Demong. 1980. J. Comp. Physiol. A Sens. Neural Behav. Physiol. 137:47–49.—During spring, caged night-migrating birds are known to continue displaying nocturnal activity into the breeding season long after free-flying birds have ended migration. The authors compared the nocturnal orientation of caged Indigo Buntings during the normal migration period and the period when free-flying birds had begun breeding. From mid-April until the end of May, the normal migratory period, the experimental birds displayed seasonally appropriate northerly orientation. From early to mid-June, the period when most Indigo Buntings had started breeding, the experimental birds continued to display similar levels of nocturnal activity, but their orientation became random. The authors speculate that random orientation and the continuation of nocturnal activity after the termination of the normal migration season would enable wild Indigo Buntings without a breeding territory or mate to continue to move within the breeding range of the species in search of critical resources for breeding.

Although the results of this paper are interesting, its importance lies mainly as a warning to researchers examining the orientation of caged birds. The results show that extending spring experiments beyond the normal migratory season may result in altered directional preferences or even random orientation unrelated to the variables which concern researchers.—Verner P. Bingman.

8. The effect of celestial cues on the ontogeny of non-visual orientation in the Garden Warbler (*Sylvia borin*). W. Wiltschko, E. Gwinner, and R. Wiltschko. 1980. Z. Tierpsychol. 53:1–8.—This study examines whether experience with sun and stars during early development affects the non-visual, presumably magnetic, orientation of a bird's first migration. Hand-reared Garden Warblers were maintained either indoors or in an outdoor aviary exposed to the sky during their first summer. Both groups were later tested indoors for their non-visual, migratory orientation. The group that never saw the sky displayed seasonally appropriate southerly orientation. The group that experienced the sky, however, displayed random orientation. Although celestial experience impaired the non-visual orientation of hand-reared Garden Warblers, the results suggest that experience with celestial stimuli is involved in the normal maturation process of migratory orientation. The experience-independent magnetic compass suggested by previous studies (see review **6**) is apparently connected with celestial experience in a way more complex than previously thought. It is my personal bias that studies, such as this one, that examine integration of information during ontogeny, will significantly advance our understanding of avian migratory orientation.—Verner P. Bingman.

POPULATION DYNAMICS

(see also 20, 46)

9. A model for interyear change in the size of bird populations. G. J. G. Upton and G. A. Lampitt. 1981. Biometrics 37:113–127.—This paper describes a new model for estimating changes in breeding bird population size which is intended to replace the one currently used by the British Trust for Ornithology. The old binomial model uses counts of occupied territories for its population estimates but does not account for the possibility that some individual territories are tenured during successive years. Since optimal territories will be occupied each year, a binomial distribution cannot model the data and therefore the old model technically is biased. The new model proposed here assumes optimal territories will be occupied every year, while suboptimal territories will not. The probability of interyear occupation of a territory is therefore added as a new parameter into the model to increase its value as an estimator over the old model. A goodness-of-fit test using likelihood ratios showed data from 10 of 12 bird species fitting the new model as predicted.—Richard M. Zammuto.

10. Demography of White-crowned Sparrows (*Zonotrichia leucophrys nuttalli*). M. C. Baker, L. R. Mewaldt, and R. M. Stewart. 1981. Ecology 62:636–644.—Baker et al. express the view that demographic studies, as currently executed by ecologists, can never be useful in leading to a synthesis of population genetics and population ecology. Any possible variation among cohorts or year classes is ignored whether the life table constructed is horizontal, in which a single cohort is followed through time, or vertical, in which all year classes are assumed to have started at an equal size. Baker et al. feel that life history dynamics can only be understood with sets of cohort-specific data on age-specific fertility and age-specific mortality. To this end, they report here on such variations among five cohorts of White-crowned Sparrows that were banded just prior to fledging in different months and/or years. Quite unsurprisingly, minor variations were found to exist both between sexes within a cohort and between cohorts. However, without further information about the concomitant variations in resources available, one really can't speculate as to the evolutionary or ecological significance of the variations in either life expectation or net reproductive rate that were found. While the authors' point that full understanding of life history dynamics requires more specific observations than are now commonly made, a true synthesis of ecology with population genetics remains to be made.—A. John Gatz, Jr.

NESTING AND REPRODUCTION

(see also 32, 33, 34, 38, 42, 43)

11. The conflict between male polygyny and female monogamy: the case of the Pied Flycatcher *Ficedula hypoleuca*. R. V. Alatalo, A. Carlson, A. Lundberg, and S. Ulfstrand. 1981. Am. Nat. 117:738–753.—The authors report on the Pied Flycatcher in which most males defend a single nest hole and are monogamous, while some males (in this case 15–22%) defend 2 widely separated nest holes (polyterritorialism) and are successfully bigamous. A bigamous male shares parental duties only with his first or primary female. After mating, and presumably during laying, the secondary female is deserted, reduces her clutch, and is forced to incubate and tend her young alone. As a result, secondary females have a much lower reproductive success than either primary or monogamous females (mean number of fledged young 3.60 vs. 5.48). The authors note that such a pattern is not consistent with more traditional variable-territory-quality (Verner-Willson-Orians) or "sexy son" explanations of adaptive female choice of polygyny. They argue instead, that in their case once-mated males *deceive* later arriving females into a secondary status by hiding their own mated state via polyterritorialism. Secondary females are forced to accept their status, even though they are deserted before incubation, because once they have begun laying, further delay, by abandoning their first effort and finding an unmated male to repeat the cycle, would reduce their reproductive success *below* that expected by a secondary female raising a brood alone. The provocative conclusion: "in the 'battle between the sexes,' the male sex is relatively victorious in the Pied Flycatcher."—William M. Shields.

12. Sexual differences in parental activities of breeding Black Skimmers. J. Burger. 1981. Am. Nat. 117:975–984.—Burger has produced an interesting data set on sexual differences in the breeding behavior of the Black Skimmer (*Rynchops niger*). Males incubated slightly more (about 53% vs. 47% of total; all data interpreted from her graphs), brooded much more (70% vs. 47%), guarded chicks less when mate brooded (5% vs. 15%), and fed chicks much less (24% vs. 76% of fish) than females. Males vigorously defended mates against other males, especially before and during egg-laying, while females more vigorously defended young against potential predator conspecifics of either sex. Females, then, appear to expend a greater effort at parenting, while males expend a great deal of their time and energy attempting to cuckold others and prevent being cuckolded themselves.

Her data, then, appear consistent with Triver's view that in monogamous species females will show a "somewhat greater" investment in young, while males will be more preoccupied with mating and its prevention. Owing to a slight conceptual confusion, she views her data as contradicting Trivers, who, she asserts, implied that females show a greater *total* reproductive effort. Trivers never suggested that, and Burger's confusion stems from her failure to distinguish between the components of reproductive effort: 1. mating investment, the time and energy expended to ensure mating, e.g., territory maintenance, which is often greater in males, and 2. parental investment, time and energy expended *directly* on progeny, which is often greater in females (for an excellent review of these distinctions, see Borgia *in* **Sexual selection and reproductive competition in insects,** Blum and Blum, eds., Academic Press, N.Y., 1979).—William M. Shields.

13. The breeding biologies of the sooty albatrosses *Phoebetria fusca and P. palpebrata.* A. Berruti. 1979. Emu 89:161–175.—These two species occur sympatrically on the sub-antarctic Prince Edward Islands off Australia, although *palpebrata* is much less common. This is a good life history, telling of the breeding cycle, growth and development of young, and the high mortality of young (14% of *fusca* starved to death, and only 23% fledged). Nest site selection was quite similar, with both *fusca* (n = 4254) and *palpebrata* (n = 424) preferring older, gray lava substrates. Other characteristics of breeding biology were also quite similar, surprisingly so for sympatric congeners. Only in the types of food for the nestlings were really significant differences found. The author states that *palpebrata* nestling growth rates in other colonies without *fusca* are faster, indicating food stress in this study area (at least in this single year!). He suggests this is because *palpebrata* must forage farther than *fusca* for food. I feel this study clearly shows that, at least sometimes, ". . . there is little or no surplus in the energy budgets of breeding albatross." At least in these species, it is very fortunate that adults are long-lived since, if this year was typical, each pair would take 16 years to replace itself, allowing only 50% mortality between fledging and breeding. These birds are indeed on the cutting edge of natural selection.—C. J. Ralph.

14. Clutch sizes and breeding strategies among Bermudan and North American passerines. K. K. Crowell and S. I. Rothstein. 1981. Ibis 123:42–50.—Numerous hypotheses have been advanced to explain geographical variation in clutch sizes in birds. This study compares clutch sizes of 4 passerine species breeding both on Bermuda and the North American continent to test these hypotheses. Clutch sizes of 3 of the 4 species were significantly smaller on Bermuda than on the mainland; egg size did not vary significantly. Lucid explanations of several hypotheses of Lack, Cody, and Ashmole were presented and found to be confirmed in a general way by the data. However, without basic information on time and energy budgets of the populations and carrying capacities of their habitats, and without precise definitions of stable and unstable climates, the data could not be used to discriminate among the hypotheses.—Cynthia Carey.

15. Breeding of Starlings (*Sturnus vulgaris*) in nest boxes of various types. A. Moeed and D. G. Dawson. 1979. N.Z. J. Zool. 6:613–618.—Because of its supposed value in controlling insect pests of pastures, the Starling has been intensively studied in New Zealand. This study sought to determine the best nest box for the species. The box material (wood, concrete, or plastic) had no effect. Rather, the internal basal area determined bird use. Highest fledging rate was from boxes of 180–310 cm^2. Smaller entrance holes were preferred. A good discussion of the materials and their costs is included. Cavity nesting species are often the hardest hit when forests are altered and more studies like this (on perhaps a species more in need of help!) would certainly be good. Many of the earlier references on the subject were subjective at best and the authors are to be congratulated on their frank discussion of the problems in designing an accurate "test" of nest box design.—C. J. Ralph.

16. Nautical owls. C. Trichka. 1981. N. Am. Bird Bander 6:18.—Two young Barn Owls (*Tyto alba*) were found under the tarpaulin covering a boat stored at a marina in Stratford, Connecticut. The boat was being stored in the top rack (four tiers up) of an outdoor shed. The top of the cockpit and bow of the boat were covered with excrement and pellets. This owl is a rare breeder in Connecticut and, perhaps, a shortage of nest sites contributes to that fact.—Richard J. Clark.

17. Increased reproductive effort with age in the California Gull (*Larus californicus*). B. H. Pugesek. 1981. Science 212:822–823.—Three samples: 3–5-year-olds, 7–9-year-olds and 12–18-year-olds were compared. Feeding rate and nest attendance increased with age, as did reproductive success. Older gulls were relatively more frequent toward the center of the colony, but position was not correlated with reproductive success within the age group.—C. H. Blake.

BEHAVIOR

(see also 11, 12, 22, 41, 42, 43, 45)

18. Variability and periodicity of dustbathing behavior in Japanese quail (*Coturnix coturnix japonica*). W. R. Statkiewicz and M. W. Schein. 1980. Anim. Behav. 28:462–467.—Fifteen adult Japanese quail (*Coturnix coturnix japonica*) were subjected to varying light regimes and comparisons were made to determine the amount of time invested in dustbathing over a 24 h period. Attention was also directed to the relationship dustbathing had with preening, ingestion, and sexual/agonistic behavior. One group of 5 quail (1 male, 4 female) was observed during exposures to photoperiods of 14L:10D (3 months), 24LL (1½ months), and 10L:14D (3 months); while a second group of 10 quail (2 male, 8 female) was observed during exposures to photoperiods of 24LL (4.5 months), 22L:2D, and 14L:10D. The results of Statkiewicz and Schein's investigation indicated that dustbathing was not directly correlated with photoperiod (except under constant light). However, some birds spent more time dustbathing than others. There was no correlation between dustbathing and other behavioral activities, yet there was a definite peak in the frequency of dustbathing within a 24 h period (except under constant light). Statkiewicz and Schein suggest that this cyclic nature of dustbathing and individual variance is possibly under genetic control, emanating from the domesticated quail's "wild state" in which the advantages outweighed the disadvantages. The paper lacks a clear explanation of methods and fails to discuss potential variables.—Camela Chop.

19. Functional aspects of the pair bond in winter in Bewick's Swans (*Cygnus columbianus bewickii*). D. K. Scott. 1980. Behav. Ecol. Sociobiol. 7:323–327.—Scott argues that mates assist each other in competition for food during the winter while swans are grouped in large flocks. Herein lies an advantage associated with maintaining a pair bond during the non-breeding season. The behavior of partners both with and without their mates nearby was sampled. Both males and females experienced more success in aggressive encounters, were threatened less often, and spent more time feeding when close to their mates. Possibly mate proximity inhibits threats from other birds and when aggressive encounters do occur pair members assist each other. If Scott's interpretation is correct, partners should maintain closer proximity the denser the winter flock because of increased probability of encounters. Proximity of partners varied in that direction.—Frank R. Moore.

20. Cooperative breeding of the Northwestern Crow *Corvus caurinus* in British Columbia. N. A. M. Verbeek and R. W. Butler. 1981. Ibis 123:183–189.—Yearlings of this species do not breed and some individuals may assist the adults occupying the territory on which they were raised. In most instances, the adults appeared to be the parents of the helper. Helpers participate to some degree in territorial defense, food caching, and feeding the young. Helpers feed on the territory and may occasionally be fed by the male parent. Adults with a helper produce larger clutches and more fledglings per nest than those without helpers.—Cynthia Carey.

21. Self-awareness in the pigeon. R. Epstein, R. F. Lanza, and B. F. Skinner. 1981. Science 212:596–606.—Three White Carneaux pigeons (*Columba livia*) were trained to peck at the location of blue spots on their bodies which they could not see directly but only in a mirror. This ability is called "self-awareness."—C. H. Blake.

ECOLOGY

(see also 5, 9, 10, 13, 27, 40, 43, 45, 46)

22. Optimal foraging and territorial defence in the Great Tit (*Parus major*). A. Kacelnik, A. Houston, and J. Krebs. 1981. Behav. Ecol. Sociobiol. 8:35–40.—Optimality theory has been a valuable tool in the study of foraging behavior. Krebs and his associates, while contributing much in this area, acknowledge certain problems and shortcomings of this approach (see his contribution to **Foraging Behavior**, Kamil and Sargent, eds., 1981:3–18). An animal's behavior may not conform to simple optimal foraging models for several reasons. For example, most models are based on the assumption that foraging decisions maximize the net rate of food intake. What of other contingencies such as risk of predation or the whereabouts of mates? Foraging decisions are undoubtedly being made with other priorities in mind. The authors investigated the trade-off between foraging and territorial vigilance in Great Tits in a large indoor aviary. Food was obtained from two operant "patches" in which the supply of food was gradually depleted during a visit. During control sessions the birds were expected to switch between patches so as to maximize their overall feeding rate. A rival male was introduced briefly at the beginning of an experimental session. The prediction was that birds would switch more often, sacrificing food intake for "territorial vigilance." The results tend to confirm their predictions. One problem associated with multiple-criteria decisions is establishing a common currency. How are the benefits of territorial vigilance quantified and calibrated against feeding? Readers should find instructive the authors' application of an "inverse optimality" approach to this problem (see McFarland, Nature 269:15–21, 1977).—Frank R. Moore.

23. Central place foraging in the Whinchat, *Saxicola rubetra*. M. Andersson. 1981. Ecology 62:538–544.—Andersson provides field verification of several predictions from his model (Andersson, Theoret. Pop. Biol. 13:397–409, 1978) for central place foraging in a plane, uniform habitat by an "energy maximizer" (i.e., a species taking the most food per unit time to the nest). These predictions are: (1) that search time per unit area should decrease as distance from the central place increases; (2) that with an increase in food density, search time per unit area should increase still higher near the central place and decrease even lower farther away; (3) that with an increase in food density, the total foraging area should decrease; and (4) that foraging should commence near the central place and only be extended farther away as nearby food resources are depleted. Behavioral patterns concordant with these predictions were consistently seen each day for all 5 male Whinchats during the 2 to 2.5 h period starting 1 h after sunrise. Birds were observed with only the natural foods available for the low food density conditions and with a supplement of 225 Petri dishes containing 2 live mealworms each to give the increased food density. The only observations reported that did not follow the theory directly were that the decrease in search time with distance in prediction 1 was not linear but rather was convex with a rapid initial decrease in search time. Andersson offers several reasonable interpretations for this discrepancy. What Andersson does not do, but what would be of great interest considering the controversies existing about how often animals actually are foraging optimally, is to extend his observations of Whinchats to other times of day. He chose early morning, i.e., the termination of the inactive nocturnal period, for his study as a way to maximize his chances of having the birds fit his model. Now that Whinchats are known to act as energy maximizers in the early morning time period in the SW Swedish bog, it would be most interesting to know if similar behavior occurs all day or whether "optimal" behavior is necessitated only in the first stressful hours of the day.—A. John Gatz, Jr.

24. Competition between the Great Tit and Blue Tit outside the breeding season in field experiments. A. Dhondt and R. Eyckerman. 1980. Ecology 61:1290–1296.—Great Tits (*Parus major*) were prevented from breeding in nestboxes in territories usually shared with Blue Tits (*P. caeruleus*). Both winter roosting and summer breeding densities of the Great Tit were found to decrease significantly in comparison with control populations, while both roosting and breeding densities of the Blue Tit were found to increase significantly. Dhondt and Eyckerman conclude that, in winter, competition with the Great Tit limits the population density of the Blue Tit. This conclusion is weakly based on another researcher's 1957 findings that the Great Tit excludes subordinate conspecifics from roosting sites; Dhondt and Eyckerman hypothesize that since the Blue Tit is smaller than the Great Tit, it is probably excluded as well. They propose that the continued sharing of territory is made possible by the reproductive advantage that the Blue Tit holds over the Great Tit in summer. A problem with this proposal is that this advantage only exists when Blue Tit density is high, a situation that does not seem to be the natural consequence of the Great Tit's superiority in winter. Furthermore, natural nest sites were not monitored, so that the actual densities of the two species are unknown. More importantly, the conclusions rest on the idea that juvenile Great Tits are not attracted to territory with limited nest sites; the actual distribution of juveniles must be determined before the conclusions can be accepted.—Lia M. Cooper.

25. The breeding habitats of waders on North Uist machair. R. J. Fuller. 1981. Scott. Birds 11:142–152.—The level sandy plain that lies along the Uist in Scotland, referred to as a machair, provides excellent breeding conditions for shorebirds. Within the machair there are 7 different habitats that attract a diversity of species. The population of territorial birds was counted by dividing the habitat into uniform zones which were visited on foot. Estimates of the number of snipe could only be based on their winnowing sounds since they were so inconspicuous. The total population count is an estimate since a few birds' territories straddled a boundary of two zones and were probably counted more than once.—Tracy A. Busch.

26. Ecological significance of the early breeding in White-backed Woodpeckers *Dendrocopus* [sic] *leucotos*. S. Matsuoka. 1979. Tori 28:63–75. (In English, Japanese summary.)—This study compares breeding seasons, nest sites, and feeding methods of 5 species of woodpeckers. The author states that among the species there were 2 leaf-gleaning species (feeding mainly on insect larvae), one broad-niched ground and tree forager, one ground feeder (on ants), and one hammerer (feeding on beetle larvae). By catching the fecal pellets from the foliage-living caterpillars in pans, the author was able to quantify the number of potential prey and (through pellet size) their biomass for the leaf gleaners. He found that peaks of breeding of 4 of the woodpeckers were coincident with peaks of lepidopteran and larval abundance. Only the White-backed (the hammerer) was early, possibly to take advantage of availability of beetle larvae, although it is not clear from the author's discussion exactly how.

Although in general a good study of woodpecker ecology, many crucial data are not given, and sweeping assumptions are rather blithely made. One also is nagged by the feeling that the author has confused the correlations he found with actual relations, a not uncommon event among ornithologists.—C. J. Ralph.

WILDLIFE MANAGEMENT AND ECONOMIC ORNITHOLOGY

(see also 15, 43, 46)

27. Woodpeckers and the southern pine beetle. J. C. Kroll, R. N. Conner, and R. R. Fleet. 1980. Agriculture Handbook 564. U.S. Department of Agriculture. 23 pp.—This is an attractive booklet, using 11 colored photographs and relatively little text material. In fact, it may have more in appearance than in substance. This conclusion is supported also by the fact that the 23-page booklet was published as the "Southern Pine Beetle Handbook." Recommendations are made in forest management practices aimed at fuller use of woodpeckers in control of southern pine beetles (*Dendroctonus frontalis*). The chief practice recommended includes killing and leaving standing scattered trees of various sizes not suitable for harvesting. If a handbook is required to bring foresters to recognize the simple fact that birds have a proper place in forest management, I can only applaud the publication of this handbook.—Paul A. Stewart.

28. Wagtails as predators of field bean aphids. A. K. Chakravarthy and S. Lingappa. 1979. J. Bombay Nat. Hist. Soc. 76:367.—Yellow and Grey wagtails (*Motacilla flava* and *M. caspica* [=*M. cinerea*]) were found feeding on mustard aphids (*Lephaphis erysini*) infesting field beans in India. The authors concluded that the wagtails perform an important role in controlling aphids on field beans.—Paul A. Stewart.

29. Habitat management for hole-nesting birds in forests of western larch and Douglas-fir. B. R. McClelland, S. S. Frissell, W. C. Fischer, and C. H. Halvorson. 1979. J. For. 77:480–483.—In three years of research in mountain forests of Montana, searches were made for tree cavity nests. A total of 273 nests of 20 species was found. Based on the abundance of cavity-nesting birds, the authors suggested that a forest management plan should provide for leaving scattered dead trees where cavities can be constructed by woodpeckers, the cavities to be used for nesting by woodpeckers and other birds. While I know enough about forest birds that I am willing to accept the implication that the presence of cavity-nesting birds is beneficial in forest management, I can empathize with forest owners who might wish to know something about the benefits to be expected from the presence of the birds rather than just to know the birds are present.—Paul A. Stewart.

CONSERVATION AND ENVIRONMENTAL QUALITY

(see also 43, 44, 47)

30. Human disturbance in Western Gull *Larus occidentalis livens* colonies and possible amplification by intraspecific predation. J. L. Hand. 1980. Biol. Conserv. 18:59–63.—This paper reports observations indicating that human activities are having serious adverse effects on reproduction of the endemic *Larus occidentalis livens* in the Gulf of California, possibly posing a threat to survival of the race. It is suggested that some action to regulate human interference may be essential.—Paul A. Stewart.

31. The human influence on seabird nesting success. D. W. Anderson and J. O. Keith. 1980. Biol. Conserv. 18:65–80.—The activities of humans were found to be detrimental to the nesting success of Brown Pelicans (*Pelecanus occidentalis californicus*) and Heermann's Gulls (*Larus heermanni*) in the Gulf of California. Research scientists and educational groups were mentioned along with recreationists and fishermen as imposing hazards on the birds. Ornithologists are increasingly confronted with the problem of needing to redefine their goals to make certain that their efforts at helping birds do not impart more damage than benefit to the birds and to the image of science.—Paul A. Stewart.

PHYSIOLOGY

(see also 6)

32. Testosterone treatment blocks the termination of the gonadal photorefractory condition in White-throated Sparrows maintained on short days. F. W. Turek, A. Wolfson, and C. Desjardins. 1980. Gen. Comp. Endocrinol. 41:365–371.—The gonads of most seasonally breeding birds undergo regression at the completion of breeding and enter into a state called photorefractoriness in which long photoperiods cannot stimulate gonadal growth unless the bird is first exposed to short photoperiods. Little is known about the neuroendocrine events during short photoperiods that result in the termination of photorefractoriness. This study tested the relation between plasma testosterone levels and termination of the photorefractory period. Implantation of testosterone in silastic capsules maintained plasma concentrations of testosterone above those normally found in photorefractory birds and prevented gonadal growth when the birds were subsequently exposed to long photoperiods. The site of action of testosterone was not analyzed nor was the importance of these results fully detailed relative to the neuroendocrine control of gonadal cycles in birds.—Cynthia Carey.

33. Pinealectomy affects circannual testicular rhythm in European Starlings (*Sturnus vulgaris*). E. Gwinner and J. Dittami. 1980. J. Comp. Physiol. 136:345–348.—The pineal gland is currently hypothesized to be the site of control of at least some avian circadian rhythms. Since circadian rhythms seem intertwined with regulation of annual breeding cycles in birds, this study attempted to determine if the pineal plays a role in regulating annual cycles. Sham-operated and pinealectomized individuals were maintained on a 12-h photoperiod and at constant temperatures for 16 months. Pinealectomy caused earlier regression of testes and onset of molt in the first gonadal cycle and abolished the second gonadal cycle evident in control birds. The pineal was hypothesized, on the basis of these results, to exert an effect on the testicular annual cycle by altering the phase relationships between entrained circadian rhythms and light/dark cycles.—Cynthia Carey.

34. Shell resistance and evaporative water loss from bird eggs: effects of wind speed and egg size. J. R. Spotila, C. J. Weinheimer, and C. V. Paganelli. 1981. Physiol. Zool. 54:195–202.—Boundary-layer effects and wind speed are only of slight importance in gas and water exchange of bird eggs of all sizes.—C. R. Blem.

35. Prenatal withdrawal from opiates interferes with hatching of otherwise viable chick fetuses. M. D. Kuwahara and S. B. Sparber. 1981. Science 212:945–947.—Three-day-old chick embryos were made dependent on NLAAM by injection into the chorioallantois. This did not interfere with hatchability. Treatment with naloxone to break the addiction diminished hatchability of such chicks, but naloxone did not reduce the hatchability of non-addicted chicks.—C. H. Blake.

MORPHOLOGY AND ANATOMY

(see also 43)

36. Bird topography. Editors. 1981. Br. Birds. 74:239–242.—A plethora of bird topographies exists. The rather complete labeled drawings by P. J. Grant in this short editorial are not just another one. I intend to refer these pages to the undergraduate and graduate students in my future ornithology classes. It is the best guide to bird topography for field identification that I have seen.—Patricia Adair Gowaty.

PLUMAGES AND MOLT

(see 1, 18, 33, 37)

ZOOGEOGRAPHY AND DISTRIBUTION

(see 14)

SYSTEMATICS AND PALEONTOLOGY

(see also 43)

37. Notes on moult and seasonably variable characters of the Antarctic Blue-eyed Shag *Phalacrocorax atriceps bransfieldensis*. 1980. N. P. Bernstein and S. J. Maxson. Notornis 28:35–39.—Soft-part coloration and plumage patterns affected by molt were used to characterize populations of the Blue-eyed Shag complex in the southern hemisphere. This paper, based on a 14-month study on the Antarctic Peninsula, shows that molt is very protracted and that variation in the color of the soft parts (eye-ring and facial caruncles) varies seasonally. While the population studied may not be typical of the complex, the data will have to be accommodated in any future revisions (cf. Devillers and Terschuren, Gerfaut 28:35–39, 1978.—J. R. Jehl, Jr.

EVOLUTION AND GENETICS

(see also 10, 41, 43)

38. Inbreeding in an island population of the Great Tit. A. J. van Noordwijk and W. Scharloo. 1981. Evolution 35:674–688.—Twenty years of breeding data for Great Tits (*Parus major*) on the island of Vlieland in the Netherlands were analyzed to compute the level of inbreeding in these birds, and to infer the effects of the degree of inbreeding of adults on the success rate of hatching, fledging, and recruitment of their offspring. The breeding population consisted of approximately 100 individuals. Eight percent of the individuals were immigrants. Pedigrees of varying completeness were available for the remaining birds. For birds with complete pedigrees going back at least 2 generations, the average inbreeding coefficient was 0.0441 (SD = .0211). Hatchability of eggs was strongly influenced by inbreeding; a 10% increase in the inbreeding coefficient resulted in a 7.5% reduction in number of eggs hatching. Thus, there appears to be definite inbreeding depression at this stage. However, this depression is counteracted by increased fledging success and recruitment from these clutches whose size had been reduced by the lowered hatchability. Consequently, the net effect is an overall marginally higher fitness for birds producing inbred clutches. This counter-intuitive result will be of some interest to evolutionary theorists. However, the levels of inbreeding here are not large (all analyzed cases have F less than .25) and the results are at variance with the results of a study of inbreeding in the Great Tits of Wytham Wood (Bulmer, Heredity 30:313–325, 1973). Clearly, more such studies are needed.—George F. Barrowclough.

39. Chromosomes in birds (Aves): evolutionary implications of macro- and microchromosome numbers and lengths. H. Tegelstrom and H. Ryttman. 1981. Hereditas 94:225–233.—This is a review of the karyotypes of 234 species of birds representing 21 orders. Unfortunately the species involved are not listed. The mean diploid number in this sample was 78.0 (±3.9). The range was 40 (*Burhinus oedicnemus*) to 126 (*Upupa epops*). The mean haploid number of macrochromosomes was 8.3 (±1.8); for microchromosomes, this average was 30.8 (±4.2). There was little variation among orders in these means, with the exception of the Falconiformes, which are not treated here. The authors suggest there may be a "standard bird karyotype" of 16 macro- and 64 microchromosomes.—George F. Barrowclough.

FOOD AND FEEDING

(see also 22, 23, 27, 28)

40. Foods of Ruffed Grouse in Ohio. R. J. Stoll, Jr., M. W. McClain, C. M. Nixon, and D. M. Worley. 1980. Ohio Fish and Wildl. Rep. 7, Ohio Department of Natural Resources, Columbus, OH.—Ruffed Grouse (*Bonasa umbellus*) occur in glaciated northeastern Ohio and in the hill country of east and southeastern Ohio. Diet is more varied than among grouse of more northern latitudes. In particular, aspen is less important, partly because it is less common in Ohio's predominantly oak-hickory forests and partly because snow cover is rarely heavy enough to prevent grouse from foraging on the ground. The paper includes many dietary details and management recommendations. The wealth of data is impressive, although most dietary samples were collected in southeastern counties, making generalization to northeastern counties somewhat tenuous. Separate consideration of fruits and twigs in species where both are important dietary components (e.g., hawthorn) might have sharpened some trends.—Edward H. Burtt, Jr.

SONGS AND VOCALIZATIONS

41. **The role of male vs male interactions in maintaining population dialect structure.** M. C. Baker, D. B. Thompson, G. L. Sherman, and M. A. Cunningham. 1981. Behav. Ecol. Sociobiol. 8:65–69.—Song dialect may function to keep individuals within a habitat to which they are adapted (see Nottebohm, Condor 71:299–315, 1969). This hypothesis has recently gained some support. Baker (Evolution 29:226–241, 1975) discovered significant genetic differences between contiguous dialect populations. Post-breeding dispersal patterns also appear to be influenced by song dialect (see Baker and Mewaldt, Evolution 32:712–722, 1978). Are there behavioral mechanisms that help maintain the integrity of dialect populations? The authors test the hypothesis that male-male interactions may reduce dialect mixing in a nonmigratory population of White-crowned Sparrows (*Zonotrichia leucophrys nuttalli*). They recorded the reaction of territorial males to playback songs from (1) a stranger in their own ("clear") dialect population, (2) the adjacent and contiguous ("buzzy") dialect population, and (3) a dialect ("Bodega") population 55 km away. Resident ("clear") males responded more aggressively toward neighboring "buzzy" playbacks than to the home dialect. The weakest response, however, was toward the Bodega dialect. Possibly "clear" males are not even recognizing Bodega song as White-crown song. The authors provide possible explanations for the stronger response to the neighboring "buzzy" dialect. In general, the results are consistent with the notion that male-male interaction represents a proximate mechanism promoting dialect isolation.—Frank R. Moore.

42. **Acoustic signals and behavior of nidifugous birds (Galliformes and Anseriformes) in early ontogeny. 1. Prenatal stages of development. 2. Signals and behavior of hatchlings.** (Akusticheskaia signalizatsiia i povedenie vyvodkovykh ptits (kurinye i plastinchatokliuvye) v rannem ontogeneze. Prenatalyny stadii razvitiia. Signalizatsiia i povedenie ptentsov). A. V. Tikhonov. 1980. Vestn. Mosk. Univ. Ser. XVI Biol. 1:47–55 and 2:3–12. (In Russian with English summaries.)—The ontogeny of acoustic signals during embryonic stages of development and in young hatchlings was studied in 16 species of gallinaceous birds and 23 species of waterfowl.

A. Prenatal Stages of Development.

1. *Peeps* are first heard several days before hatching. For some species, it was necessary to remove a chip of shell to hear them. Before the embryo puts its beak into its air sac, its peeps are short, weak, single sounds given 30–60 min apart. The embryo is not beginning spontaneous breathing. After the amniotic membrane is pierced and the bird is breathing air with its lungs, vocal activity increases, and during pipping the peeping comes in series of 2 or 3 peeps. The duration of a peep is directly related to the size of the species.
2. *Clicks* are weak and sporadic noises that become almost continuous when the embryo begins breathing air. Common to all bird species, they probably function to coordinate the hatch of a clutch, or, in single-egg clutches, to begin communication with the parents.
3. *"Distress" or "discomfort" sounds* can be heard from the stage when clicking becomes regular. They resemble peeps but are louder and longer and are responses to the egg being chilled, bumped, or turned suddenly.
4. *"Comfort" signals* begin 5–14 h after pipping. They are a quiet twitter or whistling given after a spate of movement by the embryo, or when a chilled egg is warmed. They are quite variable between species as to whether given singly or in groups, and in duration. After a series of comfort signals, the embryo may utter a trill. When goose eggs are warmed, the embryo's activity lessens and it gives a trill like the "sleepy" trill described for goslings.
5. The *egg tooth* can be heard clicking against the shell as the bird within moves its head.
6. *Hatching signals* can also be considered pain signals, since the umbilical "stalk" is being broken. These are like "discomfort" sounds, but are more prolonged and have no characteristic frequencies. When a hatchling assumes the proper horizontal position after leaving its shell, hatching sounds are replaced by "comfort" signals.

Although embryos of both gallinaceous birds and waterfowl are capable of making sounds even before they are truly breathing, waterfowl begin vocalizing up to 3 days before hatching, gallinaceous birds no more than 1.5 days. This is because young waterfowl must have established lung breathing before hatching so that they can thermoregulate as soon as they hatch, for they leave the nest for water shortly thereafter. These embryonic vocalizations coordinate the behavior of sibling embryos to help synchronize hatching, can summon a parent bird back to the nest to resume incubating, and are preliminary to formation of parent-offspring bonds.

B. Signals and Behavior of Hatchlings.

1. *"Distress" or "discomfort" sounds* are rhythmic series of impulses and have the same dome-shaped curve on a sonogram as do the distress signals of embryos. "Distress" sounds are uttered while standing, with head up, neck extended, and beak open wide, and indicate that the bird is cold, hungry, or separated from parent and/or siblings.
2. *Location calls* resemble discomfort signals but are not so loud and are given without stretching neck or raising head. If separated from its family long enough, a young bird will eventually replace location calls with distress sounds, resuming the location signal if a parent bird answers.
3. *"Comfort" sounds* are heard when nestlings are being warmed or fed or cleaned, when they are sleepy, or when they come into contact with parent or siblings. These are varied kinds of chirpings and trills, which, in gallinaceous birds, are not peculiar to any one of these situations. The waterfowl have less diversity in their "comfort" sounds and these are more specific to the situation.
4. *Alarm and defense (or protection) sounds* are either trills or tonal (single or grouped whistles). Young birds raised by hand may give alarm calls in circumstances that are not actually threatening but merely unfamiliar; birds raised by their parents seem to learn from the adults to discriminate.
5. *Conflict signals* are given when young birds are jostling each other at food or water dishes or when establishing the pecking order. There are aggressive trills, defensive trills, pain trills and tones, and fear trills and tones. Nearby birds react by moving away with fear or by giving defense signals.

These several types of signals have survival value: discomfort sounds elicit approach by the other young birds, thus keeping the brood together; comfort sounds synchronize behavior like sleeping; "greeting" sounds may aid in family recognition (particularly important in geese). The structural organization of sounds is shared by Galliformes and Anseriformes: rhythmic series frequently repeated are "discomfort" sounds; aggression/defense and alarm calls are predominantly trills; and quieter trilling noises are characteristically "comfort" signals.—Elizabeth C. Anderson.

BOOKS AND MONOGRAPHS

43. Proceedings of the First Welder Wildlife Foundation Symposium. D. L. Drawe, ed. 1979. Allen Press, Lawrence, Kansas, vi + 276 pp. (Copies may be obtained from the Welder Wildlife Foundation, P.O. Drawer 1400, Sinton, TX 78387. $6.06, postage included.)—The proceedings present a diverse collection of papers. Such diversity prompts me to provide separate reviews of the 8 avian papers.

White-dark polymorphism in herons. D. W. Mock.—What selective pressures establish and maintain avian polymorphism? What advantages accrue to each morph? Polymorphic and dichromatic (e.g., Reddish Egret, *Egretta rufescens*) herons have been better studied than other polymorphic birds, however, the lack of data largely limits Mock's review to the second question. White herons are less conspicuous to fish and more conspicuous to congeners than dark herons. Hence, they can approach fish more closely than dark herons and maintain feeding territories by their conspicuous presence. Dark herons may be less vulnerable to territorial encroachment and piracy. Their dark, durable plumage may enable them to exploit more abrasive habitats. Dark plumage may also prevent penetration of solar radiation enabling dark herons to forage in more sunlit habitats than their white relatives. These are the major points raised in a well-referenced, provocative review that is simply and clearly written. Because Mock's purpose is to stimulate more interest in the evolution of polymorphism, I wish that he had included a discussion of hypotheses that have not been applied to herons, for example, ultraviolet shielding by melanic feathers. There is some loose reasoning, for example, the assumption in evolutionary discussions that white is the most conspicuous color, whereas evidence shows only that it is more conspicuous than dark. However, Mock pleads for more study of the selective pressures that establish and maintain avian polymorphism. I agree. Understanding color polymorphisms may provide the keys to understanding avian colors and patterns generally.

Vegetation as a determinant in avian ecology. R. R. Roth.—Vertical and horizontal dimensions of vegetation affect the ecological and evolutionary roles of birds, yet indices of the horizontal dimension are poorly developed and explored. Roth applies 3 such indices to several avian communities and discusses their predictabilities. None of the indices is entirely adequate and Roth concludes with a plea for development of a "universally applicable, reliable, simple, and ecologically meaningful method and index to quantify avian habitat . . . ," an index that would simplify and improve the work of applied ecologists. Although the search for such an index is itself valuable, the existence of a simple, accurate representation of a complex, variable world is questionable.

The Black-bellied Whistling Duck in South Texas: a review. E. G. Bolen.—The nomenclatural history of the Black-bellied Whistling Duck (*Dendrocygna autumnalis*) indicates that the nominate race (*D. a. autumnalis*) is the South American race and that the northern race which ranges north into Texas should be designated *D. a. fulgens.* Zoogeographical data indicate a tropical origin for the Black-bellied Whistling Duck. A brief review of the phylogeny and comparative behavior of whistling ducks demonstrates a scarcity of data on whistling ducks which, because of their primitive phylogenetic position within the Anatidae, offer fertile ground for comparative study.

Weights and linear measurements of Black-bellied Whistling Ducks in Guyana. G. R. Bourne.—As predicted by Bergmann's Rule, Guyanan Black-bellied Whistling Ducks are smaller than their Texan conspecifics. However, the extremities are not consistently longer among Guyanan than Texan ducks as predicted by Allen's Rule. There is no sexual dimorphism in weight or size.

The Attwater's Greater Prairie Chicken: endangered grouse of the Texas coastal prairie. W. B. Kessler.—Changes in present land management can preserve Attwater's Greater Prairie Chicken (*Tympanuchus cupido attwateri*). Specifically, controlled burning can increase food quality and availability, reduce the accumulation of litter, and increase the diversity of cover. Rotation grazing reduces the accumulation of litter, provides openings in the cover, increases the diversity of cover, controls the succession to woody species, and creates booming grounds. Grain fields near properly managed grassland can provide summer cover and supplemental food. The critical factor appears to be convincing land owners to implement such management practices.

Timing of migration and route selection in North American songbirds. J. H. Rappole, M. A. Ramos, R. J. Oehlenschlager, D. W. Warner, and C. P. Barkan.—Data from the Welder Wildlife Foundation Refuge and the Tuxtlas Mountains of southern Veracruz, Mexico, indicate differences in route selection and timing of spring and fall migration among North American migrant passerines. No single factor accounts for the many different patterns found. The paper presents frustratingly little data, leaving the reader unable to evaluate the patterns suggested by the authors. Furthermore, the discussion of migratory routes becomes confused because, after variation 4, descriptions and figures fail to agree.

Limiting factors of Rio Grande Turkeys in south Texas: a review. B. W. Baker and M. F. Passmore.—Populations of the Rio Grande Turkey (*Meleagris gallopavo intermedia*), recently estimated at ½ million, are limited primarily by excessive brush control and overgrazing.

Texas colonial waterbird census, 1977–1978. G. W. Blacklock, R. D. Slack, D. R. Blankinship, A. H. Chaney, K. A. King, J. C. Smith, and L. Mullins.—Colonial waterbirds were censused from the air and ground along the Texas coast in what ranks as one of the most thorough counts ever undertaken. The status of 25 species is discussed with special attention to 7 species that are experiencing problems: Brown Pelican (*Pelecanus occidentalis*), Olivaceous Cormorant (*Phalacrocorax olivaceus*), Reddish Egret (*Dichromanassa rufescens*), White-faced Ibis (*Plegadis chihi*), Laughing Gull (*Larus atricilla*), Least Tern (*Sterna albifrons*), and Black Skimmer (*Rynchops niger*).—Edward H. Burtt, Jr.

44. Introduced birds of the world. J. L. Long. 1981. Agricultural Protection Board of Western Australia, Perth, W.A., 528 pp.—The introduction considers several general topics: the history of introductions which began in prehistory; reasons for introductions such as aesthetics, food and hunting, pest control, escapes and liberations of cage birds, and accidental introductions; distribution of introduced species (e.g., the number of definitely established species ranges from 45 in Hawaii, 39 in North America, 38 in New Zealand, and 32 in Australia down to zero); menace of naturalized birds through competition with native species, diseases and parasites of man as well as birds, hybridization and genetic changes, agricultural damage, and continued spread of introduced species; and benefits from naturalization including recreation, pest control, conservation of endangered species, introduction to safe areas or reintroduction to original range.

Introductions, reintroductions, and transplants totalling 425 species in 20 orders are discussed in reasonable detail. Each species is illustrated with a map showing original range, migration, and introductions distinguished as successful or unsuccessful. Useful black-and-white sketches of many species are included. Attention is given to reasons for introduction and economic effects. The work closes with a very useful summary that should (but may not) serve as a warning to those who try to improve on nature.—C. H. Blake.

45. The Foraging Behavior of Mountain Bluebirds. H. W. Power. 1980. Ornithological Monographs No. 28. American Ornithologists' Union, Washington, D.C. 72 p. $8.50.—Five possible evolutionary origins of sexual foraging differences are discussed and experimentally evaluated. These are (1) sexual selection, (2) intersexual competition, (3) division of labor, (4) foraging efficiency, and (5) intersexual exploitation. The monograph is tersely written, sometimes pedantic, and too frequently in the passive voice; and although, I am in favor of more sexual selection hypotheses, I am unconvinced that as Power dogmatically states "sexual selection is always at the root of sexual foraging differences" (p. 1 and 66). Nonetheless, this monograph is powerful. The design and execution of the experiments used to evaluate the hypotheses are remarkable. The experiments are thrifty; Power's judicious use of experimental manipulation is exemplary. Among the impressive aspects of the monograph is the complete discussion of biases and the explicit statements of information necessary to accept or reject hypotheses.

The first of the main experiments was designed to test the importance of work load on sexual foraging differences by comparing the behavior of pairs with high and low work loads, i. e., with broods of 5 or 6 young or broods of 3 young, on the 10th and 11th day of nestling life. Increased work load resulted in increased work output by both males and females; females with large broods experienced greater foraging costs than their mates. The second experiment was designed to sort out 4 possible factors of work load and 3 possible explanations of sexual foraging differences during the nestling period. The second experiment was built on the experimental population of the first experiment. At 13 nests, no adults were collected: 7 nests had 6 young and 6 nests 3 young. At 13 nests females were collected leaving only males to care for the nestlings: 6 of these nests had 6 young and 7 had 3. At the remaining 12 nests, males were collected leaving only females to care for the nestlings: 6 of these nests had 6 nestlings and 6 had 3 nestlings. The number of young per attendant adult is responsible for work output in foraging behavior. Because unpaired birds worked harder than paired birds, the hypothesis of intersexual food competition was rejected as an ultimate factor in sexual foraging differences. Evidence of male reluctance to increase work load combined with evidence that males can increase work load suggest that predation risks during foraging may be more costly for males than for females. The third experiment was designed to test the effect of mate loss on foraging behavior. Foraging behavior was compared before and after the day 12 manipulations. All groups of birds changed their behavior following the experimental manipulations at their nests on the twelfth day of nestling life; birds losing their mates changed their behavior more dramatically than birds not losing their mates.

Besides the 3 main experiments, additional experiments evaluated hypotheses concerning the role of territory in bluebird life, the impact of non-bonded consorts on foraging behavior, and the effects of possible male exploitation on female well being.

Overall, I found Power's monograph to be full of interesting ideas and experimental approaches. Everyone interested in foraging theory should read it as well as anyone interested in field experimentation. Clearly we need more explicitly experimental field studies and despite the laconic style of the written presentation, this work is an admirable example.—Patricia Adair Gowaty.

46. Bird community dynamics in a ponderosa pine forest. R. C. Szaro and R. P. Balda. 1979. Studies in Avian Biol. 3. 66 pp. [$6.50. Order from Cooper Ornithol. Soc., % Dept. Biology, Univ. of California, Los Angeles, CA 90024 U.S.A.]—For each of 3 years on each of 5 differently managed plots of ponderosa pine forest, Szaro and Balda determined the breeding density, behavior, and territory size of the birds. Their purpose was to learn how different patterns of timber management in a monoculture forest affected the birds. Their methodology included making rather extensive field observations that were subsequently analyzed quite elegantly using not only traditional ecological methods but also uncommon ones such as cluster analysis of the species using behaviorally based Euclidean distances among the species. What Szaro and Balda found was that 2 categories of species tended to be abundant year after year on several of the plots irrespective of what management treatment had been used. Behaviorally plastic species comprised one such category; these birds altered their tree species preferences, perch size use, and foliage height use in accordance with what was available. Species with no close competitors because of being extraordinarily isolated by body size from other members in their feeding guild comprised the other category of perpetually abundant species. In contrast to these 2 groups, species with close competitors and lacking plasticity in their foraging behavior disappeared from some of the treatment plots. How one manages a forest affects what species will be there in the ponderosa pine forests of Arizona.—A. John Gatz, Jr.

47. The Peregrine Falcon. D. Ratcliffe. 1980. Buteo Books, Vermillion, South Dakota, USA, and T. and A. D. Poyser, Ltd., Great Britain. 416 pp. ($42.50 US.)—The sixteen chapters of this book cover virtually all aspects of the biology and natural history of *Falco peregrinus* (insofar as is known) as well as their relationship to man. Admittedly the emphasis is on the Peregrine in the United Kingdom with secondary emphasis on this bird in North America, but this is for reasons obvious to anyone reading of this bird either in the professional journals or in the newspapers. The literature for the species in other parts of the globe is, however, adequately treated so that it will serve as a reference for anyone working with the species. The author has worked with this species in an unusually comprehensive way and this is reflected in the book. He has studied the bird's biology in Great Britain, communicated extensively with biologists in other parts of the world, accomplished a major break-through in placing organochlorine insecticides in their proper ecological context by identifying their role in the Peregrine's food base and its effect in the overall biology of the species, led team efforts at monitoring the population trends of the Peregrine during and after extremely stressful times, and served a major role in organizing conservation efforts designed to insure and enhance the chances of this species' survival. That the turn around in drastically declining population trends in certain parts of the Peregrine's range has not been achieved by a single person is evidenced in the more than six pages of acknowledgments. Hickey's work with this species (with both the convening of the 1965 University of Wisconsin Conference and subsequent publication of **Peregrine Falcon Populations: Their Biology and Decline,** U. of Wisconsin Press, 1969, certainly serves as a landmark along the road to survival of the species and I think this work will also. While the former work put forward hypotheses for the drastic decline in populations of this (and other diurnal raptor) species, the latter reports on the results of testing certain of these hypotheses. Lest one is led to believe that the book is of interest only to scientists, I would offer that the text is very readable while documentation is very thoroughly provided in more than 6 pages of bibliography and about 30 pages of tables. I did not check all tables, but assume that they were compiled with the same care as was the text. One typographical error and one reference omitted from the bibliography were all that I found as oversights in the text.

The text is handsomely illustrated with color plates by Donald Watson, and line drawings are interspersed in the text. There are 32 black-and-white figures (= plates) that illustrate points made in the text. While reading this book I was impressed with the ability of this species to survive in spite of man—persisting through the onslaughts of egg-collectors, gamekeepers, falconers, skin collectors, pigeon fanciers, and others. Yet the Peregrine has persisted also, because of men such as Derek Ratcliffe and others who are readily identifiable in the text. Survival "tactics" that have evolved in this species include flexibility of behavior (e.g., in nest-site and prey selection), tenacity to nesting eyries, fearlessness in defending eyries and their contents, wide-ranging movements, and others.

Any species that stirs the emotions of man is apt to be damned by some and defied by others and so it is with the Peregrine. The author presents a much more balanced picture of the Peregrine through the objective use of objectively gathered information. However, a hint of awe for the species still creeps in at times. The final chapter is a fitting one, for it deals with conservation and the future of the Peregrine. It is a very thorough and straightforward treatment of the subject identifying major problems and offering suggestions for their handling. I think that even those who are somewhat "turned off" by this species (or more appropriately, those working with it), contending that all the attraction the Peregrine has drawn detracts from much needed work with other lesser known or perhaps even common species, will find that there is good reason for all the attention that has been given it.—Richard J. Clark.