

RECENT LITERATURE

Edited by Edward H. Burttt, Jr.

BANDING AND LONGEVITY

(see 13)

MIGRATION, ORIENTATION, AND HOMING

(see also 28, 45, 52)

1. **Homing behavior of Wood Thrushes (*Hylocichla mustelina*).** K. P. Able, W. F. Gergits, J. D. Cherry, and S. B. Terrill. 1984. *Behav. Ecol. Sociobiol.* 15:39-43.—Seven Wood Thrushes were displaced over distances of 6.5-17.3 km in several directions from their nesting territories. These individuals were radio-tracked in order to determine if this typical migrant passerine was capable of homing. All but 3 flights greater than 0.5 km occurred early in the morning, most at dawn before the sun was visible. The distribution of directions of pooled data was significantly oriented. The birds moved in a series of short flights, usually 1/d. The slowness of such homeward movement was unexpected and led to the hypothesis that the homing mechanism requires short flights with stopovers during which reassessment of information is performed; however, based on data at hand, homeward orientation did not appear to improve with successive flights, leaving the slowness of this oriented movement unexplained. These observations are significant because in many homing studies the long intervals between release and recapture of birds at home are taken as evidence for random search. Given that the trajectories of homeward movement for these thrushes was significantly oriented, the possibility of random search was eliminated for these thrushes, and raises the question of the sufficiency of data required to claim random search for other species as well.—Patricia Adair Gowaty.

2. **Night sky orientation of migratory Pied Flycatchers raised in different magnetic fields.** V. P. Bingman. 1984. *Behav. Ecol. Sociobiol.* 15:77-80.—Does the ambient magnetic field calibrate initial night sky orientation in migratory Pied Flycatchers (*Ficedula hypoleuca*)? Apparently not. Birds raised outdoors in the local magnetic field (the control group) exhibited seasonally appropriate, southerly mean direction when tested outdoors, as did the 2 experimentally manipulated groups (B and C). Group B birds were raised in 2.00 m Helmholtz coils that shifted the inclination of the magnetic field 105° west relative to the earth's field. Group B birds were expected to show a 105° counter-clockwise shift in their mean orientation relative to the control group. Group C birds were exposed to only a vertical magnetic field that nulled the horizontal component of the earth's field (a magnetic field without direction). These birds were expected to show no migratory orientation. Thus, these data do not support the hypothesis that the earth's magnetism serves as a calibrating reference in the development of migratory orientation of Pied Flycatchers.—Patricia Adair Gowaty.

3. **Homing behavior of pigeons after telencephalic ablations.** V. P. Bingman, P. Bagnoli, P. Ioale, and G. Casini. 1984. *Brain Behav. Evol.* 24:94-108.—Homing pigeons released 30-70 km from home and with lesions in the hippocampus and parahippocampalis of the dorsomedial forebrain, or the Wulst, showed disappearing azimuths that were as well oriented towards home as those of control birds. Although all of the control birds and those with lesions in the Wulst homed successfully, only 2 of 28 birds with lesions in the dorsomedial forebrain did so. When birds of the 3 groups were released within sight of their home loft, only those with the hippocampus ablated failed to return to and enter their home loft. These results suggest that the hippocampus, parahippocampalis, and visual Wulst are not needed for a pigeon to determine the direction towards home (map and compass components), but the dorsomedial forebrain is necessary for the pigeon to recognize its home loft once it is in the vicinity.—Robert C. Beason.

4. **Pigeon navigation: time course of olfactory signal processing and dependence on access to fresh environmental air.** H. G. Wallraff, S. Benvenuti, and A. Foa. 1984. *J. Comp. Physiol. A* 155:139-150.—This paper reports on the effects of supplying pigeons

(*Columba livia*) unfiltered air versus air passed through a charcoal filter, and on the effects of xylocain applied to the pigeon's nostrils shortly before release. The results are presented in an elegant series of elaborate graphs which are difficult to interpret. To further complicate interpretation, the + and - symbols are so small that they are easily mistaken for decimal points. The overall conclusion, using the homeward component of the mean vectors, was that lack of access to outside air prior to release had a more detrimental impact on the disappearing direction than the application of anesthesia to the nostrils at the release site shortly before release. Air to half of the birds was passed through an activated charcoal filter while the other half received unfiltered air. Fresh air was provided during the outward journey or during a 4 h wait at the release site. Birds performed equally well under both procedures. Although the anesthesia appeared to have less influence on vanishing bearings than did air filtration, it greatly reduced homing speeds. Reducing the volume of fresh air to the birds was also detrimental to initial orientations. When the results of all 16 releases were combined, there was an eastward bias for all 4 treatments (with or without filtered air, with or without xylocain). This bias was strongest for the birds receiving filtered air. The authors conclude that the pigeons determine the location of the release site using local olfactory cues and then know in which direction home lies. If the bird is denied access to fresh air during the outward journey, it needs more than 15 min but less than 4 h of fresh air at the release site to determine its location. There is a great deal of variability in many of the individual releases which, along with the small sample sizes, detract from the validity of the conclusions. The pooled analysis of the 16 releases provides the strongest support.—Robert C. Beason.

5. Pigeon homing: the effect of outward-journey detours on orientation. F. Papi, P. Joale, V. Fiaschi, S. Benvenuti, and N. E. Badaccini. 1984. *Monit. Zool. Ital.* 18:53–87.—This paper provides a summary of the 54 outward-journey detour experiments performed in Italy 1973–1975. The results of some of the individual experiments had been published previously. In each release one group was driven to the release site using a clockwise (CW) circular route. The other group was transported using a counter-clockwise (CCW) route. The result was that each group of birds departed the home loft and arrived at the release site from opposite directions. In 34 of 52 releases (2 were excluded for technical reasons), the differences in the distributions of vanishing bearings were significant. New-to-site birds showed significant differences in 24 of 33 releases. In many cases the effect of the detour was to produce a mean vanishing bearing intermediate between the homeward direction and the detour direction. For some additional releases, the bearings of the 2 groups differed, but were both CW or CCW of the homeward direction, apparently because of release-site or home-loft bias. When a detour experiment was replicated using the same birds, the detour effect progressively diminished, and disappeared in some cases. Application of xylocain (see review 4) abolished the deflection produced by the detour. Consequently, the authors concluded that deflections were caused by olfactory information gained during the journey to the release site.—Robert C. Beason.

POPULATION DYNAMICS

(see also 8, 9, 11, 51)

6. Summary of the evolution of the Goosander, *Mergus merganser*, in the Léman Basin. (Essai de synthèse sur l'évolution du Harle bièvre, *Mergus merganser*, dans le bassin du Léman.) P. Géroutet. 1985. *Nos Oiseaux* 38:1–18. (French, English summary).—Spectacular changes have occurred recently in the size of the Goosander population at Lake Léman, Switzerland. Between 1890 and 1938, the number of Goosanders was very small (8–10 nesting pairs in 1929) and the species was seriously endangered. But, the population has increased dramatically and in 1984 it reached about 1600 birds, including at least 700 potential nesting pairs.

Such changes are, in Géroutet's opinion, due to hunting restrictions, the provision of nest boxes (which began in 1965), and the fact that Lake Léman is an excellent source of food for these ducks. The most pronounced expansion of the population began after 1972 with protection of the species in the French part of the lake, as well as the Swiss part. In 1962 in Switzerland and subsequently in 1971 in France, the hunting season was shortened

so that it did not overlap the time of year when the ducks were establishing breeding territories. Then in 1974, all hunting in the Geneva area was stopped. Reduced hunting pressure also diminished the ducks' fear of humans and permitted them to exploit otherwise inaccessible areas.

The result of such spectacular change is overpopulation, which is now most apparent on the western edges of Lake Léman. There is severe competition for nest sites and at least 20 records of dump nests containing eggs contributed by 2, 3, or even 4 females. Nest boxes are reused as soon as they become available. In fact, Goosanders sometimes lay eggs in the nests of Tawny Owls (*Strix aluco*) before the latter's chicks fledge so that they can move into the nests as soon as they are vacant. It is now common to find nests in unusual places such as buildings, and the birds themselves now commonly perch on the points of roofs and chimneys. The nonbreeding portion of the population has also increased and average productivity has declined. (There are no data in the text to substantiate these statements.)

Curiously, such population pressure has not significantly altered the distribution of nesting Goosanders around the lake, although they have moved onto sand bars at the west end. They apparently prefer crowding to emigration and are poor colonizers.

Géroutet includes a summary of the Goosander's annual cycle at Lake Léman, both in the text and in a nicely organized figure. Mixed groups of them appear in Geneva at the end of September and early October, but the first males in complete nuptial plumage are not present until mid-October and mid-November. Nuptial displays and pair formation occur in January, territories are established and copulations occur in mid-February, and egg-laying begins in early March. Females apparently lay eggs every 2 d and begin to incubate with laying of the penultimate or the last egg. Incubation lasts 32–35 d. Males do not incubate or help rear the ducklings, but they regularly accompany females when they leave the nest boxes. Hatching begins in mid-April and ends in early June (first clutches) and mid-July (second clutches). Ducklings leave the nest boxes between the end of April and mid-July. They can fly 60–70 d after hatching. Males begin to disappear from nesting areas at the end of May and early June, i.e., when molt begins. They congregate in groups on the lake or depart for places unknown. In July–September juveniles and adult females also disappear from the nesting areas, form groups, and females molt. Molting adults cannot fly between mid-August and mid-September. Males probably do not become sexually active until they finish their first complete molt (at 17 mo of age). Immature females probably cannot reproduce for 12 mo after hatching, but are clearly interested in adult behavior and nest boxes at an earlier age.

Géroutet thinks that under existing conditions adults may easily live 12–15 yr. Mortality factors include predation (e.g., by martins) and fishing accidents (birds caught in nets or on fish hooks).—Michael D. Kern.

NESTING AND REPRODUCTION

(see also 6, 17, 21, 22, 29, 31, 40, 47, 51, 52, 60)

7. **Census and distribution of nests in a mixed colony of gulls (*Larus argentatus*, *L. fuscus*, *L. marinus*).** (Recensement et distribution des nids dans une colonie pluri-spécifique de Goelands [*Larus argentatus*, *L. fuscus*, *L. marinus*].) P. Migot and J.-C. Linard. 1984. *Alauda* 52:248–255. (French, English summary).—Nesting populations of Herring, Lesser Black-backed, and Great Black-backed gulls have increased on the 3 islands (Roc'h Hir, Enez Kreiz, and Banneg s.s.) of the Bannec or Banneg Archipelago (Brittany, France, 48°26'N, 5°01'W) since censuses were first conducted in 1955. The Herring Gull population expanded from 30 pairs in 1955 to 1045 pairs in 1979, but then declined by 1983 to 902 pairs. Lesser Black-backed Gulls colonized the islands rapidly between 1955 (30 pairs) and 1971 (1403 pairs), remained fairly stable until 1979 (1471 pairs), and then increased to 1788 pairs in 1983. The recent increase apparently occurred because many suitable nest sites were still available on Banneg s.s. In fact, Lesser Black-backed Gulls now occupy the center and north end of the island, whereas in 1960 they were confined to its south end. The size of the colony on the south end of the island is also considerably larger now than in 1960. Coincidentally, the number of Great Black-backed Gulls has expanded slowly and at a relatively constant annual rate from a single pair in 1955 to 126 in 1983.

The authors suggest that Great Black-backed Gulls are responsible for the decrease of Herring Gulls. The 2 species compete for nest sites. Great Black-backed Gulls also eat Herring Gull chicks and may cause adult Herring Gulls to leave areas where both species are present.

Larids are almost certainly responsible for the disappearance of terns from Banneg s.s. since the 1970s. They may adversely affect British Storm Petrels (*Hydrobates pelagicus*) as well, since the latter's remains show up in their regurgitated pellets.—Michael D. Kern.

8. Reproductive synchrony in the Fieldfare (*Turdus pilaris*) in relation to spring arrival, nest predation and nestling starvation. C. G. Wiklund. 1984. Behav. Ecol. Sociobiol. 15:311-316.—For Fieldfares breeding in Sweden, the mean date of clutch initiation in colonies and colony size were not correlated, a fact taken in this study as evidence against the hypothesis of social facilitation of breeding synchrony. As in several other studies, synchronization was strongest in years when breeding began late and weakest in years when breeding began early. Nest predation risk was greatest for late starters and nestling starvation risk was greatest for early starters. Some of the significant selection pressures related to breeding synchrony have been clearly identified here, however, the lack of correlation between colony size and degree of synchrony cannot allow rejection of the hypothesis that synchrony is stimulated by interactions between neighboring individuals. For instance, the correlation analysis tells nothing about the degree of nearest neighbor synchrony, whether in large or small colonies, and thus it appears that other potentially strong selective pressures related to the evolution of synchrony have gone unexamined and unexplained.—Patricia Adair Gowaty.

9. Colonial and single breeding in Fieldfares, *Turdus pilaris* L.: a comparison of nesting success in early and late broods. V. Haas. 1985. Behav. Ecol. Sociobiol. 16: 119-124.—Is colonial or solitary (single) nesting more advantageous for Fieldfares? Are the advantages associated with decreased probabilities of predation or increased foraging efficiency?

Early in the breeding season, before leaves are on the trees, colonies are more common than single nests, and birds nesting in colonies have greater nesting success. Solitary broods are significantly more successful in the late brood period, when leaves are on trees, than in the early brood period. Early broods with 3 or more neighbors are more successful than those with only 1 or 2, irrespective of the nearest neighbor distance. These observations suggest that predation pressure may provide the advantage to colonially nesting Fieldfares, an idea further corroborated in this study through the experimental presentation of a live Little Owl (*Athene noctua*) at colonial and solitary Fieldfare nests. Fieldfares engage in simultaneous aimed defecation on and mobbing of potential predators. As one might expect, the number of attacks with defecation on the Little Owl was significantly higher for colonial nests than for solitary nests. It is reasonably concluded in this straightforward and well-written paper that coloniality in Fieldfares evolved under a high predation pressure and the need to breed as early as possible (earthworms, Fieldfares' main food resource, decrease in availability as the season progresses).—Patricia Adair Gowaty.

10. Nesting of Passeriformes in the plains of Apure, Venezuela. (Nidificación de los Passeriformes en los Llanos de Apure [Venezuela].) C. Ramo and B. Busto. 1984. Biotropica 16:59-68. (Spanish, English abstract).—Of 90 passerine species observed in the area, 164 nests of 35 species were studied. Data were collected on nest shape, construction, and location, as well as egg color and size. Average clutch size for all nests combined was 2.54 eggs. Nesting activity was confined to the rainy season (May–November). Overall nest failure was high (65%), with nest predation responsible for most nest losses. A descriptive account is provided for the nest and eggs of each species studied.—Robert C. Beason.

11. Individual variation in seasonal breeding success of Pied Flycatchers (*Ficedula hypoleuca*). P. J. Harvey, M. J. Stenning, and B. Campbell. 1985. J. Anim. Ecol. 54:391-398.—This article examines some parameters that may affect the causes of variation in reproductive success of birds. Studies on shorebirds that have a long life span indicate that breeding success increases as the males and females of those species get older. Similar studies on shorter-lived passerines have dealt with the age of the female. This study uses

the Pied Flycatcher (*Ficedula hypoleuca*) which readily nests in boxes provided and has many individuals of both sexes which do not breed in the first year (older birds appear to be more successful). First egg date, clutch size, and number of young fledged were recorded from 1948–1958. Approximately 10% of males breed polygynously in the nearby woods each year. Individual females that breed both as one-year-olds and two-year-olds have a higher chance of surviving to breed as three-year-olds than those breeding for the first time as two-year-olds. Birds with previous breeding experience attempted to rear larger broods whether or not they had the same mate as the year before. Perhaps “birds that have bred before being better, in the sense of being higher quality or fitter birds (that is *why* they were able to breed on a previous occasion)” have a better chance of leaving offspring and surviving to breed again for the next season. This is based on the fact that females that had bred as both one-year-olds and two-year-olds were more likely to survive and breed again than birds which bred for the first time as two-year-olds. Secondly, males whose mates produced early clutches one year were more likely to survive and breed again than those which produced later clutches. A high percentage of birds is reported as being non-breeders in their first year (39.7% males and 40.0% females).—R. W. Colburn.

12. The enormous eggs. G. S. Grant. 1985. Living Bird Quart. 4:14–19.—The breeding biology of the Laysan (*Diomedea immutabilis*) and Black-footed (*D. nigripes*) albatrosses, the Bonin Petrel (*Pterodroma nigripennis*), and White Tern (*Sterna nereis*) are compared on Midway Island. Albatrosses are the main focus of the article. Eggs of all 4 species declined in weight by 15% during incubation due to water loss. Prolonged incubation may relate to diet, essentially squid and fish.—John C. Kricher.

13. Several pieces of information obtained while visiting the nest boxes of Tengmalm's Owl, *Aegolius funereus*. (Quelques données recueillies en visitant des nichoirs à Chouette de Tengmalm, *Aegolius funereus*.) H. Baudvin, J.-L. Dessolin, G. Barabant, and G. Olivier. 1985. Nos Oiseaux 38:19–24. (French).—Tengmalm's Owls are abundant in some areas of the Department of Côte-d'Or (France), where the authors studied them for 3 years in forests 30–35 km from Dijon. The authors banded 34 adult females and 118 juveniles in 1982–1984, but no adult males.

Adult females and juveniles were highly mobile. None of the banded females was recaptured in the cavity where it was originally banded. Juveniles and adult females moved freely between the study areas, which were 65 km apart. One banded juvenile was found 200 km east of where it was banded. Male owls were probably more sedentary than juveniles or females, but such inference is based on nightly listening sessions during consecutive years in the same forested areas, rather than on banding data.

Banding data suggest that Tengmalm's Owl produces two broods in years when climatic conditions permit and when prey are abundant. Females reached sexual maturity within 1 year of hatching, nested successfully within 40 km of each other, and nested successfully in a natural cavity that was only 30 m away from an active martin's (*Martes martes*) nest. One owl's nest with chicks contained an unusually large cache of prey items: 41 voles (*Clethrionomys glareolus*) and 28 field mice (*Apodemus sylvaticus* and *A. flavicollis*). The authors also found dead kittens (*Felix sylvestrus*) in 2 nest boxes, but circumstantial evidence suggests that martins, rather than Tengmalm's Owls, stored them there.—Michael D. Kern.

14. Reproduction of the Winter Wren, *Troglodytes troglodytes*, in a mature oak woods in Allier. (Sur la reproduction du Troglodyte, *Troglodytes troglodytes*, dans une vieille chênaie de l'Allier.) F. Lovaty. 1985. Nos Oiseaux 38:27–31. (French).—Lovaty studied the nesting activity of Winter Wrens in a 12-ha stand of mature oak forest in the Department of Allier (France) April–August 1974. None of the wrens was banded. He determined the distribution of nests in and around “territories” where males were observed singing, examined these nests periodically, and kept records about the number that were in use and their contents (eggs or chicks). Using this information and assuming a 15-d incubation period and a 17-d brood period, he reconstructed the history of each active nest (dates of egg-laying, incubation, and brooding; clutch and brood size).

Although his observations were neither regular nor systematic, he tentatively concludes

that (1) the nesting season lasted from April–August, (2) the males were polygynous, at least on 2 of the territories where 2–4 females nested simultaneously, (3) females appeared to be attracted to males with the largest number of nests in their territories, (4) the number of females nesting simultaneously increased progressively from April–July, (5) most young wrens fledged in July and August, and (6) the Winter Wren was present in all successional stages of the oak forest in the same year.—Michael D. Kern.

BEHAVIOR

(see also 1, 14, 23, 65, 66)

15. Sympatric corvids: effects of social behaviour, aggression and avoidance on feeding. R. K. Waite. 1984. *Behav. Ecol. Sociobiol.* 15:55–59.—Four sympatric corvids, Magpies (*Pica pica*), Rooks (*Corvus frugilegus*), Jackdaws (*Corvus monedula*), and Eurasian Crows (*Corvus corone*), overlap in winter resource use. Aggression by Eurasian Crows towards the other 3 species has been interpreted as direct interference competition against food competitors; and flocking by Rooks and Jackdaws is believed to reduce the effects of Eurasian Crow aggression enabling sympatric coexistence. This author examined some aspects of aggressive interaction among the 4 species and tested the hypothesis that flock size reduces the effects of aggression by Eurasian Crows. Intraspecific displacements occurred in all 4 species, but interspecific interactions were seldom recorded. Eurasian Crows displaced individual Jackdaws, Rooks, and Magpies at statistically similar rates when flock size was controlled. Eurasian Crows suddenly attacked foraging Rooks, Jackdaws, and Magpies by flying fast at the birds, often stridently calling, and flushing them from the ground. Of 125 of these observed attacks, 55.2% were against Rooks, 28% against Jackdaws, and 16.8% against Magpies, proportions similar to the occurrence of these species in winter censuses. Chase attacks by Eurasian Crows seem due not to resource overlap, but to the reduction in the availability of earthworms when the other species are present. Despite the fact that the other species do not eat earthworms, it seems clear that the observed interspecific aggression between Eurasian Crows and the other corvids is related to access to a resource, and might best be interpreted as competition for space over an earthworm's burrow.—Patricia Adair Gowaty.

16. The "dawn chorus" and incubation in the coot. J. A. Horsfall. 1984. *Behav. Ecol. Sociobiol.* 15:69–71.—Diurnally feeding birds may be at or near energy deficits during early morning; feeding interferes with territorial advertisement, thus, dawn territorial advertisement, acoustic or otherwise, must offer significant selective advantages. American Coots (*Fulica americana*) do not "sing" at dawn. In fact, none of their repertoire of several calls seems to function in territorial defense. But, non-acoustic aggressive and territorial displays of coots do peak at dawn, just as acoustic displays ("dawn chorus") do in songbirds. Obviously, diurnal variations in acoustic conditions cannot explain the non-acoustic "dawn chorus" of coots. These early morning displays positively correlate with the peak (after night time migration) in intruder numbers on coot territories, suggesting a plausible function for the non-acoustic dawn chorus and acoustic choruses as well. These acoustic and non-acoustic displays probably function in territorial defense and sexual advertisement.—Patricia Adair Gowaty.

17. Do male Tree Swallows guard their mates? D. Leffelaar and R. R. Robertson. 1984. *Behav. Ecol. Sociobiol.* 16:73–79.—Based on the percent of time spent at or near nest boxes by females and males alone and with their mates, there was no significant difference in association between males and females during fertile and post-fertile periods of the nesting cycle. I consider this a strong contribution to the mate-guarding literature because it reports compelling, negative data that neatly counter the mate-guarding bandwagon. This study is subject to some of the criticism that necessarily follows claims made from a failure to reject a null hypothesis (e.g., are there methodological oversights? Does close association by males and females occur away from the nest site? Would "mate-guarding" be observed based on focal female rather than focal box sampling? etc.). The objections to the reported methodologies that immediately occurred to me are almost all addressed in the manuscript. For example, all observed copulations were at the box or on

nearby perches; given the aerial foraging strategy of Tree Swallows (*Tachycineta bicolor*), it seems likely that significant copulatory activity has not been overlooked. The comparative framework of the discussion focuses on variation in breeding strategy among Tree Swallows and their relatives that leads to the observed variations in mate-guarding tactics in the family.—Patricia Adair Gowaty.

18. Territorial defense and intra-pair cooperation in the Carrion Crow (*Corvus corone*). I. Bossema and R. F. Benus. *Behav. Ecol. Sociobiol.* 16:99–104.—The evolution of avian monogamy is often associated with division of duties between the sexes. How are pair members involved in territorial defense and how do they cooperate? Responses to a tame, caged Carrion Crow by resident female and male crows were measured in this attempt to answer these questions. Neither the temporal patterning of tests (whether during non-breeding or breeding season, during nest-building, egg-laying stages, etc.) nor the sex of the test bird was known (“probably a female”). Thus, it seems to me, the data are particularly difficult to interpret. For instance, is an increasing probability of attack in the presence of mates, which was observed and reported, related to intra-pair cooperation or to an increased threat to some limited resource of particular importance to one or to both members of a pair? Aggression fields for mated, usually cooperating birds, probably show spatial as well as temporal variability associated with sex. Without description of such variability, even the assumption that aggression is territorial is suspect. Therefore, I am not convinced that these birds cooperate by operating simultaneously, by choosing particular spatial positions, and by vocal behavior. It is clear, however, that some sort of increased responsiveness to a tame, caged intruder occurs in the presence of mates, and that some sort of communication may occur as a result of particular spatial positions and through vocalization.—Patricia Adair Gowaty.

19. Breeding territory quality and agonistic behavior: effects of energy availability and intruder pressure in hummingbirds. S. Tamm. 1985. *Behav. Ecol. Sociobiol.* 16:203–207.—Theoretically, displays and display rates should reflect trade-offs in time and energy budgets of birds. Specifically, displays should be positively correlated with the energy resources available to or controlled by displaying animals. Two questions were experimentally addressed using a population of Calliope Hummingbirds (*Stellula calliope*): (1) Are display rates a behavioral index of resources available? and (2) Are displays used in the presence of intruders, i.e., are they used in territorial defense?

In the food manipulation experiment, 7 resident hummingbirds were first conditioned to the use of artificial feeders and then inconspicuous feeders from which they were regularly observed to feed were placed in their territories. These inconspicuous feeders were not used by intruders. Dive and hover displays were more frequent when extra food was available. In the intruder manipulation experiment the display and chase frequencies of 2 marked birds with and without conspicuous feeders in their territories were observed. The erection of conspicuous feeders in the territories of these birds were sufficient to attract intruders to these territories. Only the rates of chases of intruders changed when feeders were present compared to when they were not. This study makes no excessive conclusions from these results. It is not claimed that displays repel competitors or attract mates, only that display rates vary with energy availability. Thus, the way is now clear to ask questions about the ultimate control of display rates among Calliope Hummingbirds.—Patricia Adair Gowaty.

20. On the function of warning coloration: a black and yellow pattern inhibits prey-attack by naive domestic chicks. W. Schuler and E. Hesse. 1985. *Behav. Ecol. Sociobiol.* 16:249–255.—In almost all cases up to now, avoidance responses by predators to warningly-colored prey have been considered acquired or learned traits. In this study day-old, naive domestic chicks were offered choices of warningly-colored black-and-yellow and non-warningly-colored green (or olive), painted mealworms. Naive chicks ate more than 10 times fewer black-and-yellow larvae than green, an outcome inconsistent with the novelty hypothesis that says that warningly-colored insects are rejected because they look different from the prey to which the bird is accustomed to eating. The series of experiments reported here also eliminated the possibility that inhibition of attack was caused by an unpleasant taste of the colors used on the mealworms, and lead to the conclusion that the

distribution of the colors, but not their taste caused the inhibition of attack in the chicks. As the experimental trials on given chicks proceeded, the mean percentage of larvae eaten continued to increase for both color types, indicating a reduced selectivity on the part of the chicks rather than an increased selectivity, which would have indicated unpalatability to the chicks. This rejection of warningly-colored prey, even among chicks never fed before, leads to the conclusion that inhibition is innate and can best be understood as a genetically-fixed predisposition to avoid warningly-colored prey. This paper is methodologically and logically sound, leaving no obvious alternatives. Inhibition of attack on warningly-colored insects by naive domestic chicks is not acquired through learning.—Patricia Adair Gowaty.

21. Polygyny in the great Reed Warbler, *Acrocephalus arundinaceus*: a possible case of deception. C. Catchpole, B. Leisler, and H. Winkler. 1985. *Behav. Ecol. Sociobiol.* 16:285–291.—Two hypotheses for the evolution of polygyny are considered and rejected in this uncommonly comprehensive study. First, significant positive correlations exist between male quality and territory characteristics, counter to the predictions of the sexy-son hypothesis. Second, breeding success of primary females of polygynous males, and females of monogamous males, were not significantly different, although breeding success of secondary females mated to polygynous males was significantly lower than both the others, counter to the prediction of the polygyny-threshold hypothesis. What then might explain the occurrence of polygyny in a population with a 1:1 sex ratio among potentially breeding adults? If males conceal their mated status from potential secondary mates, these females may be deceived into accepting already-mated males and the reduced breeding success associated with such matings. This paper is based on only one year's data and may suffer all the limitations of such short studies; nevertheless, I believe it to be one of the better papers on mating systems that I have seen.—Patricia Adair Gowaty.

22. Mate guarding in the Mallard *Anas platyrhynchos*. S. F. Goodburn. 1984. *Ornis Scand.* 15:261–265.—The widespread occurrence of forced, extra-pair copulations in Mallards suggests that males should guard their mates closely during the fertile period (herein defined as 4 d before the start of egg-laying through clutch-completion) to prevent cuckoldry. Goodburn watched Mallards on a 2-ha pond in England and found that males stayed closer to their mates, and attacked intruding males more vigorously, during the fertile period than at other times. Males also initiated significantly fewer moves away from their mates during the fertile period than before it (i.e., they followed rather than led their mates). Mate guarding appears to be an anti-cuckoldry tactic in Mallards and should be expected in other waterfowl species in which forced copulations are frequent.—Jeffrey S. Marks.

ECOLOGY

(see also 7, 19, 61, 72)

23. Search behavior of the Checker-throated Antwren foraging in aerial leaf litter. J. A. Gradwohl and R. Greenberg. 1984. *Behav. Ecol. Sociobiol.* 15:281–285.—Checker-throated Antwrens (*Myrmotherula fulviventris*) eat arthropods from dead curled leaves that hang in the understory of neotropical forests. Because they visit each leaf individually, the hypothesis that antwrens use visual cues to distinguish leaf quality relative to prey availability was tested using observations collected in the field on wild foraging antwrens. Conspicuous features of dead curled leaves that might act as cues to prey abundance are leaf length and degree of curl, because as assessed by sampling leaves, a leaf that is either long or highly curled is more likely to hold prey than a leaf that is small or flat. Despite the greater prey availability on longer and more highly curled leaves, antwrens visited leaf types in proportion to their occurrence in the aerial leaf litter. But, antwrens had greater foraging success at the leaf types with more prey items per leaf. Why then do antwrens seem to ignore the available cues to prey availability? The authors argue that antwrens probably can make the discrimination among leaf types and that specialization on highly curled leaves would not increase foraging efficiency. Because antwrens visually inspect leaves to locate prey, more highly curled leaves require a greater search effort, decreasing their profitability relative to the other leaf classes. Thus, the inclusion of foraging

time in the measure of profitability tends to equalize the pay-off from the 3 leaf classes.—Patricia Adair Gowaty.

24. Ecological factors associated with degree of edge effect in breeding birds. R. L. Kroodsma. 1984. *J. Wildl. Manage.* 48:418–425.—Ever since Aldo Leopold coined the term “edge effect” (*Game Management*, Charles Scribner’s Sons, New York, 1933), wildlife ecologists have been trying to quantify it. It is difficult to do. Defining the concept as “the tendency for variety and density of organisms to be greater at the borders between plant communities than in the interiors of the communities,” Kroodsma concentrates on the density aspect of edge effect. He examined variation in edge effect (defined as increased density of birds along habitat edges) of 5 bird species in 13 study plots along 4 power-line corridors through Tennessee forests. The species were Prairie Warbler (*Dendroica discolor*), Common Yellowthroat (*Geothlypis trichas*), Yellow-breasted Chat (*Icteria virens*), Indigo Bunting (*Passerina cyanea*), and Field Sparrow (*Spizella pusilla*).

Species’ territory maps from each plot were divided into 3 strips: 2 edge strips (consisting of part of the open corridor plus a 4.6-m-wide forest strip) and 1 corridor strip (consisting of the interior part of the corridor). “Relative density” of each species was expressed as the ratio of absolute avian density in edge strips to that in interior strips, and was used to index the degree of edge effect. A relative density value >1 indicated greater density in corridor edge versus corridor interior. The relationship between edge effect and habitat was examined through correlations of these density measures with habitat variables.

Mean relative densities were: Prairie Warbler, 0.98; yellowthroat, 0.19; chat, 0.77; Indigo Bunting, 0.76; and Field Sparrow, 0.50. The only statistically significant difference among species was that of the yellowthroat. The absence of a significant negative correlation between degree of edge effect and avian density in the corridor interior indicated that edge effect was independent of habitat quality in the corridor interior.

Absolute bird densities at edges and in the entire corridor were positively correlated with patchiness of blackberry (*Rubus* sp.) and saplings. Absolute density in edge strips was negatively correlated with corridor width (which ranged from 55–116 m) and frequency of tall (>2 m) vegetation, suggesting “that the edge becomes less attractive to birds” as the values of these variables increase. Corridor width was “considerably more important” than vegetation in its effect on avian density at corridor edge. Relative density was negatively correlated with corridor width and frequency of tall vegetation.

Kroodsma expected to see a decrease in edge effect with increasing habitat quality in the corridor interior (indexed by greater bird density there). No such relationship was found, suggesting that “habitat quality in the corridor interior did not influence edge effect.” The author admits that “A potential criticism of my results is that it was feasible to consider only five species,” but feels that those species adequately represent the community as a whole. Another criticism is the use of avian densities to indicate quality of habitat. Avian density can be an inaccurate indicator of habitat quality (Van Horne, *J. Wildl. Manage.* 47:893–901, 1983). Birds at lower density may have greater reproductive success due to less competition, lower rates of predation, etc. Habitat quality is a difficult parameter to measure, particularly in edge habitats that can funnel predators to nesting birds (Gates and Gysel, *Ecology* 59:871–883, 1978). Kroodsma feels that the presence of better singing perches in edge strips and in tall vegetation may have caused the apparent lack of edge effect. Other factors may also be at work.

Edge effect is a complex concept that Kroodsma has shown does not always fit traditional definitions. It demands further, careful study.—Richard A. Lent.

25. Comparison of the importance of different habitat attributes to avian community organization. J. Rice, B. W. Anderson, and R. D. Ohmart. 1984. *J. Wildl. Manage.* 48:895–911.—Ornithologists, dust off your copies of *A Field Guide to the Trees and Shrubs*. Rice et al.’s important paper examines the relative contribution of tree species versus habitat structure in predicting site occupancy by birds. Tree species are gaining the upper hand in this continuing debate.

Bird population and habitat data were collected on 72 variable distance transects located in riparian vegetation along the lower Colorado River. For each bird species and season, transects were divided into 2 groups: those used (species detected in at least 2 of the

3 yr of the study) and unused (species not detected in any of the 3 yr). Three test data sets were derived from the field data. All 3 sets contained measures of foliage density in 3 vertical strata and indices of foliage height diversity (FHD). The first set also contained arcsine-transformed proportional abundances of 8 dominant tree species. The second data set (called LOG) differed from the first only in that tree species abundances were expressed as log-transformed absolute abundances. The third data set was identical to the LOG set except that it added an index of horizontal habitat patchiness (PI). The authors used discriminant function analysis (DFA) in a series of pairwise comparisons of the performance of each of the 3 data sets.

DFA is a multivariate analysis technique that computes linear combinations from a set of original variables that maximize and describe the differences among several groups (in this case the used and unused transects). An additional product of DFA is a classification of the entities (transects) into the predetermined groups, based on the original variables. The accuracy of this classification step was used "as a measure of the ability of the various data sets to reflect accurately habitat selection attributes of the species." The order and frequency of selection of habitat variables in stepwise discriminant analyses indicated the relative importance of each variable in predicting species occurrence.

All of the data sets adequately reflected habitat use patterns of the bird species, based on accuracy of transect classification. The LOG data set, however, functioned slightly better than the others. Tree species measures were selected significantly more often, more often first, and more often as the only variable in linear models than were foliage density measures. FHD and PI did not differ in frequency or order of selection.

These results lead the authors to state that "tree species composition attributes are the most important attributes involved in riparian community habitat selection." This conclusion is at odds with many studies, some of them classics (e.g., MacArthur and MacArthur, *Ecology* 42:594-598, 1961), that show significant relationships between avian distributions and vegetation structure (as opposed to floristics). Rice et al. suggest 2 reasons for this discrepancy: (1) early studies ignored tree species, and (2) there is a true difference between habitat selection of birds in their study area and those elsewhere. They call for further research to see if reason 2 is valid. As for reason 1, they suggest that early habitat work probably led too quickly to the conclusion that vegetation structure determined avian community composition. The present paper, and others (i.e., Robinson and Holmes, *Auk* 101: 672-684, 1984) have shown that the species of trees, not simply their structure, can explain observed variation in bird distributions.

A complication is the fact that vegetation structure is correlated with floristics. This can lead to statistically significant correlations of birds with vegetation structure, but with the "true" underlying cause of the correlations being the species of tree, not its foliage structure. Site occupancy by birds may be related to the presence of certain tree species because insect diversity is often correlated with specific tree species (Southwood, *J. Anim. Ecol.* 30:1-8, 1961).

To sift through this web of complex interrelationships the researcher must carefully decide what his research question is. To explain broad patterns of bird distribution in response to habitat features, measurement of structural variables can successfully "capture" the important variation in vegetation. This works because a measure like FHD indices a whole suite of intercorrelated variables including site floristics and successional age. On the other hand (and this is a major point of Rice et al.), dependence only on habitat structure as a predictor of avian distribution may lead to false conclusions, again because plant species and vegetation structure are correlated. This is critical if fine-scale responses of birds to vegetation are of interest, as in studies of foraging behavior or for habitat management. For example, selective removal of yellow birch (*Betula lutea*), which is of high commercial value, from northern hardwood forests could result in the decline of several bird species (Holmes and Robinson, *Oecologia* 48:31-35, 1981). Substitution of another birch species, although of similar foliage structure, may not mitigate this habitat disturbance. Inclusion of only structural variables in a statistical model of bird response may result in formulation of misleading management recommendations.

The authors sum up this thought-provoking paper by stressing the need for data collection that thoroughly describes the ecosystem under scrutiny: "As demands and need

for better habitat mitigation and assessment escalate, the need for comprehensive studies grows comparably."—Richard A. Lent.

26. Recent changes in eagle and *Buteo* abundance in southeastern Idaho. T. H. Craig, E. H. Craig, and L. R. Powers. 1984. *Murrelet* 65:91-93.—Craig et al. surveyed wintering and nesting raptors on the Idaho National Engineering Laboratory site from 1974-1976 and again from 1981-1982. Black-tailed jackrabbits (*Lepus californicus*), the major prey of large raptors in the study area, were scarce in the mid 1970s and abundant in 1981-1982 (indeed, southeastern Idaho's bloody jackrabbit drives made national news in 1982). Counts of wintering *Haliaeetus leucocephalus*, *Buteo jamaicensis*, *B. regalis*, *B. lagopus*, and *Aquila chrysaetos* increased 10 fold from 1974-1975 to 1982, and the number of nesting pairs of *B. jamaicensis*, *B. regalis*, and *A. chrysaetos* went from 5 in 1976 to 26 in 1982. This is a classic example of a numerical response of raptors to an increase in abundance of their prey.—Jeffrey S. Marks.

27. Breeding lowland waders in East Sutherland. J. Barrett and C. F. Barrett. 1984. *Scott. Birds* 13:2-7.—Oystercatchers (*Haematopus ostralegus*), Ringed Plovers (*Charadrius hiaticula*), Lapwings (*Vanellus vanellus*), Snipes (*Gallinago gallinago*), Curlews (*Numenius arquata*), Redshanks (*Tringa totanus*), and Common Sandpipers (*Actitis hypoleucos*) breed in the low grasslands and coastal plain of northern Scotland. Dry grassland with bracken contained 158 pairs/km², the highest density of waders found in the study area. However, Common Sandpipers were limited to riparian habitat. A 45% decline in the breeding populations followed the harsh winter of 1981-1982, suggesting that species winter locally. In 1983 the population had largely returned to its 1981 level.—Edward H. Burt Jr.

WILDLIFE MANAGEMENT AND ECONOMIC ORNITHOLOGY

(see also 33, 59, 72)

28. Migration and winter distributions of Canvasbacks staging on the upper Mississippi River. J. R. Serie, D. L. Trauger, and D. E. Sharp. 1983. *J. Wildl. Manage.* 47:741-753.—Canvasbacks (*Aythya valisineria*) staging in traditional areas along the Mississippi have declined in the years 1955-1966, but have shown an increase in numbers in navigational Pools 7, 8, and 19. Canvasbacks were captured in baited traps and by night lighting. Males were marked with rhodamine B (red), Sevron (blue), and picric acid. A wetting agent was used and color retention was adequate for 2-3 mo. Both sexes were banded in 1973-1975 as an aid to examine the distribution of direct and indirect recoveries. A RECOVDIST program (Cowardin, Fish and Wildl. Serv. Spec. Sci. Rep. Wildl.:198, 1977) and chi-square test were used to determine whether direct recoveries and observations from each banding and marking site were comparable. Staging began in October with peaks on Pools 7, 8 by 1 November and on Pool 19 by 10 November. Wintering Canvasbacks staging on the upper Mississippi River (Pools 7, 8) are distinct populations, although the authors indicate that they may not be differentiated until they begin to leave Pools 7, 8. Some birds move in a corridor extending east to the eastern Great Lakes and another southward. Pools 7, 8 appear to have large numbers of Canvasbacks wintering from the 3 eastern flyways passing through them.—R. W. Colburn.

29. Do field observers attract nest predators and influence nesting success of Common Eiders? F. Gotmark and M. Ahlund. 1984. *J. Wildl. Manage.* 48:381-387.—Apparently not: the authors "found no significant evidence of attraction of avian nest predators to islands [in southern Sweden] where incubating eiders [*Somateria mollissima*] were flushed." Potential nest predators on 8 small islands included Hooded Crow (*Corvus corone cornix*), Black-billed Magpie (*Pica pica*), Great Black-backed (*Larus marinus*), Herring (*L. argentatus*), Lesser Black-backed (*L. fuscus*), and Mew (*L. canus*) gulls. The authors compared predator abundance and activity 1 h before and after flushing of all incubating eiders and covering their nests with down. They also compared egg and nest mortality on the experimental islands to that on 11 undisturbed islands. No major differences were found in clutch size or number of robbed nests on disturbed versus undisturbed islands. Covering of nests with down after flushing incubating birds was important in deterring nest predators,

based on a comparison of simulated nests with and without a down covering. There was an increase in the number of observations of predation following eider flushing, but this had no effect on clutch size or number of robbed nests. The authors stress the importance of covering disturbed eider nests with down, particularly in areas of high human use where frequency of disturbance is high.—Richard A. Lent.

30. Comparison of variable circular-plot and spot-map censusing methods in temperate deciduous forest. P. B. Hamel. 1984. *Ornis Scand.* 15:266–274.—This is the first comparison of the spot-mapping (SM) and variable circular-plot (VCP) census methods using replicate plots, thus allowing comparisons at different spatial scales. Ten 10-ha SM tracts were set up in 5 stands of oak-hickory forest (2 tracts/stand) in South Carolina. Five VCPs were systematically placed in each SM tract, and a single VCP was randomly located in each forest stand. Each SM tract was censused at least 8 times, during which 20-min point counts were taken at 2 or 3 VCP stations. Density estimates from the 2 methods were compared at the tract, forest stand, and overall scales.

VCP detected 50 of 55 species recorded during SM. Although VCP both over- and underestimated SM densities at all spatial scales, the 2 methods yielded similar results at the overall scale. For work in large areas of similar habitat, VCP censusing is about as accurate as SM and can be conducted in a fraction of the time.—Jeffrey S. Marks.

CONSERVATION AND ENVIRONMENTAL QUALITY

(see also 6, 24, 26, 71)

31. Breath of Vulcan. J. L. Hayward. 1985. *Living Bird Quart.* 4:5–8.—Mt. St. Helens affected many animal and plant populations when it erupted, including a colony of Ring-billed (*Larus delawarensis*) and California (*L. californicus*) gulls. Gulls remained on their colony following the eruption and deposition of ash, many gulls uncovering their nests from beneath the fallen ash. Nest excavation depended upon habitat, because nests beneath dense vegetation were more difficult to relocate. Temporary burial under ash had no effect on hatchability.—John C. Kricher.

32. Trouble with loons. L. L. Alexander. 1985. *Living Bird Quart.* 4:10–13.—Mercury poisoning was responsible for the deaths of at least 2500 (and possibly as many as 7500) Common Loons (*Gavia immer*) along the Gulf Coast of Florida during the winter of 1983. Loon numbers were depressed in subsequent winters.—John C. Kricher.

33. Where have all the songbirds gone? D. S. Wilcove. 1985. *Living Bird Quart.* 4:20–23.—The author studied possible causes for the decline of several passerine species over the past 30 yr in woodlots which have not, themselves, markedly changed. High rates of nest predation were correlated with small forest fragments. Wilcove offers several reasons why neotropical migrants might be more vulnerable to nest predation than are residents. Loss of habitat in the neotropics was also cited as a possible factor contributing to the decline of certain species.—John C. Kricher.

34. Effects of a minor oil tanker incident on avifauna. (Conséquences sur l'avifaune d'un incident pétrolier mineur.) A. Thomas and J.-Y. Monnat. 1983. *Oiseau Rev. Fr. Ornithol.* 53:105–120. (French, English summary.)—In April 1979, 20–100 tons of no. 2 fuel oil, a very light motor oil, spilled into the Bay of Douarnenez (Finistère, France) from the oil tanker *Sea Valiant*. The oil spread over a surface of about 160 km² (i.e., covered 72% of the bay) and came ashore on beaches between Penntrez and Cape Sizun.

The Bay of Douarnenez is the major overwintering area of marine ducks on the Finistère coast. Furthermore, 4 major breeding sites of sea birds are in or near the bay and are active in April. Most of the overwintering birds were gone at the time of the spill, and it missed the major breeding sites.

The description of the accident is significant for its completeness: the authors were able to document all or nearly all of the mortality associated with it, whereas in previous tanker accidents only a small fraction (10–30%) of the actual mortality has been recorded. The spill resulted in the death of only 102 birds: 56 Razorbills (*Alca torda*), 14 Common Guillemots (*Uria aalge*), 15 scoters, and 1–4 individuals of several other species. Seventy-

two percent of the oiled birds that washed ashore were auks (55% of them were Razorbills), 14% were Black Scoters (*Melanitta nigra*), and 13% were diving ducks and grebes.

Several species of gulls and waders, which are less dependent on water and hence less sensitive to oiling than intertidal birds, were also affected by the spill, but were not beached. The authors observed soiled plumage on Oystercatchers (*Haematopus ostralegus*), Sanderlings (*Calidris alba*), Herring Gulls (*Larus argentatus*), Lesser Black-backed Gulls (*L. fuscus*), Black-headed Gulls (*L. ridibundus*), Little Gulls (*L. minutus*), and Black-legged Kittiwakes (*Rissa tridactyla*). They estimate that 30% of the Herring Gulls and 10% of the kittiwakes in the Michel-Herve Julien Reserve near the bay had oil on their plumage. In contrast, only one Razorbill and 1-3 guillemots from breeding colonies in this reserve bore oil spots. Birds covered with large amounts of oil disappeared from these colonies quickly, but those with only small amounts of oil were able to clean themselves up.—Michael D. Kern.

35. The status of the Mute Swan in the Lothians. A. W. Brown and L. M. Brown. 1984. *Scott. Birds* 13:8-15.—Since 1961 the Mute Swan (*Cygnus olor*) population in the Lothians, southern Scotland, has declined by about 50%, a decline similar to that elsewhere in the United Kingdom. Beginning in 1977 the number of breeding pairs and the number of large cygnets have gradually increased. However, many former breeding sites remain unoccupied and most breeding pairs occur on private estates suggesting that human disturbance is a primary factor in the reduced number of breeding swans.—Edward H. Burt Jr.

36. Long-term seabird monitoring on the Isle of Canna. R. L. Swann and A. D. K. Ramsay. 1984. *Scott. Birds* 13:40-48.—Canna, one of the Small Isles group south of Skye, harbors increasing populations of Shag (*Phalacrocorax aristotelis*), Guillemot (*Uria aalge*), Razorbilled Auk (*Alca torda*), and Black Guillemot (*Cepphus grylle*); slowly increasing or stable populations of Great Black-backed Gull (*Larus marinus*), Lesser Black-backed Gull (*L. fuscus*), Herring Gull (*L. argentatus*), and Kittiwake (*Rissa tridactyla*); stable populations of Manx Shearwater (*Puffinus puffinus*) and Puffin (*Fratercula arctica*); and a stable or declining population of the Fulmar (*Fulmarus glacialis*).—Edward H. Burt Jr.

37. Winter sighting of peregrines at Caerlaverock. R. Mearns. 1984. *Scott. Birds* 13:73-77.—The number of Peregrine Falcons (*Falco peregrinus*) wintering at Caerlaverock, on the southern coast of Scotland, increased from 1974 to 1982 despite a major decline in 1981 following a cold, wet summer. The winter population was closely correlated with the number of young fledged within 130 km of the study site, but not correlated with fluctuations in the British population at large.—Edward H. Burt Jr.

38. Breeding seabirds on the Yell Sound Islands, Shetland. J. A. Fowler, M. Heubeck, and R. J. Tulloch. 1984. *Scott. Birds* 13:77-83.—The islands of Yell Sound in the Shetland Islands are home to 19 species of seabirds and the site of a major North Sea oil terminal. An oil spill during the winter of 1978-1979 had little impact on the population of seabirds in the sound owing to the small and scattered populations of most species, particularly in winter, the time of the spill. Only the Tystie has declined since the spill. Unfortunately, this information is of little use. Tystie is not listed in any taxonomic work available to me nor do the authors or editor include scientific names for this or any other species. Failure to adhere to a basic custom of international scientific communication is inexcusable.—Edward H. Burt Jr. [Tystie is an alternative common name of guillemots, *Cepphus*. J.A.J.]

PHYSIOLOGY

(see also 3, 4, 12, 68)

39. Pulmonary vascular resistance during unilateral pulmonary arterial occlusion in ducks. F. L. Powell, R. H. Hastings, and R. W. Mazzone. 1985. *Am. J. Physiol.* 249:R39-R43.—Pulmonary vascular resistance has not been measured in birds and it is unclear if the pulmonary vasculature allows vascular resistance to vary with cardiac output as it does in mammals. This study measured mean pulmonary arterial pressure during temporary unilateral pulmonary arterial occlusion. Doubling the flow to the lung resulted in no significant change in the vascular resistance of one lung. Therefore, pulmonary

vascular resistance of the avian lung is relatively insensitive to changes in blood flow, in contrast to mammals.—Cynthia Carey.

40. Development of photorefractoriness in intact and castrated male Starlings (*Sturnus vulgaris*) exposed to different periods of long-day lengths. A. Dawson, A. R. Goldsmith, and T. J. Nicholls. 1985. *Physiol. Zool.* 58:253–261.—Birds breeding at mid- to high latitudes maintain functional gonads for only a short time each summer. Gonadal growth in the spring is stimulated by increasing day lengths, but after a short period, gonads regress despite the continuation of long day lengths on their breeding grounds. This study was designed to test the effect of long day lengths on gonadal regression. Starlings were held for 20 wk on 11L:13D, a regime that causes maximal testicular growth, but does not cause regression. Then, groups were transferred for varying periods of time to 18L:6D and then returned to 11L:13D. At least 7 d on 18L:6D were necessary to initiate photorefractoriness. Exposure to that regime for 1–3 d did not cause photorefractoriness, but did predispose birds to become photorefractory when exposed to long day lengths. Plasma LH levels increased immediately after exposure to long days. These data suggest that long days stimulate photorefractoriness, perhaps by initiating prolactin release.—Cynthia Carey.

41. Renal clearance studies in Stubble Quail *Coturnix pectoralis* and King Quail *Coturnix chinensis* under conditions of hydration, dehydration, and salt loading. J. R. Roberts, R. V. Baudinette, and J. F. Wheldrake. 1985. *Physiol. Zool.* 58:340–349.—Stubble Quail are endemic to the desert regions of Australia, while King Quail (*Excalfactoria chinensis*) are a Pan-Asian species found in wet grasslands. This study extends previous work indicating that the presence of Stubble Quail in arid regions is associated with a lower minimum water requirement, a greater capacity to process saline solutions without loss of body water, production of a more concentrated urine, and a higher medullary ratio. The glomerular filtration rate of Stubble Quail was lower than that of King Quail under conditions of full hydration, dehydration, and salt-loading. Effective renal plasma flow was lowered to a greater extent by Stubble Quail during dehydration and salt-loading. An allometric equation was formulated from data on 13 species defining the relationship of glomerular filtration rate to body mass: $GFR (ml \cdot min^{-1}) = 2.37 M^{0.76}$.—Cynthia Carey.

MORPHOLOGY AND ANATOMY

(see 62, 68, 74)

PLUMAGES AND MOLT

(see also 6)

42. Life history studies of the Lesser Snow Goose (*Anser caerulescens caerulescens*). III. The selective value of plumage polymorphism: net fecundity. F. Cooke, C. S. Findlay, R. F. Rockwell, and J. A. Smith. 1985. *Evolution* 39:165–177. **Life history studies of the Lesser Snow Goose (*Anser caerulescens caerulescens*). IV. The selective value of plumage polymorphism: net viability, the timing of maturation, and breeding propensity.** R. F. Rockwell, C. S. Findlay, F. Cooke, and J. A. Smith. 1985. *Evolution* 39:178–189.—The frequency of blue phase Snow Geese increased (from 21% to 27%) at the La Perouse Bay colony between 1969 and 1977. In these 2 papers the authors investigated fitness and viability components of the 2 color phases, including clutch size, hatching success, fledging success, recruitment, age of first breeding, and adult survivorship. In spite of very large sample sizes, no differences were detected between the morphs in any aspect of their life history components. The authors interpreted these results to mean that selection plays little or no role in the maintenance of the plumage polymorphism. Rather, they interpreted the increase in blue phase birds to have been due to gene flow from predominantly blue colonies mediated by pair-formation on common wintering grounds. If they are correct, then we would expect all Lesser Snow Goose colonies to eventually reach the same equilibrium white:blue ratio. The time to reach this equilibrium will be a function of generation time, the degree of assortative mating, and the nature of the mapping of breeding colonies onto the wintering and pairing grounds. Given sufficient information, it should be possible to make specific predictions about the trajectory through time of these changes.—George F. Barrowclough.

43. Variability and inheritance of color pattern in the Rock Dove. (Izmenchivost' i nasledovanie okraski u sizyikh golubei.) N. Yu. Obukhova and A. G. Kreslavsky. 1984. Zool. Zh. 53:233-244. (Russian, English summary.)—Two melanic color patterns, black and black-chequer, are common in synanthropic populations of the Rock Dove (*Columba livia*), and the blue-chequer pattern as a transient to the black-chequer occurs as well. The frequency of melanic forms increases in the vicinity of big cities and increases from the periphery toward the center. In Moscow, for example, the typical bluish individuals are replaced toward the city center with increasing proportions of intermediate and melanic birds. Melanic doves were as much as 80% of the flocks sampled in this study.

The authors provide an extensive discussion of the genetics governing plumage darkening and increased dark spots in plumage, but come to no clear conclusion about how darker plumage or spots are inherited. They are intrigued by the increase in melanism of synanthropic Rock Doves with increased density of humans and of Rock Dove flocks, which were denser in downtown Moscow than in outlying areas. I remain intrigued by the correlation of melanism with the fact that the sample sites in Moscow were the squares and intersections where subway stops are located, the Moscow subway system presumably having been laid out more or less in accord with human population density.—Elizabeth C. Anderson.

ZOOGEOGRAPHY AND DISTRIBUTION

(see also 7, 10, 35, 36, 54, 70, 73, 74)

44. Notes on resident landbirds of the Banc d'Arguin National Park (Mauritania). (Données sur l'avifaune terrestre résidente du Parc national du Banc d'Arguin [Mauritanie].) B. Lunais. 1984. Alauda 52:256-265. (French.)—Lunais presents notes on 22 species of breeding or potentially breeding landbirds within Banc d'Arguin National Park (Mauritania, West Africa). He gathered this information during a 16-d visit to the park in April 1982. This publication is particularly important because it concerns parts of the park that are rarely visited and because it concerns landbirds—previous publications have dealt exclusively with the park's aquatic avifauna.

Lunais visited (1) two major dry washes (Oued Zidine and Oued Chibka) and three capes (el Sass, Tegarar, and Tafarit) in the northern half of the park, as well as the islands of Arguin, Ardent, and Marguerite near its northern boundary, (2) Iouik, Ten Alloul, grâret al Hamir, and Zira Island in the park's center, and (3) Teichot, grâret Agoueïfa, dhâyet Amouré, Tidra Island, and the Thila Peninsula (as far as Rguibet Thila) at the park's southern end. Aside from the well of Bir el Gareb (north end of the park) and a cistern on Arguin Island, no standing bodies of freshwater were present in these areas at the time Lunais visited them.

Lunais' notes are generally brief. For each species, he gives the number of birds seen, when and where he saw them and signs, if seen, of breeding (e.g., parents with chicks, singing, alarm, nuptial flights) or territorial behavior. He frequently compares his findings with published information for species in the western Sahara.

In the following lists, only one individual or one pair of a species was observed if its scientific name is accompanied by the superscript "1"; species whose names are accompanied by the superscript "2" showed signs of breeding activity; and those with the superscript "3" were territorial. Otherwise, the species appears to be reproductively inactive.

Osprey (*Pandion haliaetus*)³, House Swift (*Apus affinis*)¹, Pale Crag Martin (*Ptyonoprogne obsoleta*)¹, and Desert Sparrows (*Passer simplex*)¹ were only seen in the northern half of the park. A Peregrine Falcon (*Falco peregrinus*)¹, Eagle Owls (*Bubo b. ascalaphus*)², and Trumpeter Finches (*Rhodopechys githaginea*)² were only present in the center of the park. Most of the 22 species which Lunais observed were in the south. These included an Arabian Bustard (*Choriotis arabs*)¹, a Stone Curlew (*Burhinus oediconemus saharae*)^{1,2}, Cream-colored Coursers (*Cursorius cursor*)^{1,2}, Spotted Sandgrouse (*Pterocles senegallus*), Short-toed Larks (*Calandrella c. brachydactyla*), Black-crowned Finch Larks (*Eremopterix nigriceps*)², Bar-tailed Desert Larks (*Ammomanes cincturus*), Dunn's Larks (*A. dunni*), Crested Larks (*Galerida cristata*), and a Desert Whitethroat (*Sylvia nana*)^{1,2,3}.

Lanner Falcons (*F. biarmicus erlangeri*) were nesting on the capes in the north, but showed no signs of reproductive activity on Arguin Island. Apparently, they no longer nest

on Marguerite Island. Hoopoe Larks (*Alaemon alaudipes*) were everywhere. Those in the north and south were reproductively active, but those in the center of the park were not. Great Grey Shrikes (*Lanius excubitor*) were equally widespread, but only those in the south showed signs of breeding activity. Bar-tailed Desert Larks and Brown-necked Ravens (*Corvus ruficollis*) occupied northern and southern sites, but not those in the park's center. Yellow Wagtails (*Motacilla flava*) were found in the center and the south, but only those in the park's center showed signs of breeding activity.

If it is confirmed that Stone Curlews nest near Teichot, this will be the southern limit of the species' breeding range in the Sahara. The adult Eagle Owl that was seen in flight near Ten Alloul was accompanied by a large juvenile with down on its head. This suggests that Eagle Owls lay eggs here in January. The flocks of Short-toed Larks at grâret al Hamir, Rguibet Thila, and Tidra Island were probably migrants. The dark color on the back of the Great Grey Shrikes at dhâyet Amouré suggests that they belonged to the nominal race of the species rather than the race *L. e. elegans*. Forty Trumpeter Finches seen in a millet field at grâret al Hamir were in nuptial plumage, but given the dry nature of the area, had probably not nested yet.—Michael D. Kern.

45. Birds of northwest Africa. Additional notes. (Les oiseaux du nord-ouest de l'Afrique. Notes complémentaires.) N. Mayaud. 1984. *Alauda* 52:267–284. (French.)—This is the fourth (see *Alauda* 50, 1982; *Alauda* 51, 1983) in a series of articles summarizing recent published information about the avifauna of northwestern Africa. It covers 36 species including Ring-billed Gulls (*Larus delawarensis*), terns, Razorbills (*Alca torda*), guillemots, puffins, sandgrouse, columbids, cuckoos, owls, and nightjars.

There is no standardized content in the accounts for each species, perhaps because so little is known about many of them. The principal subjects in these accounts are migration, breeding, overwintering status, and distribution in northwestern Africa. Libya, Tunisia, Algeria, Morocco, Mauritania, and Senegal are the primary countries surveyed. A few passages deal with other African countries such as Sudan, Guinea, Niger, and Sierra Leone. For someone who is well acquainted with northwest Africa, the article will make perfect sense, but for those less familiar with the area, the reading will be frustrating because the author frequently identifies towns, oases, mountain ranges, etc. without indicating the countries in which they occur (and presents dates without including the year).

The following examples illustrate the variety of topics covered in the species accounts. The Ring-billed Gull was first reported in Africa (at Port Essaouira, Morocco) in August 1982. Sandwich Terns (*Sterna sandvicensis*) migrate and overwinter preferentially with Lesser Crested Terns (*S. bengalensis*). Western European populations of Little Terns (*Sterna albifrons*) apparently migrate south along the Atlantic coast of Africa and overwinter in tropical Africa. Arctic Terns (*S. paradisaea*) banded in Greenland, Norway, Netherlands, Germany, and Great Britain have recently been recaptured in Morocco, Senegal, and Mauritania. The plumage of sandgrouse chicks of several species is very similar. This convergence is probably an adaptation to their desert habitat. Sandgrouse lack functional nasal glands even though they drink salt-enriched water. The breeding area of Laughing Doves (*Streptopelia senegalensis*), a common oasis bird, has increased appreciably in Tunisia. Barn Owls (*Tyto alba*) eat overwintering weavers, small palaearctic wading birds, and terns at Bissau (Guinea), but geckos and small pelagic birds, especially White-faced Storm-Petrels (*Pelagodroma marina*), on islands in the Archipelago of Cape Vert. In contrast, the *ascalaphus* race of Eagle Owls (*Bubo bubo*) has a diet that consists mostly of small mammals. African Marsh Owls (*Asio capensis tingitanus*) no longer occur in Algeria, but inhabit undisturbed grassy and marshy regions such as Larache (Morocco) and Mehdiya (Tunisia). Recent banding data confirm that Short-eared Owls (*Asio flammeus*) migrate (from Russia and Finland) across the Sahara Desert.—Michael D. Kern.

46. Observations of species submitted for verification, in France during 1983. (Les observations d'espèces soumises à homologation en France en 1983.) P. Dubois and the National Committee for the Verification of Rare Birds. 1984. *Alauda* 52:285–305. (French.)—In 1983, its second year of deliberations, the National Committee received 204 reports of rare birds from various parts of France and verified 84% of them. This number does not include sightings from 1983 that are still being examined and several from 1981 and 1982 that were not included with the Committee's first report.

Thirty-one species listed in the Committee's first annual report (see J. Field Ornithol. 56:205, 1985) were again seen in France during 1983. Of note among them are Great Egrets (*Casmerodius alba*), which are becoming increasingly numerous and have overwintered in Vendée for 4 consecutive years, and Iceland Gulls (*Larus glaucooides*), whose presence in 1983 was associated with an invasion elsewhere in Europe (British Isles, Belgium, and Holland).

The presence of 10 species was verified for the first time since the Committee began its deliberations: Brent Goose (*Branta bernicla hrota*), Black-shouldered Kite (*Elanus caeruleus*), White-rumped Sandpiper (*Calidris fuscicollis*), Desert Wheatear (*Oenanthe deserti*; also reported in France in 1980), Siberian Ground Thrush (*Zoothera sibirica*; no other French record in the 20th century), Black-throated Thrush (*Turdus ruficollis*; last reported in 1876, but probably present in Camargue in 1969), Red-backed Shrike (*Lanius collurio phoenicurooides*; first report of this race in France), Rose-colored Starling (*Sturnus roseus*; last seen in 1972), Red-eyed Vireo (*Vireo olivaceus*; an American species already observed in Great Britain on 19 occasions before 1982), and Parrot Crossbill (*Loxia pytyopsittacus*; part of an invasion of the species into Denmark, Holland, and Great Britain; last seen in France in 1896). Also on the list this year is the Ruddy Duck (*Oxyura jamaicensis*), a native North American species introduced into Great Britain where it reproduces freely. In the Committee's first annual report, this duck was on the "second list" consisting of species whose wild origin was not established.

This year's report also includes (1) a "second list" (as defined above) of 7 species including 4 new additions: Western Reef Heron (*Egretta gularis*; about 500 imported into Germany in 1981 and 1982; escapees (?) seen later in Germany and Switzerland, as well as France), Baikal Teal (*Anas formosa*), Barrow's Goldeneye (*Bucephala islandica*), and Hooded Merganser (*Lophodytes cucullatus*); and (2) unconfirmed records for 1981-1983.—Michael D. Kern.

47. Nidification of the Melodious Warbler, *Hippolais polyglotta*, in Alsace. (Nidification de l'Hypolaïs polyglotte, *Hippolais polyglotta*, en Alsace.) M. Fernex. 1985. Nos Oiseaux 38:25-26. (French, English summary.)—Two pairs of Melodious Warblers nested successfully at the Basel-Mulhouse airport in Alsace (Department of Haut-Rhin, NE France), 3 km from the Swiss frontier, in July 1984. One nest was in brambles at the foot of a gravel cliff, 0.6 m off the ground; the second 1.3 m off the ground in the outer branches of a white willow tree. The nesting habitat was a gravel pit covered with sparse vegetation, dominated by white willows and orchard trees, but including nettles, thistles, teasel, mulberries, and some grass.

This is the first breeding record for the Melodious Warbler in Alsace. However, an individual was found dead near Strasbourg, West Germany, in 1959 and others were heard at the Basel-Mulhouse airport in June 1982 and at Regisheim (Haut-Rhin) in June 1984. A young bird was also captured in July 1984 at Kembs, Rhine Island, 5 km from the same airport. These records illustrate the recent gradual expansion of this southern species into northeastern Europe. It appeared in Champagne and Ardennes (France) between 1975 and 1982, Luxembourg in 1975, Belgium in 1977, and north of Basel (West Germany) in 1982. It is now sympatric with another newcomer, the Icterine Warbler (*H. icterina*) in the Geneva area, but the 2 species do not compete since Melodious Warblers prefer warmer, drier habitats than Icterine Warblers.—Michael D. Kern.

48. Long-tailed Skuas *Stercorarius longicaudus* in New Zealand. D. S. Melville. 1985. Notornis 32:51-73.—Long-tailed Jaegers (skuas) are almost unknown in New Zealand, so that a wreck of 16-35 individuals in January-February 1983 is noteworthy. Other species of jaegers were not involved in this event, which may be associated with a change in range necessitated by the severe El Niño of 1982-1983. Melville provides a thorough review of the characteristics of *longicaudus*, which are more variable than most current works suggest. The length of the forearm (essentially that of the ulna) seems to be the most reliable character allowing its separation from *parasiticus*, but not even the bill/cere ratio, which has been widely used, affords a clear and consistent separation.

What little is known of the winter range is treated in detail, even though the data are weak. Obviously, if no fully reliable field characters exist (except for adults), one must have some reservations about accepting conclusions based solely on field observations. Even ex-

perienced observers may disagree in their views. According to Melville, some authors contend that this species is less likely than other jaegers to approach ships. Yet, in my experience, it may be the most likely to make a brief approach. Perhaps such differences are related to the stage of migration, geographic area of observation, and the availability of food. The article provides a useful reference to the biology of a still-mysterious species in its pelagic range.—J. R. Jehl, Jr.

49. Thoughts about the current status of the Barnacle Goose (*Branta leucopsis*) in France. (Réflexion sur le statut actuel de la Bernache nonnette (*Branta leucopsis*) en France.) V. Schricke. 1983. Oiseau Rev. Fr. Ornithol. 53:121–132. (French, English summary.)—A Russian population of Barnacle Geese (*Branta leucopsis*) that normally overwinter in West Germany and the Netherlands spreads into Belgium and northwestern France during cold spells. About 8000 geese appeared in France during January 1963 when weather conditions in Holland were unusually severe. These birds were heavily concentrated on the coast of Picardy and also inland along the Loire and Seine rivers. A second invasion of geese occurred in January 1979 and large numbers were observed at Champagne (225 geese), Normandy (120), and the bays of Somme (500) and Mont Saint-Michel (100).

Barnacle Geese have regularly appeared in France after cold spells since 1963. Because they probably follow cold fronts, they appear in different localities (illustrated nicely by year since 1962/63) from one winter to the next. Nonetheless, all have been reported north of a line between Bassin d'Arcachon (France) and Lake Léman (Switzerland). They arrive at major French sites several days after the beginning of each cold spell and are associated there with Greylag (*Anser anser*), White-fronted (*A. albifrons*), and Bean (*A. fabalis*) geese in intertidal areas, natural meadows, and cultivated fields. Their stay may be as short as several d or as long as 1–2 mo.

On a nearly yearly basis, small numbers of them overwinter on the coast of Picardy (especially at the Bay of Somme), at the Bay of Mont Saint-Michel, and inland in the Champagne region (e.g., at the Seine Reservoir and Lake Der). These sites are near the goose's traditional Dutch overwintering area, have a high capacity to hold birds, contain suitable foraging and resting areas, are hunting reserves, and contain other species of geese. Barnacle Geese have also been reported irregularly in France during spring and autumn, as well as mild winters. The author suggests that such reports involve captive geese that have escaped from parks and bird preserves in France.

Barnacle Geese can no longer be considered a rare species in France, but should be accorded the status of an overwintering species concentrated along the English Channel and Atlantic seaboard.—Michael D. Kern.

50. Recent information about the avifauna of the Kerguelen Islands (Austral Lands and French Antarctica). (Données récentes sur l'avifaune des îles Kerguelen [Terres australes et antarctiques françaises].) T. Thomas. 1983. Oiseau Rev. Fr. Ornithol. 53:133–141. (French, English summary.)—Thomas has published his notes about the avifauna in the eastern half of the Archipelago of Kerguelen (49°S, 69°E), which he visited between January 1978 and April 1979. He presents dates for the first clutches of 12 of the 30 species that nest there. The dates are nearly the same as they were in 1951 except for Southern Black-backed Gulls (*Larus dominicanus*), Kerguelen Cormorants (*Phalacrocorax verrucosus*), and Eaton's Duck (*Anas eatoni*), all of which began to lay significantly earlier in 1978 than in 1951. The period of egg-laying of Eaton's Duck was unusually protracted: 4.5 mo.

Thomas then describes the status of several species that breed in the archipelago. Populations of Black-browed Albatross (*Diomedea melanophris*) have swelled to 1750 breeding pairs and possibly more since some regions of the Kerguelen Islands have not been censused adequately. Grey-headed Albatrosses (*D. chrysostoma*) are now observed regularly and occasionally reproduce at the Canyon of Black Brows. Among the 80 pairs of Light-mantled Sooty Albatrosses (*Phoebastria palpebrata*) that nest in the same canyon are some individuals with dark plumage: it is still not clear whether they are Sooty Albatrosses (*P. fusca*) or young *P. palpebrata* breeding for the first time. Large groups of Hall's Giant Petrel (*Macronectes halli*) occur near Port of France (between Guite and Morne Points). The total breeding population (425 pairs) of this species has been stable since 1953, but changes have

occurred in the size of individual colonies. Giant Petrels (*M. giganteus*) did not nest in these colonies in 1978 and were only present in September and October during the breeding season of sea elephants. Black-faced (Lesser) Shearwaters (*Chionis minor*) laid eggs in January 1978 and nested in colonies of Kerguelen Cormorants and Black-browed Albatrosses, which they parasitized.

Considerable information is given about Kerguelen (*Sterna virgata*) and Swallow-tailed (*S. vittata*) terns. Kerguelen Terns forage on marine crustacea and stream fish in winter, but on terrestrial invertebrates during the nesting season, whereas Swallow-tailed Terns apparently feed on small fish at sea. Kerguelen Terns are sedentary in the archipelago, but Swallow-tailed Terns are migrants that visit the islands to breed between December and April. The reproductive cycles of the 2 species are 40 d out of phase: *S. virgata* has laid eggs before *S. vittata* arrives in the area. Both species lay clutches of a single egg. Kerguelen Terns usually nest some distance from the shore (more than 500 m; 10 km inland in Studer Valley), whereas Swallow-tailed Terns prefer the coastline (never more than 200 m from it). The latter are more closely tied to the marine environment, both in terms of food and choice of nest sites.

Thomas concludes with an annotated list of nonresident species that he saw at Kerguelen Islands. These include 4 of 6 previously described visitors from Antarctica: the Emperor Penguin (*Aptenodytes forsteri*), Bearded Penguin (*Pygoscelis antarctica*), Adélie Penguin (*P. adeliae*), and Antarctic Petrel (*Thalassoica antarctica*); and 3 palaeartic visitors, only 1 of which was reported earlier: Curlew Sandpiper (*Calidris ferruginea*), Common Sandpiper (*Actitis hypoleucos*), and Greenshank (*Tringa nebularia*; seen previously).—Michael D. Kern.

51. Birds of Hope Bay, Antarctic Peninsula (63°24'S, 56°59'W). (Les oiseaux de la baie de l'Espérance, Péninsule antarctique (63°24'S, 56°59'W.) J.-R. Cordier, A. Mendez, J.-L. Mougin, and G. Visbeek. 1983. Oiseau Rev. Fr. Ornithol. 53:143-176. (French).—This is the first of at least 2 publications that describe the ecology of nesting and visiting seabird species at Hope Bay. In this article, the authors examine 2 nesting species, the Gentoo (*Pygoscelis papua*) and Adélie (*P. adeliae*) penguins and include brief notes about 5 nonresident species, the Emperor Penguin (*Aptenodytes forsteri*) and 4 petrels. Subsequent installments will cover cormorants, ducks, shearwaters, skuas, gulls, terns, and other petrels (Hydrobatidae).

Hope Bay is on the northern extremity of the Antarctic (Trinity) Peninsula. About 10 km² of the eastern side, including Seal Point, are used extensively by seabirds. The authors studied the avifauna there between November 1979 and March 1980.

Their commentary about the penguins that nest at Hope Bay is extensive and detailed. The following subjects are presented for each species: breeding latitudes; previous and current sizes of the breeding population; locations and characteristics of breeding colonies including information about the dispersion and density of nests in them; dates when the species return to Hope Bay to nest; dates of egg-laying, hatching, and fledging; egg, clutch, and brood size; nest attendance by each sex during incubation and brooding; density of breeding and nonbreeding birds at the nesting colonies throughout the reproductive season; duration of hatching from pipping of the shell until the chick is completely hatched; interval between the hatching of eggs in 2-egg clutches; incubation period; growth of the chicks in mass and dimensions (forelimb, foot, and culmen); how often the parents feed the chicks; egg and chick mortality; and dates when adults and chicks leave the colonies. This article is must reading for ornithologists working on the ecology and natural history of seabirds.

There was only one nesting colony of Gentoo Penguins (45 nests) at Hope Bay during 1979/80. This represents a significant reduction compared to 1901-1903. Since 1947-1948, the annual rate of decline in the breeding population has been 3.7%. In contrast, the breeding population of Adélie Penguins at Hope Bay in 1979-1980 was distributed in 312 widely scattered colonies and included 117,095 breeding pairs. This represents considerable expansion both in area occupied and the size of the breeding population.

The authors compare their data for these 2 species of penguins with information collected previously at Hope Bay and elsewhere in the antarctic and subantarctic zones. The following trends emerge from some of these comparisons. The first clutches of Gentoo Penguins are laid earlier at northern latitudes than at southern latitudes. However, the last

clutches are not. Consequently, the egg-laying period is much shorter at higher latitudes than at lower ones: 5 months in subantarctic colonies, but only 1 month on the Antarctic Peninsula. Incubation shifts of Gentoo Penguins are shorter and more frequent in southern populations than in northern ones. This difference is probably related to the proximity of food sources: near the coast of the Antarctic Peninsula; far removed from islands in the Archipelago of Crozet. Egg size differs latitudinally in Gentoo Penguins: eggs (and also adults) are smaller at Hope Bay (*P. papua ellsworthi*) than in more northern areas of the breeding range (*P. p. papua*).

This article also features extensive explanatory notes keyed to specific parts of the text. In these, we learn, for example, that the weight recession supposedly characteristic of Adeline Penguin chicks actually occurs in only 55% of the population. There are also numerous, detailed figures covering such topics as daily changes in the mass and size of penguin chicks; maps showing the size and location of penguin colonies at Hope Bay; and tables of comparative information, mortality factors, and meteorological conditions. (Note that the data compiled in Table 6 belong in Table 10 and vice versa.)

Finally, there are a few comments about species that visit Hope Bay, but do not breed there. Emperor Penguins, Silver-gray Petrels (*Fulmarus glacialisoides*), and Snow Petrels (*Pagodroma nivea*) were rarely seen. Giant Petrels (*Macronectes giganteus*) and especially Pintado Petrels (*Daptione capense*) were present in large numbers almost daily.—Michael D. Kern.

52. The Audouin Gull (*Larus audouinii* Payr.) on the coasts of Morocco. (Le Goéland d'Audouin (*Larus audouinii* Payr.) sur les côtes du Maroc.) P.-C. Beaubrun. 1983. Oiseau Rev. Fr. Ornithol. 53:209–226. (French, English summary.)—This report describes the movements and several aspects of the biology of Audouin Gulls on both the Mediterranean (Saïda to Tangiers) and Atlantic (Tangiers to Oued Massa) coasts of Morocco. It is based on exhaustive surveys of these coastlines in 1979–1982.

The only known nesting colony of Audouin Gulls in Morocco is on the Chaffarines' Islands near Saïda has expanded from 1000 nesting pairs of gulls in 1966 to 2220 in 1981. The latter, together with 500 pairs that were recently discovered in Algeria, constitute 60% of the known population of this species.

During the summer, Audouin Gulls on the Mediterranean coast of Morocco are concentrated between Saïda and Cap des Trois Fourches in the extreme east, and between El Jebha and Sebta in the extreme west, i.e., near the Strait of Gibraltar. Few of them occur on the intervening Mediterranean coast, at the Strait of Gibraltar, or along the Atlantic coast of Morocco. Fifty-two percent of the birds on the Atlantic seaboard and 79% of those between El Jebha and Sebta are immature gulls.

Audouin Gulls congregate in large numbers near the Chaffarines' Islands in July soon after chicks have fledged and begin the postnuptial migration. They move west along the Mediterranean coastline to the Strait of Gibraltar (first appear there on 25 June) and then south along the Atlantic shoreline in compact, often large (106–256 individuals) groups. In July, 65% of the migrants are young birds, whereas in September and October almost all of them (90%) are adults, contrary to previously published reports. Migration through the Strait of Gibraltar is particularly heavy during August–September and is complete by the end of October. Movements along the Atlantic coast continue into mid-November.

Since nesting populations of Audouin Gulls at stations between the Chaffarines' Islands (Morocco) and Oran (Algeria) number 2600–2700 pairs, and assuming that each pair fedges 1.25 chicks, the population in this region of the Mediterranean Sea at the end of the breeding period is 8500–8800 birds. Only about 1100 of them (95% adults) remain on the Mediterranean coast during the winter: 500–600 in the east and about 350 in the west. A few others settle along the northern Atlantic shore of Morocco, but most overwinter farther south below Agadir.

They return to the Mediterranean (prenuptial migration) between the end of January and early May, but not in groups. To illustrate, in March 1981, 113 gulls (86% adults) passed northward by Sidi Moussa in bunches no larger than 8 in a period of 7.5 h. Prenuptial movements are heaviest in late February and early March, no gulls cross the Strait of Gibraltar before 24 February. Most (89%) of the gulls that spend the winter on the western Mediterranean coast also migrate east, disappearing from that winter station

by the end of March. Young birds appear to stop on the Mediterranean coast west of the breeding colony in the Chaffarines' Islands.

Audouin Gulls forage on the continental shelf, contrary to what has been published. On the Mediterranean coast, they rest ashore during the day and fish in bands of 5-10 individuals at night when commercial trawlers are active and anchovies and sardines (which constitute 77.5% of their diet) are near the ocean's surface. On the Atlantic coastline, where commercial fishing goes on day and night and where schools of pelagic fish are much larger than those in the Mediterranean, they fish day and night, fish in the company of other sea birds (*Larus*, *Sula*, *Stercorarius*, *Rissa*), and often rest at sea in the company of other larids. In May, large numbers of them also gather in stubble fields between Ras Kebdana and Kariet Arkman, where they feast on insects, particularly orthopterans.

After feeding, Audouin Gulls rest on sand beaches near freshwater outlets where they drink and bathe. They consistently rest in the company of other larids, generally in small numbers. In a survey of 115 resting groups, the number of Audouin Gulls per group averaged 13.1 individuals, was largest (24.0) during postnuptial migration, and smallest (3.1) during prenuptial migration.

The biology and movements of Audouin Gulls are closely associated with the accessibility of coastal pelagic fish. Gulls reoccupy nesting areas in the Mediterranean in April and May when the weather is good and commercial fishing is in full swing, and when a high proportion of the fish on which they feed are small in size. Their nesting areas are near major fishing zones. At the end of summer, when bad weather sets in and commercial fishing in the Mediterranean stops, most of the gulls return to fishing areas on the Atlantic coast south of Agadir where stocks of fish are abundant and commercial fishing continues.—Michael D. Kern.

SYSTEMATICS AND PALEONTOLOGY

(see also 56, 69, 74)

53. Problems in avian classification. R. J. Raikow. 1985. *Curr. Ornithol.* 2:187-212.—In this review the author attempts to explain the current debate over the higher level systematics of birds. The controversies have been more the result of differing philosophies concerning how to analyze data, rather than disputes over the data, per se. The major, theoretical issues that have filled volumes of *Syst. Zool.* are briefly discussed; these include, for example, the 3 major schools of systematics, the question of monophyly and ranking of taxa, and the problem of information retrieval from a classification. Of necessity, the review does not treat many of the controversial issues in much depth, but adequate references are given for those interested in further reading. Particularly useful are 2 examples of Raikow's logic and reasoning in analyzing some of his own data involving the 9-primaried oscines and the Hawaiian honeycreepers. The problem of recognizing adaptive grades is well-illustrated by these cases.

Much of the excitement and flavor in systematics over the last 2 decades has arisen from personality clashes, strongly held points of view, and provocative prose; these aspects do not come across in this review.—George F. Barrowclough.

54. The Barred Owlet *Glaucidium capense* in West Africa. Description of a new geographic race. (La Chevêchette du Cap *Glaucidium capense* dans l'ouest africain. Description d'une race géographique nouvelle.) C. Erard and F. Roux. 1983. *Oiseau Rev. Fr. Ornithol.* 53:97-104. (French, English summary.)—The authors suggest that 7 Barred Owlets collected in Ivory Coast and on the Liberian part of Mount Nimba since 1962 belong to a new geographic race of *Glaucidium capense* for which they propose the taxonomic designation *G. capense ethecopari* ssp. nov. The type specimen of this proposed taxon—a male collected 5 May 1976 at Lamto-N'Douci, Ivory Coast, by C. Chappuis and J. Viel-liard—is registered under the number 1983-1970 in the National Museum of Natural History (Paris, France). *Dimensions*: folded wing = 132 mm; tail = 76 mm; bill = 12 mm; tarsus = 23 mm. *Present known distribution*: forests of Ivory Coast and Liberia.

In contrast to other current recognized races of *G. capense* (*G. c. capense*, *ngamiense*, and *scheffleri*), the specimens from Ivory Coast and Liberia (1) are significantly smaller; (2) are darker above: with a sooty gray brown head and chocolate brown neck, alar coverts,

and rectrices (the other races are more red-brown in color); (3) have fewer light bars on the rectrices: 10–11 as opposed to 12–14 for the other races; (4) have narrower light transverse stripes on the upper parts, particularly on the rectrices: 1.0–1.5 mm instead of the 2.5–3.0 mm typical of the other races; (5) exhibit less contrast between light and dark bars on the primary and secondary remiges: there is no sharp delineation of light and dark bars; and (6) may have fewer white marks on the wings and scapular feathers, although this characteristic is highly variable among the 7 specimens.

The owlets from Ivory Coast and Liberia are also distinct from *G. castaneum*, which is bright chestnut red and has a spotted head and unbarred alar coverts, even though it too has light bars on the rectrices that are narrow and few in number. *G. castaneum* also has proportionately shorter rectrices than the presently recognized races of *G. capense* and the specimens from Ivory Coast and Liberia. Differences in songs cannot be used to distinguish *capense* from *castaneum* because the vocalizations of the latter are unknown. However, songs of Barred Owlets from Ivory Coast (2 of which are described by the authors) resemble those of *G. capense* from East Africa (Kenya). Differences in habitat between the recognized geographic races of *capense* (savannahs) and the specimens from Ivory Coast and Liberia (forests; similar in this respect to *castaneum*) are probably more apparent than real because so little is known about the natural history of the species.—Michael D. Kern.

EVOLUTION AND GENETICS

(see also 42, 43, 64, 66, 68)

55. Temporal allozyme frequency changes in density fluctuating populations of Willow Grouse (*Lagopus lagopus* L.). U. Gyllensten. 1985. *Evolution* 39:115–121.—Gyllensten used electrophoresis to study temporal and spatial variation of allelic frequencies in fluctuating populations of Willow Grouse. Samples were collected over several hundred km and at periods of high and low population densities. Six of 23 enzyme loci were polymorphic; genic heterozygosity, 8.3%, was slightly higher than that found in many birds. Of the total genic variation, 2.5% was distributed among populations and another 2.5% was distributed among time periods. The former is typical of other avian studies. The fact that the temporal-variance-component was as large as the among-locality-component suggests that random genetic drift over time could easily be a sufficiently large effect to lead to the spatial genic variation found in this species.—George F. Barrowclough.

56. Stability of the Northern Flicker hybrid zone in historical times: implications for adaptive speciation theory. W. S. Moore and D. B. Buchanan. 1985. *Evolution* 39:135–151.—The authors revisited and made new collections of Northern Flickers (*Colaptes auratus*) across the Great Plains hybrid zones. This contact area had been previously examined by Short, who made a series of collections in the mid-1950s. These, and older collections, including some up to 100 yr old, were also reexamined by these investigators. Using a hybrid index and principal component analyses, the authors found that, although there were minor changes over time at some localities, there had been no overall detectable changes in the flicker hybrid zone on any of 7 river systems during this period of time. That is, the hybrid zone is apparently not becoming narrower, wider, or otherwise moving towards the east or west.

During the last 10 yr, there has been much qualitative and quantitative speculation concerning the nature and dynamics of hybrid zones and clines. These authors argue that their data are not consistent either with the ephemeral zone hypothesis that predicts increasing introgression and gradual widening of such zones, or with dynamic-equilibrium hypotheses that predict that clines and hybrid zones will move until they encounter an area of low population density. These authors' own censuses suggest the hybrid zones occur in areas of high, not low, density of flickers. Consequently, with these 2 hypotheses falsified, the data seem consistent only with Moore's own theory of hybrid superiority in ecologically intermediate areas. These specific falsifications, though, depend critically on particular assumptions about rates of gene flow and the geometry of the species' range. Moreover, the hybrid superiority hypothesis is favored in large part because it generates no easily falsified predictions. Thus, an important revelation arising from this analysis is that intensive, long-

term field studies of hybrid zones may still be insufficient for dissecting the evolutionary processes underlying the observed patterns.—George F. Barrowclough.

FOOD AND FEEDING

(see also 9, 15, 23, 72)

57. Observations on fruiting and dispersers of *Cecropia obtusifolia* at Los Tuxtlas, Mexico. A. Estrada, R. Coates-Estrada, and C. Vazquez-Yanes. 1984. *Biotropica* 16: 315–318.—*Cecropia obtusifolia*, a pioneer tree species that colonizes openings of the Neotropical rain forest, is wind pollinated, and almost continuously produces fleshy fruits eaten by birds and mammals. The fruits contain a higher proportion of proteins and a similar proportion of lipids as other fruits available at the study site. Forty-eight animal species (1 ant, 1 Iguana, 13 mammals, 33 birds) were observed using the fruits. Both migratory and resident species of birds use fruit from the trees. Seed germination was enhanced by passage through the digestive system of at least some of the species which ingested them.—Robert C. Beason.

58. Avian consumers of *Bursera*, *Ficus*, and *Ehretia* fruit in Yucatan. P. E. Scott and R. F. Martin. 1984. *Biotropica* 16:319–323.—The 3 species of trees produce 18–22 mm diam. fruits and are visited by a variety of opportunistic avian frugivores. Thirty-nine species were permanent residents, 1 species was a breeding season resident, 9 were winter residents that breed in North America, and 2 were migratory transients. Fruit of *B. simaruba* and *F. cotinifolia* ripen during the latter half of the dry season, about the time migrants are moving north, while *E. tinifolia* fruit ripen early in the wet season when the breeding residents begin nesting.—Robert C. Beason.

59. Some sticky solutions. S. H. Spofford. 1985. *Living Bird Quart.* 4:5–7.—This article is a basic primer on hummingbird feeding, including shapes, colors, sugar solutions, locations, and even cleaning, written by an Arizonan who has recorded 13 species of hummingbirds at her feeders.—John C. Kricher.

60. The diet and food consumption of nestling Cassin's Auklets during summer, and a comparison with other plankton-feeding alcids. K. Vermeer. 1984. *Murrelet* 65: 65–77.—Cassin's Auklets (*Ptychoramphus aleuticus*) carry food to their single chick in a large neck pouch, and each parent makes only 1 food delivery per day. Over a 2-yr period, Vermeer obtained 496 collections of neck-pouch contents from Cassin's Auklets breeding on Triangle and Frederick islands, British Columbia. The most important prey items were 3 species of euphausiids, a copepod, and small fishes. The mass of the average meal was about 19 g. Vermeer calculated that each chick receives 1.6 kg of food during the 6-wk nestling period, and that the entire North Pacific breeding population (1.8 million birds raising 0.7 chicks/pair) receives 1008 metric tons during a single nesting season. Copepods, euphausiids, and amphipods are major prey of all species of auklets that bring food to their young in a neck pouch.—Jeffrey S. Marks.

61. Avifauna and macrozoobenthos in the estuary of Somme: I. The Oystercatcher *Haematopus ostralegus* and populations of cockles *Cerastoderma edule* (Mollusca: bivalve). (Avifaune et macrozoobenthos dans l'estuaire de la Somme: I. L'Huitrier pie *Haematopus ostralegus* et les populations de Coques *Cerastoderma edule* [Mollusque: bivalve].) E. Caudron, J.-P. Ducrottoy, and P. Triplet. 1983. *Oiseau Rev. Fr. Ornithol.* 53: 227–240. (French, English summary.)—Oystercatchers and cockles are integral parts of the food web in the Bay of Somme, a 70-km² estuary in northern France. The number of Oystercatchers that overwinter at the bay (up to 12,000 birds) probably constitutes a significant (7.8–23.8%) part of the total French population. However, the bay is not an important nesting area for Oystercatchers, although they are present there year-round: the nesting population is only 10–20 pairs. Indeed, numbers of Oystercatchers in the bay are below 1000 in April–July, and do not increase dramatically until August when pairs return for the winter.

Much of this article concerns associations between Oystercatchers and invertebrates,

particularly cockles. At low tides, Oystercatchers are distributed on the bay's exposed cockle beds. The frequency with which the birds exploit such beds depends not on the density of molluscs, but on the diversity of the invertebrate fauna there: the beds that were used the most contained substantial numbers of bivalves, annelids, and crustaceans. This suggests that Oystercatchers avoid areas where cockle density alone is high and which are consequently used by clam-diggers; or, and perhaps more likely, that the bird's diet consists of other bivalves, such as *Macoma balthica*, and annelids, particularly *Nereis diversicolor*, as well as cockles. Support for the latter suggestion comes from several sources: (1) Oystercatchers feed annelids to their chicks, (2) Oystercatchers at the Bay of Somme, as elsewhere, feed on prey other than cockles when densities of the latter diminish to 50–100/m² substrate, (3) based on the success of their soundings, Oystercatchers in the bay apparently have difficulty finding cockles in some areas, even when density exceeds 100/m², and (4) the bay contains areas that are not subject to much human disturbance where annelids are abundant and can be captured readily by Oystercatchers.

Cockles consumed by birds at the bay were most frequently 19–24 mm in size. Those that were most often ignored were either 21 or 26 mm in size. Curiously, cockles of the former size constituted the most abundant size-class in the bay, whereas cockles of the latter size were relatively scarce. The number of Oystercatchers in the Bay of Somme was directly related to the number of cockles available there; both were scarce in spring.

In Wales, Oystercatchers have apparently decimated cockle stocks. The same is not true at the Bay of Somme. Here, bathymetric factors (e.g., changes in substrate composition and reductions in areas suitable for cockle development), extreme temperatures, and the clam-digging activities of humans limit the growth of cockle populations.—Michael D. Kern.

62. Prey selection in relation to body size and bill length of five species of waders feeding in the same habitat. J. T. Lifjeld. 1984. *Ornis Scand.* 15:217–226.—Esophageal contents were collected from Ringed Plovers (*Charadrius hiaticula*), Little Stints (*Calidris minuta*), Dunlins (*C. alpina*), Curlew Sandpipers (*C. ferruginea*), and Ruffs (*Philomachus pugnax*) that fed in a wrack bed in northern Norway during autumn migration. The wrack bed supported high densities of only 2 prey species: *Lumbricillus* sp. (an oligochaete) and *Scatophaga litorea* (a larval dipteran). Little Stints, the smallest of the shorebirds, ate more *Lumbricillus* (64% of diet) than *Scatophaga* (32%). The other 4 species fed primarily on various sizes of *Scatophaga* (80–94% of diet). Prey size was positively correlated with body size of the shorebirds (both weight and wing length), but not with bill length. In a separate feeding study, captive shorebirds were given a choice of 4 size classes of *Scatophaga*. There was a significant, positive correlation between prey size and handling time for all individuals except the Ruffs, which were the largest of the species tested.

Lifjeld suggests that bill morphology in shorebirds reflects foraging habitat and foraging behavior rather than prey size. The upper size limit of prey may be related to the gape size of the shorebird.—Jeffrey S. Marks.

SONGS AND VOCALIZATIONS

(see also 16)

63. Sound degradation as a distance cue in Great Tit (*Parus major*) song. P. D. McGregor and J. R. Krebs. 1984. *Behav. Ecol. Sociobiol.* 16:49–56.—Thirty-two individuals were exposed to 2 songs, 1 familiar and 1 unfamiliar in both undegraded and degraded form. Three categories of familiar song included 1 of the test bird's own, a neighbor's, and a song in both the test bird's and a neighbor's repertoire. Responses to playbacks show that: (1) Great Tits respond less strongly to degraded than to undegraded songs only if the songs are familiar to the birds; (2) discrimination between degraded and undegraded songs seems to be enhanced when the bird possesses the song; and (3) the response to degraded familiar songs is weaker than to degraded unfamiliar songs. Thus Great Tits use degradation cues to estimate the distance between themselves and the stimulus song because degraded songs are treated as though they are from distant singers. In addition, it appears that song degradation is compared against some internal standards of both own and neighbor's songs and suggests that birds learn more songs than they sing.—Patricia Adair Gowaty.

64. Geographic variation in songs of the Bewick's Wren: a search for correlations with avifaunal complexity. D. E. Kroodsma. 1985. *Behav. Ecol. Sociobiol.* 16:143–150.—Are patterns of macro-geographic variation in song parameters inversely related to the avifaunal complexity experienced by individuals of the same species in different places? If so, relatively stereotyped songs should characterize rich mainland avifaunas, while less species-distinct songs should characterize the depauperate avifaunas of islands. Eight mainland and 1 island population of Bewick's Wrens (*Thryomanes bewickii*) were studied, including a population in species-rich Madera Canyon, Arizona and species-poor Santa Cruz Island, California. Five of 14 measurements taken from each song type of each recorded bird were independent, and used to characterize the differences among locations. Nearly all the measured parameters revealed some degree of geographic variation, but among the most striking features of the reported data were: (1) the simple and highly stereotyped songs of wrens from the rich avifauna of Madera Canyon, and (2) the positive correlation between frequency range of mainland song phrases and latitude. Each of these correlations is consistent with the notion that the sound environment selects for avifaunal complexity. These correlations cannot implicate cause and effect. Nevertheless, "it may be unwise to dismiss the hypothesis that the complexity of the sound environment may have an important bearing on signal design." I look forward to increasing numbers of similarly well-designed, carefully analyzed and concluded papers on the origins of signal design.—Patricia Adair Gowaty.

65. Song repertoires and density assessment in Red-winged Blackbirds: further tests of the Beau Geste hypothesis. K. Yasukawa and W. A. Searcy. 1985. *Behav. Ecol. Sociobiol.* 16:171–175.—The "Beau Geste" hypothesis says that song repertoires are advantageous in territorial defense because they are deceptive indices of densities of territorial males that discourage other males from seeking to establish territories nearby. A previous experimental test, in which male Red-winged Blackbirds (*Agelaius phoeniceus*) were removed from territories and replaced with speakers, supported the Beau Geste hypothesis: A repertoire of song types was more effective in discouraging trespassers than a single song type. This paper addresses whether assumptions of Beau Geste are fulfilled among Red-winged Blackbirds. These ideas tested are: (1) males seeking territories avoid areas already densely settled by conspecific males, and (2) male density is positively correlated with the number of song types heard in an area. For each of 4 yr, no consistent and significant correlations between the rate of territorial intrusion and the density of males were evident, thus assumption 1 was not supported. However, there was a significant, positive correlation between density of males and the density of song types, supporting assumption 2. The authors conclude that because assumption 1 was not supported, Beau Geste cannot account for the evolution of song repertoires in Red-winged Blackbirds, and further, song repertoires are probably the result of phylogenetic inertia, a nonfunctional explanation.

This is one of the best written, most carefully analyzed and reasoned papers that I have read in BE&S in a long time. I thoroughly enjoyed it, but I think their conclusion is hastily drawn. It can be argued that their assumption 1—that male Red-winged Blackbirds avoid areas already densely settled—is not a crucial assumption, but a prediction of Beau Geste. I believe a crucial assumption of Beau Geste is that there are selectively important disadvantages to settling in crowded habitats. The possibility that crowded habitats could easily indicate benefits (or costs) for Red-winged Blackbirds was discussed (though not tested here). If crowded habitats are (ever) beneficial to Red-winged Blackbirds, Beau Geste would be rejected as an explanation for song repertoires—in that habitat and for that species, at least. Given the original experimental result that potential trespassers avoided areas with high song-type densities and the fact that repertoire size is correlated with age and reproductive experience in Red-winged Blackbirds, research might profitably focus on whether song types are really communication, testing the explanation idea (i.e., is information transferred?) and, if so, is the communication honest or not?—Patricia Adair Gowaty.

66. Vocal "dialects" in Nuttall's White-crowned Sparrow. D. E. Kroodsma, M. C. Baker, L. F. Baptista, and L. Petrinovich. 1985. *Curr. Ornithol.* 2:103–133.—The White-crowned Sparrows (*Zonotrichia leucophrys*) of coastal California sing songs that vary geographically. In association with this variation, song structure, song development, de-

mography, dispersal, genetics, and mate selection have all been studied, but the interpretation of these data represent one of today's most controversial areas in avian behavioral evolution. This review is a joint effort by members of two of the sides of the argument. The result is surprising; many of the strong statements of earlier papers are substantially moderated. For example, the authors appear to agree that the concept of vocal "dialects" may be misleading in this case; various elements of the song do not vary concordantly. Consequently, it is not at all clear what a dialect boundary actually represents. It is also agreed that demographic differences exist between major study populations separated by less than 100 km; this is to some extent responsible for the differences between the Baker and the Baptista/Petrinovich interpretations. Finally, whether or not "dialects" affect genetic structure through reducing dispersal and promoting assortative mating is now designated a "research hypothesis," and not a conclusion.

This paper makes it clear that the situation in the White-crowned Sparrow is neither simple nor close to resolution. Generalizations have not emerged from these intensive, now long-term, studies. Although further clarification of the song, demographic, and genetic structure in this species is necessary, it has now also become important to determine whether this example is somehow aberrant, or if cases of microgeographic vocal variation are routinely this complicated.—George F. Barrowclough.

MISCELLANEOUS

67. Data analysis and the design of experiments in ornithology. F. C. James and C. E. McCulloch. 1985. *Curr. Ornithol.* 2:1-63.—This is a review not so much of some particular esoteric branch of ornithological knowledge, but rather of how ornithologists proceed in obtaining that knowledge. Discussed are concepts of models, hypothesis testing, the nature of experiments, and data analysis. The authors point out that all scientists, whether consciously or not, use models, that statistical tests are frequently used without attention to underlying assumptions, and that interpretation of data in terms of some idea should not be considered confirmation of that idea—alternate theories may yield similar predictions. This is a useful contribution and deserves to be read widely. I was particularly pleased to see the ideas of Popper and Tukey discussed in an ornithological review.—George F. Barrowclough.

BOOKS AND MONOGRAPHS

68. Ecogeographical variation in size and proportions of Song Sparrows (*Zonotrichia melodia*). J. W. Aldrich. 1984. *Ornithol. Monogr.* No. 35. 134 p. \$10.50.—Whereas many studies have demonstrated the effects of single environmental factors on the morphological features of birds, few have attempted to relate morphological variability within a species to all environmental factors influencing its survival. This ambitious monograph analyzes the relationship between morphological variation within the wide-ranging Song Sparrow and the major biotic communities presently recognized by ecologists. The author used life areas as defined by Aldrich and ecoregion provinces as summarized by Bailey as indicators "of combined climatic and physiographic factors . . . to which the birds must be adapted in order to survive" in an attempt to determine if intraspecific morphological differences coincided with the distribution of these ecogeographical units.

Wing measurements exhibited the most consistent relationships within these ecogeographical units. Wing lengths conformed to Bergmann's rule with the longest wings found in sparrows occupying the colder climates. However, wing lengths were also influenced by the life form of the vegetation since populations occupying more open habitats had proportionally longer wings. Wing shape demonstrated a different relationship, with rounded wings characteristic of sedentary populations, while pointed wings were found in migratory populations and those inhabiting more open vegetative communities. Hence, wing shape was found to correspond with flight habits to a greater degree than total wing length.

Bill characteristics were correlated with the food habits of each population as well as their overall body size. Longer and thinner bills were characteristic of populations using a greater proportion of insects throughout the year, while stouter bills were indicative of seed-dependent populations during certain seasons. This relationship between bill characteristics and food habits produced contradictory trends in different portions of the species range.

Eastern populations apparently follow Allen's rule, with bill lengths irregularly increasing from north to south. However, western populations contradicted Allen's rule since bill lengths generally decreased from north to south, although the trend was reversed in Mexico. The data also indicated sexual differences in bill characteristics, although these differences could not be correlated with proven differences in food preferences.

Tarsal length generally conformed with Bergmann's rule. This feature was not related with vegetative life form since both long- and short-legged populations occupied open and closed vegetative communities. However, tarsal length may be related with each population's food habits although the nature of this relationship remains nebulous in the absence of supporting behavioral observations. Middle toe length varied similarly with different feeding behaviors thought to be responsible for the observed interpopulation variability. Tail lengths generally conformed to Bergmann's rule without apparent influence from migratory habits or the life form of the vegetative communities.

Using these results, the author reached the important conclusion that "ecological forces selecting adaptive genetic differences have a greater effect on morphological change or microevolution than do geographical separation or isolation." This conclusion was based on significant morphological differences between neighboring populations occupying different habitats while no morphological differences were found in populations inhabiting widely separated but ecologically similar areas.

Despite small sample sizes for some populations and a scarcity of data on food preferences and feeding behavior, the author successfully supported his significant conclusions. More importantly, this study identified additional topics that would provide valuable insights into the ecogeographical variability of Song Sparrows. From both perspectives, this monograph will serve as a milestone in the development of our understanding into the relationship between ecogeographical factors and morphological variability within a species.—Bruce G. Peterjohn.

69. The dictionary of American bird names. E. A. Choate. 1985. Harvard Common Press, Boston, Massachusetts. 276 p. Paper \$9.95; cloth \$17.95.—Have you ever wondered about the origin or meaning of common or scientific names of birds? Many names commemorate general collecting sites, "*D. dominica* (Linnaeus): Yellow-throated Warbler; ML. (Modern Latin) *dominica*, 'St. Domingo,' now Hispaniola where this bird was first found." Other names commemorate a particular location, "*D. magnolia* (Wilson): Magnolia Warbler; E. (English) *magnolia* so named by Wilson, who shot a specimen in a magnolia tree." Still others commemorate an early ornithologist or friend of an ornithologist, "*Sayornis Bonaparte*. Gr. (Greek) *ornis*, 'bird'; for Thomas Say . . . *S. saya* (Bonaparte): Say's Phoebe; doubly honoring Thomas Say." The book contains a brief biography of Say along with the many other ornithologists and their friends now immortalized in the ornithological nomenclature.

Not all names have such obvious derivations, among my favorites is the common name "Mallard. ME. (middle English) *malard* from OF. (Old French) *malard* 'the mallard,' From OF. *male*, 'male,' which derives from L. (Latin) *masculus*, extended from L. *masculus*, 'male,' and L. *mas*, 'a male,' plus the intensifying suffix *-ard* from HG. (High German) *hart*, an adjective meaning 'bold, hardy,' akin to the E. *hard*. It generally has a pejorative sense as in drunkard, dullard, and sluggard. The suffix seems to fit well the mallard male who exemplifies in his relations with the female a singular concentration on the physical union alone. The female, after she is snatched bald-headed, gets the eggs to hatch, the ducklings to raise, and her drake's name." Equally detailed and interesting are the characterizations or stories embedded in many of the scientific names, "*Setophaga* Swainson. Gr. *setos*, 'a moth'; Gr. *phago*, 'to eat.' *S. ruticilla* (Linnaeus): American Redstart; L. *ruticilla*, 'red tail.'" or "*Sphyrapicus* Baird. Gr. *sphyra*, 'a hammer'; L. *picus*, 'a woodpecker.' Picus loved Pomona and spurned the importunities of Circe. Lacking the guile of Ulysses and possibly ignorant of the proclivity of the one he disdained for turning those she found indifferent into some specimen of the animal kingdom, Picus ended up as a woodpecker. MacLeod disagrees with Ovid, stating that it is his belief that the woodpecker had a name before the youth's transformation. . . . *S. varius* (Linnaeus): Yellow-bellied Sapsucker; L. *varius*, 'variegated,' for the mixed plumage." Although I want to quote just one more of my favorite derivations, that will only lead to another and another and you had better buy your

own copy and find your own favorites before I succumb to the temptation of just one more favorite derivation. **The Dictionary of American Bird Names** will add a whole new dimension to ornithology, whether it is your vocation or avocation.—Edward H. Burtt Jr.

70. The atlas of breeding birds of Vermont. S. B. Laughlin and D. P. Kibbe, eds. 1985. University Press of New England, Hanover. 478 p. and 8 vinyl overlays. \$45.00.—The concept of a breeding bird atlas originated in England during the 1960s and quickly spread throughout western Europe, culminating in published atlases from most countries between 1975 and 1980. This practice slowly spread to North America. The first statewide atlases were begun in Massachusetts during 1974 and Vermont in 1976. While the idea has become quite popular and atlas projects are presently underway in most eastern states, Vermont is the first state to have successfully completed its atlas and published its results.

As described in the introduction, the framework for the Vermont atlas was similar to that presently used in most other states. Their priority blocks were considered to be adequately covered when 75+ species with 35+ confirmed nesting species were recorded although fewer species were found in a few blocks with relatively uniform habitats. In addition to this background information on atlas procedures, the introduction also included a brief summarization of the habitat and climatological factors within Vermont as well as a discussion of the biases and limitations associated with atlas projects.

The text largely consists of accounts for each confirmed nesting species in Vermont. A distribution map is provided for each species as well as a breakdown of its occurrence in the state's 7 physiographic regions. These accounts also include a discussion of each species' total range, breeding habitats, nest characteristics, breeding phenology, historical status, and present distribution within the state. Most of the breeding phenology data were accumulated from instate sources and are fairly scant although representative of the expected egg, nestling, and fledging dates from Vermont. Most of the other information was drawn from an extensive review of literature sources. Following these accounts of confirmed nesting birds, there are 2 brief sections describing possible or probable nesting species and 2 birds that have been reintroduced or confirmed as nesting following completion of the atlas.

This atlas certainly achieved its goal of significantly contributing to the present understanding of breeding bird distribution within Vermont. The wealth of information provided within the species accounts includes the first documented nesting records for Turkey Vulture (*Cathartes aura*), Common Barn-Owl (*Tyto alba*), Carolina Wren (*Thryothorus ludovicianus*), Bay-breasted Warbler (*Dendroica castanea*), and other species. Ranges of a number of "southern" birds such as Tufted Titmouse (*Parus bicolor*), Blue-gray Gnatcatcher (*Poliophtila caerulea*), Blue-winged Warbler (*Vermivora pinus*), and Northern Cardinal (*Cardinalis cardinalis*) have greatly expanded during the past 20 years. Even a few "northern" birds including Lincoln's Sparrow (*Zonotrichia lincolnii*) and Rusty Blackbird (*Euphagus carolinus*) were more widely distributed than previously thought. It also documented the decline of Sedge Wrens (*Cistothorus platensis*), Henslow's Sparrows (*Ammodrammus henslowii*), and others that have virtually disappeared from most northeastern states. The atlas also serves as a complete baseline reference for measuring future changes in bird distribution within the state.

Everybody involved with the Vermont breeding bird atlas should be congratulated for their efforts in producing this excellent book. It is unfortunate that the price may discourage some people from acquiring it. As the first published breeding bird atlas in this country, it certainly sets a very high standard that other states may find difficult to match.—Bruce G. Peterjohn.

71. The return of the sea eagle. J. A. Love. 1983. Cambridge Univ. Press, Cambridge. 227 p. \$29.95.—The White-tailed Sea Eagle (*Haliaeetus albicilla*) last bred in the United Kingdom in 1918. Because of the reintroduction project on the Isle of Rum, under the direction of the Nature Conservation Council, the species may again breed. The book outlines the natural history of the sea eagle and discusses in detail the reasons for its decline in Great Britain and elsewhere in Europe. Chapters detail the classification, distribution, breeding biology, and food habits before discussing the persecution and decline, conservation, reintroduction, release, and recolonization. Written for the general reader, the book is well-illustrated with photographs, pen-and-ink drawings, and data charts.—John C. Kricher.

72. Marine birds: their feeding ecology and commercial fisheries relationships.

D. N. Nettleship, G. A. Sanger, and P. F. Springer, eds. 1984. Proc. Pac. Seabird Grp. Symp. (1982). 220 p.—These nicely produced proceedings are divided into 3 sections: (1) Feeding ecology of marine waterfowl (6 papers), (2) Feeding ecology of pelagic marine birds (7 papers), (3) Seabird-commercial fisheries interactions (10 papers). The waterfowl include 5 papers on diving ducks and 1 on Black Brant (*Branta bernicla nigricans*); 5 of the studies were done in Alaska, the other in British Columbia. S. R. Johnson presents evidence for the opportunistic feeding of Oldsquaw (*Clangula hyemalis*) and in doing so, makes useful comparisons of different methods of dietary analysis. G. A. Sanger and R. D. Jones Jr. compare food webs of Oldsquaw and White-winged Scoters (*Melanitta fusca*). Their study together with Johnson's suggests that Oldsquaws are specialist feeders in summer and extreme generalists in winter. K. Vermeer and N. Bourne make some interesting comparisons among the diets and foraging patterns of North American scoters; the deep-water foraging pattern of the White-winged Scoter may be related to its large size. The stimulating analytical efforts in E. W. F. Kiera's study of the herbivorous grazer, the Black Brant, could with some refinement prove useful in many contexts.

All of the papers on the feeding and foraging ecology of pelagic seabirds were carried out in the Pacific; 3 of the 7 papers are concerned with Sooty Shearwaters (*Puffinus griseus*) and 2 with Rhinoceros Auklets (*Cerorhinca monocerata*). The feeding distribution of Red (*Phalaropus fulicaria*) and Red-necked (*P. lobatus*) phalaropes was studied by K. T. Briggs, K. F. Detman, D. B. Lewis, and W. B. Tyler with a sophisticated integration of ship, air, and satellite techniques. Phalaropes concentrated where sea surface temperature (SST) changed rapidly with horizontal distance and where chlorophyll concentrations were low. The authors suggest that zooplankton and phalarope distributions along fronts and visible discontinuities (e.g., slicks) might be studied with ship transects that parallel the coast, as do the fronts. In another nice integration of bird and prey distributions with oceanographic information, D. Schneider and G. L. Hunt Jr. report dietary differences between conspecifics on islands <100 km apart and an association between foraging distributions and major bathymetric features around colonies. The latter relationship holds important implications for models of central place foraging that are based solely on distance travelled from colonies. E. W. Chu relates the migratory energetics of Sooty Shearwaters to seasonal shifts in prey exploitation and composition. A comparison of her study (off California) with H. Ogi's (NW Pacific) reveals geographic differences in the diets of Sooty Shearwaters which appear to be predominantly fish-eaters throughout the Pacific. Squid may be a more important food at higher than lower latitudes and Ogi suggests that its rapid digestion by shearwaters may result in a tendency for analyses of stomach content weights to underestimate its consumption. Avian distributions were associated with SST on a broad scale and with prey distribution on a fine scale; simultaneous studies of bird and prey distributions with SST will help clarify such interrelationships (cf. Briggs et al., Schneider and Hunt). L. V. Hutchison, B. M. Wenzel, K. E. Stager, and B. L. Tedford present evidence for the olfactory ability of Sooty Shearwaters and Northern Fulmars (*Fulmarus glacialis*) to locate (from downwind) cod liver oil fractions released from discrete sites at sea. This sensory dimension of prey searching by tubenosed seabirds could be an important factor in multi-species feeding flocks, as the shearwaters are pelagic flock initiators. K. Vermeer and S. J. Westrheim draw the cogent conclusion that seabirds can be used to naturally assay fisheries stocks and that Rhinoceros Auklets, in particular, can be used to assay juvenile age classes of fish that are so difficult to sample by conventional fisheries methods. Their informative analyses of food types could be enhanced with determinations of the organic composition and energy contents of the different species and age classes of prey. S. A. Hatch found that Rhinoceros Auklet parents delivered larger fish to older chicks. Judged in light of Vermeer and Westrheim's results, Hatch's finding that Pacific sandlance was the auklets' dominant food might be related to sampling food in July.

The 10 papers in the section on seabird-commercial fisheries interactions cover a wide range of geographic areas and analytical levels. R. W. Furness emphasizes the importance of sensitivity analyses in modelling trophic relationships in order to delineate parameters that most greatly affect the confidence intervals of model outputs, i.e., those most in need of further study. At present, population estimates and foraging activity costs are major

constraints on modelling precision, which is claimed to be $\pm 30\%$. Because seabird populations cannot usually be estimated with better than 20% error, this could prove to be the ultimate level of accuracy for models of population energetics. Foraging ranges, diets, and prey production within an oceanographic area are required to set population energy requirements into a firm biological context. Furness's other contribution to the symposium focuses on his earlier estimate that the seabird community on Foula consumes 29% of the annual pelagic fish production within an approximately 45 km radius of the island. The effort spent justifying the 45 km range for the pelagic fulmars is useful, because small changes in foraging radius produce large changes in total foraging area and hence estimates of prey depletion. Competition between birds from adjacent colonies is suggested, an idea that has recently been elaborated by Furness and T. R. Birkhead (Nature 311:655-656, 1984). The consumatory demands placed on pelagic fisheries by fish, seabirds, marine mammals, and fishermen are considered to be so tightly linked that changes in one component will inevitably affect others. The well documented negative effects of purse seining in the 1960s on the herring and mackerel stocks in the North Sea may have had some positive consequences for opportunistic seabirds by (1) providing a new abundant food source, offal, for pelagic species (see Burger and Cooper below), and by (2) allowing increases of forage species, such as sandlance and sprats, through reduction of the abundances of larger predatory fish. D. W. Anderson and F. Gress review many of their previous demonstrations of a positive association of the breeding success and winter populations of Brown Pelicans (*Pelecanus occidentalis californicus*) with the abundance of their dominant prey, the northern anchovy. The international aspects of conservation are emphasized; for example, it seems biologically counterproductive to restrict U.S. anchovy quotas but not Mexican ones, when fishermen from southern California and Mexico exploit the same stocks and when the U.S. and Mexican catches tend to be inversely correlated. It is suggested that minimum biomass levels be set as "forage reserves" for marine predators. The authors note that the recovery of seabirds from the toxic effects of pollutants was much more rapid than expected and is a testament to the resiliency of seabird populations. This encouraging note may need qualification for inshore feeders with multiple egg clutches. A. D. MacCall points out that the Peru, California, and Benguela currents share many similar convergent oceanographic features by virtue of being eastern boundary systems. The density of forage species, such as anchovies and sardines, may change little in the center of their distributions, even in the face of massive fluctuations in abundance that are associated with range contractions and expansions. Seabird colony locations are thus implicated as important aspects of long term success, because colonies near the center of forage species' distributions should have a more constant food supply than peripheral colonies. A. E. Burger and J. Cooper report that the refuge from demersal trawlers has provided a new food source for nonbreeding migrant procellariiforms and some Cape Gannets (*Sula capensis*). Offshore purse seining has removed important prey of gannets, Jackass Penguins (*Spheniscus demersus*), and Cape Cormorants (*Phalacrocorax capensis*); the penguins are the hardest hit apparently because of their limited ability to switch to alternate prey. J. E. Carscadden reports that the present knowledge of capelin population dynamics indicates that fishing mortality has probably been a significant factor in the recent decline of one stock, but not of others in Newfoundland waters. A complex of factors can influence capelin year-class strengths, and many of the present difficulties in understanding the dynamics of capelin populations is a result of the fishery out pacing scientific investigation. With regard to predator/capelin interactions, there have been no firm demonstrations that fluctuations in capelin abundance (availability) influence predator populations (see Carscadden *NAFO SCR Doc.*, 83/IX/72, 7 p, 1983). R. G. B. Brown and D. N. Nettleship suggest that seabirds in Newfoundland waters consume about 250,000 t of capelin. This useful first approximation will stimulate further inquiry. Some calculations in the present paper may, however, overestimate capelin consumption, because % consumption for gulls and murre is based on the number of meals in which capelin was the sole or principle component and for Greater Shearwaters (*Puffinus gravis*) % consumption refers to every stomach in which capelin occurred. Atlantic Puffins (*Fratercula arctica*) fledged at significantly higher rates and weights in 1968-1969 than in 1981 (a poor capelin year), when chicks were fed little capelin (the puffin's major food in Witless Bay) and fewer and smaller meals. The association of light fledging weight with a low percentage of capelin in the chicks' diets suggests a possible nutritional effect and that

puffins may not have suitable alternative prey if capelin are unavailable. Hand-rearing chicks on diets of capelin vs. other prey might help to clarify a possible nutritional effect, as would organic and energy analyses of different prey types. The fledging success data are less compelling: if the late 1960s sample is partitioned by year (Nettleship, *Ecol. Monogr.*, 42:239–268, 1972) rather than lumped as in the present analysis, then fledging success in 1968 (43%) and 1981 (45%) can be seen to be very similar, and 1969 (a “good” year) rather than 1981 becomes the odd year in terms of percent fledging success. The association between poor puffin breeding performance and low capelin availability points out an area of important future investigation (see also Carscadden *NAFO SCR Doc.*, 83/IX/72, 7 p., 1983).

The last 3 papers in the volume focus on seabird mortality in fishing gear. J. F. Piatt, D. N. Nettleship, and W. Threlfall show that in Newfoundland murrens had a much higher mortality than puffins and were killed in bottom set cod gill nets, whereas puffins died in surface salmon nets, a finding that Piatt and Nettleship have recently related to diving depths and body size. The recovery data of murre bands (mostly L. M. Tuck's) suggested that net mortality increased from low levels in the 1950s and 1960s to high levels in the 1970s, as alcid populations and fishing effort increased. The 1972 mortality estimate (based on the recoveries of a single fisherman) was considered to represent 13% of the local breeding population, whereas the most recent and extensive 1980–1981 data indicate a greatly reduced mortality level, accounting for perhaps 3–4% of the local population. The 3-fold decrease between 1972 and 1980–1981 suggests that the earlier estimate may be high, because fishing effort did not decrease over this time course (more total net settings are used in the calculation of the 1980–1981 estimate). Whatever the case with the earlier estimate, the problem is serious and is deserving of research attention and monitoring. Based on a reanalysis of earlier published data Piatt and D. G. Reddin speculate that drowning in nets may again be a serious problem for Thick-billed Murres (*Uria lomvia*) off western Greenland, because of (1) the later timing of the salmon fishery nearer the period of increased murre vulnerability and (2) a northward movement of the fishery closer to the murre colonies, where earlier studies had shown the highest net mortality occurred. Further investigation seems warranted. H. R. Carter and S. G. Sealy estimate that about 8% of the fall population of foraging Marbled Murrelets (*Brachyramphus marmoratus*) die in fishing nets. Most birds were killed within 3 to 5 m of the water surface, perhaps being attracted to nets by small schooling prey that collect at net/surface interfaces. They suggest that the restriction of fishing areas and the elimination of night fishing could reduce murrelet net mortality.

In sum, this attractive volume contains valuable food for thought and pulls together a very useful sampling of the current state of seabird research. It is important reading for marine ornithologists.—W. A. Montevocchi.

73. Birds of Nahanni National Park, Northwest Territories. G. W. Scotter, L. N. Carbyn, W. P. Neily, and J. D. Henry. 1985. Sask. Nat. Hist. Soc. Spec. Publ. No. 15. 74 p. \$7.00.—This publication describes avian distribution and abundance within the 4760 km² Nahanni National Park located in the southwestern corner of the Northwest Territories, Canada. The park supports diverse habitats from closed boreal forests to alpine tundra, while deciduous communities are restricted to riparian areas and dense cover surrounding the Nahanni Hotsprings. This habitat diversity and the park's location at the Cordillera-Great Plains interface are primarily responsible for records of a relatively large total of 170 species. The status and distribution of each species is briefly described and includes the first Northwest Territory sightings of Wandering Tattler (*Heteroscelus incanus*), Barred Owl (*Strix varia*), Hammond's Flycatcher (*Empidonax hammondi*), Clark's Nutcracker (*Nucifraga columbiana*), Philadelphia Vireo (*Vireo philadelphicus*), Black-throated Green Warbler (*Dendroica virens*), and Mourning Warbler (*Oporornis philadelphia*). Records of an additional 10 species constitute significant range extensions within the territory. This annotated list provides a valuable contribution to our knowledge of the avifauna within this remote and poorly studied region of boreal Canada.—Bruce G. Peterjohn.

74. World inventory of avian anatomical specimens: geographical analysis. D. S. Wood and M. A. Jenkinson. 1984. A.O.U. and Oklahoma Biological Survey, Norman, Oklahoma. 290 p.—Thanks to 2 previous volumes (both Wood et al., A.O.U. and Oklahoma

Biological Survey, 1982) one can easily determine the number of skeletal and alcoholic specimens available for any avian species and at which museums these are located. These straightforward and immensely useful lists encourage efficient use of existing specimens and indicate the most appropriate type of preparation for new material. Wood and Jenkinson have a world view; it doesn't matter where specimens are located as long as adequate specimens exist somewhere.

The current volume approaches the same problems from a new direction: instead of museums, geographical regions are inventoried. The authors have divided the world into 60 non-overlapping areas and detailed the seasonal status of all avian species within each area. As a result, 2 sorts of contributions are made. First, there is the anatomical inventory. For each of 3 basic areas of the world (New World; Old World incl. Africa; Australasia, the Orient, and the Pacific Islands) roughly 80 pages detail anatomical specimen representation in many subregions. Secondly, the volume presents a compact (1 volume), up-to-date world summary of avian distributions. This should be of general interest to ornithologists. The compilation of these volumes must have been an enormous effort; the ornithological community is in the debt of the authors for their labors.

This acknowledged, I confess to frequent frustration in using the geographical analysis. The data, made readily available, are intriguing and tantalizing, but because of several aspects of the presentation, it is difficult to go as far with it as one might like.

For one thing, there is little synthesis. One gets the sense of this being merely the data for a paper not seen. In point of fact, the authors note that an article submitted to the Auk provides further analysis. It is my strong opinion that this volume is the place for analysis, possibly to be summarized elsewhere as well.

One might wish to know, for example, the proportion of each region's avifauna that is represented by anatomical specimens, thereby indicating those regions of the world most in need of further collecting. Such information, easily generated and exactly of the sort I expected to find, is not given. A second example relates to the seasonal status of each species, so carefully tabulated on 240 pages of computer-generated matrices. A summary of the proportion of each region's avifauna that is resident, transient, etc., would make an interesting 3-page matrix but is not included here.

A second frustration relates to the type of information that is provided. For example, an intriguing 4-page matrix presents the number of species occurring within each region and the number of species shared between each pair of regions. We see that Madagascar shares 43% of its 231 species with East Africa. New Zealand shares 62% of its 221 species with Australia, 21% with South Africa, and 24% with Argentina and Chile. In fact, every pair of regions shares at least one species. The Brown Noddy (*Anous stolidus*) is the species shared by the Antarctic and Trinidad, and the Northern Pintail (*Anas acuta*) is the species shared between the Antarctic and the Mediterranean countries. Such comparisons are tantalizing, but how would such matrices look if constructed in other, more traditional ways: excluding seabirds; or based only on resident or breeding birds instead of all seasonal classes?

Another set of matrices, on 9 pages, indicates the percentage of each region's avifauna represented by anatomical specimens in each of the originally inventoried museums. Again, species are included in a region's avifauna no matter what their seasonal status. A museum might, for example, be listed as holding a significant percentage of the West Indian avifauna without actually having any specimens from the West Indies, the high figure merely indicating the large number of North American species which occur in the West Indies as migrants. These tables might be usefully duplicated based only on breeding or resident birds.

But these objections are really a tribute to the volume's interest and potential use. Although best included here, further analysis can still be made because the greatest task, the compilation and computerization, has been done. Perhaps the day will come when such information, constantly updated, will be available to other workers on an ornithological computer "bulletin-board." In the mean time, this volume and its predecessors present much to work from. Based on these volumes, one can estimate that roughly 20% of the world's avian species are unrepresented by a skeleton specimen and over 25% are unrepresent-

sented by an alcoholic specimen. Collecting permits are difficult to obtain in most parts of the world, but the rewards are important, as these useful volumes emphasize. Many libraries and individuals will want these volumes and no natural history museum should be without them.—Peter F. Cannell.