

ABSTRACTS OF PAPERS ON SHOREBIRDS PRESENTED AT MEETINGS

ABSTRACTS OF PAPERS PRESENTED AT THE ANNUAL MEETING OF THE AMERICAN SOCIETY OF ZOOLOGISTS, SEATTLE, WASHINGTON, 27-30 DECEMBER 1980.

Incubation capacity as a limiting factor of shorebird clutch size

by S.Hills, Univ. of Washington, Seattle.

A fifth egg was added to each of 21 nests of 4 species of shorebirds (Charadrii) in Wales, Alaska, during the breeding seasons of 1978 and 1979. An average of 2.62 young were hatched per experimental nest with all possible eggs hatching in only 8% of the nests. The 50 controls produced an average of 3.88 young per nest with all possible eggs hatching in 88% of the nests. Incubation temperatures of eggs in different positions within an experimental five-egg clutch of Spotted Sandpiper *Actitis macularia* were measured with a thermo-couple imbedded in a paraffin-filled egg and ranged from 27.8° C. to 35.4° C.; this work was done in Seattle, Washington, May 1980. Addition of the fifth egg results in a much less compact, usually asymmetrical arrangement and uneven heating of the entire clutch. An individual egg may be in the "cold" position long enough to kill the embryo or just long enough to slow development making synchronous hatching impossible and significantly reducing the number of young hatched per nest.

The effect of sand grains on feeding by shorebirds on a Southern California mudflat

by M.L.Quammen, Univ. of Cal., Irvine and Univ. of Cal., Santa Barbara.

Field experiments using exclosures showed that 3 species of shorebirds which feed in the top few cm of substrate reduced their invertebrate prey in muddy benthic substrates but not in sandy-mud substrates. Experimental additions of small amounts of sand to plots of mud made at the muddy location significantly reduced the time spent feeding by shorebirds compared to adjacent areas with no added sand. The treatment had no effect on the numbers of prey over the time of the experiments (2 and 3 days). I propose that the reduction in feeding time on the sandier plots resulted from lowered success in prey capture where the prey were intermingled with inedible particles of the same diameter. This interpretation is consistent with the shift toward larger species of shorebirds taking larger prey or picking prey off the surface on sandier substrates.

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ABSTRACTS OF PAPERS PRESENTED AT THE 1981 MEETING OF THE AMERICAN ORNITHOLOGISTS' UNION, HELD IN EDMONTON, ALBERTA, 24-27 AUGUST 1981.

Sex difference in breeding behaviors of Killdeer, *Charadrius vociferus*.

by Terrence R. Mace, Department of Zoology, University of Montana, Missoula, MT 59812

I observed the behaviors of a pair of Killdeer during three one-hour periods spaced evenly throughout each day of a successful reproductive effort. My observations were alternated daily between the nesting area and a nearby flood pond, frequently used by the breeding pair. During each observation period, I recorded the amount of time each individual spent in feeding, aggressive, sexual, maintenance, and incubation or chick care behaviors, as well as the amount of time present on the area. Both individuals took approximately equal responsibilities in the aggressive behaviors to maintain their territories, one around the nest and one at the flood pond, occupied after hatching. Incubation, though shared, is more dynamic. The male spent more time incubating than the female both early and late in the 26 day period and the female did the vast majority of the incubation in the middle of the incubation period. After hatching, the female was far more attentive than the male toward the precocial chicks.

The effect of a predator on Sanderling winter spacing behavior

by J.P.Myers, Museum of Vertebrate Zoology, University of California, Berkeley, CA 94720.

To make it through the winter, Sanderlings must find food and avoid being eaten. Observations on the response of Sanderlings to the presence of a Merlin emphasize the primacy of avoiding predation in the control of winter spacing behavior. When a Merlin is present, Sanderlings stop territorial defense even though feeding conditions are unchanged. Flock sizes increase from 10±3.5 birds/flock to 31±8 birds/flock. Flocks become tighter, with a higher proportion of birds occurring in flocks characterized by inter-individual distances of 1 m or less. Finally, home range size of nonterritorial Sanderlings increases in the presence of a Merlin. With no predator, 90% of a nonterritorial bird's activity is contained within 1500 m of beach; with a predator, 90% occurs within 3000 m of beach.

Sexual selection and philopatry in the polyandrous Spotted Sandpiper

by L.W.Oring, D.B.Lank and S.J.Maxson, Department of Biology, The University of North Dakota, Grand Forks, ND 58202.

Sexual selection theory leads one to predict that some aspects of the sex roles of polyandrous birds will be reversed from those of polygynous species. In those species expressing Resource Defense Polyandry or Male Access Polyandry, males do most or all of the incubating and brooding, and females are more aggressive -- a situation which is the reverse of the polygyny norm. Other traits, such as dispersal, also might be reversed. We present here data from an 8-year study of Spotted Sandpipers (*Actitis macularia*) which, for the first time, provide a look at philopatry and arrival schedules in a species with a Resource Defense Polyandrous mating system.

Survival, site tenacity, and philopatry of Long-billed Curlews (*Numenius americanus*) breeding in southwest Idaho.

by Roland L. Redmond and Donald A. Jenni, Department of Zoology, University of Montana, Missoula, MT 59812.

Long-billed Curlews are large scolopacid shorebirds that breed monogamously on short grass rangelands in western North America. During the 1977-1979 breeding seasons, we color-marked 42 adult Curlews and 270 chicks. Observations of marked individuals during the 1978-1981 breeding seasons enabled us to estimate annual adult survival and to document site tenacity and philopatric tendencies for this population.

Site tenacity was more variable and generally lower in magnitude than adult survival each year. Curlews color-marked as chicks were never sighted on the breeding grounds as yearlings. Males were the more philopatric sex and did not attempt to breed until their third year. Females may begin breeding at two years of age. Demographic implications of these results will be discussed.

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Habitat requirements of Long-billed Curlews (*Numenius americanus*): Vegetative characteristics.

by Thomas K. Bick and Donald A. Jenni, Department of Zoology, University of Montana, Missoula, MT 59812.

We observed breeding Long-billed Curlews during 1976, 77, 78, 79 and 81 at five locations in North America; the Nebraska Sandhills, the Black Canyon, Crane Creek and Kuna Planning Units in Idaho, and southeastern Phillips County, Montana. Topography and physical structure of the vegetation are superficially similar on these areas, however, plant species composition and importance are different. Curlew numbers are not related to plant species composition or importance, but are significantly, negatively correlated with vegetation height and vertical coverage. Curlew pairs require about 15 hectares of short vegetation on rolling topography for establishment of nesting territories. Curlews also need areas of taller (> 3.0 dm) vegetation or frequent small (< 0.5 ha) patches of bunch grasses which provide chicks with refugia from predators. Breeding Curlews use areas surrounded by similarly suitable habitat that function as a buffer against disturbance.

The evolution of Avian Polyandry: Two hypotheses.

by Walter D. Gaul, Douglas W. Mock and Scott R. Derrickson, Colorado Division of Wildlife, 317 W. Prospect, Fort Collins, CO 80526 and Department of Zoology, University of Oklahoma, Norman, OK 73069, and Endangered Species Program, Patuxent Wildlife Research Center, Laurel, MD 20811.

We previously suggested that polyandry may be an adaptation associated with extreme fluctuations in food levels. Maxson and Oring rejected this concept with respect to the Spotted Sandpiper (*Actitis macularia*). Alternatively, they concluded that the polyandrous mating system of the latter species has been derived from monogamy under conditions of high food availability and relatively high nest loss rates. Based upon their Spotted Sandpiper data and incomplete comparative data, we propose that their conclusion is premature.

Wintering behavior and site-faithfulness of American Golden Plovers (*Pluvialis dominica fulva*) in Hawaii.

by Oscar W. Johnson, Patricia M. Johnson and Phillip L. Bruner, Department of Biology, Moorhead State University, Moorhead, MN 56560, and Natural Sciences Division, BYU-Hawaii, Laie, HI 96762.

Adults began arriving on the wintering grounds in August; juveniles did not appear until late September. The wintering population consisted of territorial and non-territorial birds in approximately equal proportions. Daily behavior of 37 color-banded individuals was chronicled until spring migration in late April. Each territorial plover aggressively defended a specific territory during day-light hours for the entire wintering cycle. Nocturnal roosting was communal on nearby small islands. Some juveniles of both sexes established territories, but most territory holders were adult males. In fall of 1980, 30 of the 37 marked birds (81 percent) returned to the study area. Each returning individual behaved as it had during the previous winter: in all, 16 territorial and 14 non-territorial. Moreover, each of the territorial birds reoccupied the same territory it had defended previously.

Nesting success of the Whimbrel (*Numenius phaeopus*) in relation to habitat.

by Margaret A. Skeel, 7648-172 Street, Edmonton, Alberta T5T 0J6

Nesting success, determined from egg loss, of the Whimbrel near Churchill, Manitoba was significantly higher in hummock-bog habitat (82.8%, n=33) than in sedge-meadow (66.7%, n=19) or tundra (44.0%, n=7) habitats. Nesting density was also considerably higher in the hummock-bog habitat where it averaged 0.11 pairs/ha compared to from 0.01 to 0.06 pairs/ha in the other two habitats. Predation by the Herring Gull was the main source of egg loss. Predation was lowest in the hummock-bog habitat probably because of effective protection through joint effort by several pairs and enhanced crypticity of the nests in this structurally more complex habitat. Of the three habitat types, the return rate of banded Whimbrels was highest in the hummock-bog habitat where a high proportion of birds re-nested to within 70 to 476 m of their previous nest-site.

Exploiting prey in a patchy environment: A field study of Black Oystercatchers foraging in the Rocky Intertidal.

by Sarah Groves, Dept. of Zoology, University of British Columbia, Vancouver, B.C., V6T 1W5 (Present address: 2228 Bowness Road N.W., Calgary, Alberta, T2N 3L3)

Animals foraging in patchy environments solve three problems as they forage: 1) what prey to take (prey choice), 2) where to forage (patch choice), 3) how to allocate foraging time between patches (patch switching). Ecological theory has addressed all three of these foraging problems, and insights into strengths and weaknesses of this theory may be gained by asking how well foraging behaviour of animals in the field is predicted by theory. Here, results of a study of black oystercatchers foraging in the rocky intertidal are used to do this and the following conclusions drawn. 1) As predicted by theory, Black Oystercatchers became more selective in their choice of prey as prey abundance increased. 2) Contrary to theoretical predictions, relative prey profitabilities in different patches were not reliable predictors of patch choice by foraging Oystercatchers, and 3) Oystercatchers did not allocate foraging time among patches or switch patches according to a quantitative rule such as the "marginal value theorem".

ABSTRACTS OF PAPERS ON SHOREBIRDS GIVEN AT THE COOPER ORNITHOLOGICAL SOCIETY ANNUAL MEETING, FALLEN LEAF LAKE, CALIFORNIA, 9-12 MAY 1981

The prebasic molt of Wilson's Phalarope, or losing your shirt at Mono Lake

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For most shorebirds the prebasic molt is a protracted process, beginning on the breeding grounds and terminating 3-4 months later in wintering areas. Wilson's Phalarope is different. This phalarope evidently undertakes a molt migration, as has been reported in many waterfowl, to areas of incredible prey abundance, where virtually the entire prebasic molt can be completed in as few as 35-40 days. One such area is Mono Lake. The presence of unique alkali lakes in the Great Basin seems a dominant factor in the evolution of this pattern.

Annual variation in breeding and post-breeding shorebird numbers in Arctic Alaska

Peter G. Connors, Kimberley G. Smith and J.P. Myers, Bodega Marine Laboratory, University of California, Bodega Bay, CA 94923, and Museum of Vertebrate Zoology, Berkeley, CA 94720.

We measured shorebird density for 3 to 5 years at 3 sites in Arctic Alaska: Barrow and Atkasook breeding tundra and Barrow littoral habitat. For most species, densities were highest on tundra transects during the breeding period and on littoral transects after breeding. Littoral densities did not correlate with tundra breeding densities at either site. Neither breeding nor post-breeding densities correlated with temperatures during the breeding season, but late summer temperatures correlated with migrant densities of some species. Littoral post-breeding densities of 2 groups of shorebirds varied together over 4 years. Dunlin, Pectoral, Semipalmated and Western Sandpiper formed one group; Ruddy Turnstone and Red Phalarope formed another. Our results indicate that annual variation in numbers of post-breeding migrants on littoral transects represents more than local breeding density fluctuations.

Post-breeding habitat selection of birds at Barrow, Alaska

Kimberley G. Smith, Peter G. Connors and Carolyn S. Connors. Bodega Marine Laboratory, University of California, Bodega Bay, CA 94923.

We censused 22 transects from approximately mid-July through mid-September during 1975, 1976, 1977 and 1978 at Barrow, Alaska. A total of 56 species were observed, of which 31 were fairly common in all 4 years. We measured 6 habitat variables along each transect and principal component analysis of these data confirmed our subjective conclusion that our transects represented 3 habitat types: gravel beach, littoral flats, and slough edge. Plotting the density of the 11 most common species in the habitat space defined by the PC analysis demonstrated that different species respond differently to these 3 habitat types. Ordinating the transects bases on the presence or absence of bird species generally confirmed that the 3 habitat types attract different suites of birds. This principal coordinates analysis of bird distribution gave similar results using both all 56 species and only the 31 common species. Our analysis shows the importance of these 3 different habitat types to post-breeding birds along the arctic coastline.

Do Sanderlings have friends?

J.P. Myers, Museum of Vertebrate Zoology, University of California, Berkeley, CA 94720.

Persistent associations between individuals can lead to elaborate social interactions and also set the context for arcane patterns in natural selection. I studied Sanderling flock composition to determine if individuals remain together in flocks through time. My results indicate that Sanderling winter flocks undergo frequent changes in composition and that no associations between individuals persist. Sanderling flocks are thus best viewed as an anonymous mob whose composition at any given time is largely determined by individual movement patterns rather than group cohesion.

Site-fidelity and nomadism in wintering Sanderlings

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We examined site-fidelity in a population of wintering Sanderlings by measuring turnover rates of marked individuals through 2 successive winters at Bodega Bay, California. Turnover rates were high in early fall and rose again in spring. Through winter fewer than 15% of marked individuals changed between successive 2 week periods. Part of this seasonal pattern resulted from arrival and departure in migration. More important, however, were changes in site-fidelity of individuals wintering at Bodega Bay. Birds wandered regionally in August and September after returning from the breeding grounds, and also during periods of intense winter storms. These movements carried individuals up to 200 km from Bodega Bay, but more typically 20-30 km distant. These results indicate that considerable interchange occurs among Sanderling winter populations during some times of year. Changes in resource distribution and stability probably underlie seasonal patterns in nomadism.

Why do shorebirds go out with the tide?

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Many shorebirds adjust their foraging positions to follow the outgoing tide. We tested two hypotheses for this pattern: (1) that feeding conditions improve as the tide line reaches lower levels; or (2) that feeding conditions deteriorate at sites as they become exposed and desiccate. We made repeated censuses along transects perpendicular to tidal flow to verify that shorebirds on sandflats at Bodega Bay, California, follow the general pattern. We then estimated caloric intake rates at different sites on an outgoing tide, first as the tide line passed over them, then 2 hours afterward. Caloric intake rate estimates were based on regression equations derived in previous laboratory experiments with Sanderlings that related prey capture rates to substrate penetrability and prey depth, size and density. Prey

capture rates were then converted to caloric intake rates based on prey biomass. Our results support hypothesis 1 and indicate that feeding conditions improve largely because of increased invertebrate densities at lower tide levels.

ABSTRACTS OF PAPERS PRESENTED AT THE SOUTHEASTERN COASTAL AND ESTUARIES BIRDS CONFERENCE IN GEORGETOWN, SOUTH CAROLINA, 11-13 SEPTEMBER 1981

Use of the Atlantic high marsh by migrating shorebirds.

by Marshall A. Howe, Migratory Bird and Habitat Research Laboratory, U.S. Fish and Wildlife Service, Laurel, Maryland 20708.

Shorebirds migrating along the Atlantic coast encounter a variety of habitats potentially suitable for feeding and roosting. Most studies have focussed on utilization of intertidal feeding areas. In the present study, I examine patterns of use by five species of shorebirds in marsh habitats above mean high tide level, the zone known generally as the high marsh. Censuses show that populations of most species cycle with respect to tide, showing peaks in the high marsh around high tide. However, the magnitude of this response varies among species, and these variations correspond to the degrees to which this zone is used as a prey source. For small species, such as the Semipalmated Sandpiper, a significant portion of the diet may come from the high marsh. Preliminary information on prey choice is presented. Structured censuses to determine the relationship between bird numbers, water conditions, and vegetation structure were also conducted. The results of these censuses suggest that some species prefer large areas of shallow water, while others show little discrimination with respect to size of open areas or selection against large areas. The results are discussed in the context of assessing the significance of high marsh habitats for migrating shorebirds.

The ecology of wintering Sanderlings at Bodega Bay, California: An overview.

by J.R.Walters¹, J.P.Myers² and F.A.Pitelka², ¹Zoology Department, North Carolina State University, Box 5577, Raleigh NC 27650. ²Museum of Vertebrate Zoology and Bodega Marine Laboratory, University of California, Berkeley, CA 94720.

We have studied the ecology of Sanderlings wintering at Bodega Bay, California since 1974. Our initial investigation of spacing behavior has blossomed into an intensive study of a variety of issues related to wintering behavior, including the following: (1) population structure: individuals are basically site-faithful, both between years and within a year, but wander regionally at times, especially in early fall and spring, and following intense winter storms. (2) flock structure: associations between individuals are not persistent; flocks are anonymous mobs rather than discrete social units. (3) foraging efficiency: laboratory experiments indicate rate of prey intake depends on substrate penetrability and prey size, depth, and density. Field data from open beach habitat show a tight relationship between these parameters, beach profile, and Sanderling use. (4) spacing behavior: territoriality occurs only within a particular range of feeding conditions, but the presence of a Merlin wintering in Bodega Bay precludes territoriality regardless of feeding conditions, and affects flock structure in several ways. Our experience exemplifies the perils of studying particular issues in isolation. Only by studying many components of wintering ecology have we achieved some understanding of any of them.

Effects of shorebird predation on intertidal invertebrates.

by J.R.Walters¹, J.P.Myers² and F.A.Pitelka². ¹Zoology Department, North Carolina State University, Box 5577, Raleigh NC 27650. ²Museum of Vertebrate Zoology and Bodega Marine Laboratory, University of California, Berkeley, CA 94720.

We repeatedly censused shorebirds foraging along two line-transects located in an intertidal sand-flat in Bodega Bay, California, and took core-samples to determine the distribution and abundance of the benthic invertebrates on which the birds fed. Based on regression equations derived from laboratory experiments with Sanderlings, we converted prey depth, size, and density, and substrate penetrability to estimates of bird caloric intake rate. Bird use of the transects was then related to estimated intake rate. Most shorebirds followed the tide line closely when foraging. Our intake rate estimates suggest that this was due to improvement in feeding conditions as the tide line reaches lower tide levels, primarily because of increased prey densities, rather than deterioration of feeding conditions at sites as they desiccate following exposure. Caloric intake rates declined over the winter due to changes in prey abundance and prey size. An enclosure experiment suggested that this decline was attributable in part to depletion of prey wrought by shorebird predation. Predation pressure varied with tide level. These results have important implications for the evolution of invertebrate communities, as well as the ecology of wintering shorebirds.