

ABSTRACTS OF TALKS ON SHOREBIRDS AT THE AOU MEETING, SAN FRANCISCO, CALIFORNIA, 10-13 AUGUST 1987

Assimilation efficiency of Sanderlings (*Calidris alba*) feeding on Horseshoe Crab (*Limulus polyphemus*) eggs

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Millions of shorebirds of several species concentrate in Delaware Bay (New Jersey) during their spring migration. Their arrival coincides with the emergence of hundreds of thousands of Horseshoe Crabs (*Limulus polyphemus*) that lay their eggs on the beach. Sanderlings (*Calidris alba*) feed upon this superabundant resource, shifting from their usual worldwide intertidal, invertebrate diet. I estimated the assimilation efficiency of Sanderlings when feeding on this particular food and compared it with a standard food type (mealworms). While the assimilation efficiency on mealworms is within normal ranges, the assimilation efficiency on horseshoe crab eggs is very low (39%) when compared with efficiencies of other birds feeding on animal foods. Sanderling's choice of this diet is probably due to the extremely high abundance of this resource, regardless of its digestive properties.

Seasonal changes in space use patterns of individual sanderlings

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Sanderlings show strong philopatry to their wintering grounds. However, site fidelity varies greatly among individuals, seasons and years. Timing of arrival and departure of winter residents from Bodega Bay is diverse: patterns range from an individual arriving as early as mid-July and remaining until April, to a bird not returning until November and departing as early as February. In large part, this is due to seasonal movement to other beaches in the region. At one extreme, this may simply reflect adjustments to spatiotemporal variability in resource availability. In contrast, it may reflect traditional movement patterns learned in an individual's first winter, or it may be a consistent function of age or sex classes.

Endocrinological analysis of sandpiper social systems: 1. Testosterone

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I examined the relationship between circulating testosterone (T) levels and social system in two species of sandpipers breeding sympatrically near Churchill, Manitoba. Semipalmated Sandpipers (*Calidris pusilla*) are monogamous and territorial. Both parents incubate equally. Red-necked Phalaropes (*Phalaropus lobatus*) are polyandrous and non-territorial. Only the male phalarope cares for eggs and young. Contrary to results from previous studies that attempted to measure gonadal levels of steroids, female phalaropes here had significantly lower circulating T

levels than male phalaropes. In fact, levels of this hormone were similar in females of both species. Levels of T generally declined throughout incubation in all birds. However, male Semipalmated Sandpipers seemed to maintain higher levels than male phalaropes during incubation. This may be related to the territorial behaviour of Semipalmated Sandpipers. In 1986, harsh weather conditions and low food availability resulted in only half of the normal breeding densities of both species. It is possible that the lower T levels found later in the season in 1986, compared to 1985, are a reflection of this.

Distribution and dispersal in the Piping Plover (*Charadrius melodius*)

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Recently, explanations of dispersal patterns have compared the somatic costs/benefits of competition for local resources with the genetic costs/benefits of inbreeding. While these factors may play a critical role in determining dispersal patterns, distribution of habitat is a factor that also must be considered. To address the issue, I studied dispersal patterns of juvenile and adult Piping Plovers for five years in Manitoba, Minnesota, and the Gulf of Mexico. Results of this work, and other Piping Plover studies, indicated few juveniles of either sex returned to natal sites to breed, although areas adjacent to natal sites were used. Most adults returned to former breeding sites; male and female patterns did not differ significantly; and non-fidelic adults used adjacent breeding sites, if they were available. Patterns observed within the species varied as greatly as among species patterns. Habitat distribution provided a partial explanation.

Inland migration of shorebirds in central Michigan

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Seasonal occurrence and variations in the abundance of migrant shorebirds were observed at a freshwater inland pond in the central lower peninsula of Michigan from 1985 - 1987. Eighteen species utilized the habitat including 13 species during spring migration and 17 species during fall migration. The greatest proportion of observations of spring migrants included Lesser Yellowlegs, Pectoral Sandpipers, and Dunlins, while Killdeer and Common Snipe constituted the greatest proportion of fall migrants. Repeated use of adventitious stopover sites suggests that reliable food may provision segments of shorebird populations outside major migratory routes.

A stochastic model for coordination of turning in avian flight flocks

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Leadership models for the initiation and coordination of turning in cluster-flock flying birds (blackbirds, small shorebirds, etc.) present difficulties in selection and location of the leader, and the medium of the leader's turn command. I present a model, based on John H. Conway's computer game of *Life*, which would generate a turn and end it in a flock of closely-flying birds, without a leader. The model assumes each bird in the flock will follow a few simple rules, and be influenced by the behavior of its neighbor. The model would explain commonly observed flight flock behavior like straggling, and splitting of the flock.

The Eskimo Curlew (*Numenius borealis*) and the Little Curlew (*Numenius minutus*) - recent history and prospects for conservation

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The Eskimo Curlew is one of the most endangered birds in the world. This paper analyzes sighting reports from 1980 to the present. Tom Barry's search for nests in the Anderson River area of Canada from 1981-1984 is included.

The Little Curlew is also considered endangered; but not as rare as the Eskimo. It has many characteristics in common and may be a subspecies. Field work by Boris Veprintsev in 1978 captured the courtship of the species on film and tape.

On the basis of this recent work an examination of the prospects for survival of both species was conducted. They are fully covered by all applicable international and national laws. Neither faces a threat to its breeding grounds or non-breeding habitats. No other major problems are currently known to exist.

Several species of *Numenius* have been held in captivity in the past, but none have ever bred. There is no information on their management requirements. The two species show a high degree of tolerance for humans. This and their broadly based diet leads to the prospect of captive breeding by natural or artificial means.

Flock size, vigilance, and predator detection in wintering shorebirds

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Flocking may reduce an individual's risk of predation by enhancing the likelihood that an approaching predator will be detected before it can strike. Individuals may exhibit one of two types of vigilant behavior with regard to flock size: (1) they may adjust their personal vigilance efforts according to flock size so as to maintain a constant level of flock awareness, or (2) they may invest a fixed amount of effort in vigilance activities regardless of flock size, resulting in a positive relationship between flock size and awareness. I examined the scanning behavior of wintering sandpipers (*Calidris* spp.) as a function of flock size, and related this to

their ability to detect approaching Merlins (*Falco columbarius*) in a three-year study at Bolinas Lagoon, CA. Individual scan rates and the proportion of time devoted to scanning were highly variable and were unrelated to flock size. The proportion of "early" responses to Merlins increased with flock size, while that of "late" responses decreased. Correspondingly, the ability of Merlins to surprise a flock and capture a bird was an inverse function of sandpiper flock size.

Do females prefer large leks: an experimental study in Ruff (*Philomachus pugnax*)

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We tested whether lek size affected the relative attractiveness of sites to passing females and males. Twin aviaries were constructed 35 m apart in nesting habitat of Ruff, a lekking shorebird. The aviaries were stocked with 0-4 adult males each, and the responses of passing flocks of Ruffs (1-5 birds) were scored for aviary preference, if any. Fifty-eight of the 67 groups of Ruffs seen flying by the aviaries approached, circled, or landed. There was a fixed preference for one aviary over the other, probably due to its closer position towards a shore. However there was also a preference for whichever aviary contained more males. Most of the shore-bias occurred in passing flocks of males; flocks containing females showed a size effect most clearly. When a male joins a lek, it may both decrease the proportion of matings available to other males and increase the total pool available to the group.

Breeding habitat use of American Oystercatchers (*Haematopus palliatus*) along the United States east coast

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Flexibility of American Oystercatcher (*Haematopus palliatus*) breeding habitat use was examined at marsh habitats in New York, New Jersey, and North Carolina. General habitat use varied between states. In North Carolina birds nested on sand on marsh habitats but in New York and New Jersey birds nested on sand, wrack and grass. The number of nest site use characteristics that differed significantly between New York and North Carolina was 71%, between New York and New Jersey 29%, and between New Jersey and North Carolina 43%. General habitat use varied within the New York study site where birds preferred nesting on marsh islands rather than barrier islands, and on islands with large areas of sand. Nest site selection was examined in New York by comparing nest characteristics to random sites about the nesting area. Of nest characteristics measured 75% were significantly different from random. The birds were selecting habitats which: 1) had a base of sand or wrack rather than grass, 2) were greater distances from the water, and 3) were higher in elevation in comparison to random locations. Nesting on higher sand areas is an important adaptation because it provides protection against tidal flooding.

Life-history variation in the oystercatchers: competition for food?

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Five of the eleven purported species of oystercatchers are black and the remainder are pied. Black oystercatchers are large (> 700 g) whereas pied oystercatchers are small (< 550 g). No black oystercatchers, except *Haematopus bachmani* regularly have clutches of greater than two eggs. For all 'species' the relationship between egg-size and body size is about 7%. All species except *H. ostralegus* have similar maximum growth rates. In general, black oystercatchers breed on dark, rocky shorelines in higher densities than pied species and feed on limpets. Pied species breed on pebbled or sandy beaches and feed on bivalve mollusks. The hypothesis that differences in life-histories between black and pied oystercatchers are due to greater competition for food in black species is evaluated and weakly supported.

Lekking versus solitary display: temporal variations on a theme in the Buff-breasted Sandpiper

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Immediately upon their arrival to the arctic tundra breeding grounds, male buff-breasted sandpipers display on small, contiguous, non-resource based territories. During the first three days of lek occupancy, display territories remain small and the majority of matings take place. There is a high mating skew among males. By the fourth day, most males begin to abandon the lek but those that remain expand their display territories to include areas chosen by females for nesting. Statistically, dispersion changes from clumped to regular (i.e., dispersed) on the sixth day after initiation of display. Solitary males successfully mate; it appears that they mate with females that have lost their first clutch of eggs. The change in dispersion in males correlates with changes in movements of females: on arrival, females move over large areas and are generally in groups; once nesting begins, they move solitarily and over smaller areas. These patterns are most consistent with a hotspot model of lek evolution in this species.

Population structure and use of local resources by wintering Dunlin

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Predation by an unusually large population of dungeness crabs in Bodega Harbor, CA in 1985 drastically depressed populations of small invertebrates upon which shorebirds forage. Shorebird populations subsequently exhibited changes in seasonal abundance patterns, distribution and behavior. Physiological condition of Dunlin, *Calidris alpina*, was poorer at this site than at other unaffected sites, and pre-nuptial molt was delayed. Substructure was evident within regional and local populations, with clear differences in degree and timing of movements among alternate

coastal foraging sites. Population groups that differed in area-use patterns also differed in physiological condition, even among groups which overlapped in foraging areas. Population structure was evident at several different scales, including within a single night-time roost. The reasons for this substructure, the mechanisms by which it develops and is maintained, and its significance to local populations present a complex puzzle which we are attempting to solve.

Habitat use and population ecology of Piping Plovers in the northern Great Plains

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In central North Dakota, Piping Plover nesting beaches were significantly wider than unoccupied beaches. Nesting areas differed from unoccupied sites in the distribution of vegetation and gravel abundance and distribution. Alkaline lake beaches used by nesting plovers were characterized by sparse, highly clumped vegetation and abundant widely distributed gravel substrates. Territories with successful nests had less vegetation that was more clumped than unsuccessful territories. Nests placed on gravel had a higher success rate than those on salt-encrusted substrate. Predation was the greatest threat to nests. There were 1.48 chicks fledged per pair in 1984, 1.04 in 1985, and 0.46 in 1986. Based on our data and those from other studies in the northern Great Plains, Piping Plover reproductive success may be insufficient to maintain a stable population in this region.

Effects of prey density, substrate quality and biogenic tube density on feeding success by dunlin (*Calidris alpina*)

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The dunlin is a small sandpiper that finds prey by tactile probing in the sediments of bays, estuaries, and ponds. Experiments with captive birds were conducted to examine the effect of prey density, substrate particle size, and density of infaunal *Phoronopsis viridis* tubes on prey capture rate. Mealworms were buried to a constant depth in three densities, five sediment types, and with three densities of tubes, and the number of prey taken in 90 seconds was recorded. Capture rate increased with increasing prey density and decreasing particle size. In addition, invertebrate tubes had a negative effect on capture rate. These results suggest that dunlin should select sites of low tube density and small grain size (for a given prey density) to maximize foraging success. The relationship between density of feeding dunlin and these manipulated factors is presently being studied in the field.

The effects of Semipalmated Sandpiper predation on prey demography in the upper Bay of Fundy

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The majority of Semipalmated Sandpipers breeding in eastern and central Canadian tundra utilize the upper Bay of Fundy as a stopover

area during fall migration. Most sandpipers spend about two weeks in the upper Bay, doubling their weight in preparation for a non-stop migration to wintering grounds in South America. The prey of the shorebirds is primarily the amphipod crustacean, *Corophium volutator*. Experiments were performed to test the effects of shorebird and fish predation on *Corophium* abundance and demography. In July and August, the exclusion of fish and especially shorebirds resulted in a tripling of *Corophium* biomass but a decline in abundance relative to

controls. Populations within cages were composed mainly of adults while control populations consisted mostly of small juveniles. This pattern is explained as an interaction of size-selective predation on large amphipods and intraspecific competition between adult and juvenile *Corophium*. The addition of large *Corophium* to ambient densities resulted in a decrease in the density of small *Corophium*, supporting the claim that size-selective predation mediates intraspecific competition in *Corophium*.

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