SEASONAL ABUNDANCE AND HABITAT USE PATTERNS OF SHOREBIRDS AT TWO SITES IN NORTHERN ALASKA

by J.P. Myers and F.A. Pitelka

Since 1975 we have studied the tundra shorebird community at two sites on the Arctic Coastal Plain of northern Alaska. One study site lies adjacent to the Arctic Ocean near Barrow (71°18'N 156°42'W) while the other is approximately 100 km to the south towards the Brooks Range foothills, at Atkasook (70°27'N 157°19'W). The main focus of our research has been to compare the abundances and habitat use patterns of different wader species at these two locations. We shall report briefly here on two broad trends in the results that highlight seasonal habitat shifts at each site coupled with a large-scale annual movement toward the coast of shorebirds breeding along the interior of the Alaskan North Slope.

Our methods entail censuses repeated every 5 days throughout the summer along permanently marked transects. In all, we census 240 ha every census period. Each transect is subdivided into 40 small (50 x 50 - m) units, all of which have been measured for habitat characteristics (see below). During the censuses we record each bird observed within a unit, so that in the analysis we can assign it the habitat values determined for that unit. This allows us to follow seasonal patterns in habitat use, to compare species, and to examine inter-year differences.

Part of the habitat analysis involves a multivariate statistical technique, factor analysis, that summarises the 14 habitat variables we measure in each transect unit as a reduced number of habitat gradients. We shall discuss the statistical details elsewhere (see also Cattell 1965, Ferns 1978) but simply describe the outcome here to allow the discussion below. The two main gradients revealed by the analysis were a polygonisation gradient and a pondiness gradient. The first, polygonisation, describes variation in the development of tundra polygons (Britten 1957), topographic relief, and drainage: a transect unit ranking low along this gradient (negative values, Figure 1) is flat and poorly drained, whereas units ranking high are well-drained with strong polygonisation. The second gradient describes variation in the development of ponds: a transect unit ranking low (negative values in the pondiness dimension, Figure 1) would contain no ponds, while units ranking high contain a high proportion of surface area given over to ponds.

Together, the two gradients described above define a two-dimensional habitat space used by shorebirds at our study sites. This space is represented in Figure 1, where we have plotted the density of shorebirds (all species, birds per ha) as a surface, with the height of the surface indicating bird density. Outside of the lowest contour line, labelled 0, lies a large, flat region of hypothetical habitat space that actually did not exist at one or the other of the sites; its implied existence in the figure is a graphical artifact. (Note, this is true for 9 of the 10 surfaces; in the lower right, bird density fell to 0 within a few areas of real habitat space, as can be seen by comparing it with the others). Figure 1 pools 4 years of data from Barrow and 3 years from Atkasook with a total of 15,736 waders recorded on the transects. Wader species occurring on the central arctic Alaskan Coastal Plain and their status are indicated in Table 1.

Table 1. Shorebird species found on the central arctic Alaskan Coastal Plain (C, common; U, uncommon; R, rare)

	Barrow	Atkasook
Breeders		
Black-bellied Plover *Pluvialis squatarola*		C
American Golden Plover *Pluvialis dominica*	C	C
Semipalmated Plover *Charadrius semipalmatus*	U	
Ruddy Turnstone *Arenaria interpres*	C	C
Common Snipe *Capella gallinago*	R	
Pectoral Sandpiper *Calidris melanotos*	C	C
White-rumped Sandpiper *Calidris fuscicollis*	U	
Baird's Sandpiper *Calidris bairdii*	C	R
Dunlin *Calidris alpina*	C	C
Semipalmated Sandpiper *Calidris pusilla*	C	C
Western Sandpiper *Calidris mauri*	U	C
Buff-breasted Sandpiper *Tryngites subruficollis*	U	C
Long-billed Dowitcher *Limnodromus scolopaceus*	U	C
Bar-tailed Godwit *Limosa lapponica*		U
Red Phalarope *Phalaropus fulicarius*	C	C
Northern Phalarope *Lobipes lobatus*	U	C
Transients		
Common Snipe		R
Whimbrel *Numenius phaeopus*	R	R
Red Knot *Calidris canutus*	U	
Sanderling *Calidris alba*	C	
Western Sandpiper	C	
Stilt Sandpiper *Micropalama himantopus*	U	R
Long-billed Dowitcher	C	
Bar-tailed Godwit	U	
Hudsonian Godwit *Limosa haemastica*	R	
Vagrants		
Mongolian Plover *Charadrius mongolus*	R	
Killdeer *Charadrius vociferus*	R	
Dotterel *Eudromias morinellus*	R	
Wood Sandpiper *Tringa glareola*	R	
Lesser Yellowlegs *Tringa flavipes*	R	
Wandering Tattler *Heteroscelus incanum*	R	
Polynesian Tattler *Heteroscelus brevipes*	R	
Sharp-tailed Sandpiper *Calidris acuminata*	R	
Curlew Sandpiper *Calidris ferruginea*	R	
Least Sandpiper *Calidris minutilla*	R	
Rufous-necked Sandpiper *Calidris ruficollis*	R	
Little Stint *Calidris minuta*	R	
Ruff *Philomachus pugnax*	R	

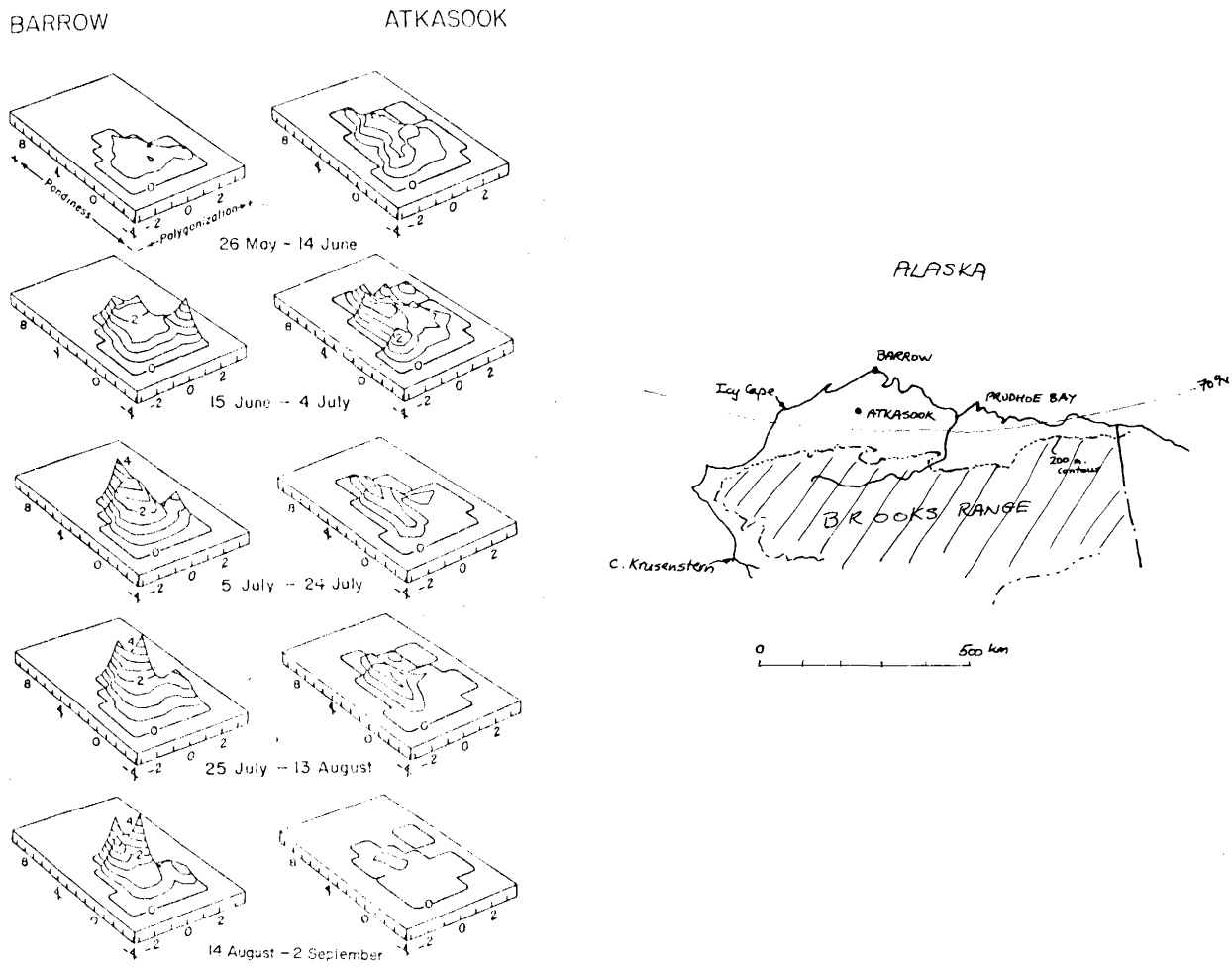

Figure 1. Seasonal changes in density (birds/ha) of shorebirds within different regions of a two-dimensional habitat space, averaged over all years of the study. Surface height indicates bird density: contour lines at 0.5 birds/ha intervals. Habitat space defined by gradients revealed in a factor analysis (see text).

Comparing the surfaces at each site through time reveals gradual shifts in the distribution of shorebirds within habitat space. At Barrow during the first two periods, bird distribution is relatively even. During the height of the breeding season -- the latter part of June at Barrow -- shorebird density ranges between 1 and 2.5 birds per hectare throughout habitat space. Beginning in early July, however, density begins to drop in the polygonised, unponded upland areas (lower right of surface) and it rises sharply in strongly ponded sites with intermediate polygonisation (upper centre of surface). This trend continues at Barrow through mid August, with the density in the most favoured habitats rising to over 4 shorebirds per hectare. By early September (not plotted here), shorebird density drops to under 0.1 birds per hectare during the final stages of fall migration.

The same pattern prevails at Atkasook: through the summer, shorebird activity becomes increasingly concentrated in lowland, ponded areas of habitat space. Except during the breeding season, however, overall density at Atkasook is considerably below levels observed at Barrow.

By early July, shorebird densities at the two sites diverge strongly throughout habitat space. Lying behind this divergence are fundamental differences in the ways that shorebirds use these two areas on the coastal plain tundra. Atkasook is used exclusively for reproduction: local breeders arrive in the first days of June, nest and then depart. We observe no large post-breeding movements of birds into the area and, in fact, do not even witness any pre-departure build-up by local nesters. Barrow, on the other hand, is not only used heavily by breeding birds, but is also a major site for post-breeding accumulations. Beginning with movements of Red Phalarope Phalaropus fulicarius females and Pectoral Sandpiper Calidris melanotos males in late June and early July, a steady progression of birds moves through the area until late August. The first birds are always post-breeding adults, but by late July young of the year form a major component. Juvenile Long-billed Dowitchers Limnodromus scolopaceus along with adult and juvenile Dunlin Calidris alpina close out the Barrow season with a final push in mid August. More detail on some of these waves is provided in Connors et al (1979).

We believe the events at these two sites are typical for much of the North Slope of Alaska. The interior of the coastal plain tundra as well as the Brooks Range foothills are important breeding areas but probably figure little for post-breeding movements. Shorebirds move north and coastward beginning in late June and concentrate within a coastal belt. Peak densities within this belt are probably reached by mid to late July but may be maintained throughout the first half of August, at least within preferred habitats.

The spatial limits of the post-breeding coastal corridor are poorly understood. Reports from other studies (Connors and Risebrough 1976, 1977, S.G. Jones pers. comm.) as well as our own observations away from the Barrow-Atkasook area indicate that the corridor extends laterally along the coast at least as far as Prudhoe Bay and as far west as Icy Cape, for a total of some 550 km. According to Connors (pers. comm.), no significant fall build-up is evident on the coastal tundra near Cape Krusenstern, roughly 200 km further west and south from Icy Cape. There he observes post-breeding accumulations in tidal habitats much like those reported by Gill and Jorgenson (1979) in Nelson Lagoon on the Alaskan Peninsula, but distinct from the initial non-tidal build-ups we see at Barrow.

Information about the distributional extent of the corridor perpendicular to the coast is even sparser. The data from Atkasook define a known southerly limit , but the belt probably ends much closer to the coast than this. Work in the Prudhoe Bay area indicates a decrease in numbers only 25 km south from the coast and virtually no build-up only 50 km south (S.G. Jones pers. comm.).

In conclusion, the data available on this post-breeding movement suggest a massive accumulation of shorebirds spreading east-west along much of the Alaskan coastal plain tundra but restricted to a narrow belt adjacent to the Arctic Ocean. Why this movement occurs is unclear. It may be a response to some seasonal deterioration of feeding conditions in the interior or an improvement along the coast. Alternatively, it may simply be a part of the migration route for different wader species without regard to special stopover conditions along the coast. This raises the question of individual turnover rates for these transients, about which, regretably we have no data. Whatever the cause, however, it is clear that this corridor has important implications for the commercial development of the region's energy resources: By mid-July and early August virtually the entire annual production of waders on Alaska's North Slope may be compressed within a very tight belt smack within areas currently undergoing the most intensive development for oil.

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NOVEMBER NESTING OF THE COLLARED PLOVER Charadrius collaris IN WESTERN MEXICO

by Ralph S. Widrig

During the winter of 1977-1978, I spent some months in San Blas, Nayarit, Mexico, pursuing the abundant bird life in this remarkable area. Having a particular interest in shorebirds, I wanted to find the tiny Collared Plover which has been reported as occasional there (Clow 1977). For several days I searched feeding flocks of Semipalmated Plover Charadrius semipalmatus, Wilson's Plover Charadrius wilsonia and Snowy Plover Charadrius alexandrinus on the outer beaches and estuary bars, but could not find a bird which I felt was a candidate for C. collaris. On 30 November 1977, I was scanning an extensive area of drying mud, or marisma, about 3 miles inland when I picked up a small plover feeding alone. While approaching the bird for a better view, a second bird appeared which seemed to be executing a rodent run. At this point I had decided that the first bird was, beyond question, C. collaris. I retreated and concentrated on observing the second bird. After about 20 minutes it retraced its course, bobbed its head, and settled in the incubating posture typical of small plovers. As I rose to approach, the bird bolted away and ran at least 200 feet with no display. The nest was in a cattle track in damp but firm mud, sparsely lined with dry grass, and contained 3 tan-coloured eggs, dotted and scrawled with dark brown. Meanwhile, the first bird had taken a position approximately 350 feet from the nest site and remained motionless, with no display.

On 1 December I again approached the nest, and again the incubating bird (I could not tell the sexes apart) departed without any display. I then did a careful float check of one of the eggs, using luke-warm water. The egg floated with 10 mm exposed on its larger end, suggesting that incubation was well progressed and that hatching would probably occur within a few days.

On 2 December the nest was again checked. An adult was incubating the 3 eggs, the second adult was present some 300 feet from the nest site, and neither bird gave any display.

The nest was visited again on 4 December. One of the adults was incubating, and the second adult was about 150 feet from the nest when I approached. The incubating bird departed as usual, but the second adult commenced a slow, continuous run with head and tail low, as if concealing its departure, not the short, rapid runs observed the previous days. I checked carefully for chicks which might have been following, but could see none. The nest contained one egg, there were no shell fragments or evidence of predation, and I believe the second adult was tending 2 chicks, which must have hatched, away from the nest site when I approached. I could not find them near the nest, and assume that the second bird had hidden them in depressions before commencing its 'concealed departure'. I did not approach the area where the chicks may have been hidden for fear of stepping on them. Again, no display by either adult.

I returned to the site on the morning of 5 December. No adults could be found, and the remaining egg was cold. I assume that the adults had taken the chicks to a different area for feeding and rearing. I could not find them again. I collected the remaining egg, which measured 30 by 21 mm, and it has been deposited with the Western Foundation of Vertebrate Zoology in Los Angeles. There it was found to have been fertile and contained a well-developed embryo (L. Kiff, pers. comm.).

In a search of the literature, I have been unable to find any previous nest record of this species north of South America, although evidence of breeding in Mexico and Honduras has been reported. A fledgling hardly old enough to fly was collected on 13 May 1952 at the Isthmus of Tehuantepec, and very small chicks were observed with their parents in Chiapas on 20 May 1952 (Amadon and Eckelberry 1955). In Honduras, downy young accompanied by adults were found on the beach at Tela on 18 August 1962 (Monroe 1968).

Later in December I located two more adult pairs of this plover Both were in similar habitat - drying mud with shallow water nearby - and both pairs were exhibiting what I believe was courtship behaviour This consisted of one bird approaching the other, puffing out its breast feathers and, with head rather erect, chasing the other bird in a continuous