FEEDING OF WESTERN AND SEMIPALMATED SANDPIPERS IN PERUVIAN WINTER QUARTERS

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LARGE numbers of shorebirds that breed in North America spend the winter in the region of the Bay of Paracas, 150 miles south of Lima, Peru. During a short period in October and November 1965 I had the opportunity to observe some aspects of the feeding behavior of mixed flocks of two very similar species, the Semipalmated Sandpiper (*Ereunetes pusillus*) and the Western Sandpiper (*E. mauri*), which has a considerably longer bill. They were feeding in a small harbor-like inlet with a narrow entrance, situated at La Puntilla, Pisco, about 2 miles north of the Bay of Paracas. The tides caused important changes in this habitat, and these varied considerably from day to day; the lowest tides virtually emptied the inlet, while the highest of the low tides left the inlet bottom at least one third covered with water. At low tide, three zones could be distinguished; water, wet mud (shiny), and dry mud (dull). These zones are presumably equivalent respectively to zones D and E, zone B, and zone A in Figure 3 in Recher's study of the feeding of shorebirds (Ecology, 47: 393–407, 1966). The extent of the three zones changed continually as the water flowed in and out of the inlet, and as wet mud dried on the outgoing tide and dry mud became wet mud on the incoming tide.

The numbers of birds in the inlet varied from day to day; in late October and the first half of November there were usually between 20 and 100 Semipalmated Sandpipers (average 33) and between 3 and 40 Western Sandpipers (average 8). The Western Sandpipers were frequently in two or three loose groups within the flock of Semipalmated Sandpipers, and the two species fed over the same general area, frequently only a meter or so apart. I noticed only occasional inter- or intraspecific aggression.

My objective was to determine the extent to which these two species differ in their exploitation of the feeding habitat. As close as possible to the time of low tide, I made a series of counts of the flock in quick succession, noting first how many of each species were in water, then how many were on wet mud, and finally how many were on dry mud. Birds at the boundaries of the defined substrates were ignored, for instance birds standing on wet mud but feeding in water. These counts were repeated several times on each of 6 days. The totals for each day (Table 1) show that on most days the highest percentage of both species fed on wet mud. On all days the Western Sandpiper tended to be relatively more abundant in water, and the Semipalmated Sandpiper to be more abundant on dry mud. The consistency of this trend indicates a real difference in zone

TABLE 1

NUMBERS OF WESTERN SANDPIPERS (*ERENEUTES MAURI*) AND SEMIPALMATED SANDPIPERS (*E. PUSILLUS*) FEEDING IN DIFFERENT ZONES ON A TIDAL MUDFLAT

Date	Species	Number of counts	Total numbers (and %) in each zone		
			Water	Wet mud	Dry mud
4 November	*E. mauri*	6	5 (17%)	24 (80%)	1 (3%)
	E. pusillus	6	13 (5%)	127 (49%)	117 (46%)
5 November	*E. mauri*	5	8 (57%)	3 (21%)	3 (21%)
	E. pusillus	5	12 (25%)	20 (42%)	16 (33%)
10 November	*E. mauri*	5	8 (15%)	35 (66%)	10 (19%)
	E. pusillus	5	9 (7%)	26 (20%)	94 (73%)
18 November	*E. mauri*	5	26 (22%)	69 (60%)	21 (18%)
	E. pusillus	5	29 (7%)	289 (72%)	81 (20%)
19 November	*E. mauri*	3	24 (24%)	66 (65%)	11 (11%)
	E. pusillus	3	19 (11%)	128 (72%)	31 (17%)
TOTALS	*E. mauri*	24	71 (23%)	197 (63%)	46 (15%)
	E. pusillus	24	82 (8%)	590 (58%)	339 (34%)

utilization between the species, even though the successive counts on each day cannot be considered to be completely independent of each other because they were made over fairly short periods and involved many of the same birds. Although Recher (1966) did not observe the Western and Semipalmated Sandpipers together in the same area, his histograms show that in the separate areas where he watched them the Semipalmated Sandpiper spent more of its time on dry mud than did the Western Sandpiper.

I also determined the proportion of feeding time spent in probing, as opposed to pecking, by each of the species within each of the three zones, ignoring birds close to the boundaries (Table 2). Probing I define as feeding by jabbing continually with at least the tip of the bill always below the surface, except for brief moments when the bird changed its probing site; pecking is feeding by pecking the surface, each peck being a clearly distinct feeding movement. I obtained data by watching individual feeding birds, chosen at random, in each of the zones that had feeding birds present during the observation periods. I recorded the total time of the observation on one stopwatch and the amount of time spent probing as opposed to pecking on a second watch. Each observation was continued until the bird was disturbed or stopped feeding, which always occurred within 3 minutes. The average length of the observation was just under 1 minute and only four observations extended beyond 2 minutes. I watched the birds only while feeding and made no attempt to determine what proportion of their total time they spent in feeding.

In water, the Western Sandpiper spent all its feeding time probing, while the shorter-billed Semipalmated Sandpiper probed for only half of the time. On wet mud the Western Sandpiper probed three fourths of the

TABLE 2

AMOUNT OF FEEDING TIME SPENT IN PROBING AS OPPOSED TO PECKING

	Species	Zone		
		Water	Wet mud	Dry mud
Number of days of observation	*E. mauri*	3	5	3
	E. pusillus	3	5	3
Number of observations	*E. mauri*	8	15	7
	E. pusillus	8	16	8
Total time watched (seconds)	*E. mauri*	294	1071	363
	E. pusillus	368	1499	390
Time spent probing (seconds)	*E. mauri*	293	804	2
	E. pusillus	204	432	0
Per cent of feeding time spent in probing	*E. mauri*	100	75	1
	E. pusillus	55	29	0

time and the Semipalmated Sandpiper only one third of the time. Even on dry mud the Western Sandpiper probed occasionally. The individual observations showed slight variation, but only once did I see a Semipalmated Sandpiper probe in wet mud for a greater proportion of its feeding time than a Western Sandpiper on the same day. Although birds feeding at the water's edge were excluded from quantitative consideration because of the difficulty of defining this feeding zone, I watched Semipalmated Sandpipers there on one day feed largely by probing.

Combining the information in Tables 1 and 2 shows that the Western Sandpiper spent about 70 per cent of its feeding time in probing, compared with 21 per cent for the Semipalmated Sandpiper. The rest of the feeding time it spent in pecking. As might be expected, although the two species feed in such close association, they evidently exploit the habitat in somewhat different ways; the Western Sandpiper, with its longer bill, probed below the surface for much of its feeding time and concentrated on shallow water and wet mud, while the Semipalmated Sandpiper fed to a greater extent by pecking, spending most of its time on the wet mud and the dry mud.

Apart from the two sandpipers, six other species of shorebirds (Charadrii) fed regularly in the inlet during the end of October and the first half of November. Short-billed Dowitchers (*Limnodromus griseus*) were present in larger numbers (average 89 per day) than any other species. They generally fed in tight groups in shallow water, constantly probing, often submerging the whole bill, but also came out onto wet mud to probe. Willets (*Catoptrophorus semipalmatus*) were present in only small numbers (average 4), and fed isolated from one another. They tended to be in deeper water than the dowitchers, although sometimes a single bird fed

in shallow water with a group of dowitchers or pecked among the stones and seaweeds at the water's edge. Sanderlings (*Crocethia alba*) were fairly numerous (average 18) and fed almost entirely by probing at the water's edge among dowitchers, Western Sandpipers, and occasionally Semipalmated Sandpipers. (Outside the inlet, Sanderlings fed in the more typical way—running down after the receding waves, feeding rapidly, and fleeing up the strand again.) A small number (average 3) of Spotted Sandpipers (*Actitis macularia*) fed by pecking mainly on wet mud near the waterline. They were solitary feeders and were hostile to members of their own and other species. Turnstones (*Arenaria interpres*) were also present (average 20) and had more varied feeding habits than the other species. They searched in the kitchen garbage that was thrown over the harbor wall several times a day, pecked on the mud not in very close association with other species, and excavated holes in the mud with their beaks, while other small species pecked in the upturned mud. Numerous (average 39) Semipalmated Plovers (*Charadrius semipalmatus*) fed fairly well spaced out on wet and dry mud, often close to the sandpipers. They were mainly after pink "worms" for which there was considerable competition. The plovers, Willets, Turnstones, and the Grey Gulls (*Larus modestus*), but not the sandpipers often chased each other for a worm for several minutes at a time.

When feeding on wet mud and at the water's edge, the two sandpipers came into close contact with Short-billed Dowitchers and Sanderlings, but competition with other species was minimal in all three feeding zones.

Recher (1966) noted the Least Sandpiper (*Erolia minutilla*) feeding in association with the Western Sandpiper on mud flats on the Californian coast, although it also frequented marsh areas there. On the New Jersey shore he saw the Least Sandpiper in the same general area as the Semipalmated Sandpiper, but there it fed mainly in the tidal marsh and avoided the mudflats where the Semipalmated Sandpiper was feeding. In Peru the Least Sandpiper is rarely seen in the same area as the other two sandpipers; it occurs more frequently in fresh water and brackish marshy habitats and not on tidal mudflats. Thus the Western Sandpiper may be found feeding alongside either the Least Sandpiper or the Semipalmated Sandpiper, although where the two latter very similar species occur in the same area, they tend to feed in separate habitats.

SUMMARY

Western and Semipalmated Sandpipers in winter quarters in Peru tended to exploit the mudflat habitat in different ways. The longer-billed Western Sandpiper spent about 70 per cent of its feeding time probing, chiefly on wet mud and in the water, while the Semipalmated Sandpiper spent

only 21 per cent of its feeding time in probing and fed mainly on wet mud and dry mud. A third species, the Least Sandpiper, was only rarely seen in the region and was not seen feeding in association with the other two. Among other Charadriiformes feeding regularly in the area, only Short-billed Dowitchers and Sanderlings fed in close association with the sandpipers.

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