

THE USE OF SALINAS BY WADERS IN THE ALGARVE, SOUTH PORTUGAL

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INTRODUCTION

The salt extraction in "salinas" involves the building of several ponds at slightly different levels. The water flows between them, coming eventually to the last ones where evaporation is completed. Because of this cycle, the water level changes during the year and the salinity varies from one pond to another, resulting in an uneven distribution of macrofauna in a salt extraction complex.

During the winter, there is no salt extraction and the water present in the ponds is that remaining from the previous season, diluted by rain-water. Most of the sluices are left open and so the water tends to collect in the lower ponds, but not the extraction ones, which are usually kept dry in this season.

In the Ludo complex (Ria Formosa) (37° 02'N 08° 00'W), the water coverage varied in the several ponds from over 50% at the beginning of the study (January) to barely any at the end (March). We already knew that the area was important as a high tide roost for waders in winter (Rufino et al. 1982) and it was our aim to establish whether the birds could use the habitat successfully also as a feeding ground.

METHODS

We collected information on food items and their relative abundance in some of the ponds. The changes in the number of birds present through the tidal cycle were recorded. Observations of the feeding patterns in the salinas were made so that comparisons could be made with nearby mud and sandflats.

To investigate site fidelity and the immigration and emigration rates of Dunlins *Calidris alpina*, an effort was made to dye-mark as many birds as possible. However, although in several salina complexes waders roosted at high tide in both daylight and darkness, birds did not roost in our area during nocturnal high tides. Our attempts to catch them with mist-nets were not very successful.

RESULTS AND DISCUSSION

Importance of salinas for waders

In the period of work, from January to March 1984, the proportion of birds roosting in salinas varied between 36% and 24% of the total population of the Ria Formosa lagoon complex, with a maximum of 7500 birds in the salinas. The birds did not use the salinas only at high tide: at low tide a large number of waders stayed there to feed (Table 1). Some species like the Black-tailed Godwit *Limosa limosa* used the salinas almost exclusively, with more than 90% of the total population always feeding there. Others like the Kentish Plover *Charadrius alexandrinus* roosted there in considerable numbers (average 89%) but divided their feeding areas between the Ria and the salinas (39% and 61% respectively), Bar-tailed Godwits *Limosa lapponica* did not use the habitat at all.

Number of birds during the tidal cycle

Because of these movements from the salinas to the Ria and vice-versa, the numbers present in salinas varied during each tidal cycle. In Ludo we made several counts in selected ponds to see if there was a regular pattern. The results were not very clear because not all of the ponds were counted, but we can say that the numbers tended to be lower during low tide (Figure 1). Variation was also noted between tides, with apparently larger numbers on neap tides, probably as a consequence of the reduction of the feeding areas in the Ria.

Food

The main prey items available in the areas counted were Chironomidae (mosquito) larvae, which ranged from 0 - 1300 individuals/m², a gastropod mollusc *Hydrobia* sp., and Ephydriidae larvae, ranging from 0 - 440 individuals/m².

Table 1. The importance of the salinas for the waders. Values are averages. Percentages are the number of waders as a percentage of the total population.

	JAN		FEB		MAR	
	n	%	n	%	n	%
Total wader population in the Ria	20 993		19 852		9310	
Waders in salinas at High Tide	7500	36	4666	24	2722	29
Waders in salinas at Low Tide	-		3429	17	-	

Table 2. Average feeding rates of Redshanks in different habitats. n gives the number of observation periods of 30 s.

Habitat	a No. of prey	b Capture attempts	c Efficiency (a/b)	d No. of paces	n
Salinas	6.0	31.0	19.4	27.7	37
Mud	2.0	8.8	22.7	57.6	35
Muddy Sand	2.3	8.5	27.1	42.9	22

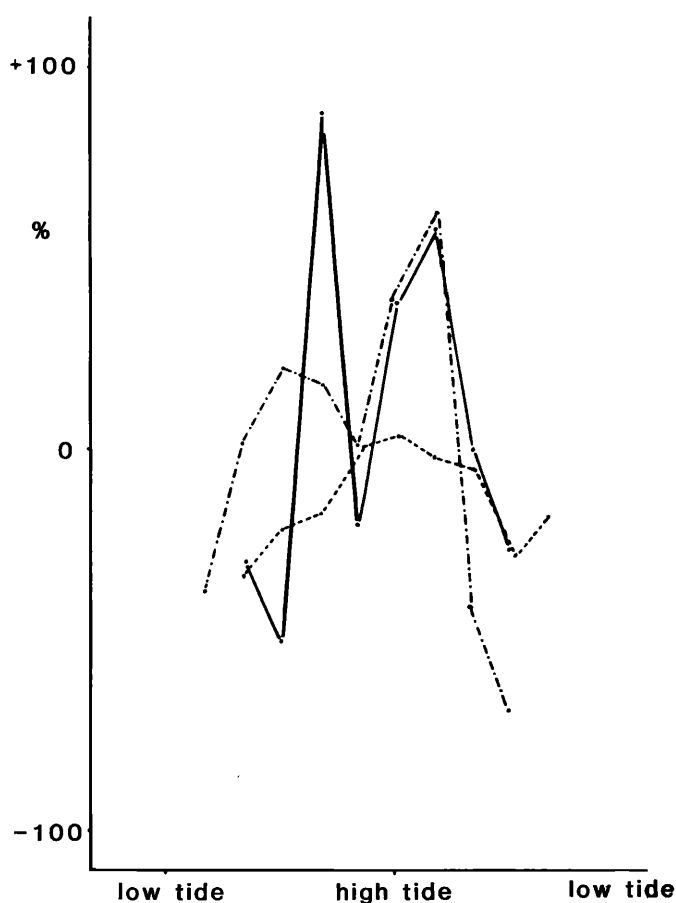


Figure 1. Variation in the use of the salinas by Dunlins (—), Redshanks (---) and Kentish Plovers (· · ·) during the tidal cycle. Numbers are plotted as the percentage of the average number of that species present.

Feeding patterns

The feeding patterns of a species varied according to its feeding place. This was clear on the estuary between mud and muddy-sand. It was even more obvious between these two substrates and the salinas, for at least some of the species investigated. For example, in the Redshank *Tringa totanus*, the birds feeding in the salinas had lower efficiency (percentage successful pecks). Although they were eating more items/minute, each item was very small, and the number of paces per 30s was lower than

on the mudflats (Table 2). However, the amount of food taken in salinas in the winter was apparently enough to maintain these birds. We could not investigate whether the remaining food supply would have been sufficient during pre-migratory fattening in spring (March) as the salinas were by then almost dry and few birds fed there.

Site fidelity and turn-over of Dunlins

Although only 16 Dunlins were dye-marked (with picric acid), this was enough to confirm that some birds remained in the salinas throughout the tidal cycle, since there were regular observations of dyed birds at low tide.

Some differences in the proportions of marked birds in flocks were found in different areas of the salinas complex. 90% of the dyed birds observed were seen always in the western salinas where all the ringing took place. So even in a small area like the Ludo (ca. 200 ha.) the birds seemed to show some site fidelity.

Between January - March 1984 the total number of Dunlins present decreased (Table 1) but the percentage of dyed birds in the flocks (0.9 - 1.1%) did not change. This indicates that at least until mid-March there was little or no immigration. The decrease in the population began in mid February and many birds had left by mid March.

We hope that this note gives an idea of the importance to waders of the salina habitat in southern Portugal. We aim to make further studies on the waders in these areas.

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REFERENCE

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