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## Migration pattern of waders at the Salobrar de Campos, Mallorca, in autumn 1996 and spring 1997

**Matthias Kestenholz & Dieter Peter**

Kestenholz, M. & Peter, D. 1998. Migration pattern of waders at the Salobrar de Campos, Mallorca, in autumn 1996 and spring 1997. *Wader Study Group Bull.* 85: 45-50.

In autumn 1996 and spring 1997, the salinas in south-eastern Mallorca were used as a stop-over site by 30 wader species, among them four breeding species. Phenological patterns of the most abundant species are presented. In most species, spring numbers outweighed autumn numbers. For several species, the migration patterns on Mallorca correspond with those known from the central European inland flyway.

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### INTRODUCTION

Waders are among the most outstanding migrants, travelling between continents and crossing oceans and deserts. On their journeys, they rely on an extensive network of major and minor staging sites. Although waders have been studied intensively on the East Atlantic Flyway (Piersma *et al.* 1987), there is a lack of data for the Mediterranean (Gromadzka 1987). As Smit (1986) has shown, this region is more important for waders than has so far been supposed.

Wintering populations of waders have been counted annually for many years in Spain (Velasco & Alberto 1993) and on Mallorca (Ramis *et al.* 1996). However, for Mallorca, information on numbers and phenology in spring and autumn is very poor. We report on the first systematic wader counts in spring and autumn in the Salobrar de Campos. We describe phenology patterns and give peak numbers which also provide valuable information for assessing the importance of this wetland and protecting it. Given the geographical position of Mallorca (Figure 1), 300 km from the mainland, the data presented could also contribute to a better understanding of flight strategies of waders crossing the western Mediterranean.

### STUDY AREA

The salinas of Salobrar de Campos are situated in south-east Mallorca, Spain (39°19' N, 03°05' E), 2 km north-east of the nearest coastline. They are part of a protected area designated in 1984 (Area Natural de Especial Interés = site of special scientific interest). The salinas comprise a complex of salt

pans with a total area of about 400 ha (Figure 1). The older salt pans have water all year round; those exploited commercially (evaporation beds, 100 ha) are flooded periodically. Therefore, the salinas provide a pattern of shallow waters of varying salinity, whose depth varies from a few to 50 cm. It also comprises small emergent mudflats, vegetated banks and causeways. The vegetation is halophilous consisting mainly of *Salicornia spp.*, *Salsola spp.* and *Tamarix spp.*. The salt-tolerant maxillipod crayfish *Artemia salina* and non-biting midges *Chironomus spp.* are the major food resources for waders.

### METHODS

Our camp was situated on the eastern edge of the Salobrar de Campos where we carried out radar studies on bird migration in autumn 1996 and spring 1997 (see Bruderer *et al.* 1996). We observed and censused waders on a daily basis from 10 August to 22 October 1996 and from 19 March to 22 May 1997. The surveyed area (Figure 1) covered about 50% of the salinas and the range of vision depended on the vegetation height on the causeways. We recorded all passage migrant species but excluded the four breeding species Black-winged Stilt *Himantopus himantopus*, Kentish Plover *Charadrius alexandrinus*, Redshank *Tringa totanus*, and Stone-curlew *Burhinus oedipnemus* (Avellà *et al.* 1997). Numbers were assessed by means of visual counts using telescopes 25 x 60 and 20 x 80.

The first and last day of observations are given as well as the



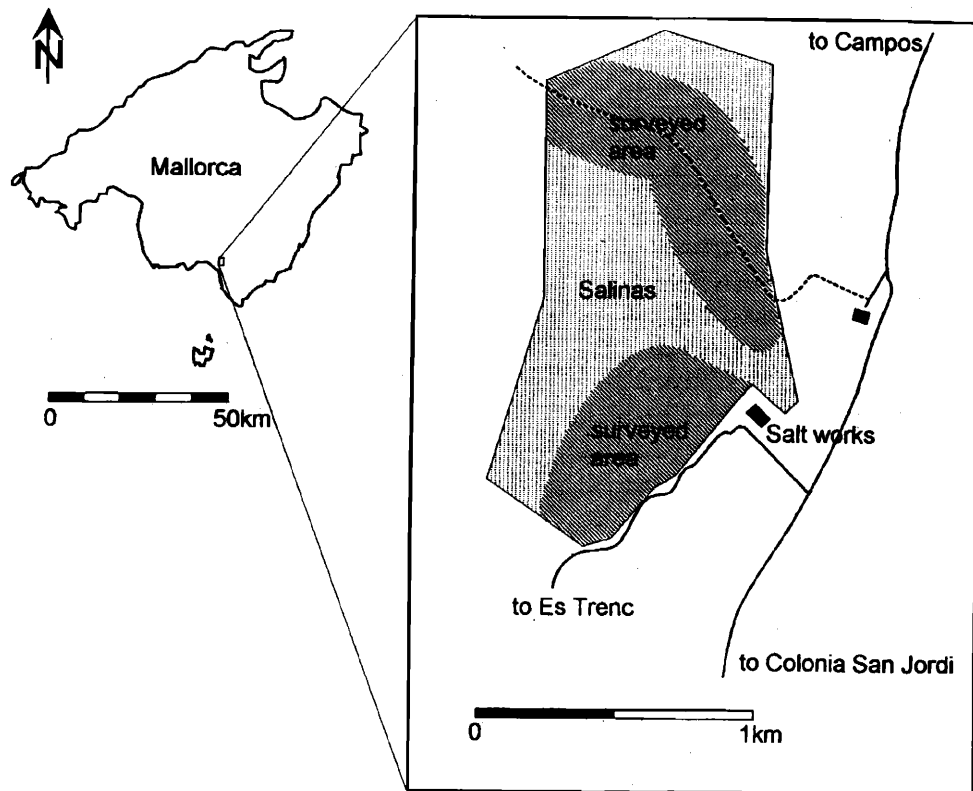


Figure 1. Map of the Salobrar de Campos in south-east Mallorca showing the area surveyed.

Table 1. Wader phenology at the Salobrar de Campos: Dates of first (F) and last (L) observations, maximum number (M) and date of maximum number (DM). Asterisks indicate the beginning (\*) and the end (\*\*) of the observation periods.

Species	Autumn 1996				Spring 1997			
	F	M	DM	L	F	M	DM	L
<i>Recurvirostra avosetta</i>	02.09	5	02.09	22.10**	23.03	11	19.04	14.05
<i>Glareola pratincola</i>	10.10	1	10.10	11.10	01.04	3	12.04	15.05
<i>Charadrius dubius</i>	10.08	4	06.09	17.10	11.04	4	12.04	12.05
<i>Charadrius hiaticula</i>	26.08	25	03.09	22.10**	23.03	60	09.05	22.05**
<i>Pluvialis apricaria</i>		2	22.10					
<i>Pluvialis squatarola</i>	23.09	3	14.10	18.10	12.04	1		16.05
<i>Vanellus vanellus</i>		10	18.10					
<i>Calidris canutus</i>		1	20.10		23.04	2	10.05	12.05
<i>Calidris alba</i>	18.08	1		26.09	23.03	4	20.05	21.05
<i>Calidris minuta</i>	10.08*	c.400	several	22.10**	21.03	c.300	several	22.05**
<i>Calidris temminckii</i>	25.08	2	05.09	04.10	30.03	3	30.03	10.05
<i>Calidris ferruginea</i>	10.08*	30	05.09	17.10	17.04	50	14.05	21.05
<i>Calidris alpina</i>	13.08	20	19.10	22.10**	21.03	40	23.03	11.05
<i>Philomachus pugnax</i>	01.09	40	06.09	22.10**	19.03*	200	21.03	12.05
<i>Gallinago gallinago</i>						1	11.05	
<i>Limosa limosa</i>					20.03	2	20.03	23.04
<i>Limosa lapponica</i>	25.08	2	28.09	28.09				
<i>Numenius phaeopus</i>					13.04	2	23.04	26.04
<i>Numenius arquata</i>	26.08	6	04.09	21.10	30.03	10	02.04	18.05
<i>Tringa erythropus</i>					30.03	10	13.04	26.04
<i>Tringa stagnatilis</i>	27.09	1		21.10	30.03	2	12.04	13.04
<i>Tringa nebularia</i>	11.08	15	28.09	22.10**	28.03	30	23.04	14.05
<i>Tringa ochropus</i>	22.08	5	06.09	28.09	19.03*	3	31.03	12.04
<i>Tringa glareola</i>	31.08	7	04.09	27.09	30.03	10	several	14.05
<i>Actitis hypoleucos</i>	11.08	5	06.09	22.10**	28.03	5	09.05	14.05
<i>Arenaria interpres</i>	18.09	2	11.10	20.10	17.04	1		23.04



peak number of birds and the date this was recorded (Table 1). For seasonal patterns, data were grouped in five-day periods for which the maximum values are given in histograms.

Seasonal sums of maxima for five-day-periods were compared as an indication of abundance in spring and autumn (Table 2).

**Table 2.** Sum of maxima of five-day-periods in autumn 1996 and spring 1997.

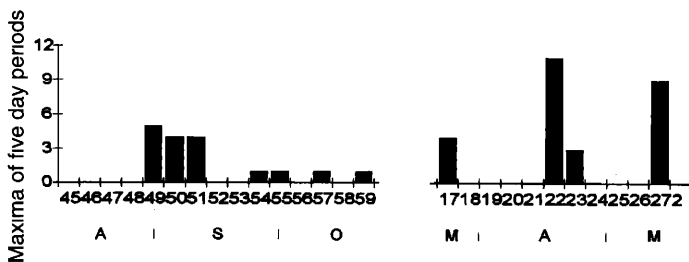
Species	Autumn 1996	Spring 1997	spring/autumn ratio
<i>Philomachus pugnax</i>	79	558	88:12
<i>Tringa glareola</i>	13	40	75:25
<i>Tringa nebularia</i>	40	94	70:30
<i>Charadrius hiaticula</i>	91	167	65:35
<i>Numenius arquata</i>	22	37	63:37
<i>Calidris alpina</i>	76	124	62:38
<i>Recurvirostra avoetia</i>	17	27	61:39
<i>Calidris ferruginea</i>	132	96	42:58
<i>Actitis hypoleucos</i>	23	13	36:64
<i>Calidris minuta</i>	1190	2400	33:67

#### SPECIES ACCOUNTS

Thirty species were recorded in autumn 1996 and spring 1997. The most abundant of these are discussed in detail below. For each species, mean and maximum numbers in mid-January 1991-1997 (Ramis *et al.* 1996) are mentioned for comparison. The number counted in January 1997 is given separately, as it falls between autumn 1996 and spring 1997.

#### *Avocet Recurvirostra avoetia*

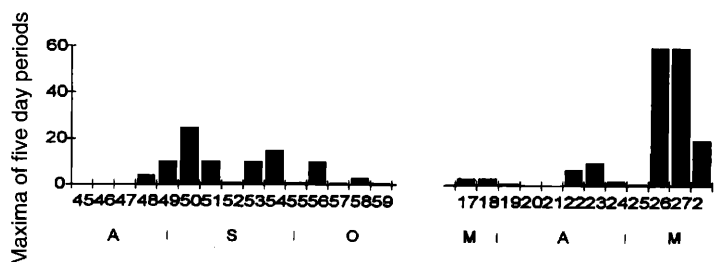
In autumn, the first birds arrived in early September and numbers declined towards the end of October. In spring, two small waves of migrants occurred in mid-April and mid-May. The small numbers and the erratic movements of breeders from the Mediterranean basin do not allow further analysis. Mean and maximum numbers counted in mid-January 1991-1997 were one and three, respectively; one bird was counted in January 1997.



#### *Ringed Plover Charadrius hiaticula*

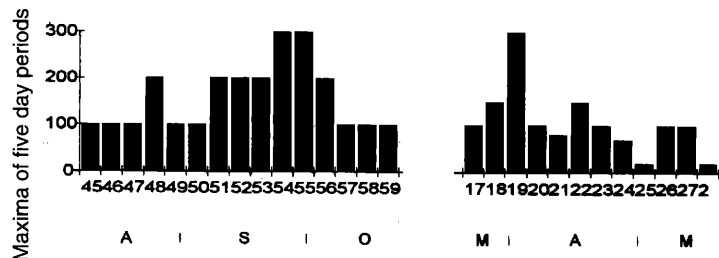
There was a pronounced peak in migration in early September and mid-May. This pattern refers mainly to the arctic Eurasian *tundreae* population (Cramp & Simmons 1983). Compared with central Europe (Schmid *et al.* 1992; OAG Münster 1994), autumn migration in Mallorca seems to be less marked than spring migration. For comparison, the autumn phenology in north-east Spain shows two clear peaks in late August and mid-September at the Ebro Delta but only one peak in mid-September at the Aiguamolls de l'Empordà Natural Park, 350 km north of the Ebro Delta (Figuerola & Martí 1994). Mean and maximum numbers counted in mid-January 1991-1997

were 4 and 12, respectively; two birds were counted in January 1997.



#### *Little Stint Calidris minuta*

Little Stint was the most abundant passage wader species throughout both seasons. Numbers were estimated only roughly. In autumn, peak migration was recorded in late September. In spring, most April birds left at the end of the month, and a second set of birds arrived about ten days later. Mean and maximum numbers counted in mid-January 1991-1997 were 169 and 395 respectively; 80 birds were counted in January 1997.



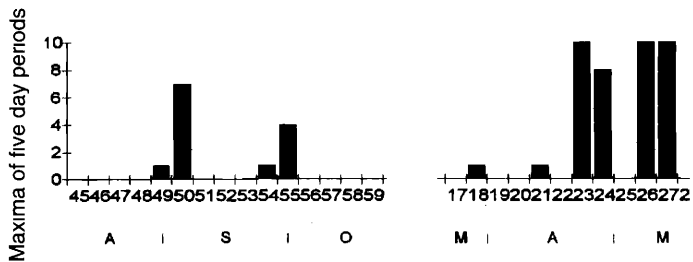
#### *Curlw Sandpiper Calidris ferruginea*

In autumn, two peaks were recorded in early and late September; in spring, there was one sharp peak in mid-May. The peak numbers of this rapidly-migrating bird occur in the same five-day period as in Switzerland (Schmid *et al.* 1992). Autumn numbers in the Ebro Delta (Figuerola & Bertolero 1996) outnumber those at Mallorca by a factor of 40. In the Ebro delta (Figuerola & Bertolero 1996) on autumn migration, adults precede first-year birds (Wilson *et al.* 1980) and adult males precede adult females, by about 10 days. Mean and maximum numbers counted in mid-January 1991-1997 were 0 and 0 respectively; no birds were counted in January 1997.



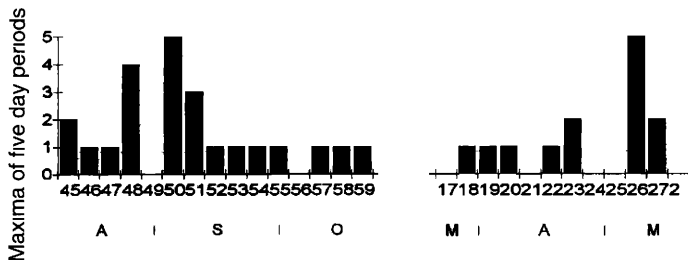


low numbers of returns from Iberia (Cramp & Simmons 1983), suggesting a more easterly migratory route from and towards tropical Africa. Mean and maximum numbers counted in mid-January 1991-1997 were 0.3 and 1 respectively; no birds were counted in January 1997.



### Common Sandpiper *Actitis hypoleucos*

Present in very small numbers almost throughout the season. Migration peaks in early September and in early May. The pattern on Mallorca is similar to that in Switzerland but peak dates shifted by 10 days according to latitude (Schmid *et al.* 1992). Mean and maximum numbers counted in mid-January 1991-1997 were one and two, respectively; one bird was counted in January 1997.



## DISCUSSION

On the whole, Mallorca does not offer favourable staging sites for waders. Most of the coastline consists of rocky shores, and the tidal range is only approximately 20-30 cm. Therefore, most waders concentrate at the island's only two valuable stop-over sites, the marshes of S'Albufera on the north-east coast and the salinas Salobrar de Campos in the south-east. Nevertheless, only relatively small numbers of waders were encountered at the Salobrar de Campos, even when taking into account that the number of individuals using the salinas may considerably exceed the number recorded during peak count because of turnover. Waders staging on Mallorca may use the central European inland flyway, since the migration pattern of several species, *e.g.* Dunlin and Common Sandpiper, correspond well with the patterns of southern France (Girard 1992) and central Europe (Schmid *et al.* 1992; OAG Münster 1994).

For most species, numbers encountered in spring were higher than in autumn, most markedly in the Ruff (Table 2). The difference may be even more pronounced when taking into account the winter mortality and the slightly shorter observation period in spring. Hence, it might indicate a more direct migration route through inland Europe in spring, a higher propensity for sea-crossing in spring than in autumn or a greater tendency for birds to land having crossed the Sahara desert. Quantitative comparisons between Mallorca and the Ebro Delta as a main stop-over site for waders on the western Mediterranean mainland, might reveal species-specific

differences in their tendencies to cross the open sea and make use of islands as stop-over sites.

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