

Autumn Migration of Raptors through Sagres (SW Portugal)

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INTRODUCTION

The main flight pathways for raptors in Western Europe are probably already well known (Porter & Beaman 1985). However, some inter-linking flyways between these main routes remain to be discovered and described in detail (Porter & Beaman 1985). These studies are important, both to gain a better understanding of migration strategies of raptors and to further identify threats to migrating raptors.

Following preliminary observations suggesting that numbers of migrating soaring birds occur annually in Sagres Peninsula (SW Portugal) (Abreu 1986; L.Palma, unpubl. data), a fall migration count was organized in September/October 1990.

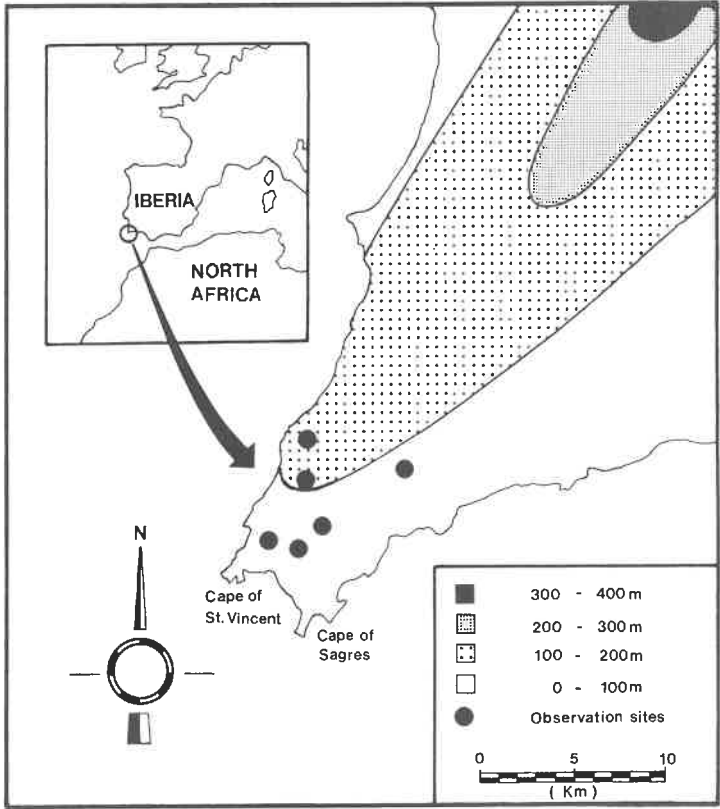
Questions addressed were:

- What are the numbers and species involved, and what is the chronology of their migration?
- What are the patterns of raptor migration and with what weather conditions is the occurrence of large numbers of birds associated?
- Is this a suitable area for further understanding migration strategies and movements of raptors in Iberia?

METHODS

The count was carried out in Sagres (Fig. 1) from 23 September to 13 October. Each day, birds passing by were counted from three to six fixed vantage points and sometimes also a car, usually between one hour after sunrise and the ceasing of migration at mid or late afternoon. Number of birds of each species, flocking patterns and flight behaviour were noted at five minute intervals on registration forms. Weather variables were recorded daily. A total of 47 observers were involved in this count.

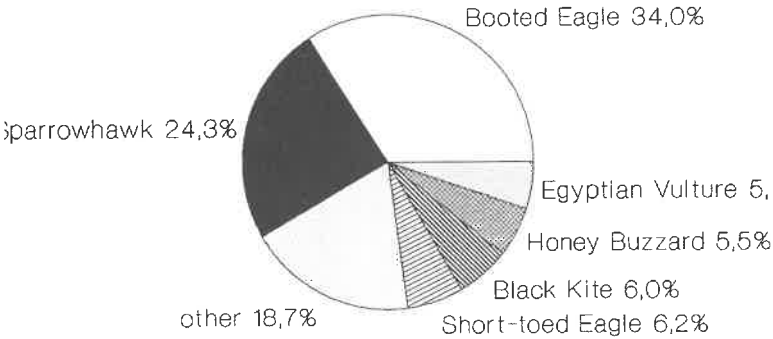
Figure 1. Map of the study area, indicating the observation sites and the general ridge orientation of the hills.



RESULTS

A total of 160 hours were spent counting. Migrants were seen every day, and 2012 raptors of 22 species, 16 storks and 62 large non-soaring migrants were counted (Table 1). Booted Eagles (34.0%) and Sparrowhawks (24.5%) made up the bulk of migrants (Fig. 2). Other migrants were

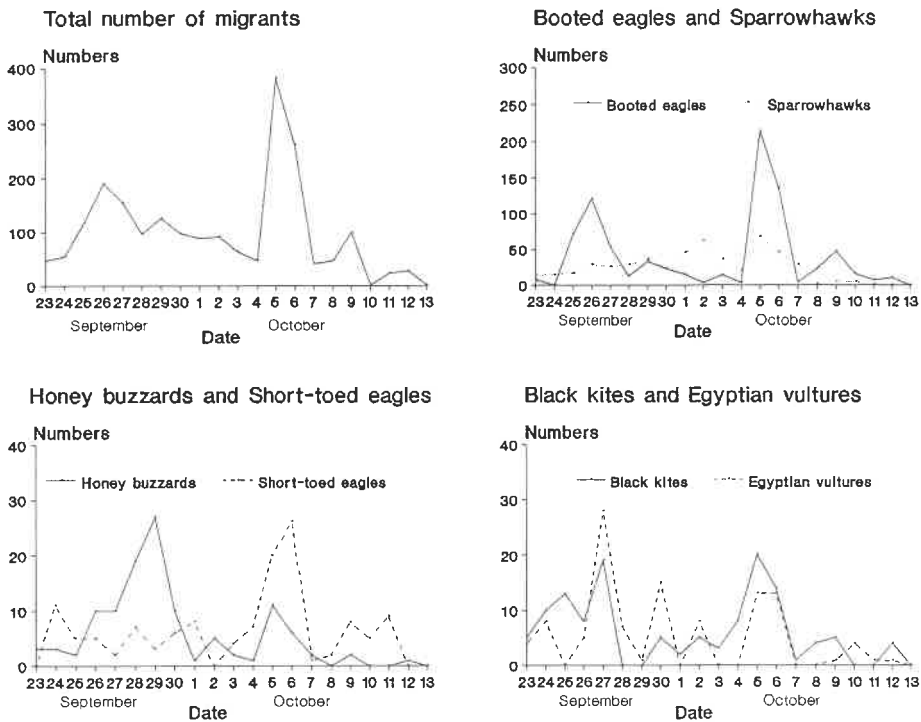
Figure 2. Proportion of migrant species seen at Sagres, autumn 1990.



also observed, including numbers of Short-toed Eagles (6.2%), Black Kites (6.0%), Honey Buzzards (5.5%) and Egyptian Vultures (5.2%). A noteworthy feature of the migration was that a large number of species were represented by a very few individuals. These included Long-legged Buzzards (3), a fairly regular early spring vagrant in the area (L.Palma & P.Beja, unpubl. data), Lanners (4) and Eleonora's Falcon (11), probably a former breeder on the Portuguese west coast (Onofre & Palma, in press). Peregrine Falcons and Kestrels were observed every day but were not considered migrants, because several pairs of these two species are resident in the Sagres area. Resident Common Buzzards also occur in Sagres, but it was usually possible to distinguish migrant from non-migrant individuals by differences in behaviour and flight patterns.

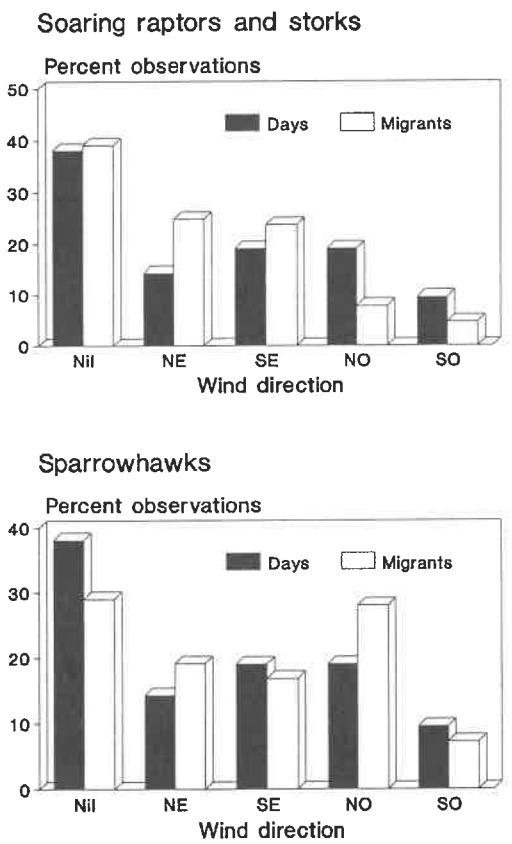
Although no particular effort was made for determining the age class of the raptors, scattered observations suggested that juveniles made up the large majority of the migrants. Adults were dominant only in Black Kites and Eleonora's Falcons. Most Short-toed Eagles were light morphs, an inversion of the characteristic ratio in the Portuguese population (L.Palma, unpubl. data).

Figure 3. Chronology of the migration for the most abundant species and for all the migrants together.



There was a large day-to-day variation in both the species and numbers counted (Fig. 3). These variations were probably related to weather conditions and to the timing of migration for the different species. To test for the effects of wind direction on the numbers of migrants observed every day, we compared the proportion of days with a given prevalent wind direction with the corresponding proportion of migrants counted on those days. No statistically significant differences were found for both the typical soarers altogether ($\chi^2=2.149$, $df=2$, NS) and for Sparrowhawks ($\chi^2=0.668$, $df=2$, NS). However, there was a slight non-significant tendency for soarers mostly occurring in days of prevalent easterly winds, and for Sparrowhawks mostly occurring in days of prevalent northerly (tail) winds (Fig. 4). Thermal streets were a common meteorological event in the area, apparently favouring the observation of large numbers of raptors.

Figure 4. Proportion of days with a given prevalent wind direction in relation to the proportion of migrants counted on those days, for all soarers together and for Sparrowhawks.



Birds entered the observation area from the north along the west coast cliffs , probably using the associated declivity currents, and from north-east, following the general ridge orientation of the hills located in the near interior (Fig. 1). Local movements were varied, ranging from a direct passage to a prolonged circulation over the area, with small numbers eventually staying overnight. Migrants left Sagres either following a south-east path over land or southwest and south directions over the sea.

Foraging in the area was the rule for Hen Harriers and was frequently observed in Sparrowhawks, Booted Eagles, Black Kites and Egyptian Vultures.

DISCUSSION

During this migration count a large movement of raptors was observed, particularly of Booted Eagles and Sparrowhawks. Although we are confident that the count covered the main stream of migrants, we think that the figures obtained are probably underestimates of the numbers of raptors migrating through Sagres in the autumn of 1990, because some early and late movements are known to occur. Irregular observations carried out in August and September of 1990 and other years indicate that there is some passage of Montagu’s Harriers and Black Kites early in the season

Table 1. Migrating raptors, storks, and other large non-soaring migrants seen at Sagres, autumn 1990.

Species		Numbers counted	% of Total
RAPTORS			
Egyptian Vulture	<i>Neophron percnopterus</i>	109	5.2
Griffon Vulture	<i>Gyps fulvus</i>	6	0.2
Golden Eagle	<i>Aquila chrysaetos</i>	1	0.05
Iberian Imperial Eagle	<i>Aquila adalberti</i>	2	0.1
Bonelli's Eagle	<i>Hieraaetus fasciatus</i>	8	0.4
Booted Eagle	<i>Hieraaetus pennatus</i>	814	34.0
Short-toed Eagle	<i>Circaetus gallicus</i>	129	6.2
Common Buzzard	<i>Buteo buteo</i>	45	2.2
Long-legged Buzzard	<i>Buteo rufinus</i>	3	0.1
Honey Buzzard	<i>Pernis apivorus</i>	115	5.5
Goshawk	<i>Accipiter gentilis</i>	16	0.8
Sparrowhawk	<i>Accipiter nisus</i>	507	24.3
Red Kite	<i>Milvus milvus</i>	6	0.3
Black Kite	<i>Milvus migrans</i>	126	6.0
Black-winged Kite	<i>Elanus caeruleus</i>	1	0.05
Marsh Harrier	<i>Circus aeruginosus</i>	18	0.9
Hen Harrier	<i>Circus cyaneus</i>	76	3.6
Montagu's Harrier	<i>Circus pygargus</i>	2	0.1
Lanner	<i>Falco biarmicus</i>	4	0.2
Eleonora's Falcon	<i>Falco eleonora</i>	11	0.5
Hobby	<i>Falco subbuteo</i>	6	0.3
Lesser Kestrel	<i>Falco naumanni</i>	7	0.3
STORKS			
White Stork	<i>Ciconia ciconia</i>	5	0.2
Black Stork	<i>Ciconia nigra</i>	15	0.5
OTHER LARGE NON-SOARING MIGRANTS			
Grey-Heron	<i>Ardea cinerea</i>	41	2.0
Spoonbill	<i>Platalea leucorodia</i>	1	0.05
Raven	<i>Corvus corax</i>	20	1.0
TOTAL		2090	

(Abreu 1986; L.Palma, unpubl. data) Seemingly, migrants have been observed passing by as late as December. The numbers of Sparrowhawks were also quite probably underestimated because their early morning movements were largely unnoticed in the first half of the count period.

Sagres revealed itself to be a secondary, though relatively important, autumn migration path in Iberia, in particular for juveniles and immatures. However, data from observations made in the same area by Moreau & Monk (1957) and Owen (1958) in late August and September 1956 and 1957 only report on small passages of a few Egyptian Vultures, Montagu's Harriers, Hen Harriers and Black Kites, which together with more recent non-systematic observations (L.Palma, unpubl. data) indicate that migration in quantity may not occur every year.

The origin of raptors migrating through Sagres is not known, though some evidence suggests that at least some birds may not be from Portuguese populations. Short-toed Eagles were predominantly light morphs, a feature not observed in the Portuguese population. Ringing recoveries are scarce, but include a few birds ringed outside Portugal, namely one Griffon Vulture (Spain), one Osprey (Great Britain), one Black Kite (Germany) and one Hobby (France) (Abreu 1986).

As for many other areas (Kerlinger 1989), meteorological conditions may be the reason for oscillations and disparities in numbers observed between days and years at Sagres, pushing birds to or away from this observation point. Although in this study we found no definite relationship between weather and migration, there was some evidence suggesting that the movement of soaring birds through the area may be favoured by easterly winds, whereas birds that rely on powered flight, such as Sparrowhawks, mostly occur in the area during predominant northerly winds. It remains to be ascertained whether this pattern remains constant over the years or whether it was simply a result of a particular set of meteorological conditions during the observation period.

Another point to be determined is the direction in which the birds leave the area. Although some birds were observed flying to the south-east over land, presumably in the direction of Gibraltar, some others were watched flying to the south and south-west, over the sea, apparently trying to cross straight to North Africa. Whether or not birds accomplish this long over-sea crossing (at least 400km) is not known, but reports on Griffons found drowned and landing exhausted in fishing boats (Abreu 1986) foster the idea that some birds try to fly directly to Africa. However, preliminary radar observations carried out during this count have shown that sometimes birds leaving in a south-west offshore direction rotate to regain the continent and subsequently follow a south-east overland route.

Migration of raptors through Sagres is most likely a small part of a larger movement of raptors through Portugal that so far has remained unnoticed. The radar observations suggest that other flight paths directly oriented to Gibraltar occur to the north-east of Sagres and that these are alternatives to the coastal route, though they seem not to be mutually exclusive.

Besides the need for a further in-depth characterisation of the migratory movements in Sagres and their interpretation in relation to geography, topography and meteorology, this autumn count raises some interesting ecological and behavioural questions:

- What populations migrate through Sagres? To what extent are there differential migration strategies by age class in these populations?
- What relationships exist between Sagres and other routes in Iberia? Are migrants occurring in Sagres simply being drifted from their main flight pathways or, on the contrary, are they taking a truly alternative route, for example in response to adverse climatic conditions elsewhere?
- Do migrants cross from Sagres to North Africa over the sea, and with what weather conditions are they most likely to do so? Also, what is the fate of migrants that fly over this large body of water?
- How do migrants use the habitats along the coast and the nearby back country? What lessons for conservation and land management can be drawn from that?

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