

## CURRENT STATUS OF THE OSPREY IN THE CAPE VERDE ISLANDS

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ABSTRACT.—In 1998 and 1999, we carried out a systematic survey of the Osprey (*Pandion haliaetus*) in the Cape Verde Islands, to evaluate its population and conservation status. Some poorly surveyed areas were revisited in the summer of 2001 to complete our status assessment. We found an estimated 72–81 pairs on the archipelago, of which 94% were concentrated in the northern *Barlavento* (windward) islands group. In this area the species is common and seems to be recovering from a presumed decline, probably caused by a long-term overharvesting of eggs and nestlings by humans during past decades. On the contrary, in the southern *Sotavento* (leeward) islands the species is currently scarce, seemingly still on the decline and already extirpated in the southwesternmost islands. The high percentage of abandoned near-shore nests in the eastern “flat” islands is probably associated with the increasing tourism activities.

KEY WORDS: *Osprey*; *Pandion haliaetus*; *Cape Verde Islands*; *survey*; *status*.

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### ESTADO ACTUAL DEL ÁGUILA PESCADORA *PANDION HALIAETUS* EN LAS ISLAS DE CABO VERDE

RESUMEN.—Durante el año 1998 y la primavera de 1999 se hizo una prospección sistemática del águila pescadora (*Pandion haliaetus*) en las islas de Cabo Verde con la intención de actualizar la información sobre su estado poblacional y de conservación. Algunas áreas peor prospectadas fueran visitadas en el verano de 2001 para confirmar datos anteriores. Se obtuvo como estimación más probable el número de 72–81 parejas reproductoras en todo el archipiélago, largamente (94%) concentradas en el grupo de islas septentrionales del *Barlavento*. En este área, la especie es bastante común y parece estar recuperándose de un presunto declive durante las décadas pasadas, como resultado probable de un continuo expolio de huevos y pollos para la alimentación humana. Al contrario, en las islas del grupo sureño del *Sotavento*, la especie es actualmente muy escasa y sigue aparentemente en declive y incluso ya extinguida en las islas del extremo suroccidental. El incremento del turismo costero constituye una amenaza adicional para los núcleos poblacionales de las islas “llanas” orientales al echar la especie de sus sitios vulnerables de nidificación costera, como lo indica el alto porcentaje de nidos abandonados a lo largo del litoral.

[Traducción de los autores]

The breeding distribution of the Osprey (*Pandion haliaetus*) in the Western Palearctic is patchy. Northern populations, especially those of Fennoscandia and Russia, are large and secure, while those of the south, in the Mediterranean region and Macaronesia, are relict and endangered (Sau-

rola 1997, Schmidt 1998). Formerly, the species bred in all Macaronesian islands, except for the Azores. In the Canary Islands the Osprey has undergone a marked decline (González et al. 1992), whereas in the Madeira Islands it was extirpated long ago (Palma 2001). Yet, several toponymic references remain along sea cliffs as evidence of the Osprey's occurrence in the past.

In the Cape Verde Islands, the Osprey was prob-

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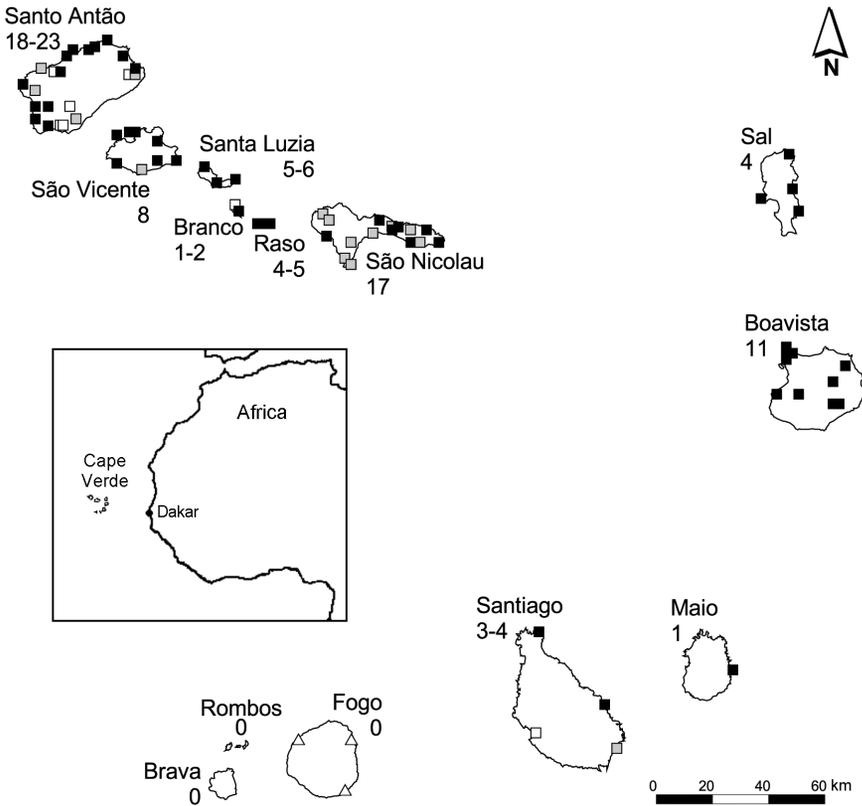


Figure 1. Geographic location of the Cape Verde Islands and distribution of Osprey breeding territories: confirmed (black squares), probable (gray squares), possible (open squares), and deserted (open triangles). Figures indicate the estimated number of pairs per island.

ably common during the 19th century and the first half of the 20th century, as suggested by the scanty and imprecise references available (e.g., Alexander 1898, Murphy 1924, Bourne 1955). Naurois (1987) estimated the population during the 1960s at 45–70 pairs, plus one possible extra pair in the islets of Rombos, based on an old nest observed. However, these figures resulted from general ornithological observations, and not from a species-targeted census. Also from incidental observations, Hazevoet (1995) estimated about 50 pairs for the period 1988–93. More recently, R. Dennis and S. Hille (pers. comm.) estimated the slightly higher number of 55–65 pairs, extrapolated from the pairs and occupied nests observed in 1996–97.

Here, we present the results of an Osprey survey carried out in the Cape Verde Islands in 1998–99, with further surveys of some poorly covered areas in June–July 2001. We assessed the current population and conservation status to provide up-to-

date data for the species' conservation. Preliminary results from this survey were presented by Ferreira and Palma (2000).

STUDY AREA AND METHODS

The Cape Verde archipelago (4026 km<sup>2</sup>; 1047 km coastline perimeter) is made up of 10 islands and six larger islets, about 500 km off continental west Africa between 14°48'–17°12'N and 22°44'–25°22'W (Fig. 1). With the exception of Santa Luzia and the islets, all the islands are inhabited.

The islands' physiography varies widely, ranging from the highly rugged Santo Antão, São Nicolau, Santiago, Fogo, and Brava to the relatively flat Sal, Boavista, and Maio. The coast of the mountainous islands is steep with high rocky cliffs and sea stacks interspersed by small to medium-sized pocket beaches, whereas in the low islands the littoral zone is predominantly bordered by extensive sandy beaches and low near-shore islets.

**Preliminary Data Collecting.** Prior to fieldwork, we gathered all available data on the species in Cape Verde from the literature, mapped toponymy as well as unpubl. data from various observers, mainly C. Hazevoet and S.

Table 1. Osprey survey effort, and checking of toponymies, literature references, and pers. comm. indicating Osprey locations in the Cape Verde Islands (1998–2001).

ISLANDS	ALTITUDE <sup>a</sup>	SURVEY EFFORT <sup>b</sup>	TOPONYMIES		REFERENCES	
			VERIFIED	UNVERIFIED	VERIFIED	UNVERIFIED
Santo Antão	1979	0.326 (44)	2	1	5	0
São Vicente	774	0.315 (29)	5	1	8	0
Santa Luzia <sup>c</sup>	395	—	0	0	0	2
Branco <sup>c</sup>	327	—	0	0	1	1
Raso	164	0.210 (2)	0	0	4	0
São Nicolau	1304	0.103 (14)	4	0	4	0
Sal	406	0.124 (11)	1	0	7	0
Boavista	390	0.183 (22)	5	0	15	0
Maio	436	0.075 (6)	0	0	4	0
Santiago	1392	0.174 (35)	1	1	8	0
Fogo	2829	0.131 (11)	6	0	4	0
Brava	976	0.217 (9)	0	0	1	0
Rombos <sup>c</sup>	96	—	0	0	0	2
Total		(183)	24	3	61	5

<sup>a</sup> Maximum altitude in meters.

<sup>b</sup> No. man-d (in brackets)/km of coastline.

<sup>c</sup> No systematic survey carried out by the authors.

Hille (pers. comm.). We considered toponymy valuable information because the common name of the Osprey in both Portuguese and Capeverdean Creole (“guincho”) can be considered a reliable reference to traditional Osprey nest sites. Such toponymies are common in current and presumed former breeding areas along the coasts of southwestern Portugal, the Madeira archipelago, the Canaries, and the Cape Verdes. Examples from the latter are “Tope do Guincho” (Top of the Osprey), “Ponta Ninho do Guincho” (Point of the Osprey Nest), and “Ninho do Guincho” (Osprey Nest), among 27 sites (Table 1) that were checked for their current occupancy status.

**Field Surveys.** We carried out a comprehensive field survey, searching for territorial pairs and nest sites from December 1997–April 1999 throughout the archipelago, with the exception of Santa Luzia and the Islets of Branco and Rombos. Fieldwork was designed to encompass the Osprey extended breeding season in the islands that begins in late November (Naurois 1987, Hazevoet 1995).

We conducted an overall search in 1998. The following yr, we followed this effort with more intensive searches in the rugged islands of Santo Antão and São Nicolau, and checking of previously detected territories in São Vicente, Sal, Boavista, Maio and Santiago. From May–September 2001, we further verified some unconfirmed sites in Santo Antão.

We looked for birds and nests systematically, trying to cover the whole of both the coast and the hinterland of the islands, whether or not there were historic sites. Primarily, the search was done by motorcycle, car, and foot with binoculars and telescope, either along roads, tracks and footpaths or from lookouts. Whenever needed and feasible, the coasts were also viewed by boat from the sea.

Regularly, we interviewed local residents in rural and

fishing communities to collect information on the location of current and old nest sites, and areas where the species was observed commonly in the recent past. Information was complemented by that of other observers in the cases of Branco (March 1999; T. Clarke pers. comm.), and Santa Luzia and Rombos (October 1999 and February 2001, respectively; P.L. Suárez pers. comm.).

Birds and nests found were mapped on 1:25 000 topographic maps of the Republic of Cape Verde published by the Portuguese Army Geographical Institute. Breeding territories were mapped on an ArcView GIS (Environmental Systems Research Institute, Inc., Redlands, CA, U.S.A) simplified overlay (Fig. 1) of the 1:500 000 digital map of the Cape Verde Islands of the Portuguese Army Geographical Institute. Each territory was plotted by the geographic coordinates of the center of the correspondent 2 × 2 km UTM square, read from the 1:25 000 topographical maps.

**Survey Effort.** We calculated an index of the relative survey effort on each island, relating the number of mand of fieldwork per island with its perimeter, measured with a curvimeter on the 1:25 000 topographic maps (No. man-d/km of coastline). Santa Luzia, Branco, and Rombos were not included in these estimates because information was mainly based on incidental data collected by other observers.

**Population Status and Trends.** We classified Osprey breeding territories as *confirmed*, *probable*, or *possible*, according to birds’ observed behavior, frequency and type of sightings at a given location (foraging activities were discarded), and nest occupancy. *Confirmed*—adults or young on nest, pairs seen (>3 times) within a restricted area, solitary adults seen (>3 times) close to unoccupied nests or where information collected strongly supports

Table 2. No. of individual sightings, nests observed, and nest occupancy status of the Osprey in the Cape Verde Islands (1998–2001).

ISLANDS	OSPREY SIGHTINGS	NESTS VERIFIED	PERCENT NESTS OCCUPIED	PERCENT NESTS UNOCCUPIED	PERCENT NESTS ABANDONED
Santo Antão	78	16	56	38	6
São Vicente	70	12	58	42	0
Santa Luzia	—	5 <sup>a</sup>	—	—	—
Branco	—	0	—	—	—
Raso	12	7	71	29	0
São Nicolau	63	10	60	10	30
Sal	14	10 <sup>b</sup>	40	20	40
Boavista	75	25 <sup>b</sup>	32	32	36
Maio	5	1	0	0	100
Santiago	7	4	50	50	0
Fogo	0	3	0	0	100
Brava	0	0	0	0	0
Rombos	0	—	—	—	—
Total	324	93 <sup>c</sup>	47	29	24

<sup>a</sup>J. M. Semedo and P. L. Suárez (pers. comm.).

<sup>b</sup>Includes nests reported by Barone and Delgado (1998; see text).

<sup>c</sup>Occupancy totals calculated from 88 nests (i.e., excluding Santa Luzia).

breeding. *Probable*—pairs seen (<3 times) where information supports breeding, a pair and solitary adults observed on different occasions within a restricted area, solitary adults seen twice close to unoccupied nests, or solitary adults observed 2–3 times where information supports breeding. *Possible*—a pair seen displaying, a pair and a solitary adult observed on different occasions within a restricted area, solitary adults seen once near an unoccupied nest, or areas with no adults or nests seen but with supporting information suggesting breeding.

To categorize each nest as *occupied* (with eggs or young, or at least attended [i.e., repaired and ornamented], *unoccupied* (i.e., presently unattended, but still well preserved), or *abandoned* (decaying) we spent only the time needed to view its contents and condition, and to assess presence or absence of birds. We assumed that unoccupied nests were either (1) alternate nests, thus one occupied nest should exist within the territory, or (2) temporarily *not* occupied, i.e., observed out of the breeding season or not occupied due to breeding failure during the study period.

In evaluating trends, we calculated a minimum change in number of nests per island, comparing the mean values of two estimates (Naurois 1987 and this study). The difference found is presented as a percentage of the mean value of Naurois's estimate.

## RESULTS

**Survey Effort and Land Coverage.** During 183 man-days of fieldwork, about 94% of 988-km (the total coastal perimeter of the archipelago, excluding Santa Luzia, Branco, and the Rombos) was surveyed. In general, survey effort was higher in is-

lands of rougher ground (e.g., Santo Antão; Table 1) to compensate for the lower conspicuousness of birds and nests. São Nicolau and Fogo were exceptions due to the relatively high accessibility of the coastal belt. Santiago, despite over 30 man-d of survey, remained at a comparatively low effort rate due to the large size of the island (Table 1). We checked 89% of all toponymies and 92% of historical references for the presence of Ospreys.

**Birds and Nests Observed, and Nest Occupancy.** Our surveys yielded 324 sightings of Ospreys (Table 2) and 83 nests. Four additional nests were reported from Boavista and one from Sal during the study period (Barone and Delgado 1998, Barone et al. 1999). Furthermore, in Santa Luzia, two nests were found incidentally by J.M. Semedo (pers. comm.) in 1998 and three others by the "Cabo Verde Natura 2000" team in 1999 (P.L. Suárez pers. comm.). Altogether, we recorded 93 nests during the study period (Table 2).

In calculating percent occupancy, we did not consider nests reported from Santa Luzia due to lack of details. Of the remaining 88 nests, 41 (47%) were occupied, 26 (29%) unoccupied, and 21 (24%) abandoned. Except in Fogo, abandoned nests were mainly located on the eastern "flat" islands (Sal, Boavista, and Maio), and on São Nicolau (Table 2). In Fogo, only abandoned nests were

Table 3. Present and former (1960s; Naurois 1987) Osprey population estimates, densities, and recent population trends in the Cape Verde Islands.

ISLANDS	1998–2001 ESTIMATE <sup>a</sup>	DENSITY <sup>b</sup>	NAUROIS'S ESTIMATE	PERCENT CHANGE
Santo Antão	18–23	0.15	8–11 <sup>c</sup>	+115.8
São Vicente	8	0.09	3–6	+77.8
Santa Luzia <sup>d</sup>	5–6	0.17	3–4	—
Branco <sup>d</sup>	1–2	0.18	3–4	—
Raso	4–5	0.47	1–2	+200
São Nicolau	17	0.13	5–8 <sup>c</sup>	+161.5
Sal	4	0.04	6–8	–42.9
Boavista	11	0.09	5–8	+69.2
Maio	1	0.01	2–3	–60
Santiago	3–4	0.02	4–6 <sup>c</sup>	–30
Fogo	0		2–5 <sup>c</sup>	–100
Brava	0		3–5	–100
Rombos	0		1?	–100
Total	72–81	0.13	46–71	+31 <sup>e</sup>

<sup>a</sup> No. of estimated territories/pairs; lower estimates include confirmed and probable territories.

<sup>b</sup> Mean No. estimated pairs/km of coastline.

<sup>c</sup> Crude estimates according to Naurois (1987), hence corresponding percent change is unreliable.

<sup>d</sup> Percent change not calculated due to the unreliability of current estimates.

<sup>e</sup> Overall percent change calculated from totals excluding Santa Luzia and Rombos.

recorded, and in Brava no nests or birds were found. In the Rombos, P.L. Suárez (pers. comm.) also did not find any evidence of Osprey use in 2001.

Nests were built on the top of pinnacles (18%), on isolated sea rocks (14%), on rock ledges on steep slopes (14%), on hilltop peaks and crests (12%), on sea-cliff ledges and fallen blocks (10%), on protruding rock platforms on gentle slopes (21%), on level ground by the shore (5%), and on flat near-shore islets (1%). The first five types of nest sites predominate on mountainous islands, while the others are typical of the flatter islands. We also found a few nests atop masts of stranded vessels (5%). Nesting on the crown of palms (*Phoenix atlantidis*) (Hazevoet 1995, Ontiveros 2003) and on the sand (S. Hille pers. comm.) has also been reported from Boavista. This high plasticity in the choice of nest sites, comparable to that found by Bretagnolle et al. (2001) in New Caledonia, had already been described by Naurois (1987).

#### Distribution, Population Estimates, and Trends.

We initially estimated the Osprey population at 54–81 pairs within the area surveyed (54 confirmed, 18 probable, and 9 possible). However, we considered the lower value (confirmed pairs) too conservative as both the comparison between 1998 and 1999 censuses in Sal and Boavista, and the check-

ing of unconfirmed sites at Santo Antão in 2001, indicated that most of the probable pairs would likely be confirmed with enough fieldwork. Therefore, we believed that adding both confirmed and probable pairs would offer the more realistic estimate of 72–81 pairs in 1998–99 (Table 3). The preliminary figure of 5–6 pairs in Santa Luzia is based on data provided by P.L. Suárez (pers. comm.).

The highest numbers of Osprey pairs are in Santo Antão, São Nicolau, and Boavista, which account for 37% of the coastline and 63–64% of the Osprey population. The majority, 94% of Osprey pairs are concentrated in the Barlavento (“windward”) group (Santo Antão ↔ Boavista; 60% of the coastline), in contrast with only 6% of the population in the Sotavento (“leeward”) group (Maio ↔ Brava; 40% of the coastline; Table 3, Fig. 1).

Mean linear densities (Table 3) are much higher in the Barlavento (0.16 pairs/km of coastline) than in the Sotavento (0.01 pairs/km). Density is especially high in the small islet of Raso (0.47 pairs/km).

The comparison between the present estimate and Naurois (1987) suggested that during the last three decades, upward trends occurred in Santo Antão, Raso, and São Nicolau, and moderate positive changes in São Vicente and Boavista, all in the Barlavento (Table 3). However, the figures for San-

to Antão and São Nicolau should be taken with caution because Naurois's estimates were not made systematically.

The trends were negative in Sal, Maio, Santiago, Fogo, Brava, and Rombos, which, apart from Sal, are all in the Sotavento. At the last three islands there was no evidence of Osprey presence. In Santiago the percent of change must also be viewed with caution because of the uncertainty of Naurois' estimate. The overall trend in the archipelago is positive.

#### DISCUSSION

**Nest Occupancy.** The interpretation of present nest occupancy during a short-term study is limited by the fact that these estimates are not independent of the number of extant alternate nests. Such alternate nests are common all over the archipelago, especially in islands of milder topography, probably as a way to avoid natural and human predation or disturbance. In Boavista, where human interference and predation by Brown-necked ravens (*Corvus rufficollis*) are presumably high, P.L. Suárez (pers. comm.) has recorded that nests outnumber pairs by 3–4 times. Although the variety of nesting situations suggests that breeding habitat is not a limiting factor in the species distribution in general, the vulnerability of many nest sites in the eastern islands is probably impairing reproduction.

The percent occupancy of nests (Table 2) is clearly lower at islands such as Sal, Boavista, and Maio, where potential disturbance is higher. In Boavista, low occupancy rates have also been reported by other observers (Ontiveros 2003, P.L. Suárez pers. comm.). A tendency to desert near-shore nests seems evident at this island and may eventually cause the disappearance of pairs occupying areas of level or slightly broken terrain (Ontiveros 2003). In São Nicolau, despite its steep-inland mountains, the number of abandoned nests was also high probably due to their vulnerable locations by the shore. In New Caledonia, Bretagnolle et al. (2001) also reported a tendency of Ospreys to desert nests exposed to human disturbance, especially those on the ground. High nest vulnerability may explain the Osprey decline in Sal and Maio.

Conversely, in mountainous islands such as Santo Antão, São Vicente, and Santiago, less accessible nests predominate, as well as low percentages of abandoned nests. However, all nests found in Fogo were abandoned, despite being located in inacces-

sible places, so disturbance is unlikely to be the cause of desertion at the island.

**Population Status and Trends.** Apart from Santo Antão and São Nicolau, Naurois (1987) considered the Barlavento well surveyed. In São Nicolau, however, birds and nests are relatively conspicuous, so the numbers he reported were probably fairly accurate. Therefore, we believe, with the exception of Sal, that a genuine population increase has occurred for the Barlavento since Naurois' time.

The population recovery in the Barlavento likely resulted from a decreasing intensity of the collecting of eggs and nestlings reported by Naurois (1964). This was corroborated by statements of residents during our study and seems particularly obvious in São Vicente, where the present situation contrasts with what Naurois formerly described as near extirpation of Osprey due to overharvesting.

Opposite of the pattern observed in the Barlavento, a depression in numbers was still evident in all islands of the Sotavento, where the Osprey has apparently always been less abundant. Naurois (1987) suggested that variation in prey availability may explain the differences in Osprey numbers using these two groups of islands. The Osprey population seems to be most depressed further to the southwest (Table 3). In particular, the decaying state of the nests found in Fogo and the lack of any trace of Osprey presence in Brava and Rombos suggest that the species has been extirpated from these islands as a breeder.

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