

SEASONAL ABUNDANCE OF AQUATIC BIRDS AT ÓBIDOS LAGOON

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SUMMARY - Despite being one of the largest coastal lagoons in Portugal, the Óbidos Lagoon and its bird community has received little attention and there is almost no published information on the aquatic birds that occur in this area. Monthly bird counts were performed (September 2004 to July 2005) directed at all the aquatic bird species present in the lagoon. Throughout the year, I evaluated the seasonal abundance of each species and the relative importance of waders (Charadrii), gulls (Laridae), wildfowl (Anatidae), egrets and herons (Ardeidae) and others (including Phalacrocoracidae, Threskiornithidae, Phoenicopteridae, Rallidae and Sternidae). There was a mean of 1660 aquatic birds per count. During autumn and winter, waders were the most abundant group (41-40%), followed by gulls (29-22%) and wildfowl (22-28%). In spring, these three groups had similar abundances (26-34%), while in the summer, gulls (64%) were clearly the most abundant, followed by waders (23%), and wildfowl (9%). Amongst the most abundant species were the Mallard *Anas platyrhynchos* (352 individuals/count); the waders, Dunlin *Calidris alpina* (268 ind./count), Grey plover *Pluvialis squatarola* (67 ind./count), Ringed plover *Charadrius hiaticula* (63 ind./count); the gulls, Lesser black-backed gull *Larus fuscus* (198 ind./count), Yellow-legged gull *L. cachinnans* (181 ind./count) and Black-headed-gull *L. ridibundus* (171 ind./count). During the winter, some species achieved nationally important numbers, showing that this coastal lagoon is one of the top five sites in Portugal, for those species. Also worthy of notice was the presence of Greater flamingo *Phoenicopterus roseus* and Oystercatcher *Haematopus ostralegus*, throughout the year (with the exception of July), and the observation of species that are uncommon in Portuguese wetlands, namely Brent goose *Branta bernicla* and Artic tern *Sterna paradisica*.

ABUNDÂNCIA DE AVES AQUÁTICAS NA LAGOA DE ÓBIDOS - Apesar de se tratar de uma das maiores lagoas costeiras da costa portuguesa, a avifauna da Lagoa de Óbidos tem sido pouco estudada, sendo escassa a informação publicada sobre as aves aquáticas desta lagoa. De Setembro de 2004 a Julho de 2005, realizaram-se mensalmente contagens de aves, em períodos de baixa-mar, dirigidas às aves aquáticas da Lagoa de Óbidos. Foi avaliada ao longo do ano a abundância de cada espécie e a importância relativa de limícolas (Charadrii), gaivotas (Laridae), anatídeos (Anatidae), garças (Ardeidae) e outros (incluindo Phalacrocoracidae, Threskiornithidae, Phoenicopteridae, Rallidae e Sternidae). Observaram-se em média 1660 aves por contagem, sendo que, durante o Outono e Inverno, as limícolas (41-40%) foram o grupo mais abundante, seguidas das gaivotas (29-22%) e anatídeos (22-28%). Na Primavera estes três grupos tiveram abundâncias semelhantes (26-34%), enquanto que no Verão as gaivotas (64%) foram claramente o grupo mais importante seguidas das limícolas (23%) e dos anatídeos (9%). Entre as espécies mais abundantes, contaram-se o Pato-real *Anas platyrhynchos* (352 indivíduos/contagem); as limícolas, Pilrito-de-peito-preto *Calidris alpina* (268 ind./contagem), Tarambola-cinzeira *Pluvialis squatarola* (67 ind./contagem) e Borrelho-grande-de-coleira *Charadrius hiaticula* (63 ind./contagem); e as gaivotas, Gaivota-d'asa escura *Larus fuscus* (198 ind./contagem), Gaivota-de-patas-amarelas *L. cachinnans* (181 ind./contagem) e Guincho *L. ridibundus* (171 ind./contagem). Algumas destas espécies atingiram, no Inverno, números de alguma

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*relevância a nível nacional, revelando que a Lagoa de Óbidos é um dos cinco locais de maior importância para essas espécies em Portugal. Refira-se ainda a ocorrência de Flamingo *Phoenicopterus roseus* e Ostraceiro *Haematopus ostralegus* durante todo o ano (à excepção do mês de Julho) e a observação de espécies pouco comuns nas zonas húmidas portuguesas, como o Ganso-de-faces-pretas *Branta bernicla* e a Gavina-do-ártico *Sterna paradisea*.*

With a total area of 6.57 km² and a perimeter of 22 km, the Óbidos lagoon is one of the largest coastal lagoons in the Portuguese coast (Farinha & Trindade 1994). Despite its size, few studies have analysed the importance of this lagoon for wildfowl and other aquatic birds. In fact, in several years, the Óbidos lagoon was not even included in the national winter aquatic bird counts, performed every year by the Institute for Nature Conservation (e.g. Costa & Rufino 1994).

Several disturbance factors have long hampered the environmental quality of this lagoon, namely urban and industrial sewage from nearby towns (Caldas da Rainha and Óbidos), pesticides carried from farmland into the lagoon basin, tourist pressure, construction along the banks, wetland drainage, illegal hunting and sedimentation (Pereira da Silva 1992). However, the lagoon is known to have some importance for egrets (Farinha & Trindade 1994), gulls (Rufino 1989a), cormorants (Rufino 1989a, 1992, 1993) and waders (Rufino 1993).

The aim of this study is to analyse the seasonal abundance of aquatic birds at the Óbidos lagoon in order to assess its ecological importance and create awareness for its protection.

METHODS

Study site

The Óbidos lagoon (39°25'N, 9°13'W) is located near Caldas da Rainha, about 80 km north of Lisbon. This lagoon is formed by the catchments of three small rivers: Cal, Rial and Arnóia, and meets the ocean near Foz do Arelho (Figure 1). The lagoon is open to the ocean throughout the year and therefore forms a tidal environment, but, during periods of heavy rainfall, the freshwater input has a greater influence on the water level.

Bird counts

Between September 2004 and July 2005, I carried out monthly bird counts (n=11), usually on the third weekend of each month. For each count, I drove around the lagoon, searching for birds with a spotting telescope from a few vantage points (Figure 1) that allowed me to identify and count all the aquatic birds present in the lagoon. Each count was made during low tide, taking two to three hours to complete, and all bird movements were recorded to avoid counting birds twice. Due to the strong tourist use of the lagoon in August, I decided not to carry out bird counts in that month, which may have influenced the summer averages.

The counts were directed at all aquatic birds present, namely waders (Charadrii), gulls (Laridae), waterfowl (Anatidae), herons and egrets (Ardeidae) and others (including Phalacrocoracidae, Threskiornithidae, Phoenicopteridae, Rallidae and Sternidae). All results are presented as mean \pm standard error.

RESULTS

An average of 1680 \pm 214 (n=11) aquatic birds were observed per visit, representing a total of 46 species. These included several species of international concern (Table 1). The highest numbers of birds were observed during autumn and winter, with much lower numbers in spring. The relative importance of each group varied throughout the year with waders representing the largest portion of birds during autumn and winter, and gulls representing over 60% of the birds observed in summer, whereas similar number of waders, gulls and wildfowl were counted during spring (Figure 2a). The remaining species corresponded to a small proportion of birds.

The most abundant species was the Mallard *Anas platyrhynchos*, followed by Dunlin *Calidris alpina*, and three species of gulls (Lesser black-backed gull *Larus*

fuscus, Yellow-legged gull *L. cachinnans* and Lesser black-headed gull *L. ridibundus*). The Ringed plover *Charadrius hiaticula*, Grey plover *Pluvialis squatarola* and Curlew *Numenius arquata* were also amongst the most abundant waders (Table 1).

Mallard was most abundant between October and March, showing a small increase in May (Figure 2b). The most common waders show a similar temporal pattern, with higher abundances between November and March (Figure 2c). Dunlin and Ringed plover reached also a peak in September, and there were also higher numbers of Dunlin in May.

Regarding gulls (Figure 2d), the Black-headed gull was abundant throughout autumn and winter, with a large peak in March, while Yellow-legged gull had higher numbers between June and November. The Lesser black-backed gull reached its highest abundance between September and November; the results from July are omitted in the graphic, as the very high count (1457) was strongly influenced by a single flock of birds that stayed in the lagoon for only two days.

Some of the less abundant species reached high numbers during winter, like Coot *Fulica atra* (max: 102 individuals) Great cormorant *Phalacrocorax carbo* (max: 85 ind.), Knot *Calidris canutus* (max: 67 ind.) and Bar-tailed godwit *Limosa lapponica* (max: 51 ind.). Knot reached a maximum of 91 individuals during

spring migration, while Sanderling *Calidris alba* reached 58 individuals in autumn migration. Black-winged stilt *Himantopus himantopus* breeds at the Óbidos Lagoon (pers. obs.) and a maximum of 54 adults were observed during the breeding period.

DISCUSSION

The highest numbers of birds were observed during winter, which was already expected as the majority of the observed species are winter visitors for Portugal (Cramp & Simmons 1983). In spring, the most abundant species were those that breed in the lagoon or in nearby areas, like Mallard (Rufino, 1989b), Yellow-legged gull (Morais *et al.* 1998) or Black-winged stilt (pers. obs.).

The lagoon seems to be more important for Mallard as a wintering area than as a breeding site. In fact, the January count of 689 individuals represents 6-12% of the total wintering population in Portugal in recent years, and places the Óbidos Lagoon as one of the top five sites for this species in the country (Rufino 1988, 1989a, 1992, 1993, Costa & Rufino 1994 1995, 1996, 1997).

The Óbidos lagoon holds several hundreds of gulls throughout the year, but the phenology of the three most abundant species showed different patterns. Black-headed gull was the most abundant

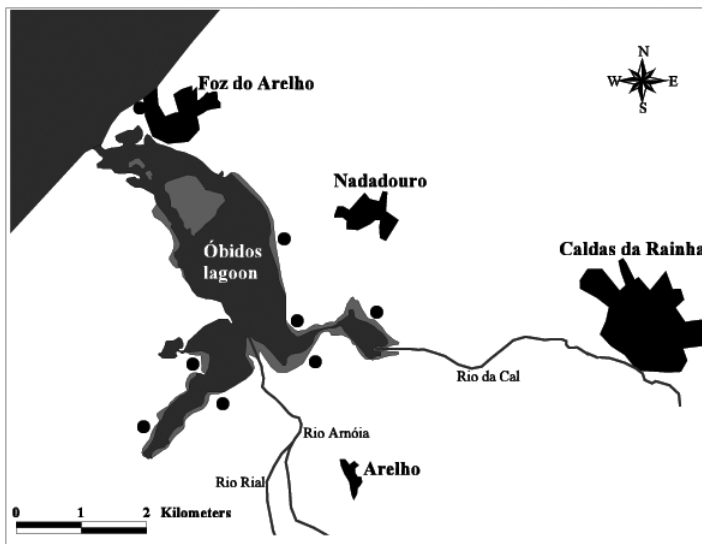
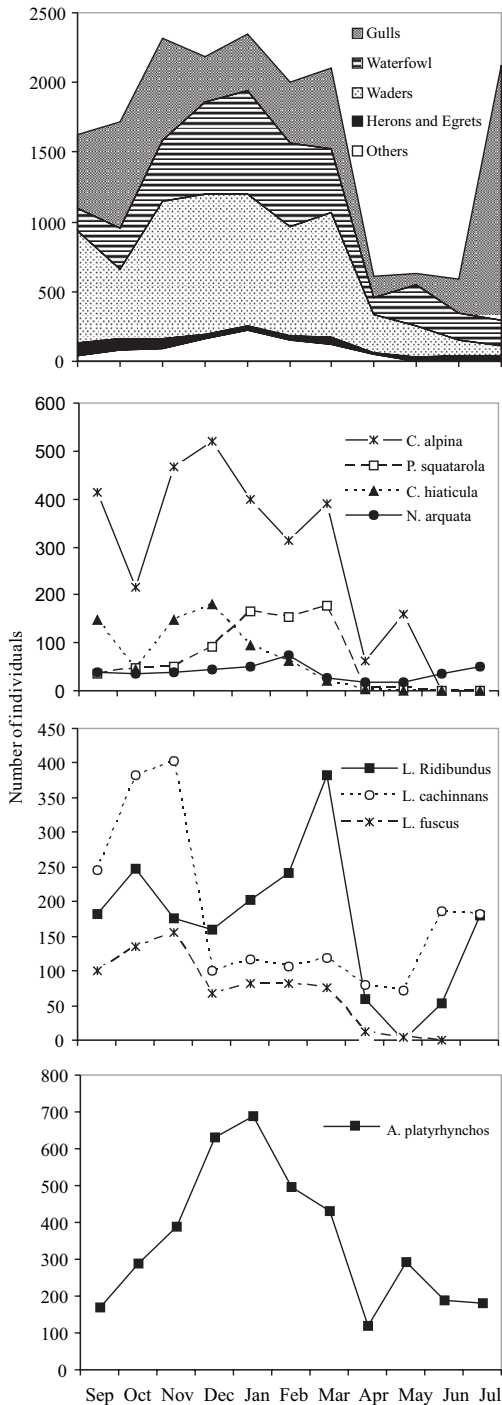


Figure 1. Map of the study area. Light grey represents the intertidal areas of the lagoon, urban areas are represented in black. The black dots represent the locations from where the counts were performed. / **Figura 1.** Mapa da área de estudo. As áreas a cinzento claro referem-se às zonas entre-marés da lagoa, a preto estão representadas as áreas urbanas. Os pontos pretos representam os locais das contagens.

Table 1. Mean number of birds (\pm SE) in each season (Autumn, Winter and Spring: n = 3; Summer: n = 2) and SPEC category of each species. (1) BirdLife International (2004). * This result was strongly influenced by a single flock of birds that stayed in the lagoon for only two days. / **Tabela 1.** Número médio \pm Erro Padrão de aves em cada estação (Outono, Inverno e Primavera: n = 3, Verão: n = 2) e a categoria SPEC de cada espécie. (1) BirdLife International (2004). * Este resultado foi influenciado por um grande bando de gaivotas que permaneceu na lagoa por apenas dois dias.

	SPEC category(1)	Autumn	Winter	Spring	Summer
<i>Podiceps nigricollis</i>		1 \pm 0.7	4 \pm 0.9	0	0
<i>Tachybaptus ruficollis</i>		1 \pm 0.3	2 \pm 0.9	0	1 \pm 0.4
<i>Phalacrocorax carbo</i>		63 \pm 10.5	50 \pm 17.8	31 \pm 2.4	16 \pm 11.2
<i>Egretta garzetta</i>		23 \pm 6.7	10 \pm 2.2	5 \pm 1.2	20 \pm 11.0
<i>Bubulcus ibis</i>		0	4 \pm 1.9	0	1 \pm 0.6
<i>Ardea cinerea</i>		35 \pm 6.5	26 \pm 6.4	19 \pm 4.9	42 \pm 11.2
<i>Ardea purpurea</i>	SPEC 3	0	0	2 \pm 0.9	1 \pm 0.8
<i>Platalea leucorodia</i>	SPEC 2	0	1 \pm 0.6	0	0
<i>Phoenicopterus roseus</i>	SPEC 3	6 \pm 1.3	24 \pm 1.5	6 \pm 4.0	1 \pm 0.8
<i>Cygnus olor</i>		1 \pm 0.3	0	0	0
<i>Branta bernicla</i>	SPEC 3	1 \pm 0.7	1 \pm 0.3	1 \pm 0.3	0
<i>Anas platyrhynchos</i>		435 \pm 101.7	538 \pm 77.6	201 \pm 50.6	174 \pm 4.3
<i>Anas strepera</i>	SPEC 3	5 \pm 3.2	0	2 \pm 1.7	0
<i>Anas acuta</i>	SPEC 3	0	1 \pm 0.3	0	0
<i>Anas penelope</i>		3 \pm 2.7	16 \pm 9.2	0	0
<i>Anas crecca</i>		15 \pm 5.2	31 \pm 8.7	0	0
<i>Anas clypeata</i>	SPEC 3	2 \pm 1.5	15 \pm 9.4	0	0
<i>Fulica atra</i>		35 \pm 21.3	73 \pm 21.6	1 \pm 1.0	0
<i>Haematopus ostralegus</i>		14 \pm 3.7	16 \pm 1.1	12 \pm 1.9	3 \pm 2.2
<i>Charadrius hiaticula</i>		123 \pm 41.4	58 \pm 21.1	1 \pm 1.0	73 \pm 59.8
<i>Charadrius alexandrinus</i>	SPEC 3	15 \pm 6.2	16 \pm 6.9	7 \pm 2.5	12 \pm 0.8
<i>Arenaria interpres</i>		0	0	0	3 \pm 2.4
<i>Pluvialis squatarola</i>		62 \pm 14.2	166 \pm 6.6	4 \pm 1.9	18 \pm 14.7
<i>Calidris ferruginea</i>		3 \pm 1.7	4 \pm 2.9	0	6 \pm 4.5
<i>Calidris alpina</i>	SPEC 3	401 \pm 93.4	368 \pm 27.2	75 \pm 46.8	207 \pm 169.0
<i>Calidris canutus</i>	SPEC 3	33 \pm 17.0	61 \pm 18.9	12 \pm 10.0	13 \pm 10.4
<i>Calidris alba</i>		30 \pm 15.9	32 \pm 8.5	15 \pm 15.3	1 \pm 0.8
<i>Calidris minuta</i>		13 \pm 4.9	0	2 \pm 1.7	3 \pm 2.2
<i>Gallinago gallinago</i>	SPEC 3	1 \pm 0.7	0	0	0
<i>Numenius arquata</i>	SPEC 2	39 \pm 2.8	50 \pm 14.1	24 \pm 6.2	45 \pm 4.3
<i>Numenius phaeopus</i>		5 \pm 2.0	4 \pm 2.0	4 \pm 2.7	6 \pm 2.2
<i>Limosa limosa</i>	SPEC 2	1 \pm 0.7	38 \pm 18.2	0	2 \pm 1.6
<i>Limosa lapponica</i>		57 \pm 15.1	25 \pm 13.5	14 \pm 10.7	17 \pm 14.1
<i>Actitis hypoleucos</i>	SPEC 3	10 \pm 2.9	3 \pm 2.3	1 \pm 0.7	7 \pm 3.1
<i>Tringa nebularia</i>		14 \pm 3.8	15 \pm 1.9	4 \pm 3.7	7 \pm 5.3
<i>Tringa totanus</i>	SPEC 2	12 \pm 1.5	2 \pm 1.5	1 \pm 1.0	14 \pm 11.4
<i>Recurvirostra avosetta</i>		0	1 \pm 0.3	4 \pm 3.7	0
<i>Himantopus himantopus</i>		0	12 \pm 11.7	28 \pm 13.3	3 \pm 1.4
<i>Larus fuscus</i>		118 \pm 26.5	79 \pm 1.9	6 \pm 3.8	784 \pm 557.7*
<i>Larus cachinnans</i>		295 \pm 97.1	114 \pm 4.0	112 \pm 36.9	213 \pm 25.5
<i>Larus melanocephalus</i>		1 \pm 0.7	3 \pm 3.0	1 \pm 0.3	0
<i>Larus ridibundus</i>		194 \pm 27.2	275 \pm 54.8	37 \pm 18.9	180 \pm 1.4
<i>Sterna sandvicensis</i>	SPEC 2	8 \pm 7.7	10 \pm 6.7	8 \pm 6.7	4 \pm 3.1
<i>Sterna hirundo</i>		1 \pm 0.7	0	0	0
<i>Sterna paradisea</i>		0	0	1 \pm 0.3	0
<i>Sterna albifrons</i>	SPEC 3	0	0	0	1 \pm 0.2



gull during the winter, but reached highest numbers in March, during spring migration, in accordance to what is known for the Tejo estuary (Moreira 1995). The smaller peak, between July and October, has also been recorded in other locations in Iberia (Galarza 1984, Moreira 1995), probably relating to the autumn migration of this northern European breeder (Cramp & Simmons 1983). Lesser black-backed gull also occurs in Portugal mostly during winter (Galissa 1988). At the Óbidos lagoon this species reached its highest abundance between September and November, with also a large peak in July, suggesting that the species uses the area mostly in the autumn migration, unlike in the Tejo estuary, where this species is very abundant throughout the winter (Moreira 1995). Yellow-legged gull had a clearly different pattern, occurring mostly during breeding and post-breeding dispersal, up until December. This must have been determined by the geographic proximity of this site to one of the species' main breeding colonies in Portugal, the Berlenga Island, which is about 20 km from the Óbidos lagoon (Morais *et al.* 1998).

Wader numbers were highest during the winter, period in which most species occur in Portugal, before departing to their breeding grounds in northern Europe (Cramp & Simons 1983). The exceptions were Black-winged stilt and Kentish plover *Charadrius alexandrinus*, which breed in

Figure 2: Seasonal abundance of aquatic birds at the Óbidos lagoon. a) abundance of different bird groups throughout the year; b) abundance of mallard *Anas platyrhynchos* throughout the year; c) abundance of the main wader species (dunlin *Calidris alpina*, grey plover *Pluvialis squatarola*, ringed plover *Charadrius hiaticula* and curlew *Numenius arquata*) throughout the year; d) abundance of the main gull species (black-headed gull *Larus ridibundus*, yellow-legged gull *Larus cachinnans* and lesser black-backed gull *Larus fuscus*) throughout the year.

Figura 2: Abundância sazonal de aves aquáticas na Lagoa de Óbidos. a) abundância dos vários grupos ao longo do ano; b) abundância do pato-real *Anas platyrhynchos* ao longo do ano; c) abundância das principais espécies de limícolas (pilrito-de-peito-preto *Calidris alpina*, tarambola-cinzenta *Pluvialis squatarola*, borrelbo-grande-de-coleira *Charadrius hiaticula* e maçarico-real *Numenius arquata*) ao longo do ano; d) abundância das principais espécies de gaivotas (quincho *Larus ridibundus*, gaivota-de-patas-amarelas *Larus cachinnans* e gaivota-d'asa-escura *Larus fuscus*) ao longo do ano.

Portugal. Dunlin was the most abundant species and the January count of 400 individuals represented 0.6-1.6% of the wintering population in Portugal in recent years, and indicates that Óbidos lagoon is one of the main sites for this species outside the main estuaries of Tejo, Sado and Mondego (Rufino 1988, 1989a, 1992, 1993, Costa & Rufino 1994, 1995, 1996, 1997). Outside winter, the abundance of dunlin in the lagoon had two peaks, in May and September, corresponding to the migratory passages, as reported also for other areas in Iberia (Galarza 1984, Rufino 1984, Batty 1992). The January counts of Grey plover (166 individuals, 1.6-4.0% of the national total), Ringed plover (94 individuals, 1.6-6.8% of the national total), Knot (67 individuals, 4-12% of the national total), Bar-tailed godwit (51 individuals, 0.8-2.8% of the national total) and Curlew (50 individuals, 1.5-8.0% of the national total) indicate that the lagoon also holds important numbers of these species during winter (Rufino 1988, 1989a, 1992, 1993, Costa & Rufino 1994, 1995, 1996, 1997).

The lagoon seems to have some importance as a stop-over site for knot and sanderling. The first had an abundance peak in spring, when many African wintering birds pass through the Iberian Peninsula on the way to their breeding grounds (Smit & Piersma 1989, Hortas 1990, Moreira 1995). The latter had a peak during autumn migration, showing a similar pattern to that observed in the Tejo estuary (Moreira 1995).

Another interesting finding was that Great flamingo *Phoenicopterus roseus*, occurs in the lagoon throughout the year (the only exception was July), although in small numbers (mean: 10.1 ± 3.0 , range: 0-27 individuals). This is relevant as the species in Portugal is not common outside its main places of occurrence like the Tejo, Sado and Ria Formosa (Farinha *et al.* 1991, 1992).

The results show that the Óbidos lagoon holds important numbers of several aquatic bird species, particularly in winter, and probably has some significance as a stop-over site for migratory birds. Even if the importance of the species in relation to the national totals, as presented here, may be overestimated (they were based on national estimates that may underestimate the size of the populations), I believe this study clearly shows the importance of the Óbidos lagoon for aquatic birds. Future studies should improve our understanding of this coastal

habitat, focusing not only on aquatic birds but also on other bird groups and aspects of the natural richness of this site, namely long-term studies, and an analysis of the impacts of human activities in the lagoon. There is a need for a better management of the Óbidos lagoon, in order to preserve the bird community it now holds and to recover some of the past losses due to poor management from local authorities.

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