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Editorial

Fui o primeiro editor principal do Airo, desde que passou a ser publicado pela Sociedade Portuguesa para o Estudo das Aves e este será o meu último volume como editor principal. Foi um período algo difícil devido à reduzida submissão de manuscritos mas a revista sobreviveu, o número de manuscritos tem vindo a aumentar e conseguimos que o Airo seja agora indexado na base de dados "Biological Abstracts" e "Biosis Previews" da Thomson scientific. O nosso objectivo de só publicar artigos em inglês não foi alcançado, pois alguns autores continuam a preferir escrever artigos em Português. No entanto o número de artigos publicados em inglês também aumentou ligeiramente. Por fim, resta-me agradecer a colaboração do Luís Costa na maquetação dos artigos e desejar ao novo Editor do Airo, Dr. José Pedro Granadeiro, um grande sucesso na continuação da publicação do Airo.

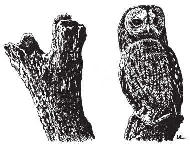
I was the the first editor of Airo, since it began to be published by the Portuguese Society for the Study of Birds and this volume is the last that I shall handle as Scientific Editor. My terms as editor went through a difficult period due to the reduced number of submissions per year. However, the journal has survived, the number of submitted manuscripts are now increasing and the journal is now indexed and abstracted in Biological Abstracts and Biosis Previews of Thomson Scientific. Our aim to publish articles only in English did not succeed, because several authors continue to prefer to submit articles in Portuguese. However, the number of articles written in English has increased slightly. It only remains for me to thank Luis Costa for text layout and design and wish the new Editor, Dr. José Pedro Granadeiro, every success with the Airo.

Jaime M. Ramos

Airo 18: 5-14 (2008)

Modelling owl mortality on roads of Alentejo (Southern Portugal)

Clara Isabel Correia da Silva[1], Clara Grilo[2] & António Mira[3]



SUMMARY - *Owls are one of the birds of prey most commonly found dead along roads. Thus, we investigated the importance of 22 environmental variables on the owl casualties and developed predictive models to estimate the likelihood of owl-vehicle collisions in Alentejo, southern Portugal. We recorded 123 corpses of three owl species, the Barn Owl* Tyto alba *made up 43% (n=53) of the road-kills, followed by the Little Owl* Athene noctua *(29%, n=36) and the Tawny Owl* Strix aluco *(28%, n=34), along 314 km of local roads on a two week basis from August to November 2004. Topography and land use explained the occurrence of owl road kills. Predictive models allowed the identification of several hotspots of owl mortality where a set of combined mitigation measures should be applied to reduce owl mortality. We recommend management of road verges vegetation, implementation of non-transparent screens on roadsides, removal of structures that act as perching sites, and lowering the traffic speed limits.*

MODELAÇÃO DA MORTALI DADE DE RAPINAS NOCTURNAS EM ESTRADAS DO ALENTEJO - *Os Strigiformes são o grupo de aves de rapinas mais vítimas de atropelamento na estradas. Assim, avaliou-se a influencia de 22 variáveis ambientais na ocorrência de mortalidade das rapinas nocturnas nas estradas e ainda, foram construídos modelos predictivos da ocorrência de atropelamentos para cada uma das espécies de Strigiformes. Foram contabilizados 123 cadáveres pertencentes sendo a Coruja-das-torres* Tyto alba *a rapina nocturna mais afectada correspondendo a 43% (n=53) do total de atropelamentos, seguida do Mocho-galego* Athene noctua *(29%, n=36) e da Coruja-do-mato* Strix aluco *(28%, n=34) ao longo de 314 km de estradas do Alentejo entre Agosto e Novembro de 2004. O uso do solo e a topografia foram os dois factores que mais influenciaram a ocorrência de mortalidade de Strigiformes. São ainda propostas medidas de prevenção e minimização do número de atropelamentos, a serem implementadas nos locais com maior incidência de atropelamentos. Essas medidas consistem na limpeza e manutenção das bermas, colocação painéis ao longo das estradas, eliminação das estruturas que possam servir de poisos e sinalização que limite a velocidade do tráfego rodoviário.*

Traffic mortality is nowadays one of the most recent and important causes of non-natural mortality in owls and has long been recognized as one of the largest conservation problems affecting this group (Hernández 1988, Newton *et al*. 1997, Fajardo *et al*. 2000, Fajardo 2001, Meek *et al*. 2003). According to these studies, the mortality induced by the collision with vehicles can be a limiting factor to their populations, bringing several owl species to an unfavourable conservation status (Fajardo & Pividal 1994, Del Hoyo *et al*. 1999). Several authors suggest that owls use the roads to hunt, as marginal habitats, or for navigation corridors through the landscape (Fajardo *et al*. 1998, Meunier *et al*. 2000, Ramsden 2003).

Despite the large number of road mortality studies (Hernández 1988, Grajera *et al*. 1992, Muntaner & Mayol 1996, Fajardo 2001), knowledge of the

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effects of roads on owl populations is still scarce. In Portugal just a few studies have focused on this subject, but only in some particular roads (Marques 1994, Franco 2000, Ascensão 2001, Lourenço *et al*. 2003), and no study has made an approach at a broader scale.

Thus, finding integrated solutions to minimise the negative effects of roads on owls is a great challenge. To do so, monitoring programs are needed to allow the identification of which owl species are more vulnerable to roads, the role of environmental and road-related features on road kill incidence and where owls are more susceptible to high killing rates along roads (Iuell *et al*. 2003).

In this context, the present study summarizes and describes the patterns of owl mortality in Alentejo, southern Portugal. With this aim, we (i) quantified the occurrence of owl road kills; (ii) analysed the spatial patterns of road mortality; and (iii) developed predictive models of road mortality in order to identify the major environmental descriptors influencing owl fatalities and locate the potential hotspots. Finally, recommendations of mitigation measures are discussed.

METHODS

» Study Area

A total of 314 km of roads were surveyed in Alentejo, southern Portugal (8º49'N, 38º46'E), encompassing different kinds of road sections: main roads with high traffic volume and high speeds (IP2 and IC2) and several national roads with medium traffic volume (Figure1; Table1). This is an area of vast plains typically Mediterranean, where summers are hot and dry and winters cold and rainy. Total annual precipitation varies from 800mm^3 in the northwest to less than 500mm^3 in the southwest (Rivas-Martinez 1981).

The study area is dominated by cork and holm oak woodlands (named "montado") (40%), cereal fields (28%), orchards, vineyards and olive groves (13%), forest plantations (*Eucalyptus* spp. and *Pinus pinaster*) (11%), and urban areas (8%) (Source: IGP 1990). Three Natura 2000 sites are included in the study area: Alvito/Cuba, Cabrela and Monfurado. This region is known by the high human population exodus in the last decades. As a consequence, human population and road density are low, on average of 43 inhab./km^2 and 0,25km roads/km^2, respectively.

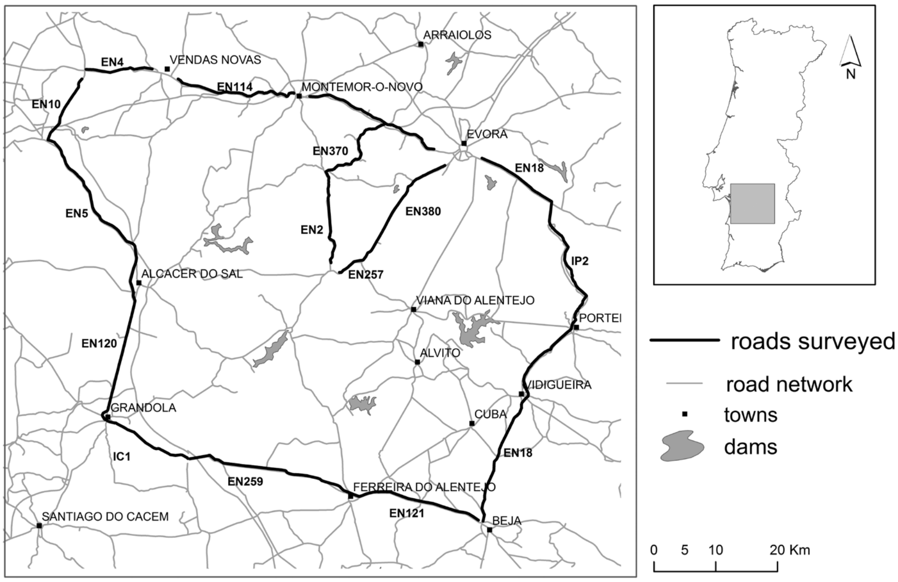


Figure 1. Location of the study area. / ***Figura 1.*** *Localização da área de estudo.*

» Road-kill surveys

From August 2004 to November 2004, roads were surveyed on both directions twice per month, in a total of eight sampling sessions. The surveys were carried out by two observers using a vehicle with a constant speed of about 20km/hour. For each observed casualty we identified the species and recorded the geographic coordinates using a global positioning system All carcasses were removed on sampling occasion to avoid double counting.

Table 1. Monitored roads, distances and daily traffic volume over four months of sampling. / ***Tabela 1.*** *Estradas monitorizadas, distâncias percorridas e densidade de tráfego correspondente aos quatro meses de amostragem.*

Roads surveyed		Travelled Distance (Km)	Number vehicles /day [a]
Principal Itinerary	IP2	40	5920
Complementary Itinerary	IC1	16	---
National roads	EN2	16	---
	EN4	31	8084
	EN5	33	9361
	EN10	12	8276
	EN18	34	8845
	EN114	23	13252
	EN120	19	---
	EN121	22	6508
	EN257	4	---
	EN259	27	5389
	EN370	15	---
	EN380	22	5944
Total		314	---

[a] Total of vehicles registered per day, during the summer months of year 2001. Official traffic database, supplied by the Instituto de Estradas de Portugal (IEP, 2001).
-- No data.

» Environmental descriptors

We used 22 environmental descriptors known to influence owl ecology as well as road mortality spatial patterns (topography, land use, road related features, perching sites availability, and traffic volume – Table 2) (Mikkola 1983, Hernandez 1988, Petty 1989, Marques 1994, Massemin & Zorn 1998, Meunier *et al.* 2000, Fajardo 2001, Clevenger *et al.* 2003). Roads were divided into 500m segments and were characterised for each variable (Table 2).

» Data analysis

Predictive models of road-kills for each owl species were obtained through binary logistic regression, following the procedures in Hosmer & Lemeshow (2000). The dependent variable used was the presence/absence of a road-kill at each 500m road segment. The absences were randomly chosen and in the same proportion of presences. We first performed a univariate logistic regression. Variables significant at a 0.25 level in the Wald test were retained for further analysis (Hosmer & Lemeshow 2000). Prior to this analysis, a Spearman rank correlation test was computed between all pairs of environmental descriptors to evaluate the existence of collinearity. When correlation coefficients were higher than 0.7 (Tabachnik & Fidell 2001), only the variable with more biological meaning was retained. A multivariate logistic regression was carried out with all the descriptors from the previous selection using a forward stepwise selection method (p-value for variable entry=0.05). The area under the ROC (Receiver Operating Characteristics) curve was used to evaluate the performance of the model (Hosmer & Lemeshow 2000). Model validation was done through a Jackknife procedure according to Olden *et al.* (2002). As suggested by López (1993), "hotspots" of mortality were defined as road sections with values higher than 0.75 as obtained in the predictive models.

All statistical procedures were done with the SPSS® statistical package version 12.0 (Norusis 2003). Spatial data was computed with ArcGIS 8.2 (ESRI 2000).

RESULTS

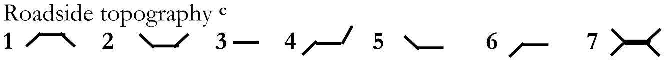
» Species composition

We found 123 dead owls belonging to three species. Barn Owl (*Tyto alba*) was the species more affected (n=53, 43%), followed by the Little Owl (*Athene noctua*) (n=36, 29%), and the Tawny Owl (*Strix aluco*) (n=34; 28%). Although occurring in the study area, no records were found for Long-eared owl (*Asio otus*) and Eagle Owl (*Bubo bubo*), both threatened in Portugal (Cabral *et al.* 2005).

» Spatial patterns of owls fatalities

Owl road-kills were unevenly distributed throughout the sampled road section (Figure 2). Two sites with high incidence of Barn Owl mortality were identified - Ferreira do Alentejo (EN259) and Alcácer do Sal (EN5) - in areas dominated by cereal

Table 2. Definition and description of variables used in the analysis of factors explaining road-kill occurrence.
Tabela 2. *Denominação e definição das variáveis usadas na análise dos factores explicativos da ocorrência de atropelamento.*

Variable name	Definition
Topography	
ALTITUDE	Mean altitude[a] (m)
SLOPE	Mean slope [b] (m)
Land use	
D_TOWN	Distance to nearest town [a] (m)
OAK WOODLAND	Holm oak and/or cork oak woodland [c] (%)
SHRUBS	Shrubland area [c] (%)
CEREAL FIELDS	Cereal fields area [c] (%)
FOREST_P	Forest (pine/eucalyptus) plantation [c] (%)
OGVO	Orchads, vegetable gardens, vineyards and olive groves [c] (%)
URBAN	Urban area [c] (%)
RIPARIAN_VEG	Riparian vegetation (%)
RICE	Rice fields area [c] (%)
CORRIDOR	Corridors of trees [c] 0 – without corridor; 1 – corridor of one side; 2 – corridor on both sides
CONTRAST	Positive contrast [c] (roadside *vs.* adjacent area) 0 – without contrast (open *vs.* open area); 1 – vegetative cover *vs.* open area; 2 – shrublands *vs.* open area; 3 – vegetative cover + shrublands *vs.* open area Negative contrast [c] (roadside *vs.* adjacent area) 0 – without contrast (vegetative cover + shrublands *vs.* closed area); -1 – shrublands *vs.* closed area; -2 – vegetative cover *vs.* closed area; -3 – open *vs.* closed area
T_WATER	Type of water body [c] 0 – without water body; 1 – temporary puddle; 2 – permanent puddle; 3 – lagoon
D_WATER	Distance to nearest water body[c] (m)
N_WATER	Nº of water bodies [c](absolute value)
Road-related features	
ROADS_WIDTH	Roads width [c] (m)
ROAD_ROUGH	Roughness [c] (counted the largest slope value)
ROAD_TOPO	Roadside topography [c] 
REFLECTORS	Presence (1)/ absence (0) of reflectors [c]
LINEAR_TYPE	Type of linear structures [c] - hedges, trees, fences, rail lines, furrows
FENCES	Type of fences [c] 0 – without fence; 1 – wire netting; 2 – net; 3 – progressive net; 4 – straight net; 5 – wall
TRAFFIC	Daily traffic volume (see Table 1)

[a] Variable obtained from Atlas do Ambiente (CNA, Atlas de cartografia digital (CNA, 1983);IA, s/d).
[b] Derived values of variable Altmedia, using extension *Spatial Analyst* of Arcview GIS version 3.1 (ESRI,1996).
[c] Variable measure obtained from field measurement, in buffer of 250m in turn of each road section.

fields and "montado". A large number of Little Owl kills was detected in road sections near villages, such as Portel (IP2), Vidigueira (EN18), Beja (EN18) and Ferreira do Alentejo (EN121). These areas are also characterized by the existence of cereal fields, pine and eucalyptus plantations, and "montados". The pattern of Tawny Owl mortality along the studied road sections was uniform. However, some road sections showed a higher number of Tawny Owl fatalities - Pegões-Marateca (EN10), Alcácer do Sal (EN5), Grândola (IC1) and Montemor-o-Novo (EN114).

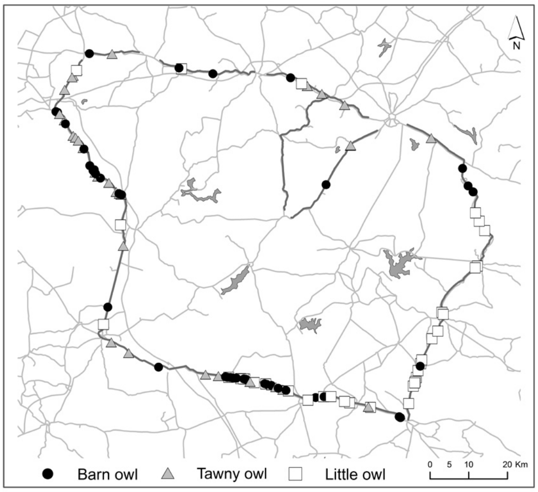


Figure 2. Location of the study area.
Figura 2. *Localização da área de estudo.*

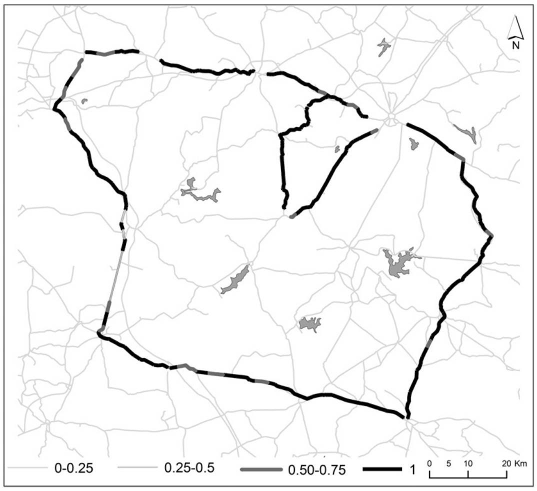


Figure 3. Location of the study area.
Figura 3. *Localização da área de estudo.*

Overall, national roads had higher numbers of owls fatalities than high traffic roads (IP and IC) (Table 3). Nevertheless, Little Owl and Tawny Owl had the highest proportion of mortality on the IP and IC roads.

» Influence of the environmental descriptors on road-kills

Barn Owl road-kills were negatively associated with ALTITUDE and FOREST_P (Table 4). The model classified correctly 70.5% of the cases (74% of the absences and 67.1% of the presences) and was moderately adjusted (AUC=0.763, P<0.001). We also found a significant association between the observed and the predicted values (AUC=0.682, P<0.001), which suggested that the model is valid and performs well. The majority of road segments (85%) had more than 75% of likelihood of Barn Owl vehicle collisions (Figure 3).

D_TOWN, SHRUBS and D_WATER were the most important factors in explaining Little Owl road-kills. Little Owls were more likely to be killed in the vicinity of towns and in road segments without shrublands and far from water bodies. The model explained 67.2% of the absences and 83.6% of the presences. On average, 75.4% of observations were correctly classified. The model adjustment was high (AUC=0.783; p<0.001) and valid (Jackknife's model AUC= 0.763, P<0.000), which suggested that it performs well and can be used in other areas with similar characteristics. In 29% of the road sections, the probability of collision risk for the Little Owl ranged from 0.5 to 0.75 and the higher likelihood mortality (prob. >0.75) is located in 10% of road sections (Figure 4).

ALTITUDE, ROAD-ROUGH, CORRIDOR, OAK WOODLAND ranked high in how they influenced Tawny Owl fatalities (Table 4). Tawny Owl road kills were found in low elevation and roughness. The presence of trees parallel to the roads, as well as the existence of oak woodlands, were positively correlated with road-kills.

Table 3. Kilometric index of road-kill abundance for each Owl species surveyed by road type and length.
Tabela 3. *Índice quilométrico de mortalidade para cada uma das três espécies em estudo (nº ind./km), em função do tipo e comprimento da estrada.*

Road Type	EN	IP	IC
Total (km)	258	40	16
Barn Owl	0.19	0.10	0.06
Little Owl	0.11	0.18	0
Tawny Owl	0.12	0	0.13
Total	0.42	0.28	0.19

The model classified correctly 78.8% of the cases (77.3% of absences and 80.3% of presences), it was the model best fitted to the data (AUC=0.839, P<0.001), and the Jackknife results validated the model (AUC= 0.812, P<0.001). Only 15% of the

Figura 4. Location of the study area.
Figura 4. *Localização da área de estudo.*

Figure 5. Location of the study area.
Figura 5. *Localização da área de estudo.*

Table 4. Logistic regression models for the three owl species with the selected variables, coefficients (β) standard error (S.E.), and Wald test p-value / ***Tabela 4.*** *Modelos de regressão logística para as três espécies em estudo com as variáveis seleccionadas coeficientes (β), erro padrão (S.E.) e significância do teste de Wald (p-value).*

Variable	β	S.E.	Wald	P-value
Barn Owl				
ALTITUDE (÷100)	-1.213	0.265	20.937	0.000
FOREST_P (÷100)	-4.246	1.300	10.672	0.001
Constant	2.190	0.488	20.131	0.000
Little Owl				
D_TOWN (÷1000)	-0.302	0.083	13.352	0.000
SHRUBS (÷100)	-2.905	1.097	7.019	0.008
D_WATER (÷2000)	0.172	0.069	6.255	0.012
Constant	0.537	0.383	1.961	0.161
Tawny Owl				
ALTITUDE (÷1000)	-9.305	2.563	13.181	0.000
ROAD_ROUGH	-1.209	0.596	4.116	0.042
CORRIDOR	0.945	0.417	5.140	0.023
OAK WOODLAND (÷100)	2.033	0.584	12.115	0.001
Constant	0.403	0.482	0.698	0.404

road segments showed a road-kill probability higher than 0.75, suggesting a reduced number of mortality hotspots for the Tawny Owl (Figure 5).

DISCUSSION

Owls are frequently killed on roads and such mortality may be largely explained by their hunting behaviour and nocturnal activity (Ramsden 2003). Their peculiar predatory behaviour is well suited to take advantage of the small mammals that circulate on verges and of the corpses of small animals that remain in the asphalt (Meunier *et al.* 2000, Slater 2002). For nocturnal birds of prey, spotlights of cars may also be an element of great importance because they dazzle the owls and delay their reaction to the approximation of a vehicle (Slater

2002, Ramsden 2003). Since owls abundances are relatively low when compared with other terrestrial birds (Tucker *et al.* 1994, Díaz *et al.* 1996, Elias *et al.* 1998, Lourenço *et al.* 2004), future studies regarding abundance and road mortality are needed in order to clarify the vulnerability of owls populations to losses due to the collision with vehicles.

The Barn Owl was the species with higher mortality values per kilometre over the four months of sampling. This species, in particular, usually hunts at low heights, which increases the probability of collision with vehicles (Martínez & López 1995, Massemin & Zorn 1998, Ramsden 2003).

Overall, road-kills did not occur randomly but were spatially clustered and tended to be linked to specific road and environmental features. Our results showed that elevation and favourable habitat have the highest explanatory power for all owl species fatalities, as documented by other studies (Martínez & López 1995, Baudvin 1997, Elias *et al.* 1998, Massemin & Zorn 1998, Erritzoe *et al.* 2003).

The negative association between Barn Owl casualties and forested areas suggests that the species abundance has a major influence on the road mortality. Because Barn Owl predatory behaviour is disrupted in dense woods, due to the difficulty in locating preys, this species mostly occurs in non-forested areas (Mikkola 1983, Hagemeijer & Blair 1997, Lourenço *et al.* 2004). Surprisingly, elevation strongly influenced not only Barn Owl but also Tawny Owl casualties. Nevertheless, the study area does not have such a high range of altitude values that can influence the occurrence or behaviour of these owl species, suggesting that this factor behaved in fact as a confounding effect. Thus, the combination of other factors linked with altitude, such as prey abundance (not assessed in this study) and land use, may explain this unexpected relationship.

The variables retained in the multivariate logistic model for the Little Owl (distance to the nearest town, shrubland area, and distance to the nearest water body) reflect quite realistically the habitat preferences of the species. This species is well adapted to dry areas and hunts on open ground, so areas of dense shrubland are avoided (Cramp 1985, Elias *et al.* 1998). The negative relationship with distance to towns may be explained by the high abundance of the species in olive and vineyards, which are mainly located on the surroundings of villages. In fact, the Little Owl is an opportunistic bird, adaptable to humanized areas, often using farms, orchards, olive grooves, gardens and hedges (Mikkola 1983, Cramp 1985, Tucker *et al.* 1994, Hagemeijer & Blair 1997, Lourenço *et al.* 2004, Tomé *et al.* 2004).

The model developed for the Tawny Owl fatalities showed that the highest values of mortality likelihood occurred in oak woodlands and on roads with trees along the verges. This species uses trees, such as cork and holm oaks, not only as nesting and roosting sites, but also as perching sites while hunting (Mikkola 1983, Cramp 1985, Hagemeijer & Blair 1997). The majority of the records were found on the 34 road sections with tree corridors, suggesting that the presence of tree corridors strongly attracts the Tawny Owl to the roads (Taylor 1994, Ramsden 2003). The topographical diversity of the roads was also negatively associated with the occurrence of road casualties of the Tawny Owl. The probability of road-kills seems to increase in more flat sections of the road (Cramp 1985, Ramsden 2003). Here our findings are in contradiction with those of other authors, which suggest that embanked roads, without marginal vegetation, have higher road-kill probabilities (Baudvin 1997, Massemin & Zorn 1998, Lodé 2000, Clevenger *et al.*2003, Erritzoe *et al.* 2003).

Regarding Barn Owls, high values of road-kill probability occur in about 85% of the sampled area, which reflects the wide range of this species in the region, consequence of the extensive and continuous presence of suitable habitat. This limits the implementation of mitigation measures with a low cost-benefit ratio. We recommend for this particular species a clustering analysis (Malo *et al.* 2004) and modelling the identified hotspots (clusters of high incidence of mortality), instead of presence/absence of casualties. This approach may identify small sections of high incidence of Barn Owl mortality where mitigation measures can be applied with higher efficiency. On the contrary, high values of mortality likelihood occurred in less than 30% of the road network for the Little Owl and Tawny Owl, and so the costs of mitigation measures may correspond to considerable benefits.

Thus, mitigation measures should focus primarily on structures or actions that prevent owls from using roads and that force them to fly higher above these structures. For the latter case, an option could be the implementation of non-transparent screens along the roadsides. Discouragement of hunting along the verges could be obtained through vegetation (grasses and shrubs) clearing in order to reduce prey density. The periodic removal of the vertebrate corpses of roads is also an important action that may reduce the attraction of owls to the vicinity of roads. Long-term surveys of mortality are also recommended in order to provide a detailed picture of the major factors influencing owl casualties. Road monitoring should be combined with surveys of population densities to clarify the relationship between density and road-kills.

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Nocturnal and diurnal nearshore foraging of European Storm Petrels *Hydrobates sp.* along the Lisbon coast, Portugal

Alimentação costeira nocturna e diurna de Alma-de-mestre *Hydrobates sp.* ao longo da costa de Lisboa, Portugal

Martin Poot[1]

SUMMARY - *During three days in June 2006, tens of European Storm-petrels* Hydrobates sp. *were observed foraging along the Lisbon coast during full daylight. On one morning along a 12 km stretch of coast between Guincho and Parede a minimum of 135 different birds were observed foraging up close to the rocky shores and inside the Estoril bay. In September 2007 birds were observed flying towards the coast of Guicho Bay and foraging close to the shore near Cabo Raso. In September almost all birds were seen in the evening after sunset. Up to a maximum of 97 different birds were observed in one evening. It is discussed that the patterns of occurrence of the Storm-petrels nearshore in both periods must be explained by a combination of high food availability and a lowered predation risk. The observations in September 2007 of birds actively foraging nearshore in the dark are in line with two diet studies, where it was concluded that Storm-petrels regularly use inshore and nearshore areas at night to forage, based on found prey species in regurgitates, with one of the studies made in the southwest of Portugal. The observations in June 2006 are a novelty as they show that relatively intense nearshore foraging can also occur during the day and does not have to be confined to the darkness of the night. The low risk of predation in June, compared to other periods of the year when large numbers of gulls and Greater Skuas* Stercorarius skua *are present, might play a role here as well, like in nocturnal foraging. Although the observations in both June and September coincide with the main migration period of northern breeding populations of European Storm-petrels, attention is drawn to the possibility that local breeding might occur along the Portuguese coast. Effort is needed to check for breeding birds on the isolated islands in front of the coast of Cabo da Roca, being the best potential breeding locations in the region.*

RESUMO - *Durante três dias em Junho de 2006, dezenas de Almas-de-mestre* Hydrobates sp. (pelagicus/melitensis) *foram observados a alimentarem-se ao longo da costa de Lisboa durante o dia. Numa só manhã ao longo de 12 km de costa situada entre o Guincho e a Parede, foram observadas um mínimo de 135 aves a alimentarem-se não só perto da costa rochosa, mas também dentro da baía do Estoril. Em Setembro de 2007 foram efectuadas observações crepusculares de um máximo de 97 indivíviduos que desde o Cabo Raso, se encontravam ou a voar em direcção à costa ou a alimentarem-se na faixa costeira. É discutido que os padrões de ocorrência do Alma-de-mestre nos dois períodos de observação podem ser explicados pela interacção de dois factores: 1) uma elevada disponibilidade de alimento e 2) um baixo risco de predação. As observações em Setembro de 2007 são consistentes com dois estudos de dieta alimentar baseados no conteúdo específico de regurgitações onde se concluíu que durante a noite os Alma-de Mestre utilizam a faixa costeira e as baías para se alimentarem, sendo que um destes estudos foi realizado na costa sudoeste de Portugal. As observações em Junho de 2006 são inovadoras pois mostram que as aves podem alimentar-se intensamente perto da costa durante o dia. O baixo risco de predação em Junho comparado com outros períodos do ano,*

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quando elevados números de gaivotas e de Alcaides Stercorarius skua *estão presentes, pode ter também um papel importante. Apesar dos períodos de observação de Junho e Setembro coincidirem com o principal período migratório das populações de Almas-de-Mestre que nidificam a norte, chama-se a atenção para a possibilidade de algumas das aves observadas poderem nidificar nas ilhas rochosas em frente da costa do Cabo Raso. Seria interessante verificar a existência de aves em reprodução nestas ilhas isoladas, pois parecem ser as áreas com maior potencial para as aves se reproduzirem.*

The European Storm Petrel *Hydrobates sp.* is the species name which covers two closely related cryptic species, the British Storm Petrel *Hydrobates pelagicus*, and the Mediterranean Storm Petrel *Hydrobates melitensis*. The current population estimates of the British Storm Petrel *Hydrobates pelagicus* occurring in the northeastern Atlantic (Iceland, Faeroes, Ireland, United Kingdom, Norway, France, and Spain, including the Canary Islands) are between 300,000 and 680,000 breeding pairs (Mitchell *et al.* 2004). The nearest known breeding colonies from Portugal are just over the border along the Galician coast, and further along the Spanish north coast and the west coast of France (Mínguez 2004, Cadiou *et al.* 2004). In the Mediterranean Sea also a breeding population of *Hydrobates* birds occurs (about 10.000 pairs, Mitchell *et al.* 2004), which has recently been proposed as a separate species *Hydrobates melitensis* (Dutch Birding 30(1): 20-22, 2008), e.g. based on genetic analysis (Cagnon *et al.* 2004) and differences in vocalizations and other features (Robb *et al.* 2008). The observations presented here likely only apply to *Hydrobates pelagicus*. However, the choice here has been made to use European Storm Petrel *Hydrobates sp.* as species name, since it is uncertain whether *H. melitensis* can occur in the Atlantic or the species is restricted to the Mediterranean Sea (Robb *et al.* 2008). The winter distribution of British Storm Petrels stretches out along the Atlantic coasts of Africa as south as South Africa and even further (Snow & Perrins 1998, Wernham *et al.* 2002). They only come to land during the breeding season and then only during the night, avoiding being predated by aerial predators (e.g. Phillips *et al.* 1999).

During spring and autumn probably thousands of European Storm Petrels pass through Portuguese coastal waters, indicated by offshore observations of several hundreds to over 1,000 birds during pelagic trips (Paterson 1997, Petronilho *et al.* 2004, Ramírez *et al.* 2008). Most of the irregular diurnal observations from the coast are related to stormy conditions and are made from capes during systematic sea watching sessions (Paterson 1997). But also then the birds are not easily observed as they are very small and easily missed in between the waves, and at some distance from the shore.

Under the condition of a scarcity or nearly complete absence of observations of diurnal nearshore foraging birds, two studies on diet have shown that the species regularly forage at night close to the shore (Thomas *et al.* 2006) and inshore areas (study in the Gulf of Biscay, France, D'Elbee & Hemery 1997). Specific invertebrate prey species of near and inshore habitat found in the freshly regurgitates of the nocturnally caught birds were conclusive as evidence for nearshore and inshore foraging. Furthermore, the prey found in the regurgitates were isopods, which are known to be nocturnal vertical migrants to the sea surface, hence it was concluded that the foraging activity of the birds near and inshore was restricted to the night.

In this paper observations of European Storm Petrels are described which confirm the occurrence of nearshore foraging in these seabirds also along the Lisbon coast at night, but as a novelty, at times also during the day. Additionally, as the observations presented here were made within the time frame of the breeding cycle of the species, it is discussed whether the Cabo da Roca coast is suitable for holding a breeding colony, because of the presence of isolated, rocky islands.

METHODS

In June 2006 and September 2007 observations were made of European Storm Petrels along the Lisbon coast, central Portugal. In June 2006 on a total of 3 different days and in September 2007 on a total of ten different days the Lisbon coast was visited.

During all observations a general distinction in behaviour was made between birds flying in a straight line with a specific direction, birds in search flight and foraging (pattering) also with a specific direction, and birds foraging on one particular spot with landing/sitting on the water. In order to describe the sea surface conditions during the observations the following five sea states are used; mirror calm (0), tiny ripples (1), small waves (2; no whitecaps), small waves (3; with few whitecaps), moderate waves (4; numerous whitecaps).

On the morning of 2 June there was no wind along the coast of Guincho, Cabo Raso, and further to the east. European Storm Petrels could easily been observed flying fast and low over the mirror like water surface. Because of the exceptional observation conditions, the total sea surface area of the coastal strip up to Parede could thoroughly be searched for European Storm Petrels by scanning over the sea in a systematic way from 8 different observation points (see Figure 1). From each location sea scans were made with 10x binoculars and by a 32x telescope amplification. On each location at least 15 minutes was spent to arrive at a maximum number of different birds present. It was estimated that on June 2 most birds could be picked up within a 1 km radius. Due to the exceptional conditions, a few birds could be observed up to 1.5 km from the shore with the telescope. In between the 8 different locations the coverage of the coastal area was not complete, especially more to the east, near Estoril.

On all other days, in both June 2006 and September 2007, no scans, but so-called sea watch observations were made. This method implies that observations are made from one location with a telescope in a fixed direction, most of the time from a wind sheltered position to avoid trembling of the view as much as possible. Therefore, because the wind and sea state conditions to observe storm-petrels were much worse than on 2 June, on 3 and 4 June sea watch observations made from Cabo Raso. With sea states 3-4 and some oceanic swell the estimated effective observation distance was estimated to be 500 m or less on these days. On 3 June during a short period of time observations were also made from Praia Grande (north of Cabo da Roca) and from a location a west of Cabo Raso, and on 4 June in the Bay of Guincho from Forte da Cresmina.

In September 2007 only sea watch observations were made, with four sessions from Cabo Raso in the evening (9, 11, 13, and 14 September) and eight in the morning (10, 11, 14, 16, 21, two sessions on 22, 23), and four visits in the morning to Praia Grande (two sessions on 11, 23, 29).

RESULTS

» Observations June 2006

In June tens of European Storm Petrels were observed foraging and in apparent good condition. Total numbers observed, behaviour and general wind/observation conditions are presented in

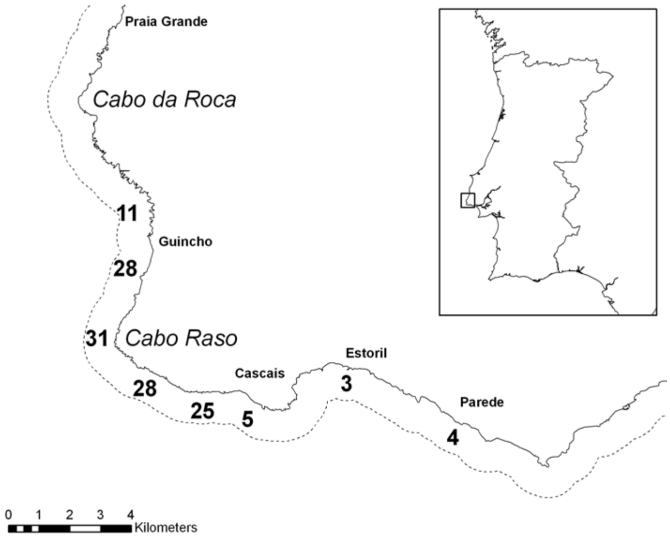

Figure 1. Numbers of European Storm Petrels foraging nearshore on 2 June 2006, observed from 8 different observation points: 7.25 – 8.30h observations north of Cabo Raso, 8.30-9.30h observations east of Cabo Raso-Cascais, 9.30-10.30h observations along the Estoril-Parede coast. / ***Figura 1.*** *Número de* Hydrobates pelagicus *observados em alimentação ao longo da costa de Lisboa durante o 2 Junho 2006. As observações foram eefctuadas em 8 locais distintos: 7.25 – 8.30h observações a norte do Cabo Raso, 8.30-9.30h observações a leste do Cabo Raso-Cascais, 9.30-10.30h observações ao longo do troço Estoril-Parede.*

Table 1. Total number per day of observed European Storm Petrels along the Lisbon coast in June 2006, with information on flight direction, behaviour and wind conditions. / ***Tabela 1.*** *Número de* Hydrobates sp. *observados por dia ao longo da costa de Lisboa durante o Junho 2006, com informação sobre a direcção de voo, comportamento e condições do vento.*

Date	Start	End	Count type/location	n birds	Flight direction	Wind direction and force (Bf)
2-6-2006	7:25	10:30	Scans coast Guincho to Parede	>135	All directions, all birds foraging	Wind still
3-6-2006	7:30	7:45	Sea watch Praia Grande	2	2 to N	NNW 1-2
3-6-2006	8:15	8:45	Scans 1 km W of Cabo Raso	7	locally foraging	S 2
3-6-2006	9:00	10:30	Sea watch Cabo Raso	62	See Figure 2	S 2, change to NNW 3-4
4-6-2006	7:30	8:50	Sea watch Cabo Raso	11	5 to S, 6 locally foraging	S 1-2
4-6-2006	9:10	9:40	Scans Bay of Guincho	7	Towards E against the wind to coast and back offshore	E 1, local offshore wind

Table 1. Because of the exceptional observation conditions on 2 June the coastal area from Guincho up to Parede could be checked for a total number of European Storm Petrels present in a coastal strip of about 1 – 1.5 km wide (Figure 1). Most birds were observed in Guincho Bay, around Cabo Raso, up to Boca do Inferno. Despite the lower observation effort in the coastal area near Estoril-Parede, the decrease in numbers/density of birds to the east is real. This decrease is probably related with the observation time, as the observations in Estoril-Parede were carried out later in the morning than the observations near Guincho/Cabo Raso, and it is possible that there is a temporal decrease in nearshore foraging activity.

On 3 and 4 June, the observation conditions to detect European Storm Petrels were less favourable. Like on 2 June, mainly foraging birds were observed, some regularly landing on the water, and some coming very close to the coast. On both days most birds with a straight flight direction flew against the wind. All these birds were foraging as well, in the typical manner of the species, pattering over the water. On 3 June the wind was coming from the NNW with a sea state 3 and most birds were flying N. However, close to the shore the wind came from S. During the course of the morning the wind conditions changed and this influenced both the behaviour of the birds as well as the detection. At 9h20 the white wave caps came also nearshore because the offshore wind from NNW was taking over. After 9h50 wind speed increased further, up to 4 bf. This change of the weather clearly influenced the behaviour of the birds, with an increase in the number of birds landing on the water, followed by a period with lower numbers per 10 minutes due to a lowered detection (Figure 2).

On June 4 the directions were opposite; the wind was coming from the S and most birds were also flying S. In Guincho Bay specific local wind conditions made that European Storm Petrels (5 different solitaire birds and one duo) could be well observed as they approached the rocky shore up to 50 metres. The birds flew here against the locally prevailing eastern wind, a situation created by the Serra de Sintra. The birds were constantly foraging, and when reaching the shore they turned around to fly with the wind offshore again.

» Observations September 2007

During the eight morning sessions of sea watching at Cabo Raso and four at Praia Grande during September there were no records of European Storm Petrels. European Storm Petrels were only detected in the evenings of 9, 11 and 13 September, with most observations being made in the evening of 13 September (Figure 3). It is likely that differences in weather conditions might have

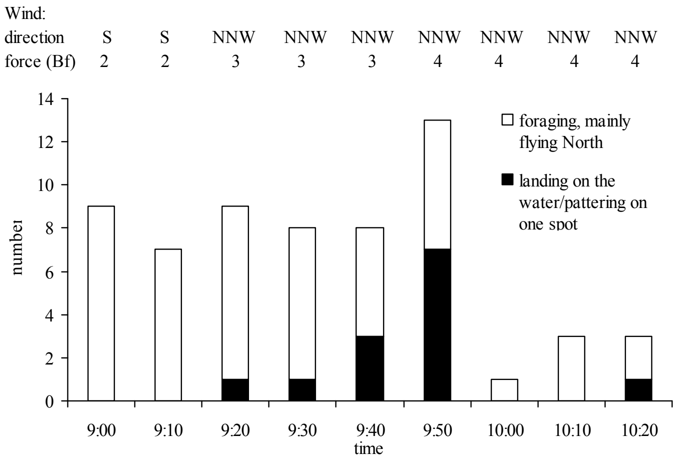

Figure 2. Timing of European Storm Petrels in the morning flying by near Cabo Raso on 3 June, number of birds per 10 minute periods, with an indication of wind direction and force in beaufort. / ***Figura 2.*** *Número de Alma-de-Mestres observados de manhã a voarem ao longo do Cabo Raso durante o 3 Junho 2006 e condições do vento.*

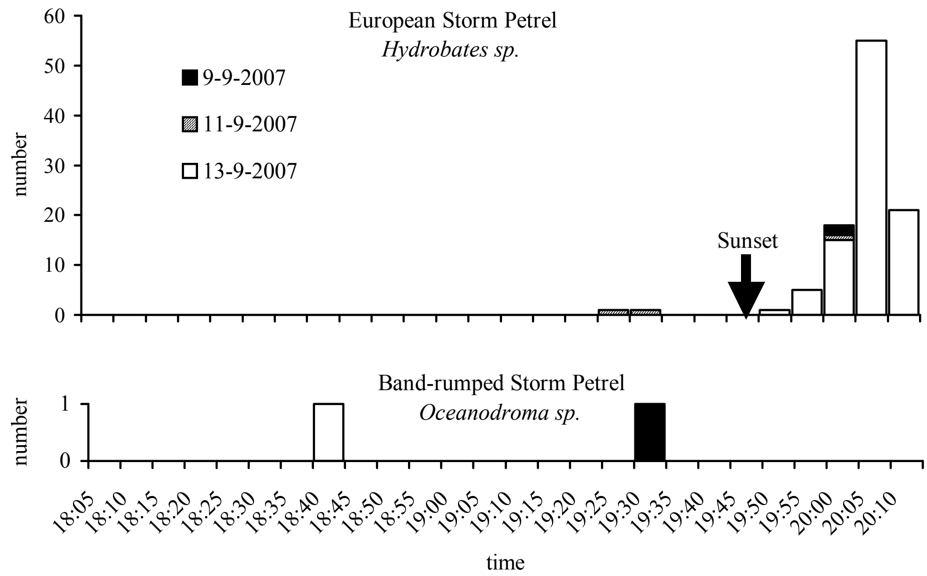

Figure 3. Timing of Storm Petrels in the evening flying by near Cabo Raso on 9, 11 and 13 September 2007, per 5 minute periods. Above European Storm Petrel *Hydrobates sp.* (with indication of the moment of sunset) and below Band-rumped Storm Petrel *Oceanodroma sp.*. All European Storm Petrels observed were foraging (pattering), while both Band-rumped Storm Petrels were passing by in a straight line. / ***Figura 3.*** *Número de painhos observados ao crepúsculo ao longo do Cabo Raso durante 9, 11 e 13 Septembre 2007, por períodos de 5 min. Em cima, o Alma-de-Mestre (com indicação do pôr-de sol) e em baixo o Roquinho.*

played a role here, with differences in detection conditions and/or even timing/behaviour of the birds to come nearshore. In line with this, in the evening of 14 September the wind force was strongest compared to the days before and no birds were observed at all (Table 2).

On the evening of 13 September 2007 a total of 97 Storm Petrels were observed from Cabo Raso. All were observed in a period of 25 minutes just after sunset (Figure 3). 16% of the individuals were flying as singles, 35% as pairs and 48% in flocks of 3 or more.

Table 2. Observation effort (- : no observations) and wind conditions (direction and force in beaufort) along the Lisbon coast in September 2007./ ***Tabela 2.*** *Actividade de observação e condições do vento ao longo da costa de Lisboa durante o Septembre 2007.*

Date	Cabo Raso morning	Cabo Raso Evening	Praia Grande morning
9-9-2007	-	NW 3-4	-
10-9-2007	NNW 2-3	-	-
11-9-2007	NNW 3-4	WSW 3-4	NNW 1-2
13-9-2007	-	NNW 2-3	-
14-9-2007	NW 3-4	NW 4-5	-
16-9-2007	NNW 1	-	-
21-9-2007	NNW 2-3	-	-
22-9-2007	NNW 5-6	-	-
23-9-2007	NNW 5-6	-	NW 3-4
29-9-2007	-	-	S 2-3

The largest flock consisted of 14 birds. The proportion of pairs was actually higher as within the flocks of 3 or more, birds were also flying in pairs. Due to the light conditions the area observed was restricted to the first 500 m from the shore. Only the two first birds observed before sunset on 11 September were flying far out at sea (and were identified as *Hydrobates* based on flight pattern *cf.* Flood & Thomas 2007). Within the indicated range all birds observed after sunset on 13 September were foraging and moving slowly towards NE into Guincho bay. The foraging consisted of the typical behaviour of pattering, with birds also regularly landing on the water for short periods.

Twice in September a Band-rumped Storm Petrel *Oceanodroma sp.* was observed, both some time before sunset (Figure 3). The birds did not forage but flew in a direct line to the north straight to Cabo da Roca, and not entering but crossing Guincho Bay in a shearwater like flight style.

DISCUSSION

» Diurnal nearshore foraging as a novelty

The observations in September 2007, with birds coming far from sea to forage nearshore after dark, are in line with two studies on diet choice, based on found prey species in regurgitates along the Atlantic coast of Europe which have concluded that at night inshore and nearshore areas are used by European Storm Petrels for foraging (D'Elbee & Hemery 1997, Thomas *et al.* 2006). The study of Thomas *et al.* is of particular interest as it describes the situation of the southwest coast of Portugal. The findings presented here confirm that nocturnal nearshore foraging might be more common than thought before under the condition that it is difficult to record by field observers.

The observations in June 2006 along the Lisbon coast must be regarded as a novelty as they show that relative intense nearshore foraging in European Storm Petrels can also occur during the day and does not have to be confined to the night. Interestingly, the observations made in June 2006 do not stand alone. Between 20 May and 3 June 2006 from at least ten different locations along the Cantabrian coast of northern Spain similar observations were made (Valeiras 2007). As described here, the birds were actively foraging in bays and very close to the coast during the day, and in apparent good condition. The question can be raised whether diurnal nearshore activity of Storm Petrels is more common than thought before, because the effort of sea watching in Portugal is generally low in this period of year. Along the Spanish north coast the observation effort is higher, and the idea is that such large numbers of birds foraging near the coasts as observed in May and June 2006 should be recorded before (pers. com. X. Valeiras).

The total numbers observed in June and in September must have been a fraction of the total numbers present, because the detection of birds in the twilight in September was strongly limited, and the observations in June are likely to have suffered from detection limitations due to a incomplete coast coverage.

» Abundant food and low predation risk in nearshore foraging

Nearshore foraging might be profitable at night when abundant food becomes available because of the vertical migrations of many marine organisms, ranging from zooplankton up to predatory fish (Blaxter & Hunter 1982). Based on the analysis of regurgitates of nocturnally tape-lured Storm Petrels along the southern coast of Portugal Thomas *et al.* (2006) found two species of coastal isopods which become restrictively active in the water column and/or at the water surface at night (while living in the sandy bottoms along the shores during day time). The observations made in June show that apparently enough food can be available nearshore during the day to attract Storm Petrels during daylight. The birds observed during daylight could be 'a left over' of a more intensive nocturnal foraging event from preceding nights, with hungry birds forced to forage during the day on a localized food resource. Alternatively, the observations along the Lisbon coast together with the observations in northern Spain possibly hint at a much larger event along the complete Atlantic nearshore coast of Iberia, and which might have it's equivalent in scale and cause like in invasive 'wrecks' occurring in Little Auks *Alle alle (cf.* Stenhouse & Montevecchi 1996), another plankton feeder.

Another factor that might play a role in the occurrence of nearshore foraging is the lowered risk of predation. During most of the year, including September, the risk for a European Storm Petrel to get predated near the coast must be high because of the presence of aerial predators like Great Skuas *Stercorarius skua* (Phillips *et al.* 1999). Based on the findings of D'Elbee & Hemery (1997) it might even be that areas further inshore as the Tejo estuary are also potentially good foraging areas at night when the predation risk is low. Other potential threats come from the large numbers of wintering Lesser Black-backed Gulls *Larus fuscus* and Yellow-legged Gulls *Larus michaelis*. The risk to be predated is probably much lower or nearly absent during the nightly hours as nocturnal predation of Storm Petrels by Great Skuas is probably only confined to the breeding areas (Votier *et al.* 2006). In June, the presence of aerial predators is lower compared to other periods of the year (Paterson 1997, own observations). During summer only relatively small numbers of Yellow-legged Gulls are present in the studied area (own observations).

The Band-rumped Storm Petrels were probably breeding birds of the Berlengas as the breeding period of this species is in late autumn. Here the species name Band-rumped Storm Petrel is used as the species Madeiran Storm Petrel *Oceanodroma castro* is currently under revision (Bolton *et al.* 2008), with possibly four different species. The population of the Berlengas islands is not formally described as a separate species yet, besides the Berlengas also consisting of the cool-season breeding populations of the Azores, Canary Islands, Madeiran archipelago, and Selvagens (Robb *et al.* 2008). The timing of their passage, early in the evening, fits in the schedule of arrival in the breeding colonies on the Berlengas islands not long after sunset (and to be reached from Cabo Raso after a two hour flight to the north with an average ground speed of 40 km/h).

» Breeding along the Lisbon coast?

Taking into consideration the distribution of colonies around Portugal (along the Galician/ Spanish north coast and Mediterranean coast, Mínguez 2004) and along the French Atlantic coast (Cadiou *et al.* 2004), the complete lack of breeding colonies along the Portuguese coast is remarkable. The low lying rocks southwest of Cabo da Roca and the Ursa rock north of Cabo da Roca coast seem particularly suitable for breeding of the species, therefore colonies could potentially occur along this part of the Portuguese coast. However, no effort has been made to check these islands near Cabo da Roca for the presence of Storm Petrel colonies. On the one hand, the Ursa rocks hold a breeding colony of Yellow-legged Gulls *Larus michaelis* showing the suitability as a 'bird island', but on the other hand the presence of a gull colony could be disadvantageous for the breeding storm-petrels (Mínguez & Oro 2003).

Although the observations in both June and September coincide with the migration period of more northern breeding populations, they both are also within the breeding time frame of the surrounding populations (Arroyo *et al.* 2004, Cadiou 2001). Additionally it should taken into account that a large annual variability in the timing of breeding can occur, probably due to variations in oceanographic conditions and food resources just before laying (Cadiou 2001). In colonies on the coast of Brittany, France, it was found that the latest chicks can fledge as late as October, or even sometimes in November. This implies that also birds observed in September could potentially be local breeders.

Ringing recoveries show that the birds occurring in southern Portuguese waters originate from a wide breeding range, indicating that the peak numbers in June are partly migrants heading to northern breeding areas (Wernham *et al.* 2002, http://stormies-online.blogspot.com). The largest proportion of these birds consists of so-called 'prospectors', mostly young birds that have not yet acquired breeding status (*cf.* Okill & Bolton 2005). Some of the birds caught in Southern Portugal had active brood patches, feeding the hypothesis whether the coast of Portugal might hold undiscovered colonies of this species (Thomas *et al.* unpublished report). However, the brood patch is not a fully reliable proof of successful breeding in this species; e.g. in breeding colonies in France sometimes birds are found in burrows without an egg, alone or in a pair, but exhibiting an active brood patch (B. Cadiou, pers. com., Thomas *et al.* unpublished report).

Regarding the relatively large number of birds observed both in June 2006 and September 2007 it is likely that most of the birds were non-breeding, migrant or wandering birds. Furthermore, diurnal observations of (foraging) storm-petrels are highly uncommon near the breeding colonies (B. Cadiou, pers. com.). Interestingly, the birds along the Spanish north coast in May/June 2006 (Valeiras 2007) were observed in a region where breeding occurs, but no specific relationship with the locations of colonies in the region seemed to be present, indicating that also these birds were probably migrants and/or wandering birds. Nevertheless, it remains an intriguing question whether the Portuguese coast is really the no man's land between respectively the Atlantic *pelagicus* (the Canary Islands and along the Galician coast) and the *melitensis* populations of *Hydrobates* storm petrels in the Mediterranean. Only a substantial effort of nocturnal visits to the potential breeding locations in Portugal at the right time of the year will enable to answer this question.

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Censos de Periquito-rabijunco *Psittacula krameri* no Jardim da Estrela, Lisboa

Monthly counts of Ring-necked Parakeets *Psittacula krameri* at Jardim da Estrela, Lisbon

Rafael Matias[1]

O Periquito-rabijunco *Psittacula krameri* apresenta uma área de distribuição disjunta, ocorrendo de forma natural na África subsariana (aproximadamente entre os paralelos 20ºN e 5ºN, desde a Senegambia à Eritreia) e no sudoeste da Ásia (a sul do paralelo 35ºN, desde o Paquistão ao sudeste da China; Cramp & Simmons 1980, del Hoyo *et al.* 1997, Juniper & Parr 1998). Esta espécie foi introduzida em diversos pontos de África, da Ásia ocidental, nos EUA, nas Ilhas Maurícias, em Hong Kong, em Macau, em Singapura e em vários países europeus (Fry *et al.* 1988, del Hoyo *et al.* 1997, Hagemeijer & Blair 1997).

Fora da época de reprodução, este periquito apresenta hábitos gregários, reunindo-se em dormitórios conjuntos ao final da tarde. O local onde se encontra instalado o dormitório é, normalmente, usado ano após ano, embora ocasionalmente a sua localização se possa alterar (Pithon & Dytham 1999a).

Durante o período reprodutor, nidifica geralmente de forma isolada ou em pequenos grupos dispersos, permanecendo junto das cavidades de nidificação, onde pernoita. Assim, durante este período, muitas aves não se dirigem ao dormitório conjunto ao anoitecer. Alguns dias após a saída do ninho, os juvenis tornam-se independentes. É uma espécie monogâmica e não territorial (Cramp 1985, Fry *et al.* 1988).

Em Portugal, a sua ocorrência em liberdade tem sido registada pelo menos desde 1977, sendo uma espécie muito frequente em cativeiro. Actualmente ocorre em toda a Grande Lisboa, sendo conhecidos registos na margem norte do rio Tejo, desde a zona de Sintra e Cascais até Alverca, e na margem Sul em Almada. Em menor número tem sido também observada na zona de Torres Novas, nas imediações da Reserva Natural do Paul do Boquilobo, na zona de Mira e também nalguns pontos do Algarve. Observações de indivíduos isolados foram também efectuadas na zona do Porto, em Évora, em Castro Verde e na serra da Arrábida (Matias 2002, 2003, 2004).

No final dos anos 1980, um dormitório desta espécie foi detectado no Jardim Guerra Junqueiro (ou "Jardim da Estrela"), situado em Lisboa, contando em 1990 com bandos de 20 a 30 indivíduos observados no local (M. Melo, com. pess.). O dormitório das aves situa-se numa grande figueira tropical *Ficus* sp. (com cerca de 30 m de altura e 15 m de diâmetro de copa), situada sobranceiramente a um lago artificial. Uma contagem efectuada em quatro de Janeiro de 1999 totalizou 48 indivíduos (Matias 2002). Apesar de ser observada regularmente noutros pontos da Grande Lisboa (Oeiras, Palácio Nacional de Queluz, Tapada da Ajuda, Tapada das Necessidades, Benfica e outros), são desconhecidos outros dormitórios regulares da espécie na região.

Na sua área de distribuição asiática, em particular na Índia, o Periquito-rabijunco inflige danos consideráveis sobre produções agrícolas, tendo estatuto de espécie-praga (Dilger 1954, Feare 1996). Noutros pontos onde ocorre naturalmente não são conhecidos impactos notórios (Feare 1996; contudo ver del Hoyo 1997). Nos locais onde foi introduzida, o seu número tem vindo a crescer, atingindo as populações dimensões consideráveis (por exemplo, da ordem do milhar e meio, no Reino Unido, ou de algumas centenas na Holanda; Pithon & Dytham 1999a, Keijl 2001).

Na ausência de informação sistematizada sobre esta espécie em Portugal, dados sobre a sua fenologia e abundância são desejáveis, uma vez que se trata de uma espécie potencialmente invasora (Feare 1996,

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C. Lever *in* Hagemeijer & Blair 1997).

De Janeiro de 2002 a Dezembro de 2003 foram efectuadas contagens de Periquitos-rabijuncos no Jardim da Estrela. Estas foram realizadas com uma periodicidade mensal e a partir de um ponto de observação fixo, situado a cerca de 40 metros a nordeste da árvore-dormitório (figueira tropical *Ficus* sp.). O período de contagem iniciou-se pelo menos uma hora antes do pôr-do-sol e terminou apenas já na ausência de luz, ou quando passaram pelo menos 10 minutos sem entrarem novas aves no dormitório. Os indivíduos foram contabilizados apenas quando entraram na árvore-dormitório. As aves observadas a cruzar o jardim, ou que abandonavam a árvore-dormitório foram, respectivamente, ignoradas e descontadas. Não foi utilizado qualquer material óptico, de forma a maximizar o número de aves detectadas. As contagens mensais foram realizadas apenas por um observador e apenas num único dia situado entre os dias 17 e 21 de cada mês. As condições atmosféricas foram relativamente constantes em todos os dias de censo, normalmente com céu limpo ou pouco nublado e vento fraco ou nulo. Em duas ocasiões a contagem foi repetida devido a condições meteorológicas desfavoráveis (vento forte ou chuva).

O padrão de ocorrência da espécie foi bastante consistente ao longo dos dois anos de contagens (Figura 1), apresentando máximos entre Novembro e Janeiro e mínimos entre Abril e Junho. O número total de aves aumentou ao longo dos dois anos, tendo sido registadas 154 aves em Janeiro de 2002, 156 em Janeiro de 2003 e 208 em Novembro de 2003.

O período de chegada dos periquitos à área do dormitório foi sempre consistente com a hora do pôr-do-sol, com a esmagadora maioria das chegadas a concentrarem-se durante um período de tempo curto que oscilou entre cerca de meia hora e cerca de uma hora (Figura 2). De uma forma geral, os periquitos instalaram-se na árvore-dormitório progressivamente mais cedo relativamente à hora do pôr-do-sol de Janeiro até Junho e novamente mais tarde de Julho mês até Dezembro (Figura 2). A totalidade da área do jardim foi frequentada por um número reduzido de aves durante o dia, normalmente não ultrapassando cerca de 12 indivíduos.

O padrão de ocorrência observado ao longo dos dois anos (Figura 1) é melhor perceptível se for interpretado tendo em consideração a biologia da espécie. A época de reprodução do Periquito--rabijunco é mal conhecida em Portugal. Foi registada a ocupação de cavidades de reprodução em Fevereiro e Março (jardins do Palácio Nacional de Queluz; Matias 2003, 2004). Em Inglaterra, a época de reprodução estende-se desde o início de Março, com a realização das primeiras posturas, até pelo menos meados de Maio, quando ainda há juvenis nos ninhos (Pithon & Dytham 1999b). Em Itália, foi registada a nidificação de Fevereiro a Julho (Maranini & Galuppo 1994). O comportamento conhecido da espécie durante a época reprodutora parece explicar grandemente as variações no

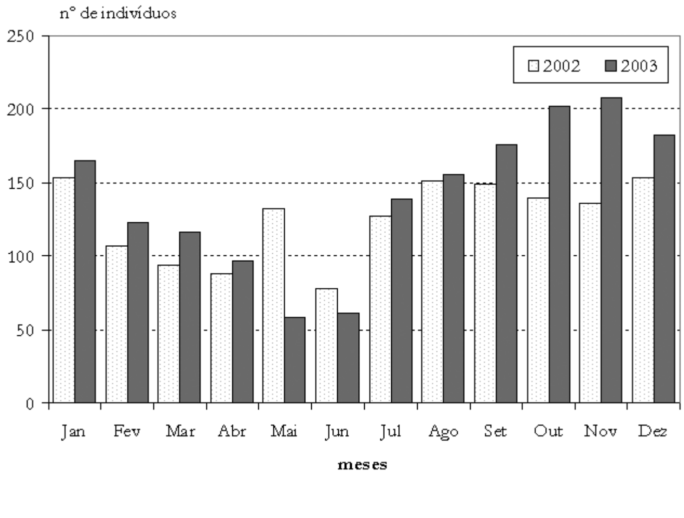

Figura 1. Resultados dos censos mensais de Periquito-rabijunco: variação mensal e inter-anual. / ***Figure 1.*** *Results from Ring--necked Parakeet monthly counts: monthly and between-years variation.*

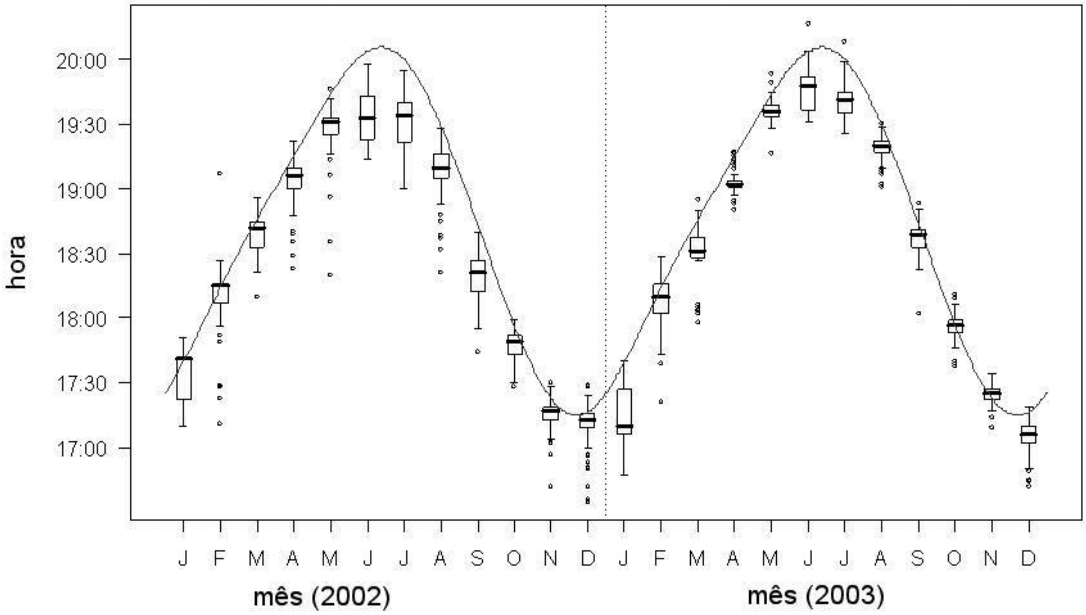

Figura 2. Dispersão temporal das chegadas (estão representados indivíduos) ao dormitório ao longo de 2002 e 2003. A linha contínua sinusoidal marca a hora do pôr-do-sol. Nos diagramas de extremos e quartis (ou "caixas-de-bigodes"), a barra transversal indica o tempo mediano das chegadas de indivíduos; os pontos representam *outliers* (indivíduos). / ***Figure 2.*** *Time-dispersal of arrivals (individuals are represented) at the roosting site in 2002 and 2003. The sinusoidal line shows the time of sunset. The median time of arrival (of individuals) is represented on the boxplots as a transversal segment; the dots represent outliers.*

número de aves presente no dormitório. Assim, os mínimos verificados em Maio/Junho estão certamente relacionados com um provável pico no número de casais envolvidos em reprodução nesse período, altura em que as aves reprodutoras dormem junto dos locais de nidificação, muitas vezes situados bastante longe do dormitório conjunto. O decréscimo acentuado verificado a partir de Janeiro (ou mesmo de Dezembro) sugere que a época de reprodução desta espécie se estenda pelo menos desde essa altura (quando forma casais e começa a inspeccionar potenciais cavidades de nidificação; Pithon & Dytham 1999b e obs. pessoais), até Junho (ou talvez Julho), de forma coincidente com a situação verificada em Inglaterra e em Itália (Cramp 1985). É possível que alguma mortalidade não quantificada possa eventualmente também contribuir para o decréscimo observado. As aves presentes no dormitório a partir de Maio deverão ser, por um lado, aves não reprodutoras, e por outro, aves reprodutoras, nidificantes em locais situados nas proximidades.

O súbito aumento, em Maio de 2002, é difícil de explicar. É possível que a saída do ninho de várias ninhadas, provenientes de locais de nidificação próximos do dormitório, tenha contribuído para o número de aves registado, aparentemente discordante do padrão geral. Infelizmente, o facto de, ao longo do período de contagem, as observações decorrerem sob luz progressivamente mais deficiente, torna bastante difícil determinar o sexo, ou mesmo a idade das aves que vão chegando, não sendo possível confirmar a hipótese proposta com base nos dados disponíveis.

Embora a árvore-dormitório tenha sido utilizada durante todo o período do presente estudo, em final de Fevereiro de 2004 o local não foi frequentado como dormitório, tendo as aves usado um ou talvez vários outros locais alternativos não detectados. Refira-se que, em final de Janeiro de 2004, o número de aves contadas era já inferior ao esperado (154 aves registadas), tendo o decréscimo sido, aparentemente, algo progressivo. A deserção total temporária de um dormitório usado regularmente por esta espécie não é um facto inédito, tendo sido registado em Inglaterra e na Holanda (Pithon & Dytham 1999a, Keijl 2001). Também é possível que parte das oscilações verificadas durante este estudo se deva à mudança de local de dormitório por parte de algumas aves em determinadas alturas do ano.

Observações paralelas a este estudo permitiram obter as primeiras informações acerca da origem das aves que utilizam o dormitório. Durante a maior parte do dia é observável apenas um número reduzido de Periquitos-rabijuncos no Jardim da Estrela, sendo pouco frequente ver mais do que dois casais em simultâneo. Nesse período, as aves que frequentam o dormitório alimentam-se numa área de raio ainda desconhecido. Observações frequentes de pequenos bandos em voo, momentos antes do pôr-do-sol, em diversos pontos, de Lisboa e de alguns dos concelhos limítrofes (em locais onde normalmente não ocorrem durante o dia), parecem indicar que as aves tomam a direcção do Jardim da Estrela. Na zona do Campo Grande, por exemplo, são vistos Periquitos-rabijuncos com frequência, voando em direcção a Sul ou Sudoeste, antes do pôr-do-sol. Observações menos esperadas incluem pequenos bandos (10-30 aves) que se alimentam durante o dia na área dos jardins do Palácio Nacional de Queluz, voando antes do pôr-do-sol, a ganharem altitude e dirigindo-se quase rectilineamente, rumo a SE ou SSE. A partir de um posto de observação situado no sul do concelho da Amadora foi possível verificar que estas aves, provenientes de Queluz, se dirigiram com rota bem definida passando pelo norte do Parque Florestal de Monsanto. A distância em linha recta ao Jardim da Estrela é de 11 km. Outras aves observadas na zona de Benfica adquiriram a mesma aparente direcção de voo antes do pôr-do-sol.

É provável que a contagem efectuada em Janeiro de 1999 (Matias 2002) tenha subestimado ligeiramente o número de aves presente. Em Janeiro de 2002 nova contagem revelou a presença de pelo menos 154 indivíduos, o que significaria a triplicação da população em apenas três épocas de reprodução. No entanto, em Janeiro de 2003, 165 Periquitos-rabijunco foram registados no local, podendo indicar que o crescimento populacional não se está a processar a um ritmo tão acelerado como se poderia supor e que, consequentemente, a sua taxa de sucesso reprodutor não terá sido muito elevada, pelo menos durante a época de nidificação de 2002. A possibilidade de esta espécie estar sujeita a uma mortalidade elevada poderia ser outra razão para o reduzido incremento populacional, que, no entanto, não parece provável, dada a reconhecida longevidade da generalidade dos psitacídeos, aliada às condições climáticas amenas e de disponibilidade alimentar presentes no nosso país, talvez mais favoráveis a esta espécie do que noutras zonas europeias em que se registaram incrementos importantes (*e.g.* Pithon & Dytham 2002). Outra hipótese, talvez mais plausível, é a de se terem formado novos dormitórios da espécie, ainda não detectados, que tenham tornado o crescimento populacional menos evidente.

Assumindo que todas as aves presentes no dormitório entre Maio e Junho são não reprodutoras, a população nidificante da área da Grande Lisboa deverá ser composta, de forma grosseira, por cerca de 100 indivíduos. Este número deverá subestimar consideravelmente o total da população devido a, por exemplo, não considerar aves reprodutoras a utilizar o dormitório nesse período e por não considerar outros possíveis dormitórios ainda não detectados, apesar de ter sido desenvolvido algum esforço nesse sentido.

Para além da população que utiliza o dormitório do Jardim da Estrela, outros pequenos núcleos populacionais são conhecidos de outros pontos do país, nomeadamente em Torres Novas (*ca.* 20 indivíduos; C. Noivo com. pess.), em Mira (mais de 20 indivíduos em Janeiro de 2002; Petronilho *et al.* 2004), em Vale de Lobo, Loulé (mais de 5 indivíduos; D. Woodhead *et al. in* Matias 2003) e em menor número noutros locais do país (num total de mais de 20 indivíduos; Matias 2002, 2003) onde não é conhecida a regularidade com que ocorre. Não se conhecendo a possível proporção de aves não reprodutoras em cada um dos locais, os números apresentados referem-se ao máximo conhecido para cada um deles. Desta forma, o número máximo obtido para a totalidade do país ascende a mais de 270 aves, sendo a primeira estimativa para a população nacional desta espécie. Na área da Grande Lisboa é possível que outros núcleos existam (por exemplo, nas regiões de Cascais e de Sintra) de forma independente do dormitório do

Jardim da Estrela, estando, no entanto, mascarados pelos movimentos diários das aves provenientes desse dormitório em busca de alimento. Contudo, apesar de nenhum outro dormitório ter sido localizado durante o período a que respeitou este estudo, em finais de 2004 e em 2005 um pequeno dormitório foi detectado na zona do Campo Grande (P. Lourenço & C. D. Santos, com. pess.), não sendo clara a relação deste com o dormitório do Jardim da Estrela.

Em reduzido número, esta espécie tem sido também observada nas Regiões Autónomas dos Açores e da Madeira, respectivamente desde 2001 e 2000, apresentando nestes locais estatuto ainda por determinar (ver Matias 2003, 2004).

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SUMMARY

Monthly counts of Ring-necked Parakeet *Psittacula krameri* were carried out from January 2002 to December 2003 at the largest roost of the species in Portugal, located at Jardim da Estrela, Lisbon. The observed pattern of occurrence was similar during the two successive years, being probably related to the breeding cycle of this species in Portugal. It seems likely that most Ring-necked Parakeets are breeding from January to July. The maximum number of birds recorded at the roost was of 208 individuals. The total population of Ring-necked Parakeets occurring in Portugal is probably higher than 270 birds, this being the first national estimation for this species.

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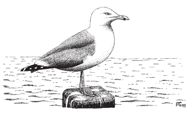

Nidificação de Gaivota-de-patas-amarelas (*Larus michahellis*) na cidade de Peniche, Portugal

Roof-nesting yellow-legged gulls (Larus michahellis) in the town of Peniche, Portugal

Lurdes Morais[1] & António Casanova[1]

Desde meados do século XX que a nidificação de gaivotas em meio urbano é conhecida e documentada em vários pontos do globo terrestre (e.g. Reino Unido, França, Estados Unidos da América, Austrália, respectivamente Monaghan 1979, Vincent 1982, Dwyer *et al.* 1996, Temby 2002), havendo um desenvolvimento mais recente deste tipo de situações ao longo das cidades litorais do norte de Espanha (Núñez 1983, Mouriño *et al.* 1999), oeste de França (e.g. Marie de Brest 2007, Cherbourg octeville 2007) e Itália (Benussi 2005).

As interacções entre as gaivotas e o homem rapidamente atingiram contornos de conflito devido à perturbação do descanso causada pelo ruído das gaivotas, aos prejuízos em edifícios, decorrentes de entupimentos de caleiras com material dos ninhos e restos de alimentos, à deterioração do material de cobertura de edifícios (Belant 1997, Temby 2002, Benussi 2005) e deterioração da pintura de viaturas e outros estragos causados pelos dejectos ácidos. A este quadro juntam-se ainda alguns casos de agressão a cidadãos por parte das gaivotas. Estas razões levaram várias municipalidades a tomar medidas de controlo das populações reprodutoras de gaivotas em meio urbano, que passaram por retirada de ninhos e ovos (e.g. Coulson 2004, Ayuntamiento de Gijón 2007), inviabilização de ovos (Benussi 2005, Mairie de Dieppe 2006), acções de afugentamento (Mairie de Dieppe 2006), e eliminação de adultos reprodutores (Ayuntamiento de Gijón 2007).

Este fenómeno é igualmente conhecido dos habitantes de Peniche já há alguns anos mas, exceptuando uma prospecção de locais de nidificação feita em 2005 (Lurdes Morais, dados não publicados), não existem documentos ou estudos que o descrevam e/ou avaliem. Pretendeu-se neste estudo quantificar a nidificação de gaivota na malha urbana de Peniche, sendo apresentados os resultados relativos a 2005 e 2006.

Em 2005 foi feita uma prospecção aos telhados no mês de Julho, que embora tardia na época de reprodução permitiu recolher alguns dados. Foi registado o endereço de todos os locais onde estivesse presente um casal em atitude de defesa do território e/ou juvenis de gaivota. De 18 de Maio a 19 de Junho de 2006 prospectámos os telhados de Peniche com o auxílio de binóculos e telescópio. Todos os ninhos encontrados foram fotografados e identificados os respectivos locais. Toda a cidade foi prospectada e as prospecções foram repetidas no mínimo três vezes para cada local de observação ao longo deste estudo. Devido ao intricado das coberturas dos edifícios, o método de prospecção utilizado – observação a partir de pontos altos acessíveis (e.g. terraços, varandas) – não possibilitou a visualização de todos os locais propícios à nidificação, havendo por isso um quantitativo desconhecido de ninhos que não foram detectados.

Considerámos “nidificação confirmada” sempre que observámos uma gaivota a incubar e crias ou juvenis de gaivota, e “nidificação provável” sempre que observámos um casal em atitude de defesa territorial. Designamos por “local de nidificação” todos os locais considerados individuais do ponto de vista da cobertura, como por exemplo: o telhado de uma casa ou vivenda, ou a cobertura ou telhado comum a vários edifícios de habitação. Assim, um “local de nidificação” poderá conter mais do que

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um ninho.

Data de 2002 o primeiro registo de nidificação de Gaivotas-de-patas-amarelas, *Larus michahellis*, em Peniche, quando foram retirados pelo ICNB/ Reserva Natural das Berlengas, oito juvenis não voadores de três ninhos situados no telhado da Igreja de S. Pedro, localizada no centro da cidade, onde decorriam obras de restauro (Carlos Santos & Lurdes Morais obs. pess.). Em 2005 detectámos no edificado de Peniche 43 locais que corresponderam a 43 ninhos confirmados e dois prováveis, e em 2006, 61 locais que corresponderam a 69 ninhos confirmados e quatro prováveis (Tabela 1, Tabela 2). Em nove destes locais houve nidificação em ambos os anos. A maioria dos ninhos concentra-se na zona antiga da cidade (Figura 1).

Tanto em 2005 como em 2006, cerca de metade dos ninhos foram construídos em coberturas de telha, seguindo-se em menor escala a construção sobre caleiras (Tabela 3). De notar que 60% do total de ninhos construídos sobre coberturas de telha em 2006, eram suportados por chaminés para evitar o deslizamento ao longo do telhado, 30% não tinham suporte, situando-se simplesmente sobre as telhas, e 5% eram suportados por muretes do beirado. Saliente-se que para evitar o deslizamento, um ninho era suportado por uma antena parabólica. Dos ninhos construídos sobre caleiras em 2006, 73% situavam-se em caleiras com murete. Em alguns locais com nidificação confirmada encontrámos mais do que um ninho (Tabela 4), havendo na generalidade uma barreira visual entre eles (e.g. num telhado com duas águas situa-se um ninho numa água e o outro na outra). No entanto, em alguns casos os casais de diferentes ninhos podiam observar-se (Figura 2).

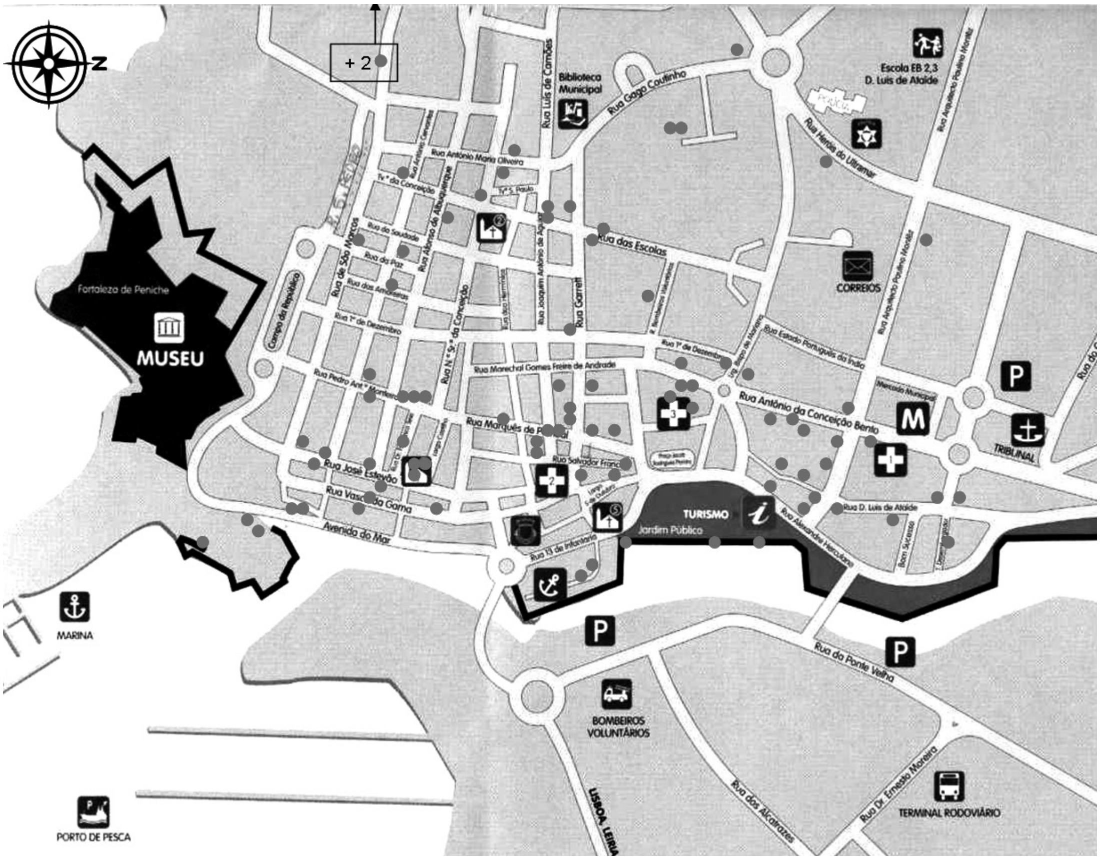

Figura 1. Localização dos ninhos de Gaivota-de-patas-amarelas na cidade de Peniche em 2005 e 2006.
Figure 1. *Location of rooftop nests of Yellow-legged gulls at Peniche town in 2005 and 2006.*

Tabela 1. Número de locais no edificado da cidade de Peniche com nidificação de Gaivota-de-patas-amarelas detectados em 2005 e 2006. / ***Table 1.*** *Number of roof sites were Yellow-legged gull were found breeding in 2005 and 2006 at Peniche town.*

Locais com nidificação / *Roof breeding sites*			
Ano *Year*	**Confirmada** *Confirmed*	**Provável** *Probable*	**Total de locais** *Total no. of roof breeding sites*
2005	41	2	43
2006	57	4	61

Tabela 2. Número de ninhos de Gaivota-de-patas-amarelas detectados em 2005 e 2006 no edificado da cidade de Peniche. / ***Table 2.*** *Number of Yellow-legged gull roof nests found at Peniche town in 2005 and 2006.*

Ninhos / Nests			
Ano *Year*	**Confirmados** *Confirmed*	**Prováveis** *Probable*	**Total**
2005	43	2	45
2006	69	4	73

Tabela 3. Distribuição do número de ninhos de Gaivota-de-patas-amarelas, de acordo com o tipo de cobertura no edificado de Peniche em 2005 e 2006. Entre parênteses encontra-se a percentagem de ninhos em cada tipo de estrutura. ***Table 3.*** *Distribution of Yellow-legged gull nests according to type of roof of the town of Peniche in 2005 and 2006. The Percentage of nests for each type of roof is in brackets.*

Ninhos construídos sobre / *Nests built over*	**2005**	**2006**
Chapa ondulada / *Corrugated galvanised iron roof*	2 (4,4)	4 (5,5)
Telha / *Tile roof*	22 (48,9)	40 (54,8)
Caleira/Algeroz / *Roof gutter*	2 (4,4)	11 (15,0)
Cornija de pedra / *Roof ornamented corner*	-	1 (1,4)
Floreira / *Flower pot*	-	1 (1,4)
Pedra / *Rock*	-	3 (4,0)
Placa de cimento / *Flat roof*	-	4 (5,5)
Plataforma sobre telhado / *Platform over roof*	-	1 (1,4)
Outros / *Others*	19 (42,3)	8 (11,0)
Total	45 (100,0)	73 (100,0)

Tabela 4. Número de locais com 1, 2, 3 e 4 ninhos de Gaivota-de-patas-amarelas detectados no edificado de Peniche em 2005 e 2006. / ***Table 4.*** *Number roof sites with 1, 2, 3 and 4 Yellow-legged gull nests, found at Peniche town in 2005 and 2006.*

Locais de nidificação com *Nesting places with*					
Ano *Year*	**1 ninho** *1 nest*	**2 ninhos** *2 nests*	**3 ninhos** *3 nests*	**4 ninhos** *4 nests*	**Total**
2005	41	2	-	-	43
2006	49	5	2	1	57

Durante as prospecções efectuadas foi-nos possível confirmar a presença de pelo menos 34 crias em 19 ninhos (1,79 cria.ninho^{-1}), embora possam ter existido mais eclosões/crias nestes ninhos que não foi possível visualizar devido à forma e às estruturas das coberturas que lhes proporcionam esconderijos. Pelas mesmas razões, não foi possível confirmar a presença de crias nos restantes ninhos.

O total de ninhos detectado neste estudo fica aquém da realidade, uma vez que se revelou impossível observar todos os locais que podem conter ninhos. Uma melhor estimativa da dimensão

Figura 2. Dois exemplos de locais de nidificação com dois ninhos cada, em que as Gaivotas-de-patas-amarelas de um dos ninhos têm visualização directa para o outro ninho. / ***Figure 2.*** *Two examples of roof sites with two nests each, where Yellow-legged gulls from one nest could directly see those from the other nest.*

da colónia urbana de Gaivota-de-patas-amarelas poderá ser obtida no futuro, juntando ao método aqui usado, um questionário porta a porta. Ainda assim, seria uma estimativa com algum erro associado, uma vez que alguns cidadãos desconhecem a existência de ninhos de gaivota na cobertura dos próprios edifícios onde habitam (obs. pess.). Tipicamente, são mais atractivos os telhados inclinados com uma estrutura que impeça o deslizamento do ninho e forneça alguma sombra (e.g. chaminé, antena). A aparente preferência por coberturas de telha para nidificar pode indicar apenas que a maioria das coberturas do edificado de Peniche é feita daquele material e não uma preferência, mas este aspecto não foi avaliado.

O facto da maior colónia de gaivota-de-patas-amarelas de Portugal continental se localizar a cerca de 6 milhas da cidade, na ilha da Berlenga, poderá ter contribuído para a colonização inicial dos telhados de Peniche. O crescimento exponencial daquela colónia, verificado durante os anos 80 do século XX (Morais *et al.* 1998), levou a que nos anos de 1994 a 1996 fossem efectuadas, acções de controlo da população adulta pelo Instituto da Conservação da Natureza. A partir de 1999 e até à data, a mesma entidade realiza campanhas anuais de controlo de natalidade através da destruição sistemática de ovos. Estas acções, fortemente perturbadoras, poderão ter influenciado e ainda estar a influenciar o recrutamento de reprodutores à colónia da Berlenga, levando a que as aves se reproduzam na colónia emergente em Peniche. Por outro lado, os desperdícios do porto de pesca da cidade de Peniche e a faina a ele associada, proporcionam uma fonte alimentar temporalmente constante e quantitativamente abundante para as gaivotas (obs. pess.). Estes factores, aliados ao facto do *habitat* de nidificação (coberturas de edifícios) não ser um factor limitante, favorecerão o crescimento da colónia urbana.

No entanto, outros factores menos óbvios e mais difíceis de identificar poderão estar subjacentes à colonização das urbes. O fenómeno, bem estabelecido no Reino Unido (Dunn *et al.* 2004) e no norte de França (Mairie de Dieppe 2006, Cherbourg octeville 2007, Mairie de Brest 2007), tem vindo a intensificar-se nas cidades costerias espanholas (e.g. Ayuntamiento de Santander 2005, Junta de Andalucia 2007, Ayuntamiento de Gijón 2007). Em Portugal existe nidificação urbana confirmada em Viana do Castelo (P. Correia *in* Elias 2005), Porto (um casal na Ribeira em 1997; Peter Rock com. pess.), Peniche (este estudo) e Lisboa (observada uma cria com cerca de 15 dias e respectivos progenitores num telhado do Bairro Alto em 2007; Leonor Narciso, com. pess.). Segundo Peter Rock citado por Gordinho (2005) existem ainda suspeitas de nidificação nas cidades de Lagos e Portimão. No entanto, à excepção de Peniche, as observações nas restantes urbes são esporádicas não estando por isso quantificados os ninhos nem as eventuais tendências de crescimento das populações nidificantes urbanas.

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SUMMARY

The breeding of Yellow-legged gulls in the rooftops of the town of Peniche was confirmed since at least 2002. The roofs of Peniche were surveyed from vantage points in 2005 and 2006. Forty-three sites had 43 confirmed and two possible nests, and 61 sites had 69 confirmed and four possible nests of Yellow-legged gulls *Larus michahellis* in 2005 and 2006, respectively. Breeding in both years occurred in nine of those roof sites. Fifty five percent of the nests were located on roofing tile roofs and 15% on roof gutters in 2006. Owing to the intricate of roofs, an unknown number of nests were not located. The large availability of roof sites and food from the fishing harbour will favour the growth of the colony in the future.

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Airo 18: 34-39 (2008)

On the occurrence and nesting of the Black Wheatear *Oenanthe leucura* in the area of Foz-Tua (Douro Wine Demarked Region, NE Portugal)

On the occurrence and nesting of the Black Wheatear *Oenanthe leucura* in the area of Foz-Tua (Douro Wine Demarked Region, NE Portugal)

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The Black Wheatear *Oenanthe leucura* is a small thrush characteristic of arid habitats (Snow & Perrins 1998). Once relatively common throughout the SW Mediterranean (e.g., Degland & Gerbe 1867, Seebohm 1881, Ramsay 1923), the distribution of this species in the Western Palearctic is now restricted to the Iberian Peninsula and NW Africa (BirdLife International 2005). Although not globally threatened, the species is considered to be at risk in Europe (category SPEC3, "Rare"; BirdLife International 2005), a classification that reflects the drastic decline of its European populations in the period 1970-1990 (Tucker & Heath 1994).

The presence of the Black Wheatear in Portugal has been documented since the last decades of the 19th century (Arévalo y Baca 1887, Oliveira 1896, Bragança 1903). By the first quarter of the 20th century the species was already restricted to three main nuclei in the SE border and in the upper valleys of the Tagus and Douro rivers (e.g., Tait 1924, Reis Jr. 1930), but it still was relatively abundant in these areas (Tait 1924). The second half of the 20th century saw a generalized and continuous regression of its distribution area in Portugal, dramatically illustrated by the systematic surveys of the "Atlas of the Portuguese Birds (1979-84)" (Rufino 1989) and the "New Atlas of the Portuguese Birds (1999-2005)" (ICN *et al.*, in prep.).

Today, the Black Wheatear only occurs in semi-isolated geographic areas in the nuclei of Tagus and Douro rivers (ICN *et al.*, in prep.) with the total population being estimated as 250 to 2,500 individuals (Almeida *et al.* 2005). Consequently, it was classified as "Critically Endangered" in the recent revision of the Portuguese Vertebrate Red Data Book (Almeida *et al.* 2005).

Despite the acknowledged situation of the species in Portugal, there is no published information on its biology and ecology (Almeida *et al.* 2005), even in the Upper Douro region, where it is known for more than a century due to its association with the vineyards producing the famous Port Wine (Giraldes 1879, Themido 1893, Tait 1924).

This study aims to begin filling the gap in the knowledge of the species and to contribute towards its conservation. We present some preliminary information on the recent occurrence and nesting activities of a small population of the Black Wheatear in the fringe of the species' distribution area in NE Portugal (Foz-Tua area, in the core of the Douro Wine Demarked Region).

The study site, located in the mouth of river Tua, in the Douro Wine Demarked Region (41º15'N 7º24'W, Figure 1) is a hilly area of about 5000 ha. Until recently, the landscape was mostly an agricultural mosaic dominated by traditional vineyards, built in narrow terraces delimited by schistous stonewalls and mixed with olive-trees (Ribeiro 2000). However, in the past two decades, these vineyards have been gradually substituted by more intensive forms of plantation. Whenever possible, the original topography is altered and new, large earth-walled

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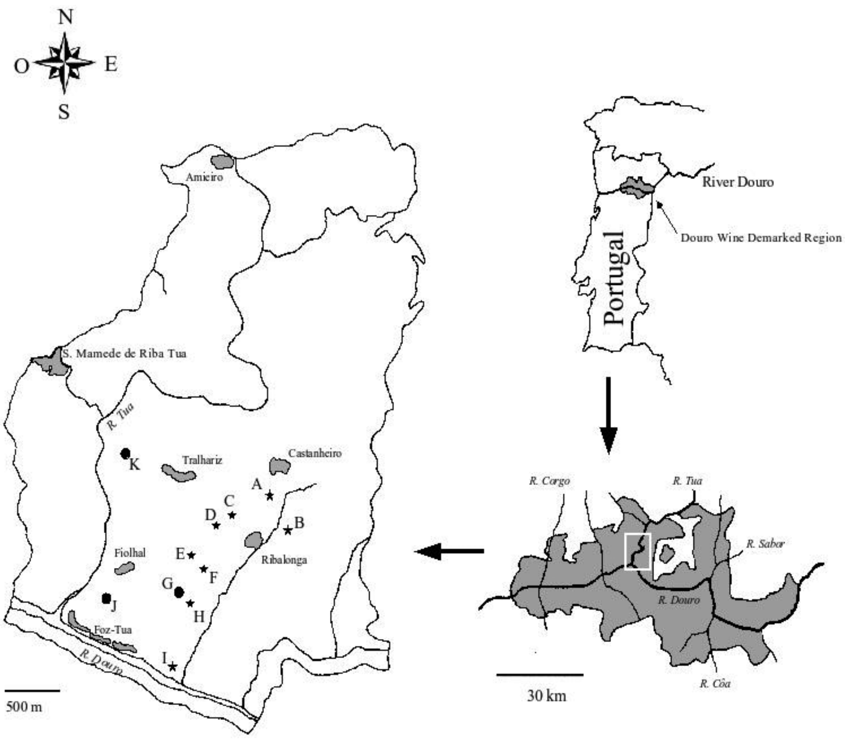

Figure 1. Location of the study area in the the Douro wine Demarked Region (NE Portugal) and approximate position of the Black Wheatear pairs detected in 2004. The letters identify each pair and indicate the presence of nests or the putative center of the territory (see text); a distinction is made between pairs with confirmed breeding (nests and/or young: ★) and those without it (●), that is, for which no breeding behavior, nests and/or juveniles were observed.
Figura 1. *Localização da área de estudo na Região Demarcada do Douro e posição aproximada dos casais de Chasco-preto detectados em 2004. As letras identificam cada um dos casais e referem-se aos locais dos ninhos ou centro do presumido território (ver texto); faz-se a distinção entre os casais cuja reprodução foi confirmada (ninhos e/ou juvenis: ★) e aqueles em que não o foi (●), isto é, para os quais não se observaram indícios de comportamento reprodutor, ninhos e/ou juvenis.*

terraces without any other vegetation are built (intensive vineyards). When such transformation is not possible, due to topographic or economic reasons, the original terraces are kept. However, the vegetation, including trees is all removed, and the density of vineyards per terrace is lowered, in order to allow at least partial mechanization (semi-intensive vineyards).

The study area was the target of a systematic vertebrate survey from 1979 to 1984 (Ferrand de Almeida 1987) coinciding with the first Atlas of the Breeding Birds, and again in 2002-03 within the framework of an independent project (Múrias, unpublished). Between the two periods, it was under a regular, although not systematic, survey (Ferrand de Almeida & Múrias, unpublished), and separate records were made of the most interesting observations. During the New Atlas of the Breeding Birds (1999-2005) it was visited independently by other observers (P. Travassos, pers. comm.)

The presence of the Black Wheatear has been recorded in the study area since the early 1980's (Ferrand de Almeida unpublished). During the 2002-03 survey, and following informal consultation with local people, we realized that the species seemed to be more common than previously thought. Therefore, in 2004, we conducted a specific survey to assess the abundance and distribution of this species in the area. From January to March 2004 all zones where the Black Wheatear was reported as having been seen by local people, or could potentially appear, were surveyed. Experience eventually assured that all the suitable places for nesting in the area were visited.

A preliminary description of the breeding habitat was attempted by estimating the percentage of area occupied by relevant land-use types (vineyards, olive-trees or other vegetation) in a 250 m-radius around each nest or, when it was not found, the birds' preferred perches. The reason we used the perches to characterize the nesting habitat was because they were usually located in the vicinity of the nest site. The following parameters were taken to characterize the nest: (1) type of substrate, (2) height from the soil, (3) number of stones at the entrance (an indicator of the male's fitness according to Soler & Soler 1994).

Each pair was regularly monitored between March and late July. The nests were followed with binoculars until fledging or failure. Despite the difficulty of accessing the nests and/or looking inside, a close inspection was attempted to confirm the fate of the clutches when the parents' behaviour suggested that some abnormality had occurred (e.g. if they stopped transporting food to the nest). Whenever possible, we also recorded the probable laying date (which was counted backwards, assuming that the hatching dates coincided with the beginning of the parents' feeding trips), the number of eggs and the number of fledging produced. Regular observations continued until September to cover the post-fledging period. A preliminary description of the chick diet was made possible through the analysis of some fecal pellets (n=14) collected from three pairs in April and May. On some occasions it was also possible to identify the prey items carried by the adults in the bill, just before they entered the nest.

In the period 1979-84, the Black Wheatear was only sporadically observed during the winter in the study area (Ferrand de Almeida pers. comm.). The first confirmed information on the breeding of the species in the area was reported in 1987, when a nest was found in the stone wall of a warehouse (Múrias, unpublished). This territory was apparently occupied in the following years, but no juveniles were seen. In 1999-2000, the fieldwork performed in the area for the New Atlas of the Breeding Birds in Portugal, detected another pair (P. Travassos pers. comm). The detailed survey of 2004 provided evidence that at least 11 pairs nested in the area that year.

The core of all territories was dominated by vineyards (81.0% ± 11.9% (standard-deviation), range: 70-96%, n=11), mostly under the semi-intensive form. Sparse olive-trees accounted for about 14% of the area and only 5% were occupied by other spontaneous vegetation (scrub, trees other than olive-trees). More than half the territories (61%) included a waterline (temporary stream), and all were set in zones of steep slope (>45º).

Only eight of the Black Wheatear pairs detected in the study area in 2004 presented signs of breeding activity (Figure 1). Ultimately we found eight nests, belonging to six pairs (Table 1). Two more pairs produced juveniles, but their nests were not found. Most nests were built in the vineyards' supporting walls, at an average height of 1.13 ± 0.37 (SD) m (range: 0.64 to 1.61 m, n=6). Two were located higher, in a warehouse (4.08 m above the ground) and in a cemetery wall (2.71 m). The mean number of stones present at the entrance was 19.8 ± 18.6 (range: 0 to 45, n=6) (Table 1).

In 2004 the early breeding attempts took place in March (pairs C and D), although most nests were built in April (pairs A, B and E), and a later one in May (pair F). Second clutches were initiated in May (pair D) and June (pair E), roughly two months after the first attempt, irrespectively of the fate of previous clutches (Table 2). Both pairs that nested earlier (pairs C and D) lost their clutches, possibly due to a sudden burst of bad weather that occurred in late March-early April. While pair D resumed its attempts to breed (successfully) later in the season, pair C did not. Overall, the mean number of juveniles produced in 2004 was 1.63 ± 1.69 young/pair (range: 0 to 4, n=8).

Each fecal pellet from the chicks contained an average of 2.8 food items. The main prey items were ants (Hymenoptera) and beetles (Coleoptera), which represented 41.0% and 33.3% of the total number of prey, respectively (n=39). Other representative groups were flies (Diptera, 10.3%), crickets (Orthoptera, 2.6%) and spiders (Aranea, 12.8%). The prey that could be identified by sight, when brought to the nest by the parents, were centipeds (Chilopoda) and small lizards.

Table 1. Summary of the Black Wheatear (*Oenanthe leucura*) breeding characteristics in the study area in 2004. The letter identifying each pair (those whose breeding was confirmed in 2004) is equivalent to that of Figure 1. **n.d.**: not determined. "Stonewall" indicates the schistous walls supporting the terraces in the traditional way in the Douro Demarked Region. / ***Tabela 1***. *Resumo das características da nidificação do chasco-preto (*Oenanthe leucura*) na área de estudo em 2004. As letras que identificam cada casal (aqueles cuja nidificação foi possível confirmar em 2004) são as mesmas da Figura 1. n.d. : não determinado. "Stonewall" indica as paredes de xisto que suportam os terraços nas vinhas tradicionais da Região Demarcada do Douro.*

Pair	Nest characteristics			Clutch	Laying date	Number eggs	Number fledgings	Observations
	Nest location[1]	Height (m)	N. of stones					
A	Warehouse	4.08	n.d.	?	April	n.d	2	-
B	Cemetery	2.71	n.d.	?	April	n.d	0	Lost[2]
C	Stonewall	0.64	0	?	March	n.d	0	Lost[2]
D	Stonewall	1.16	6	1st	March	3	0	Lost[2]
-	Stonewall	1.61	28	2nd	May	n.d	1	Substitution
E	Stonewall	1.50	45	1st	April	n.d	3	-
-	Stonewall	1.00	35	2nd	June	n.d	1	-
F	Stonewall	0.86	5	?	May	n.d	0	Lost[3]
H	Nest not found			?	n.d	n.d	4	-
I	Nest not found			?	n.d	n.d	2	-

Notes:

[1] In the oldest buildings and traditional vineyards, the stonewalls are made of schistous layers, with no cement, which provide suitable holes for nest building.

[2] All these clutches were lost in the same week in early April, which was marked by a sudden drop of temperature, heavy rain and hail.

[3] No apparent cause for clutch loss was found.

Assessing the distribution and abundance of the Black Wheatear is a difficult task, given its discrete behaviour. Nevertheless, all evidence suggests that the species is in a process of accelerated regression in Portugal (Almeida *et al.*, 2005; ICN et al., in prep.). The data presented here contradicts this perception, at least for the study area. The hypothesis of an insufficient sampling before 2000-2004 should be ruled out, given the unusual intensity and regular surveys that the study area has been subjected to since the mid-1980's (Ferrand de Almeida 1987, Múrias unpublished). The hypothesis of the species' local increase in the past decades is corroborated by the perception of the local inhabitants and farmers that the Black Wheatear is now "more common" (i.e., seen more often) than some years ago. Despite its subjectivity, we think that this assessment should be taken into consideration, since the species is clearly identified and well-known in the region, where it is called "Rabo-branco" (White-tail). In fact, the territories of some pairs were detected due to specific hints from farmers or other locals.

For the moment it is not possible to assess how representative are the data presented here, even at a regional level, due to general lack of information for this species in Portugal. Apparently, the values of the breeding parameters of the Foz-Tua population did not differ from the average values published for other populations in the core of the species' distribution area (e.g., Tellería *et al.* 1999), as it could be expected for a marginal population of a species in a generalized regression throughout its distribution area. Also, the events reported here are coincident with the increment of the two major habitat changes that took place in the region in the past two decades: land abandonment and plantation of intensive vineyards (Andresen *et al.* 2004, Múrias *et al.* unpubl.).

While land abandonment may be detrimental to the Black Wheatear, as it promotes the re-vegetation of the open spaces that were suitable for the species (Román & Soler, 2003, Almeida *et al.* 2005), the plantation of intensive and semi-intensive vineyards may be an advantage. In fact, this type of vineyards requires large earth platforms with no vegetation and provides suitable perching sites on the sticks used to support the vines. It thus enhances both the availability of food supplies (mostly soil invertebrates) and its detection. Moreover, as many of these vineyards are built over old terraces, large stretches of the traditional stonewalls are preserved, which also provides good nesting places. Finally, because part of the abandoned land is converted to these new vineyards, the total area of this habitat tends to increase, thereby favouring the settling of suitable habitat conditions for the Black Wheatear.

As already shown by Real in NE Spain (Real 2000), the Black Wheatear seems to rapidly take advantage of new suitable conditions to recolonize previously abandoned areas. The preliminary observations reported in this paper are consistent with this idea, although more detailed work is needed to test this hypothesis. From the conservation point of view, the possibility of helping the species to naturally recolonize at least parts of its former area of distribution is exciting. However, the first priority in conserving the species is to outline the factors leading to its generalized decrease (see Almeida *et al.* 2005). With this paper we hope to stimulate the undertaking of the so urgently needed research on the biology and ecology of the species in Portugal, the first step towards its long-term conservation.

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RESUMO

*O chasco-preto (*Oenanthe leucura*) é uma espécie ameaçada na Europa, onde actualmente só ocorre na Península Ibérica. Em Portugal, onde existem registos desde, pelo menos, o final do século XIX, a sua distribuição já se estendeu de norte a sul do país, embora apenas em habitats favoráveis. Hoje, a sua ocorrência está limitada aos troços superiores dos rios Tejo e Douro. Apesar da espécie se encontrar, aparentemente, em regressão acentuada, pouco se conhece sobre aspectos básicos da sua biologia e ecologia, passo essencial para promover a sua conservação. Na zona de Foz-Tua (Região Demarcada do Douro), situada no limite oeste da área de distribuição da espécie no Douro, existem indícios de que esta tem vindo a aumentar desde meados da década de 1980, contrariando a tendência geral observada. Em 2004 foram detectados na área 11 casais, cuja nidificação foi acompanhada entre Março e Setembro. A maioria dos territórios é dominada por vinhas, localizadas em encostas de inclinação acentuada e junto a linhas de água. De oito ninhos detectados (seis casais), seis foram construídos nos muros de suporte de vinhas e dois nas paredes de outras construções. As primeiras tentativas de nidificação foram feitas em Março, mas a maioria dos ninhos foi construído em Abril, ocorrendo segundas posturas em Maio e Junho. Em média, foram produzidos 1,63 crias por ninhada, e 40% das posturas não tiveram sucesso. As formigas constituíram a base da alimentação das crias na fase pré-voadora. Estes resultados não diferem muito dos valores médios para a espécie, ao contrário do que se poderia esperar numa população marginal de uma espécie em acentuada regressão. Uma possível explicação para o aparente aumento da espécie na área é a de que a substituição das vinhas tradicionais por vinhas de*

tipo intensivo ou semi-intensivo promove condições para um aumento da disponibilidade alimentar (sobretudo fauna do solo) que, associada à existência de numerosos e relativamente seguros potenciais locais de nidificação, favorece a expansão local do Chasco-preto.

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