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WINTERING BIRD DISTRIBUTION AND ABUNDANCE IN THE BAIXO ALENTEJO (SOUTHERN PORTUGAL): AN ATLAS REVIEW

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ABSTRACT. During the three winters 1992/93 to 1994/95 atlas mapping was performed in an area larger than 10 000 km² in the region of Baixo Alentejo, southern Portugal. The grid was 10 × 10 km UTM (166 squares). For owls, a special effort was made. Several tests warrant that all squares and sectors were visited at random. The method proved to be effective. Between years great differences could be demonstrated.

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INTRODUCTION

The winter distribution of birds in the Iberian Peninsula is relatively poorly known. The Atlas of Wintering Birds in the Western Algarve (Bolton 1987) is the only winter atlas for Portugal and Spain which has been published so far, although two other similar projects are under way in the Peneda-Gerês National Park (Pimenta & Pimenta 1994) and the Malcata Mountains Natural Reserve (Silva 1994). Nevertheless the Atlas of Wintering Birds of Baixo Alentejo is the first to cover an area larger than 10 000 km².

The atlas field work in the Baixo Alentejo district began in the winter of 1992/93. This area was chosen because of its outstanding ornithological importance and because it contains a large variety of habitats and landscapes. Furthermore, it covers the southern part of the Sado Estuary Nature Reserve and the northern part of the "South-west Alentejo and Coast of Cape St. Vincent Natural Park". It also covers other areas which are of international importance, such as Murta Dam, Santo André Lagoon, Sancha Lagoon, Castro Verde plains, Moura-Safara, Vidigueira-Beja and the River Guadiana Valley, all of them designated as Important Bird Areas in Europe (Grimmett & Jones 1989).

ATLAS METHODOLOGY

Following current practice in most other European atlas projects, the 10 × 10 km grid, based on the Universal Transverse Mercator (UTM) coordinates, was used, resulting in 166 sampling units. The area was divided into three sectors, each having at least one fieldwork coordinator, familiar with the specific problems of the area, resulting in a more effective coverage.

Data were collected during three successive winters, 1992/93 - 1994/95, between November 26th and January 31st. To quantify the species abundances, the method described by Lack (1986) was followed, although some modifications were made. Few people and small economic resources for this atlas project required changes as follows: (1) squares were prioritised in order to distribute the effort more evenly, (2) when using the "time-of-the-visit" correction, the normalised time, T, was three hours instead of six, and the significance level demanded was 95 % instead of 99.9 %, and (3) a special census method was used for owls.

Referring to point 1, since only about 85 % of the squares were visited yearly, each square was priority-classified according to the frequency it was visited, number of hours spent and number of species detected. For further details see Elias & Reino (1994a, 1994b).

Referring to point 3, dedicated techniques on owls were introduced in the second year, as during the firs year of survey few records of nocturnal species were made, since all the ordinary visits were made during daylight. For the three most common species (Barn Owl *Tyto alba*, Little Owl *Athene noctua* and Tawny Owl *Strix aluco*) we used two point counts of 15 minutes each, replaying tape recordings of their calls. Three less common species (Eurasian Eagle Owl *Bubo bubo*, Long-eared Owl *Asio otus* and Short-eared Owl *A. flammeus*) were also investigated, though at selected localities, based on previous records, local inquiries or habitat availability. This method resulted in a large increase in the number of records of both the common species and the Eagle Owl.

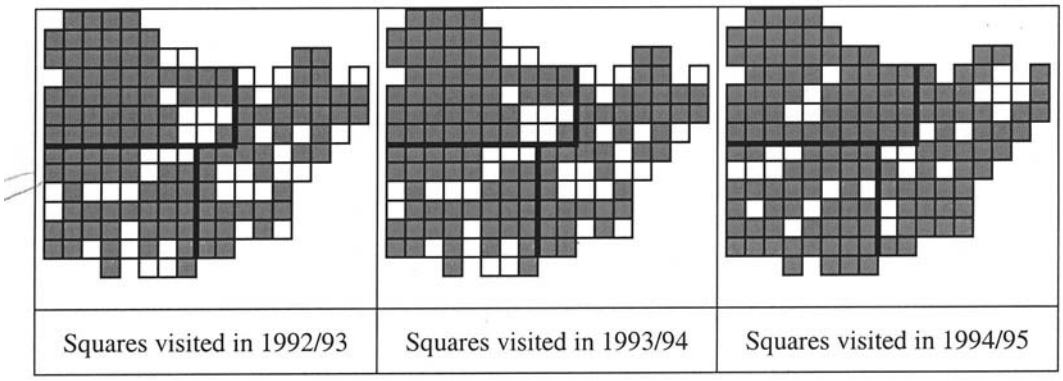
EFFORT EVALUATION

In a three years study like this, it is necessary to distribute the effort similarly between the years and to distribute it evenly over the study area. Otherwise the mapped distribution of species would be biased for species that show differences in abundance and range between winters (cf. Lack 1985).

Homogeneity in the amount of effort among years was tested in several ways: 1) the number of visits in each year and sector was compared using a χ^2 test ($P<0.05$); 2) the average duration of the visits within the three years was compared using the Bootstrap method (Wonnacott & Wonnacott 1990); 3) the geographic distribution of the effort was mapped in order to compare it between years (fig. 1).

As a result, the first analysis indicates that the hypothesis of homogeneity of the number of

Figure 1. Atlas coverage in the three subsequent winters.
Division by sectors: sector 1-NW; sector 2 - E; sector 3 – SW.



visits to each sector in the three years was not rejected (Table 1). The Bootstrap analysis doesn't not show differences in the average hours of fieldwork in the three years (Table 2).

Table 1. Number of tetrads visited by sector in each winter. The hypothesis of statistical dependence was shown not to be significant ($\chi^2 = 3.39$, g.l.= 4, n.s.).

Sector	1992/93	1993/94	1994/95	TOTAL
1	49	51	53	153
2	41	53	47	141
3	37	49	42	128
TOTAL	127	153	142	422

Table 2. Confidence intervals for the average length of the visits, calculated using the Bootstrap method. The hypothesis of homogeneity of the number of visits to each sector in the three years was not rejected at the 95% confidence level.

Winter	Minimum	Maximum
1992/93	2.7	3.5
1993/94	2.6	3.2
1994/95	2.9	3.5

RESULTS: VARIATION AMONG WINTERS

Since, for the majority of the species, the sampling effort in each of the three years was comparable, the number of squares occupied each year can be used to detect fluctuations in the size of wintering populations. We found clear differences not only for some of the commonest species but also for some scarce migrants.

Table 3 shows the range differences between years for five selected species: House martin *Delichon urbicus*, Swallow *Hirundo rustica*, Song Thrush *Turdus philomelos*, Redwing *Turdus iliacus*, Mistle Thrush *Turdus viscivorus*. Apart from the Mistle Thrush, the selected species are migrants or partial migrants and show large differences in the occupied area between the three winters.

Both swallows increased in the third year, unlike the migratory thrushes. In the case of the thrushes, the relation between weather and trophic conditions and winter movements has been widely studied (cf. Santos 1982). In fact, the winter 1993/94 was harsher than the other two, which might explain the large variation in the range of species such as the Redwing. But the success in the previous breeding season may also affect numbers. For some species, a slight increase in the number of birds seen over the three years, may be due to an improvement of observer skills (cf. Sauer et al. 1994).

Table 3. Number of squares in which the species were detected in each year. The results of the χ^2 test based on the hypothesis that the variation is year-dependent are also shown (*P<0.05).

Species	1992/93	1993/94	1994/95	Hypothesis of dependency
Delichon urbicus	2	4	12	$\chi^2 = 9.33$*
Hirundo rustica	13	17	28	$\chi^2 = 6.24$*
Turdus philomelos	65	103	103	$\chi^2 = 10.66$*
Turdus iliacus	14	43	37	$\chi^2 = 14.96$*
Turdus viscivorus	37	43	48	$\chi^2 = 1.42$ n.s.

CONCLUSIONS

Bird counts using both time and space census methods are essential to detect possible differences in distribution and abundance between years or different parts of the year (Lack 1985). For a full coverage, including the less common and shy species, additional approaches should be used in conjunction with the basic methods.

In fact, the advantage of regional versus nation-wide atlases is that regional ones can record the distribution of birds more in detail and monitor local bird populations more precisely. This increase in accuracy is useful for the protection of rare habitats and species.

Overall, the methodology used in this project proved to be effective and filled well the need of a regional atlas with a 1/15 of the observer/area ratio of the Atlas of the Wintering Birds of Britain and Ireland (Lack 1986). The costs of the field work were quite low, mainly because all the work was done by volunteers.

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