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Breeding bird assemblages in eucalyptus plantations in Portugal

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The results of bird censuses carried out during two breeding seasons in eucalyptus plantations in Portugal are presented. In one season two different methods were used (mapping and line transect), and the results were compared with those from pine plantations of the same region. In the other season only the line transect method was used in different places and no comparisons with pine were made. Bird densities were very low in eucalyptus stands, possibly because of factors such as the growth rate and the quick change in the structure and also the few insect attacks. Monitoring the bird communities of woods of this recently introduced and rapidly spreading tree is advisable.

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1. Introduction

Introduced in Portugal early in the 19th century, *Eucalyptus globulus* Labill. was mainly used as an ornamental tree, until, in the first half of the 20th century, its exceptionally good properties as raw material for the pulp industry were discovered. From then on several pulp mills were built, and the area occupied by the species increased very fast: 77 000 ha in 1955, 148 000 ha in 1965 and 285 000 ha in 1974 (Gois 1977). Nowadays the area is calculated in ca. 450 000 ha, which puts it in the fourth place among forest trees in Portugal.

The increasing planting and the intense exploitation of eucalyptus stands has aroused violent criticism, being accused, among other things, of faunal empoverishment. This paper gives some information on breeding bird numbers of eucalyptus stands and compares the results with census data from maritime pine (*Pinus pinaster* Aiton) plantations, which is the most widespread forest tree in Portugal.

2. Material and methods

This study was carried out during two breeding seasons, the first in 1982 when a comparison between eucalyptus and pine was made (Leiria, Furadouro), and the second in 1987, when only the eucalyptus stands were censused, but over a larger area (Bogalheira, Arripiado, Crato; Fig. 1).

The methods used were mapping (IBCC, 1969) and line transect (Järvinen & Väisänen 1975, 1983) methods in 1982, and line transect in 1987. The plot sizes were 8 ha for the pine and 9 ha for the eucalyptus and the transect lengths varied between 1.4 and 6.9 km (Tables 2, 3, 4).

The specific constants K of the transect method, obtained from the number observed in a belt 25 m on both sides of the observer (main belt – MB) and the total number of observations (survey belt – SB) for each species, were calculated adding our figures to those given by Järvinen and Väisänen (1983). For those species not included on their list, only our data was used (Table 1).

In both years two different growing stages were sampled, one 2 to 5 years and another 12 to 15 years old, referred to in this paper as I and II respectively. For the pine woods with more or less the same tree size as in eucalyptus woods, the ages were 14 and 72. The older eucalyptus stands were older than the usual cutting age and so they represent the final stage of that kind of forest in Portugal.

3. Results and discussion

The results (Tables 2–4) show rather low densities, mainly for eucalyptus and especially when compared with the other two most important forest trees in Portugal: *Quercus suber* ca. 700 pairs/km² (Rabaca 1983) and *Quercus rotundifolia* ca. 300 pairs/km² (unpublished).

For the pine woods the low densities were expected from some IKA censuses made in previous

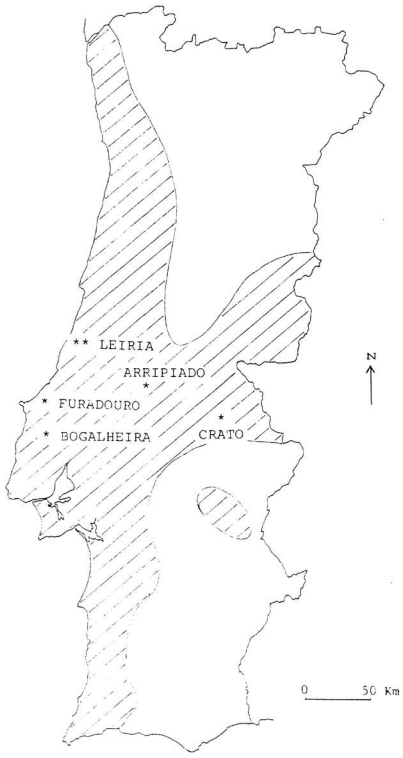

Fig. 1. Location of the study areas (** = *Pinus pinaster*; * = *Eucalyptus globulus*). The hatched area shows the distribution of *E. globulus* in Portugal.

Table 1. Specific constants K used, obtained from the relationship of the observations in a belt 25 m to each side of the observer (MB) and the total number of observations (SB) available for each species. The figures of our censuses were added to those given by Järvinen & Väisänen (1983). For the species marked with *, only Portuguese data were used.

Accipiter nisus	3.485	*Parus cristatus*	10.140
*Alectoris rufa**	3.485	*P. ater*	6.534
Columba palumbus	1.570	*P. major*	6.808
Streptopelia turtur	1.404	*P. caeruleus*	12.081
Picus viridis	2.967	*Certhia brachy-*	
Dendrocopus major	5.001	*dactyla**	3.659
Lullula arborea	3.058	*Garrulus glandarius*	7.406
Troglodytes troglodytes	5.255	*Corvus corone*	1.517
Erithacus rubecula	6.348	*Sturnus unicolor**	3.505
*Luscinia megarhynchos**	2.053	*Passer domesticus*	7.906
Turdus merula	5.100	*Fringilla coelebs*	4.943
T. viscivorus	3.074	*Carduelis chloris*	3.949
Sylvia atricapilla	5.510	*C. carduelis*	4.691
*S. undata**	4.223	*C. cannabina*	6.805
*S. melanocephala**	6.375	*Serinus serinus**	1.912
*Cristicola juncidis**	2.245	*Miliaria calandra**	5.314

Table 2. Mapping method. Number of pairs observed in the plots (I = young plantations; II = old plantations). Data from Pina 1982.

	Leiria *P. pinaster* (8 ha)		Furadouro *E. globulus* (9 ha)	
	I	II	I	II
Troglodytes troglodytes	2	1	5	–
Erithacus rubecula	1	–	–	–
Sylvia atricapilla	–	–	1.5	–
Parus cristatus	0.5	3.5	–	–
P. ater	–	4.5	–	–
Certhia brachydactyla	–	2	–	–
Fringilla coelebs	–	3.5	–	–

years, but eucalyptus showed even lower values. In fact, and for the transect method, only in one case the density in eucalyptus woods is over 100 pairs/km² and also only on that very case three species with more than 10 pairs/km² were found. All the other censuses have smaller values, with the highest density of 64 pairs/km² and a maximum of two species with more than 10 pairs/km².

The difficulty of using the mapping method is evident, since there is a great probability of not registering a species at all if the recommended plot size is used, as in Furadouro II (9 ha, Table 2).

Of the 30 species recorded, only two appeared in all transects, *Parus major* and *Troglodytes troglodytes*. The latter was always among the three most frequent species, with values of 11.3 to 47.7% of the total density. It is usually connected with the presence of shrubs, but the stands are regularly cleaned. *P. major* has much lower densities, and only twice its frequency exceeded 10%.

Six other species (*Sylvia melanocephala, Parus ater, Garrulus glandarius, Fringilla coelebs, Carduelis carduelis* and *Serinus serinus*) appear in all places, although not in all transects, and perhaps can be considered as characteristic of these plantations. The other species show a less regular distribution, but sometimes with high densities, as *Carduelis cannabina* in Bogalheira.

Table 3. Bird densities of eucalyptus stands. SB observations (transect method; data for Furadouro from Pina 1982). (I = young plantations; II = old plantations).

	Furadouro		Bogalheira		Arripiado		Crato	
	I	II	I	II	I	II	I	II
Transect lenght, km	3.7	6.9	3.0	1.4	5.2	5.2	3.0	6.8
Accipiter nisus	–	–	–	–	–	–	–	2
Alectoris rufa	–	–	–	–	1	–	–	–
Columba palumbus	1	1	–	–	–	–	–	–
Streptopelia turtur	4	1	–	–	–	–	–	–
Picus viridis	1	–	1	–	–	–	–	3
Dendrocopus major	–	–	–	1	–	–	–	4
Lullula arborea	–	–	2	–	–	–	5	–
Troglodytes troglodytes	38	7	5	9	25	23	3	20
Erithacus rubecula	3	7	6	1	–	–	–	–
Luscinia megarhynchos	–	–	–	–	5	–	–	–
Turdus merula	7	1	–	–	–	1	4	2
T. viscivorus	–	–	–	–	–	–	–	6
Sylvia atricapilla	14	–	–	–	4	14	–	–
S. undata	–	–	–	–	3	–	–	–
S. melanocephala	3	–	1	–	8	2	1	–
Cisticola juncidis	1	–	–	–	–	–	–	–
Parus cristatus	–	–	1	–	2	1	–	6
P. ater	–	3	1	2	1	3	1	–
P. major	6	4	1	1	1	1	2	3
P. caeruleus	–	–	–	–	1	–	–	–
Certhia brachydactyla	–	–	–	–	–	–	–	1
Garrulus glandarius	1	–	–	1	–	1	1	6
Corvus corone	–	–	–	–	–	–	–	1
Passer domesticus	–	–	–	–	–	–	–	1
Fringilla coelebs	1	11	–	2	4	–	–	28
Carduelis chloris	13	3	–	1	3	–	–	–
C. carduelis	9	3	1	1	–	1	–	2
C. cannabina	–	–	18	3	–	–	2	2
Serinus serinus	4	–	1	–	1	–	3	1
Miliaria calandra	–	–	–	–	–	–	2	–

Table 4. Bird densities of pine stands. SB observations (transect method; data from Pina 1982). (I = young plantations; II = old plantations).

	Leiria	
	I (2.15 km)	II (2.0 km)
Picus viridis	–	4
Lullula arborea	2	–
Troglodytes troglodytes	12	6
Erithacus rubecula	3	2
Turdus merula	2	1
Sylvia undata	3	–
Parus cristatus	2	11
P. ater	5	17
P. major	2	4
Certhia brachydactyla	–	6
Garrulus glandarius	–	1
Sturnus unicolor	–	2
Fringilla coelebs	3	21
Carduelis chloris	3	5
Serinus serinus	–	1

A more detailed analysis of bird communities of *E. globulus* woods is not possible with the data available. Successional patterns are not clear: the 1982 figures pointed to a lower density in the older trees, but the other censuses did not confirm this trend. This is certainly an interesting subject to study, as the structure of eucalyptus forests change quicker than for any other forest tree in Portugal. The usual cutting age is 10–12 years, with an average height of about 20 m. This means that for the rotation period of the pine stand studied (80 years) there can be more than six cuts of eucalyptus.

Another aspect that has been pointed out as related to the low bird densities is that eucalyptus trees, in Portugal, support almost no insects. Only a few years ago an important attack by an introduced beetle (*Phoracantha semipunctata* Fab., Cerambycidae) was observed but the results from the bird censuses do

not show any correlation with this insect in the areas where its incidence was higher.

As the area of eucalyptus forests is quickly increasing in Iberia due to their economic importance, sometimes replacing native communities of great natural value, one can see the importance of monitoring the evolution of its bird populations.

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