

# Searching for the best scale that explains bird community composition in a montado system near Évora (Portugal)

Filipe Oliveira<sup>1</sup>, Luís Quinta-Nova<sup>1</sup> & Raquel Caldeira<sup>1</sup>

<sup>1</sup>Escola Superior Agrária de Castelo Branco, 6000 Castelo Branco, Portugal

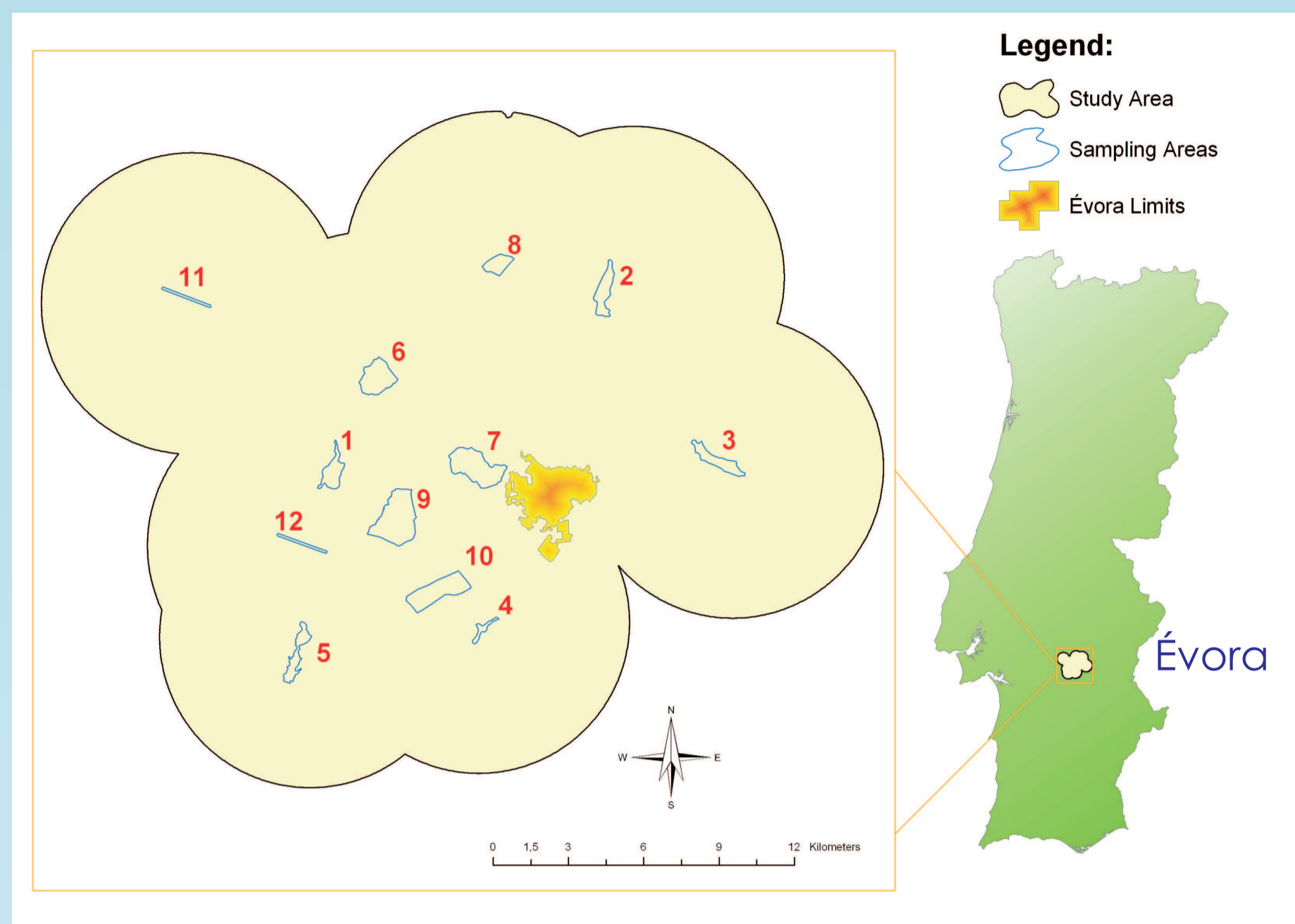
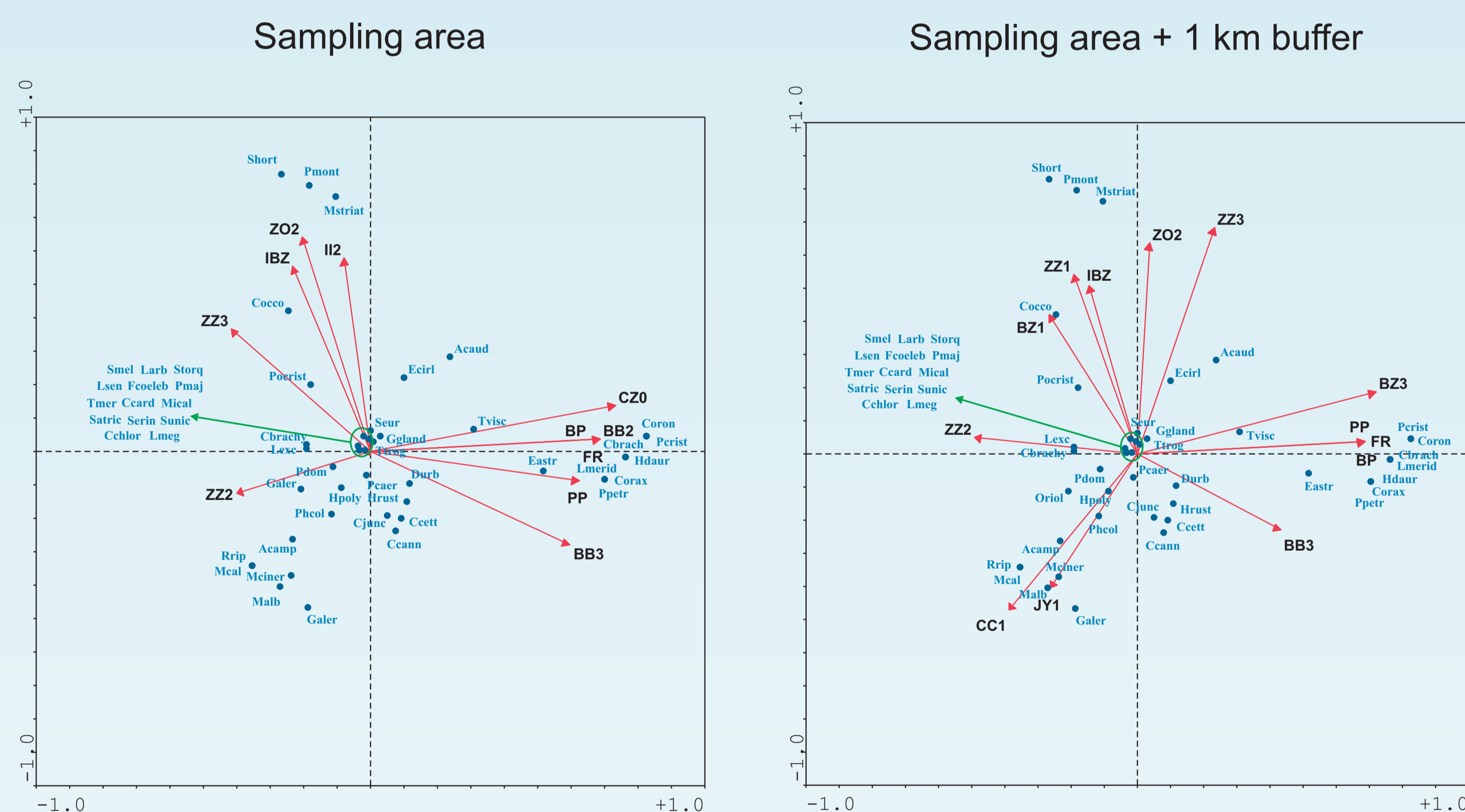


Fig. 1- Study area

## METHODS

The study area is located in the Évora region (Fig. 1), including a surrounding area of approximately 27x34 km. Within this region, 12 **sampling areas** were defined. Those areas represent the different agro-forestry systems occurring in the region (Fig. 2). Buffers of 1 km and 2 km wide were defined surrounding each original area. The land use cover percentage was obtained for each **sampling area**. Bird censuses were carried out through the **sampling areas** during the Spring of 1995.

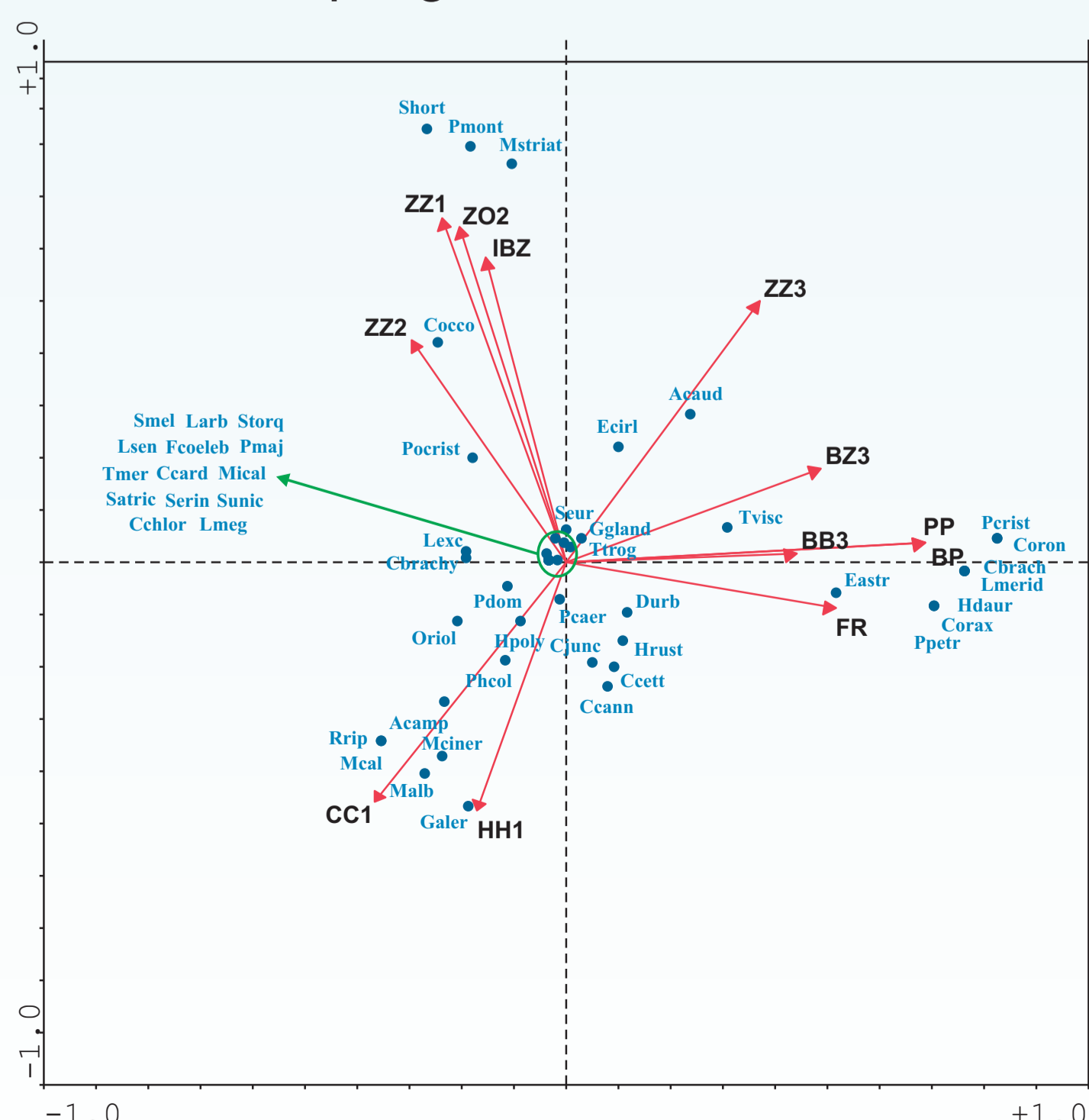
In order to correlate the land use pattern with the presence/absence of breeding passerines a direct ordination technique - **CCA (Canonical Correspondence Analysis)** - was used. The CCA is useful to detect the multiple relations between the land use types and the avian presence. A diagram was plotted showing the avian species ordered along the canonical axes representing the existing land uses.



Legend:

<i>Lullula arborea</i>	<b>Larb</b>	<i>Aegithalos caudatus</i>	<b>Acaud</b>	<i>Passer montanus</i>	<b>Pmout</b>	<i>Oriolus oriolus</i>	<b>Oriol</b>
<i>Hirundo rustica</i>	<b>Hrust</b>	<i>Parus cristatus</i>	<b>Pcris</b>	<i>Petronia petronia</i>	<b>Ppetr</b>	<i>Galerida sp.</i>	<b>Galer</b>
<i>Hirundo daurica</i>	<b>Hdaur</b>	<i>Parus caeruleus</i>	<b>Pcaer</b>	<i>Fringilla coelebs</i>	<b>Fcoeleb</b>	<i>Anthus campestris</i>	<b>Acamp</b>
<i>Delichon urbica</i>	<b>Durb</b>	<i>Parus major</i>	<b>Pmaj</b>	<i>Serinus serinus</i>	<b>Serin</b>	<i>Muscicapa striata</i>	<b>Mstriat</b>
<i>Troglodytes troglodytes</i>	<b>Ttrog</b>	<i>Sitta europaea</i>	<b>Seur</b>	<i>Carduelis chloris</i>	<b>Cchlor</b>	<i>Coccothraustes coccothraustes</i>	<b>Cocco</b>
<i>Luscinia megarhynchos</i>	<b>Lmeg</b>	<i>Certhia brachydactyla</i>	<b>Cbrach</b>	<i>Carduelis carduelis</i>	<b>Ccard</b>	<i>Miliaria calandra</i>	<b>Mical</b>
<i>Saxicola torquata</i>	<b>Storq</b>	<i>Lanius senator</i>	<b>Lsen</b>	<i>Carduelis cannabina</i>	<b>Ccann</b>		
<i>Turdus merula</i>	<b>Tmer</b>	<i>Lanius meridionalis</i>	<b>Lmerid</b>	<i>Emberiza cirius</i>	<b>Ecir</b>		
<i>Turdus viscivorus</i>	<b>Tviss</b>	<i>Lanius excubitor</i>	<b>Lexc</b>	<i>Riparia riparia</i>	<b>Rrip</b>		
<i>Cettia cetti</i>	<b>Ccett</b>	<i>Garrulus glandarius</i>	<b>Ggland</b>	<i>Motacilla cinerea</i>	<b>Mcin</b>		
<i>Cisticola juncidis</i>	<b>Cjunc</b>	<i>Corvus corone</i>	<b>Coron</b>	<i>Motacilla alba</i>	<b>Malb</b>		
<i>Hippolais polyglotta</i>	<b>Hpoly</b>	<i>Corvus corax</i>	<b>Corax</b>	<i>Podiceps cristatus</i>	<b>Pocris</b>		
<i>Sylvia melanocephala</i>	<b>Smel</b>	<i>Sturnus unicolor</i>	<b>Sunic</b>	<i>Calandrella brachydactyla</i>	<b>Cbrachy</b>		
<i>Sylvia atricapilla</i>	<b>Satric</b>	<i>Estrilda astrild</i>	<b>Eastr</b>	<i>Melanocorypha calandra</i>	<b>Mcal</b>		
<i>Sylvia hortensis</i>	<b>Short</b>	<i>Passer domesticus</i>	<b>Pdom</b>	<i>Phylloscopus collybita</i>	<b>Phcol</b>		

## Sampling area + 2 km buffer



Land use types

BB2	Cork oak Montado (30 to 50% cover)
BB3	Cork oak Montado (>50% cover)
BP	Cork oak + Pinus
BZ1	Cork oak and Holm oak Montado (10 to 30% cover)
BZ3	Cork oak and Holm oak Montado (>50% cover)
CC1	Cereals/ Pasture
CZ0	Cereals/ Pasture + Holm Oak
FR	Broadleaved and Coniferous mixed forest
HH1	Streams
II2	Scrub
IBZ	Abandoned tree grove with tall shrub cover
JY1	Bare ground
PP	Pine tree stands
ZO	Holm oak + Olive
ZZ1	Holm oak Montado (10 to 30% cover)
ZZ2	Holm oak Montado (30 to 50% cover)
ZZ3	Holm oak Montado (>50% cover)

Fig. 3 - Species/environment diagrams from CCA

## INTRODUCTION

The study of wildlife communities to assess the landscape value is crucial in Landscape Ecology in order to develop biodiversity management strategies in rural landscapes and to assist land managers with their decision making processes. The scope of this work is to check the reliability of the use pattern by using a multi scale approach, verifying how the nesting avian communities of passerines are related with the montado structure.

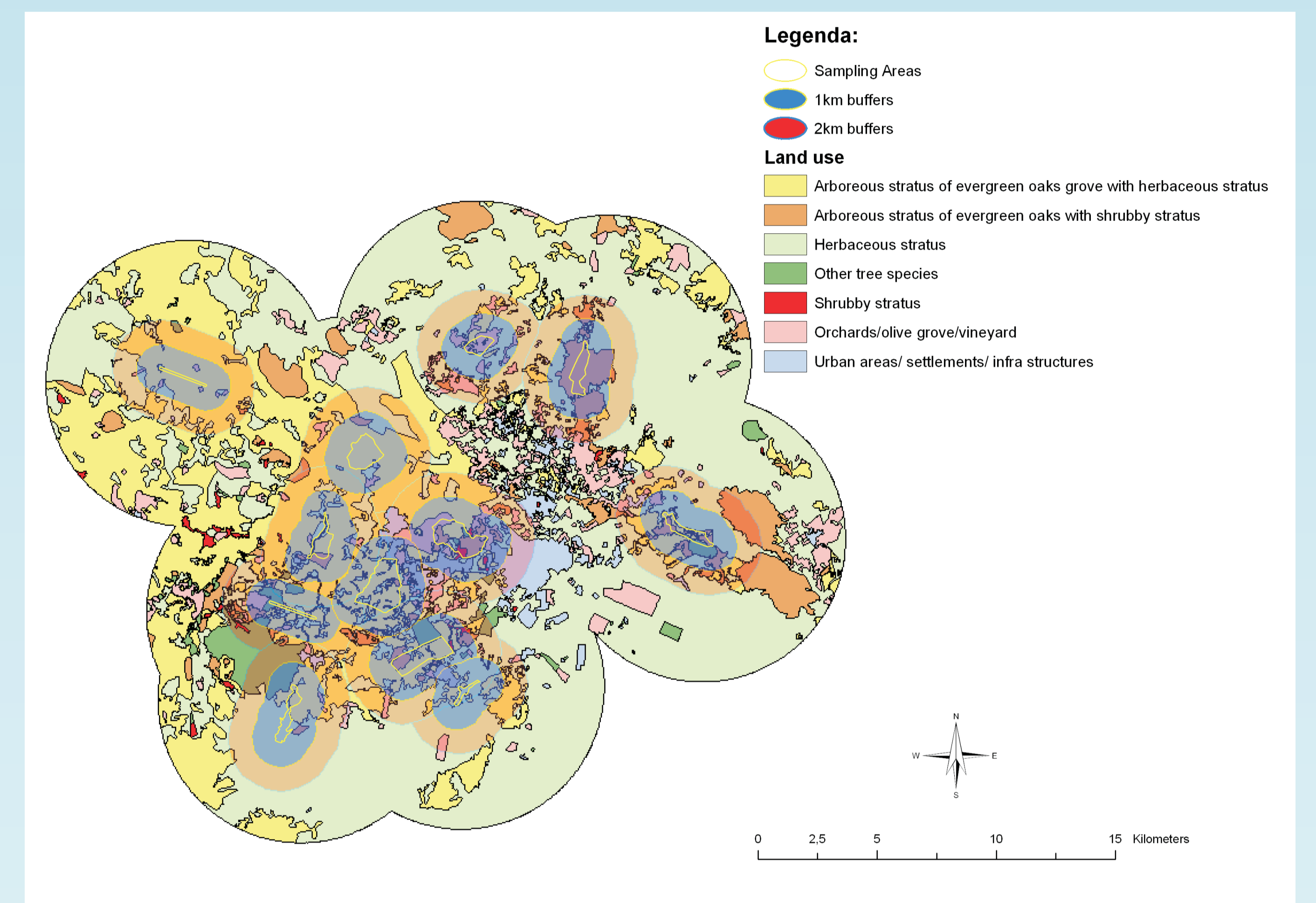


Fig. 2 - Land use map

## RESULTS AND DISCUSSION

Four main groups of birds can be depicted from the analysis of the 3 CCA diagrams produced (Fig. 3). Those groups were characterized after the birds' preferences in terms of habitat use, breeding and feeding guilds.

The results show clusters coherent in terms of habitat structure, with relevance to two habitat types. One is strongly correlated with the canonical axes representing cereals/pastures and bare ground (open areas). Some bird species that occur in this land use types are *Anthus campestris*, *Motacilla alba* and *Galerida sp.* Those species belong to a guild that fits the mentioned features (open areas with a sparse vegetation cover). In the opposite side the diagram shows the canonical axis of high density holm oak montado. The bird species correlated with this arrow are *Emberiza cirius* and *Aegithalos caudatus*. Those species are associated with dense deciduous oak stands and a shrubby cover.

We point out the gradient along the above mentioned axes, that goes from open field habitats (third quadrant) to high density oak stands (second quadrant). The bird species preferences confirm that gradient.

The other 2 functional groups identified are highly correlated with the first and second diagram axes. The canonical axes most correlated with the first axis include pine tree stands, cork oak montados and mixed stands of cork oak with pine trees. This group is composed of species such as: *Parus cristatus*, *Certhia brachydactyla*, *Lanus meridionalis* and *Petronia petronia*. These species are included in feeding and breeding guilds related with tree stands.

The other group, correlated with the second axis, includes abandoned grove with tall shrub cover and mixed stands of Holm oak with Olive grove. The birds associated to those axes are *Sylvia hortensis*, *Passer montanus* and *Muscicapa striata*. These species prefer complex agro-forestry patterns with high edge density.

The discussion was based mainly in the results obtained from the analysis made for the sampling area+2 Km buffer. Compared with the other two diagrams (sampling area and sampling area+1km buffer), is the one that explains (illustrates) more clearly the relationship between the bird guilds and the environmental variables (agro-forestry types).