The importance of landscape attributes in biodiversity assessment
The Évora case study

Luís Quinta-Nova[1] & Teresa Batista[2]

[1]Escola Superior Agrária de Castelo Branco, 6000 Castelo Branco, Portugal
E-mail: lnova@esa.ipcb.pt
[2]Department of Ecology, University of Évora, 7000 Évora, Portugal
E-mail: mtfb@uevora.pt

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. This poster reports the results achieved assessing biodiversity using landscape structural indicators. The main objective was to identify the landscape measures having a greater influence on the presence of avian communities in agrosystems located around Évora (South of Portugal).

Birds were sampled within *detail areas* representing the different land use patterns occurring in the study region. Land use types were mapped within buffers around those *detail areas*.

The landscape indicators applied to each buffer are *Shannon-Wiener*'s Diversity Index (H') (1962) for habitats biodiversity and Modified *Simpson*'s Index (E) (Romme & Knigth, 1982) for habitats heterogeneity. Avian diversity was also measured using the *Shannon-Wiener*'s index. GIS software ArcView was used to map the land cover features and to calculate the values for the selected indices.

The relation between the avian communities present and its attributes with the different landscape measures was analysed with multivariate statistics tools.

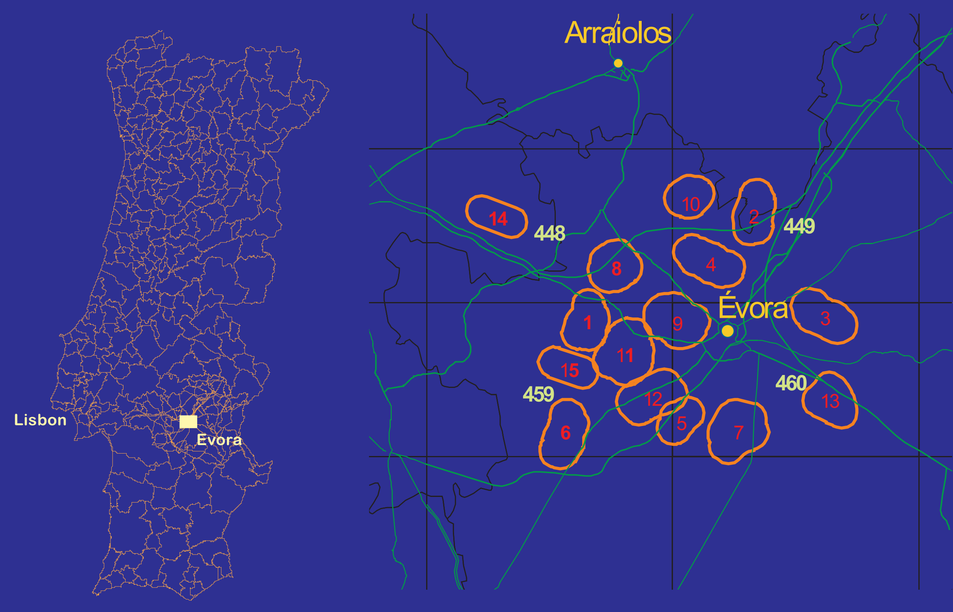
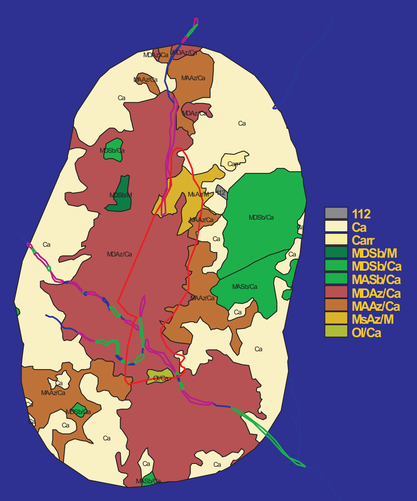


Figure 1 - Location of the study areas

Detail area 2



Detail area 11

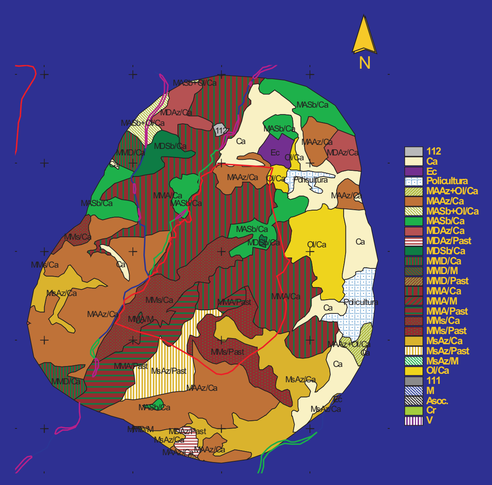


Figure 2 - Detail areas 2 and 11

RESULTS AND DISCUSSION

Five clusters with a diferent faunistic composition can be despicted from the cluster analysis made (Fig. 3). Those clusters were caracterized after its similarity in terms of landscape structure attributes, and dominance of the different land use types (Tab. 1).

Table 1 - Land use patterns with relevance to the avian community composition

	Landscape diversity	Land use
Cluster I	Higher	Matrix of cork oak and holm oak montado with different physiognomic types, from open areas to dense tree cover
Cluster II	Medium to high	A more homogeneous montado
Cluster III	Different values	Co-dominance of montado stands and herbaceous communities of cereals/ pastures and irrigated areas
Cluster IV	Low to medium	A more divided type of property, with herbaceous cultures
Cluster V	Lower	Open fields occupied with cereals and pastures

In order to detect guilds, two statistics techniques were used: cluster analysis and CCA (Fig. 4).

The results show clusters ecologicaly coerent, with relevance to two guilds. One that has species mainly insectivores, that occur in open habitats, with a herb layer or a sparse shrub cover. Those species are associated with the areas in the cluster V. Some of the species that occur in this land use pattern type are ***Cisticola juncidis, Anthus campestris, Oenanthe hispanica*** and ***Carduelis cannabina***.

The other guild identified occurs in "***Montado***" stands with high habitat diversity values. The species related with this type of landscape structure use different habitat layers, from canopy to understory. Those species are ***Fringilla coelebs, Lanius senator, Lullula arborea, Sitta europaea, Aegithalos caudatus*** and ***Garrulus glandarius***.

The avian diversity values show a strong correlation with the landscape diversity and heterogeneity indices. The high values of avian diversity detected in "***Montado***" stands could be explained by the fact that in those highly diversified agro-foresty system the species that use the understory to search for food and to breed will not be replaced by other species more related with a more dense tree cover. On the contrary, we see that the species with different needs of habitat co-exist in "***Montados***".

METHODS

The study area is located in the Évora region, including a sorrounding area of 19x19 km. Within this square, 15 sample areas were defined. Those areas caled *detail areas* represent the different agro-foresty systems occuring in the region (Fig. 1).

Bird censuses were carried out through those *detail areas* during April, May and June 1999. Experienced field workers took note of all visual and auditive contacts. The avian diversity was calculated after *Shannon-Wiener* index (Magurran, 1988).

The land use data obtained in each *detail area* was loaded in a GIS that was created using ArcView software. A buffer of 1 km wide was defined surrounding each original area in order to calculate the landscape diversity values. The habitat diversity and heterogeneity was calculated by applying the *Shannon-Wienner* index (H') and the modified *Simpson* index (E).

In order to correlate the land use structural measures with the avian community measures we used a set of multivariate analysis techniques. Cluster analysis *UPGMA* was used to identify the land use structural aspects with faunistic relevance by clustering the *detail areas* based on the presence/absense of breeding passerines. We supose that those clusters mean similar habitats for birds.

A direct ordination technique - *CCA-Canonical Correspondence Analysis* - was used as well to detect the multiple relations between the land use types and the avian abundance. A diagram was plotted showing the avian species ordered along the canonical axes representing the existing uses.

A correlation between the habitat diversity/ heterogeneity and the avian diversity measures was made using a linear regression technique.

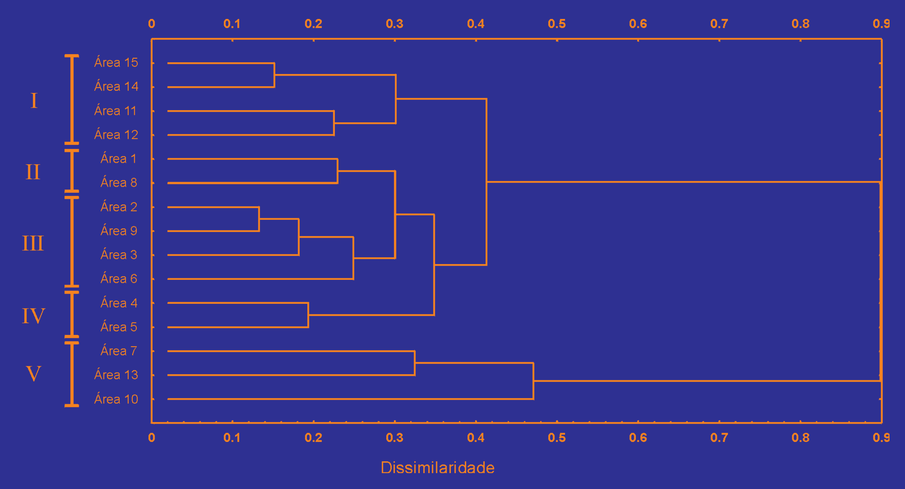


Figure 3 - Cluster Analysis results

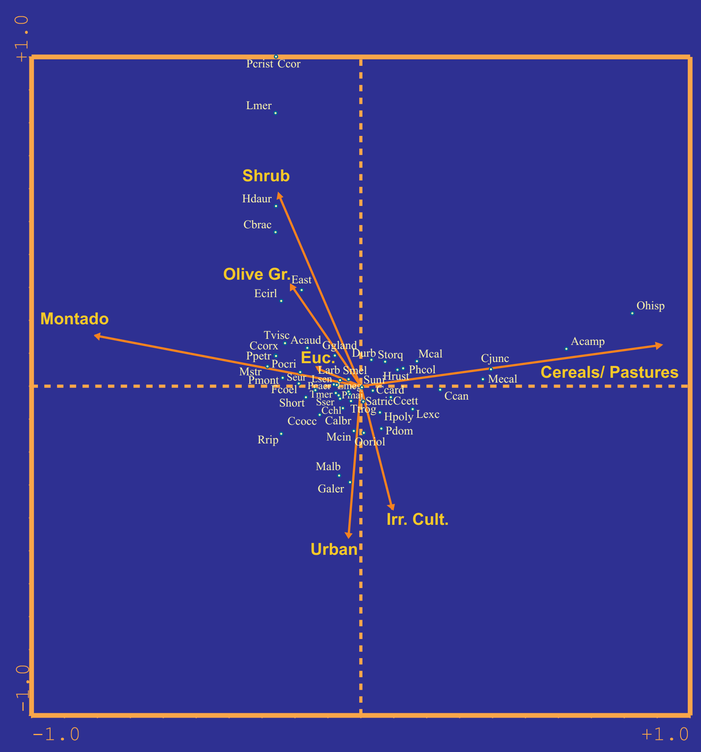


Figure 4 - Canonical Correspondence Analysis