Breeding bird communities as an indicator for agricultural landscapes ecological quality in Bulgaria

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18th International Conference "Life sciences for sustainable development"

INTRODUCTION

The ecological quality of agricultural landscapes affects both productivity and biodiversity conservation. The processes of intensification and abandonment are main drivers, forming farmland landscapes in Europe. Common farmland bird communities are proved to be good indicators for agro-ecosystems quality assessment. Landscape elements, such as woody vegetation hedges, small woodlots and shrubby vegetation islands are essential microhabitat for many bird species.

The aim of the survey is to study the relationship between bird communities and landscape composition in areas along agricultural intensification gradient in Bulgaria, and use it as an indicator of the state and quality of local agro-ecosystems.

MATERIALS AND METHODS

The research was conducted in two case study areas (CSAs) in Western and Central Bulgaria in 2018; 20 study plots (500x500 m) were randomly selected in each CSA (Fig. 1). The point count method was used for bird species surveys - five counting points per study plot, each with a diameter of 200 m (Fig. 2). In each point we counted for 5 min all birds heard or seen within a radius of 100 m. Bird sampling was repeated two times along the breeding season (April-June) at regular intervals of 3-4 weeks to detect both sedentary, early breeding species and late-season migrants. Intensity of land use in each study plot was determined by expert assessment using a predetermined scale from 1 (extensive land use) to 5 (intensive land use) based on the density and structure of the respective agricultural crop.

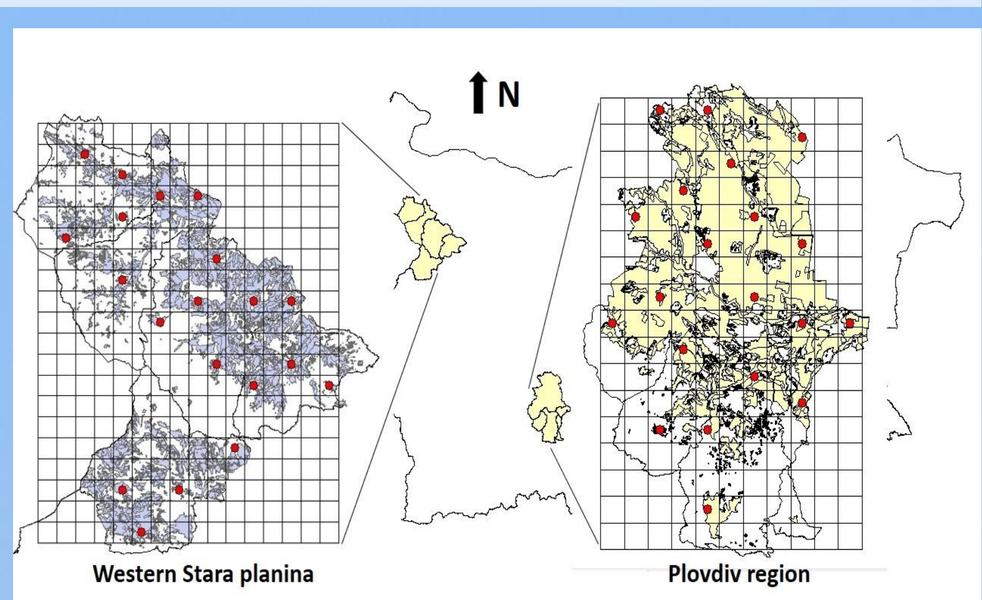


Fig. 1: Map of the two CSAs with underlying CORINE landcover agriculture layer in a 3 km grid, with red points indicating the 500x500 m study plots.

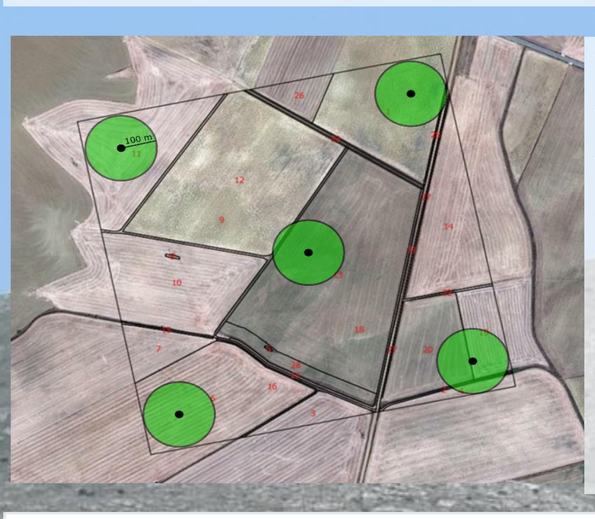


Fig. 2: Satellite image with outlined elements that were used in the sampling campaign. Numbers depict the code for each feature used to identify land uses. Points indicate the location of bird sampling.

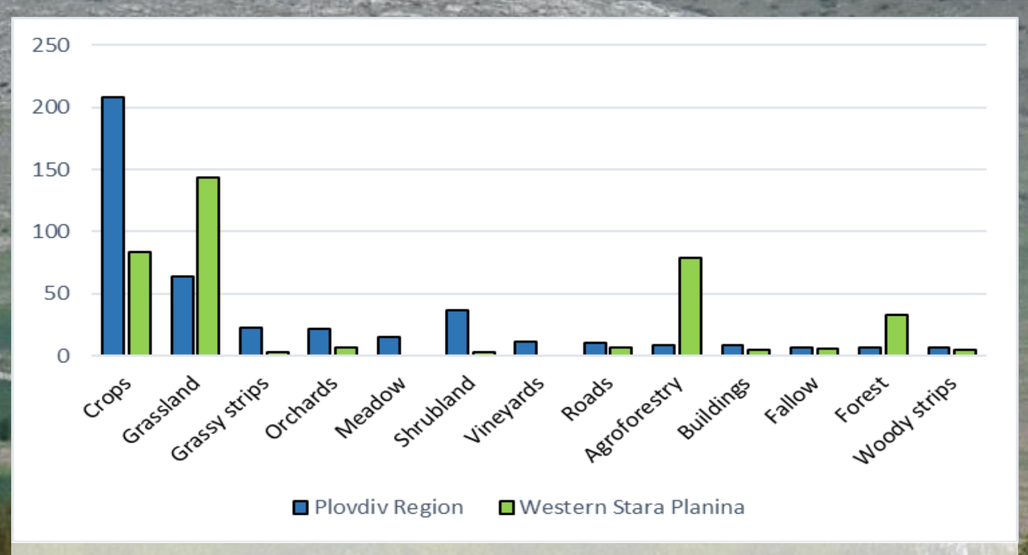


Fig. 3: Landscape composition of the two CSAs (Area in Ha)

RESULTS AND DISCUSSION

Presence data for 72 bird species was collected and used for the assessment of community structure. In Western Stara Planina 56 species (397 individuals) were registered, and in Plovdiv Region 17 study plots were visited and 41 species (574 individuals) were registered.

Composition and configuration metrics, calculated at point and landscape level, showed significant differences between the landscapes at the two CSAs (Fig. 3). Plovdiv Region CSA showed greater diversity of landscape classes – 22, while in Western Stara Planina CSA were registered 14 landscape classes. A possible explanation is the widespread land abandonment occurring across the latter. The analyses also showed the habitat preferences of the different guilds (Fig. 4) and the importance of heterogeneity and the presence of particular landscape elements (such as small woodlots and shrubby vegetation along the fields) that ensure rich species diversity (Fig. 5).

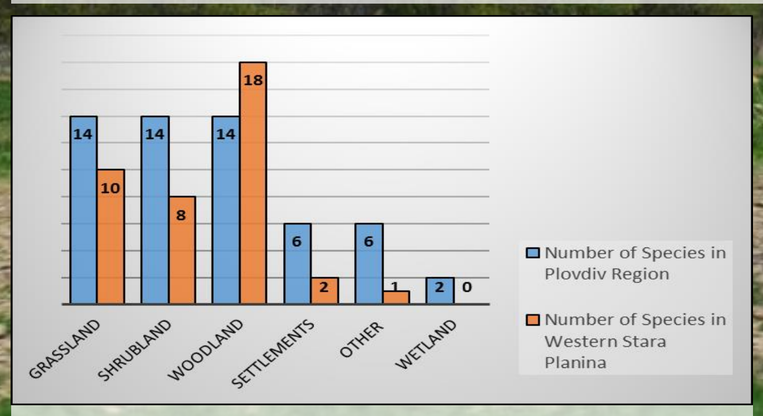


Fig. 4: Birds habitat guilds.





Fig. 5: Sampling plots with **(a)** lowest **(**H =1.936) and **(b)** highest (H=2.746) Shannon Bird Diversity Index Value

CONCLUSIONS

Birds are sensitive to landscape composition at field and landscape level and some landscape elements in agricultural habitats are important predictors for biodiversity assessment. In order to minimize the loss of farmland bird diversity in the rural areas, a sustainable development should be reinforced by a proper implementation of policy measures at landscape level.

Acknowledgements. This work was supported by the project BIOGEA: Testing BIOdiversity Gain of European Agriculture with CAP greening (BiodivERsA3-2015-180), funded by the National Science Fund of Bulgaria under the contract number D002/2.