Comparative analysis of breeding bird communities in different agricultural habitats (Lajta Project, Western Hungary)

Daniel WINKLER*, Ádám ERDŐ, István HARTA

University of West Hungary, Institute of Wildlife Management and Vertebrate Zoology
*corresponding author: dwinkler@emk.nyme.hu

The negative effects of agriculture intensification on biodiversity are recognized and have been studied at many spatial scales on plants, invertebrates and vertebrates (Hawes et al. 2010, Lavelle 1996, Padoa-Schioppa et al. 2005). The aim of this study was to investigate the role played by habitat diversity in landscape on open farmland bird community species richness and diversity.

Bird censi were carried out twice during the breeding season in 2011 (once in April and once in late May) using the "double-visit fixed-radius point count technique" as suggested by the Hungarian Biodiversity Monitoring System (Báldi et al. 1997). The census-points were located in the following habitats: winter wheat, maize and alfalfa fields, grasslands and fallows. Bird communities of ruderal edges were surveyed using the line-transect method. The methods used were suitable for passerine bird (Passeriformes) species only.

The attributes of breeding bird communities in the sampled habitats are presented via comparison of species richness and diversity indices. Two measures of species a diversity were calculated for each habitat: the Shannon index (H') and equitability (J). Community structure comparison between the different forest habitats was estimated using single linkage cluster analysis based on Jaccard's similarity index.

A total of 11 bird species were recorded. *Table 1* shows the density breeding pairs of each bird species occurred. The most important structural properties of breeding bird communities are presented in *Table 2*.

Table 1. Density values (pairs/10 ha) of breeding bird species in different agricultural habitats (WW – winter wheat, MA– maize, AL – alfalfa, GR – grasslands, FA – fallow, RE – ruderal edges)

	WW	MA	AL	GR	FA	RE
Alauda arvensis	1,062	0,910	1,062	1,911	1,274	0,694
Motacilla alba					0,637	
Saxicola torquata			0,531		0,637	
Saxicola rubetra						0,694
Oenanthe oenanthe					0,637	
Sylvia curruca		0,455				
Parus major		0,455				
Lanius collurio						0,694
Fringilla coelebs		0,455				
Emberiza citrinella			0,531	0,637	1,274	2,778
Emberiza calandra	0,531			0,637	0,637	0,694
∑	1,592	2,275	2,123	3,185	5,096	5,556

Table 2. Structural properties of bird communities of the different studied habitats

	WW	MA	AL	GR	FA	RE
Species richness (S)	3	4	3	3	6	5
Shannon diversity (H')	1,040	1,332	1,040	0,950	1,733	1,386
Equitability (J)	0,946	0,961	0,946	0,865	0,967	0,861

Standardized species richness and total density were relatively high on the grass fallow sites and ruderal edges. Density values of the skylark (*Alauda arvensis*) and of the corn bunting (*Emberiza calandra*), two

farmland bird species of special attention, were also the highest on less intensively managed yet not abandoned farmlands and edges. Diversity and equitability were the highest in fallow habitats, while their values were lower in intensively managed fields (Hutcheson's t-test yielded significant differences for Shannon diversity.

The agglomerative cluster analysis based on Jaccard's single linear similarity index (*Fig. 1*) clearly demonstrates the differences and similarities between breeding bird communities in different habitat types.

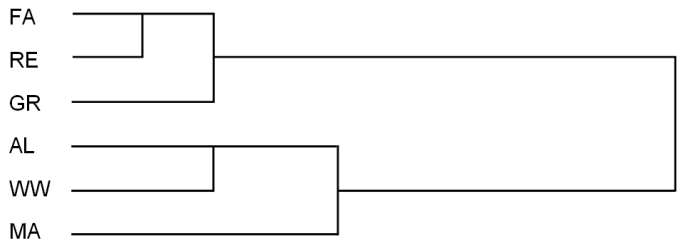

Figure 1. Dendrogram based on cluster analysis using Jaccard's coefficient of similarity on the bird communities of the sampled habitats

Cluster analysis separated the sampled habitats into two main groups: there is a complete separation between intensively managed habitats and grassland, fallow and ruderal edge habitats.

The study was made possible with the support of the Social Renewal Operation Programme TÁMOP 4.2.1.B-09/1/KONV-2010-0006 research project co-funded by the European Social Fund.

Báldi A., Moskát Cs. & Szép T. (1997): *Nemzeti Biodiverzitás-monitorozó Rendszer IX. Madarak.* Magyar Természettudományi Múzeum, Budapest. 81 pp.

Hawes, C., Squire G.R., Hallett P.D., Watson C.A. & Young, M. (2010): Arable plant communities as indicators of farming practice. *Agriculture, Ecosystems and Environment* 138: 17–26

Lavelle, P. (1996): Diversity of Soil Fauna and Ecosystem Function. *Biology International* 33: 3–16

Padoa-Schioppa E., Baietto M., Massa R., Bottoni L. (2005): Bird communities as bioindicators: The focal species concept in agricultural landscapes. *Ecological Indicators* 6: 83–93.