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STRUCTURE OF THE BREEDING BIRD ASSEMBLAGES IN THE FIELDS WITH WHEAT (NORTHEASTERN SLOVENIA)

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Abstract. Qualitative research on breeding birds was carried out in six fields with wheat located in an agricultural area in the northeastern Slovenia. Eight species were found breeding on the fields. The density of birds in the fields studied ranged from 0.6 to 6.1 pairs/10 ha. The differences between fields according to bird biomass is not significant (Kruskal-Wallis test = 4.59, df = 5, P > 0.05). Number of species and bird density were not dependent from the area (r = 0.59 and r = 0.43 respectively) neither from the relative edge length (r_S = –0.59 and r_S = – 0.43 respectively). Significant correlation between diversity index and the logarithm of fields area was not found (r = –0.13). The number of species increased significantly with increasing bird density (r_S = 0.94, P < 0.01).

Key words: Slovenia, intensive fields, wheat, breeding birds.

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Структура скоплений гнездящихся птиц на полях пшеницы в Северо-Восточной Словении. - М. Вогрин, А. Миклич. - Беркут. 13 (2). 2004. - Исследования проводились на 6 полях пшеницы на северо-востоке Словении. На гнездовании обнаружено 8 видов. Плотность населения колебалась от 0,6 до 6,1 пар/10 га. Различия между полями по биомассе птиц недостоверны (тест Краскелла-Уоллиса = 4.59, df = 5, P > 0.05). Количество видов и плотность населения не зависели ни от площади (r = 0.59 и r = 0.43 соответственно), ни от длины границы (r_S = –0.59 и r_S = – 0.43 соответственно). Достоверной корреляции между индексом разнообразия и логарифмом площади поля не обнаружено (r = –0.13). Количество видов достоверно увеличивалось с повышением плотности населения птиц (r_S = 0.94, P < 0.01).

Introduction

Intensively used environments today characterised in general by low numbers of species (Bezzel, 1985), agricultural areas are none exception (e.g. Solonen, 1985). Although much has been written about birds on the intensive fields in West and North Europe (e.g. Pain, Pienkowski, 1997 and references therein), little has been reported from other parts, i.e. Eastern and Southern Europe. The main exception is Poland (see e.g. Tryjanowski, 1999).

The same hold true also for Slovenia, where only a few papers deal with quantitative data (e.g. Vogrin, 1999a, 2000). In this paper we present some data about breeding birds from intensive fields covered with wheat.

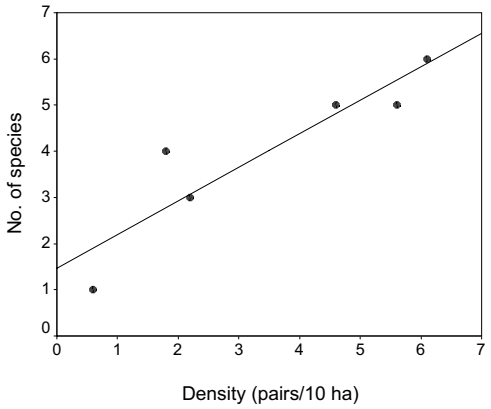
Study area

The study area are situated on Dravsko polje (approximately 46°25'N, 15°45'E) in lowland, northeastern Slovenia. Dravsko polje belongs to the sub-Pannonic phytogeographical area (Marinček, 1987). The climate is modify Continental with about 1000 mm annual rainfall and mean temperature about 8 °C (Furlan, 1990). The original landscape of the Dravsko polje has been transformed mainly in the last 40 years into a large agricultural area devoted to intensive crops (mainly wheat, maize, sugar-beet). Cereals are sown in autumn or in spring and harvested in July/September.

Of the fields within this area, 7 fields with wheat, ranging in size from 8 to 38.5 ha, were investigated (Table 1). One field was without birds and was omitted from the analyses. All fields are surrounded with ditches.

Methods

The birds were censused using a mapping technique described by Bibby et al. (1992) by the first author. The fields were censused four times during breeding season in 1997, on visits evently spaced between April and June. The time spent searching in each field was determined not only by the area of the field, but also by the conditions of bird activity and the



The relationship between the number of species and bird density on the intensive fields in NE Slovenia.
Соотношение между количеством видов и плотностью населения птиц на полях с интенсивным хозяйством в Северо-Восточной Словении.

detectability of different species at the time. The fields were not censused during weather likely to depress bird activity, namely rain and strong winds.

Field area was measured in the field. Obvious visitors (e.g. *Corvus cornix*) were disregarded. For species that was find out that breed in ditches (e.g. *Acrocephalus palustris*) only half of their territory was take into consideration. *Motacilla feldegg* was considered as an independent species according to e.g. Gantlett et al. (1996).

The species diversity of the bird communities was calculated according to Shannon-Wiener's formula (e.g. Hayek, 1994):

$$H' = -\Sigma P_i \cdot \ln P_i,\ P_i = n_i/N$$

where H' denotes the size of information expressed in bits per individual in the set of species examined, n_i is the number of individuals of each species in the set examined, N is the total number of individuals of all species in a community.

The structure of species domination within a community (evenness or equitability) – J' was determined by the formula given by Pielou (1966):

$$J' = H'/\ln S$$

where H' is Shannon-Wiener's index, S is the number of species.

For comparisons of similarities between bird assemblages we used the density similarity index (Tomiałojć, Wesołowski, 1991):

$$DS\ (\%) = 2\ \Sigma\ \min\ (d_{1i}, d_{2i})/\ D_1 + D_2 \cdot 100$$

where d_{1i} and d_{2i} are the densities of the *i*-th species in the assemblages 1 and 2, and D_1 and D_2 are total densities of assemblages 1 and 2 respectively. The index varies between 0 (no species in common) and 100 (identical densities of all species).

For studying relation between density and edge length we estimated relative edge length (supposing that fields are squares) according to Suhonen and Jokimaki (1988):

$$REL = 400 \cdot \sqrt{A}/A\ (m/ha),$$

where A is the field area in hectares.

The body mass of bird species, was extracted from the literature (Cramp, Simmons, 1980, 1983; Kooiker, 1994).

Data were analysed using the SPSS 6.0 statistical programs and according to Sokal, Rohlf (1995). In general, log-transformation was used to normalize the data.

Table 1

Variables used to describe the fields covered with wheat where research was carried out
Параметры исследованных полей пшеницы

	Together	Average size	Min	Max	Median
Fields (n = 6, ha)	133	22.16	8	38.5	19.35
Relative edge length (m/ha)	–	95.0	64.5	141.4	91.1

Table 2

Bird densities – G (pairs/10 ha) and dominance – D (%) in six fields (F1–F6) with wheat in 1997 on Dravsko polje (NE Slovenia)
Плотность населения птиц – G (пар/10га) и доминирование – D (%) на шести полях пшеницы в 1997 г. на Дравском поле (Северо-Восточная Словения)

Species	18 ha		35.2 ha		8 ha		38.5 ha		20.7 ha		12 ha	
	G	**D**	**G**	**D**	**G**	**D**	**G**	**D**	**G**	**D**	**G**	**D**
Coturnix coturnix	0.28	4.5	–	–	–	–	0.26	14.3	0.24	11	0.40	9.1
Alauda arvensis	0.28	4.5	0.42	7.5	0.62	100	–	–	–	–	–	–
Motacilla flava flava	–	–	–	–	–	–	–	–	–	–	0.83	18.2
M. f. cinereocapilla	4.44	72.8	1.12	20.0	–	–	–	–	–	–	0.83	18.2
M. feldegg	–	–	1.12	20.0	–	–	–	–	–	–	–	–
Saxicola torquata	0.28	4.5	2.27	42.5	–	–	0.78	42.9	0.97	44.5	1.70	36.4
Acrocephalus palustris	0.56	9.1	0.56	10.0	–	–	0.65	35.7	0.97	44.5	0.40	9.1
Sylvia communis	–	–	–	–	–	–	0.13	7.1	–	–	–	–
Emberiza citrinella	0.28	4.5	–	–	–	–	–	–	–	–	0.40	9.1
Pairs/10 ha	6.1		5.6		0.6		1.8		2.2		4.6	
No. of species	6		5		1		4		3		5	
Diversity (H')	1.01		1.43		–		1.19		0.96		1.63	
Evenness (J')	0.56		0.89		–		0.86		0.87		1.00	

Results and discussion

In the six studied fields with wheat, the nesting of eight species has been recorded. On average 4 species bred on the fields under study. The dominant species (> 5%) in the total data set were *Coturnix coturnix*, *Motacilla f. cinereocapilla*, *Motacilla feldegg*, *Saxicola torquata* and *Acrocephalus palustris*. The bird communities density ranges from 0.6 to 6.1 pairs/10 ha what is similar as Vogrin (1999a, 2000) found on the fields with sugar beet and maize. The abundance of the communities of the birds concerning their biomass range from 36 g to 808 g respectively, but the differences were not significant (Kruskal-Wallis test = 4.59, df = 5, P > 0.05). The state of other biocenotic characteristics, as the species diversity H' and the structure of species domination J' are shown in Table 2.

Density similarity values fall between 0 and 83.5 %. The reason for such differences among fields is not clearly known. However small areas could be one of the reason.

The number of species increased, following the general rule, with increasing sample size (e.g. Cieslak 1985; Suhonen, Jokimaki, 1988; Cieslak, Dombrowski, 1993; Solonen, 1996), however this rule is not valid in our case (r = 0.59 P > 0.05, n = 6) probably due small sample size. The same result was obtained also Vogrin (1999a) on four fields covered with maize.

The number of species was, in general, significantly related to the abundance (Solonen, 1996) or length (Suhonen, Jokimaki, 1988) of edges. In small habitat, however, there was no such relationship with the relative amount of edges (Solonen, 1996). This rule is valid in our case too (r = –0.59, P > 0.05, n = 6). Density was even negatively correlated with the edge length (r = –0.43, P > 0.05, n = 6).

Significant correlation between diversity index and the logarithm of fields area was not found (r = –0.13, P > 0.5). The opposite results were obtained Cieslak and Dombrowski (1993) who studied forest bird communities.

The number of species increased significantly with increasing bird density (r = 0.94, P < 0.002, n = 6) – see Figure. The same result was obtained also Solonen (1996) who studied forest bird communities.

Between bird density and the size of the

study area we found positive, but not significant relationship ($r = 0.43$, $P > 0.05$, $n = 6$). This results are in contradiction with some previous studies, e.g. in parks and forest habitat (Vogrin, 1999b and references therein). Such differences could have arisen for several reasons. Firstly all above mentioned studies were performed more or less in small forest habitats where some other factors (e.g. more diverse habitats) could influence on breeding birds. Secondly, species favouring edges were by definition likely to be found in highest numbers in the smallest woods (e.g. Bellamy et al., 1996). From species which bred on the intensive fields in our study area at least four species (*Saxicola torquata, Acrocephalus palustris, Sylvia communis, Emberiza citrinella*) could be classified as edge species but all favour bigger fields (pers. obs.). However, all four mentioned species mainly nest on the edges of the fields, e.g. in or near ditches. Thirdly, composition of breeding bird communities in small forest may be influenced by surrounding habitats (e.g. Helle, 1984, 1985) what is probably not true in the fields (pers. obs.).

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