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BIRD DISTRIBUTION IN BIOTOPES OF OPEN AGRICULTURAL LANDS IN BREEDING SEASON

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Bird Distribution in Biotopes of Open Agricultural Lands in Breeding Season. Kuzmenko T. M. — Based on comparative analysis of the vegetation structure in fields of different crops and taking into account intensity of land cultivation and types of avifauna communities formed in these fields, we identified five groups of fields in the Left-Bank Polissya and Wood-and-Steppe zone of Ukraine. The greatest number of breeding species and the most abundant species are in the first group (cereals, flax, white mustard, and buckwheat). The largest total average density, the highest average density of breeding species with nesting of two characteristic species is typical for fields of the second group (rapeseed and peas). The smallest proportion of breeding birds and the large dominant proportion were seen in low crops and in dense closed crops (soybean, lupine), these values are slightly higher than those in fields of beet and potatoes.

Key words: classification, agricultural field, bird, habitat, biotope, crops.

Особенности биотопического распределения птиц открытых агроландшафтов в гнездовой период. Кузьменко Т. Н. — На основе сравнительного анализа структуры растительного покрова полей разных сельскохозяйственных культур с учётом влияния интенсивности ухода за посевами и формирующихся на этих полях орнитофаунистических комплексов, на территории Левобережного Полесья и Лесостепи выделено пять групп полей. Наибольшее количество гнездовых видов и наибольшее видовое богатство характерно для первой группы (зерновые, лён, горчица белая, гречиха), самая большая общая средняя плотность и средняя плотность гнездовых видов, а также гнездование двух специфических видов свойственно полям второй группы (рапс, горох). Наименьшее количество гнездовых видов и большая доля доминанта наблюдалась на невысоких посевах, среди которых на плотных сомкнутых (соя, люпин) эти показатели несколько выше, чем на полях свеклы и картофеля.

Ключевые слова: классификация, сельскохозяйственное поле, птицы, биотоп, сельскохозяйственные культуры.

Introduction

The studies of avifauna in agricultural landscapes as a separate bird habitat were initiated more than a half century ago. These researches were mainly focused on shelterbelts (Budnychenko, 1968; Bukachenko, 1952; Volchanetskiy, 1970), while areas in agricultural fields near the forest belts were considered as an ancillary biotope only. Therefore, the forest shelterbelts were classified by age, structure, composition, etc. (Budnychenko, 1968), and fields remained out of ornithological interests. Productive agricultural classification was developed long ago and is still traditionally used; however, it covers fields of crops with different characteristics as biotope and thus can not be used for description of birds inhabiting specific group of agricultural fields in general due to the dissimilarity between bird populations of different fields within a group according to production agricultural classification. Therefore, similar classification of agricultural fields as bird habitats should be developed.

Material and methods

Our classification is based on comparative analysis of the vegetation structure in fields of different crops and takes into account intensity of land cultivation and types of avian communities formed in such fields.

The structure of the vegetation is characterized by the height of vegetation cover, density of planting (distance between plants), and plants closeness. The height of vegetation was conditionally divided into low (below 30 cm), medium (30 to 60 cm), high (60–120 cm) and very high (above 120 cm). Accordingly, the distance between rows in 10 cm was considered as narrow (corn) and in 70 cm or more — as very wide (potato), thus the density of planting was graded from very wide to narrow. Plants closeness within 90-100% was considered as very high, 70–89% — high, 40–69% — high, and lower than 40% — low. The study of species composition and density of birds distribution was conducted by route method of bird count for routine technique (Ravkin, 1982) taking into account the peculiarities of bird count in agricultural lands (Korovin, 1986). Bird counts were made on routes with total length of 324. 2 km where 9, 074 birds were counted. The studies covered the period from the second half of April to late June — early July 2008–2010, 115 days totally. They were performed on twelve agricultural fields of crops in the forest-steppe zones and Polissya in the Left-Bank Ukraine in the vicinity of 147 villages in 36 districts of Chernihiv, Sumy, Kyiv, Cherkasy, Poltava and Kharkiv oblasts.

Results and discussion

According to the vegetation structure and the degree of crop cultivation, we divided fields into five groups (table 1).

The first group classifies high and dense plantings with little anthropogenic load during the growing season such as fields of grain crops of the 1st group (wheat, rye, barley, oats according to industrial crops classification), buckwheat, flax and mustard. These plants belong to different groups in production and botanical classifications, but during the vegetation period they form similar habitats, resulting in similar bird communities in fields of this group.

The second group includes fields of rape and peas, mostly very dense and high crops with great closeness (table 1). The third group includes fields of maize and sunflower. These are high crops with wide spacing, which, however, may be of low closeness while growing. Their cultivation consists of number of agro-technical measures regularly performed during the nesting season and significantly disturbing birds, destroying nests with eggs and nestlings by agricultural machinery, and by using of various herbicides.

Two subsequent groups include mostly low, but very different, field crops. The fourth group, according to the classification proposed, is presented by beet and potato fields, low and middle height plants with wide spacing, little closeness, regular agro-technical measures. Finally, the fifth group combined crops of soybean and lupine — dense, close, with relatively low agricultural load.

Table 2 shows parameters taken into account in the analysis of bird communities formed in the fields of different groups. However, the impact of each of them is different. Although the total number of bird species, their total average density and species diversity index (Margaleff diversity index) are important characteristics for grouping, with increased length of counting route in some group of fields, the probability of meeting species occurring in this habitat sporadically also increases, in particular location only, or being casual ($r = 0.97$). Enriching the total list of species greatly, they have

Table 1. Description of crops as habitat

Таблица 1. Биотопическая характеристика сельскохозяйственных культур

Parameter	Group				
	I	II	III	IV	V
Crops	Grain I flax buckwheat mustard	Rape peas	Maize sunflower	Beet root potato	Soy lupine
Height of crops	++++/+++	++++/+++	++++	++	++
Density of crops	+++	++++	++	+	+++
Closeness	+++	++++	+++/++	+	++++/+++
Cultivation intensity	++	++	++++	++++	+++/++

Note. Asterisks indicate intensity of parameter effect: low (+) high (++++) and very high (++++).

no significant effect on this bird community in general. Therefore, we consider these two parameters as secondary, and first of all pay attention to nesting species, and such their parameters as total density, dominant species and their contribution to the group (Berger-Parker index). Also, we should emphasize specific species present in all fields in one group only, and hence they are indicators of certain habitat conditions. These species are not in all groups, but if they are present this factor becomes leading.

Thus, based on the comparative analysis of geobotanical and ornithological components, different crops can be divided into five groups, and each of them has a number of common features.

Fields with crops from the first group are visited by the largest number of bird species and the largest number of species breeding here with relatively high rates of total average nesting density. They have the highest rate of species diversity among other groups in combination with low Berger-Parker index — small part of dominant, Skylark *Alauda arvensis* Linnaeus, 1958, characterizing these groupings as stable. Anthropogenic load on these habitats during the growing period is low. Given that majority of birds have time to bring their nest before these crops become the highest in height and their attractiveness as nesting habitat decreased, and due to the wide prevalence of crops from the first group, such fields are leading and important places for bird nesting in open agricultural lands.

The group of such high and dense crops as rapeseed and peas growing relatively quickly and sometimes reaching the maximum size already in the third decade of May has low species diversity with a great number of breeding species and their largest total average density. Field lark is dominant with the highest average density as compared to communities of the other groups. An important characteristic feature of this group is the presence of two specific species nesting in the fields of the above crops: Whitethroat *Sylvia communis* Latham, 1787, and Marsh Warbler *Acrocephalus palustris* (Bechstein, 1798). This suggests that the fields of crops from this group have specific conditions making them attractive as biotope for shrub species.

Corn and sunflowers are the representatives of the third group. They are sown relatively lately, and protective functions as breeding habitat these fields acquire later reaching the maximum height only in the end of breeding period. Avifauna in fields of this group has a number of specific features: two dominating species (each of them consists of more than 10% in the grouping): Skylark and yellow wagtail *Motacilla flava*

Table 2. Avifaunistic crop description

Таблица 2. Орнитофаунистическая характеристика разных групп сельскохозяйственных культур

Parameter	Group				
	I	II	III	IV	V
Total number of species	73	42	46	23	44
Total average density, oc/km	90. 40	115. 94	47. 49	53. 11	145. 99
Number of breeding species	9	8	6	3	5
Total average density of breeding species, couple/km	24. 18	39. 26	14. 70	18. 82	25. 59
Dominant species	<i>Alauda arvensis</i>	<i>Alauda arvensis</i>	<i>Alauda arvensis</i> , <i>Motacilla flava</i>	<i>Alauda arvensis</i> , <i>Motacilla flava</i>	<i>Alauda arvensis</i>
Average density of dominant, couple/km	15. 45	27. 69	9. 75 / 4. 37	14. 35 / 4. 31	18. 02
Specific breeding species	-	<i>Sylvia communis</i> , <i>Acrocephalus palustris</i>	-	-	-
Margaleff index	8. 47	5. 69	6. 61	4. 09	5. 79
Berger-Parker index	0. 23	0. 36	0. 29	0. 42	0. 45

Linnaeus, 1758, however, the density of Skylark is much higher (table 2); the total average density of breeding species is the lowest while their number is slightly lower than that in the fields of the aforementioned groups; dominant's share is the lowest. These data are consistent with habitat characteristics of this group: sparse loose crops have bad protective conditions, and the high level of disturbance during the agro-technical measures makes fields of crops from the third group less attractive to birds.

The smallest number of species visits field with the fourth group of crops — potatoes and beets. Low bird diversity is confirmed with the lowest Margaleff index (table 2). The number of breeding species and their total average distribution density is also the lowest. To a certain extent, this is due to the same factors that are significant for the fields of the third group, and here it is aggravated by low vegetation: little protective function, and great human pressure resulted in poor qualitative and quantitative composition of the avifauna in the fields of the fourth group. Two dominant species (table 2), proportion of dominants in grouping is high, and for the lark it is one of the highest among the other groups.

Low, dense and locked crops of the fifth group (soybean, lupine) attract more species of birds, both in general and for breeding. Dominant here is only one, but its share in the grouping is the maximum among the other groups.

Conclusions

1. Based on comparative analysis of geobotanical and ornithological characteristics, the field crops in the Left-Bank Polissya and the Forest-Steppe zones are divided into five groups.

2. The majority of bird species breeds in the fields of the first group (corn, buckwheat, etc.), and the highest density in distribution of breeding species is typical for the dense crops of the second group (rapeseed, peas). Low crops from the fourth and fifth groups have low number of breeding species and large dominant share.

3. Crops regularly cultivated with agro-technical measures have fewer bird species and their total density.

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