

introducing foreign genes, in particular, affecting the resistance to rhizobia, with a subsequent change in their adaptive potential [5].

Analysis of the nucleotide and amino acid sequences of the E-type allele of the Le-C gene allowed to conclude that the fixing of this allele in the population occurred as a result of positive selection. It is concluded that *B. teSHOON* actively undergoes the process of diversification of functionally diverse Le genes, which have a significant effect on the salt tolerance and symbiotic effectiveness of rhizobi [5].

Conclusion. Symbiotic studies of nitrogen fixation should be carried out with the advent of new varieties and preparations of nodule bacteria, taking into account the new conditions of the changing climate. Thus, preliminary treatment of seeds with various strains of bacterial preparations based on nodule bacteria increases the yield and increases the production of crude protein per unit area.

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BIRD COMMUNITIES IN MOSCOW CITY PARKS

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Abstract. *Some results of the research of bird fauna in seven Moscow city parks conducted in 2018-2019 are presented in this article. It is shown that the one of the key factors affecting bird communities in city parks may rather be the quality of habitats than their area.*

Keywords: *synurbization, bird communities, Moscow city parks.*

The urban landscape, including cities, is a very complex and specific habitat for living organisms, such as birds. They have to challenge high noise levels, disturbance, small size of suitable habitats and fast environment transformation. At the same time, food is often more abundant and the nesting conditions are better in cities, especially within parks, than in suburb areas. City parks can serve as “launch pads” for urbanization in migratory birds and refuges for protected species [1, 2]. Despite the increasing rate of global urbanization and a great number of bird species found in cities, little attention is paid to the details of birds’ synanthropization and synurbization.

The aim of the research is to carry out a comparative analysis of bird fauna in 7 Moscow parks in years 2018-2023. The objectives are:

1. To find out species composition of bird fauna in each of the seven parks;
2. To identify population density and proportion of each species.
3. To analyze long-term fluctuations of species’ density.
4. To identify diversity indexes for each bird community.
5. To determine nesting status of protected species in each park.
6. To describe features of nesting biology in model species in context of synurbization.
7. To assess the impact of several environmental factors on bird fauna.
8. To develop a new system for assessing birds’ degree of synurbization.

The research takes place in seven Moscow city parks (Zaryadye Park, Petrovskiy Park, Neskuchny Garden, Vorobyovy Gory, Timiryazevskiy Park, Sokolniki Park, Tsaritsyno Park), all situated within the Moscow Ring Automobile Road, during years 2018-2023. The standard strip transect method is used in order to count birds and to observe their behavior. Several parameters that are calculated for each park undergo correlation analysis.

A total of 97 bird species have been recorded by the beginning of 2020. 27 of them are protected according to Moscow Red List [3]. The commonest birds in all parks both in breeding season and in winter were Great Tit *Parus major*, Blue Tit *Cyanistes caeruleus*, Tree Sparrow *Passer montanus*, Hooded Crow *Corvus cornix*, Rock Dove *Columba livia* and Mallard *Anas platyrhynchos*. These species are known to be especially well adapted to urban environments in European Russia. Most of the protected species were recorded in non-breeding season. These species are for the most part migratory and occur in urban environments during wintering only.

The largest number of species was recorded in the largest Tsaritsyno Park. However, most of the protected species were found in Timiryazevskiy Park. High bird densities were recorded both in large and small parks.

The most diverse and even bird communities were found in Sokolniki Park (Table). Probably a “gradient” between strongly transformed landscapes in the southern part of the park and almost undisturbed forest in northern part creates favourable conditions for both urbophilic and urbophobic bird species.

Diversity indexes for bird faunas in 2018-2019

Breeding season (Apr-Sept)				
	D _{mf}	H	E	D
Zaryadye	4,48	2,48	0,76	0,14
Petrovskiy	3,98	2,10	0,66	0,24
Neskuchny Garden	4,96	2,42	0,70	0,16
Vorobyovy Gory	6,12	2,94	0,80	0,08
Timiryazevskiy	7,18	3,05	0,77	0,08
Sokolniki	6,84	3,09	0,79	0,07
Tsaritsyno	8,07	2,96	0,71	0,10
Breeding season – arboreal species				
Zaryadye	3,81	1,35	0,46	0,02
Petrovskiy	3,72	1,43	0,48	0,03
Neskuchny Garden	4,21	1,54	0,50	0,03
Vorobyovy Gory	4,98	2,29	0,67	0,06
Timiryazevskiy	5,99	2,41	0,64	0,07
Sokolniki	5,81	2,37	0,64	0,05
Tsaritsyno	6,28	1,84	0,48	0,02
Non-breeding season (Oct-Mar)				
Zaryadye	3,47	2,15	0,75	0,19
Petrovskiy	2,14	1,86	0,73	0,20
Neskuchny Garden	3,05	2,68	0,90	0,30
Vorobyovy Gory	3,72	2,26	0,74	2,03
Timiryazevskiy	3,93	2,21	0,65	0,17
Sokolniki	3,71	2,11	0,64	0,10
Tsaritsyno	4,90	2,34	0,63	0,17

Correlation analysis of some parameters has shown that:

1. The highest density is typical for small number of common non-arboreal species;
2. Most of the protected species occur and breed in large parks;
3. One of the limiting factors for many species may be the area of built-up territories and lawns within parks
4. Number of feeders in parks might affect the number of breeding and protected species not only during wintering, but also in breeding season ($r = 0.74$ and $r = 0.71$ in non-breeding season, $r = 0.58$ and $r = 0.69$ in breeding season; $p < 0.05$);
5. For the arboreal species, one of the key factors seem to be not the area of forested territories, but the quality of habitats within them, as no correlation was found between relative area of forested territories and number of arboreal species.

Some unusual results were obtained as well. For example, the relative area of water basins correlates positively with the number of protected arboreal species and

the number of breeding protected arboreal species ($r = 0.61$ and $r = 0.64$; $p < 0.05$). The reasons are yet to be explained during future research.

Although most of the data is still being processed, some conclusions can be drawn. First, bird communities of Moscow city parks comprise both abundant species common for urban landscapes and rare species occurring mostly in winter. Second, the total park area is important for protected species. However, this is not the key factor affecting bird communities as a whole. Third, the most diverse and even bird communities can develop in parks that include both highly urbanized areas and almost undisturbed landscapes. Fourthly, feeders seem to support bird communities in parks not only in winter, but also in breeding season. Finally, for the arboreal species, the quality of habitats within forested areas rather than the area of such territories seems to be one of the most important factors.

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DIAGNOSTIQUE DU GROUPE CYLINDRE-PISTON PAR LA METHODE DE COMPRESSION VIDE

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Résumé: *Cet article examine l'urgence de diagnostiquer l'état technique des GPC à l'aide de la méthode de compression-vide et sa modernisation ultérieure visant à accroître sa fiabilité.*

Mots clés: *méthode de compression-vide, groupe cylindre-piston, diagnostique du groupe cylinder-piston.*