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Distribution and numbers of *Delichon urbicum* in the Nizhny Novgorod Oblast

Original Article

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Abstract:

The paper aimed to evaluate the current state of the breeding population of the house martin *Delichon urbicum* in the Nizhny Novgorod Oblast based on the analysis of the results of our field surveys and data collected by citizen science. Based on repeated counts of nests in 10 colonies, we discovered the number of house martins decreased by an average of 7.16% per year from 2012 to 2024. Based on the average annual population decline, the probable number of nests in 49 colonies from 786 to 916 nests is calculated in 2024. The calculated regional number of house martins ranges from 2,116 to 2,488 pairs. The prospect of further research is the organization of a regional census of the house martins, the development of the database of colonies and further monitoring of the species conditions in the Oblast, and the implementation of European experience in artificial nest erecting.

Key words:
western house martin, *Delichon urbicum*, Red Data Book, Nizhny Novgorod Oblast, population trends

Apstrakt:

Rasprostranjenost i brojnost vrste *Delichon urbicum* u Nižnjenovgorodskoj oblasti

Rad je imao za cilj da proceni trenutno stanje gnezdilišne populacije gradske laste (*Delichon urbicum*) u Nižnjenovgorodskoj oblasti na osnovu analize rezultata terenskih istraživanja i podataka prikupljenih kroz građansku nauku. Na osnovu ponovljenih prebrojavanja gnezda u 10 kolonija, otkrili smo da se brojnost gradskih lasta smanjivala u proseku za 7,16% godišnje u periodu od 2012. do 2024. godine. Na osnovu prosečnog godišnjeg opadanja brojnosti populacije, procenjeni broj gnezda u 49 kolonija u 2024. godini iznosi između 786 i 916. Izračunata regionalna brojnost gradskih lasta kreće se od 2.116 do 2.488 parova. Perspektive daljih istraživanja uključuju organizaciju regionalnog popisa gradskih lasta, razvoj baze podataka o kolonijama i kontinuirani monitoring stanja vrste u oblasti, kao i implementaciju evropskih iskustava u postavljanju veštačkih gnezda.

Ključne reči:
zapadna gradska lasta, *Delichon urbicum*, Crvena knjiga, Nižnjenovgorodska oblast, populacioni trendovi

Introduction

The western house martin *Delichon urbicum* is a widespread synanthropic bird, a vivid example of an urbanized species (Von Blotzheim et al., 2012), which is, in the middle zone of European Russia, associated with settlements and is not found in natural habitats. Until recently, the status of the species was of least concern everywhere. However, estimates of the species numbers are very different in recent publications. For example, the global species population ranges from 10.5 to 500 million adults, and in Europe – from 22.4 to 47.2 million adults (Dvořáková et al., 2024). According to The IUCN Red List of Threatened Species (2024) data, the global species population is estimated at 38.3 – 80.2 million adults, and the European population is 23-48.1 million adults. In some European cities, the breeding density of house martin is very high (Jerzy, 2001; Kopij, 2016). Many specialists note the negative population trend for the species and discuss the reasons for such decline (Evans et al., 2012; Schmolz, 2020; Kette et al., 2021; BirdLife International, 2023; Dvořáková et al., 2024).

The Nizhny Novgorod Oblast (S=76,600 km^2) is located in the center of the Russian Plain. Western house martin is listed in the second edition of the regional Red Data Book (Bakka & Kayumov, 2014). During the designing of the third edition of the regional Red Book, specialists were discussing the need to preserve the conservation status of this synanthropic species, which inspired the authors to conduct this study aimed at identifying the regional numbers of the species and its population trends.

In the first half of the XX century, the western house martin was a common breeding species in the Nizhny Novgorod region and spread almost as widely as the barn swallow. However, there were no specific data on the localities of colonies and the species (Serebrovkiy, 1918; Puzanov et al., 1955; Vorontsov, 1967). There is only information about eight localities for 10 specimens from the collection of the Zoological Museum of the Nizhny Novgorod State University, of which nine were found in Nizhny Novgorod and its surroundings, and one near the Mikhaylovka village on the modern territory of Vyksa (**Fig. 1**). The species was probably of least concern until the 1990s. Based on data obtained in the 1980s and 1990s, we made an expert assessment of its regional population of 5,000-10,000 pairs. This number was already significantly lower than the number of other swallows.

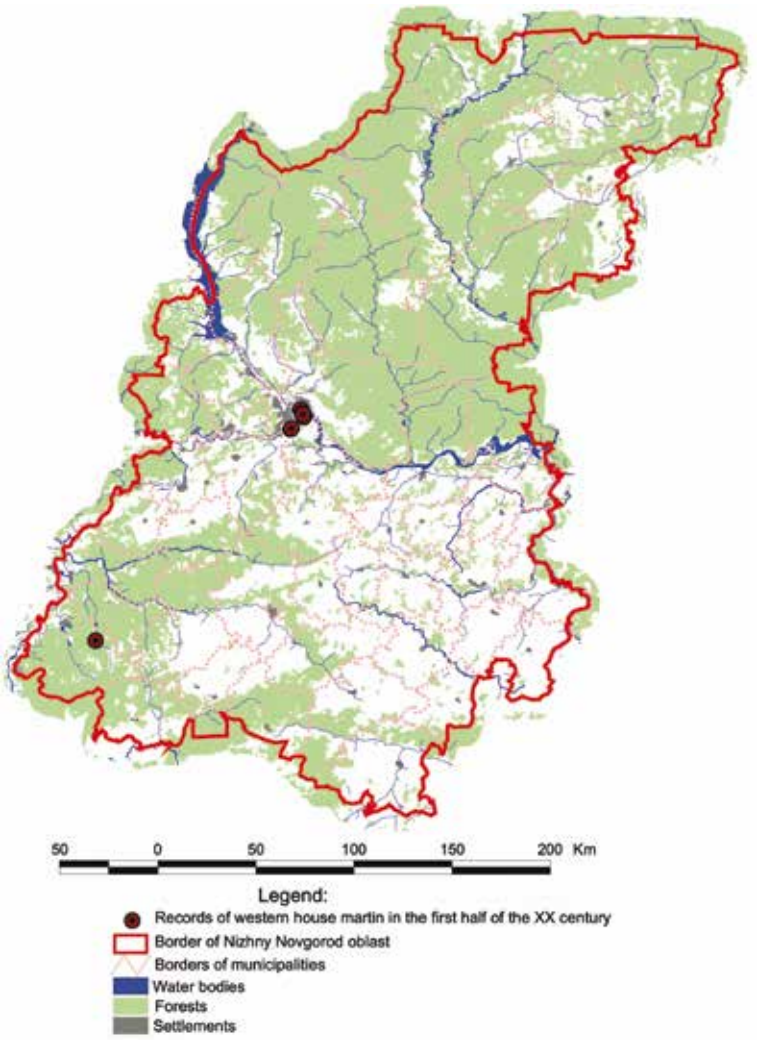

Fig. 1. Records of western house martin in the Nizhny Novgorod Oblast in the first half of the XX century (made by the authors based on the materials of the collection of the Zoological Museum of the Lobachevsky State University of Nizhny Novgorod) leaves

By 2012, only five small colonies of house martin had remained in Nizhny Novgorod, where a total of 25-35 pairs breed. A colony in the Avtozavodsky district of the city, numbering dozens of pairs, has disappeared. The breeding population of house martin in Arzamas has been reduced to 4-5 microcolonies, which consist of two or three breeding pairs. Besides Nizhny Novgorod and Arzamas, 80-85 pairs of house martin were known to nest in other seven settlements. These data became the reason to list the house martin in the Red Data Book of the Nizhny Novgorod Oblast (Bakka & Kayumov, 2014), as well as the basis for estimating the regional population number of the species in 200-400 pairs (Bakka & Kiseleva, 2007, 2017). During the long-term monitoring of the avifauna of the Nizhny Novgorod airport, the house martin was observed only twice: in 2013 and 2018 (Noskova et al., 2020).

Approving the house martin as a protected species in the Oblast has provided scientific interest to study the distribution and abundance of the species, including by scientific volunteers (citizen science). After 2014, a significant number of previously unknown habitats of the species were discovered in villages and small towns of the Nizhny Novgorod Oblast. It became clear that the species number estimated as 200-400 pairs (Bakka & Kiseleva, 2017) is significantly underestimated. It was important to determine the reasons for such differences in population estimates: is it the species recovery, its relocation from large cities to rural areas or the insufficiency of census data for the late XX – early XXI centuries; and to estimate the modern species number in the region.

Materials and Methods

This paper aims to estimate the current state of the

breeding population of the western house martin in a typical region of the central part of the Russian Plain on the example of the Nizhny Novgorod Oblast. To achieve this goal, the tasks are as follows:

- to analyze all data on the numbers and distribution of house martin in the Nizhny Novgorod Oblast obtained by authors and scientific volunteers in the XXI century;
- to estimate its current population numbers and trends;
- to reveal the species' habits in its distribution in the Oblast;
- to provide reasons for preserving the conservation status of the species;
- to develop proposals for the organization of further study, monitoring of the species populations and their protection.

Generally, the direct counting of active swallow nests seems to be a reliable method for estimating the size of breeding populations and their trends on large spatial and temporal scales (Tella et al., 2024). Researchers also note the important role of civic science in studying the distribution and numbers of swallows (Dickinson et al., 2012; Kettel et al., 2021). Since direct counts were carried out only in a part of the known colonies of the house martin in the Oblast, we had to extrapolate the results of our surveys using data of citizen science from the site iNaturalist.com, as well as an expert assessment of probable underestimation.

All our data on records of house martins in the Nizhny Novgorod Oblast in 2007-2024 were summarized, including the results of the nest census in colonies (76 units of information: data on 66 colonies, nine records of adults during the breeding season and one registration of a flock of house martins during the autumn migration). The data of citizen science collected in 2007-2024 and mainly presented on iNaturalist-website were also processed (100 units of information: 48 registrations of colonies and 52 records of adults during the breeding season). Databases on all the records have been compiled, including 184 units of information, including eight localities of specimens from the collection of the Zoological Museum of Nizhny Novgorod State University, which were shot in the first half of the XX century. In addition, information about two colonies that became extinct in the 2000s were taken into account (Bakka & Kayumov, 2014). The localities of the house martin records in the Nizhny Novgorod Oblast in 2007-2024 are shown in **Fig. 2**.

All the analyzed data on the habitats of the house martin in the Nizhny Novgorod Oblast and the general logic of the study are presented in **Fig. 3**.

A GIS-theme has been created in order to identify the overlaps of our data and the information of citizen science, data obtained by different authors at different times, but related to the same localities of the species. The distribution of western house martin nesting sites on the territory of the Nizhny Novgorod Oblast was analyzed: significant differences in the species density in four natural regions in the Oblast

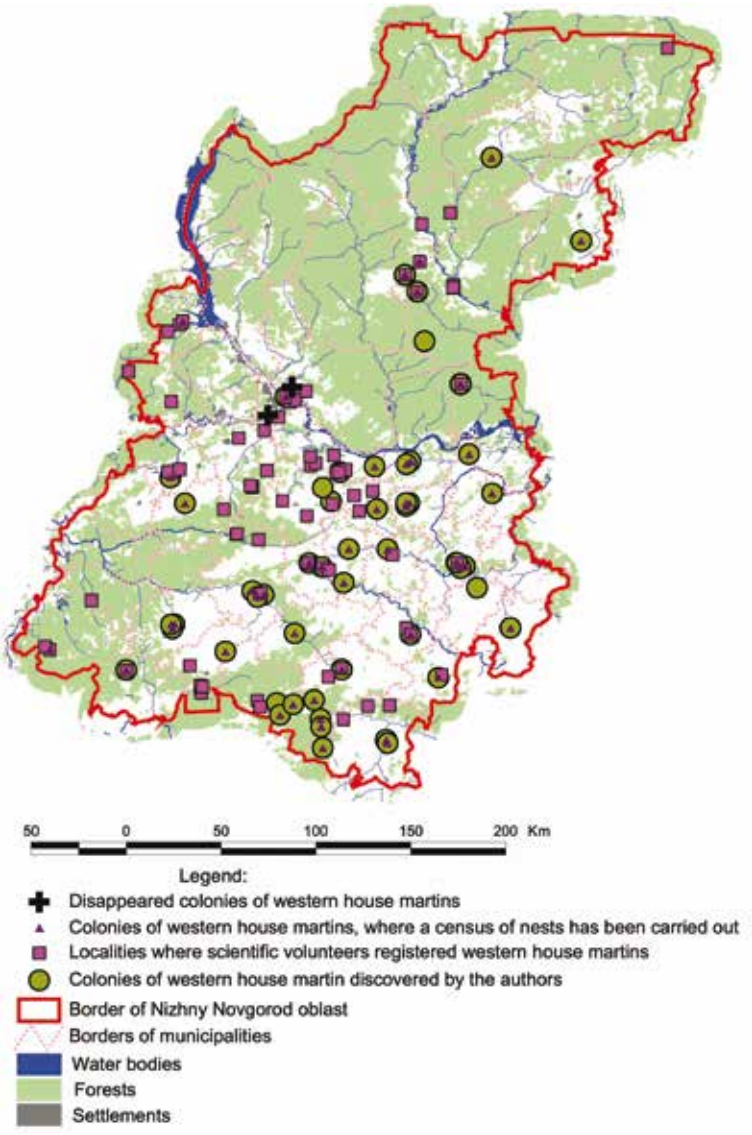

Fig. 2. Records of the western house martin in the N. Novgorod Oblast in 2007–2024 (designed based on the results of our surveys and data of citizen science from iNaturalist-website)

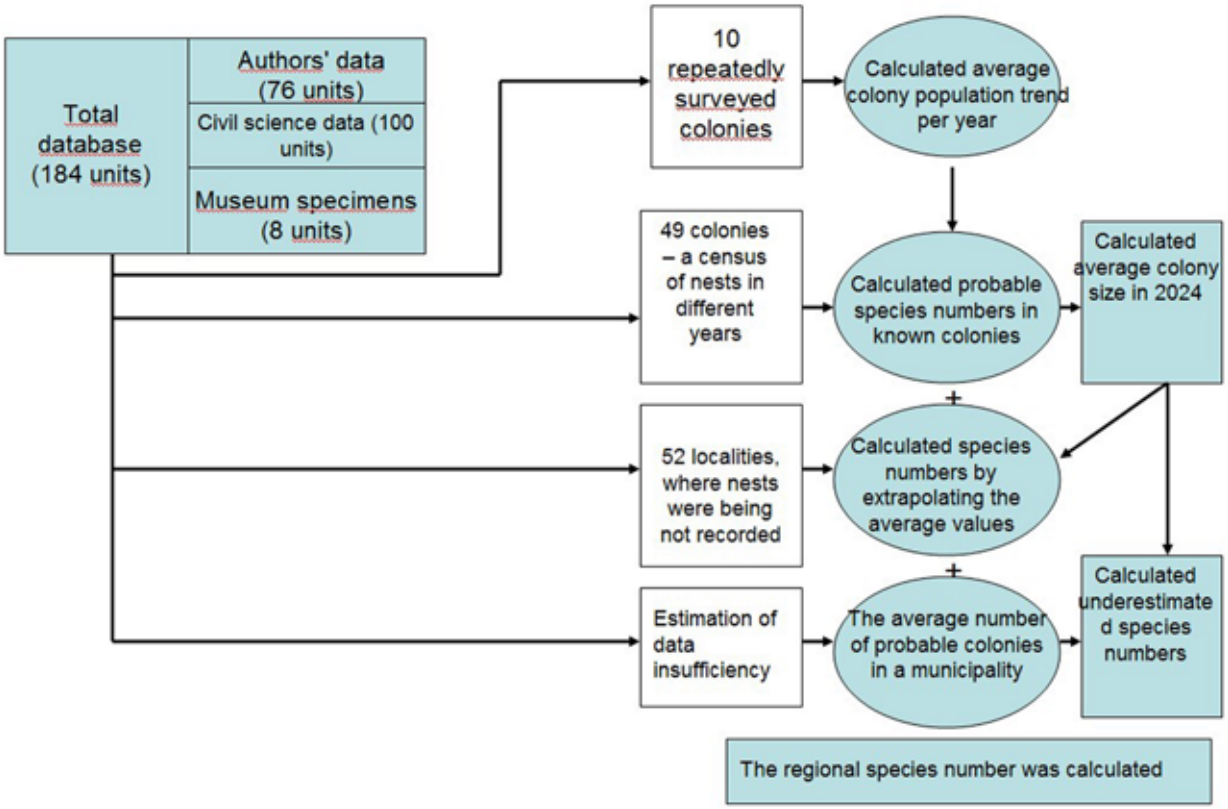

Fig. 3. All the analyzed data on the habitats of the house martin in the Nizhny Novgorod Oblast and the general logic of the study (designed by authors)

have been shown.

We found 10 colonies of the western house martin being surveyed repeatedly from 2012 to 2024: nine colonies were surveyed twice and one colony – four times. Based on these data, the average population trend for a year was calculated. The obtained value was used in further calculations.

The census of active nests during the period of surveys was carried out in 49 colonies of western house martins, but in different years, including the census in 16 colonies in 2024. Using the calculated value of the average annual population trend, the active nest numbers in colonies counted in earlier years allow us to project the status in 2024. The average colony size in 2024 was calculated. This value was used to estimate the number of western house martins in 52 localities, where the number of nests was not counted. As a result, we obtained the total number of western house martins in all habitats identified in the Nizhny Novgorod Oblast. A histogram for the distribution of colonies by the number of nests has been designed.

The low share of overlaps identified by the authors and scientific volunteers was accepted as evidence of a significant underestimation. To evaluate the probable underestimation, the number of records and the number of breeding pairs were determined for 57 municipalities of the Nizhny Novgorod Oblast in four natural regions. If the borders of the natural regions divided the municipal district, then its parts were considered separately. For each natural region, the average number of known and projected colonies in a municipality was calculated. In districts, where the known number of records was less than the average, the data was considered incomplete (underestimated) and, during further evaluation, replaced with average values. The underestimation in the colony numbers was calculated, and the number of nests at those localities was calculated based on the average size of western house martin colonies in the Nizhny Novgorod Oblast. Based on these extrapolations, we estimated the data insufficiency, which we consider to be minimal. Taking into account this value, the probable species number in the region was determined. All calculations were carried out using the Microsoft Excel software.

Results

As a result of the analysis of data obtained, we discovered 10 colonies of the western house martin being surveyed repeatedly from 2012 to 2024: nine

colonies were surveyed twice and one colony – four times. Empty cells in the columns indicate the absence of census data for a particular year, but not the absence of nests (**Tab. 1**).

The change in the number of active nests in the western house martin colonies during the surveyed period is presented in **Tab. 2**. The negative trend was noted for most colonies. Considering these data, the average population in the period from 2012 to 2024 was 7.16% per year (StdDev=9.37). The confidence interval for the selected probability of 90% ranges from -2.71% to -11.61%.

The census of nests during the period of surveys was carried out in 49 colonies of western house martins, but in different years, including the census in 16 colonies in 2024 (**Tab. 3**). A total of 956 nests were counted in those 49 colonies. Using the calculated value of the average annual decrease in the number of western house martins (min – 2.71%, max – 11.61%), we projected the nest numbers in colonies in 2024. The total number of western house martins in 49 colonies ranged from 786 to 916 nests,

Table 1. Number of active nests in colonies of the western house martin, which were surveyed repeatedly from 2012 to 2024 (designed by authors)

Colony localities	Number of active nests in the colony							
	2012	2014	2015	2019	2021	2022	2023	2024
Vad (Vadskiy district)				51			41	
Lopatino (Vadskiy district)					44		31	
Kuz'miyar (Vorotynskiy district)					20		22	
Bokovaya (Semenovskiy district)	10			14		9		4
Knyaginino (Knyagininskiy district)						25		22
Pechi (Lukoyanovskiy district)				11		12		
Pokrovka (Lukoyanovskiy district)				7		5		
Sergach (Segachskiy district)			12					5
Ardatov (Ardatovskiy district)		12						5
Lyskovo (Lyskovskiy district)							32	28

Table 2. The change in the number of active nests in the western house martin colonies from 2012 to 2024 (designed by authors)

Colony localities	The period between censuses, years	The change in the number of active nests in a colony		
		the absolute value for the period between censuses	% of previous census value	Average per year, %
Vad	4	-10	-19.6	-4.9
Lopatino	2	-13	-29.5	-14.75
Kuz'miyar	2	2	10	5
Bokovaya	7	4	40	5.71
	3	-5	-35.7	-11.9
	2	-5	-55.6	-27.8
Knyaginino	2	-3	-12	-6
Pechi	3	1	9.1	3.03
Pokrovka	3	-2	-28.6	-9.53
Sergach	9	-7	-58.3	-6.48
Ardatov	10	-7	-58.3	-5.83
Lyskovo	1	-4	-12.5	-12.5
Total:				-7.16

Table 3. The results of nest census in the western house martin colonies in different years and projected nest numbers in 2024 (designed by authors)

Colony locality	Year	Counted active nests	Period since the census to 2024, years	Population trend to 2024, % of counted nest number		Projected nest number in 2024	
				min	max	min	max
Potrokhovo village (Krasnobakovsky district)	2015	5	9	-105	-24	0	4
Norkovka village (Vyksa)	2023	1	1	-12	-3	1	1
Novaya village (Chkalovsk)	2022	35	2	-23	-5	27	33
Bokovaya village (Semenovsky district)	2024	4	0	0	0	4	4
Sechenovo (Sechenovsky district)	2013	5	11	-128	-3	0	4
Perevoz (Perevozsky district)	2013	39	11	-128	-3	0	27
Bolshoe Boldino (Bolsheboldinsky district)	2013	5	11	-128	-3	1	4
Pochinki (Pochinkovsky district)	2014	18	10	-116	-27	0	13
Ichalki (Perevozsky district)	2015	1	9	-105	-24	0	1
Knyaginino (Knyagininsky district)	2019	5	5	-58	-14	2	4
Kommunar village (Pochinkovsky district)	2019	6	5	-58	-14	3	5
Neley village (Pervomaisk)	2019	15	5	-58	-14	6	13
village (Pervomaisk)	2019	18	5	-58	-14	8	16
Vladimirskoye (Voskresensky district)	2019	1	5	-58	-14	0	1
Knyaginino (Knyagininsky district)	2022	2	2	-23	-5	2	2
Bol'shoe Murashkino (Bolshemurashkinsky district)	2022	4	2	-23	-5	3	4
Sergach (Sergachsky district)	2022	9	2	-23	-5	7	9
Pechi village (Lukoyanovsky district)	2022	13	2	-23	-5	10	12
Pokrovka village (Lukoyanovsky district)	2022	5	2	-23	-5	4	5
Shutilovo (Pervomaisk)	2022	112	2	-23	-5	86	106
Glukhovo (Diveevsky district)	2022	5	2	-23	-5	4	5
Kuzhendeevo (Ardatovsky district)	2022	5	2	-23	-5	4	5
Rozhentsovo (Sharangsky district)	2022	6	2	-23	-5	5	6
Uren (Urensky district)	2022	2	2	-23	-5	2	2
Vad (Vadsky district)	2023	41	1	-12	-3	36	40
Lopatino (Vadsky district)	2023	31	1	-12	-3	27	30
S. Valgusy (Buturlinsky district)	2023	3	1	-12	-3	3	3
Bridge Over the Ezhat River at Panovo-Osanovo (Gaginsky district)	2023	48	1	-12	-3	42	47
Kuzmiyar (G.O. Vorotynsky district)	2023	22	1	-12	-3	19	21
Turbanka village (Spassky district)	2023	6	1	-12	-3	5	6
Lukoyanov (Lukoyanovsky district)	2023	5	1	-12	-3	4	5
Shatki (Shatkovsky district)	2023	4	1	-12	-3	4	4
Vyesdnoe (Arzamas)	2023	54	1	-12	-3	48	53
Arzamas (Arzamas)	2023	15	1	-12	-3	13	15

Sosnovskoye (Sosnovsky district)	2024	1	0	0	0	1	1
Lyskovo (Lyskovsky district)	2024	28	0	0	0	28	28
Knyaginino (Knyagininsky district)	2024	22	0	0	0	22	22
Sergach (Sergachsky district)	2024	2	0	0	0	2	2
Sergach (Sergachsky district)	2024	19	0	0	0	19	19
Sergach (Sergachsky district)	2024	5	0	0	0	5	5
Bolshaya Pokrovskaya Str., 29 (Nizhny Novgorod)	2024	45	0	0	0	45	45
Sergach (Sergachsky district)	2024	32	0	0	0	32	32
Building near the highway 1.5 km southwest of Kislovka village (Lyskovsky district)	2024	6	0	0	0	6	6
Building near the highway N. Novgorod - Vyksa (Pavlovsky district)	2024	5	0	0	0	5	5
Blagodatovka near the highway (Voznesensky district)	2024	139	0	0	0	139	139
Ardatov (Ardatovsky District)	2024	5	0	0	0	5	5
Krasnoe (Arzamas)	2024	19	0	0	0	19	19
Razino (Lukoyanovsky district)	2024	36	0	0	0	36	36
L'vovo (Vorotynsky district)	2024	42	0	0	0	42	42
Total						**786**	**916**

with an average of 851 nests in 2024 (**Tab. 3**).

The distribution of western house martin colonies in the Nizhny Novgorod Oblast (n=49) by the nest numbers in 2024 is shown in **Fig. 4**, and the distribution of the total nest numbers by colonies of different sizes is shown in **Fig. 5**.

Following data from **Tab. 3**, the average probable colony size ranged from 16 to 19 nests in 2024. These values were used to estimate the number of western house martins in 52 localities where the

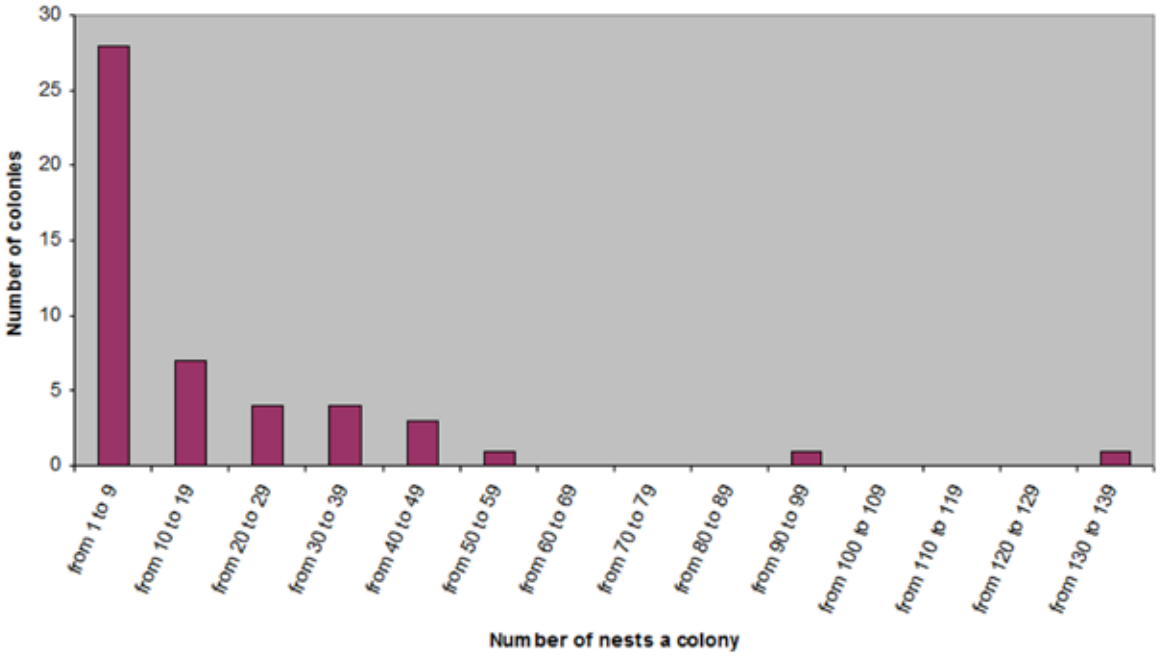

Fig. 4. The distribution of western house martin colonies (n=49) in the Nizhny Novgorod Oblast by the nest numbers in 2024 (designed by authors)

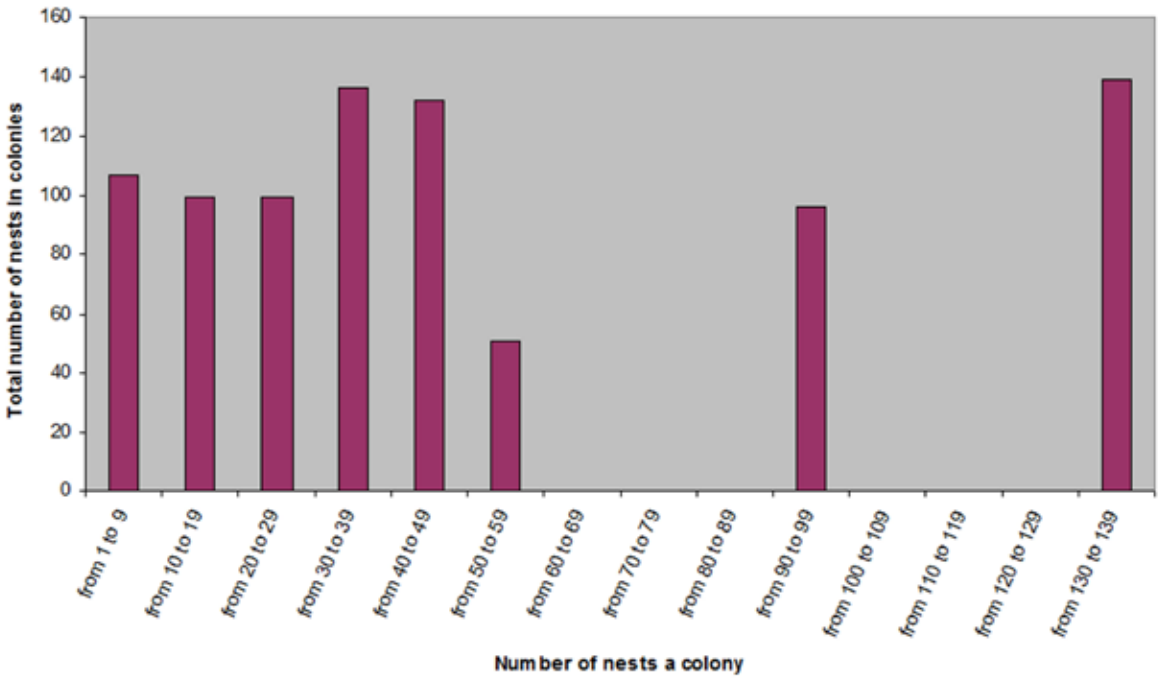

Fig. 5. The distribution of the total active nest numbers by colonies of different sizes (n=49) (designed by authors)

number of active nests was not counted. The total estimated number of nests there ranged from 832 to 988. As a result, we obtained the total number of western house martins in all habitats discovered in the Nizhny Novgorod Oblast: from 1,617 to 1,904 pairs.

The distribution of the discovered western house martin habitats across the territory of the Nizhny Novgorod region is shown in **Fig. 6**, which clearly illustrates the unevenness of this distribution. There are differences in the occurrence of the species in different natural regions. The western house martin breeds with the highest density in the south-east of the region and with the lowest density in the north.

The results of the estimation of the probable underestimation are presented in **Tab. 4**. In general, for the Nizhny Novgorod Oblast, the colony numbers were underestimated by 31, and the number of breeding pairs was underestimated by a range from 499 to 584. According to our estimate, the share of the missed part of the regional population is 30.7%.

The number of colonies and nests of the western house martin in different natural regions of the Nizhny Novgorod Oblast is shown in **Tab. 5**, and the results of the breeding density calculation are shown in **Tab. 6**.

Discussion

The census of occupied and empty nests is proposed as one of the methods for assessing the long-term population trend of the western house martin population in colonies (Tella et al., 2024). This method is practically not applicable in the Nizhny Novgorod Oblast. Our observations indicate that western house martin nests rarely existed for more than one year. Despite the status of a protected species, building owners clean the walls of old swallow buildings almost every year. It has been shown that the breeding success of western house martins in nests from the previous year is higher than in newly built ones (Kettel et al., 2021). Therefore, the regular destruction of nests, even after the fledglings leave, can be a serious limiting factor for the species.

On the other hand, this is a reason why we have never found swallow nests occupied by *Passer domesticus*. Several authors note that the impact of sparrows reduces the breeding success of swallows (Maréchal, 1986; Jerzy, 2001; Ieziekel & Yosef, 2020; Tella et al., 2024). Another limiting factor for the western house martin can be the high number of swifts *Apus wapus* in the towns of the Nizhny Novgorod Oblast. According to some researchers, when the numbers of flying insects are relatively low in towns, the swift is a trophic competitor to the western house martin (Gashek & Krasutsky, 2021), although researchers note more sophisticated mechanisms associated with the isotopic range of resources consumed by the western house martin in wintering grounds (Evans et al., 2012).

Many authors declare the negative effects of

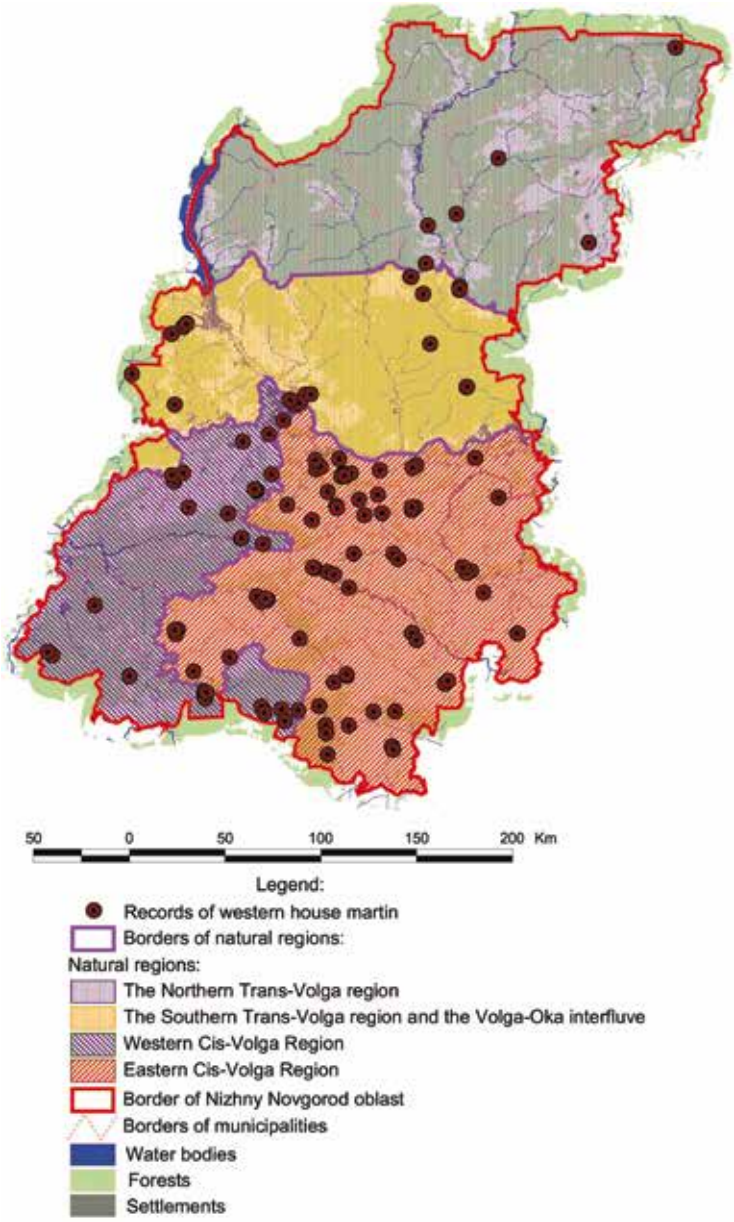

Fig. 6. The distribution of the western house martin colonies in natural regions of the Nizhny Novgorod Oblast (designed by authors)

climate change on western house martins, both directly and indirectly, through the impact on insect accessibility (Imlay & Leonard, 2019; Brahmia et al., 2021; Dvořáková et al., 2024). At the same time, the western house martin can enter torpor during cold spells and safely experience negative weather conditions (Prinzinger & Siedle, 1988). This adaptation reduces the impact of negative climate during the breeding season.

Our results indicate that in the Nizhny Novgorod Oblast, the western house martin forms mainly small colonies (less than 9 nests). The share of such small colonies is 57% (28 out of 49 surveyed colonies) of the total number. At the same time, only 12.5% of breeding pairs inhabit such a large number of small colonies. Only 3 large colonies of more than 50 nests have been found in the Oblast (6% of the number of discovered colonies), 33% of the registered nests are in these localities. A significant number of small colonies and single nests are evidence of the species' disadvantage. The breeding success in small colonies is known to be less, since one pair spends much more time on nest building (up to two days) than in a large colony, where swallows together build a nest in 2 h (Ieziekel & Yosef, 2020).

The increasing use of plastic in the construction and facing of houses reduces the breeding success of swallows (Kettel et al., 2021). The erecting of artificial nests as an effective method of maintaining swallow populations is discussed in several papers (McNeil & Clark, 1977; Willi et al., 2011; Kettel et al., 2021; Elle & Lanfer, 2023; Allera et al., 2024). An essential factor in the artificial nest occupancy by birds is their erecting near natural colonies of western house martins (Meister & Ehrengruber, 2015). We believe the experience of artificial nest erecting for western house martins should be adopted in the Nizhny Novgorod Oblast.

Despite its synanthropy and long-term adaptation to living next to humans, the western house martin turned out to be a vulnerable species. The problem is that a species related to the human being becomes hostage to changing human activity without direct impact on nature: changes of materials and construction of houses (repairs, cleaning, etc.). Thus, synanthropic species depends on this situation which may cause its instability. A species being adapted and living next to a human does not mean prosperous, and the western house martin demonstrates this well. In addition, the vulnerability of the species increases due to its coloniality. Breeding pairs are concentrated in a few suitable habitats. The locality of colonies in Northern Eurasia is determined by the need to combine man–made structures suitable for nesting and the presence of numerous objects of its diet – flying insects (Mel'nikov, 2016; Møller, 2019; Gashek & Krasutsky, 2021).

According to our estimate, the modern number of western house martins in the Nizhny Novgorod

Table 4. Total numbers of colonies and active nests of the western house martin in the natural regions of N. Novgorod Oblast (designed by authors)

District	Number of localities (colonies)			Number of nests (pairs)					
				in known localities		probable underestimation		total	
	known	projected	min under-estimation	min	max	min	max	min	max
The Northern Trans-Volga region									
Varnavinsky district	0	0.5	0.5	0	0	8	10	8	10
Vetluzhsky district	0	0.5	0.5	0	0	8	10	8	10
Voskresensky district	0	0.5	0.5	0	0	8	10	8	10
Shakhunsky district	0	0.5	0.5	0	0	8	10	8	10
Semenovsky district	0	0.5	0.5	0	0	8	10	8	10
Sokolsky district	0	0.5	0.5	0	0	8	10	8	10
Koverninsky district	0	0.5	0.5	0	0	8	10	8	10
Krasnobakovsky district	3	3	0	32	42	0	0	32	42
Tonkinsky district	0	0.5	0.5	0	0	8	10	8	10
Tonshaevsky district	1	1	0	16	19	0	0	16	19
Urensky district	1	1	0	2	2	0	0	2	2
Sharangsky district	1	1	0	5	6	0	0	5	6
Average for the region	*0.5*	*0.8*	*0.3*	*4.6*	*5.8*	*5.3*	*6.7*	*9.9*	*12.4*
Northern Trans-Volga region, total	***6***	***10***	***4***	***55***	***69***	***64***	***80***	***119***	***149***
The Southern Trans-Volga region and Volga-Oka interfluves									
Voskresensky district	3	3	0	32	39	0	0	32	39
Vorotynsky district	1	1	0	19	21	0	0	19	21
Borsky district	2	2	0	32	38	0	0	32	38
Semenovsky district	1	1	0	4	4	0	0	4	4
Gorodetsky district	0	1	1	0	0	16	19	16	19
Lyskovsky district	0	1	1	0	0	16	19	16	19
Balakhninsky district	0	1	1	0	0	16	19	16	19
Volodarsky district	2	2	0	32	38	0	0	32	38
Dzerzhinsk	0	1	1	0	0	16	19	16	19

Chkalovsky district	3	3	0	59	71	0	0	59	71
Pavlovsky district	0	1	1	0	0	16	19	16	19
Average for the region	*1.1*	*1.5*	*0.5*	*16.2*	*19.2*	*7.3*	*8.6*	*23.5*	*27.8*
Southern Trans-Volga region and Volga-Oka interfluves, total	***12***	***17***	***5***	***178***	***211***	***80***	***95***	***258***	***306***
The Western Cis-Volga region									
Bogorodsky district	4	4	0	64	76	0	0	64	76
Vachsky district	0	2	2	0	0	32	38	32	38
Voznesensky district	1	2	1	139	139	16	19	155	158
Arzamas	2	2	0	32	38	0	0	32	38
Vyksunsky district	2	2	0	17	20	0	0	17	20
Kulebaksky district	1	2	1	16	19	16	19	32	38
Nizhny Novgorod	4	4	0	93	102	0	0	93	102
Navashinsky district	0	2	2	0	0	32	38	32	38
Sarov	4	4	0	64	76	0	0	64	76
Pavlovsky district	3	3	0	37	43	0	0	37	43
Sosnovsky district	2	2	0	17	20	0	0	17	20
Average for the region	*2.1*	*2.6*	*0.5*	*43.5*	*48.5*	*8.7*	*10.4*	*52.3*	*58.8*
Western Cis-Volga region, total	***23***	***29***	***6***	***479***	***533***	***96***	***114***	***575***	***647***
The Eastern Cis-Volga region									
Ardatovsky district	2	2.6	0.6	9	10	10	11	19	21
Bolsheboldinsky district	1	2.6	1.6	1	4	26	30	27	34
Bolshemurashkinsky district	4	4	0	51	61	0	0	51	61
Buturlinsky district	2	2.6	0.6	19	22	10	11	29	33
Vadsky district	2	2.6	0.6	63	70	10	11	73	81
Vorotynsky district	1	2.6	1.6	42	42	26	30	68	72
Arzamas	4	4	0	96	106	0	0	96	106
Pervomaisky district	5	5	0	132	173	0	0	132	173
Perevozsky district	3	3	0	16	47	0	0	16	47
Gaginsky district	2	2.6	0.6	58	66	10	11	68	77

Dalnekonstantinovsky district	3	3	0	48	57	0	0	48	57
Diveevsky district	2	2.6	0.6	20	24	10	11	30	35
Knyagininsky district	3	3	0	26	28	0	0	26	28
Krasnooktyabrsky district	1	2.6	1.6	16	19	26	30	42	49
Kstovsky district	5	5	0	80	95	0	0	80	95
Lukoyanovsky district	5	5	0	70	77	0	0	70	77
Lyskovsky district	2	2.6	0.6	34	34	10	11	44	45
Pilninsky district	0	2.6	2.6	0	0	42	49	42	49
Pochinkovsky district	5	5	0	51	75	0	0	51	75
Sergachsky district	5	5	0	65	67	0	0	65	67
Sechenovsky district	1	2.6	1.6	0	4	26	30	26	34
Spassky district	1	2.6	1.6	5	6	26	30	31	36
Shatkovsky district	1	2.6	1.6	4	4	26	30	30	34
Average for the region	*2.6*	*3.3*	*0.7*	*39.4*	*47.4*	*11.2*	*12.8*	*50.6*	*60.3*
Eastern Cis-Volga region, total	***60***	***75.8***	***15.8***	***906***	***1091***	***258***	***295***	***1164***	***1386***
Nizhny Novgorod oblast, total	**101**	**132**	**31**	**1618**	**1904**	**498**	**584**	**2116**	**2488**

Table 5. The total number of colonies and nests of the western house martin in natural regions of the Nizhny Novgorod Oblast (designed by authors)

Natural regions	Number of localities (colonies)		Number of nests (pairs)	
	known	considering the projected ones	known	considering the projected ones
The Northern Trans-Volga region	6	10	61	129
The Southern Trans-Volga region and the Volga-Oka interfluves	12	17	204	294
Western Cis-Volga Region	23	29	515	623
Eastern Cis-Volga Region	60	76	1051	1331
Nizhny Novgorod oblast, total	**101**	**132**	**1831**	**2377**

Table 6. The breeding density of the western house martin in natural regions of the Nizhny Novgorod Oblast (designed by authors)

Natural regions	Density of localities, colonies/1000 sq.km		Density, nests (pairs)/1000 sq.km	
	known	considering the projected ones	known	considering the projected ones
The Northern Trans-Volga region	0.24	0.41	2.48	5.24
The Southern Trans-Volga region and the Volga-Oka interfluves	0.78	1.11	13.29	19.16
Western Cis-Volga Region	1.77	2.23	39.68	48
Eastern Cis-Volga Region	2.52	3.19	44.07	55.81
Nizhny Novgorod oblast, total	**1.32**	**1.72**	**23.85**	**30.96**

Oblast ranges from 2,116 to 2,488 pairs. This value turned out to be higher than previous estimates, which caused the species to be included in the regional Red Data Book (Bakka & Kiseleva, 2007). However, for a small bird from Passeriformes, the average breeding density of about 30 pairs per 1,000 km^2 is extremely low. According to zoologists in the XX century, the western house martin number was not much lower than the number of the barn swallow *Hirundo rustica* (Serebrovsky, 1918; Puzanov et al., 1955; Vorontsov, 1967), at present its number is ten times lower (Bakka & Kiseleva, 2017). The analysis of the monitoring results of separate colonies (**Tabs. 1, 2**) showed a negative trend in the funnel population in the Nizhny Novgorod region: the average annual decrease is 7.16% (the confidence interval with a probability of 90% is from 2.71% to 11.61%). The confirmed population decline and the presence of the threats mentioned above indicate the need to keep the conservation status of the western house martin in the Oblast. This status is the only legal instrument to protect colonies from destruction during the repair and reconstruction of buildings.

The distribution of western house martin colonies in the Nizhny Novgorod Oblast is very uneven. Several researchers associate similar unevenness in other regions either with landscape features (and determine the presence of building material for nests, for example) or with the humidity of the territory (Mel'nikov, 2016; Jokimäki et al., 2018; Gashek & Krasutsky, 2021). In the Nizhny Novgorod Oblast, we observe an obvious decrease in the density of the western house martin from the forest-steppe (Eastern Cis-Volga region) through the subzone of subtaiga forests to the southern taiga (Northern Trans-Volga region). At the same time, the central part of the Oblast, where pine forests end wetlands predominate on ancient alluvial and fluvioglacial sands, is more inhabited than the north of the region, where soils are often clayish.

The small number of overlaps of western house martin registrations made by us and the scientific volunteers indicates the insufficiency of the data. Estimating the regional population of the western house martin, we had to use a complex of calculations and extrapolations. The evaluation of the probable underestimation was 30.7%. We believe the effective protection of the species should be provided with more comprehensive data on its abundance and distribution. The regional census of the western house martin with the involvement of citizen science should be organized. As a result of the census, the regional database of the western house martin colonies should be developed. Based on such a database, a representative sample of western house martin colonies should be identified to monitor and control the species number.

Conclusion

We summarized and analyzed all information about the species registrations in the territory of the Oblast and the census carried out in separate colonies by us and by use of citizen science methods. A database has been developed containing 184 units of information: 76 units of information were obtained by us, 100 – by scientific volunteers, and 8 – data from museum collections.

According to our estimation the total number of the species ranges from 2,116 to 2,488 pairs in the Nizhny Novgorod Oblast. The average decrease in the western house martin population in the Oblast was 7.16% per year.

We have identified the uneven distribution of the western house martin in the Nizhny Novgorod Oblast. The breeding density of western house martin significantly decreases from the forest steppe through the subzone of the subtaiga forests to the southern taiga.

The low species number along with a negative population trend and the presence of serious threats

to the species provides the basis for keeping the conservation status of the western house martin in the Nizhny Novgorod Oblast.

We have demonstrated the necessity of organizing the regional census of the western house martin, developing the regional database and continuing the monitoring. As a measure of species protection, it is important to prohibit the regularly destroying of western house martin nests after the fledglings leave during the repair and reconstruction of buildings. It is necessary to implement the positive experience in artificial nest erecting in the Nizhny Novgorod Oblast, including this activity in the regional program of conservation measures for rare wildlife species.

Thus, the results obtained allow us to outline the prospects for further study of the revealed problem, identify the limiting factors for the species and make it clear in the upcoming third edition of the Red Data Book of the Nizhny Novgorod Oblast, as well as develop practical recommendations for the species conservation and recovery in the region.

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