Seasonal Changes in Food Supply Determine the Fluctuations of Thrush Populations in Stepanakert and Nearby Territories of Nagorno-Karabakh

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ABSTRACT

Background: Human activity causes significant transformations in the structure and functioning of biocenoses, which in turn affect the animal world, particularly avian fauna. Alongside anthropogenic factors, the seasonal availability of food resources and habitat characteristics play a key role in shaping the population dynamics of thrushes (Turdidae). These birds are capable of utilizing seasonal surpluses of resources and may engage in competitive interactions, particularly during the breeding season.

Methods: From 2017 to 2023, systematic field studies were conducted in the city of Stepanakert and its surrounding areas. The study focused on the seasonal dynamics, annual life cycles, primary dietary components, preferred habitats and seasonal fluctuations in the population of four Turdidae species. Food samples from fledglings were collected using neck ligature techniques. A total of 698 blackbirds (*Turdus merula*), 652 fieldfares (*Turdus pilaris*), 362 mistle thrushes (*Turdus viscivorus*) and 443 song thrushes (*Turdus philomelos*) were examined.

Result: The findings indicate that thrushes exhibit clear habitat selectivity, influenced by the seasonal availability of food and the birds' physiological state. Blackbirds were found to be the most widespread and dominant species across all studied landscapes throughout the year. The diet of fledglings was largely composed of invertebrates. Earthworms formed the main component in spring; in spring and summer, various insects and their larvae were consumed; while in autumn and winter, thrushes shifted to feeding on fruits, berries and vegetable crops.

Key words: Avifauna, Dynamics, Nagorno-Karabakh, Ration, Season, Thrush.

INTRODUCTION

Studies of the dynamics and seasonal changes in avifauna in cities and adjacent areas have always attracted the attention of zoologists. The intensification of human activity, the growth of cultivated land surfaces, urban development and a number of other factors have had impacts on bird colonies; these impacts are most common in densely populated areas, particularly in cities and adjacent areas. As a result, the function and structure of biocenoses undergo changes. Recent studies have highlighted the significance of urban environments in shaping avian communities, emphasizing the need for updated research to understand contemporary patterns in urban avifauna dynamics (Leveau *et al.,* 2024; Kumdet *et al.,* 2021).

Seasonal changes in food resources and habitat play a pivotal role in the dynamics of thrush populations. The main differences in the reproduction and mortality of living organisms are due to the dynamics of their numbers, which almost always coincide with the amount of the environment's feed resources. The number of long-lived species is relatively stable due to the seasonal food supply necessary for their activities (Begon *et al.,* 1986); (Kalyakin and Voltsit, 2013). Observations have shown a noticeable increase in the number, wide distribution and molting of almost all thrushes in favorable seasons. In unfavorable seasons, including snowy and harsh winters, the number of thrushes is significantly reduced due to the high mortality rate. Stable

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food resources can lead to a sedentary lifestyle for individuals and they will not even be able to fully assimilate the available food resources. The annual minimum food resource level is a limiting factor. Thrushes are bird groups that are able to use seasonal excess resources and in a saturated community, especially during the breeding season, they cause competition, which is associated with seasonal migration (Skutch, 1949; Cox, 1985; Greenberg, 1980). Like a number of passerine birds (Mikheev, 1996;

Chernetsov, 2010; Berthold, 1993; Anders *et al.,* 1998; Böhning-Gaese and Oberrath, 2003), thrushes are characterized by a change in habitat during annual cycles. This difference is caused by fluctuations in food resources (Martin and Karr, 1986), selectivity to habitats and breeding places, intra- and interspecific competition and predation (King *et al.,* 2006).

The selection of the study area and specific thrush species was not arbitrary. Stepanakert and its adjacent territories were chosen because they are subject to repeated anthropogenic influences, including urban expansion and habitat modification, as well as being located within a former conflict zone. Studying the population dynamics of four thrush species in this area is particularly important for ornithological monitoring, as it provides insights into how environmental pressures, human activity and post-conflict ecosystem changes affect bird communities (Leveau *et al.,* 2024; Kumdet *et al.,* 2021).

Furthermore, this region serves as a model for small urban areas. Understanding how such environments influence avian populations can inform broader ecological studies and conservation strategies. Incorporating contemporary literature and recent research trends has enriched this introduction, situating the study within the current scientific context and emphasizing its relevance to ongoing discussions in urban ecology and ornithology (Leveau *et al.,* 2024; Kumdet *et al.,* 2021). Furthermore, recent studies have emphasized the role of urban green spaces in shaping bird meta-communities, highlighting the functional differences between small urban areas and nearby conservation zones (Che *et al.,* 2025).

Furthermore, recent studies on livestock and seasonal feed variability in India highlight the broader ecological impacts of food resource availability in semi-urban and rural systems (Mishra *et al.,* 2021) and research on dairy farm management and seasonal milk production demonstrates the influence of resource fluctuations on animal physiology and productivity (Mishra *et al.,* 2022).

From this perspective, four thrush species living in the city of Stepanakert and its adjacent territories were selected as study objects. The purpose of this work was to identify interspecies differences and annual cycles in the seasonal dynamics of these thrushes, analyse seasonal changes in their numbers, clarify the zonal distribution of different thrushes in relation to seasonality and compile ecological data on thrushes in Nagorno-Karabakh. Additionally, contemporary literature and recent research trends have been incorporated to provide a more meaningful introduction and situate this study within the current scientific context.

MATERIALS AND METHODS

The study was conducted in the city of Stepanakert and its surroundings. Stepanakert is located in the southeastern part of the Armenian highlands on the small plain of the foothills of the Nagorno-Karabakh mountain range on the left bank of the Vararak River, a tributary of the Karkar River,

at an altitude of 650-1100 metres above sea level, at the northern latitude of 39°49′04″ and at the eastern longitude of 46°45′03″. Stepanakert has a mild climate. The average temperature in January is -0.2°C, that in July is +22.4°C and that in August is +22.2°C. The atmospheric precipitation averages 535 mm per year. The studies were carried out from 2017 to 2023 in all urban settlements of the administrative area of Stepanakert city: parks, green spaces, residential areas, streets, construction zones and industrial zones. This timeframe coincides with the period of data collection for the scientific work conducted by Lusine Aydinyan (Aydinyan and Hayrapetyan, 2024), (Hayrapetyan *et al.,* 2025). Seven stationary points were selected for monitoring in the discussed areas: Berkadzor (39°52′34″N; 46°46′54″E), Lernavan (39°50′52″N; 46°44′31″E), Aresh (39°50′17″N; 46°45′20″E), Saralanj (39°49′52″N; 46°44′51″E), Stepanakert (39°48′55″N; 46°45′7″E), Krkjan (39°48′12″N; 46°44′16.3″E), Karashen (39°47′50″N; 46°46′59″E).

The following four species of the Turdidae family were selected for detailed analysis: *T. merula* Linnaeus, 1758 (blackbird); *T. pilaris* Linnaeus, 1758 (fieldfare); *T. viscivorus* Linnaeus, 1758 (mistle thrush) and *T. philomelos* Brehm, 1831 (song thrush). Observations were carried out both at the stationary points and in adjacent areas. Data on the number and distribution of thrushes were obtained for the entire period of expeditionary research in all seasons of the year using standard calculations (Novikov 1953), (Numerov *et al.,* 2013). To estimate and compare the quantitative relationships of each thrush species across seasons and in different landscape types, we performed analysis of variance (ANOVA) using SPSS version 27. Separate ANOVAs were conducted for each species to examine seasonal variations (spring, summer, autumn, winter) and differences among landscape types (parks, green spaces, residential areas, streets, construction zones, industrial zones). Post-hoc Tukey tests were applied to identify significant pairwise differences between seasons and between landscape types for each species. Pearson correlation analyses were performed to assess the relationships between thrush population numbers and the availability of food resources in each habitat. For example, the correlation between insect biomass and the number of blackbirds in parks during spring was $r = 0.72$, $p<0.01$, indicating a strong positive relationship. Similarly, fieldfares showed a moderate positive correlation with available fruit biomass in residential areas during autumn ($r = 0.58$, $p<0.05$). Descriptive statistics, including mean, standard deviation and range, were also calculated to summarize population dynamics and food supply data. For instance, the mean number of mistle thrushes per 8 km expedition route in summer was 5.6±1.8 (range 3-9), while song thrushes in the same season averaged 4.2±1.5 individuals per route (range 2-8). These analyses allowed us to quantify seasonal and spatial patterns in thrush populations and link them to food availability. The length of each expedition was 8 km at a speed of 1-1.5 km/h and the total length of 119 expeditions was 952 km, as measured

using the Easy Fit pedometer program on the phone (Fig 1). The routes were selected in advance, taking into account the terrain and relief. The width of each calculated side of the expedition route did not exceed 40-45 m. Observations were carried out during different seasons of the year and at different times of the day, depending on climatic conditions. We used 10 × 3.5 m long mesh traps with 16 × 16, 18 × 18, 20 × 20 and 24 × 24 mm cells for hunting thrushes (Popov 1956; Eric 1967), (Numerov and Trufanova, 2010) as well as animal traps and released them in the same space after appropriate observation, maintaining a dynamic balance. To study food supplies in the thrush habitats, insect traps were installed from April to the end of November and checked every 10 days. Insect biomass was estimated by the volume and number of invertebrates. We also collected food samples by placing neck ligatures on the necks of fledglings (Malchesky and Kadochnikov 1953). In this regard, 14 nests of blackbirds with 63 fledglings, 12 nests of fieldfares with 56 fledglings, 10 nests of mistle thrushes with 38 fledglings and 9 nests of song thrushes with 34 fledglings were studied. During the studies, food samples were collected from 698 blackbirds, 652 fieldfares, 362 mistle thrushes and 443 song thrushes. The food extracted from the oral cavity of the fledglings was stored in 70% ethanol for laboratory studies. The GPS map 62 stc electronic navigation tool was used to determine geographical indicators and heights above the sea of birds' habitats.

RESULTS AND DISCUSSION

Studies of the number, distribution and diet composition of four species of the family Turdidae were carried out for the first time in Stepanakert city and its surrounding areas in Nagorno-Karabakh. Observations have shown that the migration of thrush populations within the species range was mainly due to the seasonality of food composition and availability, which naturally led to changes in species distribution. The feeding locations of thrushes varied depending on the physiological state of the birds and the season. During the nesting period, blackbirds were often found in forest glades, wetlands, cultural landscapes and cemeteries. Fieldfares fed mainly on the upper layers of the soil or on lawns with low grass; mistle and song thrushes also looked for food on the ground in forest glades. In the autumn-winter regions, blackbirds were concentrated mainly in agricultural landscapes, such as vegetable gardens, orchards and homesteads; in snowy regions, they ate fruits left on the trees and in late autumn and winter, the blackbirds' diet was supplemented with fruits, vegetables and berries. Among the fruits, a special place was occupied by oranges, figs, grapes, cornel, apples, pears, tomatoes, cucumbers, eggplant and squash from vegetables left in the gardens, as well as raspberries, blackberries, strawberries, hawthorn, rose hips and their seeds. In low-snow regions, they fed on the ground under trees or bushes; in forest glades, they ate mainly various species of invertebrates under fallen leaves. The remaining three species were quite rare in agro-landscapes. In autumn and winter, they preferred groves, forest clearings and parks, where they fed mainly on fruits on trees and invertebrates on the ground.

The diet composition of young thrushes was represented by various invertebrates: Oligochaeta, Mollusca, Myriapoda, Arachnida, Insecta, Odonata, Diptera (Tipulidae, *etc.*), Hymenoptera (Tenthredinidae, Formicidac, Apidae), Homoptera, Coleoptera (Carabidae, Silphidae, Scarabaeidae, Elateridae, Curculionidae), Lepidoptera (Torticidae, Sphingidae, Geometridae, Noctuidae, Liparidae, Nymphalidae), Orthoptera, *etc.* (Telpova 2006), (Numerov *et al.,* 2010). Research has shown that all four species feed primarily on invertebrates and their larvae during the hatching period (Fig 2).

According to our observations, the food composition of thrushes and their young has undergone seasonal changes. Spring nesting of the discussed species began in mid-April or in the second ten days, depending on the climatic conditions and continued until the first ten days of May. Among the invertebrates, the most common food available for thrushes during this period was earthworms, which were 26.6% of the blackbirds, 30.8% of the fieldfares, 24.6% of the mistle thrushes and 28.2% of the song thrushes. In the
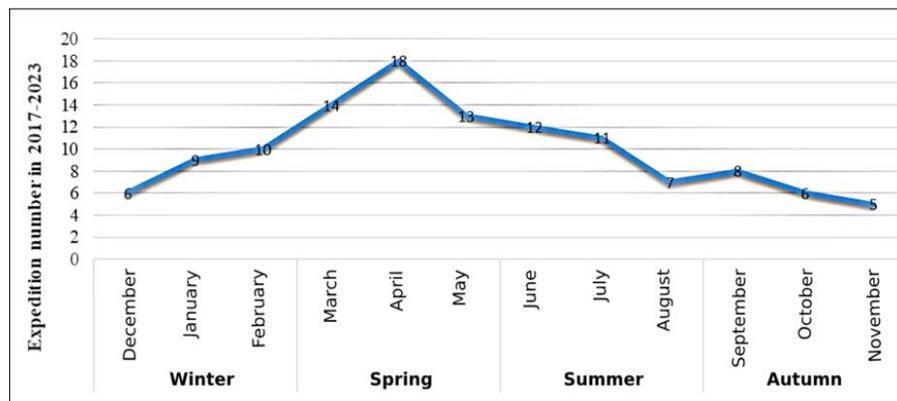

Fig 1: Expedition schedule for the period 2017-2023.

spring-summer period, the basis of thrush nutrition was various species of butterflies and their larvae, which accounted for 27.9% for blackbirds, 25% for fieldfares, 30.9% for mistle thrushes and 15.3% for song thrushes. Invertebrates were the primary component of the diet, followed by earthworms and molluscs. Seasonal changes in diet were related to both food availability and interspecific competition, which varied in intensity depending on habitat type and food abundance (Kalyakin and Voltsit, 2013).

A Pearson correlation coefficient was computed to assess the linear relationship between seasons and the percentage of different invertebrate groups. There was a negative correlation between the two variables for all thrush species [r(48) = -0.453, p = 0.001 (*T. merula*), r(48) = -0.436, p = 0.002 (*T. viscivorus*), r(48) = -0.418, p = 0.003 (*T. pilaris*), r(48) = -0.446, p = 0.002 (*T. philomelos*)]. A simple linear regression analysis was conducted to evaluate the extent to which seasons could predict the percentage of different invertebrate groups. A significant regression was found for all thrush species, indicating that seasonal changes significantly influenced the availability of prey and consequently affected thrush feeding behavior. A significant regression was found for all thrush species; for *T. merula*, it was $F(1, 46) = 11.886$, $p = 0.001$. The R^2 was 0.205, indicating that season explained approximately 20.5% of the variance in the percentage of different invertebrate groups. The regression equation was: $y = 49.0-9.6x$. That was, for each season (spring, summer, autumn and winter), the predicted percent of invertebrates for *T. merula* decreased by approximately 9.6%. 95% confidence intervals for the slope to predict percent of invertebrates from season was between -15.2 and -4.0. The linear regression results for the remaining thrush species were as follows: $F (1, 46) = 10.8$, $p=0.002$ (*T. viscivorus*), $F (1, 46) = 9.74$, $p=0.003$ (*T.*

pilaris) and $F (1, 46) = 11.4$, $p=0.002$ (*T. philomelos*), with an $R^2 = 0.19$, $R^2 = 0.175$ and $R^2 = 0.199$, respectively. Invertebrates predicted percent were equal to $y = 43.5 - 8.23x$ (95% CI -13.3 to -3.2) (*T. viscivorus*), $y = 42.91-8.0x$ (95% CI -13.2 to -2.84) (*T. pilaris*) and $y = 45.3-8.95x$ (95% CI -14.3 to -3.6) (*T. philomelos*). Therefore, the winter ratio was supplemented by fruits, berries and seeds left on the trees or fallen to the ground.

Differences in diet composition between species were partly due to food resource partitioning, which reduced interspecific competition and allowed coexistence in shared habitats (Clement and Hathway, 2000; Numerov *et al.,* 2010).

Interspecific competition for food resources was minimal in most landscapes due to resource partitioning, allowing coexistence of the four thrush species (Clement and Hathway, 2000; Numerov *et al.,* 2010). Seasonal abundance of fruits and invertebrates also reduced direct competition, particularly in orchards and forest belts.

Naturally, the ratio of different groups of invertebrates in the diet has a species characteristic. The diet compositions of the thrushes and their young counterparts were presented in Table 1, which also includes three species of earthworms and two species of molluscs. Table 1 shows the composition and quantity of food for thrushes and their young. "n" refers to the total number of prey items analyzed per species.

The diet of *T. viscivorus* was free of isopods, *T. pilaris* of myriapods and *T. philomelos* of spiders. The main component of the diet of all the thrush species consisted of various species of insects, especially butterflies and their larvae. Observations showed that the diversity of food composition was due to seasonality and bird habitats. Depending on the preferred feeding site, thrushes exhibited some habitat selectivity. In natural conditions, *T. merula* preferred to inhabit broadleaf and mixed forests
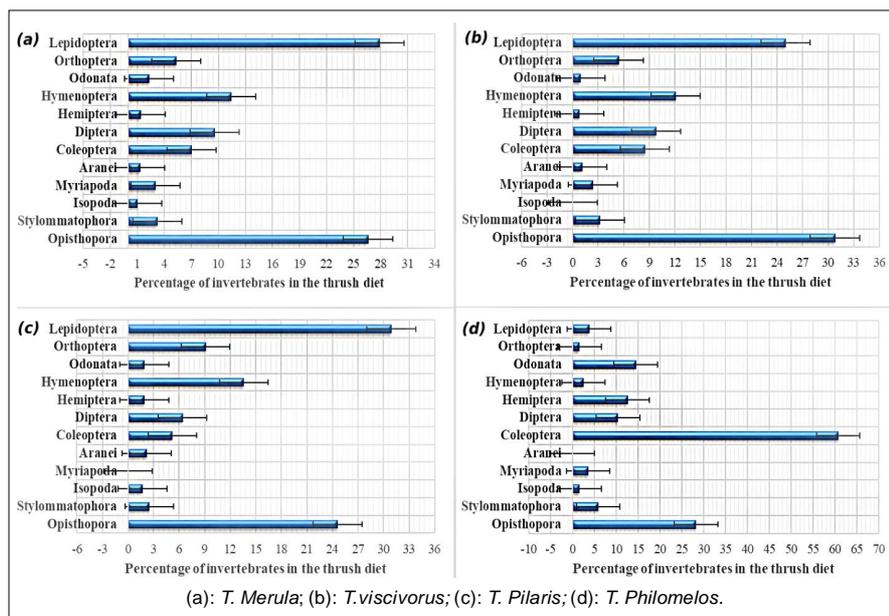

(a): *T. Merula*; (b): *T. viscivorus;* (c): *T. Pilaris;* (d): *T. Philomelos.*

Fig 2: Main invertebrate groups and their quantity in the diet of young thrushes.

Table 1: Composition and amount of feed for thrushes and their young.

	Taxa	T. merula		T. viscivorus		T. pilaris		T. philomelos	
		n-number	%	n	%	n	%	n	%
1	Opisthopora	186	26.6	201	30.8	89	24.6	125	28.2
	Lumbricus terrestris	105	56.4	69	34.3	31	34.8	52	41.6
	Dendrodrillus rubidus	49	26.4	95	47.3	35	39.4	37	29.6
	Aporrectodea caliginos	32	17.2	37	18.4	23	25.8	36	28.8
2	Stylommatophora	22	3.2	21	3.2	9	2.5	26	5.9
	Arion subfuscus	13	59.1	15	71.4	7	77.8	12	46.2
	Arion silvaticus	9	40.9	6	28.6	2	22.2	14	53.8
3	*Isopoda*	7	1	-	-	6	1.7	7	1.6
	Porcellio scaber	3	42.9	-	-	4	66.7	4	57.1
	Porcellio laevis	4	57.1	-	-	2	33.3	3	42.9
4	*Myriapoda*	21	3	16	2.4	-	-	16	3.6
	Geophilus algarum	11	52.4	7	43.7	-	-	8	50
	Cylinroiulus caeruleocinctus	4	19	3	18.8	-	-	5	31.2
	Lithobius forficatus	6	28.6	6	37.5	-	-	3	18.8
5	*Aranei*	9	1.3	7	1.1	8	2.2	-	-
	Zelotes pusilus	3	33.3	1	14.3	2	25	-	-
	Xysticus striatipes	3	33.3	2	28.6	2	25	-	-
	Pardosa agricola	2	22.3	1	14.3	3	37.5	-	-
	Pardosa partivaga	1	11.1	3	42.8	1	12.5	-	-
6	Insecta	453	64.9	407	62.5	250	69	269	60.7
6.1	Coleoptera	49	7	55	8.5	19	5.2	46	10.4
	Cetonia aurata	9	18.4	11	20	4	21.1	7	15.2
	Melolontha hippocastani	10	20.4	14	25.5	7	36.8	9	19.6
	Platycerus caraboides	11	22.5	9	16.4	2	10.5	8	17.4
	Potosia cuprea	5	10.2	12	21.7	3	15.8	11	23.9
	Phosphuga atrata	6	12.2	4	7.3	1	5.3	5	10.9
	Cetonia aurata	8	16.3	5	9.1	2	10.5	6	13
6.2	Diptera	67	9.6	64	9.8	23	6.4	56	12.6
	Bibio marci	11	16.4	9	14.1	4	17.4	5	8.9
	Bibio hortulanus	7	10.5	8	12.5	3	13	10	17.9
	Syrphus grossular	9	13.4	10	15.6	4	17.4	8	14.3
	Eristalis sepulcralis	14	20.9	11	17.2	2	8.7	7	12.5
	Calliphora vicina	11	16.4	12	18.8	3	13	11	19.6
	Tabanus bovinus	15	22.4	14	21.8	7	30.5	15	26.8
6.3	Hemiptera	10	1.4	5	0.8	7	1.9	11	2.5
	Palomena prasina	3	30	1	20	4	57.1	4	36.4
	Cinara cembrae	7	70	4	80	3	42.9	7	63.6
6.4	Hymenoptera	79	11.4	79	12.1	49	13.6	64	14.5
	Nematus ribesii	17	21. 5	22	27.8	7	14.3	16	25
	Caliroa cerasi	21	26.6	16	20.3	9	18.4	11	17.2
	Mirmica rubra	13	16.5	14	17.7	7	14.3	10	15.6
	Formica rufa	15	18.9	13	16.5	12	24.5	15	23.4
	Polyergus rufescens	13	16.5	14	17.7	14	28.5	12	18.8
6.5	Odonata	16	2.3	6	0.9	7	1.9	7	1.6
	Anax imperator	7	43.8	1	16.7	2	28.6	3	42.9
	Tachopteryx thoreyi	6	37.5	3	50	1	14.3	1	14.2
	Gomphus vulgatissimus	3	18.7	2	33.3	4	57.1	3	42.9
6.6	Orthoptera	37	5.3	35	5.4	33	9.1	17	3.8
	Tettigonia viridissima	9	24.4	7	20	6	18.2	3	17.6

Table 1: Continue....

Locusta migratoira	7	18.9	5	14.3	7	21.1	1	5.9
Heteracris pterosticha	5	13.5	8	22.8	5	15.2	4	23.5
Arcyptera fusca	1	2.7	3	8.6	3	9.1	2	11.8
Dociostaurus brevicollis	2	5.4	4	11.4	5	15.2	1	5.9
Bicolorana bicolor	6	16.2	3	8.6	4	12.1	1	5.9
Decticus verrucivorus	4	10.8	2	5.7	1	3	3	17.6
Tettigonia caudata	3	8.1	3	8.6	2	6.1	2	11.8
6.7 Lepidoptera	195	27.9	163	25	112	30.6	68	15.3
Biston betularia	49	25.1	-	-	25	22.3	13	19.1
Alcis depravata	51	26.1	42	25.8	-	-	9	13.2
Parnassius ariadna	-	-	47	28.8	23	20.6	15	22.1
Parnassius mnemosyne	45	23.1	-	-	12	10.7	-	-
Aporia crataegi	-		29	17.8	14	12.5	8	11.8
Pieris brassicae	50	25.7	45	27.6	38	33.9	23	33.8
Total	698	32.4	652	30.2	362	16.8	443	20.6

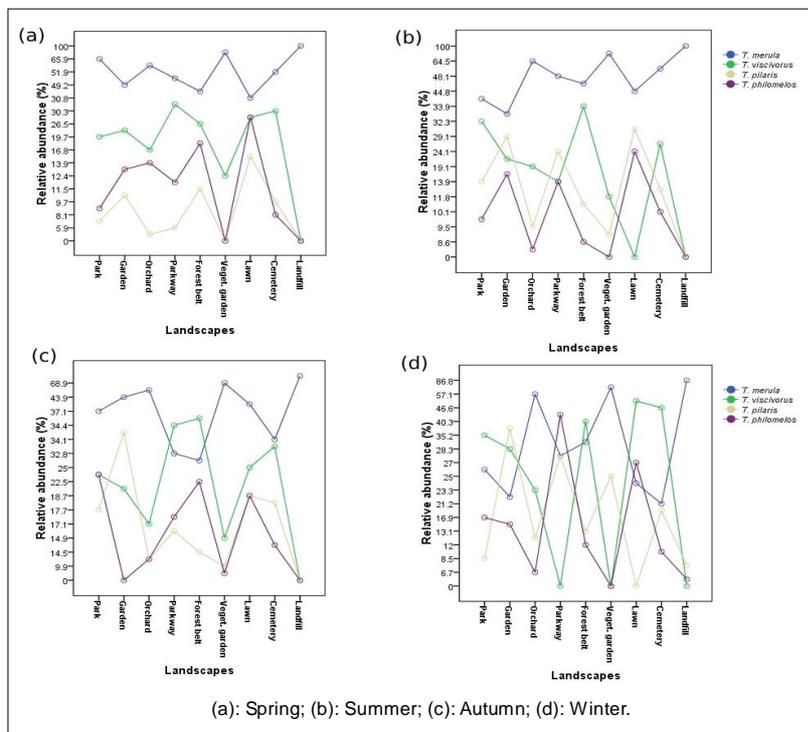(a): Spring; (b): Summer; (c): Autumn; (d): Winter.

Fig 3: Distribution of thrushes by seasons and landscapes.

with moderate humidity, where the vegetation wasn't high or dense (Baranovsky *et al.,* 2007). In urbanized landscapes, the feeding behaviour of *T. merula* has changed; *T. merula* ate in dumps, garbage cans, waste yards, sidewalks, *etc.* (Telpova 2006). *T. viscivorus* was mainly fed in forest clearings and orchards; unlike *T. merula*, it wasn't found in garbage cans or landfills. *T. pilaris* fed in forest clearings, coastal areas of streams, or rivers; sometimes, it was found in parks and gardens. *T. philomelos* mainly found food in deciduous forests, mountain shrub-steppe areas, parks and gardens. Consequently, with the seasonal changes in diet composition, the species distribution also changed. The results of the analysis of variance (ANOVA) didn't reveal statistically significant differences between the four seasons for each thrush species (*T. merula* $F_{(3,32)} = 0.20$, $p = 0.9$, M = 72.94, SD = 56.10; *T. viscivorus* $F_{(3,32)} = 0.07$, $p = 0.98$, M = 30.83, SD = 29.95; *T. pilaris* $F_{(3,32)} = 1.13$, $p = 0.35$, M = 15.83, SD = 12.02; *T. philomelos* $F_{(3,32)} = 0.45$, $p = 0.71$, M = 14.42, SD = 12.95). In our opinion, the absence of significant quantitative changes in the seasons of all thrush species common in Nagorno-Karabakh was due to their stable food base and particularly weak interspecies food competition.

A Kruskal-Wallis H test revealed a statistically significant difference in thrush species numbers across different landscapes ($\chi^2(8) = 57.226$, p<0.001), emphasizing the influence of habitat structure and food availability on species abundance. The mean ranks of species numbers were as follows: Park -68.78, garden -51.44, orchard -111.94, parkway -56.53, forest belt -116.94, vegetable garden -63.44, lawn - 47.22, cemetery -92.59 and landfill -43.62.

The study of species' relative abundance in various landscapes, depending on the season, revealed that *T. merula* dominated the discussed landscapes in all seasons; *T. viscivorus* was in second place, *T. pilaris* was in third place and *T. philomelos* was in fourth place. In addition to *T. merula*, *T. pilaris* and *T. philomelos* were also observed in landfills in the winter (Fig 3). According to our observations, the species' quantitative distributions in different landscapes changed depending on the season, with orchards, meadows, parks and cemeteries remaining the leaders.

During the nesting period, thrushes preferred the most favorable places with stable nutrition, a large field of view and dense leaf cover, which saved them and their young from high energy expenditure on feeding, searching for nesting material, forming gametes and incubating (Dolnik 1995). These expenditures increased until the midseason, along with the increase in food production associated with biocenosis. During the post hatching period, food resources must be spent on moulting. The gradual reduction in food resources contributed to a decrease in bird activity.

The diets of thrushes largely overlap (Clement and Hathway 2000) and were available to varying degrees; therefore, a long-term stay in natural habitats implied a mixed diet of thrushes. Animal-source foods ensured the long-term survival of species and enabled them to withstand energy shortages in the autumn and spring. Thrushes require stable and high-quality food. Moreover, favorable climatic conditions allowed thrushes to coexist without competition throughout the year. Thrushes optimized energy intake by selecting habitats with high prey density and low search costs, especially during nesting and post-hatching periods (Dolnik, 1995).

Overall, seasonal changes in food resources, habitat type and interspecific competition influenced thrush distribution, abundance and diet composition, emphasizing the importance of monitoring food resource dynamics for urban bird populations (Baranovsky *et al.,* 2007; Kalyakin and Voltsit, 2013; Telpova, 2006). Recent studies also highlight the effect of seasonal variation in resource availability on animal productivity and energy balance in managed agricultural systems (Deshmukh and Paramasivam, 2016). Recent studies also highlight seasonal food dynamics in urban landscapes and the effect on thrush feeding ecology (Hayrapetyan and Aydinyan, 2025), confirming that habitat selection is driven by prey availability and seasonal variation.

CONCLUSION

As a result of our studies in Stepanakert city and its environs, four types of thrushes were discovered. According to observations in different years and seasons, all four species were considered sedentary, but they could perform local, short-term migrations. Thrushes exhibited some habitat selectivity, depending on the availability of their preferred feeding grounds. According to our observations, feeding locations differed in vegetation cover and substrate. Changes in the feeding grounds of thrushes depended on the season and physiological state of the birds. They fed both on the ground and on trees, supplementing their diet with fruits. Invertebrates were the basis of the diet of the discussed species and their young individuals: in early spring, earthworms; in late spring and summer, various adult insects and their larvae; and molluscs. In connection with seasonal changes in diet composition, the dynamics of species distributions in landscapes have also changed. Blackbirds dominated in various landscapes throughout the year. During the post hatching period, the reduction in food resources forced species to reduce the time they spend seeking food to use the stored energy sparingly.

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Disclaimers

The authors declare that they have no conflicts of interest related to this study. The views and conclusions expressed in this manuscript are solely those of the authors and do not necessarily reflect the views of the funding organization or affiliated institutions.

Informed consent

For studies involving human participants, informed consent was obtained from all individuals prior to enrollment in the study. Participants were informed of the purpose, procedures, potential risks and benefits of the study. All participants voluntarily agreed to participate in the study.

For studies involving birds, all procedures were conducted in accordance with ethical guidelines for bird research and approved by the appropriate ethical review board.

Conflict of interest

The authors declare that there are no conflicts of interest related to the publication of this article. All authors confirm that they have no financial personal or institutional relatiosnship that could influence or bias the content of the paper.

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