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ANTROPOGENIC MATERIALS IN THE NESTS OF PASSERINE BIRDS IN THE WEST OF UKRAINE

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Background. Traditionally birds build their nests out of natural materials that are usually found near the location of the future nest. However, along with the expansion of human economic activity and the appearance of various types of antropogenic materials (hereafter debris) that pollute environment, they appeared in bird nests. Although it is hard to predict with certainty what significance this behavior will have for birds in the future, it is possible to investigate which species are prone to such behavior, which unnatural materials birds choose to build nests, and which factors influence it. This makes it possible to predict how changes in the environment by humans affect the nest-building behavior of different species of birds and the species-specific appearance of the nest. Moreover, incorporation of debris into birds' nests may be used as an indicator of environmental pollution.

Materials and Methods. Materials for this article included 382 nests of 42 passerine species. Nests were collected unevenly during the last two decades in different stations across the western part of Ukraine. Among them, 18.3 % of the nests were located within the borders of human settlements, 48.2 % on their outskirts, and 37.5 % in the natural or close to the natural environment far beyond settlements. Nests were decomposed with laboratory forceps and nest components were identifined as natural (grass, plant stems, tree leaves, grass roots, moss, mammalian hair, bird feather and others) and antropogenic (threads, synthetic fibers, fluff, ropes, fishing line, cigarette butts, paper, tissue, wires and others), and their percentage by volume was defined.

Results and Discussion. To construct nests, birds use antropogenic materials in the form of debris/solid waste, which they find in the surroundings. Among 382 analyzed passerine nests (42 species) collected in the west of Ukraine, artificial or man-changed materials were recorded in nest construction of 103 nests (27.0 %) of 26 species (61.9 %).

Most frequently antropogenic materials are incorporated in the nests of the Fringillidae family (*Linaria cannabina* – 85.7 % of the analysed nests, *Chloris chloris* – 71.4 %, *Fringilla coelebs* – 66.7 %).

The amount of artificial materials in the nest composition varied from minimal to up 100 %. More than a half (55.3 %) of the investigated passerine nests contain only a minimal or small amount of debris (≤ 1 % by volume).

We found 17 types of anthropogenic materials in the nests. The most popular were threads (in 47.1 % of the analyzed nests with antropogenic materials), synthetic fibers (31.7 %), fluff (20.2 %, among them artificial fluff 14.4 %, cotton wool 4.8 %, fiberglass 1.0 %), plastic film (17.4 %), ropes (14.4 %), and fishing line (12.5 %).

The number of various types of antropogenic materials in one nest varied from 1 (in 55.3 % nests), 2 (31.1 %), 3 (9.7 %), and 4 to 7 (3.9 %). The higher number of artificial material types in the structure of a bird's nest may imply purposefulness of such behavior in the environment transformed by the human.

Some selectivity of the types of solid waste (debris) that birds use for nest construction was noted. We assume that in most cases birds use antropogenic materials closely resembling the traditional natural ones usually used by birds of certain species.

The new artificial components in the composition of the nest imply that nest building is not completely genetically programmed but there is a possibility to change it by adding something new – similar, or even different. It looks quite reasonable, as it facilitates adaptation in changed environments.

Using antropogenic materials as nest components is still controversial. The species specific look of the nest has changed by a different degree in polluted environments. It is still questionable weather such behavior is beneficial for birds in the long-term perspective.

We suppose that antropogenic components may have appeared as part of the nest in the environments with available solid waste. Intentional/unintentional substitution of some natural components for nest with antropogenic ones may occur because of their high resemblance. Sometimes debris is incorporated into the nest while suitable natural components are accessible. In a polluted environment the species specific appearance of a nest may change to a certain degree.

Conclusion. Passerine birds use antropogenic materials (in the form of debris) for nest construction quite often. Debris was found in nests of 26 passerines species. Synantropic species used various types of artificial materials more often. 17 types of various anthropogenic materials were found in the nests. Some selectivity was noted. Birds use antropogenic materials that resemble natural materials, but occasionally choose completely different ones.

Keywords: nest composition, antropogenic materials, debris, Passeriformes, the west of Ukraine

INTRODUCTION

Birds (with a few exceptions) build nests to breed. For such birds the nest is of high importance in reproduction (Hansell & Overhill, 2000). It is generally assumed that birds have a genetic predisposition for selecting structurally suitable materials when building nests. However, their preference for specific nest materials is not solely determined by genetics, as both the type and amount of experience also play a role in influencing the birds' choices (Bailey *et al.*, 2014).

Birds of a certain species use typical materials for nest building, specific to their species. Thus, the appearance of the nest is species-specific (Biddle *et al.*, 2018). To build nests, birds have always used natural materials. Over the last century, the negative impact of man on the natural environment has increased significantly, and is manifested, among other things, in the drastic change of the habitat of many species and its significant pollution by household waste. Overproduction of waste and plastic pollution impact all ecosystems and ecotypes worldwide and ultimately influence wildlife (Jagiello *et al.*, 2019). Such conditions among others have led to the fact that birds began to use atypical artificial components to build nests (Antczak *et al.*, 2010; Bokotey, 1992; Bresgunova, 2008; Chaplygina & Krivitsky, 1996; Jagiello *et al.*, 2018, 2019, 2022; Igic *et al.*, 2009; Radhamany *et al.*, 2016; James Reynolds *et al.*, 2019; Suárez-Rodríguez & Garcia 2014, 2017; Suárez-Rodríguez *et al.*, 2013; Surgey *et al.*, 2012; Townsend & Barker, 2014). A deeper analysis of the question of the use of components of anthropogenic origin by birds in changed environmental conditions allows us to understand a number of important questions: how birds react to changed living conditions, in what way the changes affect their nest-building behavior, how certain species can adapt to environmental changes (plasticity), how quickly they start using new materials to build the nest, what are the consequences for the birds and changes in the architecture of the nest. These and other similar questions attract more and more researchers' attention. Most of these questions require further research, but some can be answered today. Thus, the purpose of this study was to identify species of passerine birds that use antropogenic materials for nest construction, their number and variety in nests, and possible reasons for the appearance of debris in birds' nests. This will make it possible to understand how changes in the environment affect the nest-building behavior of various species of passerine birds and how the architecture of the nest changes.

MATERIALS AND METHODS

Materials for this article consisted of 382 nests of 42 Passeriforme species (**Table 1**). Nests were collected randomly thanks to their visibility and accessibility, and purposely (nests in nest-boxes and nests of *Acrocephalus* warblers) unevenly during the last two decades. Nests were collected in different stations in protected (Roztochchia Reserve, Shatskyy National Nature Park) and unprotected areas across the western part of Ukraine (Volyn, Rivne, Ternopil, Khmelnytskyi, Lviv, Ivano-Frankivsk, Zakarpattia regions). Relative to the distance to human settlements, 18.3 % of the nests were located within the borders of settlements (cities, towns, villages), 48.2 % on their outskirts, and 37.5 % in the natural or close to the natural environment far beyond settlements.

Nests were collected after the breeding season. Each nest was air-dried for one-two weeks and placed into a plastic bag of a suitable size. All nests were placed into a cardboard box and stored at room temperature and humidity until analyzed. Individual nest materials were extracted using laboratory forceps and separated into categories, such as natural (grass, plant stems, tree leaves, grass roots, moss, mammalian hair, bird feathers and others) and antropogenic (threads, synthetic fibers, fluff, ropes, fishing line, cigarette butts, paper, tissue, wires and others). In this article we mean "antropogenic" as synthetic or man-changed and brought into the environment by man in the form of pollution. To assess the amount of every component, we used their percent by volume value (the author's method) as it gave a better (than just weight) understanding of materials quantity regardless of their unit weight. In this procedure, all the components were

evenly spread on the paper within a square frame divided into 100 identical smaller squares (10×10). Each of these smaller squares represents 1 % accuracy, ensuring precise measurement of the material. All the data was noted in special cards. Artificial materials were identified, analyzed and collected.

RESULTS AND DISCUSSION

To build nests, birds collect materials from the closest proximity. So, logically, antropogenic materials are not found in the nests of birds in the localities that bear no traces of human activity. About three quarters (73.0 %) of the analyzed nests (**Table 1**) were built only of the natural materials. They were mainly nests on meadows, marshes, pastures, forests, floodplains far from human settlements. But “fully natural” nests were also found on the outskirts and within human settlements.

Antropogenic materials were recorded in the composition of 103 passerine nests (27.0 %) of 26 species (out of 42 analyzed species, 61.9 %) (**Table 1**).

Taking into account species with the sufficient number of analyzed nests, we may assume that, most frequently, debris is incorporated in the nests of the Fringillidae family (*L. cannabina* 85.7% of analysed nests, *C. chloris* 71.4 %, *F. coelebs* 66.7 %). Other species used debris quite often – *P. major* 55.6 %, *L. collurio* 32.6 %, *T. merula* 30.0 %; and some (*S. atricapilla* 5.0 %, *F. hypoleuca* 8.0 %, *A. palustris* 8.3 %, *A. arundinaceus* 5.0 %, *T. philomelos* 0.5 %) did so occasionaly.

Often, such behavior was recorded in synantropic birds since the main preconditions for using antropogenic materials for nest construction are the presence and availability of debris in the environment. But there still are other reasons for such behavior to be checked in the future: individual experience, memory of chicks that grew up in nests with incorporated debris, species or individual plasticity regarding the choice of nest materials, exploratory behavior or other reasons.

The amount of solid waste embedded into the nest differs. More than a half of nests contained a minimal amount (≤1 % by volume of the nest), and 8.7 % of nests had a lot of debris (≥40 %) (**Fig. 1**). The latter group inludes *L. cannabina*, *C. chloris*, *P. major, L. collurio, L. excubitor* and one *P. pica* nest was almost completely built out of metal wires (**Fig. 3*A***).

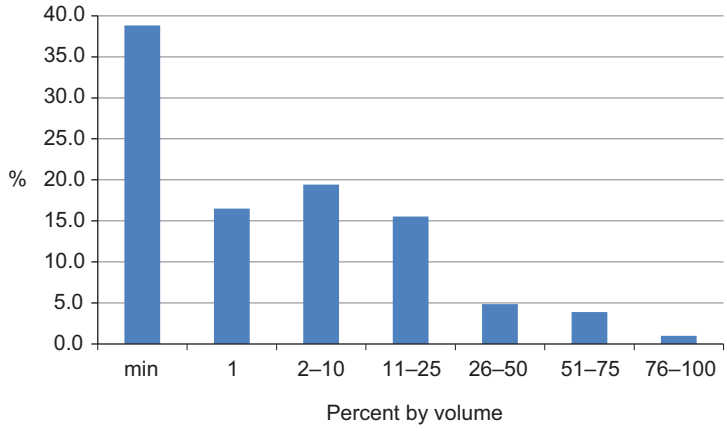

Fig. 1. The amount of antropogenic materials (percent by volume) in the nests

Table 1. **The number of analyzed passerine nests and the number of nests with the most popular antropogenic materials**

No	Species	Nests							
		all	only natural materials	with debris	types of debris (antropogenic materials)				
					threads	fibers	fluff	plastic film	ropes
1.	*Alauda arvensis*	1	1						
2.	*Anthus trivialis*	2	1	1		1			
3.	*Motacilla alba*	1		1		1	1		
4.	*Lanius collurio*	43	29	14	7	3	2	4	4
5.	*Lanius excubitor*	2	1	1				1	1
6.	*Sturnus vulgaris*	8	7	1				1	1
7.	*Pica pica*	1		1	1				
8.	*Troglodytes troglodytes*	4	4						
9.	*Prunella modularis*	1	1						
10.	*Locustella luscinioides*	5	5						
11.	*Locustella fluviatilis*	3	3						
12.	*Acrocephalus paludicola*	3	3						
13.	*Acrocephalus palustris*	24	22	2	1				
14.	*Acrocephalus scirpaceus*	23	22	1	1				
15.	*Acrocephalus arundinaceus*	20	19	1			1		
16.	*Sylvia nisoria*	5	4	1		1			
17.	*Sylvia atricapilla*	20	19	1	1				
18.	*Sylvia borin*	6	6						
19.	*Sylvia communis*	5	5						
20.	*Sylvia curruca*	8	7	1		1			
21.	*Phylloscopus collybita*	3	3						
22.	*Ficedula hypoleuca*	25	23	2	1		1		
23.	*Ficedula albicollis*	11	11						
24.	*Muscicapa striata*	5	2	3	2	2	1		1
25.	*Phoenicurus phoenicurus*	10	5	5	1				2
26.	*Phoenicurus ochruros*	1		1	1			1	
27.	*Luscinia luscinia*	2	2						
28.	*Turdus pilaris*	6	4	2	1	2			
29.	*Turdus merula*	30	21	9	1			5	1
30.	*Turdus philomelos*	20	19	1					
31.	*Turdus viscivorus*	2	1	1	1		1		
32.	*Lophophanes cristatus*	1	1						
33.	*Periparus ater*	2	2						
34.	*Cyanistes caeruleus*	2	1	1					1
35.	*Parus major*	18	8	10	6	3	3	3	2
36.	*Sitta europaea*	2	2						
37.	*Fringilla coelebs*	12	4	8	3	4			
38.	*Chloris chloris*	21	6	15	9	6	6	1	
39.	*Linaria cannabina*	21	3	18	12	8	5	2	2
40.	*Coccothraustes coccothraustes*	1		1		1			
41.	*Pyrrhula pyrrhula*	1	1						
42.	*Emberiza schoeniclus*	1	1						
	Totally	382	279	103	49	33	21	18	15

The majority (55.3 %) of nests contained only one single type of antropogenic materials among the nest materials, 31.1 % – two types, 9.7 % – three (*L. cannabina*, *C. chloris*, *F. coelebs*, *T. viscivorus*, *M. striata*, *L. collurio*, and *P. major*), 3.9 % – four and more (*L. cannabina*). A higher number of antropogenic components types in the structure of the bird's nest may imply that the reason for such behavior is in the environment transformed by the human.

The variety of antropogenic materials used by birds for nest construction included 17 kinds (**Table 2**, **Fig. 3*B***). In the literature there are records of various artificial materials in the nests of passerine birds in Ukraine (Bokotey, 1992; Bokotey & Potapenko, 1990; Bresgunova, 2008; Chaplygina & Krivitsky, 1996; Franchuk, 2013).

Table 2. **Variety of antropogenic materials in the nests of passerine birds**

No	Kind of debris	Similarity to natural materials	% nest
1.	Threads	Grass	47.1
2.	Synthetic (plastic) fibers		31.7
3.	Synthetic fluff	Plant fluff, wool	14.4
4.	Fragments of plastic film (mainly bags)	Dry tree leaves	17.3
5.	Ropes	Plant stems	14.4
6.	Fishing line	Horse hair	12.5
7.	Cigarette butts (smoked filter)	Plant fluff, wool or rotten wood	7.7
8.	Fragments of paper	Dry tree leaves	6.7
9.	Fabric, cloth, tissue		3.8
10.	Cotton wool	Plant fluff, wool	4.8
11.	Metal wire	Tree branches	1.9
12.	Tape recorder magnetic stripe		1.9
13.	Plastic foam		1.9
14.	Fiberglass	Plant fluff, wool	1.0
15.	Aluminium foil		1.0
16.	Paper clip		1.0
17.	Shining tinsel		1.0

Some selectivity can be noticed for the types of solid waste that birds use for nest construction (**Table 2**). Presumably, certain kinds of debris are used by birds not accidentally. We suppose that in most cases birds use artificial materials with a close resemblance to the traditional natural ones (**Table 2**) usually used by birds of certain species.

The most popular artificial components in the nest were threads (47.1 %) and synthetic fibers (31.7 %, **Tables 1**, **2**, **Fig. 2**). These antropogenic materials are used by birds whose nests traditionally are built of grass. Threads were of different length (up to 26 cm the longest) and of different colors (white in 24 nests, red 6, blue 5, green 4, black 3, gray 2, yellow 2, purple 1, and shiny 4). Compared to the grass, threads and synthetic fibers often possessed a higher flexibility and sometimes length. Threads were used for the main construction, for lining the nest and binding it to the vertical plant stems (*A. palustris*, for such a purpose threads are a better choice than grass).

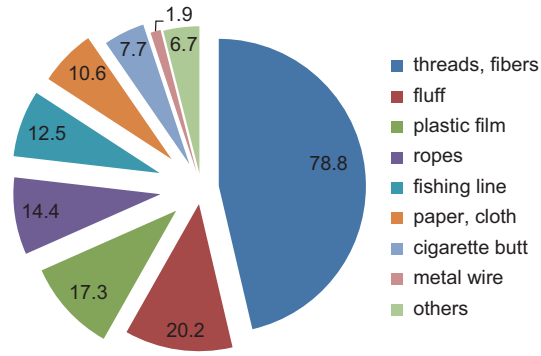

Fig. 2. Antropogenic materials (functional groups, in % of all nests with debris) in nests of passerine birds (103 nests, 26 species)

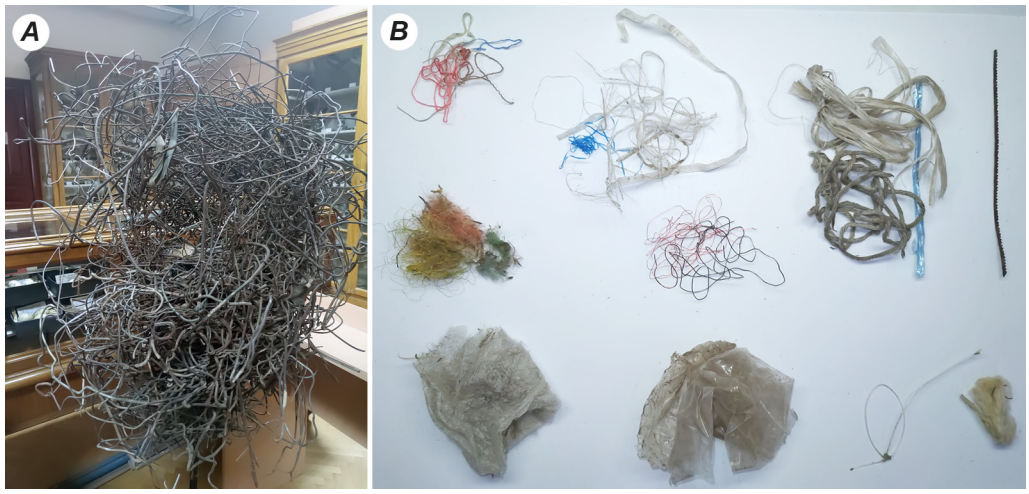

Fig. 3. ***A*** – "Metal wire" nest of *P. pica*, collected in Lviv (now is in exposition of Zoological museum of Ivan Franko National University of Lviv); ***B*** – popular antropogenic materials from nests of passerine birds (from top to bottom, from left to right): threads, fibers, ropes, metal jigsaw blade, fluff, thin metal wires, fragment of diaper, plastic film, fishing line, smoked filter of cigarette butt

Ropes were used in 14.4 % of nests (out of all nests with debris) of nine bird species (**Table 1**). The majority of the ropes were white plastic ropes. Plastic (polypropylene) string has been a very popular nest material of *L. excubitor* in Poland since the 1980s (Antczak *et al.*, 2010). Ropes have much better flexibility than dry plant stems, they do not break when bending, are easy to place between other nest materials and make the nest more inseparable. On the other hand, they are dangerous for adult birds and nestlings as sometimes they can cause death by tangling. In the nests of urban and agricultural American crows (*Corvus brachyrhynchos*) 5.6 % of nestlings were entangled in their nests (Townsend & Barker, 2014).

Fluff (artificial fluff/syntepon, cotton wool and fiberglass) were used in 20.2 % of the nests (out of all nests with artificial materials, **Fig. 2**) of 9 bird species (**Tables 1, 2**). The amount of the fluff was from minimal to up to more than half of the nest volume. The functions of synthetic fibers are more or less similar to those of plant fibers as stuffing, insulation and high adhesion, especially in combination with moss.

Fishing line (12.5 %) was used in 13 nests of 9 bird species mainly near water bodies where fish are caught or near rubbish dumps.

Artificial cloths in the nests included fragments of bandage, gauze, wet napkin, and fabric found in small amounts in 4 nests of *L. cannabina*.

Paper in the form of paper wrappers of alcoholic beverages, toilet paper, napkins was found in 7 nests of 5 bird species of Fringillidae (*L. cannabina*, *F. coelebs*, *C. chloris*) and Turdidae (*T. merula*, *T. viscivorus*).

Metal wires of various thickness were used in the construction of the nests which usually are built of thinner plant stems (*L. cannabina*) or thicker tree twigs (*P. pica*). The amount of metal wires varied from small amounts to up to practically 100 % (*P. pica*, **Fig. 2**, Lviv city). Such wire nests were not uncommon for this species in Lviv even 40 years ago (Bokotey & Potapenko, 1990). Nests of *Corvus frugilegus* in a colony in poplars along the road between urban settlements were almost completely built of wires (Škorpíková *et al.*, 2014). The *Corvus corone* nest found in Stryy (Lviv region) had many incorporated metal wires. Apparently, metal wire nests are rather popular among the Corvidae family especially in urban habitats. Metal wires have a different thickness, length and composition that impacts their flexibility and are more or less similar to the natural components such as tree branches and plant stems. Metal wires are also more durable, which is important for long-term nests. But metal wires have higher thermal conductivity and may be dangerous on hot days during egg incubation.

Fragments of plastic film (as in **Fig. 3*B***; mainly plastic bags) were rather popular (17.3 % of nests) antropogenic material in the nest structure (**Tables 1**, **2**).

Tape recorder magnetic stripe was rare in the nests of birds because it is not used nowadays, still it was found in only one locality near the dumping grounds on the outskirts of the city (Chervonograd, Lviv region) in 2 nests of Fringillidae (*L. cannabina* and *C. chloris*).

Cigarette butts are common on the streets of populated areas. Due to the fact that cigarette filters contain thousands of polymer fibers, they hardly decompose in nature, and are one of the most common types of garbage. Trampled or run over by cars or pedestrians they resemble some natural materials such as mammal wool, hair or bird feathers and are often used for nest construction. Cigarette butts (whole and just smoked filter) were found in 8 nests of 4 species (*L. cannabina* – 5 nests, *C. chloris*, *F. coelebs* and *T. philomelos*). Macerated smoked filters from cigarette butts were found in the cup lining of *T. philomelo*s nests as they are of high resemblance in color and structure to the mouldering (or rotten) wood these birds traditionally use for construction of the cup of their nest. Such behavior was also reported for this species in the west of Ukraine and the proportion of cigarette filters amounted to 25–30 % of cup lining (Franchuk, 2013). Even in the other hemisphere (New Zealand) such behavior was recorded (discarded cigarette butts were embedded into the dried mud-matrix of *T. philomelos* nests) (Igic *et al.*, 2009). The use of cigarette butts was also reported for house finches in Mexico (Suárez-Rodríguez & Garcia 2017), house sparrows in North America (Suárez-Rodríguez *et al.*, 2013) and Asia (Radhamany *et al.* 2016). In the literature there are some hypotheses about functionality of this artificial material in bird nests. Cigarette butts may serve as fixators for the frame of the lining cup, repel predators and ectoparasites that inhabit nests (Suárez-Rodriguez *et al.*, 2013). The last hypothesis is confirmed by experiments with the house finch (*Haemorhous mexicanus*) (Suárez-Rodriguez & Garcia, 2017). Cigarette butts contain poisonous substances which are not tolerated by mites and other ectoparasites, which inhabit bird nests, but cause toxic damage to chicks (Suárez-Rodriguez & Garcia, 2014). The use of cigarette butts might be considered a general behavioral innovation for urban-adapted species (James Reynolds *et al.*, 2019).

Some of the anthropogenic materials used for nest construction (**Table 2**) can be gathered into groups based on their similarity and functionality. More than 2/3 of the items are rather similar to the natural ones in appearance and/or functionality (**Table 2**) and this may be the reason for birds' substituting (distinguishing or not) some natural materials with artificial ones. Grass may be replaced with threads, plant stems – with ropes, tree branches – with metal wires; natural cotton materials obtained from plant seeds (e.g., *Typha* sp., *Salix* sp., *Populus* sp.) or mosses – with synthetic fibers, cotton wool, used cigarette filter or fiberglass; some dry leaves – with pieces of plastic film or paper (**Table 2**). These kinds of materials are fundamental for majority of passerine bird nests and are used for the main structure and lining of the nests. Though there are some differences in the physical properties that impact their functionality.

However, some materials are completely unusual and have no resemblance to the natural ones. *L. cannabina* and *C.chloris* used tape recorder magnetic stripe; *T. merula* – fragment of shiny foil and paper clip, *F. coelebs* and *L. cannabina* – white plastic foam; *P. phoenicurus* – shining tinsel. Such records are rather rare, these items may have been used not purposely or were taken to the nest up with other nest materials accidentally, still such a behavior is under question.

CONCLUSIONS

Birds use artificial or man-changed materials for nest construction in the form of debris/solid waste, which they find in the surroundings. Among 382 analyzed passerine nests (42 species) collected in the west of Ukraine, antropogenic materials were recorded in nest structure of 103 nests (27.0 %) of 26 species (61.9 %).

Most often, debris was incorporated into the nests of the Fringillidae family (*L. cannabina* 85.7% of analyzed nests, *C. chloris* 71.4 %, *F. coelebs* 66.7 %). Birds of other species such as *P. major* (55.6 %), *L. collurio* (32.6 %) and *T. merula* (30.0 %) used artificial materials quite often.

The amount of antropogenic materials varied from minimal up to near 100 %. The majority of passerine nests with embedded debris contain a single artificial material or the minimal amount of it. Among 17 types of anthropogenic materials found in the nests, most popular were threads, synthetic fibers, artificial fluff, plastic film, and ropes. A higher number of artificial material types in one nest may imply purposefulness of such behavior in the environment transformed by the human.

Some selectivity for the types of solid waste that birds use for nest construction was noted. We presume that in most cases birds use antropogenic materials with a close resemblance to the traditional natural ones usually used by birds of certain species.

The new antropogenic materials in nests imply that nest building is not completely genetically programmed but there is a possibility to change by adding something new similar or even different. It looks rather reasonable as it promotes adaptation in changed environment.

Supposedly, nests with embedded antropogenic materials appear in the environments with available solid waste, and one of the reasons for such a behavior may be substitution (intentional/unintentional) of some natural components with artificial ones because of their high resemblance. Cases of such substitution were even recorded when suitable natural components were present and available. It is plasticity that allows for adaptation in a changed environment.

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COMPLIANCE WITH ETHICAL STANDARDS

Conflict of Interest: The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Animal Rights: This article does not contain any experimental studies with animal subjects.

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АНТРОПОГЕННІ МАТЕРІАЛИ У ГНІЗДАХ ГОРОБЦЕПОДІБНИХ ПТАХІВ ЗАХОДУ УКРАЇНИ

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Обґрунтування. Традиційно птахи будують гнізда з природних матеріалів, які зазвичай знаходять неподалік розміщення майбутнього гнізда. Однак унаслідок розширення господарської діяльності людини і появи в навколишньому середовищі побутового сміття, птахи вибірково почали використовувати його для побудови гнізд.

Поки що важко стверджувати, яке значення це матиме для птахів у майбутньому, але можна дослідити, які види птахів схильні до такої поведінки, які штучні матеріали вони вибирають для побудови гнізда і які чинники на це впливають. Отже, можна передбачати, як антропогенні зміни середовища впливають на гніздобудівну поведінку різних видів птахів і видоспецифічний вигляд гнізда.

Матеріали і методи. Матеріалами до цієї статті були 382 гнізда 42 видів Горобцеподібних птахів. Гнізда були зібрані в післягніздовий період, нерівномірно протягом останніх двох десятиліть, у різних стаціях на заході України. Серед них 18,3 % гнізд були зібрані в межах населених пунктів, 48,2 % на околицях населених пунктів і 33,5 % у природному чи наближеному до природного середовищі далеко за межами населених пунктів. Усі гнізда були розібрані в лабораторних умовах, матеріали розділені на природні (злаки, стебла рослин, листки дерев, корені, мох, шерсть ссавців, пір'я птахів та інші) й антропогенні (нитки, синтетичні волокна, пух, мотузки, волосінь рибальська, недопалки, папір, тканина, дріт тощо) та визначена їхня об'ємна частка.

Результати. 27,0 % досліджених гнізд 26-ти видів Горобцеподібних птахів містили штучні чи змінені людиною матеріали. Найчастіше їх виявляли у гніздах птахів родини Fringillidae (*Linaria cannabina* 85,7 % проаналізованих гнізд цього виду, *Chloris chloris* 71,4 %, *Fringilla coelebs* 66,7 %). Кількість антропогенних матеріалів у гнізді становила від мінімальної аж до 100 %. Більшість досліджених гнізд містили поодинокі матеріали або мінімальну кількість їх. Виявлено 17 типів штучних матеріалів, які Горобцеподібні птахи вплітають у гнізда. Переважно це схожі до природних матеріали, які птахи певного виду традиційно використовують для побудови гнізда. Найпопулярнішим матеріалом були нитки (в 47,1% гнізд зі штучними матеріалами) і синтетичні волокна (31,7 %), пух (20,2 %; зокрема, штучний пух 14,4 %, вата 4,8 %, скловата 1,0 %), поліетиленова плівка (17,3 %) та мотузки (14,4 %).

Кількість різних типів штучних матеріалів в одному гнізді становила від 1 (в 55,7 % гнізд) до 7 (1,0 %). Більша кількість типів антропогенних матеріалів у гнізді може свідчити про навмисність такої поведінки у зміненому людиною довкіллі.

Матеріали антропогенного походження (у вигляді побутового сміття) в гніздах птахів з'являються на територіях, де вони наявні та доступні. Випадкова/невипадкова поява штучних матеріалів у гніздах птахів пов'язана з їхньою подібністю до природних, які птахи традиційно використовують для побудови гнізда. Часто штучні матеріали стають частиною гнізда навіть тоді, коли природні наявні у біотопі. У середовищі, де багато побутового сміття, видоспецифічний вигляд гнізда деяких птахів до певної міри змінюється.

Висновки. Горобцеподібні птахи використовують антропогенні матеріали для побудови гнізд досить часто. Найбільшу схильність до такої поведінки виявлено у синантропних птахів родини В'юркові. Кількість синтетичних матеріалів у гніздах може досягати майже 100 %. У гніздах Горобцеподібних птахів на заході України виявлено 17 типів антропогенних матеріалів, переважна більшість яких нагадує природні.

Ключові слова: склад гнізда, антропогенні матеріали, сміття, Горобцеподібні, захід України

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