



NATURAL VALUES OF THE HORBACHYKHA TRACT (KYIV, UKRAINE)

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Abstract

In this article we examined the complex value of Horbachykha floodplain tract of Dnipro River in Kyiv. Its history, flora, vegetation, animal species composition and peculiarities of distribution of rare animal species were studied. Horbachykha tract have natural island origin, and in result of Dnipro regulation in beginning of 20th century finally was formed as left bank flood tract, that in 1960–1970s lost original flood regime. Flora of Horbachykha tract consist of 161 species of vascular plants; 7 rare species of plants and 8 rare vegetation communities were registered. This clearly indicate its natural origin and current semi-natural state. Currently this is the biggest Kyiv left-bank alluvial forest fragment and very significant part of ecological corridor along the Dnipro floodplain. We also registered the presence of rare fauna: 158 species of vertebrate animals, including: 14 fish species, 7 amphibians, 3 reptiles, 132 birds, and 3 mammal species. One of the most important values – complex of rheophilic fish species that still exist according conservated hydrological regime here. A total of 62 bird species were found nesting. The registration of nesting *Otus scops* is only one current and very important registration for whole Kyiv area. This tract area is very important for most of birds migrated along Dnipro River corridor. The settlement of *Castor fiber* (melanistic) – species with high indicator significance was registered in the wetlands of Horbachykha tract. Taking into account the limited transformation of tract area and the presence of rare biodiversity, area of Horbachykha together with the adjacent water area of the Desenka distributary need to be protected initially by landscape reserve of local significance creation. After this including of this tract in National Park “Dnipro Island” strongly recommended.

Introduction

Most of the Dnipro valley has been transformed by the construction of big reservoirs. On the Middle Dnipro River in the near-natural state of, only separate fragments remained, in particular in Kyiv (KUTSOKON and KOBZAR 2017). In addition, the ecosystems of the Dnipro floodplain are very important for the conservation of the landscape and biological values of the capital of Ukraine. The landscape of Kyiv has changed dramatically over the past 20 years due to development of the city (ROMANENKO et al 2015). Business projects aimed at the development of coastal areas without proper environmental impact assessment and/or its neglect are especially destructive. This leads to the reduction of natural areas in the city. Together with global climate change, this affects the structure and distribution of flora and fauna (PIMM et al 2014). Changes in the typical natural landscape have led to a reduction in the populations and extinction of certain representatives of the flora and fauna of Dnipro River system – islands and floodplain tracts in Kyiv. The remaining ones were included in local, national and international red lists of threatened species (HRYHYK 2019, Red Book of Ukraine, Order of the Ministry of Environmental... No. 29 of January 19, 2021, GODLEVSKA et al 2010). That is why the problem of conservation the original floodplain landscapes now is critically actual. One of the main problems is that most of them are either poorly studied or practically not studied. Some regions of the Antarctic are better studied than most tracts of Kyiv (PARNIKOZA et al 2020). Moreover, some Kyiv tracts and floodplain objects, such as the area of Telbin Lake, Zapisochcha Pivdenne tract, the Gatne Island of, etc., were destroyed and never studied. Studying the nature of Kyiv is important both for its science and conservation. Horbachykha is the left bank tract with the area of 88.0 ha belongs to such areas, is a good example of such a tract, which can be destroyed. At the same time, information about its natural value is very important both for studying the question of how the nature of Kyiv initially looked and for assessing the need and form of protection of this object. The aim of the research is to characterize the history, flora, vegetation and fauna for special attention to protected species of the Horbachykha tract. We also prepared nearest measures for this tract protection.

Materials and Methods

The research was carried out in 2013–2022. The areas of research are shown in Figure 1. The boundaries of the potential landscape reserve of local significance are shown in Figure 2.



Fig. 1. Areas of research: 1 – Northern Bay; 2 – Bobrove Lake; 3 – Rusanivske Lake (upper part); 4 – Rusanivske Lake (lower part); 5 – the Chapline Lake; 6–8 – Desenka distributary

Source: own elaboration based on Google Maps



Fig. 2. Boundaries of the potential landscape reserve of local significance

Source: own elaboration based on Google Maps

The objects of research were the Horbacykha tract history, rare plants, vegetation types as well as vertebrates: fish, amphibians, reptiles, birds and mammals.

The Horbachykha tract history were studied on base of archive of Kyiv Dnipro River system maps collected by I. Parnikoza.

Rare plants and vegetation types were recognized according to following documents: Decision of the Kyiv City Council № 219/940 from 29.06.2000 (List of plants and animals., 2023), European Red List, 1991 (European... 1992), Green Book of Ukraine (Green Book., 2009), EU Habitats Directive (Interpretation manual., 2007), Annex 1 of Resolution No. 4 of Bern Convention, 1996 (Interpretation manual., 2019). Rare animal species were recognized according to following documents: Red Book of Ukraine (Order of the Ministry of Environmental... No. 29 of January 19, 2021), Appendices II and III of the Bern Convention, Resolution 6 of the Bern Convention, the Habitats and Birds Directive, and the Bonn Convention (GODLEVSKA et al 2010).

Flora and vegetation investigation of Horbachykha tract were realized in the frame of project “List of flora of vascular plants of the islands and floodplain tracts of the Dnipro River, Kyiv (2018)”. All species of vascular plants were collected and determined, why Latin name of the species was presented according to the Plants of the World Online (<https://powo.science.kew.org/>). Vegetation was described on the basis (TSKUKANOVA 2005, MATUSZKIEWICZ 2008, WYSOCKI and SIKORSKI 2009).

For fauna investigations 8 locations located in different biotope components (lakes, bays, main river stream, coastal strip, shrubs, floodplain forest) were established. Fish were caught with a fry drift net (permit No. 76 dated 22.03.2019, issued by the State Agency of Fisheries), as well as with ichthyological nets and hook-and-line fishing gear. The taxonomy and nomenclature of fish is given according to were carried out according to the official ichthyological website fishbase (FishBase org.). After identification the fish were returned to their natural environment.

Bird counting was carried out by the route-point method. We spent 20 minutes to 1 hour at the selected points 12 x 5 “Arsenal” binoculars and a Nikon P 900, 83x digital camera were used for species identification. The ecological status of birds was determined according to key (FESENKO and BOKOTEY 2002). The probability of nesting was evaluated according to the criteria recommended by the European Ornithological Atlas Committee (EOAC) (*European Breeding...* 1992, *The EBCC Atlas...* 1997). Observations of migratory birds of prey were carried out on September 5 and 30 as well as October 7, 2022. Systematics and nomenclature of birds in the article are given according to (FESENKO and BOKOTEY 2007). The presence of other rare animals: amphibians, reptiles and mammals are determined by tracks on the ground (mammals).

Results and Discussion

Horbakykha tract history

The Horbakykha tract is located within the Dnipro district of the city of Kyiv (Figure 1–2). The tract is a typical example of the Middle Dnipro floodplain tract, which passed from an actively functioning part of the active floodplain to a left-bank tract connected to the mainland coast. In the 19th century, the Horbakykha tract was a part of the river floodplain (once an island, once a left-bank tract) with sand dunes (in Ukrainian “horby”) parallel to the Desenka distributary, which stretched from the village of Vygurivshchyna to Mykilska Slobidka. This is where the name of this tract probably comes from.

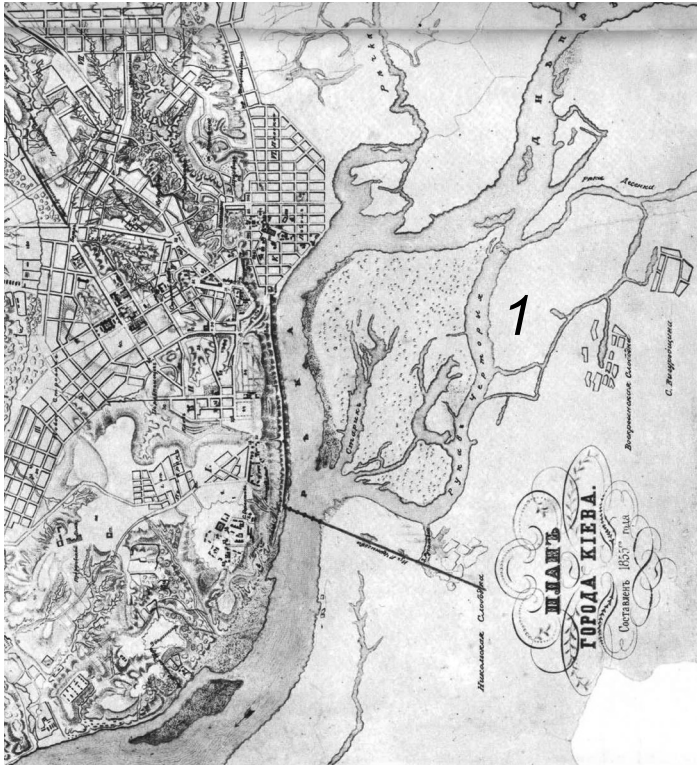


Fig. 3. The nowadays Horbakykha tract (1) on the Kyiv map of 1855
Source: own elaboration based on Parnikoza and Prychepa (2022)

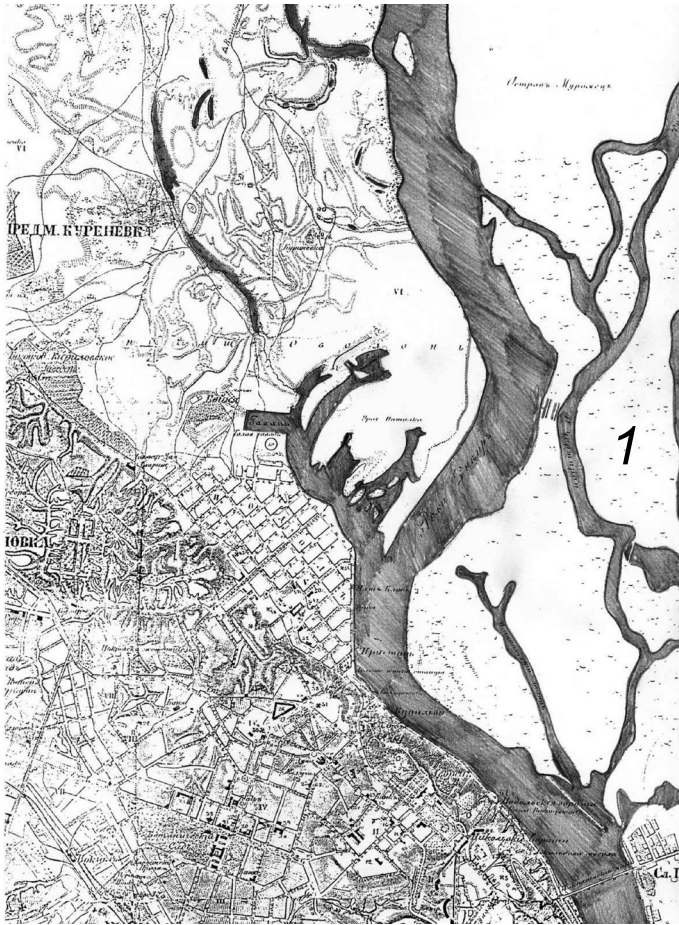


Fig. 4. Nowadays Horbakykha tract (1) on the Kyiv map of 1871–1873

Source: own elaboration based on Parnikoza and Prychepa (2022)

According to cartographic data of the middle of the 19th century, around 1855, Horbakykha was an island separated from the left bank coastal floodplain by the branch of Desenska distributary (Figure 3). Thus in 1871–1873, Horbakykha was a coastal tract separated from the mainland's left bank only by a relict bay (currently – Rusanivske Lake). So Horbakykha turned into an island only during regular spring floods (Figure 4). At that time, the tract probably was used by local residents for mowing of local meadows.

The status of the left-bank tract in the case of Horbakykha was fixed by the regulation of the Dnipro in connection with the construction of the Chain Bridge. In the course of this, in 1884, the entrance to the strait separating Horbakykha tract from the left bank was closed. This is how the

tract appears on the map of the 1896, 1903, 1910 and 1914 (Figure 5). Instead, some very interesting 1940s details have been preserved on the German map of Kyiv of 1943. Here we can find the local name of Horbacykha at that time – Kodachek (Figure 6). According to VAKULISHYN (2014), the name of the Horbacykha was established at the turn of the 1940s and 1950s.

The construction of the Kyiv and Kaniv hydropower plants led to the slowing of the current and rising of the Dnipro River level. This provides a certain fixation of the current borders of the Dnipro islands and tracts. The limitation of original regular flooding caused a change in vegetation. Most of the Horbacykha is covered by alluvial forest.

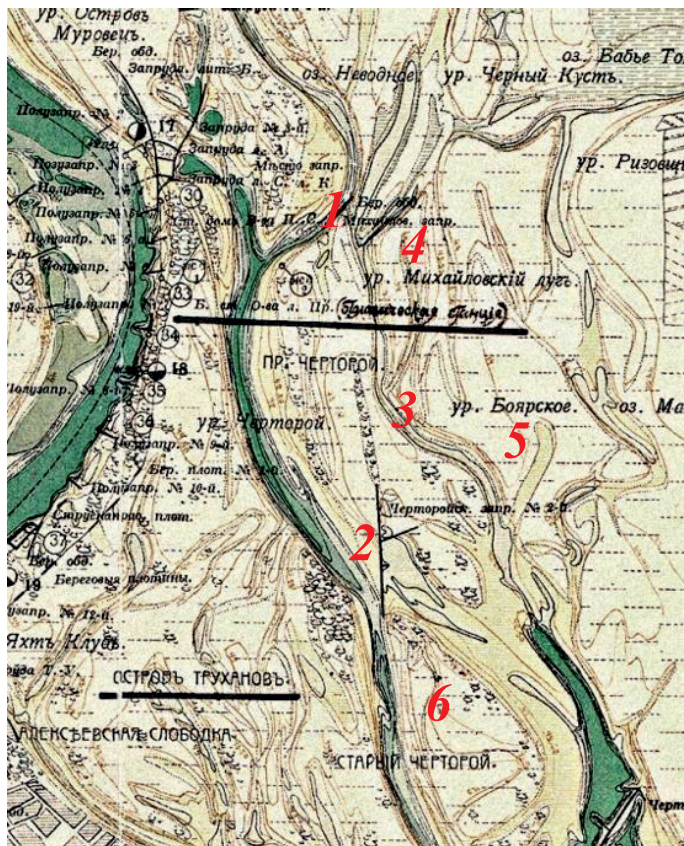


Fig. 5. The nowadays Horbacykha tract on the map of the Dnipro valley in 1914:
 1 – Mykhailiv dam; 2 – Chortoriy dam No. 2b; 3 – the former tributary – Rusanivske Lake;
 4 – Mykhailivsky Lug tract; 5 – Boyarske tract; 6 – northern part of Dolobetsky Island
 Source: own elaboration based on Parnikoza and Prychepa (2022)



Fig. 6. Kodachek tract – the nowadays Horbacykha tract (1) on the German map of 1943. An interesting detail that is clearly visible on the map of 1943 is the longer than current length of the Northern Bay of Horbacykha. After all, its long southern corner shown on the map is currently probably flooded after the water level rose when the Kaniv Reservoir was filled
 Source: own elaboration based on Parnikoza and Prychepa (2022)

On the Sailing Directions of 1982, for the first time, we meet the hydronym – *Horbachev distributary*, from which the modern name of the tract probably came (Figure 7). From the cartographic materials available to us, the name – *Horbacykha tract* appears for the first time on the scheme of Kyiv in 1989 (Figure 8).

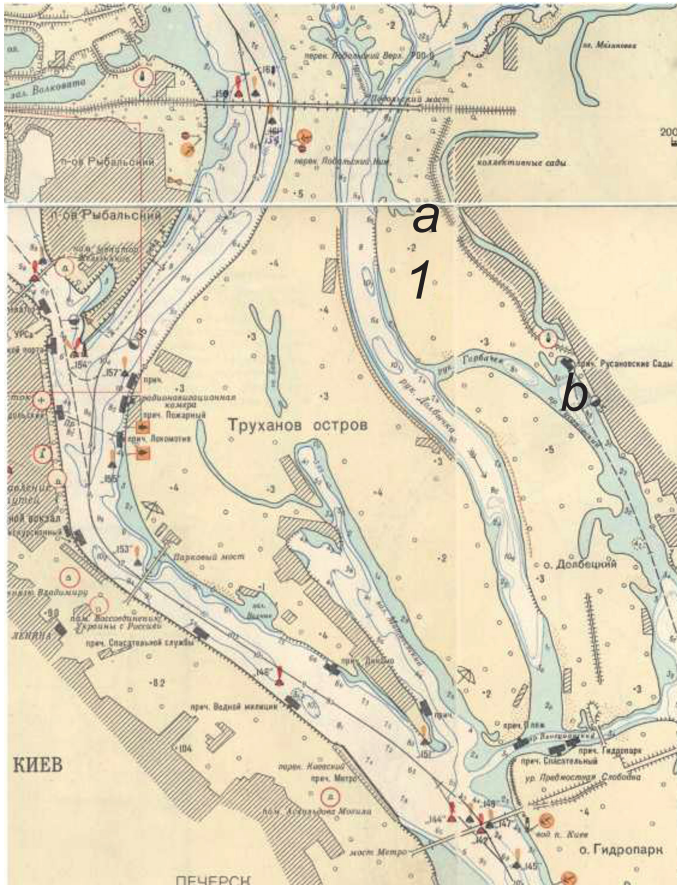


Fig. 7. Horbachykh tract on the 1982 map. The Northern (a) and Southern Bays (b) are clearly visible, the development of which was probably caused by the rise of the water level with the construction of the Kaniv Reservoir

Source: own elaboration based on Parnikoza and Prychepa (2022)

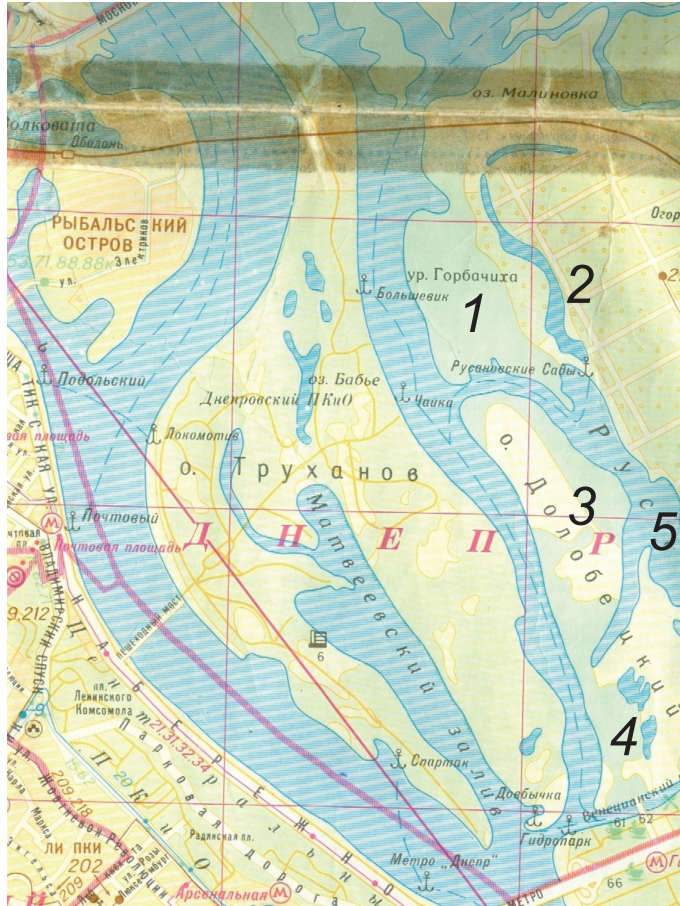


Fig. 8. Horbachykh tract (1), Dolobetsky Island (2) on the scheme of 1989, Rusanivska Strait (3) and the pier *Rusanivski Sady*

Source: own elaboration based on Parnikoza and Prychepa (2022)

Flora and vegetation

In the flora of the tract, 161 species of vascular plants were found, including 1 species of horsetails (Equisetophyta), 2 species of ferns (Polypodiophyta), 1 species of gymnosperms (Pynophyta), and 157 species of flowering plants (Magnoliophyta). For comparison, the flora of the Dnipro Islands and adjacent tracts in Kyiv, according to G. Tsukanova (2005), totals 717 species. So, flora of Horbachykh tract is 22% of total Kyiv's Dnipro floodplain flora. For the northern Kyiv islands, 267 species of vascular plants were discovered for the "Ptashyny Raj" Regional Landscape Park with area 466.8 ha (KOLOMIICHUK and ONYSHENKO 2018). All rare species are present in the flora of the tract, listed in Table 1.

Table 1

Rare plants species (7 species in total) of Horbachykha tract, Kyiv

Species	Biotope	Base of protection
<i>Nymphaea alba</i> L.	Inner bays of the tract, Chapline Lake	Decision of the Kyiv City Council № 219/940 from 29.06.2000 (List of plants and animals... 2023)
<i>Nuphar lutea</i> (L.) Sm.	Desenka distributary	Decision of the Kyiv City Council № 880/2029 from 23.12.2004 (List of plants and animals... 2023)
<i>Sparganium emersum</i> Rehmman	Riparian vegetation	Decision of the Kyiv City Council № 880/2290 from 23.12.2004 (List of plants and animals... 2023)
<i>Iris pseudacorus</i> L.	Riparian vegetation	Decision of the Kyiv City Council № 880/2290 from 23.12.2004 (List of plants and animals... 2023)
<i>Tragopogon ucrainicus</i> Artemczuk	Xeric sand vegetation	European Red List, 1991 (European... 1992)
<i>Ophioglossum vulgatum</i> L.	Alluvial forest	Decision of the Kyiv City Council № 219/940 from 29.06.2000 (List of plants and animals... 2023)
<i>Teucrium scordium</i> L.	Riparian vegetation	Currently not protected, but as a rare species recommended by us for inclusion in the list of plants protected in the city of Kyiv

As part of the vegetation of the Horbachykha tract, transformed alluvial forests occupy the largest part of the area. They are also the main value of this tract (PARNIKOZA et al 2020). As evidenced by the analysis of archival materials dating from the time before the regulation of the Dniro River, most of the tract was probably covered with xeric sand meadows, combined with fragments of *Populus-Salix* forests. Currently, in the absence of periodic and long-term flooding, most of the tract is covered with a forest biotope. This is the largest fragment of the alluvial forest on the floodplain of the left bank of the Dniro within Kyiv. In other near-main channel left-bank floodplain from Vygurivshchyna to Osokorki, such complexes are much smaller (Zapisochna Pivnichne tract) or very fragmentary (the coast of Berkovshchyna Bay) or irreversibly anthropogenically transformed (Rusanivska and Berezhnyakivska embankments). The basis of Horbachykha forests is relic stands of *Populus nigra* Mill. and *Populus alba* L. on more elevated sites, and *Salix alba* L. near inland bays and on low-lying areas that are still subject to flooding in the spring. At the same time, there are very old specimens of these trees (Figures 9 and 10).



Fig. 9. Chapline Lake is surrounded by a stand of alluvial forest created by *Salix alba*, its water area is developed with aquatic vegetation, and along the coast riparian vegetation
 Source: photo by I. Parnikoza



Fig. 10. Fragment of xeric sand calcareous grasslands on sand dunes.
 In the background are the remnants of an alluvial *Populus nigra* forest
 Source: photo by I. Parnikoza

Both native and introduced species are present in the local tree-stands: *Ulmus laevis* Pall., *Salix triandra* L., *Pinus sylvestris* L., *Fraxinus excelsior* L., *Quercus robur* L., *Acer negundo* L., *Acer saccharinum* L., *Acer platanoides* L., *Acer tataricum* L., *Sorbus aucuparia* L., *Betula pendula* Roth, *Morus alba* L., *Prunus cerasus* L., *Prunus padus* L., *Prunus tomentosa* Thunb. In the shrub layer the following species were found: *Ribes spicatum* E. Robson, *Sambucus nigra* L., *Viburnum opulus* L., *Cornus alba* L.,

Cornus sanguinea L., *Amorpha fruticosa* L., *Genista tinctoria* L., *Ligustrum vulgare* L., *Physocarpus opulifolius* (L.) Maxim., *Frangula alnus* Mill., *Rosa canina* L., *Rubus caesius* L. Such a diverse composition of species indicates the advance of species not characteristic of the natural floodplain as a result of the loss of the floodplain regime. In the deciduous forests of Horbachykha tract, lianas introduced on the Dnipro floodplain are widespread: *Parthenocissus inserta* (A. Kern.) Fritsch and wild *Vitis vinifera* L. *Viscum album* L., which is important for wintering birds, develops on old specimens of trees.

The herbaceous plants flora of forest biotopes is more diverse in comparison with areas with a water regime close to natural (Ptashyny Island or fragment of alluvial forest near the right-bank abutments of the Northern Bridge). After all, in addition to species that could withstand regular flooding with its cessation, a number of other species spread to the tract spontaneously or through human impact. Currently the following species found where: *Equisetum arvense* L., *Ophioglossum vulgatum* L., *Poa nemoralis* L., *Poa trivialis* L., *Urtica dioica* L., *Geum urbanum* A. Gray, *Geum rivale* L., *Fragaria vesca* L., *Filipendula vulgaris* Moench, *Barbarea stricta* Andr. ex Besser, *Anthriscus sylvestris* (L.) Hoffm., *Daucus carota* L., *Heracleum sibiricum* L., *Torilis japonica* (Houtt.) DC., *Aristolochia clematitis* L., *Vincetoxicum hirundinaria* Medik., *Achillea millefolium* L., *Achillea setacea* Waldst. & Kit., *Artemisia abrotanum* L., *Mycelis muralis* (L.) Dumort., *Petasites spurius* Miq., *Taraxacum officinale* aggr., *Impatiens parviflora* DC., *Silene vulgaris* (Moench) Garcke, *Betonica officinalis* L., *Glechoma hederacea* L., *Epilobium montanum* Boiss., *Chelidonium majus* L., *Plantago lanceolata* L., *Plantago major* L., *Rumex crispus* L., *Lysimachia nummularia* L., *Lysimachia vulgaris* L., *Odontites vulgaris* Moench, *Scrophularia nodosa* L., *Asparagus officinalis* L., *Carex hirta* L. and *Brachypodium sylvaticum* (Huds.) P.Beauv. A diverse composition of stands, developed shrubs are important for the existence of a rich fauna here, in particular birds, which will be described in the next section.

In the conditions of Horbachykha tract, the sand dunes are overgrown by *Salix acutifolia* Willd. Fragments of xeric sand communities of *Festuco-Koelerietum glaucae* association with *Festuca beckeri* (Hack.) Trautv. and *Koeleria glauca* DC. (Spreng.) are common on these dunes. *Secale sylvestre* Host, *Eryngium planum* Lapeyr., *Artemisia campestris* Scop. ex Steud., *Centaurea borysthena* Gruner, *Chondrilla juncea* L., *Tanacetum vulgare* L., *Tragopogon major* Jacq., *Tragopogon ucrainicus* Artemczuk, *Silene tatarica* (L.) Pers., *Hylotelephium maximum* (L.) Holub, *Sedum acre* L., *Sedum sexangulare* L., *Oenothera biennis* L., *Rumex acetosella* Fingerh., *Rumex confertus* Willd., *Rumex thyrsiflorus* Fingerh., *Potentilla*

argentea L., *Carex colchica* J. Gay and *Agrostis vinealis* Honck are spread here. In some places there are fragments of the Calamogrostitetum epigeji association formed by *Calamagrostis epigejos* (L.) Roth.

The Desenka distributary area adjacent to the Horbachykha tract is the habitat of well-preserved complexes of riparian and aquatic vegetation. These original vegetation types are characterized by a significant diversity of species: *Ranunculus repens* L., *Calystegia sepium* (L.) R. Br., *Symphytum officinale* L., *Myosotis scorpioides* L., *Berula erecta* (Huds.) Coville, *Bidens tripartita* L., *Achillea salicifolia* Besser, *Sonchus palustris* L., *Lycopus europaeus* L., *Lycopus exaltatus* L.f., *Mentha pulegium* L., *Scutellaria galericulata* L., *Stachys palustris* L., *Teucrium scordium* L., *Lythrum virgatum* L., *Persicaria hydropiper* (L.) Delarbre, *Rumex hydro-lapathum* Huds., *Galium palustre* M. Bieb., *Valeriana officinalis* L., *Carex riparia* (R. Br.) Poir., *Eleocharis palustris* (L.) Roem. & Schult., *Iris pseudacorus* L., *Juncus articulatus* L., *Calamagrostis arundinacea* (L.) Roth, *Catabrosa aquatica* (L.) P.Beauv., *Glyceria maxima* (Hartm.) Holmb., *Typha angustifolia* L., *Typha latifolia* L., *Sparganium emersum* Rehmman, *Butomus umbellatus* L., *Alisma plantago-aquatica* L. and *Sagittaria sagittifolia* L.

The coast, bays and inland reservoirs of the Horbachykha tract have a rich aquatic vegetation. The following hydrophytes were found here: *Trapa natans* L., *Stratiotes aloides* L., *Ceratophyllum demersum* L., *Myriophyllum spicatum* L., *Lemna minor* L., *Lemna trisulca* L., *Spirodela polyrhiza* (L.) Schleid., *Najas major* All., *Potamogeton perfoliatus* L., *Nymphaea alba* L. and *Nuphar lutea* (L.) Sm.

The trace of the human impact on the ecosystems of the tract is the presence of fragments of ruderal communities and certain species connected with human impact: *Bromus tectorum* L., *Oxalis stricta* L., *Geranium robertianum* L., *Erysimum cinereum* Moench, *Silene baccifera* (L.) Durande L., *Stellaria media* (L.) Vill., *Lepidium densiflorum* Schrad., *Sisymbrium officinale* (L.) Scop. (L.) Scop., *Chelidonium majus* L., *Berteroa incana* (L.) DC., *Phalacrocoma annuum* (L.) Dumort. ex F. Mull., *Artemisia vulgaris* L., *Amaranthus retroflexus* L., *Salsola tragus* L., *Artemisia absinthium* L., *Ambrosia artemisiifolia* L., *Helianthus tuberosus* L., *Chenopodium album* L., *Solidago canadensis* L., *Polygonum aviculare* L., *Portulaca oleracea* L., *Linaria vulgaris* Mill., *Echinochloa crus-galli* (L.) P. Beauv. and *Setaria viridis* (L.) P. Beauv. A number of Horbachykha's plant communities are under protection (Table 2).

Table 2

Protected Values of the communities (8 communities in total) of Horbachykha tract, Kyiv

Biotope	Base for protection	Reference
Community of <i>Salvinia natantis</i>	Green Book of Ukraine	Green Book... 2009
Community of <i>Nymphaeeta albae</i> (in complex with <i>Salvinia nutans</i> and <i>Trapa natans</i>)	Green Book of Ukraine	Green Book... 2009
Community of <i>Nuphareta luteae</i> (in complex with <i>Salvinia nutans</i> and <i>Trapa natans</i>)	Green Book of Ukraine	Green Book... 2009
Community of <i>Trapeta natantis</i>	Green Book of Ukraine	Green Book... 2009
Natural eutrophic lakes with Magnopotamion or Hydrocharition	EU Habitats Directive or as separate hydrophyte biotopes according to the Annex 1 of Resolution No. 4 of Bern Convention, 1996	Interpretation manual... 2007; Interpretation manual... 2019
Community of arborescent galleries of tall <i>Salix alba</i> and <i>Populus nigra</i> , 91E0	EU Habitats Directive and Annex 1 of Resolution No. 4 of Bern Convention, 1996	Interpretation manual... 2007; Interpretation manual... 2019
F9.1 Riverine scrub	Annex 1 of Resolution No. 4 of Bern Convention, 1996	Interpretation manual... 2019
Xeric sand calcareous grasslands (6120)	EU Habitats Directive	Interpretation manual... 2007

Vertebrates fauna

Fishes

Presence of 36 fish species belonging to 9 families was recorded over the research period. The ichthyofauna is represented by species native and typical of the Middle Dnipro. In general, 60% of the fish species composition of Kyiv is concentrated here in the water area of the Desenka distributary and internal reservoirs: *Leuciscus leuciscus* Linnaeus, 1758, *Squalius cephalus* Linnaeus, 1758, *Leuciscus idus* Linnaeus, 1758, *Rutilus rutilus* Linnaeus, 1758, *Scardinius erythrophthalmus* Linnaeus, 1758, *Alburnus alburnus* Linnaeus, 1758, *Leucaspis delineatus* Heckel, 1843, *Blicca bjoerkna* Linnaeus, 1758, *Abramis brama* Linnaeus, 1758, *Ballerus sapa* Pallas, 1814, *Ballerus ballerus* Linnaeus, 1758, *Leuciscus aspilus* Linnaeus, 1758, *Pelecus cultratus* Linnaeus, 1758, *Rhodeus amarus* Bloch, 1782, *Pseudorasbora parva* Temminck & Schlegel, 1846, *Carassius carassius* Linnaeus, 1758, *Carassius auratus* 1758, *Tinca tinca* Linnaeus, 1758, *Cobitis taenia* Linnaeus, 1758, *Misgurnus fossilis* Linnaeus,

1758, *Silurus glanis* Linnaeus, 1758, *Esox lucius* Linnaeus, 1758, *Pungitius platygaster* Kessler, 1859, *Syngnathus abaster* Risso, 1827, *Lepomis gibbosus* Linnaeus, 1758, *Sander lucioperca* Linnaeus, 1758, *Perca fluviatilis*, Linnaeus, 1758, *Gymnocephalus cernua* Linnaeus, 1758, *Gymnocephalus baloni* Holcik & Hensel, 1974, *Gymnocephalus acerina* Gmelin, 1789, *Percottus glenii* Dybowski, 1877, *Neogobius melanostomus* Pallas, 1814, *Ponticola kessleri* Gunther, 1861, *Neogobius fluviatilis* Pallas, 1814, *Babka gymnotrachelus* Kessler, 1857, *Mesogobius batrachocephalus* Pallas, 1814, *Proterorhinus semilunaris* Hockel, 1837. The presence of rare rheophilic (*Leuciscus aspius*, *Leuciscus idus*, *Leuciscus leuciscus*, *Ballerus sapa*) and limnophilic complexes (*Misgurnus fossilis*, *Carassius carassius*), is a valuable feature of the reservoirs and streams of the Horbachykha tract. This is evidence of the conservation of key landscape-biotope characteristics for lithophilic (21.6%) and psamphilic (16.2%) ecological groups of fish. The geographical location of the tract near Desenka branching between two islands creates hydrological conditions favourable for the existence of rheophilic fish (whose share in the ichthyofauna is 33.3%) on Desenka. To a large extent, in most watercourses in Kyiv, as a result of a significant transformation, the evolutionarily formed hydroecological conditions of rivers (changes in the flow velocity, deformation and siltation of the channel, the creation of hydraulic structures) were disturbed, which affected the abundance of rheophilic species (ROMANENKO et al. 2015). Such processes are observed on the Pochaina, Vita, Darnytsia, and Sovka rivers. In addition, most small rivers are chained in concrete chutes and collectors like Lybid river (ROMANENKO and MEDOVNYK 2017). Among the representatives of ichthyofauna 14 are rarities; 4 species are included in the Red Book of Ukraine 10 are protected by the Bern Convention (VASYLYUK et al 2019). One of the most abundant fish species in the coastal areas of the Desenka distributary is the *Rhodeus amarus*, the proportion of which reaches 59.8%. *Rhodeus amarus* occupies the largest percentage (83.2%) among rare fish species. This is due to favourable topographic conditions: a sufficient population of *Bivalvia*, which serve as a spawning substrate for its population. It is a common species that forms a significant percentage of ichthyocenosis in Kyiv's water bodies (KUTSOKON and KOBZAR 2017). The presence of rheophilic fish in the river channel section indicates the natural conservation of the hydrological regime of the ecosystem of Horbachykha tract. Today, due to the regulation of river flow, disturbed hydrological regime and pollution of watercourses with toxic compounds, a significant number of these species have reduced the boundaries of their ranges (DEMCHENKO 2011, TKACHENKO et al 2019). They have ceased to occur at all in some reservoirs and watercourses. That is why the places of

their reproduction need to be protected. Because of this, the water area of the Desenka distributary, is an important area as place for reproduction and fattening of young fish of commercially valuable species of the middle Dnipro River.

The little-disturbed hydrological regime provides ecological conditions for fish that actively move along the *Pelecus cultratus*, *Leuciscus leuciscus* (Figure 11) and *Leuciscus idus* are recorded in the flocks of coastal juveniles in the clean water areas. *Pelecus cultratus* is found during spring migration. In recent years, the number of populations of *Leuciscus leuciscus* and *Leuciscus idus* in the water bodies of Kyiv has significantly decreased. In particular, the species were found in the mouth of the Desna River (TYMOSHENKO et al 2019), as well as Lybid and Syrets Rivers (ROMANENKO and MEDOVNYK 2017). *Leuciscus leuciscus* is characterized by special requirements to habitat conditions – these are areas of watercourses with undisturbed migration routes. It should be noted that in the bays and areas of Desenka distributary adjacent to Horbacykha tract there are wintering holes, which also require protection.

Gymnocephalus acerina is the other protected fish species recorded on Horbacykha tract in deep pits (Figure 12). *Gymnocephalus acerina* and *Leuciscus leuciscus* require stable ecological conditions for reproduction, the change of which leads to a drop in their numbers and impaired reproductive capacity (MOVCHAN 2011). In the past years, *Lota lota* Linnaeus, 1758 was recorded in the Desenka distributary (TKACHENKO et al. 2008). Its presence cannot be excluded near Horbacykha tract. Another important finding is a specimen of *Gymnocephalus baloni* near Dolobetskyi Island (PARNIKOZA et al. 2020). This species is poorly studied, but is included in the list of fish protected by the Bern Convention. It is a river bottom fish that lives in clean, well aerated, fast flowing river sections, mainly near steep banks. *Carassius carassius* Linnaeus, 1758 and *Misgurnus fossilis* were found in Chapline Lake (Table 3). These species live in additional river systems, such as old rivers and floodplain lakes, overgrown with submerged vegetation. Currently, most of what such water bodies in Kyiv have been destroyed as a result of city development.

Cobitis taenia, Linnaeus, 1758 (Figure 13) was found in the researched locations of the Desenka distributary and Rusanivske Lake. It prefers coastal areas of water bodies with moderate current and sandy or muddy-sandy substrate. Its characteristic feature is the ability to exist in lotic and lentic biocenoses, i.e. the species is plastic to different habitats. However, the *Misgurnus fossilis* suffers from the biotic influence of invasive fish species, in particular representatives of the Ponto-Caspian faunal complexes and *Perccottus glenii* Dubowsky, 1877 (KUTSOKON et al. 2021).



Fig. 11. *Leuciscus leuciscus* – a representative of the rheophilic group of fish (listed in the Red Book of Ukraine), which inhabits parts of the Desenka distributary near to sandy beaches, where there is a current

Source: photo by M. Prychepa

Specimens of *Aspius aspius* of different ages are regularly recorded in places with a current.



Fig. 12. *Gymnocephalus acerinus*, a representative of the rheophilic group of fish (included in the Red Book of Ukraine), which inhabits the deep parts of the Desenka distributary

Source: photo by M. Prychepa



Fig. 13. *Cobitis taenia*, representative of limnophilic-rheophilic fish complex (included in Resolution 6 of the Bern Convention)

Source: photo by M. Prychepa

One of the main factors limiting the number of native rheophilic species is the regulation of rivers and disruption of the normal functioning of spawning grounds, in particular, their destruction during the transformation littoral zone. Due to the geographical location of Dolobetsky Island, two arms are formed near Horbachykha tract (VISHNEVSKY 2021). This creates favourable biotope conditions for the existence and reproduction of rheophilic species. In most water bodies, populations of rheophilic species of the Dnipro floodplain were significantly affected by natural regime transformation. 63.2% of total fauna of rheophiles of Kyiv's water bodies are concentrated in the water area of Desenka within Horbachykha tract. Among them, most have a protected status (included in Appendices II and III of the Bern Convention, Resolution 6 and the Red Book of Ukraine) and form the core of rare species.

Among the studied rare species, the largest fraction has the *Rhodeus amarus* (86.6%) (Table 3). The least represented species are *Carassius carassius*, *Cobitis taenia* and *Misgurnus fossilis*, whose proportion ranged from 0.3 to 0.8%.

Table 3

Species that have the status of protection (14 species in total) in the reservoirs and watercourses of Horbachykha tract, Kyiv

Species	Biotops	Conservation status	Proportion [%]
1	2	3	4
<i>Leucaspius delineatus</i>	Desenka water area	Appendix III of the Bern Convention*	3.3
<i>Leuciscus leuciscus</i>	Desenka water area	The Red Book of Ukraine***	2.3
<i>Idus idus</i>	Desenka water area	The Red Book of Ukraine***	2.5
<i>Aspius aspius</i>	Desenka water area	Appendix III of the Bern Convention* Resolution 6 of the Bern Convention**	1.5
<i>Ballerus ballerus</i>	Desenka water area	Appendix III of the Bern Convention**	0.5
<i>Ballerus sapa</i>	Desenka water area	Appendix III of the Bern Convention*	0.3
<i>Pelecus cultratus</i>	Desenka water area	Appendix III of the Bern Convention*, Resolution 6 of the Bern Convention**	3.1
<i>Rhodeus amarus</i>	Riparian vegetation of Chapline Lake, inner bays of the tract	Appendix III of the Bern Convention*, Resolution 6 of the Bern Convention**	83.2
<i>Carassius carassius</i>	Riparian vegetation of Chapline Lake	The Red Book of Ukraine***	0.3

cont. Table 3

1	2	3	4
<i>Cobitis taenia</i>	Desenka water area	Appendix 3 of the Bern Convention*, Resolution 6 of the Bern Convention**	0.5
<i>Misgurnus fossilis</i>	Riparian vegetation of Chapline Lake	Resolution 6 of the Bern Convention**	0.8
<i>Silurus glanis</i>	Desenka water area	Appendix III of the Bern Convention*	0.5
<i>Gymnocephalus acerinus</i>	Desenka water area	The Red Book of Ukraine***	1.0
<i>Gymnocephalus baloni</i>	Desenka water area	Resolution 6 of the Bern Convention**	0,3

Explanations: *Godlevska et al (2010); **Vasylyuk et al (2010); ***Order of the Ministry of Environmental... No. 29 of January 19, 2021

Based on the results of ichthyofauna research, the distribution of species in relation to the current was analysed. It was established that the majority of rare species are rheophiles (61.5%). Limnophiles and indifferent accounted for 15.4 and 23.1% (Figure 14).

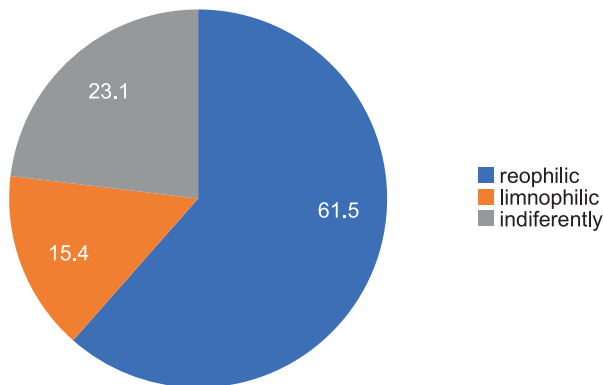


Fig. 14. Fractions [%] of rare fish species depending on biotope in the reservoirs and watercourses of Horbachykha tract, Kyiv

Amphibians and reptiles

According to data (NEKRASOVA 2008, NEKRASOVA 2010), 10 species of amphibians have been registered within the Dnipro floodplain in Kyiv. Amphibians and reptiles are a group of animals sensitive to environmental conditions. This is evidenced by the decline in the number of certain species in river floodplains since the 1940s in European countries (GONÇALVES et al. 2016, SHULSE et al. 2010). This is due to the reduction

of biotopes suitable for breeding as a result of habitat destruction. It's true for the *Bombina bombina* Linnaeus, 1758 (Bern Convention), which is reducing its range as a result of a decrease in the number of biotopes typical for the species, such as old rivers and temporary reservoirs (PUPINA et al 2018).

Batrachofauna of studied tract includes 7 species: *Lissortiton vulgaris* Linnaeus, 1758, *Bombina bombina*, *Pelobates fuscus* Laurenti, 1768, *Bufo bufo* Linnaeus, 1758, *Rana arvalis* Nilsson, 1842, *Pelophylax ridibundus* Pallas, 1771, *Hyla arborea* Linnaeus, 1758. The registered species are distributed in water and forest biotopes. For comparison, 5–7 species were found in similar biocenoses located on the Zhukiv, Muromets, and Trukhaniv islands (PARNIKOZA, 2020). Herpetofauna is represented by 3 species: *Lacerta agilis* Linnaeus, 1758, *Emys orbicularis* Linnaeus, 1758, *Natrix natrix* Linnaeus, 1758. The most typical representative of the reptile taxon in the tract is *Emys orbicularis*. Different age groups of this species were found in significant numbers in Chaplyne Lake. Currently, this species is vulnerable, especially at the borders of its range, since, in addition to changing climatic conditions (NEKRASOVA et al. 2021). All species of amphibians and reptiles are subject to protection and are included in Appendixes II and III of the Bern Convention.

Avifauna

227 species have been registered in the avifauna of the Dnipro floodplain (PARNIKOZA et al 2020). We recorded a significant species diversity of rare or endangered birds. The avifauna of Horbachykha tract is represented by 144 species belonging to 40 families (37.6% of total avifauna of Kyiv). Most species of avifauna are representatives of forest biotopes. The presence of floodplain forests on the area of the tract has a significant impact on the formation of the ornithocomplex and its structure. In general, these are typical representatives of the Dnipro floodplain: *Columbia polumbus* Linnaeus, 1758, *Streptopelia turtur* Linnaeus, 1758, *Corvus corax* Linnaeus, 1758, *Certhia familiaris* Linnaeus, 1758, *Aegithalos caudatus* Linnaeus, 1758, *Parus palustris* Linnaeus, 1758, *Coccothraustes coccothraustes* Linnaeus, 1758, *Fringila coelebs* Linnaeus, 1758, *Turdus philomelos* C.L. Brehm, 1831, *Oriolus oriolus* Linnaeus, 1758, *Sylvia atricapilla* Linnaeus, 1758, *Erithacus rubecula*, Linnaeus, 1758, *Troglodytes troglodytes*, Linnaeus, 1758, *Phylloscopus sibilatrix* Bechstein, 1793, *Ficedula albicollis* Temminck, 1815, *Muscicapa striata* Pallas, 1764. To a large extent, the avifaunistic complex of the Horbachykha tract is similar to the

rest of the Dnipro islands, in particular Muromets, Trukhaniv, Zhukiv Islands, and Hydropark (connected Dolobucky and Venetian Islands) (KOSTUSHYN 1994). That is why an important stage in the formation of an eco-network is the creation of local protected tracts with a protective status in order to preserve typical and rare representatives of the bird fauna. Given the total pressure of the city on various components of the biota, this disrupts migration processes and fragments biotopes (construction of roads, houses, entertainment centres). A small participation of meadow birds compared to the Muromets Island is related to the peculiarities of the local vegetation. In general, there are nesting groups of campophile birds in open areas: *Emberiza citrinella* Linnaeus, 1758, *Saxicola rubetra* Linnaeus, 1758, *Motacilla flava* Linnaeus, 1758, *Lanius collurio* Linnaeus 1758. As for wetland species, the Desenka water area is visited by many representatives of Charadriiformes during trophic migrations, which increases the general biodiversity of the tract compared to Trukhaniv Island or the Hydropark, where, as a result of excessive recreation and construction of a large part of the coastal strip, this species stopped relatively rarely. It should be noted that the dominance of alluvial forests in the landscape-biotope structure of the Horbachykha tract creates favourable conditions for migrating and wintering of forest birds. In the future, a detailed description of the rare avifauna of the Horbachykha tract will be carried out, in particular connections with the landscapes and biotopes.

The fraction of Horbachykha's rare species is 24.8%. In the researched biotopes of the tract, 67 species are nesting, which is slightly higher than the faunal indicators of the avifauna of Veliky (Pivnichny) Island, Muromets, Trukhaniv, Hydropark, where 36-55 bird species are concentrated (KOSTUSHYN 1994). It should be noted that a significant fraction of nesting species is hollow nesting birds, which is 13.2% (19 species). Piciformes made up 10.4% (7 species) Especially important are the findings of nesting settlements of the *Picus canus* Gmelin, 1788 and the *Dryocopus martius* Linnaeus, 1758 (Resolution 6 of the Bern Convention). These species for nesting use alluvial poplar and willow forests (Table 4).

On the Desenka tributary and Chaplyne Lake, there are species that are biotopically adapted to aquatic and coastal biotopes, in particular, ichthyophages (Ardeidae and Laridae), which used them during foraging migrations (Table 4). During the winter period, representatives of the Anatidae family can be found on open water: *Anas crecca* Linnaeus, 1758, *Bucephala clangula* Linnaeus, 1758, *Aythya fuligula* Linnaeus, 1758, *Mergus albellus* Linnaeus, 1758, *Mergus serrator* Linnaeus, 1758, *Mergus merganser* Linnaeus, 1758.

It should be noted about the nesting colonies (10–15 pairs) of the *Chlidonias hybrida* Pallas, 1811 located on a *Trapa natans* cover south of the Horbachykha tract. Every year, the *Haematopus ostralegus* Linnaeus, 1758 (The Red Book of Ukraine) is observed on flooded stumps along the Desenka distributary. There are conditions allowing us to believe that the species periodically nests within the floodplain.

Table 4

Species that have the status of protection (132 birds' species in total) registered on Horbachykha tract, Kyiv

Species	Biotope	Conservation status
1	2	3
<i>Gavia arctica</i> Linnaeus, 1758	channel part of the river	Appendix II of the Bern Convention Council Directive 2009/147/EC on the conservation of wild birds, Appendix II of the Bonn Convention*, Resolution 6 of the Bern Convention**
<i>Podiceps nigricollis</i> C.L. Brehm, 1831	channel part of the river	Appendix II of the Bern Convention, Appendix II of the Bonn Convention*
<i>Podiceps cristatus</i> Linnaeus, 1758	channel part of the river	Appendix II of the Bern Convention, Appendix II of the Bonn Convention*
<i>Podiceps ruficollis</i> Pallas, 1764	channel part of the river	Appendix II of the Bern Convention, Appendix II of the Bonn Convention*
<i>Phalacrocorax carbo</i> Linnaeus, 1758	channel part of the river	Appendix II of the Bern Convention*
<i>Ardea cinerea</i> Linnaeus, 1758	riparian vegetation	Appendix II of the Bern Convention*
<i>Egretta alba</i> Linnaeus, 1758	riparian vegetation	Appendix II of the Bern Convention, Council Directive 2009/147/EC on the conservation of wild birds, Appendix II of the Bonn Convention*, Resolution 6 of the Bern Convention**
<i>Nycticorax nycticorax</i> Linnaeus, 1758	wetland shrubs	Appendix II of the Bern Convention*, Resolution 6 of the Bern Convention**
<i>Ixobrychus minutus</i> Linnaeus, 1766	riparian vegetation	Appendix II of the Bern Convention, Appendix II of the Bonn Convention, Council Directive 2009/147/EC on the conservation of wild birds* Resolution 6 of the Bern Convention**
<i>Ciconia ciconia</i> Linnaeus, 1758	channel part of the river	Appendix II of the Bern Convention, Appendix II of the Bonn Convention
<i>Anser anser</i> Linnaeus, 1758	riparian vegetation	Appendix II of the Bern Convention, Appendix I and II of the Bonn Convention*
<i>Anser albifrons</i> Scopoli, 1769	channel part of the river	Appendix II of the Bern Convention, Appendix I and II of the Bonn Convention*
<i>Cygnus olor</i> Gmelin, 1789	channel part of the river	Appendix III 3 of the Bern Convention, Appendix II of the Bonn Convention*

cont. Table 4

1	2	3
<i>Anas platyrhynchos</i> Linnaeus, 1758	riparian vegetation	Appendix III of the Bern Convention, Appendix II of the Bonn Convention*
<i>Anas crecca</i> Linnaeus, 1758	riparian vegetation	Appendix III of the Bern Convention, Appendix II of the Bonn Convention*
<i>Anas querquedula</i> Linnaeus, 1758	riparian vegetation	Appendix III of the Bern Convention, Appendix II of the Bonn Convention*
<i>Anas penelope</i> Linnaeus, 1758	channel part of the river	Appendix III of the Bern Convention, Appendix II of the Bonn Convention*
<i>Aythya fuligula</i> Linnaeus, 1758	channel part of the river	Appendix III of the Bern Convention, Appendix II of the Bonn Convention*
<i>Bucephala clangula</i> Linnaeus, 1758	channel part of the river	The Red Book of Ukraine***, Appendix III of the Bern Convention, Appendix II of the Bonn Conven- tion*
<i>Mergus albellus</i> Linnaeus, 1758	channel part of the river	Appendix II of the Bern Convention, Appendix I, II of the Bonn Convention*
<i>Mergus merganser</i> Linnaeus, 1758	channel part of the river	Appendix III of the Bern Convention, Appendix I, II of the Bonn Convention*
<i>Mergus serrator</i> Linnaeus, 1758	channel part of the river	The Red Book of Ukraine***, Appendix III of the Bern Convention, Appendix I, II of the Bonn Convention*
<i>Pandion haliaetus</i> Linnaeus, 1758	channel part of the river	The Red Book of Ukraine***, Appendix II of the Bern Convention, Appendix II of the Bonn Conven- tion *
<i>Pernis apivorus</i> Linnaeus, 1758	alluvial forests	Council Directive 2009/147/EC on the conservation of wild birds, Appendix II of the Bern Convention, Appendix I, II of the Bonn Convention* Resolution 6 of the Bern Convention**
<i>Milvus migrans</i> Bodaert, 1783	alluvial forests	The Red Book of Ukraine***, European Red List*, Appendix 2 of the Bern Convention, Appendix I, II of the Bonn Convention*
<i>Circus cyaneus</i> Linnaeus, 1758	open habitats	Council Directive 2009/147/EC on the conservation of wild birds, The Red Book of Ukraine***, Appendix II of the Bern Convention, Appendix I, II of the Bonn Convention*
<i>Circus pygargus</i> Linnaeus, 1758	open habitats	The Red Book of Ukraine*** Appendix II of the Bern Convention, Appendix II of the Bonn Convention*
<i>Circus aeruginosus</i> Linnaeus, 1758	open habitats	Council Directive 2009/147/EC on the conservation of wild birds, Appendix II 2 of the Bern Conven- tion*, Appendix II of the Bonn Convention*, Resolution 6 of the Bern Convention**

cont. Table 4

1	2	3
<i>Accipiter gentilis</i> Linnaeus, 1758	alluvial forests	Appendix II of the Bern Convention, Appendix II of the Bonn Convention*
<i>Accipiter nisus</i> Linnaeus, 1758	alluvial forests	Appendix II of the Bern Convention, Appendix II of the Bonn Convention*
<i>Buteo buteo</i> Linnaeus, 1758	open habitats	Appendix II of the Bern Convention, Appendix II of the Bonn Convention*
<i>Buteo lagopus</i> Pontoppidan, 1763	open habitats	Appendix II of the Bern Convention, Appendix II of the Bonn Convention*
<i>Circaetus gallicus</i> Gmelin, 1788	open habitats	Council Directive 2009/147/EC on the conservation of wild birds, Appendix II of the Bern Convention, Appendix II of the Bonn Convention*, The Red Book of Ukraine***
<i>Aquila pomarina</i> C.L.Brehm, 1831	open habitats	Council Directive 2009/147/EC on the conservation of wild birds, The Red Book of Ukraine, Appendix II of the Bern Convention, Appendix II of the Bonn Convention* Resolution 6 of the Bern Convention**
<i>Haliaeetus albicilla</i> Linnaeus, 1758	channel part of the river	Council Directive 2009/147/EC on the conservation of wild birds, The Red Book of Ukraine, Appendix II of the Bern Convention, Appendix II of the Bonn Convention*, Resolution 6 of the Bern Convention**
<i>Falco subbuteo</i> Linnaeus, 1758	open habitats	Appendix II of the Bern Convention, Appendix II of the Bonn Convention*
<i>Falco tinnunculus</i> Linnaeus, 1758	open habitats	Appendix II of the Bern Convention, Appendix II of the Bonn Convention*
<i>Falco vespertinus</i> Linnaeus, 1766	open habitats	Council Directive 2009/147/EC on the conservation of wild birds, IUCN, European Red List, Appendix II of the Bern Convention, Appendix II of the Bonn Convention*, Resolution 6 of the Bern Convention**
<i>Porzana porzana</i> (Linnaeus, 1758)	riparian vegetation	Appendix II of the Bern Convention, Appendix II of the Bonn Convention*
<i>Fulica atra</i> Linnaeus, 1758	riparian vegetation	Appendix II of the Bern Convention, Appendix II of the Bonn Convention*
<i>Gallinula chloropus</i> Linnaeus, 1758	riparian vegetation	Appendix III of the Bern Convention*
<i>Grus grus</i> Linnaeus, 1758	open habitats	Appendix II of the Bern Convention* The Red Book of Ukraine***, Appendix II of the Bonn Convention*
<i>Charadrius dubius</i> Scopoli, 1786	channel part of the river	Appendix II of the Bern Convention, Appendix II of the Bonn Convention*

cont. Table 4

1	2	3
<i>Tringa ochropus</i> Linnaeus, 1758	channel part of the river, chaplyne lake	Appendix II of the Bern Convention, Appendix I, II of the Bonn Convention
<i>Tringa glareola</i> Linnaeus, 1758	channel part of the river, chaplyne lake	Appendix II of the Bern Convention, Appendix I, II of the Bonn Convention
<i>Tringa nebularia</i> Gunnerus, 1767	channel part of the river	Appendix III of the Bern Convention, Appendix I, II of the Bonn Convention*
<i>Actitis hypoleucos</i> Linnaeus, 1758	channel part of the river	Appendix II of the Bern Convention, Appendix I, II of the Bonn Convention*
<i>Philomachus pugnax</i> Linnaeus, 1758	channel part of the river	Appendix III of the Bern Convention, Appendix I, II of the Bonn Convention, Council Directive 2009/147/EC on the conservation of wild birds*, Resolution 6 of the Bern Convention**
<i>Calidris alpina</i> Linnaeus, 1758	channel part of the river	Appendix II of the Bern Convention, Appendix I, II of the Bonn Convention*
<i>Calidris ferruginea</i> Pontoppidan, 1763	channel part of the river	Appendix II of the Bern Convention, Appendix 1, 2 of the Bonn Convention*
<i>Scelopax rusticola</i> Linnaeus, 1758	alluvial forests	Appendix III of the Bern Convention, Appendix I, II of the Bonn Convention*
<i>Larus minutus</i> Pallas, 1776	channel part of the river	Appendix II of the Bern Convention*
<i>Larus ridibundus</i> Linnaeus, 1758	channel part of the river	Appendix III of the Bern Convention*
<i>Larus canus</i> Linnaeus, 1758	channel part of the river	Appendix III of the Bern Convention*
<i>Chlidonias hybrida</i> Pallas, 1811	channel part of the river	Appendix III of the Bern Convention Council Directive 2009/147/EC on the conservation of wild birds*, Resolution 6 of the Bern Convention**
<i>Chlidonias leucopterus</i> Temminck, 1815	channel part of the river	Appendix II of the Bern Convention, Appendix II of the Bonn Convention Council Directive 2009/147/EC on the conservation of wild birds*, Resolution 6 of the Bern Convention**
<i>Chlidonias niger</i> Linnaeus, 1758	channel part of the river	Appendix II of the Bern Convention, Appendix II of the Bonn Convention Council Directive 2009/147/EC on the conservation of wild birds*, Resolution 6 of the Bern Convention**
<i>Hydroprogne caspia</i> Pallas, 1779	channel part of the river	Appendix II of the Bern Convention Council Directive 2009/147/EC on the conservation of wild birds, Appendix II of the Bonn Convention*, The Red Book of Ukraine***, Resolution 6 of the Bern Convention**,

cont. Table 4

1	2	3
<i>Sterna albifrons</i> Linnaeus, 1758	channel part of the river	Appendix II of the Bern Convention Council Directive 2009/147/EC on the conservation of wild birds, Appendix II of the Bonn Convention*, The Red Book of Ukraine***, Resolution 6 of the Bern Convention**
<i>Sterna hirundo</i> Linnaeus, 1758	channel part of the river	Appendix II of the Bern Convention Council Directive 2009/147/EC on the conservation of wild birds, Appendix II of the Bonn Convention*, Resolution 6 of the Bern Convention**
<i>Streptopelia decaocto</i> Frisvaldsky, 1838	alluvial forests	Appendix III of the Bern Convention*
<i>Streptopelia turtur</i> Linnaeus, 1758	alluvial forests	Appendix III of the Bern Convention*
<i>Cuculus canorus</i> Linnaeus, 1758	riparian vegetation	Appendix III of the Bern Convention*
<i>Asio otus</i> Linnaeus, 1758	alluvial forests	Appendix III of the Bern Convention*
<i>Strix aluco</i> Linnaeus, 1758	alluvial forests	Appendix II of the Bern Convention*
<i>Otus scops</i> Linnaeus, 1758	open habitats	The Red Book of Ukraine***, Appendix II of the Bern Convention*
<i>Apus apus</i> Linnaeus, 1758	open habitats	Appendix II of the Bern Convention*
<i>Alcedo atthis</i> Linnaeus, 1758	channel part of the river, chapllyne lake	Appendix II of the Bern Convention, Council Directive 2009/147/EC on the conservation of wild birds*, Resolution 6 of the Bern Convention**
<i>Merops apiaster</i> Linnaeus, 1758	open habitats	Appendix II of the Bern Convention, Appendix II of the Bonn Convention*
<i>Upupa epops</i> Linnaeus, 1758	alluvial forests	Appendix II of the Bern Convention*
<i>Junco torquilla</i> Linnaeus, 1758	alluvial forests	Appendix II of the Bern Convention*
<i>Dryocopus martius</i> Linnaeus, 1758	alluvial forests	Appendix II of the Bern Convention, Council Directive 2009/147/EC on the conservation of wild birds*, Resolution 6 of the Bern Convention**
<i>Picus canus</i> Gmelin, 1788	alluvial forests	Appendix II of the Bern Convention Council Directive 2009/147/EC on the conservation of wild birds*, Resolution 6 of the Bern Convention**
<i>Dendrocopos major</i> Linnaeus, 1758	alluvial forests	Appendix II of the Bern Convention*
<i>Dendrocopos minor</i> Linnaeus, 1758	alluvial forests	Appendix II of the Bern Convention*

cont. Table 4

1	2	3
<i>Dendrocopos syriacus</i> Hemprich et Ehrenberg, 1833)	alluvial forests	Appendix II of the Bern Convention Council Directive 2009/147/EC on the conservation of wild birds*, Resolution 6 of the Bern Convention**
<i>Dendrocopos medius</i> Linnaeus, 1758	alluvial forests	Council Directive 2009/147/EC on the conservation of wild birds*, Resolution 6 of the Bern Convention**
<i>Riparia riparia</i> Linnaeus, 1758	channel part of the river	Appendix II of the Bern Convention*
<i>Hirundo rustica</i> Linnaeus, 1758	open habitats	Appendix II of the Bern Convention*
<i>Delichon urbica</i> Linnaeus, 1758	open habitats	Appendix II of the Bern Convention*
<i>Motacilla flava</i> Linnaeus, 1758	open habitats	Appendix II of the Bern Convention*
<i>Motacilla alba</i> Linnaeus, 1758	channel part of the river	Appendix II of the Bern Convention*
<i>Lanius collurio</i> Linnaeus, 1758	open habitats	Appendix II of the Bern Convention, Council Directive 2009/147/EC on the conservation of wild birds*, Resolution 6 of the Bern Convention**
<i>Lanius excubitor</i> Linnaeus 1758	open habitats	Appendix II of the Bern Convention, The Red Book of Ukraine***, Resolution 6 of the Bern Convention**
<i>Oriolus oriolus</i> Linnaeus, 1758	alluvial forests	Appendix II of the Bern Convention*
<i>Corvus corax</i> Linnaeus, 1758	alluvial forests	Appendix III of the Bern Convention*
<i>Bombucilla garrulus</i> Linnaeus, 1758	alluvial forests	Appendix II of the Bern Convention*
<i>Troglodytes troglodytes</i> Linnaeus, 1758	alluvial forests	Appendix II of the Bern Convention*
<i>Acrocephalus scirpaceus</i> Hermann, 1804	riparian vegetation	Appendix II of the Bern Convention*
<i>Acrocephalus arundina- ceus</i> Linnaeus, 1754	riparian vegetation	Appendix II of the Bern Convention*
<i>Hippolais icterina</i> Vieillot, 1817	alluvial forests	Appendix II of the Bern Convention*
<i>Sylvia atricapilla</i> Linnaeus, 1758	alluvial forests	Appendix II of the Bern Convention*
<i>Sylvia borin</i> Boddaert, 1783	alluvial forests	Appendix II of the Bern Convention*

cont. Table 4

1	2	3
<i>Sylvia communis</i> Latham, 1787	open habitats	Appendix II of the Bern Convention*
<i>Phylloscopus trochilus</i> Linnaeus, 1758	alluvial forests	Appendix II of the Bern Convention*
<i>Phylloscopus sibilatrix</i> Bechstein, 1793	alluvial forests	Appendix II of the Bern Convention*
<i>Phylloscopus collubita</i> Vieillot, 1817	alluvial forests	Appendix II of the Bern Convention*
<i>Regulus regulus</i> Linnaeus, 1758	alluvial forests	Appendix II of the Bern Convention*
<i>Ficedula albicollis</i> Temminck, 1815	alluvial forests	Appendix II of the Bern Convention*
<i>Ficedula hypoleuca</i> Pallas, 1764	alluvial forests	Appendix II of the Bern Convention*
<i>Muscicapa striata</i> Pallas, 1764	alluvial forests	Appendix II of the Bern Convention*
<i>Saxicola rubecula</i> Linnaeus, 1758	open habitats	Appendix II of the Bern Convention*
<i>Oenathe oenathe</i> Linnaeus, 1758	open habitats	Appendix II of the Bern Convention*
<i>Phoenicurus phoenicurus</i> Linnaeus, 1758	sparse forest in floodplain	Appendix II of the Bern Convention, Appendix II of the Bonn Convention*
<i>Luscinia luscinia</i> Linnaeus, 1758	alluvial forests	Appendix II of the Bern Convention, Appendix II of the Bonn Convention*
<i>Luscinia svecica</i> Linnaeus, 1758	wetland shrubs	Appendix II of the Bern Convention, Appendix II of the Bonn Convention, Council Directive 2009/147/EC on the conservation of wild birds, * Resolution 6 of the Bern Convention**
<i>Turdus iliacus</i> Linnaeus, 1758	alluvial forests	Appendix II of the Bern Convention*
<i>Turdus merula</i> Linnaeus, 1758	alluvial forests	Appendix II of the Bern Convention*
<i>Turdus pilaris</i> Linnaeus, 1758	alluvial forests	Appendix II of the Bern Convention*
<i>Turdus philomelos</i> C.I.Brehm, 1831	alluvial forests	Appendix II of the Bern Convention*
<i>Turdus viscivorus</i> Linnaeus, 1758	alluvial forests	Appendix II of the Bern Convention*
<i>Aegithalos caudatus</i> Linnaeus, 1758	alluvial forests	Appendix II of the Bern Convention*

cont. Table 4

1	2	3
<i>Parus palustris</i> Linnaeus, 1758	alluvial forests	Appendix II of the Bern Convention*
<i>Parus cristatus</i> Linnaeus, 1758	alluvial forests	Appendix II of the Bern Convention*
<i>Parus ater</i> Linnaeus, 1758	alluvial forests	Appendix II of the Bern Convention*
<i>Parus caeruleus</i> Linnaeus, 1758	alluvial forests	Appendix II of the Bern Convention*
<i>Parus major</i> Linnaeus, 1758	alluvial forests	Appendix II of the Bern Convention*
<i>Sitta europaea</i> Linnaeus, 1758	alluvial forests	Appendix II of the Bern Convention*
<i>Certhia familiaris</i> Linnaeus, 1758	alluvial forests	Appendix II of the Bern Convention*
<i>Passer montanus</i> Linnaeus, 1758	alluvial forests	Appendix II of the Bern Convention*
<i>Fringilla coelebs</i> Linnaeus, 1758	alluvial forests	Appendix II of the Bern Convention*
<i>Fringilla montifringilla</i> Linnaeus, 1758	alluvial forests	Appendix II of the Bern Convention*
<i>Chloris chloris</i> Linnaeus, 1758	alluvial forests	Appendix II of the Bern Convention*
<i>Spinus spinus</i> Linnaeus, 1758	alluvial forests	Appendix II of the Bern Convention*
<i>Carduelis carduelis</i> Linnaeus, 1758	alluvial forests	Appendix II of the Bern Convention*
<i>Acanthis cannabina</i> Linnaeus, 1758	alluvial forests	Appendix II of the Bern Convention*
<i>Pyrrhula pyrrhula</i> Linnaeus, 1758	alluvial forests	Appendix II of the Bern Convention*
<i>Coccothraustes cocco-</i> <i>thraustes</i> Linnaeus, 1758	alluvial forests	Appendix II of the Bern Convention*
<i>Emberiza citrinella</i> Linnaeus, 1758	open habitats	Appendix II of the Bern Convention*
<i>Emberiza schoeniclus</i> Linnaeus, 1758	open habitats	Appendix II of the Bern Convention*
<i>Emberiza calandra</i> Linnaeus, 1758	open habitats	Appendix II of the Bern Convention*

Notes: *Godlevska et al 2010, **Vasylyuk et al (2019), ***Order of the Ministry of Environmental... No. 29 of January 19, 2021.

The distribution of rare bird species analysis shown that the largest number of bird species was recorded in two biotopes – alluvial forests and open habitats, with a fraction of 71.0 % and 12.9 %, respectively (Figure 15).

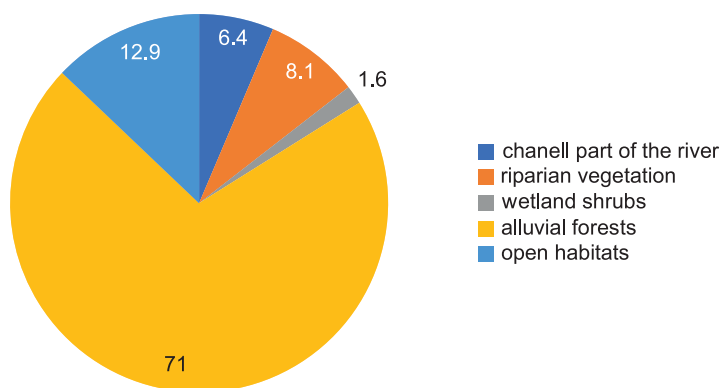


Fig. 15. Fractions [%] of bird's species in different biotopes of Horbachykha tract, Kyiv

Nesting of 44 species of birds was recorded in Horbachykha's forest biotopes. The nesting of the *Dendrocopos syriacus* Hemprich et Ehrenberg, 1833 and the *Dendrocopos medius* Linnaeus, 1758 also has been recorded in gallery forests along the Desenka distributary. The habitats of *D. medius* Linnaeus, 1758 are mostly associated with very important ill and died trees. The species often inhabits alluvial forests with shrubs of *Populus nigra* and *Salix* sp.

During 2021, nesting of the *Otus scops* Linnaeus, 1758 (The Red Book of Ukraine, Order of the Ministry of Environmental... № 29 of January 19, 2021) was observed. It is a rare bird found in small numbers in the Kyiv region. It is mainly an inhabitant of southern Ukraine (FESENKO BOKOTEY 2002). The birds used to nest on sparse poplar forest edges. Until 1982, it was widespread within Kyiv as a breeding bird (LOPAREV 1996), but according to (ATAMAS et al 2012), it was recorded only on Kozachyi Island as of the late 90s. For a long time, the species has not been observed on the Dnipro floodplain. This may be due to the intensive cutting down of green zones for buildings and the transformation of biotopes typical for the bird.

Some rare birds of prey are represented by the *Circus aeruginosus* Linnaeus, 1758 (Bern Convention) and the *Milvus migrans* Boddaert, 1783 (The Red Book of Ukraine, Order of the Ministry of Environmental... No. 29 of January 19, 2021) have been observed several times on foraging migration, in particular along the Desenka distributary.

The Horbachykha tract, like the other islands (Zhukiv Island, Trukhaniv Island and Kozachyi Island) and tracts of the Dnipro River, is

a key element of the Dnipro Ecological Corridor, through which birds of prey make their annual migrations (DOMASHEVSKY and DEMIDENKO 2009, DUBROVSKYI et al. 2008). 14 migratory species of prey birds were detected at one of the stations over the period of September-October 2022 (Table 5). 12 of it belonged to the Accipitridae and 2 to the Falconidae. The dominant species among transit migrants was the *Buteo buteo* Linnaeus, 1758 with a share of 72.1%. The percentage of the *Pernis apivorus* Linnaeus, 1758, the *Accipiter nisus* Linnaeus, 1758, the *Circus cyaneus* Linnaeus, 1766 and the *Falco subbuteo* Linnaeus, 1758 was 4.1–5.1 % (Table 5).

Table 5
Migrating birds of prey (14 species of total) on Horbachykha tract, Kyiv (2022)

Species	Number of specimens	Fraction of each species [%]
<i>Aquila pomarina</i> **	5	2.57
<i>Haliaeetus albicilla</i> **+	2	1.03
<i>Circaetus gallicus</i> **+	2	1.03
<i>Pernis apivorus</i> +	8	4.12
<i>Buteo buteo</i> *	140	72.16
<i>Buteo lagopus</i> +	2	1.03
<i>Accipiter nisus</i> +	8	4.12
<i>Accipiter gentilis</i> *	1	0.51
<i>Circus aeruginosus</i> +	4	2.06
<i>Circus pygargus</i> **+	1	0.52
<i>Circus cyaneus</i> **+	10	5.15
<i>Milvus migrans</i> **	2	1.03
<i>Falco vespertinus</i> ///	1	0.51
<i>Falco subbuteo</i> +	8	4.12
Total	194	100

Explanations: Table 5 shows species protected by the Bonn Convention (protection of migratory animals) – +; species listed in the IUCN – ///; species listed in the Red Book of Ukraine Order of the Ministry of Environmental... No. 29 of January 19, 2021**

The survey identified 53 species of birds protected by the Bonn Convention. To ensure the reliability of the migratory corridor for migratory birds, which have adapted to certain landmarks of the Desenka distributary floodplain in the process of phylogenesis, it is necessary to secure a reliable transit route.

According to the bird's species status, we recorded 62 breeding, 21 summering, and 3 probably breeding and 46 migrating species. The rest are passing and migratory and were recorded in varying numbers during the observation periods (Figure 16). Among the migratory and nesting species which were recorded in the Horbakykha tract biotopes, 32–34 were wintering.

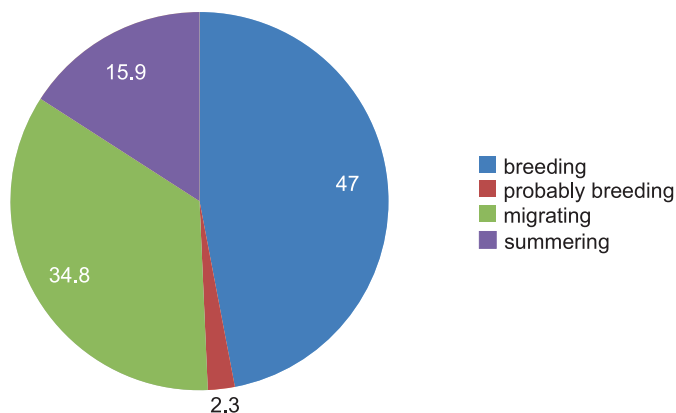


Fig. 16. Fractions [%] of rare bird species by status recorded on Horbakykha tract, Kyiv

Mammals

In the floodplain biotopes of Horbakykha tract, there is also a characteristic mammal fauna. Currently, it is poorly and in particular, following animals were recorded: *Castor fiber* Linnaeus, 1758*; *Erinaceus roumanicus* Barrett Hamilton, 1900; *Sorex araneus* Linnaeus, 1758;* *Lepus europaeus* Pallas, 1778;* *Neogale vison* Schreber, 1777; *Vulpes vulpes* Linnaeus, 1758 (PARNIKOZA and ZAGORODNIUK 2021). Species marked with an asterisk are protected by Appendix III to the Bern Convention (GODLEVSKA et al 2010).

Among the mammals, a settlement of *Castor fiber* (melanistic) in the tract has been recorded. The Desenka distributary is also home to the common beaver. *Castor fiber* is the species with high indicatory significance in Kyiv Dnipro floodplane (PARNIKOZA and ZAGORODNIUK 2021).

Current state and recommendations for Horbakykha tract protection
 Today, a difficult situation has developed in the Horbakykha tract. At present, most of the area of the tract has been allocated for residential buildings, which cannot be allowed. Only the coastal strip remained free from the construction's plans. Considering this it is necessary to implement the protection of the tract in several stages. At the first stage, it is

necessary to declare the coastal strip of the tract, which has not yet been distributed for construction, a landscape reserve of local importance. In the future, through court, it is necessary to return the lands of the Horbachykha tract distributed for residential construction to Kyiv city community. After that, the entire area of the tract of about 88 ha must be included in the landscape reserve of local significance. At the final stage, the Horbachykha, as a unique left-bank tract, should become part of the strictly protected zone and regulated recreation zone of the planned National Park “Dnipro Islands” (PARNIKOZA et al. 2020). This object with Horbachykha tract as component needs to be included in Emerald (Natura 2000) network.

Conclusions

The history of the formation of the Horbachykha, demonstrate that this tract initially was a natural island, and in result of Dnipro regulation in beginning of 20th century finally was formed as left bank floodplain tract, that in 1960–1970s lost the original flood regime. Flora of Horbachykha tract consist of 161 species of vascular plants (22% of whole Dnipro floodplane Kyiv flora); 7 rare species of plants and 8 rare vegetation communities were registered. So historical and botanical data confirms the fact that the tract had rests of aboriginal ecosystems and it`s very high value. Main part of ecosystems of this type were completely destroyed by the development of the left-bank part of the city. Horbachykha is the largest fragment of alluvial forests on the left bank of Kyiv. The existing biotopes of this tract form one of the key elements of the ecological corridor along the Dnipro floodplain.

Horbachykha tract have native and typical fauna of Dnipro floodplane. 14 species that have the status of protection of were found in watercourses and reservoirs; *Rhodeus amarus* occupies the largest percentage (83.2%) among rare fish species. The presence of 7 representatives of the rheophilic group indicates very important specific – conservation of hydrological regime. Among amphibians and reptiles, four species with a protected status were found. The avifauna is represented by 34 species of birds (12 are listed in the Red Book of Ukraine), 35.4% and 29.4% of which are adapted to channel areas of river and forest biotopes (alluvial forests) correspondingly. According to the status of stay, 9 species are breeding, 10 are flying, and the rest are migratory. The registration of nesting *Otus scops* is only one current and very important registration for whole Kyiv area. The presence of 54 species protected by the Bonn Convention, which protects migratory spe-

cies – is the strong reason to protect this tract as the part of whole migratory corridor. Several mammal species have been recorded within the research including *Castor fiber* – species with high indicatory significance.

A significant number of animals protected by Resolution 6 of the Bern Convention provide argument for including Horbacykha tract as part of the object Dnipro floodplain corridor, proposed as part of the Emerald (Natura 2000) Network.

Our research shows that the Horbacykha tract semi-natural area with documented natural origin is extremely valuable, in particular with regard to its biotope characteristics, vegetation and fauna. Initially this tract needs to be protected by creating a landscape reserve of local significance, and then by including it in the “Dnipro Islands” National Park.

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