Wetlands 'Zaymische' as a promising protected natural territories in the republic of Tatarstan

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Abstract: The article reviews the data of a comprehensive survey of wetlands of the Kuibyshev reservoir (Zelenodolsk district of Republic of Tatarstan). The study discusses wetlands as one of the key elements of the ecological frame of the city of Kazan and Republic of Tatarstan. Change of the status to reserve or national park is recommended for the conservation of wetlands.

1. Introduction

The Republic of Tatarstan is rich in water resources that could potentially be considered as objects of international importance. For instance, system of islands and shoals in the vicinity of Bulgars is present in the Perspective list of the Ramsar Convention. Many experts noted that taking into account the 'year of the water protection zones in Tatarstan' (2016), first and foremost there is a need to create protected areas of local and regional significance [1]. As protected areas were not created, the same task is on 'year of the environment and open spaces in Tatarstan Republic' (2017).

One of the areas that can be considered as potential protected area of Federal and regional importance is wetlands of the Kuibyshev reservoir in Zelenodolsk district of Tatarstan near Kazan. Territory includes Islands, peninsulas and shallow water; has a high natural value, social significance and could be included in the list of wetlands of international importance. The studied area is located in the left Bank of the Kuybyshev reservoir, on the border of Kazan (village Zaymische) and Zelenodolsky district (village Oktyabrsky). Is contains deep water area, Islands with shallow waters, inland lakes, canals and marshes.

Nowadays the water area is partially transformed as a result of reclamation of the artificial land. Reclamation work was carried out on an area of about 600 hectares. It still retains high natural value, social significance and could potentially be included in the list of wetlands of international importance.

It should be noted that right now shoal was formed 50 years ago with the creation of the Kuybyshev reservoir of the flooded territories of the Volga river basin. Currently, the area is covered with numerous Islands in the confluence of the Volga and Sviyaga rivers and it is one of the key centers of distribution of waterfowl and water birds, important fish species for the whole Middle Volga region.

During the course of hydraulic monitoring of the status of the territory (2014-2017) is was noted that these wetlands have a great potential for recovery in the absence of intense economic activity.

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This area can be recognized as one of the most promising protected areas in the Republic of Tatarstan, and measures to status change should be included to the 'year of ecology in Russia' program.

2. Results and discussion

Significance to form ecological frame of the city of Kazan and Republic of Tatarstan

The creation of a comfortable and supportive environment of vital functions of population is the main objective of spatial planning and urban development. Therefore, the adoption of economically feasible, environmentally and socially acceptable management decisions is impossible without the development of ecological-natural frame, guarantor of sustainable development of the territory [2].

For a city with population of over 1 million people there is a minimum of 25 % green space of the total area of the city. This is necessary to ensure the self-cleaning the air and creating a favorable environment for the life of citizens. At the same time, experts estimate the situation with the formation of ecological-natural frame in Kazan in recent years as unfavorable.

A natural complex of islands and peninsulas in the Zaymishche area is located on the border of the Kirov district of Kazan and the Zelenodolsk district of Tatarstan. In the immediate vicinity, at distance in 5 to 8 km there are boundaries of the Volga-Kama state natural biosphere reserve, state natural reserve "Sviyazhsky", urban forest Park "Lebyazhye" (protected areas of local importance), as well as buffer zone of the Volga-Kama biosphere reserve.

The mutual location of protected and green areas in this region clearly shows the value of the territory as a buffer and transit component of the ecological frame of Kazan and Republic of Tatarstan. In addition, the area is located at the intersection of the "green ring" of the city of Kazan and the "water arc". From this point of view it is not only a transit element, but also one of the key components of the ecological frame of the city.

Thus, the area of islands and shoals of the Kuibyshev reservoir near the Zaymishche and Oktyabrsky villages is one of the key components of the environmental frame of the Republic of Tatarstan linking urban ecological framework of city and national environmental frame.

Assessment of the current ecological status of wetlands

The comprehensive ecological survey of the territory was undertaken in 2014 with the participation of a group of researchers of Kazan (Volga) Federal University [3,4]. In addition, monitoring studies was conducted in 2015 – 2016. These studies identified more than 450 species of animals and plants. More than 50 species of plants and animals included in the Red Book (list of endangered species) of Russia, Red Book of the Tatarstan Republic, Red Books of Russian regions and the European list (Table 1).

The vegetation cover of the floodplain represented forest ecosystem types, meadow ecosystem types (grass, forb grass) as well as aquatic, riparian, lake and wetland ecosystems [4]. Botanical research in 2014 identified a list of 122 species of vascular plants, including 11 species of plants included in the Red book of Tatarstan: *Galatella rossica*, *Carex bohemica*, *Cladium mariscus*, *Scirpus radicans*, *Gentiana pneumonanthe*, *Senecio tataricus*, *Iris sibirica*, *Nyphoides peltata*, *Nympaea candida*, *Sparganium minimum*, *Salvinia natans*. They all have the 'Category 3' status of protection: rare species.

Study of the fauna of the region identified 3 species of mammals listed in the Red book of Tatarstan: *Myotis daubentoni*, *Vespertilio marinus*, *Mustera erminae*. In our studies, 17 species of mammals were observed; the mammal fauna is characterized by a mixture of wetland and forest component with the presence of some commensal species. During the course of avifauna studies we noted 92 species of birds. The following species are listed in the Red Book of Tatarstan: *Botaurus stellaris*, *Cygnus olor*, *Circus cyaneus*, *Circus pygargus*, *Haliaeetus albicilla*, *Columba oenas*, *Asio otus*, *Asio flammeus*, *Strix uralensis*, *Alce doatthis*, *Upupa epops*, *Caprimulgus europaeus*. Also, according to the data of fauna, the following rare species identified in the period 2012-2015: *Cygnus cygnus*, *Anser anser*, *Tringa nebularia*, *Tringa tetanus*, *Tringa stagnatilis Haematopus ostralegus*;

Pandion haliaetus, *Limosa limosa*, *Sterna albifrons*. Thus, the total number of rare species of birds recorded on site is 21.

Haliaeetus albicilla is a rare bird for the entire territory of Russia (Red Book of Russia, 3rd category).

It is necessary to consider the historical abundance on migration of grey herons, gull, waders, ducks and importance of the territory as a span for many species.

The complex of amphibians and reptiles for coastal and island territories includes 6 types. A single *Bombina bombina* was observed in 2014 while more than 200 of them were observed in 2015. *Bufo buf* is a rare species observed among reptiles.

Course of our research in 2014 revealed following list of rare species of insects: *Bryodema tuberculatum, Cycindela germanica, Calosoma sycophanta, Carabus clathratus, Trypocopris vernalis, Polyommatus daphnis, Callimorpha dominula, Bombus muscorum*. *Osmoderma barnabita*, *Ephialtes manifestator* were noted earlier from available data of Observatory (Oktyabrsky) [5]. There is number of species excluded from red book of Tatarstan in 2015 due to recovery of populations in the region, but they also need attention (*Myrmeleon formicarius, Calopteryx virgo, Oryctes nasicornis, Copris lunaris, Vanessa atalanta*).

Following arachnids are marked rare in Tatarstan: *Argyroneta aquatic*, *Lycosa singoriensis*, *Lepidurus arus*. Among large aquatic crustaceans as a regular form *Astacus leptodactylus* could be marked, which, in addition to their role in maintaining biodiversity, an indicator of water purity.

It is especially necessary to note the presence of *Calosoma sycophanta* on the coastal areas, tree species included in the Red book of the Russian Federation (category 2) and the European red list [6].

The ichthyofauna is very diverse and includes more than 40 species of fish, including such valuable species as *Acipenser ruthenus*, 41 species of phytoplankton 30 zooplankton species and 13 species belonging to the group of zoobenthos were revealed in the study of aquatic communities in the summer of 2014.

Table 1. Biodiversity and rare species of animals and plants of the islands and shoals of the Kuibyshev reservoir near Zaymishche, Oktyabrsky.

	Total	Red Book Tatarstan	Red Book Russia
Plants	122	11	-
Arthropods	91	13	1
Fish	40	-	-
Amphibians, reptiles	6	2	-
Birds	101	21	1
Mammals	20	3	-

Insects of the family of ground beetles (Carabidae) as one of the largest and most ecologically diverse families of the Coleoptera order and they are are a good model object for studying changes in ecosystems under the influence of anthropogenic factors. Spectrum of life forms of ground beetles as indicator of soil and plant conditions considered in the works of I.Kh. Sharova, S.Y. Gryuntal [7-9].

Collection of ground beetles were conducted in habitats located on the peninsular part of the study area, including tall grass and meadows, pine forests, riparian willow areas.

Tables 2 - 4 presents the characteristics of species of carabid life forms (imago) and ecological groups (habitat preferences).

In terms of structures of life forms zoophagous is dominating (78.2% of numerical abundance and 79.1% of the species); litter-soil stratobionts are the most abundant (30,4 species and 26.8% of numerical abundance), followed by epigeobionts (17,4; 13,7 %, respectively) and flying epigeobionts (13 and 24,7 %, respectively). This spectrum characterizes ecosystems as intact, despite intensive human impact on this area.

Table 2. The species composition of Carabidae in coastal areas.

	Vital form	Environmental group
Zoophagous		
Cycindela germanica L.	Epigeobiont flying	Meadow
Cycindela hybrida L.	Epigeobiont flying	Meadow
Cycindela maritima L.	Epigeobiont flying	Steppe mesophilous
Calosoma sycophanta L.	Epigeobiont walking, dendroepigeobiont	Forest
Carabus clathratus L.	Epigeobiont walking	Forest
Carabus granulatus L.	Epigeobiont walking	Forest-wetland
Carabus nemoralis L.	Epigeobiont walking	Forest
Carabus hortensis L.	Epigeobiont walking	Forest
Broscus cephalotes L.	Geobiont running-digging	Field
Broscus semistriatus Dej.	Geobiont running-digging	Steppe-field
Licinus depressus Pk.	Stratobiont litter-soil	Meadow
Badister unipustulatus Bon.	Stratobiont litter	Forest-steppe
Pterostichus (Poecilus) lepidus Leske.	Stratobiont litter-soil	Meadow-field
Pterostichus (Poecilus) cupreus L.	Stratobiont litter-soil	Meadow-field
Pterostichus niger Sch.	Stratobiont litter-soil	Forest mesophilous
Pterostichus oblongopunctatus F.	Stratobiont litter-soil	Forest
Pterostichus melanarius Ill.	Stratobiont litter-soil	Forest
Pterostichus mannerheimi Dej.	Stratobiont litter-soil	Forest-wetland
Myxophytophagous		
Harpalus flavescens Pill.	Geochortobiont	Forest mesophilous
Harpalus hospes Sturm.	Geochortobiont	Meadow mesophilous
Ophonus rufipes Dej.	Stratechortobiont	Meadow-field
Ophonus stictus Steph.	Stratechortobiont	Meadow-steppe
Amara aenea Dej.	Geochortobiont	Meadow-field

Table 3. Spectrum of life forms of imago Carabidae in coastal habitats.

Vital form	Abundance	
	Species	Numerical
Class Zoophagous		
1. Epigeobionts flying	13,0	24,7
2. Epigeobionts walking	17,4	13,7
3. Epigeobionts walking, subgroup dendroepigeobionts	4,3	4,6
4. Geobionts running-digging	8,8	7,9
5. Stratobionts litter-soil	30,4	26,8
6. Stratobionts litter	4,3	1,4
Class Myxophytophagus		
1. Stratechortobionts	8,8	9,4
2. Geochortobionts	13,0	11,7

Among the environmental groups forest and meadow species are dominatimg (of 33,4 and 26.6% of numerical abundance), followed by species are confined to various habitats (15,2 %).

There are species that are indicator of forest preservation and wetland habitats: *Carabus clathratus, Calosoma sycophanta, Pterostichus sp.*

Table 4. Spectrum of ecological groups of Carabidae in the coastal habitats.

Environmental group	Abundance	
	Species	Numerical
Forest	34,7	33,4
Meadow	17,4	26,6
Meadow-field	17,4	16,3
Forest-wetland	8,7	2,8
Meadow-steppe	4,3	5,6
Forest-steppe	4,3	1,1
Steppe	8,7	8,5
Field	4,3	5,6

This information about the state of the vegetation and fauna and information about the habitat of this rare species, convince of the need to preserve habitats to successfully maintain the reproduction of the species of flora and fauna. To solve this problem it is necessary to provide normal flow of hydrological regime of habitats of riparian ecosystems, promising to eliminate the capital building to strengthen control over observance of environmental legislation.

Proposals for the establishment of protected areas 'Wetlands Zaymishche'
The creation of the protected area 'Wetlands Zaymische' pursues the following main objectives:

- preservation and restoration of the unique natural complex of islands, peninsulas and shallow water wetlands in the Kuybyshev reservoir;
- the inclusion of the territory of the natural complex to the ecological frame of the city of Kazan and national ecological frame, ensuring their interconnection;
- the inclusion of the territory as a valuable "natural core" to the system of territorial development of Oktyabrsky rural settlement; the creation of conditions for regulated ecotourism and recreation in the natural environment.

Given these factors, a Natural Park (protected areas of regional significance) status change is highly reccomended. In accordance with article 15 "the Regime of special protection of territories of national parks" of the Russian Federation Law № 33-FFederal Law "About protected natural territories" it is recommended to differentiate the regime of special protection and allocate 5 functional areas: 1) reserved area; 2) specially protected area; 3) zone intended for the development of environmental education, excursions, rest and recreation of visitors; 4) zone of heritage nature use; 5) recovery zone with natural boundaries of the shoreline and islands.

Also, taking into account the anthropogenic disturbance of individual sites affected by hydraulic sustainable functioning, areas should include optimization of the hydrological regime (flow blurring), planting higher aquatic vegetation, planting herbaceous meadow plants and other events.

3. Conclusion

'Zaymische' Wetlands, containing of shallow waters, canals, pools and open waters, are one of the most valuable areas of the Kuibyshev reservoir in the Republic of Tatarstan in terms of biodiversity conservation, purification and reproduction of fish. Currently, there is the process of overgrowing vegetation of sandy mounds formed as a result of the backfill area in 2011-2013.

Given the location next to Kazan city, the area has significant recreational impact that must be considered when granting the status of protected areas. The most suitable status is a Natural Park status of national value, or National Park of Federal significance.

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