CONTRIBUTIONS TO THE STUDY OF WATER AND SEMI-AQUATIC BIRDS IN THE RAMSAR WETLAND "LOWER PRUT LAKES"

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Abstract. The Republic of Moldova has few wet areas. One of them was designated in the year 2000 with the status of Wetland of International Importance (Ramsar). The ecosystems of lakes and ponds are home to a multitude of bird species. Aquatic and semi-aquatic species make up a major component of the studied sector and consists of 94 species. Thousands of specimens transit the area during spring and autumn migrations; others retreat in the winter to be safe and to feed; the summer guests arrive in the warm period of the year to breed. Out of the total number of aquatic and semi-aquatic birds, 26 species are protected nationally and internationally. During the study period, rare or accidental species were recorded, such as: *Bubulcus ibis*, *Cygnus columbianus*, *Branta ruficollis*, *Grus grus*, *Sterna caspia*, *Arenaria interpres*, *Larus ichthyaetus* etc.

Introduction

The wetland between the city Cahul and the village Giurgiulesti covers an area of 19152 ha. The territory includes a segment of the Prut River, Manta and Beleu Lakes, a wide variety of natural and man-made ecosystems, including willow forests, marshy biotopes, wetland habitats, pastures, meadows, etc.

The first data regarding the aquatic and semi-aquatic ornithofauna of the ponds on the left bank of the Prut were collected starting with the 60s of the 20th century. The research on bird fauna intensified after 2000, being published a series of materials about the process of formation of complex colonies of semi-aquatic bird species, about the particularities of the reproduction process of some taxonomic bird groups, about population dynamics and the migratory specificity of aquatic and semi-aquatic birds, the reproductive behavior of some species [3, 4, 5, 11]. In recent years the diversity of the terrestrial vertebrate fauna from the “Prutul de Jos” Reserve, as well as the vulnerability of avifauna in the Lower Prut basin (Republic of Moldova) to climate change were studied [6, 7, 8, 9, 10, 11].

The paper is based on the analysis of older data from field research, own observations and materials published in recent years that contain information about new and accidental species encountered in the Ramsar wetland, “Lakes of the Lower Prut”.

Materials and methods

The research on aquatic and semi-aquatic species of birds was made based on our own observations, carried out between 2017-2021 in the Lower Prut and also with data from specific literature. The method of motion and fixed-point observations was used. The trips on the aquatic surfaces were made by boat. For the identification of the birds were used the 10x50 binoculars and the 15x45 telescope.

Result and discussions

The sector of Lower Prut provides vital conditions for numerous aquatic and semi-aquatic species of birds. Some of them can be met during the spring and autumn migrations; other species arrive for reproduction on summer period. Up to 2019 in this area were mentioned 75 nesting species [4, 11]. According to the latest data from the studied territory, 93 species of birds were identified (tab. 1).

Table 1. Taxonomic structure of aquatic and semi-aquatic avifauna

No.	Order	Share in the studied area			Share of the avifauna of the area from that of the republic
		Species	Share of the order from all aquatic and semi-aquatic avifauna (%)	In Republic of Moldova	
I.	Gaviiformes	1	1,1	2	50,0
II.	Podicipediformes	4	4,3	5	80,0
III.	Pelecaniformes	4	4,3	4	100,0
IV.	Ciconiiformes	13	13,9	13	100,0
V.	Anseriformes	26	27,9	28	92,8
VI.	Gruiformes	9	8,7	10	80,0
VII.	Charadriiformes	37	39,8	50	74,0
Total:		94	100	116	81,0

Analyzing the share of the avifauna of the area with that of the Republic of Moldova, we notice that the orders of Charadriiformes (37 species) and Anseriformes (26 species) have the highest degree of participation. The order Gaviiformes is represented by one of the two species encountered in the republic.

The situation of the habitats occupied by the aquatic and semi-aquatic ornithofauna identified in the studied sector, their type of nutrition, biogeographical affiliation, rarity category according to the Red Book of the Republic of Moldova [2] are presented in table 2.

Table 2. The synoptic chart of the aquatic and semi-aquatic species of birds

No	Species/ category of protection	Biogeographic origin	Aviphenologic categories of bird species phenology; trophic grup	Habitat; Observations
Order Gaviiformes				
1.	<i>Gavia stellata</i>	Arct.	Wv; DJF; Ichthyophagous	Encountered on river Prut (Slobozia Mare); lake Manta.
Order Podicipediformes				
2.	<i>Podiceps cristatus</i>	Tp	Sv, Rw; N MAMJJASO; Ichthyophagous	Present on Beleu and Manta lakes, in the ponds in the area, where they also have nesting places; wetlands with marshy vegetation.
3.	<i>Podiceps grisagena</i>	E	Sv; AMJJASO; Ichthyophagous, entomophagous	
4.	<i>Tachibabtus ruficollis</i>	E	Sv, Rw; N J AMJJASO; Zoophagous, entomophagous	
5.	<i>Podiceps nigricollis</i>	E	Sv, Rw; MAMJJASO; Zoophagous	

Order Pelecaniformes				
6.	<i>Pelecanus onocrotalus</i> / En	Mo	Sv; AMJJASO; Ichthyophagous	Present on Belev and Manta lakes, in the pond in the southern part of Brînză village and in the pond from Colibași village (fig. 1).
7.	<i>Pelecanus crispus</i> / Cr	Mo	Sv; DI AMJJASO; Ichthyophagous	Present on Belev and Manta lakes.
8.	<i>Phalacrocorax carbo</i>	TP	Sv, Rw; ND MAMJJASO; Ichthyophagous	Present on river Prut, Belev and Manta lakes.
9.	<i>Phalacrocorax pygmeus</i> / Cr	M	Sv; MAMJJASO; Ichthyophagous	Present in ponds in the localities: Giurgiu-lești, Slobozia Mare, Văleni, Brînză, Colibași, Manta, Vadul-lui-Isac, Crihana Veche, especially in the sectors where they have a place for nesting, extensive ponds with reeds and willows.
Order Ciconiiformes				
10.	<i>Botaurus stellaris</i> / Vu	Mo	Sv; AMJJASO; Ichthyophagous, zoophagous	Present in the dense reeds of the ponds from Giurgiu-lești, Slobozia Mare, Văleni, Brînză, Colibași, Manta; Ponds with dense, marshy, and aquatic vegetation.
11.	<i>Ixobrychus minutus</i>	E	Sv; MJJAS; Zoophagous	
12.	<i>Nycticorax nycticorax</i>	M	Sv; AMJJASO; Zoophagous	Encountered in the willows on the banks of river Prut; near Belev and Manta lakes close to water sources.
13.	<i>Ardeola ralloides</i> / En	M	Sv; MAMJJASO; Zoophagous	Present in the ponds from the localities: Giurgiu-lești, Slobozia Mare, Văleni, Brînză, Colibași, Manta, Vadul-lui-Isac, Crihana Veche; Large ponds, flooded or swampy lands.
14.	<i>Egretta garzetta</i>	M	Sv; MAMJJASO; Ichthyofagous, zoophagous	Present in extensive ponds, in flooded or swampy lands from the localities: Giurgiu-lești, Slobozia Mare, Văleni, Brînză, Colibași, Manta, Vadul-lui-Isac, Crihana Veche.
15.	<i>Egretta alba</i> / En	Ch	Sv, Rw; NDJ MAMJ JASO; Ichthyofagous, zoophagous	Present at the shore of the pond on wet meadows, flooded lands, shallow ponds in the localities: Giurgiu-lești, Slobozia Mare, Văleni, Brînză, Colibași, Manta, Vadul-lui-Isac, Crihana Veche
16.	<i>Ardea cinerea</i>	Tp	Sv, Rw; NDJ MAMJJASO; Ichthyofagous, zoophagous	Present in large ponds, not too deep, with thick reeds or emerging vegetation from the localities: Giurgiu-lești, Slobozia Mare, Văleni, Brînză, Colibași, Manta, Vadul-lui-Isac, Crihana Veche.
17.	<i>Ardea purpurea</i> / Vu	M	Sv; MAMJJASO; Zoophagous	Present in the wet ponds and meadows, the flooded lands from the localities: Slobozia Mare, Văleni, Brînză, Colibași, Manta.
18.	<i>Bubulcus ibis</i>	M	Acc; AMJ; Entomophagous	Observed in the pond between Văleni and Brînză villages (fig. 1)

19.	<i>Ciconia ciconia</i> / Vu	EP	Sv, P; FMAMJJASO; Zoophagous	The nests are located in most localities from Cahul district, feeding on wet and swampy lands in the Prut meadow or agricultural fields around them.
20.	<i>Ciconia nigra</i> / Cr	EP	Sv, P; MAMJJASO; Ichtyofagous, zoophagous	In-flight, solitary specimens are found over the wetland in all the studied sectors; searching for food or in-migration, near Beleu and Manta lakes. It prefers willow forests or the shore of the ponds.
21.	<i>Platalea leucorodia</i> / Cr	EP	Sv, Rw; AMJJASO; Zoophagous	In number of a few specimens, it is found in the extensive, shallow ponds, with mud and reeds, extended in the localities: Slobozia Mare, Văleni, Brânză and Manta.
22.	<i>Plegadis falcinellus</i> / Cr	M	Sv; MAMJJASO; Zoophagous	On the pondfront or in swampy areas; shallow ponds, with reeds and willows in the flooded area of the localities: Giurgiulești, Slobozia Mare, Văleni, Brânză, Colibași, Manta, Vadul-lui-Isac, Crihana Veche.
Order Anseriformes				
23.	<i>Cygnus olor</i> / Vu	E	Mp; NDJFMAMJJASO; Phytophagous, rare zoophagous	The largest number is found on Manta, Beleu and Polderul Brânză lakes; during the reproduction period 1-2 pairs on the ponds from Giurgiulești and Colibași localities; puddles spread with thick reeds on the edges.
24.	<i>Cygnus columbianus</i>	Arc.	Acc; N F; Phytophagous, rare zoophagous	2-4 specimens were recorded on and around Lake Beleu; large areas of water with a vast aquatic vegetation. On Beleu and Manta lakes, large areas of open water with aquatic vegetation.
25.	<i>Cygnus cygnus</i> / Vu	S	Wv; DJF; Phytophagous, zoophagous.	On Beleu and Manta lakes, large areas of water with aquatic vegetation.
26.	<i>Branta ruficollis</i> / Vu	Arc	Wv; DJF; Phytophagous	In very small numbers on Beleu and Manta lakes or on the meadows around them.
27.	<i>Anser anser</i>	Mo	Mp; NDJFMAMJJASO; Phytophagous	A few specimens nest in ponds in Slobozia Mare, Brânză, Manta.
28.	<i>Anser fabalis</i>	Arc.	Wv; DJF; Phytophagous	On Beleu and Manta lakes; on wet meadows, cultivated land in the vicinity of wetlands; in large ponds (for rest).
29.	<i>Anser albifrons</i>	Arc.	Wv; NDJF; Phytophagous	
30.	<i>Anser erythropus</i> / Vu	Arc.	Wv; DJF; Phytophagous	
31.	<i>Tadorna ferruginea</i> / Vu	Mo	Sv; MA JASO Phytophagous, zoophagous	In the ponds from the localities: Slobozia Mare, Văleni, Colibași, Manta, Vadul-lui-Isac.
32.	<i>Tadorna tadorna</i> / Vu	Mo	Sv; Rw; N MAMJJASO; Zoophagous, phytophagous	On Beleu and Manta lakes, in waters wealthy in aquatic vegetation.

33.	<i>Anas strepera</i>	Tp	Sv; AMJJASO; Phytophagous, rare zoophagous	Present on the Belev, Colibași, and Manta lakes; ponds with dense aquatic vegetation.
34.	<i>Anas penelope</i>	S	P; N MA SO; Phytophagous	Present on the Belev and Manta lakes; ponds with water luster and aquatic macrophytes.
35.	<i>Anas acuta</i>	S	Wv; DJF; Zoophagous, phytophagous	Present on Belev and Manta lakes.
36.	<i>Anas platyrhynchos</i>	Tp	Mp; NDJFMAMJJASO; Phytophagous	In the ponds from the localities: Slobozia Mare, Văleni, Colibași, Manta, Vadul-lui-Isac
37.	<i>Anas crecca</i>	Tp	Sv, Wv; NDJFMAMJJASO; Phytophagous, rare zoophagous	In the ponds from the localities: Slobozia Mare, Văleni, Brânză, Colibași, Manta, Vadul-lui-Isac
38.	<i>Anas querquedula</i>	Tp	Sv; MAMJJASO; Zoophagous	In the ponds from the localities: Slobozia Mare, Văleni, Colibași, Manta, Vadul-lui-Isac
39.	<i>Anas clypeata</i>	Tp	Sv, P; MAMJJASO; Zoophagous	In the ponds from the localities: Slobozia Mare, Văleni, Colibași, Manta, Vadul-lui-Isac
40.	<i>Netta rufina</i> /Vu	M	P; NO; Phytophagous	Present on the Belev and Manta lakes.
41.	<i>Aythya marila</i>	A	Wv; NDJ MO; Zoophagous, phytophagous	Present on the Belev and Manta lakes.
42.	<i>Aythya fuligula</i>	S	Wv; NDJFMAMJJASO; Phytophagous, zoophagous	Present on the Belev and Manta lakes.
43.	<i>Aythya ferina</i>	E	Sv, Wv; NDJFMAMJJASO; Phytophagous, zoophagous	Present on the Belev and Manta lakes; In the ponds from Brânză and Colibași with water luster and aquatic macrophytes (fig. 2).
44.	<i>Aythya nyrocca</i> / Cr	WP	Sv, Wv; NDJFMAMJJASO; Phytophagous	In the ponds and places wealthy in reeds and willows from the localities: Giurgiulești, Slobozia Mare, Văleni, Brânză, Colibași, Manta, Vadul-lui-Isac, Crihana Veche.
45.	<i>Mergellus albellus</i>	S	Wv; DI; Ichtyofagous, zoophagous	Present on the Belev and Manta lakes;
46.	<i>Mergus merganser</i>	Tp	Wv; DJF; Ichtyofagous, zoophagous	Present on the Belev and Manta lakes;
47.	<i>Mergus serrator</i>	S	Wv; DJ; Ichtyofagous	Present on the Belev and Manta lakes;
48.	<i>Bucephala clangula</i>	S	Wv; F; Phytophagous, zoophagous	Present on the Belev and Manta lakes, in puddles.

Order Gruiformes				
49.	Grus grus	Tp	Acc; SO; Phytophagous, zoophagous.	In flight over Lake Beleu.
51.	Porzana parva/ Vu	Wp	Sv; MJJA; Phytophagous, zoophagous	Wet meadows, rich in vegetation.
52.	Porzana porzana / Vu	Wp	Sv; AMJJASO; Phytophagous, zoophagous	
53.	Porzana pusilla/ Vu	Wp	Sv; AMJJASO; Phytophagous, zoophagous	
54.	Crex crex/ En	E	Sv; MJJ; Phytophagous, zoophagous	
55.	Galinula chloropus	Wp	Sv; MAMJJASO; Phytophagous, zoophagous	It is present in the wetland near water sources, stagnant water basins, wealthy in vegetation.
56.	Fulica atra	Tp	Sed.; NDJFMAMJJASO; Phytophagous, zoophagous	On the aquatic surfaces from all the localities from the Prut meadow; ponds with dense aquatic vegetation and water eyes.
57.	Rallus aquaticus	E	Mp; NDJ MAMJJASO Phytophagous, zoophagous	
Order Charadriiformes				
58.	Himantopus himantopus/Vu	Mo	Sv; AMJJASO; Zoophagous	At the pondfront in the localities: Slobozia Mare, Văleni, Brânza, Colibași, Manta, Vadul-lui-Isac, Crihana Veche. Ponds not too deep, muddy or sandy shores (gig. 2).
59.	Recurvirostra avosetta/ Vu	Mo	Sv, Rw; N MAMJJAS; Zoophagous	
60.	Haematopus ostralegus/ Vu	Mo	Sv; N MAMJJAS; Zoophagous	
61.	Charadrius dubius	Mo	Sv, P; AMJJASO; Zoophagous	Wet meadows, shores, open arable or grassy lands; swamps with low vegetation.
62.	Charadrius hiaticula	Mo	P; N A SO; Zoophagous	
63.	Vanellus vanellus	Mo	Sv; NMAMJJASO; Zoophagous, ichtiofagous	
64.	Stercorarius parasiticus	Arc.	P; SO; Zoophagous, ichtiofagous	Rarely near Lake Beleu and Manta.
65.	Calidris alba	Arc	Wv; DJF; Zoophagous	At the water's edge in the ponds from the localities: Slobozia Mare, Văleni, Brânza, Colibași, Manta, Vadul-lui-Isac, Crihana Veche.
66.	Calidris minuta	Arc.	P; AM SO; Zoophagous	
67.	Calidris terninckii	Arc.	P; ND AM SO; Zoophagous	
68.	Calidris ferruginea	Arc.	P; AM SO; Zoophagous	
69.	Calidris alpina	Arc.	P; AM SO; Zoophagous	
70.	Limicola falcinellus	Arc.	P; ND AM SO; Zoophagous	
71.	Philomachus pugnax	S	P; AMJJAS, Zoophagous	
72.	Lymnocyptes minimus	S	P; NDJ MASO; Zoophagous	
73.	Gallinago gallinago	E	Sv;AMJJAS; Zoophagous,ichtiofagous	

74.	<i>Limosa limosa</i>	Mo	Sv, P; MAMIIAS; Phytophagous, zoophagous	At the pondfront, stretches of water with marshy vegetation; slow flowing waters, lakes in most localities;
75.	<i>Limosa lapponica</i>	S	P; S; Phytophagous, zoophagous	
76.	<i>Numenius arquata</i>	E	Sv; MAMJJAS; Zoophagous	
77.	<i>Tringa erythropus</i>	S	P; MA AS; Zoophagous	
78.	<i>Tringa totanus</i>	Mo	P; MAMJJAS; Zoophagous	
79.	<i>Tringa nebularia</i>	S	P; MA SO; Zoophagous	
80.	<i>Tringa glareola</i>	S	P; MA SO; Zoophagous	
81.	<i>Tringa hypoleuca</i>	S	P; MA SO; Zoophagous	
82.	<i>Tringa ochropus</i>	S	P; RI; MA SO; Zoophagous	
83.	<i>Sterna caspia</i>	Mo	P; MA SO; Zoophagous	In the ecosystem of Lake Beleu; Stretched puddles with shallow water.
84.	<i>Phalaropus lobatus</i>	Mo	P; MA SO; Zoophagous	
85.	<i>Arenaria interpres</i>	Arc.	P; MA SO; Zoophagous	In the coastal area of Lake Manta
86.	<i>Larus ridibundus</i>	Tp	Sed.; NDJFMAMJJASO; Zoo- phagous	In flight, on the waterfront or on the aquarium in most localities; Prefers sandy shores.
87.	<i>Larus cachinnans</i>	Tp	Sed.; NDJFMAMJJASO; Zoo- phagous	Encountered in the studied sector on Beleu and Manta lakes; in puddles with stretches of water and marshy vegetation, slowly flowing waters.
88.	<i>Larus fuscus</i>	Arc.	Wv; IFM; Phytophagous, zoophagous	
89.	<i>Larus canus</i>	S	Wv; F; Zoophagous, ichthyofagous	
90.	<i>Larus ichthyaetus</i>	M	Sv; M; Phytophagous, zoophagous	On Lake Beleu and in its neighboring pond.
91.	<i>Sterna hirundo</i>	E	Sv; AMJJASO; Zoophagous, ichthyofagous	In the ponds of the vast majority of localities in the studied area, in greater numbers near Beleu and Manta lakes.
92.	<i>Chlidonias hybridus</i>	M	Sv; MAMJJASO; Zoophagous, ichthyofagous	
93.	<i>Chlidonias niger</i>	E	Sv; AMJJAS; Zoophagous, ichthyofagous	
94.	<i>Chlidonias leucopterus</i>	E	Sv; AMJJA; Zoophagous, ichthyofagous

Figure 1. *Pelecanus onocrotalus* and *Bubulcus ibis* – rare species

Figure 2. *Aythya ferina* and *Recurvirostra avosetta* – vulnerable species

Conclusions

The Ramsar wetland “Lakes of the Lower Prut” has an important role for 94 aquatic and semi-aquatic species of birds. Out of these, 26 are under national and international protection, with varying degrees of danger: 14 – vulnerable species; 6 - critically endangered species; 4 - endangered species. The studied area is used by thousands of birds during the autumn and spring migrations, also in the summer when they find favorable conditions for reproduction. According to the types of nutrition are distributed: 1 - ichthyophagous/entomophagous; 1- entomophagous; 1 – zoophagous/ entomophagous; 7 – ichthyophagous; 10 – phytophagous; 16 – ichthyophagous/ zoophagous; 25 – phytophagous/ zoophagous; 33 – zoophagous.

From a phenological point of view, 46 species are short-sighted visitors; 21 are passage species; 16- winter visitors; 4 - partially migratory; 3 - sedentary; 3 - meet accidentally; some species fall into several phenological categories. The following species have an irregular presence in the area: *Bubulcus ibis*, *Cygnus columbianus*, *Grus grus*, *Sterna caspia*, *Arenaria interpres*, *Larus ichthyaetus*, etc.

The studies were performed within the State Program project 20.80009.7007.02.

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