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## IMPORTANCE OF UTLIUKSKIY LIMAN FOR THE PROTECTION OF WATERBIRDS IN THE AZOV-BLACK SEA REGION DURING AUTUMN MIGRATION

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**Importance of Utliujskiy Liman for the Protection of Waterbirds in the Azov-Black Sea Region During Autumn Migration. Chernichko, I. I., Kostiusyn, V. A., Vinokurova, S. V.** — Utliujskiy Liman is one of three typical and at the same time unique limans in the northwestern part of the Azov Sea Region of Ukraine. Despite the considerable anthropogenic transformation of the liman it continues to be a valuable wetland for migratory waterbirds. The current publication based on data collected from 1994 to 2015, in the period of autumn migrations 19 counts were conducted at Utliujskiy Liman. In total 1,134,832 ind. of 90 waterbird species (8 orders) were recorded. Averagely at liman were presented 59,728 waterbirds, with maximum 115,095 individuals. Throughout the season, many characteristics of waterbirds at Utliujskiy Liman are varying significantly due to the timing of migration of different waterbird species and their abundance. Detail information on this is presented in the paper. Among the counted birds, 60 species have certain conservations status. Maximum number of 20 counted species exceeded 1% of their geographical populations. According to obtained results, Utlyujskiy Liman occupies a stable place among the five most valuable wetlands of the Azov-Black Sea coast of Ukraine — in different years from 5th to 1st place on the total number of waterbirds.

Key words: Ukraine, Azov Sea coast, Utlyujskiy Liman, waterbirds, autumn migration.

### Introduction

Utliujskiy Liman is one of three typical and at the same time unique limans in the northwestern part of the Azov Sea Region of Ukraine. For a long time the ornithological value of these limans was differently reflected in scientific publications. In spite of more than dozen publications devoted to the ornithological value of Molochnyi Liman (a full list of them is available in No 9/2015 of the ROM Bulletin, specially devoted to this body of water), there are no publications available about birds of Utliujskiy Liman. Even for Bolhradskiy Syvashik, the third of these limans, a relatively complete summary of its breeding, migratory and wintering birds has been recently published. At the same time, the number and species composition of the birds using Utliujskiy Liman as a migration stopover are not inferior to many wetlands of the Azov-Black Sea coast of Ukraine, turning this liman into one of the most valuable wetlands of the region.

Utliujskiy Liman, being an open lagoon, differs from the neighbouring wetlands, and before its central part were converted into an industrial sedimentation basin it had had a direct connection with the Sea of Azov up to estuarial zones of the small rivers flowing into it. This ensured no difference between the hydrochemical properties of the liman's waters in its lower part and the waters of the sea. However, waters of the upper reaches differentiated from the rest of the liman by their significant seasonal desalination, because two small rivers — Velykyi Utliuk and Maliy Utliuk — entered in the liman in this area. In the 1950s, the liman's central part was isolated by two dams and turned into a sedimentation tank for mine wastewaters from Dniprorudnyi City forming a unique shallow evaporator. The estuarial floodplain of the Velykyi Utliuk River was significantly reduced by dams to create fishponds.

Despite the considerable anthropogenic transformation of the liman it continues to be a valuable wetland for migratory waterbirds. Regular synchronized bird counts, conducted in August within the ROM Programme in the Azov-Black Sea Region, revealed 5,7 to 120 thousand waterbirds at Utliujskiy Liman. These data motivated to apply for the inclusion of the analyzed part of Utliujskiy Liman to the list of wetlands of international importance and to prepare the current publication in order to demonstrate the regional value of this wetland as a stopover of waterbirds during their autumn migration.

### Brief description of Utliujskiy Liman as a wetland

The current publication considers upper, central and shallow parts of the open water area of Utliujskiy Liman. These parts of the liman are located within borders of Zaporizhzhia Region (coordinates: north-western border — 46°31'48" x 35°06'07"; north-eastern — 46°32'38" x 35°11'54"; western — 46°25'46" x 35°12'41"; eastern — 46°21'40" x 35°21'05"; southern — 46°19'30" x 35°12'29"). The total area of Utliujskiy Liman exceeds 20,000 ha, of them an estuarial zone of the Velykyi Utliuk occupies 601.5 ha, an estuarial zone the Malyi Utliuk — 467.14 ha, a desalinated site "Davydovskiy" (fig. 1) — 325.72 ha, the central sedimentation tank — 5,121.26 ha, an open part of the liman's water area — 12,694.5 ha, and an adjacent shallow Kyrylivskiy Bay — 823.9 ha. All these sections are geomorphologically and hydrologically separated.

Landscape-biotope characteristics of Utliujskiy Liman and its coast are extremely diverse, being a key factor for the attractiveness of this area for the migratory birds on stopovers. The right banks of the rivers and the liman shore are high, partly precipitous, with remained patches of steppe vegetation and occasional stripes of planted trees and shrubs. Lowland river banks and the shore are occupied by halophytic meadows, saline and salt marshes. The remaining areas of the river floodplain hold well expressed stripe thickets of the common reed (*Phragmites australis*) and sea clubrush (*Bolboschoenus maritimus*). Along with small and large river reaches as well as abandoned ponds they attract birds as feeding and resting territories. The central part of the liman (industrial sedimentation tank) is shallow and highly salted.

The construction of the industrial sedimentation tank in the liman's center necessitated the building of a bypass channel to discharge the river water into the open part of the liman and through the gateway directly into the tank in its southern part. During the years of the canal operation there formed completely unique artificial habitats with stripes of reeds, separate trees and shrubs, somewhat resembling canalized channels of small rivers.

The combination of these different habitats and landscape elements support high diversity of bird species at Utliujskiy Liman, especially during the migration period.

### Material and methods

From 1994 to 2015, in the period of autumn migrations, 19 counts were conducted at Utliujskiy Liman. They were carried out from August, when an active migration of waders and terns starts, to November — the end of the migration for most of waterbird species (August — 8 counts, September — 3, October — 6, November — 2). Partially, the results of these August counts were presented in the ROM Bulletin (2005, 2006, 2010 a, b, 2014).

Bird counts were carried out by a method of absolute censuses using randomly selected observation points at the liman's shore, using binoculars with 20–60 and 10–12 magnification. The observation points were selected in the way to ensure complete bird counts on the shore and water area without repetitions and omissions. An off-road car was used to move from one observation point to another. The localization of waterbird concentrations was recorded by GPS and registered on a map of the liman. One count, covering the entire area of the liman, usually took 3 days.

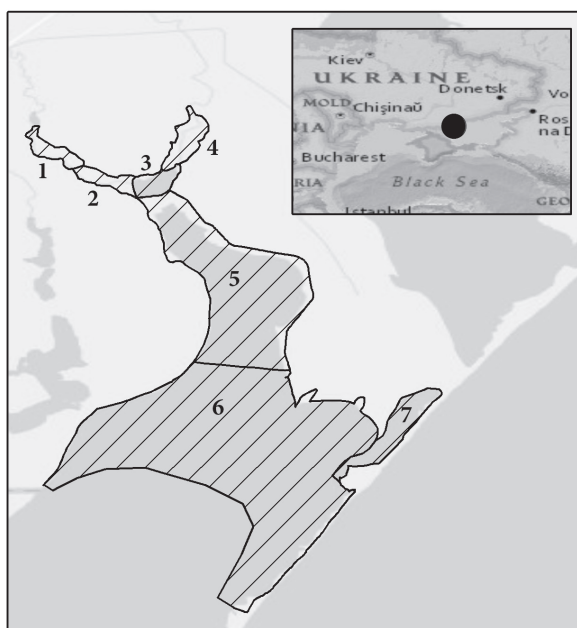


Fig. 1 Scheme of the wetland Utliujskiy Liman indicating its separate parts: 1, 2 — estuarial zone of the Velykyi Utliuk; 3 — Davydovskiy liman; 4 — estuarial zone the Malyi Utliuk; 5 — central sedimentation tank; 6 — open part of the liman's water area; 7 — shallow Kyrylivskiy Bay.

**Results and discussion**

1. General characteristics of the bird community

A total of 90 waterbird species (8 orders) were recorded during the observation period from August to November at Utluiskiy Liman, including 3 species of birds of prey, ecologically associated with wetlands (Osprey *Pandion haliaetus*, White-tailed Eagle *Haliaeetus albicilla*, and Marsh Harrier *Circus aeruginosus*). Their taxonomic structure is shown in table 1.

A total number of birds recorded during the entire period of autumn fieldworks amounted to 1,134,832 ind., including: August — 605,950 ind., September — 80,141 ind., October — 311,720 ind., November — 137,021 ind.

From 5,717 to 115,095 waterbirds were registered at the liman simultaneously (per one count), averagely — 59,728 ind.

Waterbird species, which numbers exceeded 1% of the total amount of the birds recorded during the period from August to November, are shown in fig. 2. The most numerous species in autumn were *Fulica atra* (38.01 % of all recorded birds), *Philomachus pugnax* (13.17 %), *Larus ridibundus* (11.89 %), *Podiceps nigricollis* (5.50 %), *Anas platyrhynchos* (4.47 %) and *Aythya ferina* (3.03 %). Share of each other species presented on fig. 2 was between 1–2 %. Detail information on count results is present in table 2.

**Table 1. Taxonomic composition of the birds recorded at Utluiskiy Liman during the autumn migration**

Order	Number of species
Gaviiformes	1
Podicipediformes	3
Pelecaniformes	2
Ciconiiformes	8
Anseriformes	21
including:	
geese	2
swans	2
ducks	15
mergansers	2
Falconiformes	3
Gruiformes	4
Charadriiformes	48
including:	
waders	31
skuas	2
gulls	7
terns	8
Total	90

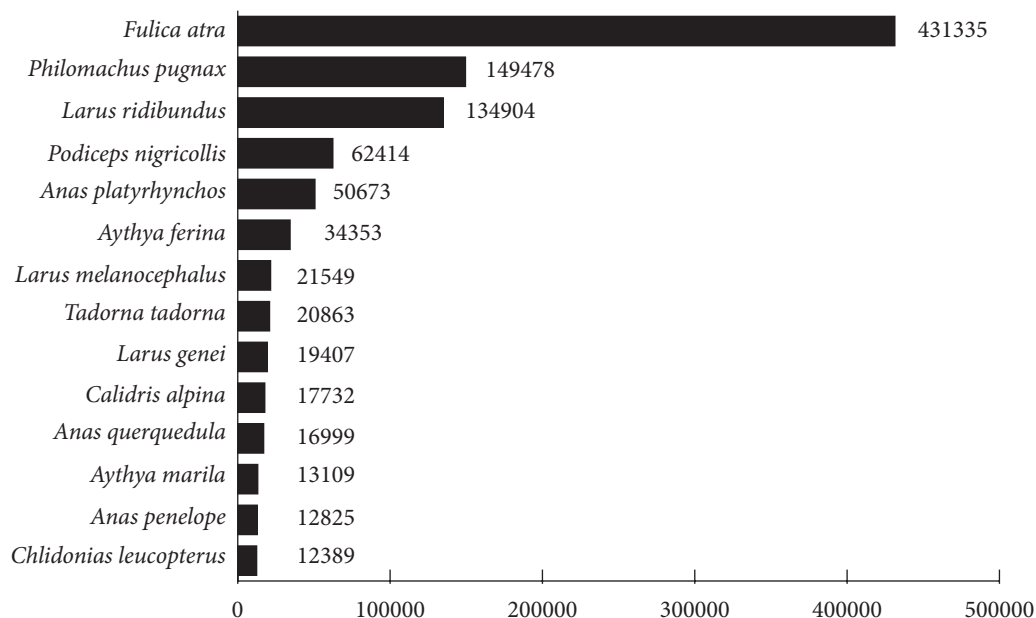


Fig. 2. The most numerous birds species at Utluiskiy Liman during the August–November period (only species which numbers exceeded 1 % of the total amount are given).

Table 2. List of species and number of water birds counted at Utluiskiy Liman during autumn migration in 1994–2015

No	Species	August (n = 8)		September (n = 3)		October (n = 6)		November (n = 2)		Total (n = 19)	
		average	min-max	average	min-max	average	min-max	average	min-max	sum	%
1	<i>Gavia arctica</i>	0.13	1					1.00	2	3	< 0.01
2	<i>Podiceps ruficollis</i>	3.13	2-19	0.33	1	4.17	2-21			51	< 0.01
3	<i>Podiceps nigricollis</i>	6,717.38	70-23,550	2,013.67	3-6,004	438.50	57-2,374	1.50	3	62,414	5.50
4	<i>Podiceps cristatus</i>	863.13	87-3,934	25.00	16-41	208.50	12-1036	250.00	500	8,731	0.77
5	<i>Pelecanus onocrotalus</i>	22.25	7-171							178	0.02
6	<i>Phalacrocorax carbo</i>	340.88	1-2,590	54.67	1-150	40.33	1-199	4.50	9	3,142	0.28
7	<i>Botaurus stellaris</i>	0.38	1-2			0.17	1			4	< 0.01
8	<i>Nycticorax nycticorax</i>	1.13	1-8							9	< 0.01
9	<i>Egretta alba</i>	149.25	7-284	11.00	33	40.17	4-89	23.50	17-30	1,515	0.13
10	<i>Egretta garzetta</i>	141.25	38-383	16.00	3-45	5.17	1-12			1,209	0.11
11	<i>Ardea cinerea</i>	223.25	19-412	36.67	4-73	20.83	5-45	5.50	1-10	2,032	0.18
12	<i>Ardea purpurea</i>	11.75	4-67	2.33	1-6					101	0.01
13	<i>Platalea leucorodia</i>	0.63	1-4							5	< 0.01
14	<i>Plegadis falcinellus</i>	6.38	2-29							51	< 0.01
15	<i>Anser anser</i>	600.50	26-3,500	236.67	262-448					7,215	0.64
16	<i>Anser albifrons</i>							383.50	767	1,806	0.16
17	<i>Cygnus olor</i>	106.25	4-310	55.00	15-87	20.00	1-60	843.00	350-1,336	3,784	0.33
18	<i>Cygnus cygnus</i>	0.25	2			296.50	3-658	495.00	3	5	< 0.01
19	<i>Tadorna ferruginea</i>	8.38	1-42	7.00	1-20	22.00	2-130	1.50		220	0.02
20	<i>Tadorna tadorna</i>	1,187.63	218-4,695	258.00	201-573	1,449.67	153-7,062	945.00	5-1,885	20,859	1.84
21	<i>Anas platyrhynchos</i>	2,664.63	732-6,710	1,406.33	200-3,689	2,703.00	1,255-4,360	4,459.50	4,134-4,785	50,673	4.47
22	<i>Anas crecca</i>	10.00	3-28	123.67	170-201	773.00	50-3,179	30.50	61	5,150	0.45
23	<i>Anas strepera</i>	0.75	6	0.33	1	1.33	2-6			15	< 0.01
24	<i>Anas penelope</i>	75.25	2-600	7.00	21	357.83	200-1,200	5,027.50	10,055	12,825	1.13
25	<i>Anas acuta</i>	0.88	3-4	222.00	666	360.33	6-1,130	75.50	151	2,986	0.26
26	<i>Anas querquedula</i>	1,232.13	94-2,908	2,371.00	7-6,956	4.83	29			16,999	1.50
27	<i>Anas clypeata</i>	77.13	23-533	30.00	15-75	52.33	13-200	14.50	29	1,050	0.09
28	<i>Netta rufina</i>	17.88	7-120	1.00	3	166.83	51-800	9.00	18	1,165	0.10
29	<i>Aythya ferina</i>	323.88	63-1,960	276.33	15-814	4,162.17	270-24,300	2,980.00	1,160-4,800	34,350	3.03
30	<i>Aythya nyroca</i>	1.63	1-12			0.67	4			17	< 0.01

31	<i>Aythya fuligula</i>	20.13	1-151	200.00	600	293.83	23-1400	3.50	7	2,531	0.22
32	<i>Aythya marila</i>	0.13	1			18.00	8-100	6,500.00	13,000	13,109	1.16
33	<i>Oxyura leucocephala</i>					0.67	4			4	< 0.01
34	<i>Mergus serrator</i>	0.13	1			0.17	1	8.50	17	19	< 0.01
35	<i>Mergus mercanser</i>					0.17	1			1	< 0.01
36	<i>Pandion haliaetus</i>					0.67	1-3			4	< 0.01
37	<i>Circus aeruginosus</i>	12.75	1-25	4.33	2-11	3.17	3-12			134	0.01
38	<i>Haliaeetus albicilla</i>							0.50	1	1	0.00
39	<i>Grus grus</i>	32.125	12-96	185.00	5-550	21.67	8-114			942	0.08
40	<i>Rallus aquaticus</i>							1.00	2	2	< 0.01
41	<i>Gallinula chloropus</i>	1.13	2-3			0.33	1			11	< 0.01
42	<i>Fulica atra</i>	23,030.38	3,900-43,531	14,415.67	732-40,000	24,236.00	23,271-79,395	29,214.50	11,300-47,129	431,335	38.01
43	<i>Burhinus oedienemus</i>	0.25	1-1							2	< 0.01
44	<i>Pluvialis squatarola</i>	373.38	50-1,558	66.33	45-154	5.50	2-18	62.00	124	3,343	0.29
45	<i>Pluvialis apricaria</i>	13.13	105					130.00	260	365	0.03
46	<i>Charadrius hiaticula</i>	214.25	9-761			7.50	45			1,759	0.15
47	<i>Charadrius dubius</i>	5.38	1-22			0.17	1			44	< 0.01
48	<i>Charadrius alexandrinus</i>	11.25	2-73			9.67	58			149	0.01
49	<i>Vanellus vanellus</i>	182.63	31-450	135.67	1	218.00	26-919	49.50	99	3,275	0.29
50	<i>Arenaria interpres</i>	33.38	12-100							267	0.02
51	<i>Himantopus himantopus</i>	62.38	18-139	10.00	2-28	0.17	1			530	0.05
52	<i>Recurvirostra avosetta</i>	848.88	128-4,041	616.67	1-1,849	335.83	2015	2.00	2	10,660	0.94
53	<i>Haematopus ostralegus</i>	48.25	8-96	0.33	1					387	0.03
54	<i>Tringa ochropus</i>	15.13	2-52	1.00	3					124	0.01
55	<i>Tringa glareola</i>	93.38	4-249	21.00	6-57	0.33	2			812	0.07
56	<i>Tringa nebularia</i>	203.38	20-586	69.33	208	0.67	4			1,839	0.16
57	<i>Tringa totanus</i>	162.63	6-1,015	4.33	6-7	11.00	11-50	7.50	15	1,395	0.12
58	<i>Tringa erythropus</i>	2.50	1-8	0.67	2	24.17	145			167	0.01
59	<i>Tringa stagnatilis</i>	40.25	1-148	2.00	6	0.00				328	0.03
60	<i>Actitis hypoleucos</i>	10.13	3-38	1.33	4					85	0.01
61	<i>Xenus cinereus</i>	0.25	2							2	0.00
62	<i>Phalaropus lobatus</i>	99.75	41-444	4.00	12					810	0.07

63	<i>Philotachius pugnax</i>	18,088.00	1,021-50,089	647.33	700-1,242	469.33	4-2774	8.00	16	149,478	13.17
64	<i>Calidris minuta</i>	48.88	4-200	0.33	1	9.67	58			450	0.04
65	<i>Calidris ferruginea</i>	1,162.38	11-3,000	11.67	12-23					9,334	0.82
66	<i>Calidris alpina</i>	750.13	21-2,615	0.33	1	925.00	60-2,560	3,090.00	150-6,030	17,732	1.56
67	<i>Calidris alba</i>					0.17	1			1	< 0.01
68	<i>Gallinago gallinago</i>	4.75	2-13	36.33	2-107	7.50	2-40	1.50	3	195	0.02
69	<i>Numenius arquata</i>	45.38	5-186	22.33	67	17.00	3-45	25.50	51	583	0.05
70	<i>Numenius phaeopus</i>	0.50	4			0.17	1			5	0.00
71	<i>Limosa limosa</i>	1,317.38	47-3,085	148.00	444	0.33	2			10,985	0.97
72	<i>Limosa lapponica</i>	0.13	1							1	< 0.01
73	<i>Glareola pratincola</i>	1.75	2-9							14	< 0.01
74	<i>Stercorarius pomarinus</i>	0.13	1			2.33	14			15	< 0.01
75	<i>Stercorarius parasiticus</i>					0.33	2			2	< 0.01
76	<i>Larus ichthyæetus</i>	7.25	2-52					2.00	4	62	0.01
77	<i>Larus melanocephalus</i>	677.25	290-4,728			2,688.50	181-15,750			21,549	1.90
78	<i>Larus minutus</i>	1.00	8	47.00	11-130					149	0.01
79	<i>Larus ridibundus</i>	7,982.50	1,564-18,000	2,624.00	220-7,252	6,837.00	1,200-13,860	11,075.00	550-21,600	134,904	11.89
80	<i>Larus genei</i>	2,055.25	163-9,610	30.00	20-70	479.17	2875			19,407	1.71
81	<i>Larus cachinnans</i>	782.63	250-2,157	195.33	100-268	210.33	10-762	869.00	358-1,380	9,847	0.87
82	<i>Larus canus</i>			53.33	160	5.00	10-20	1,910.00	3,820	4,010	0.35
83	<i>Chlidonias niger</i>	67.38	89-320							539	0.05
84	<i>Chlidonias leucopterus</i>	1,547.88	110-7,925	2.00	6					12,389	1.09
85	<i>Chlidonias hybrida</i>	167.50	1,340							1,340	0.12
86	<i>Gelocheidon nilotica</i>	187.50	3-753	0.67	2	2.50	15			1,517	0.13
87	<i>Hydroprogne caspia</i>	6.88	1-18	2.00	6					61	0.01
88	<i>Thalasseus sandvicensis</i>	202.75	30-780			670.50	2-4021			5,645	0.50
89	<i>Sterna hirundo</i>	214.50	57-440	1.00	3	10.67	64			1,783	0.16
90	<i>Sterna albifrons</i>	118.88	4-703							951	0.08
91	<i>Anas spp.</i>					976.83	11-5,850			976.83	0.52
92	<i>Aythya spp.</i>					2,166.67	2,000-11,000			13,000	1.15
93	<i>Calidris sp.</i>					1.33	8			8	< 0.01
94	<i>Waders spp.</i>					2.50	15			15	< 0.01
	Total	75,743.75		26,713.67		51,954.50		68,510.50		1,134,832	100.00

## 2. Monthly dynamics of bird numbers and species composition

### 2.1. August

A total of 8 censuses were carried out. August counts were the most regular and systematic, most of them (7 from 8) with 100 % coverage of the liman area. They were conducted according to the programme of the Regional Ornithological Monitoring (ROM) that implements simultaneous counts at the majority of main wetlands in South Ukraine and thereby ensures the identification of the ornithological value of Utliujskiy Liman in August in comparison with other wetlands of South Ukraine (see chapter 3). In August, a total of 605,950 waterbirds (81 species) were recorded. The average numbers of birds at the liman (per one count) amounted to more than 75,743 (min — 11,835 in 1995, max — 115,095 in 2001) individuals.

The most numerous were representatives of the orders Charadriiformes and Gruiformes, amounting to 49.98 % and 30.45 % of the total average bird numbers in August, respectively (fig. 3).

The data of the species, which numbers exceeded 1% of the average abundance of the birds counted in August, are given below. The Coot *Fulica atra* was dominant, equalling about one third of the total bird abundance. Its average numbers was 23,030 individuals, percent in the total number — 30.41 %. Subdominants were *Philomachus pugnax*, which average numbers reached 18,088 birds and 23.88 %, Number of other species was the following *Larus ridibundus* (7,983 ind./10.54 %), *Podiceps nigricollis* (6,717 ind./8.87 %), *Anas platyrhynchos* (2,665 ind./3.52 %), *Larus genei* (2,055 ind./2.71 %), *Chlidonias leucopterus* (1,548 ind./2.04 %), *Limosa limosa* (1,317 ind./1.74 %), *Anas querquedula* (1,232 ind./1.63 %), *Tadorna tadorna* (1,188 ind./1.57 %), *Calidris ferruginea* (1,162 ind./1.53 %), *Podiceps cristatus* (863 ind./1.14 %), *Recurvirostra avosetta* (849 ind./1.12 %), *Larus cachinnans* (783 ind./1.03 %).

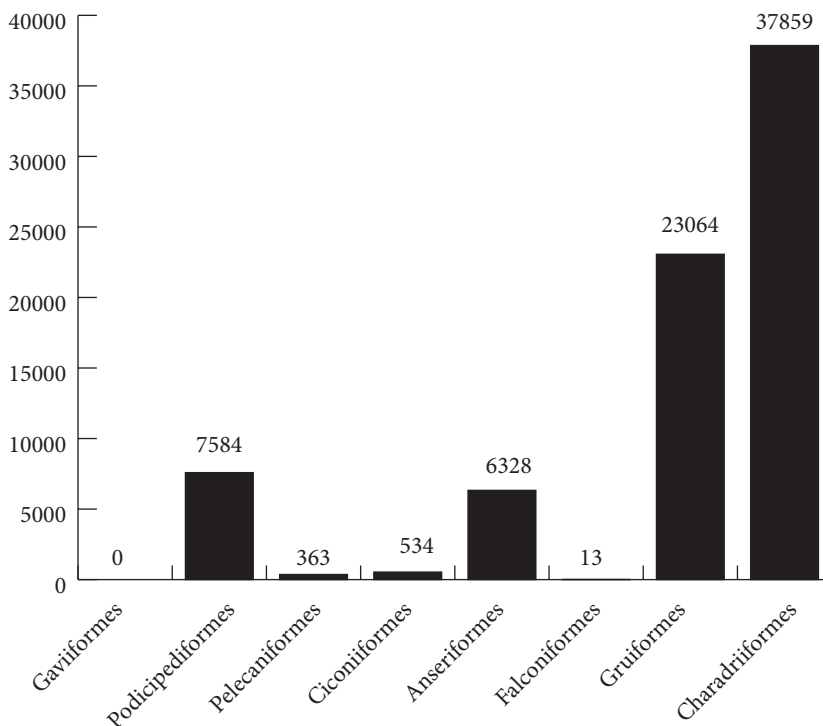


Fig. 3. An average number of different waterbird taxonomic groups at Utliujskiy Liman in August.

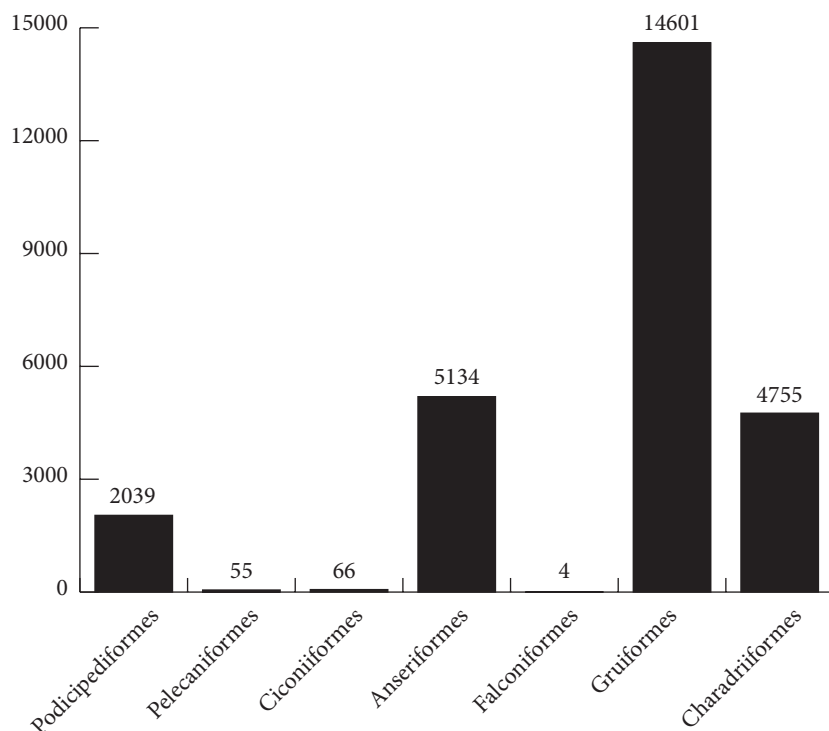


Fig. 4. The average number of different orders of waterbirds at Utlivskiy Liman in September.

### 2.2. September

Bird counts in September were occasional and often included just some areas of the liman without its complete coverage. A total of 3 counts were carried out with 80,141 waterbirds (55 species) recorded. The average bird number at the liman (per one count) was 26,713 ind. (min — 8,071 in 1996, max — 41,139 in 1994). The most numerous were representatives of the orders Gruiformes and Anseriformes, amounting to 54.66 % and 19.44 % of the total average bird numbers in September, respectively (fig. 4).

In September, similar to August, the Coot *Fulica atra* dominated. Its average numbers were 14,416 ind. or 53.95 % of average of total birds number. Other species which exceed 1 % of total number were the following: *Larus ridibundus* (2,624 ind./9.82 %), *Anas querquedula* (2,371 ind./8.88 %), *Podiceps nigricollis* (2,014 ind./7.54 %), *Anas platyrhynchos* (1,406 ind./5.26 %), *Philomachus pugnax* (647 ind./2.42 %), *Recurvirostra avosetta* (617 ind./2.31 %), *Aythya ferina* (276 ind./1.03 %).

### 2.3. October

A total of 6 counts were carried out with 311,720 waterbirds (62 species) recorded. The average bird number at the liman (per one count) was 51,955 ind. (min — 5,717 in 2002, max — 114,389 in 2010). In October, the orders Gruiformes and Anseriformes continued to be the most numerous, amounting to 46.69 % and 26.91 % of the total average bird numbers, respectively (fig. 5).

Similar to the previous months, the Coot was dominant (average — 24,236 ind./percent in the total number — 46.65 %), constituting almost half of the recorded waterbirds. Subdominants, according to their numbers, were *Larus ridibundus* (6,837 ind./13.16 %), *Aythya ferina* (4,162 ind./8.01 %), *Anas platyrhynchos* (2,703 ind./5.20 %) and *Larus melanocephalus* (2689 ind./5.17 %), *Tadorna tadorna* (1450 ind./2.79 %), *Calidris alpina* (925 ind./1.78 %), *Anas crecca* (773 ind./1.49 %), *Thalasseus sandvicensis* (671 ind./1.29 %). It is necessary to mention that high numbers of *Aythya ferina* and *Larus melanocephalus* were



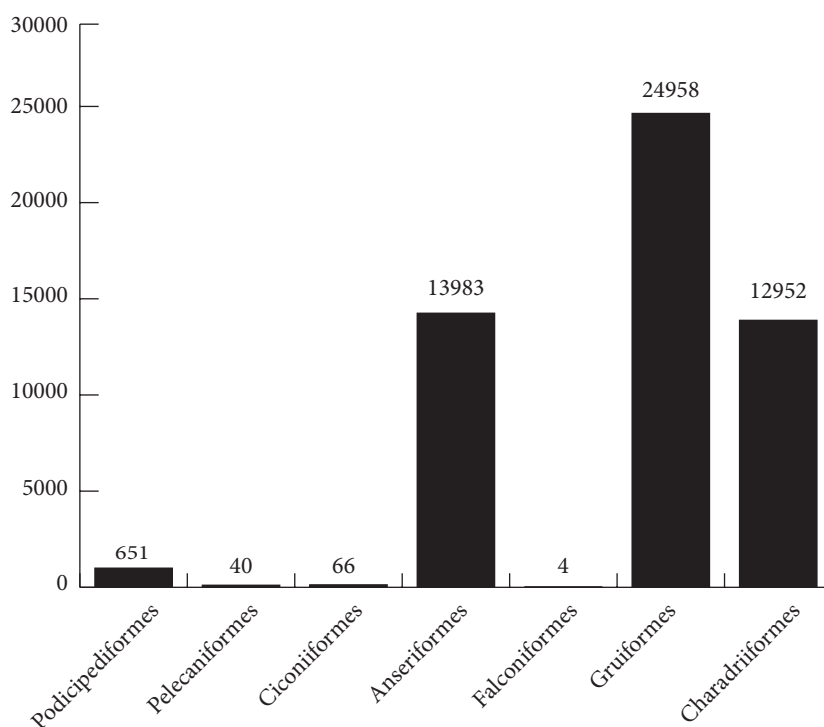


Fig. 5. The average number of different orders of waterbirds at Utliukskiy Liman in October.

registered just one time for each species — 1995 and 2010, respectively. In other years their numbers were about 200–500 individuals.

#### 2.4. November

Two counts were carried out. The coverage was similar to that (about 90 % of the wetland) in 1996 and 2013. A total of 137,021 waterbirds (37 species) were recorded. The average bird number at the liman (per one count) was 68,511 ind: min — 23,686 in 2013, max — 113,335 ind. in 1996. Similar to the previous month, the dominants in November were represented by the orders Gruiformes and Anseriformes, constituting 42.64 % and 31.79 % of the total average bird numbers, respectively (fig. 6).

In November, the Coot *Fulica atra* still dominated — 29,215 ind. or 42.64 %. Subdominants were *Larus ridibundus* (11,075 ind./16.17 %), *Aythya marila* (6,500 ind./9.49 %), *Anas penelope* (5,028 ind./7.34 %), *Anas platyrhynchos* (4,460 ind./6.51 %), *Calidris alpina* (3,090 ind./4.51 %), *Aythya ferina* (2,980 ind./4.35 %), *Larus canus* (1,910 ind./2.79 %), *Tadorna tadorna* (945 ind./1.38 %), *Larus cachinnans* (869 ind./1.27 %), *Anser albifrons* (843 ind./1.23 %).

#### 2.5. Changes in the structure of waterbird populations at Utliukskiy Liman from August to November

Throughout the season, many characteristics of waterbirds at Utliukskiy Liman are varying significantly due to the timing of migration of different waterbird species and their abundance. As most of the species had already completed their migration by November their numbers at the liman reduced to 37 (compared to 81 species in August). At the same time, the total number undergoes more complex changes, difficult to estimate properly because of the lack of detailed counts in September.

According to our data, the average number was maximum in August — 75,743 birds, then had decreased to 51,955 by October, and in November increased again to 68,511 birds. These figures demonstrate a complex picture of the migration end in some species and a

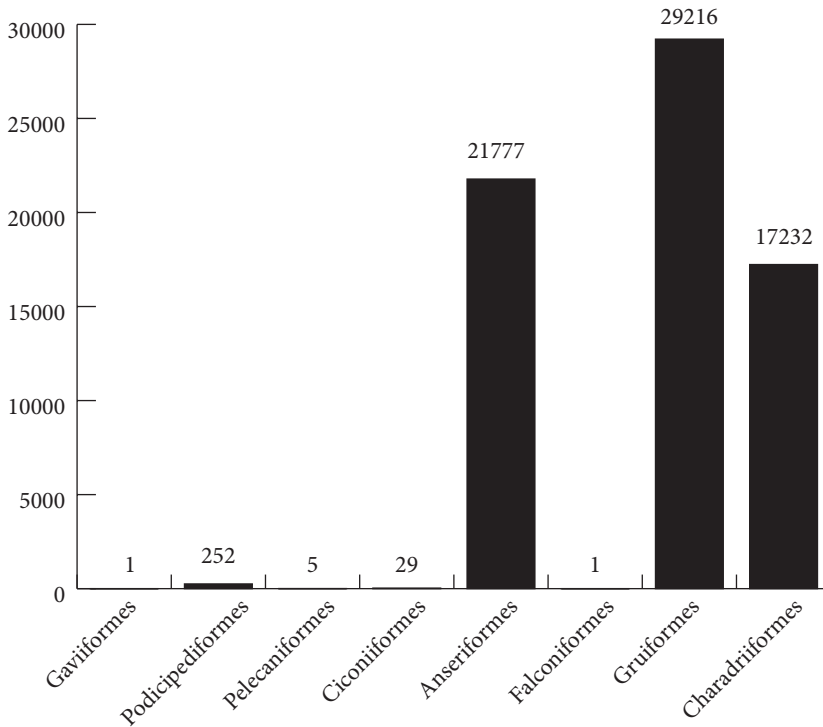


Fig. 6. The average number of different orders of waterbirds at Utlukskiy Liman in November.

growing migration process in other species, arriving later, with elements of pre-wintering concentrations of coots, ducks and swans. The most noticeable in the seasonal migration dynamics is decreasing numbers of Charadriiformes, and gradually increasing numbers of Anseriformes and Gruiformes. As for the latter, its number dynamics is determined by the only one species — *Fulica atra*, which, as we have mentioned above, was the most numerous species from August to November. The monthly percentage of the relative abundance of different orders of waterbird is shown in fig. 7 indicating that over 73 % of the total number of Podicipediformes was registered in August. Then their number dropped and in November

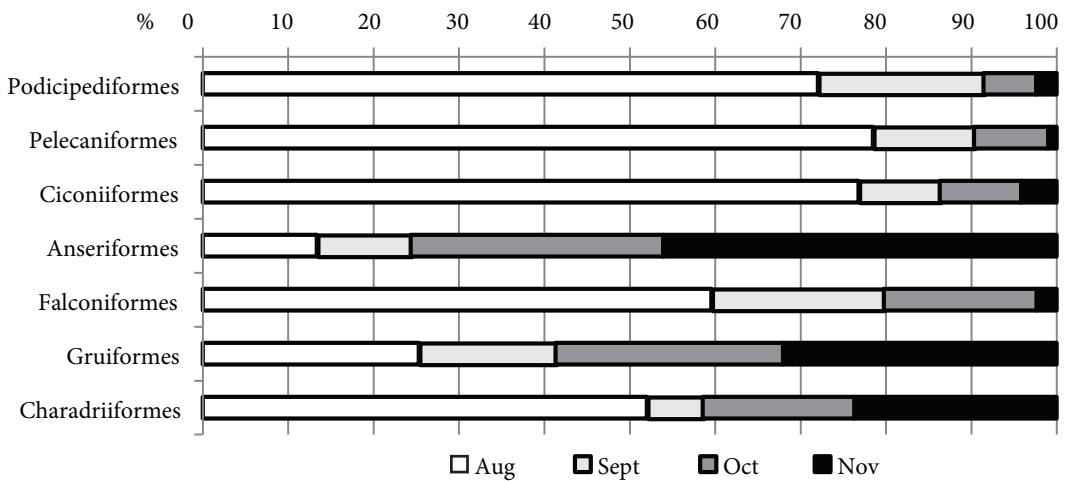


Fig. 7. Monthly percentage of the relative numbers of waterbirds at Utlukskiy Liman per different orders.

the percentage of Podicipediformes only slightly exceeded 2 %. The situation was similar for other two orders — Pelicaniformes and Ciconiiformes. For Charadriiformes it was almost the same: the largest numbers of them were seen in August, then decreased in September and slightly increased in October–November due to the migration of two species (Black-headed Gull and Dunlin) though did not reach the August numbers. The order Anseriformes was characterized by inverse dynamics — maximum bird numbers were registered in November. The Coot (Gruiformes) abundance did not change significantly, and had no any changing trend. The Coot is not only the most numerous species in the migration period but also one of the most numerous species at the liman during the wintering season (Kostiushyn et al., 2011).

### 3. The place of Utliujskiy Liman among key wetlands of the Azov-Black Sea Region according to its importance for the conservation of migratory bird populations

As it was mentioned in Introduction, the synchronized August counts of birds, carrying out regularly in the entire region, ensured the objective comparison for the capacity of key wetlands to support seasonal concentrations of birds (Bulletin ROM, 2005, 2006, 2010 a, b, 2014). We used two indicators to show the importance of Utliujskiy Liman. The first one concerns the absolute numbers of waterbirds in August at each of the wetlands, of which 5 wetlands with maximum waterbird numbers were selected. The second indicator is based on the species analysis, i. e. what percentage of the annual total number of the particular species, recorded in the region, was present at Utliujskiy Liman.

The first indicator has shown a stable place of Utliujskiy Liman among the five most valuable wetlands of the Azov-Black Sea coast of Ukraine, since it ranked from fifth to first between years of surveys (fig. 8).

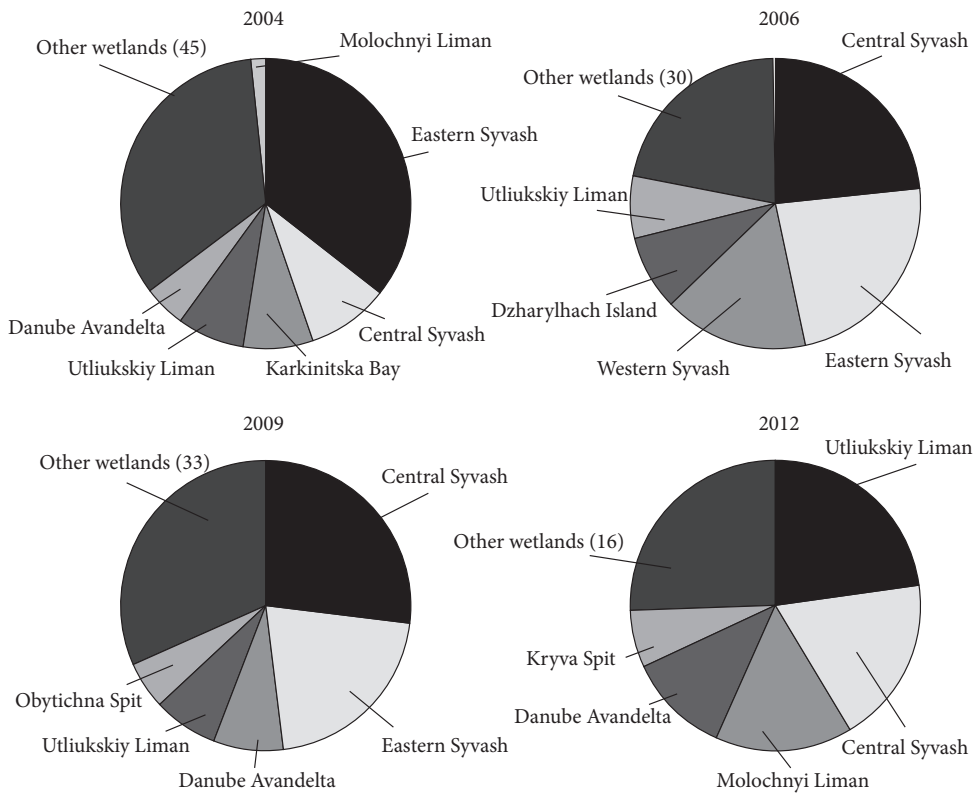


Fig. 8. Importance of Utliujskiy Liman among key wetlands of the region, basing on the ratio of the total bird numbers recorded in the region in August of 2004, 2006, 2009 and 2012.

**Table 3. The list of the species which abundance at Utliukskiy Liman between years exceeded 10 % of the total numbers (%) of these particular species in the Azov-Black Sea Region of Ukraine**

Species	2004	2006	2009	2012	2015
<i>Podiceps nigricollis</i>	87.61		83.17	98.15	11.24
<i>Podiceps cristatus</i>				40.99	34.87
<i>Egretta alba</i>		14.99		14.49	
<i>Egretta garzetta</i>		10.50		39.48	13.97
<i>Ardea cinerea</i>		12.34	14.93	25.24	25.42
<i>Ardea purpurea</i>		40.36			18.60
<i>Tadorna ferruginea</i>		41.46		10.14	32.81
<i>Tadorna tadorna</i>					32.31
<i>Anas penelope</i>				14.29	
<i>Anas acuta</i>				75.00	
<i>Anas querquedula</i>		23.25		12.26	38.52
<i>Anas clypeata</i>	12.98				20.54
<i>Netta rufina</i>		12.07			
<i>Aythya nyroca</i>			11.65		
<i>Aythya fuligula</i>	37.10				
<i>Aythya marila</i>	17.65				
<i>Grus grus</i>				21.71	
<i>Fulica atra</i>	12.46	13.67	15.47	46.04	20.07
<i>Burhinus oedicnemus</i>		23.08			20.00
<i>Pluvialis squatarola</i>	42.58	32.02		17.72	14.05
<i>Charadrius hiaticula</i>		44.94	21.05	92.02	18.91
<i>Charadrius dubius</i>			27.85	54.05	
<i>Vanellus vanellus</i>			10.28	13.06	16.50
<i>Arenaria interpres</i>			19.57		11.48
<i>Himantopus himantopus</i>				33.07	
<i>Recurvirostra avosetta</i>	12.56	10.17	10.83		53.08
<i>Tringa ochropus</i>				34.82	11.04
<i>Tringa glareola</i>				13.19	
<i>Tringa nebularia</i>				47.95	20.03
<i>Tringa erythropus</i>					24.00
<i>Tringa stagnatilis</i>				39.01	
<i>Actitis hypoleucos</i>				26.57	11.90
<i>Phalaropus lobatus</i>	12.91			36.25	31.68
<i>Philomachus pugnax</i>			12.21	11.16	31.39

<i>Calidris minuta</i>			61.11	
<i>Calidris ferruginea</i>		11.50	57.27	35.30
<i>Calidris alpina</i>			14.13	
<i>Gallinago gallinago</i>		14.44	19.05	13.21
<i>Limosa limosa</i>	14.93	25.89	49.75	38.30
<i>Larus melanocephalus</i>	32.63			
<i>Larus ridibundus</i>			11.18	11.48
<i>Larus genei</i>			56.60	14.40
<i>Larus cachinnans</i>			12.72	
<i>Chlidonias niger</i>		24.26	12.92	29.28
<i>Chlidonias leucopterus</i>	10.19		74.64	
<i>Chlidonias hybridus</i>			15.04	
<i>Gelochelidon nilotica</i>	15.88	31.93		
<i>Hydroprogne caspia</i>				12.68
<i>Sterna albifrons</i>		14.19		49.40

Note. Species in bold are included in the Red Book of Ukraine.

The fact of importance of five the most valuable wetlands, selected by us, looks convincing because in all analyzed cases the summarized bird number at the other remained wetlands constituted only 25–35 % of all the recorded birds.

For 49 (58 %) of 84 species registered in August at Utliujskiy Liman their percentage in the total bird number in Azov-Black Sea region of Ukraine exceeded 10 % (table 3). This is a rather high value especially since 10 of these 49 species were rare and included in the Red Book of Ukraine (2009).

Taking all these figures into account we can confidently state that Utliujskiy Liman belongs to the top five most valuable wetlands of the Azov-Black Sea coast of Ukraine and deserves to be designated as a Ramsar site.

#### 4. Importance of Utliujskiy Liman for protected species of migratory waterbirds

The lists and categories of the waterbird species protected at different levels — national, European, regional and global can be found in various Ukrainian and international documents. To analyze the importance of Utliujskiy Liman we used the following documents: for the national level — the Red Book of Ukraine (Red Book..., 2009); European level — the Berne Convention, Appendix II — Strictly protected fauna species and the European Red List (European..., 2015); regional — the Agreement on the Conservation of African-Eurasian Migratory Waterbirds AEWA, Appendix 3, Table 1, columns A and B (the Agreement..., 2015); global level — Convention on the Conservation of Migratory Species of Wild Animals (CMS), Annex 1 “Endangered migratory species” (table 4). All the mentioned documents, except the European Red List of Birds are legislative documents of the national and international level. Although these lists are based on similar criteria they are not fully coordinated with each other, both in initial assessments of a status of the specific species and in the system of used categories. One should also take into account that these lists were compiled for territories of different sizes — from a single country to the global level.

Table 4. Protected waterbird species of Utiukskiy Liman during the autumn migration

Species	Numbers		RBU <sup>1</sup>	BC <sup>2</sup>	EUR <sup>3</sup>	AEWA <sup>4</sup>	CMS <sup>5</sup>
	mean	max					
<i>Gavia arctica</i>		3		+			
<i>Podiceps ruficollis</i>	6.4	41		+			
<i>Podiceps nigricollis</i>	4458.1	31 931		+			
<i>Pelecanus onocrotalus</i>	89	171	EN	+		A1a3c	+
<i>Botaurus stellaris</i>	1.3	3		+		B2c	
<i>Nycticorax nycticorax</i>		8		+			
<i>Egretta alba</i>	94.7	436		+		B1	
<i>Egretta garzetta</i>	80.6	440		+		B1	
<i>Ardea purpurea</i>	14.4	73		+		B(2c)	
<i>Platalea leucorodia</i>		4	DN	+			
<i>Plegadis falcinellus</i>	17.0	29	DN	+		A3c	
<i>Anser anser</i>	555.0	3500				B1	
<i>Cygnus olor</i>	210.2	658				B1	
<i>Cygnus cygnus</i>		3		+		A2	
<i>Tadorna ferruginea</i>	27.5	192	DN	+		A2	
<i>Tadorna tadorna</i>	1303.9	14 215		+			
<i>Anas platyrhynchos</i>	2667.0	6710				B2c	
<i>Anas strepera</i>	3.8	13	RA				
<i>Netta rufina</i>	145.6	941	RA			A3c	
<i>Aythya ferina</i>	2273.3	31 874			VU	B2c	
<i>Aythya nyroca</i>	5.6	16	DN			A1a4	+
<i>Aythya marila</i>	3277.3	13 101			VU	C1	
<i>Oxyura leucocephala</i>		4		+	EN		+
<i>Mergus serrator</i>	6.3	19	DN		NT	B1	
<i>Mergus merganser</i>		1				A2	
<i>Pandion haliaetus</i>		3	EN	+			
<i>Haliaeetus albicilla</i>		1	RA	+			+
<i>Grus grus</i>	94.2	760	RA	+			
<i>Burhinus oedicnemus</i>		1	US	+			
<i>Charadrius hiaticula</i>	251.3	806	RA	+			
<i>Charadrius dubius</i>	11.0	23		+			
<i>Charadrius alexandrinus</i>	24.8	132	DN	+		A3c	
<i>Vanellus vanellus</i>	218.3	1846			VU		

<i>Arenaria interpres</i>	38.1	100		+		
<i>Himantopus himantopus</i>	53.0	168	DN	+		
<i>Recurvirostra avosetta</i>	888.3	7907	RA	+		B1
<i>Haematopus ostralegus</i>	48.4	97	DN		VU	B2c
<i>Tringa ochropus</i>	17.7	55		+		
<i>Tringa glareola</i>	81.2	308		+		
<i>Tringa stagnatilis</i>	46.9	154	EN	+		B(1)
<i>Actitis hypoleucos</i>	14.0	42		+		
<i>Xenus cinereus</i>		2		+		
<i>Phalaropus lobatus</i>	135.0	456		+		
<i>Calidris minuta</i>	64.3	259		+		
<i>Calidris ferruginea</i>	933.4	3023		+	VU	
<i>Calidris alpina</i>	1182.1	11 206		+		
<i>Calidris alba</i>		1		+		
<i>Numenius arquata</i>	41.6	349	EN		VU	A4
<i>Numenius phaeopus</i>		4	EN			
<i>Limosa limosa</i>	1098.5	3531			VU	A3c
<i>Glareola pratincola</i>	6	9	RA	+		A2
<i>Larus ichthyaetus</i>	15.5	56	EN			A3a
<i>Larus melanocephalus</i>	3591.5	20 478		+		
<i>Larus minutus</i>	49.6	138		+		B(1)
<i>Larus genei</i>	2156.3	12 555		+		B2a
<i>Chlidonias niger</i>	179.6	320		+		
<i>Chlidonias leucopterus</i>	1548.6	7925		+		
<i>Chlidonias hybrida</i>		1340*		+		
<i>Gelochelidon nilotica</i>	189.6	770		+		A3c
<i>Hydroprogne caspia</i>	8.7	24	DN	+		A1c
<i>Thalasseus sandvicensis</i>	705.6	4801		+		B2a
<i>Sterna hirundo</i>	222.9	507		+		
<i>Sterna albifrons</i>	158.5	703	RA	+		A36 3c

Note. 1 — the Red Book of Ukraine (Is. 3, 2009): EN — endangered, DN — decreasing numbers, RA — rare, US — uncertain status; 2 — BC — The Berne Convention, Appendix II — strictly protected fauna species; 3 — EUR — European Red List (2015): EN — endangered, VU — vulnerable, NT — near threatened; 4 — AEWMA — the Agreement on the Conservation of African-Eurasian Migratory Waterbirds, Appendix 3, Table 1; 5 — CMS — Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), Annex 1 “Endangered migratory species.”

**Table 5. Importance of Utlukskiy Liman during the autumn period for the supporting geographical populations of particular bird species**

No	Species	Numbers of at the liman+, ind.	%	N+++	Subspecies and / or type of the population	Size of the population, thous. ind.++
1	<i>Podiceps nigricollis</i>	23,550 (August 2012)	8.8–14.8	6	<i>nigricollis</i> , Europe / Southern & Western Europe & North Africa	159–268
2	<i>Anser anser</i>	3,500 (August 1995)	4.1	2	<i>rubirostris</i> , Black Sea & Turkey	85
3	<i>Cygnus olor</i>	658 (October 2015)	1.46	3	Black Sea	45
4	<i>Tadorna tadorna</i>	7,062 (October 2015)	5.9	4	Black Sea & Mediterranean	120
5	<i>Anas penelope</i>	10,055 (November 1996)	3.35	1	W Siberia & NE Europe / Black Sea & Mediterranean	300
6	<i>Anas acuta</i>	1,130 (October 1994)	1.9	3	NW Europe	60
7	<i>Netta rufina</i>	800 (October 2015)	1.8	1	Black Sea & Eastern Mediterranean	20–43.5
8	<i>Aythya ferina</i>	24,300 (October 1995)	3.0	1	Central & NE Europe / Black Sea & Mediterranean	800
9	<i>Aythya marila</i>	13,000 (November 1996)	6.5–13	1	<i>marila</i> , W Siberia / Black Sea & Caspian	100–200
10	<i>Fulica atra</i>	79,395 (October 2010)	3.18	9	<i>atra</i> , Black Sea & Mediterranean (win)	2500
11	<i>Charadrius hiaticula</i>	761 (August 2012)	1.04	2	<i>hiaticula</i> , N Europe / Europe & North Africa	73
12	<i>Recurvirostra avosetta</i>	4,041 (August 2015)	8.60	6	SE Europe, Black Sea & Turkey (bre)	47
13	<i>Limosa limosa</i>	3,085 (August 2015)	1.9–3.4	4	<i>limosa</i> , Eastern Europe / Central & Eastern Africa	90–165
14	<i>Larus ridibundus</i>	21,600 (November 1996)	1.2–2.8	8	Eastern Europe / Black Sea & Eastern Mediterranean	770–1800
15	<i>Larus genei</i>	9,610 (August 2012)	4.7–6.9	5	Black Sea & Mediterranean (bre)	140–205
16	<i>Larus cachinnans</i>	2,157 (August 2012)	0.2–2.2	4	Black Sea & Western Asia / SW Asia, NE Africa	100–1000
17	<i>Chlidonias hybridus</i>	1,340 (August 2012)	1.2–1.4	1	<i>hybrida</i> , Black Sea & Eastern Mediterranean (bre)	98–108
18	<i>Gelochelidon nilotica</i>	753 (August 2006)	1.45–3.1	2	<i>nilotica</i> , Black Sea & Eastern Mediterranean / Eastern Africa	24–52
19	<i>Thalasseus sandvicensis</i>	4,021 (October 2015)	2.0–6.6	2	<i>sandvicensis</i> , Black Sea & Mediterranean (bre)	61–197
20	<i>Sterna albifrons</i>	703 (August 2015)	0.6–1.1	1	<i>albifrons</i> , Black Sea & Mediterranean (bre)	63.5–113



During the summer–autumn migration period at Utliukskiy Liman there were recorded 24 species listed in the Red Book of Ukraine, 52 — strictly protected under the Bern Convention, and 9 species of the European Red List of the three categories of endangered species. 31 species had a protection status under AEW, 3 of them had the highest protection priority (category 1). Among endangered species, 4 species were protected under Bonn Convention. Table 4 below presents the average monthly species abundance for the observation season (August–November) and their maximum number per one count.

It should be noted that the liman is important for the protection of 1 % or more of the geographical population for two dozens of bird species (table 5), which is a sufficient reason to recommend Utliukskiy Liman for the inclusion to the list of Ramsar sites (Ramsar Convention).

As it is shown in the table, for most of the species such significant numbers is not a single case (however, for the Greylag Goose and some species of ducks such high numbers were registered only prior to the 2000s). Thus, Utliukskiy Liman regularly plays an important role for more than 20 species of birds.

## Conclusions

During autumn migrations in Utlyukskiy Liman was observed 90 species of waterbird species (including 3 species of birds of prey, closely associated with wetlands), whose numbers ranged from 5,7 to 122 thousands individuals, depending on the coverage of counts, period of counts, as well as climatic and hydrological conditions of the year. Among them are 60 species with certain conservation status and which are included in annexes of different international conventions or national / international red lists.

The maximum number of birds on the Utlyukskiy Liman is typical for August. Most notable changes in the seasonal dynamics are reducing the number of Charadriiformes, and a gradual increase in the number of Anseriformes and Gruiformes. Due to the formation of pre-wintering concentration of coots, ducks, swans, the number of birds even in November, remains high. The most abundant species throughout the autumn period were *Fulica atra*, *Larus ridibundus*, *Philomachus pugnax*. Coot is not only the most abundant species during migration season, but also one of the most numerous species during the winter. At the same time number of species in November is only 38 against 84 in August.

According to results of simultaneous August Counts (conducted under Regional Ornithological Monitoring scheme), Utlyukskiy Liman occupies a stable place among the five most valuable wetlands of the Azov-Black Sea coast of Ukraine — in different years from 5th to 1st place on the total number of waterbirds. From 84 species recorded in August in Utlyukskiy Liman for 49 species (58 %) their number exceeds 10 per cent of the total population of these species in the Azov-Black Sea Region of Ukraine. This is a sound indicator of Utlyukskiy Liman importance for bird conservation, especially if take into account that 24 bird species are included in Red Data Book of Ukraine (2009).

Considering that Utlyukskiy Liman regularly supported over 20 thousand waterbirds (Ramsar Criterion 5), and for 20 species of the waterbirds were recorded more than 1% of their geographic populations (Ramsar Criterion 6), this wetland should be recommended to Ramsar Bureau as a wetland of international importance.

To compare current bird numbers and distribution with results of the previous liman's surveys (though not always for all sites of the liman) we used retrospective data of the bird counts, collected by many employees of the Azov-Black Sea Ornithological Station. These are, above all, E. A. Diadicheva, R. N. Chernichko, P. I. Gorlov, V. V. Kinda, V. M. Popenko, and Yu. A. Andryushenko, to whom the authors of the current publication express their sincere gratitude.

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