ЧИСЛЕННОСТЬ ПТИЦ / BIRD ABUNDANCE

GENERAL ANALYSIS OF THE RESULTS OF AUGUST COUNTS OF WATERBIRDS IN 2004–2015 ON THE AZOV-BLACK SEA COAST OF UKRAINE

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Key words: waterbirds counts, Azov-Black Sea coast, Ukraine
Ключевые слова: водно-болотные птицы, августовские учёты, Азово-Черноморское побережье, Украина

Introduction

The history of studying waterbirds in the Azov and Black Sea region goes back for more than a century and a half. However, it is only recently the large-scale synchronized bird counts, covering key wetland areas in the region, have been launched. International Waterbird Census (IWC) — winter counts for the whole region — was introduced in 1991 (Kostiushyn et al., 2011a), while migratory waterbird census of the same scale was conducted only in October 2010 (Kostiushyn et al., 2011b). Series of August Censuses were initiated and coordinated by J. Chernichko. They are a part of the Regional Ornithological Monitoring Program covering not only Ukraine, but also the Azov and Black Sea coastal line of neighbouring countries, some others regions. There were several reasons to start counting birds in August. Firstly, by this time, the breeding season of local populations has already ended and birds begin to concentrate before the flight. Some migratory species begin autumn migration. Secondly, the hunting season which leads to significant changes in the spatial distribution of bird communities in the wetlands, is not opened yet in Ukraine. Both of these aspects enable the assessment of local avifauna after the breeding season and the significance of particular wetlands for waterfowl. In total, 5 synchronized August Censuses were conducted in 2004, 2006, 2009, 2012 and 2015 (ROM Bulletin..., 2005, 2008, 2010, 2014, 2016). The publication is to present the overview of August Census data on waterbird species composition, number and distribution of waterfowl species in the Azov and Black Sea region of Ukraine, as well as to show the importance of different wetlands for birds.

Materials, methods and study area

The current publication presents only the analyzed data collected in the Azov and Black Sea region of Ukraine. However, the August Census partially covered other regions of the country as well, and the territories of other countries, primarily the Azov Sea region of Russia. The coverage of the wetlands of the Azov and Black Sea coast of Ukraine by year was as follows: 2004 — 64 sites, 2006 — 38 sites, 2009 — 43 sites, 2012 — 25 sites, 2015 — 39 sites, or alternatively 81 different sites in total (Fig. 1).

Due to some objective reasons, the regularity of the wetlands surveys was quite low. Only 25% of the sites (20 of 81) were attended during 4–5 censuses. The rest of the sites were counted only 1–3 times. Thus, the share of the sites surveyed only once was over 37%. The majority of sites, visited 2–3 times, were surveyed at different intervals, while the synchronous surveys were held with intervals of 2–3 years. The reason for this was that ornithologists mainly conducted the surveys on a volunteer basis. Another point to emphasize is that the counts were done predominantly by the network of professional

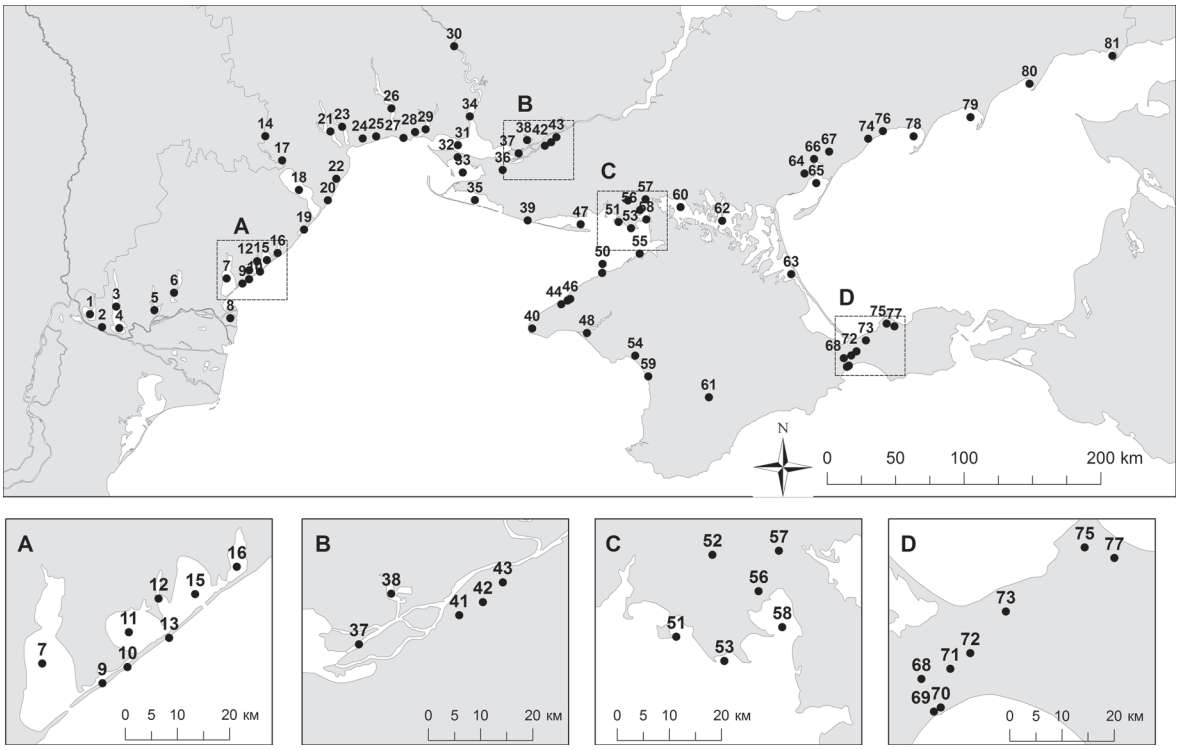

Fig. 1. Wetlands covered by counts in 2004–2015
Legend: 1 — Kagul Lake (45°23′ N, 28°23′ E); 2 — Kartal Lake (45°18′ N, 28°31′ E); 3 — Yalpug Lake (45°26′ N, 28°32′ E); 4 — Kugurlui Lake (45°18′ N, 28°40′ E); 5 — Katlabukh Lake (45°26′ N, 28°32′ E); 6 — Kitai Lake (45°33′ N, 29°10′ E); 7 — Sasyk Reservoir (45°40′ N, 29°32′ E); 8 — Lower part of the Ukrainian Danube Delta (45°24′ N, 29°32′ E); 9 — Dzhantsheiskii Liman (45°38′ N, 29°48′ E); 10 — Malyi Sasyk Liman (45°40′ N, 29°32′ E); 11 — Shagany Liman (45°43′ N, 29°32′ E); 12 — Karachaus Lake (45°47′ N, 29°56′ E); 13 — Tuzlovskaya Spit (45°43′ N, 29°58′ E); 14 — Kuchurganskii Liman (46°36′ N, 29°14′ E); 15 — Alibei Liman (45°47′ N, 30°32′ E); 16 — Burnas Liman (45°50′ N, 30°07′ E); 17 — Dniester and Turunchuk rivers interfluve (46°27′ N, 30°32′ E); 18 — Dniestrovskii Liman (46°16′ N, 30°18′ E); 19 — Budakskii Liman (46°00′ N, 30°32′ E); 20 — Baraboi River Estuary (46°12′ N, 30°35′ E); 21 — Khadzhibeiskii Liman (46°39′ N, 30°35′ E); 22 — Sukhoi Liman (46°20′ N, 30°32′ E); 23 — Kuyalnitskii Liman (46°41′ N, 30°41′ E); 24 — Bolshoi Adzhalykskii Liman (46°37′ N, 30°53′ E); 25 — Malyi Adzhalykskii Liman (46°38′ N, 31°22′ E); 26 — Tiligulskii Liman (46°49′ N, 31°46′ E); 27 — Lake near Morskoe Village (46°37′ N, 31°17′ E); 28 — Solonets-Tuzly Lake (46°40′ N, 31°23′ E); 29 — Berezanskii Liman (46°41′ N, 31°32′ E); 30 — Plavni of South Bug River (47°14′ N, 31°45′ E); 31 — Dnieprovskii Liman (46°35′ N, 31°48′ E); 32 — Kinburnskii Peninsula (46°30′ N, 31°48′ E); 33 — Yagorlytskii Bay (46°24′ N, 31°51′ E); 34 — Bugskii Liman (46°46′ N, 31°55′ E); 35 — Tendrovskii Bay (46°13′ N, 31°32′ E); 36 — Odzhigolskii Lakes (46°25′ N, 32°14′ E); 37 — Dnieper Delta (46°32′ N, 32°32′ E); 38 — Beloe Lake (46°37′ N, 32°40′ E); 39 — Ustrichnye Lakes (46°05′ N, 32°28′ E); 40 — Karadzinskoe Lake (45°23′ N, 32°32′ E); 41 — Kardashinskii Liman (46°35′ N, 32°38′ E); 42 — Ponds near Tsuryupinsk City (46°36′ N, 32°41′ E); 43 — Golubev Liman (46°38′ N, 32°44′ E); 44 — Panskoe Lake (45°32′ N, 32°47′ E); 45 — Yarylgach Lake (45°34′ N, 32°32′ E); 46 — Dzharylgach Lake (45°34′ N, 32°13′ E); 47 — Dzharylgachskii Bay (46°04′ N, 32°58′ E); 48 — Donuzlav Lake (45°21′ N, 33°32′ E); 49 — Bokalskoe Lake (45°45′ N, 33°06′ E); 50 — Bokalskaya Spit (45°48′ N, 33°11′ E); 51 — Shyrokii Bay (46°05′ N, 33°20′ E); 52 — North Crimean Canal (46°13′ N, 33°11′ E); 53 — Alekseevskii Bay (46°02′ N, 33°27′ E); 54 — Sasyk Lake (Crimea) (45°12′ N, 33°29′ E); 55 — Lebyazh'ii Islands (45°52′ N, 33°32′ E); 56 — Ponds near Stavki Village (46°09′ N, 33°32′ E); 57 — Shpindiyar Area (46°14′ N, 33°35′ E); 58 — Perekopskii Bay (46°06′ N, 33°36′ E); 59 — Kyzyl-Yar Lake (45°04′ N, 33°32′ E); 60 — Western Syvash (46°10′ N, 33°55′ E); 61 — Simferopolskoe Reservoir (44°55′ N, 34°10′ E); 62 — Central Syvash (46°05′ N, 34°32′ E); 63 — Eastern Syvash (45°43′ N, 34°32′ E); 64 — Sivashyk Liman (46°23′ N, 35°32′ E); 65 — Utlyukskii Liman (deep-water part) (46°19′ N, 35°12′ E); 66 — Utlyukskii Liman (shallow-water part) (46°28′ N, 35°12′ E); 67 — Molochnyi Liman (46°31′ N, 35°20′ E); 68 — Achi Lake (45°09′ N, 35°25′ E); 69 — Adzhigol Lake (45°06′ N, 35°32′ E); 70 — Kuchuk-Adzhigol Lake (45°06′ N, 35°28′ E); 71 — Frontovoe Reservoir (45°10′ N, 35°32′ E); 72 — Pond near Yachmennoe Village (45°12′ N, 35°32′ E); 73 — Ali-Bay Area (45°16′ N, 35°32′ E); 74 — Tubalskii Liman (46°36′ N, 35°02′ E); 75 — Aktashskoe Lake (45°23′ N, 35°32′ E); 76 — Korsak River Estuary (46°39′ N, 35°52′ E); 77 — Astaninskie Plavni (45°21′ N, 35°54′ E); 78 — Obitochnaya Spit (46°36′ N, 36°09′ E); 79 — Berdyanskaya Spit (46°43′ N, 36°32′ E); 80 — Belosaraiskaya Spit (46°55′ N, 37°32′ E); 81 — Krivaya Spit (47°04′ N, 38°05′ E).

Рис. 1. Водно-болотные угодья, охваченные учётами в 2004–2015 гг.
Условные обозначения: 1 — оз. Кагул (45°23′ с.ш., 28°23′ в.д.); 2 — оз. Картал (45°18′ с.ш., 28°31′ в.д.); 3 — оз. Ялпуг (45°26′ с.ш., 28°32′ в.д.); 4 — оз. Кугурлуй (45°18′ с.ш., 28°40′ в.д.); 5 — оз. Катлабух (45°26′ с.ш., 28°32′ в.д.); 6 — оз. Китай (45°33′ с.ш., 29°10′ в.д.); 7 — вдхр. Сасык (45°40′ с.ш., 29°32′ в.д.); 8 — нижняя часть украинской

дельты Дуная (45°24′ с.ш., 29°32′ в.д.); 9 — Джантшейский лиман (45°38′ с.ш., 29°48′ в.д.); 10 — лиман Малый Сасык (45°40′ с.ш., 29°32′ в.д.); 11 — лиман Шаганы (45°43′ с.ш., 29°32′ в.д.); 12 — лиман Карачаус (45°47′ с.ш., 29°56′ в.д.); 13 — Тузловская коса (45°43′ с.ш., 29°58′ в.д.); 14 — Кучурганский лиман (46°36′ с.ш., 29°14′ в.д.); 15 — лиман Алибей (45°47′ с. ш., 30°32′ в.д.); 16 — лиман Бурнас (45°50′ с.ш., 30°07′ в.д.); 17 — междуречье Днестра и Турунчука (46°27′ с.ш., 30°32′ в.д.); 18 — Днестровский лиман (46°16′ с.ш., 30°18′ в.д.); 19 — Будакский лиман (46°00′ с.ш., 30°32′ в.д.); 20 — устье р. Барабой (46°12′ с.ш., 30°35′ в.д.); 21 — Хаджибейский лиман (46°39′ с.ш., 30°35′ в.д.); 22 — лиман Сухой (46°20′ с.ш., 30°32′ в.д.); 23 — Куяльницкий лиман (46°41′ с.ш., 30°41′ в.д.); 24 — Большой Аджалыкский лиман (46°37′ с.ш., 30°53′ в.д.); 25 — Малый Аджалыкский лиман (46°38′ с.ш., 31°22′ в.д.); 26 — Тилигульский лиман (46°49′ с.ш., 31°46′ в.д.); 27 — озеро возле с. Морского (46°37′ с.ш., 31°17′ в.д.); 28 — оз. Солонец-Тузлы (46°40′ с.ш., 31°23′ в.д.); 29 — Березанский лиман (46°41′ с.ш., 31°32′ в.д.); 30 — плавни р. Южный Буг (47°14′ с.ш., 31°45′ в.д.); 31 — Днепровский лиман (46°35′ с.ш., 31°48′ в.д.); 32 — Кинбурнский п-ов (46°30′ с.ш., 31°48′ в.д.); 33 — Ягорлыцкий залив (46°24′ с.ш., 31°51′ в.д.); 34 — Бугский лиман (46°46′ с.ш., 31°55′ в.д.); 35 — Тендровский залив (46°13′ с.ш., 31°32′ в.д.); 36 — Оджигольские озёра (46°25′ с.ш., 32°14′ в.д.); 37 — дельта р. Днепр (46°32′ с.ш., 32°32′ в.д.); 38 — оз. Белое (46°37′ с.ш., 32°40′ в.д.); 39 — озёра Устричные (46°05′ с.ш., 32°28′ в.д.); 40 — оз. Караджинское (45°23′ с.ш., 32°32′ в.д.); 41 — Кардашинский лиман (46°35′ с.ш., 32°38′ в.д.); 42 — пруды возле г. Цюрюпинска (46°36′ с.ш., 32°41′ в.д.); 43 — Голубев лиман (46°38′ с.ш., 32°44′ в.д.); 44 — оз. Панское (45°32′ с.ш., 32°47′ в.д.); 45 — оз. Ярылгач (45°34′ с.ш., 32°32′ в.д.); 46 — оз. Джарылгач (45°34′ с.ш., 32°13′ в.д.); 47 — Джарылгачский залив (46°04′ с.ш., 32°58′ в.д.); 48 — оз. Донузлав (45°21′ с.ш., 33°32′ в.д.); 49 — оз. Бокальское (45°45′ с.ш., 33°06′ в.д.); 50 — коса Бокальская (45°48′ с.ш., 33°11′ в.д.); 51 — Широкий залив (46°05′ с.ш., 33°20′ в.д.); 52 — Северо-Крымский канал (46°13′ с.ш., 33°11′ в.д.); 53 — Алексеевский залив (46°02′ с.ш., 33°27′ в.д.); 54 — оз. Сасык (Крым) (45°12′ с. ш., 33°29′ в.д.); 55 — Лебяжьи о-ва (45°52′ с.ш., 33°32′ в.д.); 56 — пруды возле с. Ставки (46°09′ с.ш., 33°32′ в.д.); 57 — урочище Шпиндияр (46°14′ с.ш., 33°35′ в.д.); 58 — Перекопский залив (46°06′ с.ш., 33°36′ в.д.); 59 — оз. Кизил-Яр (45°04′ с.ш., 33°32′ в.д.); 60 — Западный Сиваш (46°10′ с.ш., 33°55′ в.д.); 61 — Симферопольское вдхр. (44°55′ с.ш., 34°10′ в.д.); 62 — Центральный Сиваш (46°05′ с.ш., 34°32′ в.д.); 63 — Восточный Сиваш (45°43′ с.ш., 34°32′ в.д.); 64 — лиман Сивашик (46°23′ с.ш., 35°32′ в.д.); 65 — Утлюкский лиман (глубоководная часть) (46°19′ с.ш., 35°12′ в.д.); 66 — Утлюкский лиман (мелководная часть) (46°28′ с.ш., 35°12′ в.д.); 67 — Молочный лиман (46°31′ с.ш., 35°20′ в.д.); 68 — оз. Ачи (45°09′ с.ш., 35°25′ в.д.); 69 — оз. Аджиголь (45°06′ с.ш., 35°32′ в.д.); 70 — оз. Кучук-Аджиголь (45°06′ с.ш., 35°28′ в.д.); 71 — вдхр. Фронтовое (45°10′ с. ш., 35°32′ в.д.); 72 — пруды возле с. Ячменного (45°12′ с.ш., 35°32′ в.д.); 73 — Али-Байское сухоречье (45°16′ с.ш., 35°32′ в.д.); 74 — Тубальский лиман (46°36′ с.ш., 35°02′ в.д.); 75 — оз. Акташское (45°23′ с.ш., 35°32′ в.д.); 76 — устье р. Корсак (46°39′ с.ш., 35°52′ в.д.); 77 — Астанинские плавни (45°21′ с.ш., 35°54′ в.д.); 78 — Обиточная коса (46°36′ с.ш., 36°09′ в.д.); 79 — Бердянская коса (46°43′ с.ш., 36°32′ в.д.); 80 — Белосарайская коса (46°55′ с.ш., 37°32′ в.д.); 81 — Кривая коса (47°04′ с.ш., 38°05′ в.д.).

ornithologists working in nature reserves, local universities and research institutes. With that said, the key sites were investigated almost regularly. The Azov and Black Sea coastal line belongs to the liman-lagoon type of terrain with especially favorable environment for the breeding of local birds and stopovers of migratory birds in the region. The set of 81 wetlands covered by the August censuses are compiled of 25 limans (estuaries), 25 lakes (with different water salinity) and marshes, 8 big marine spits with adjacent islands, 6 sea bays, 4 deltas of large rivers, 3 parts of marine lagoon (Syvash), 3 reservoirs and big ponds, 2 estuaries of small rivers and a number of small wetlands of no special importance in terms of regional avifauna.

Results

Characteristics of avifauna

The total number of birds counted in different years is as follows: 2004 — 1,789,696 ind. (64 wetlands covered), 2006 — 1 331 023 ind. (38 wetlands covered), 2009 — 1 110 382 ind. (43 wetlands covered), 2012 — 643 052 ind. (25 wetlands covered), 2015 — 617 242 ind. (39 wetlands covered). Out of the 116 bird species related to wetlands, only two species — *Fulica atra* and *Philomachus pugnax*, — accounted for 34% of the total number of birds (19.01% and 15.04%, respectively). Species *Larus ridibundus* (8.86%), *Phalacrocorax carbo* (8.84%), *Anas platyrhynchos* (5.10%) and *Tadorna tadorna* (4.99%) are displayed in a descending order. Species, accounting for over 1% of all the birds, are shown in Fig. 2.

Together these 19 species constitute 85.18% of all the accounted birds. Detailed information on the species composition and the number of their populations are provided in Table. Wetlands of the Azov and Black Sea region play an important role in terms of protected wetland birds from the 3rd edition of the Red Data Book of Ukraine (2009). The August census helped to identify 40 protected species with 35 of those ecologically associated with wetlands. The total

Table
Таблица

Species composition and abundance (in individuals) of waterbirds according to the August Censuses of 2004–2015.
Видовой состав и численность (особей) водно-болотных птиц по данным августовских учётов 2004–2015 гг.

№	Species / Вид	2004	2006	2009	2012	2015	Total / Всего	%
1	*Gavia stellata*				1		1	<0.01
2	*Gavia arctica*	61	30	4	14	1	110	<0.01
3	*Tachybaptus ruficollis*	291	169	147	21	19	647	0.01
4	*Podiceps nigricollis*	21,017	11,444	9,979	23,993	5,374	71,807	1.31
5	*Podiceps auritus*	5					5	<0.01
6	*Podiceps grisegena*	390	10	169	16	1	586	0.01
7	*Podiceps cristatus*	17,162	10,932	5,598	9,597	4,973	48,262	0.88
	Podiceps sp.				121		121	<0.01
8	*Puffinus puffinus*					950	950	0.02
9	*Hydrobates pelagicus*			2			2	<0.01
10	*Pelecanus onocrotalus*	14,928	2,990	13,544	5,882	5,837	43,181	0.79
11	*Pelecanus crispus*	142	22	150	122	37	473	0.01
12	*Phalacrocorax carbo*	157,222	109,984	126,739	52,865	38,572	485,382	8.84
13	*Phalacrocorax pygmaeus*	2,374	154	4,592	500	401	8,021	0.15
14	*Botaurus stellaris*	18	18	10			46	<0.01
15	*Ixobrychus minutus*	127	17	24	4	1	173	<0.01
16	*Nycticorax nycticorax*	1,120	329	179	69	24	1,721	0.03
17	*Ardeola ralloides*	932	105	303	407	43	1,790	0.03
18	*Egretta alba*	7,259	4,991	3,841	1,787	2,289	20,167	0.37
19	*Egretta garzetta*	6,452	2,934	3,205	970	1,217	14,778	0.27
20	*Ardea cinerea*	6,217	2,691	2,667	1,747	1,694	15,016	0.27
21	*Ardea purpurea*	840	167	218	29	43	1,297	0.02
	Egretta sp.			30			30	<0.01
22	*Platalea leucorodia*	838	273	336	265	148	1,860	0.03
23	*Plegadis falcinellus*	2,088	878	563	198	603	4,330	0.08
24	*Ciconia ciconia*	405	307	282	1,280	171	2,445	0.04
25	*Ciconia nigra*	44	9	22			75	<0.01
26	*Phoenicopterus roseus*		6			1	7	<0.01
27	*Anser anser*	9,523	3,430	5,759	6,809	6,994	32,515	0.59
28	*Cygnus olor*	22,766	23,865	23,963	7,471	10,709	88,774	1.62
29	*Cygnus cygnus*	2				1	3	<0.01
30	*Tadorna ferruginea*	17	41	487	69	128	742	0.01
31	*Tadorna tadorna*	35,967	55,202	124,718	43,622	14,708	274,217	4.99
32	*Anas platyrhynchos*	127,835	49,567	48,688	30,506	23,593	280,189	5.10
33	*Anas crecca*	13,982	583	550	315	558	15,988	0.29
34	*Anas strepera*	1,045	637	518	3,172	1,910	7,282	0.13
35	*Anas penelope*	551			14		565	0.01
36	*Anas acuta*	56	145		4	6	211	<0.01
37	*Anas querquedula*	63,472	19,125	7,914	7,326	4,826	10,2663	1.87
38	*Anas clypeata*	3,995	371	203	653	112	5,334	0.10
	Anas sp.	26,844	111	3,912	724	1,760	33,351	0.61

	Anas sp. – Aythya sp.				2207		2,207	0.04
39	*Netta rufina*	1,910	58	29		107	2,104	0.04
40	*Aythya ferina*	27,416	35,380	22,713	2,999	1,157	89,665	1.63
41	*Aythya nyroca*	745	24	103	46	25	943	0.02
42	*Aythya fuligula*	412	111	25	2,944	15	3,507	0.06
43	*Aythya marila*	51					51	<0.01
44	*Aythya* sp.	457	3	111	12	84	667	0.01
45	*Bucephala clangula*	4	8	2	10	8	32	<0.01
46	*Somateria mollissima*	3,600	4,145	1,560	497	1,101	10,903	0.20
47	*Oxyura leucocephala*				2		2	<0.01
48	*Mergus serrator*	54	9	1	4	1	69	<0.01
49	*Mergus merganser*	6				4	10	<0.01
50	*Circus aeruginosus*	123			222	258	603	0.01
51	*Haliaeetus albicilla*				15	10	25	<0.01
52	*Grus grus*	526	1,564	1,792	129	1,050	5,061	0.09
53	*Anthropoides virgo*	816	526	176	421	991	2,930	0.05
54	*Rallus aquaticus*	13	2	3			18	<0.01
55	*Porzana porzana*	2					2	<0.01
56	*Porzana parva*	5	2				7	<0.01
57	*Crex crex*		41				41	<0.01
58	*Gallinula chloropus*	256	38	69	32	6	401	0.01
59	*Fulica atra*	466,623	268,102	203,223	68,067	38,155	1,044,170	19.01
60	*Burhinus oedicnemus*	15	13	9	4	5	46	<0.01
61	*Pluvialis squatarola*	3,587	1,443	674	1,260	1,352	8,316	0.15
62	*Pluvialis apricaria*	52	16		125	2	195	<0.01
	Pluvialis sp.		1		10		11	<0.01
63	*Charadrius hiaticula*	377	89	133	845	645	2,089	0.04
64	*Charadrius dubius*	177	108	79	37	55	456	0.01
65	*Charadrius alexandrinus*	1,505	1,398	674	414	183	4,174	0.08
	Charadrius spp.	52	26			4	82	<0.01
66	*Vanellus vanellus*	3,885	3,830	2,316	1,225	1,534	12,790	0.23
67	*Arenaria interpres*	2,160	694	660	630	419	4,563	0.08
68	*Himantopus himantopus*	1,665	2,114	1,455	382	2,128	7,744	0.14
69	*Recurvirostra avosetta*	7,893	9,075	6,013	3,357	7,613	33,951	0.62
70	*Haematopus ostralegus*	1,472	1,176	1,205	1,720	876	6,449	0.12
71	*Tringa ochropus*	1,483	443	176	112	164	2,378	0.04
72	*Tringa glareola*	2,837	1,510	2,030	576	1,765	8,718	0.16
73	*Tringa nebularia*	3,417	1,261	1,918	1,222	767	8,585	0.16
74	*Tringa totanus*	19,898	9,229	5,198	2,402	2,275	39,002	0.71
75	*Tringa erythropus*	681	391	92	191	25	1,380	0.03
76	*Tringa stagnatilis*	2,463	2,322	570	282	115	5,752	0.10
	Tringa sp.	2,370	6	19		400	2,795	0.05
77	*Actitis hypoleucos*	207	227	192	149	169	944	0.02
78	*Xenus cinereus*	15	11	1	1	1	29	<0.01
79	*Phalaropus lobatus*	3,458	6,288	6,046	309	305	16,406	0.30
80	*Philomachus pugnax*	173,569	238,183	158,592	96,162	159,669	826,175	15.04
81	*Calidris minuta*	2515	2117	5410	252	270	10564	0.19
82	*Calidris temminckii*	49	88	20	1	1	159	<0.01

83	*Calidris ferruginea*	14,984	55,255	19,876	4,614	1,576	96,305	1.75
84	*Calidris alpina*	19,027	32,505	24,748	18,526	4,548	99,354	1.81
85	*Calidris maritima*				2		2	<0.01
86	*Calidris canutus*				1	7	8	<0.01
87	*Calidris alba*	220	250	61	12	6	549	0.01
	Calidris sp.	28,263	1,284	7,048	6,053	3,394	46,042	0.84
88	*Limicola falcinellus*	874	266	470	86	88	1,784	0.03
89	*Gallinago gallinago*	475	98	90	21	53	737	0.01
90	*Gallinago media*	3	1		11		15	<0.01
91	*Numenius tenuirostris*	12					12	<0.01
92	*Numenius arquata*	2,169	841	1,082	734	557	5,383	0.10
93	*Numenius phaeopus*	118	61	93	12	27	311	0.01
	Numenius sp.	45					45	<0.01
94	*Limosa limosa*	6,290	10,273	9,526	6,091	8,052	40,232	0.73
95	*Limosa lapponica*	2,392	519	21	1	3	2,936	0.05
96	*Glareola pratincola*	1,048	281	512	178	69	2,088	0.04
97	*Glareola nordmanni*					2	2	<0.01
	Waders sp.	937	63,545	5,154	8,391	2,484	80,511	1.47
98	*Stercorarius pomarinus*	1				13	14	<0.01
99	*Stercorarius parasiticus*	3			3	34	40	<0.01
	Stercorarius sp.		1				1	<0.01
100	*Larus ichthyaetus*	1,419	2,202	526	364	958	5,469	0.10
101	*Larus melanocephalus*	41,861	10,400	19,322	20,853	28,365	120,801	2.20
102	*Larus minutus*	48,177	17,164	1,970	14,793	4,993	87,097	1.59
103	*Larus ridibundus*	148,528	90,832	76,739	73,517	96,790	486,406	8.86
104	*Larus genei*	48,782	41,672	22,743	16,978	16,602	146,777	2.67
105	*Larus fuscus*		1	1	1		3	<0.01
106	*Larus argentatus*					384	384	0.01
107	*Larus cachinnans*	44,358	28,621	29,483	16,953	20,443	139,858	2.55
108	*Larus canus*	802	75	20			897	0.02
	Larus sp.	9,851	1,180	19,610	8,635	25,340	64,616	1.18
109	*Chlidonias niger*	2,177	2,791	794	444	419	6,625	0.12
110	*Chlidonias leucopterus*	22,413	33,841	9,085	10,617	8,112	84,068	1.53
111	*Chlidonias hybrida*	9,152	3,958	4,324	8,911	2,470	28,815	0.52
	Chlidonias spp.	10,999	3,761	11,261	2,015	1	28,037	0.51
112	*Gelochelidon nilotica*	3,243	3,436	2,521	869	1,755	11,824	0.22
113	*Hydroprogne caspia*	1,725	615	245	151	142	2,878	0.05
114	*Thalasseus sandvicensis*	14,564	8,665	9,883	24,008	15,711	72,831	1.33
115	*Sterna hirundo*	15,058	22,242	16,803	7,326	19,474	80,903	1.47
116	*Sterna albifrons*	2,803	778	1,136	883	1,429	7,029	0.13
	Sterna sp.	2,115		2,630	11,50	1,523	74,18	0.14
	Total / Всего	1,789,696	1,331,023	1,110,382	643,052	617,242	5,491,395	100.00

number of the birds counted and found in the Red Data Book was 179.5 thousand, or 3.26% of the total number of the recorded birds. The lowest recorded number was 21 thousand individuals, while the highest number was about 55 thousand individuals per census. More details can be found in our recent publication (Chernichko et al., 2018). Having analysed the ratio of different orders of birds we got the following picture. Charadriiformes was the most numerous taxonomic group (50.31% of the recorded birds: 25.13% waders, 19.16% gulls and skuas and

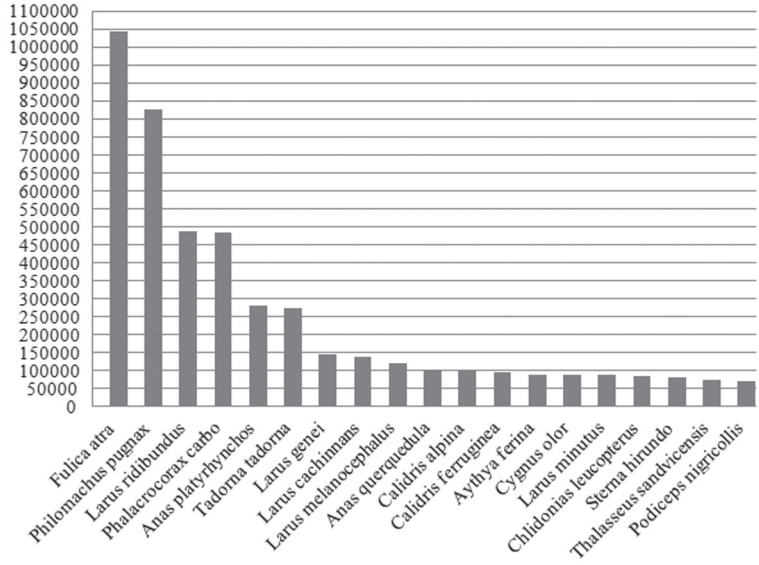

Fig. 2. The most numerous species (over 1% from the total number of birds)
Рис. 2. Наиболее многочисленные виды (свыше 1% от общей численности учтённых птиц)

Fig. 3. The most important wetlands for the Gaviiformes (> 1% of registered birds of the order) (numbering corresponds to that in Fig. 1)
Рис. 3. Наиболее значимые угодья для Gaviiformes (свыше 1% от численности птиц этого отряда) (нумерация угодий соответствует таковой на рис. 1)

6.02% terns) formed by 57 species. They were followed by Gruiformes (19.17%, 7 species). What is interesting that it was one particular species — *Fulica atra*. That accounted for the large number birds in this order. The third largest group was Anseriformes (17.34%: 15.13% ducks, 1.62% swans, 0.59% geese — 22 species all together). Pelecaniformes (9.80%, 4 species) and Podicipediformes (2.21%, 5 species) were the next in terms of orders. The number of birds in the remaining three orders — Ciconiiformes, Falconiformes and Gaviiformes — were significantly smaller.

Below you can find the information on the composition, abundance and distribution of each bird order, including the maps with the most significant wetlands for them.

Gaviiformes. A total of 111 birds of two species were recorded — *Gavia arctica* (110 ind.) and *G. stellata* (1 ind.), accounting for 0.002% of the total number of counted birds of all species (Table). They were recorded in 6 wetlands (Fig. 3), mainly in sea bays with most of the bird populations of the group found in Dzharylgachskii Bay (56.5% of all birds of the order) and Tendrovskii Bay (33.0%).

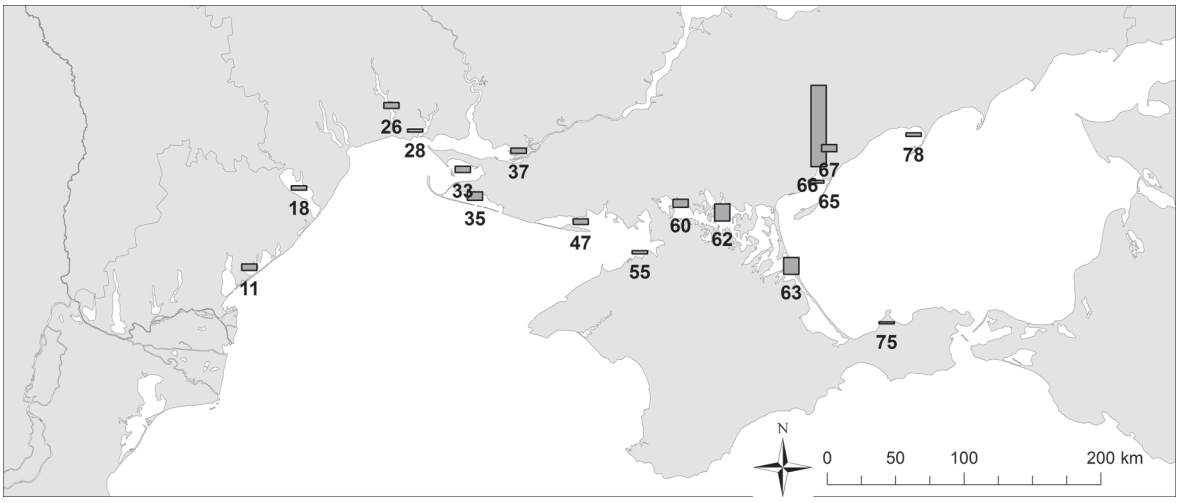

Fig. 4. The most important wetlands for the Podicipediformes (> 1% of registered birds of the order) (numbering corresponds to that in Fig. 1)
Рис. 4. Наиболее значимые угодья для Podicipediformes (свыше 1% от численности птиц этого отряда) (нумерация угодий соответствует таковой на рис. 1)

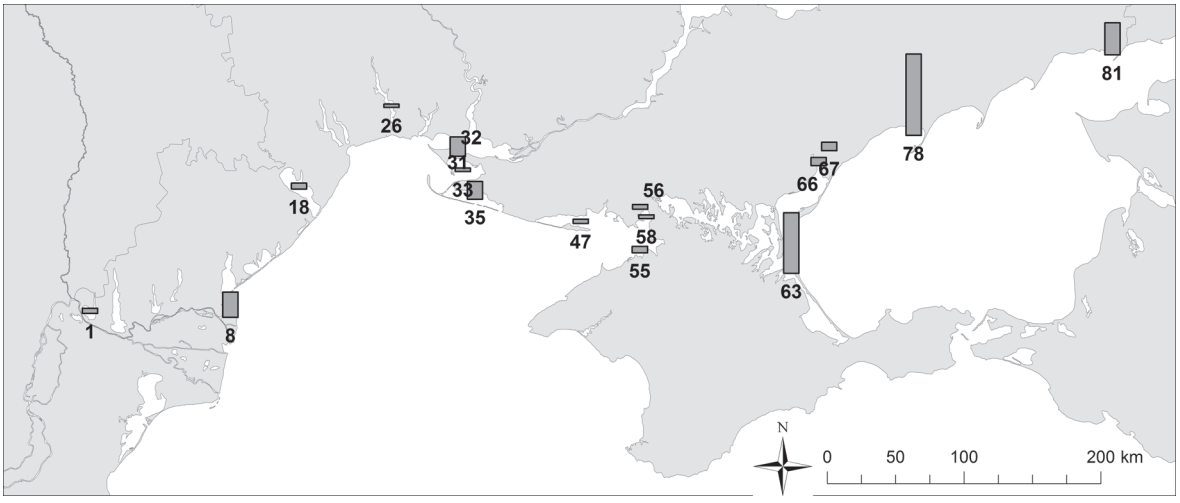

Fig. 5. The most important wetlands for the Pelecaniformes (> 1% of registered birds of the order) (numbering corresponds to that in Fig. 1)
Рис. 5. Наиболее значимые угодья для Pelecaniformes (свыше 1% от численности птиц этого отряда) (нумерация угодий соответствует таковой на рис. 1)

Podicipediformes. The order is represented by 5 species in censuses, with 121,428 ind. or 2.2% of the total number of registered birds. The most numerous species were *Podiceps nigricollis* (71807 ind.) and *P. cristatus* (48262 ind.) (Table). In total, the birds of this order were observed in 63 wetlands. You can see in Fig. 4, that Utlyukskii Liman (its shallow-water part) was most frequented by birds making it the most important location with 40.3% of all the birds of this order (number 66 on the picture) and *P. nigricollis* observed over there in quite an abundance (up to 23550 ind.). The Central (8.4%; 62) and Eastern (8.3%; 63) Syvash, Tendrovskii Bay (4.1%; 35), Western Syvash (4.0%; 60) also play a significant role for the birds of the order.

Procellariiformes. The birds of this order were seen only twice: 2 individuals of the *Hydrobates pelagicus* were recorded in the Eastern Syvash and a flock of *Puffinus puffinus,* about 950 individuals, was registered on the Kinburnskii Peninsula.

Pelecaniformes. The order is represented in censuses by 4 species, 537 057 individuals or 9.8% of the total amount of the registered birds (Table). The vast majority of the number was *Phalacrocorax carbo* (485382 ind.), followed by *Pelecanus onocrotalus* of 43181 ind. Other

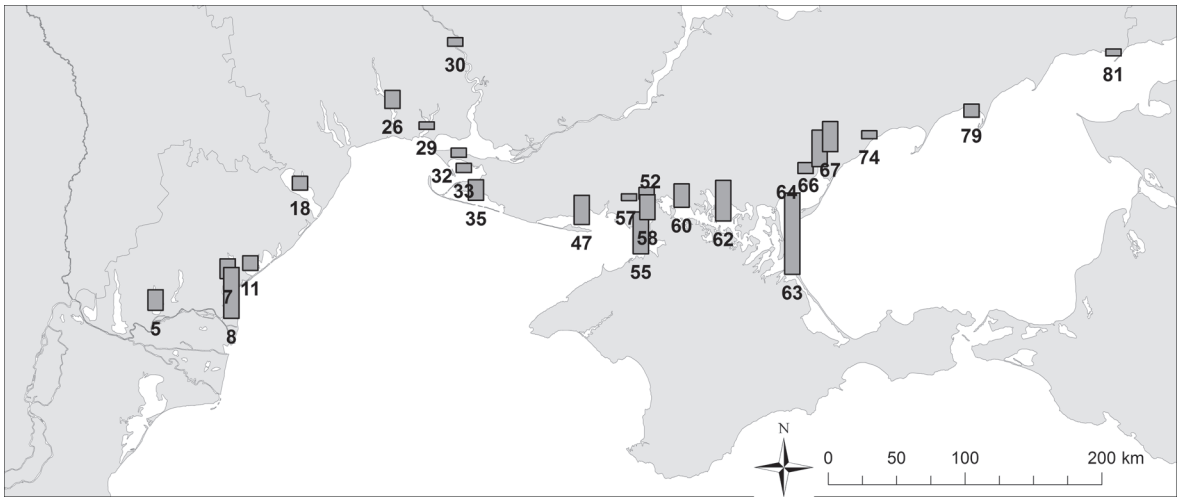

Fig. 6. The most important wetlands for the Ciconiiformes (> 1% of registered birds of the order) (numbering corresponds to that in Fig. 1)
Рис. 6. Наиболее значимые угодья для Ciconiiformes (свыше 1% от численности птиц этого отряда) (нумерация угодий соответствует таковой на рис. 1)

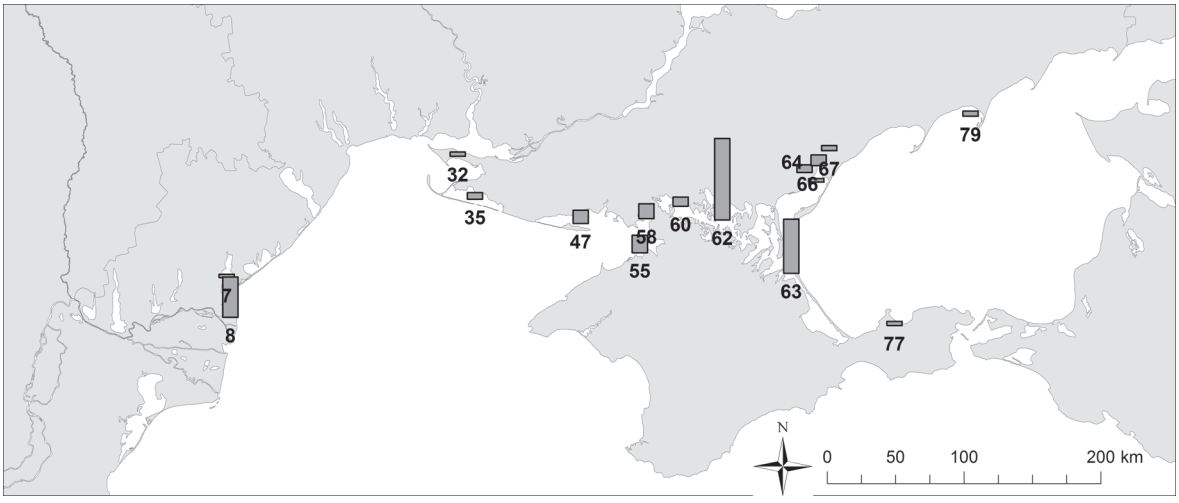

Fig. 7. The most important wetlands for the Anseriformes (> 1% of registered birds of the order) (numbering corresponds to that in Fig. 1)
Рис. 7. Наиболее значимые угодья для Anseriformes (свыше 1% от численности птиц этого отряда) (нумерация угодий соответствует таковой на рис. 1)

species were present in much smaller numbers. Species of the order were seen in 55 wetlands. The most important water bodies for these birds are (Fig. 5) the Obitochnaya Spit (25.5% of the accounted birds of the order, number 78 on the picture), Eastern Syvash (18.6%; 63), Krivaya Spit (9.9%; 81), lower part of the Ukrainian Danube Delta (7.7%; 8), the Kinburnskii Peninsula (5.9%; 32) and Tendrovskii Bay (5.4%; 35).

Ciconiiformes. The order is represented in the censuses by 13 species (Table), 63735 ind or 1.16% of the total of accounted birds. The most numerous species groups were *Egretta alba* (20167 ind.), *Ardea cinerea* (15016 ind.) and *Egretta garzetta* (14778 ind.). The birds of this group are relatively evenly distributed along the wetlands of the Azov and Black Sea coast of Ukraine and were recorded in 74 water bodies. The biggest part of the birds was seen in the following wetlands (Fig. 6): Eastern Syvash (12.4% of all the birds of the order; 63 on the picture), lower part of the Ukrainian Danube Delta (7.8%; 8), Lebyazh'ii Islands (6.4%; 55), Central Syvash (6.2%; 62), Utlyukskii Liman (its shallow-water part) (5.6%; 66), Molochnyi Liman (4.6%; 67) and Dzharylgachskii Bay (4.4%; 47).

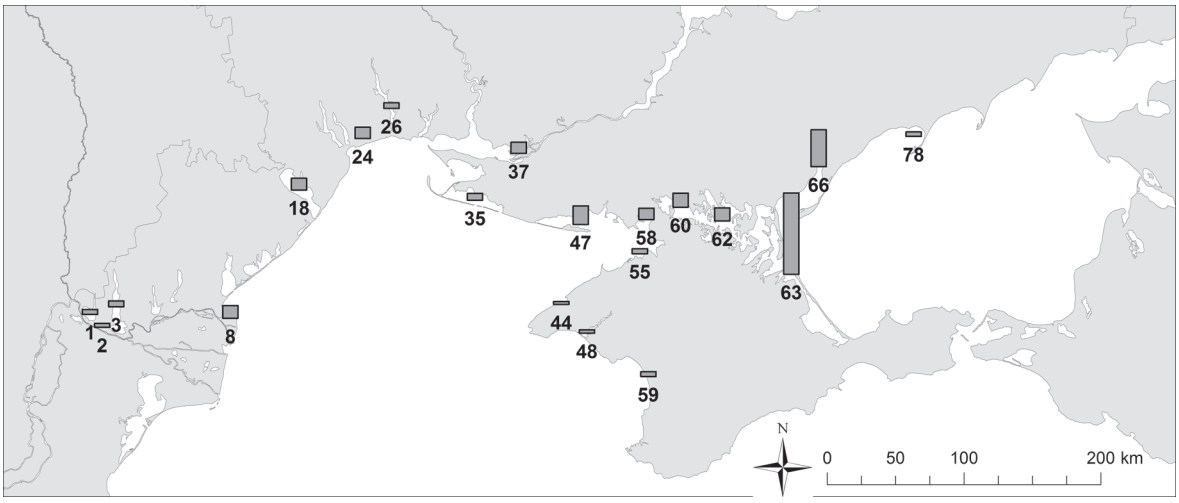

Fig. 8. The most important wetlands for the Gruiformes (> 1% of registered birds of the order) (numbering corresponds to that in Fig. 1)
Fig. 8. Наиболее значимые угодья для Gruiformes (свыше 1% от численности птиц этого отряда) (нумерация угодий соответствует таковой на рис. 1)

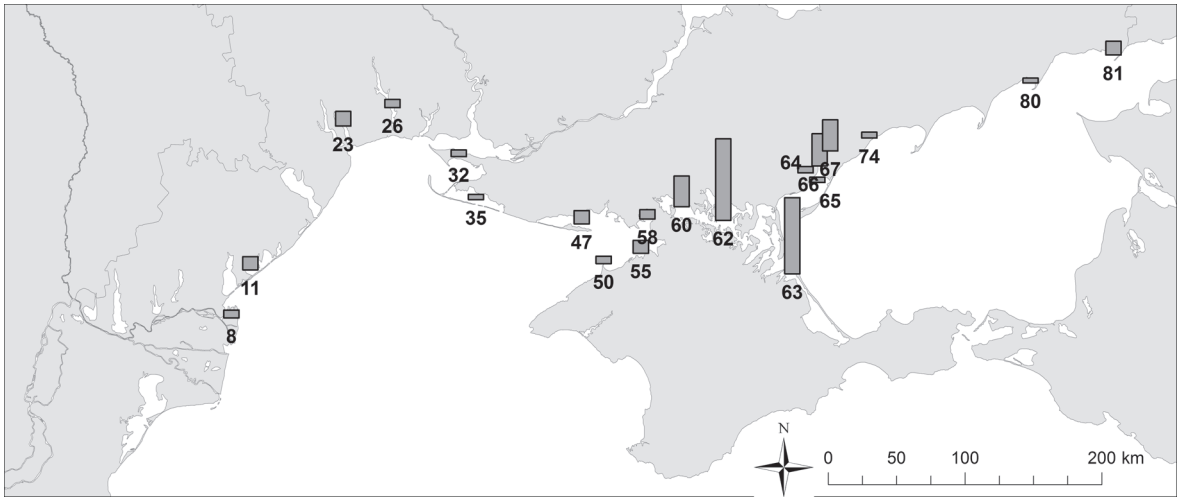

Fig. 9. The most important wetlands for the Charadriiformes (> 1% of registered birds of the order) (numbering corresponds to that in Fig. 1)
Fig. 9. Наиболее значимые угодья для Charadriiformes (свыше 1% от численности птиц этого отряда) (нумерация угодий соответствует таковой на рис. 1)

Anseriformes. 22 species of this group were recorded with 951994 ind. constituting 17.3% of the total number of all birds (15.13% ducks, 1.62% swans and 0.59% geese) (Table).

In terms of numbers, the most numerous species were *Anas platyrhynchos* (280 189 ind), *Tadorna tadorna* (274 217 ind.), *Anas querquedula* (102663 ind.), *Aythya ferina* (89 665 ind.), *Cygnus olor* (88 774 ind.), *Anser anser* (32515 ind.) and *Anas crecca* (15988 ind.).

Birds of this taxonomic order were seen in 75 wetlands. The main water bodies for them (Fig. 7) were the Central Syvash (25.4% of the accounted birds of this order; number 62 on the picture), Eastern Syvash (16.9%; 63), lower part of the Ukrainian Danube Delta (12.5%; 8), Lebyazh'ii Islands (5.4%; 55) and Dzharylgachskii Bay (4.1%; 47).

Falconiformes. Only two species of *Haliaeetus albicilla* (25 ind.) and *Circus aeruginosus* (603 ind.) that closely relate to wetlands were taken into analysis. *Pandion haliaetus*, that occurs periodically in August on separate wetlands was not observed during all synchronous counts. The rest of species of this order, registered during the surveys, however not ecologically associated with wetlands were not taken into account. Birds of this group

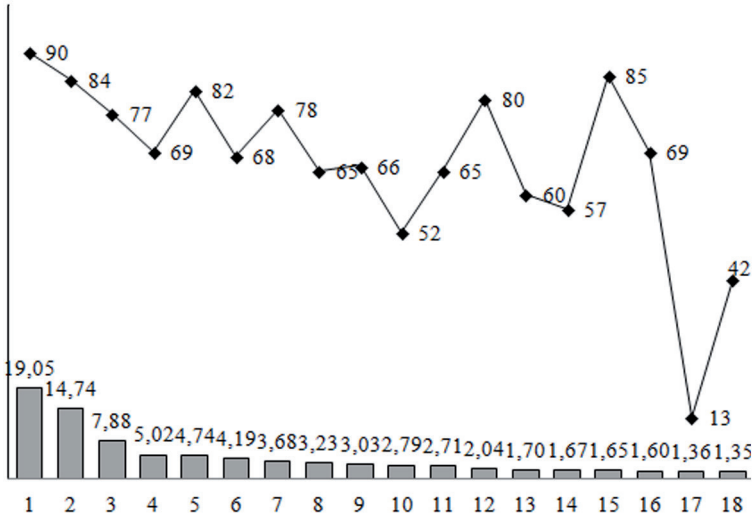

Fig. 10. The most important for waterbirds wetlands of Azov and Black Sea region in August (where the number of birds exceed 1% of the average number of all registered birds)
Legend: 1 — Eastern Syvash (45°43′ N, 34°32′ E); 2 — Central Syvash (46°05′ N, 34°32′ E); 3 — Utlyukskii Liman (its shallow-water part) (46°28′ N, 35°12′ E); 4 — Western Syvash (46°10′ N, 33°55′ E); 5 — Lower part of the Ukrainian Danube Delta (45°24′ N, 29°32′ E); 6 — Molochnyi Liman (46°31′ N, 35°20′ E); 7 — Dzharylgachskii Bay (46°04′ N, 32°58′ E); 8 — Obitochnaya Spit (46°36′ N, 36°09′ E); 9 — Lebyaz'ii Islands (45°52′ N, 33°32′ E); 10 — Perekopskii Bay (46°06′ N, 33°36′ E); 11 — Krivaya Spit (47°04′ N, 38°05′ E); 12 — Tendrovskii Bay (46°13′ N, 31°32′ E); 13 — Kuyalnitskii Liman (46°41′ N, 30°41′ E); 14 — Shagany Liman (45°43′ N, 29°32′ E); 15 — Kinburnskii Peninsula (46°30′ N, 31°48′ E); 16 — Tiligulskii Liman (46°49′ N, 31°46′ E); 17 — Bolshoi Adzhalykskii Liman (46°37′ N, 30°53′ E); 18 — Dniestrovskii Liman (46°16′ N, 30°18′ E).
grey columns — % of the average number of all registered birds;
line — number of bird species.

Рис. 10. Наиболее значимые угодья для околоводных птиц Азово-Черноморского региона в августе (где численность птиц превышает 1% от средней численности учтённых птиц)
Условные обозначения: 1 — Восточный Сиваш (45°43′ с.ш., 34°32′ в.д.); 2 — Центральный Сиваш (46°05′ с.ш., 34°32′ в.д.); 3 — Утлюкский лиман (мелководная часть) (46°28′ с.ш., 35°12′ в.д.); 4 — Западный Сиваш (46°10′ с.ш., 33°55′ в.д.); 5 — нижняя часть украинской дельты Дуная (45°24′ с.ш., 29°32′ в.д.); 6 — Молочный лиман (46°31′ с.ш., 35°20′ в.д.); 7 — Джарылгачский залив (46°04′ с.ш., 32°58′ в.д.); 8 — Обиточная коса (46°36′ с.ш., 36°09′ в.д.); 9 — Лебяжьи о-ова (45°52′ с.ш., 33°32′ в.д.); 10 — Перекопский залив (46°06′ с.ш., 33°36′ в.д.); 11 — Кривая коса (47°04′ с.ш., 38°05′ в.д.); 12 — Тендровский залив (46°13′ с.ш., 31°32′ в.д.); 13 — Куяльницкий лиман (46°41′ с.ш., 30°41′ в.д.); 14 — лиман Шаганы (45°43′ с.ш., 29°32′ в.д.); 15 — Кинбурнский п-ов (46°30′ с.ш., 31°48′ в.д.); 16 — Тилигульский лиман (46°49′ с.ш., 31°46′ в.д.); 17 — Большой Аджалыкский лиман (46°37′ с.ш., 30°53′ в.д.); 18 — Днестровский лиман (46°16′ с. ш., 30°18′ в.д.).
столбики — % от средней численности учтенных птиц;
линия — число видов птиц.

were seen in 42 wetlands. The most important sites for them are the Central Syvash (10.5% of birds of the order), Molochnyi Liman (6.4%), Dzharylgachskii Bay (5.8%), Lebyazh'ii Islands (5.4%), Perekopskii Bay (5.1%) and Utlyukskii Liman (its shallow-water part) (4.4%).

Gruiformes. Although this group is represented in the censuses by 7 species with 1 052 630 ind. or 19.17% of the total number of accounted birds of all species, it should be underlined that it is *Fulica atra* that represents nearly 90% (1 044 170 ind.) of the total amount of the Gruiformes. Birds of the order were seen in 63 wetlands. The most important for them were (Fig. 8) the Eastern Syvash (26.8% of the birds of the order; number 63 in the picture), Utlyukskii Liman (its shallow-water part) (12.2%; 66), Dzharylgachskii Bay (6.1%; 47), Western Syvash (4.6%; 60), Central Syvash (4.4%; 62) and the lower part of the Ukrainian Danube Delta (4.1%; 8).

Charadriiformes. The birds of the Charadriiformes (2 762 860 ind. or 50.31% of the birds of all species) of 57 species (Table) were the largest group in terms of their number. 38 species were represented by waders (25.13%), 11 species — by gulls (9) and skuas (2) (19.16%), and 8 species — by terns (6.02%). Birds of the

order were seen in 78 wetlands. Some water bodies were more important for waders, others — for gulls and terns. The differences were also noted in terms of the amount of birds in different wetlands. The most important were the Central Syvash (17.4% of the birds of the order; number 62 in (Fig. 9), Eastern Syvash (16.2%; 63), Utlyukskii Liman (its shallow-water part) (6.9%; 66), Molochnyi Liman (6.6%; 67) and Western Syvash (6.5%; 60).

Importance of different wetlands of the Azov and Black Sea region for waterbirds

The number of bird species in water bodies where the surveys were conducted ranged from 4 to 90 with an average value of 36.8 species. A total of 81 wetlands were studied resulting in 4 to 30 bird species recorded in 38 of them, 31 to 60 species observed in 24 wetlands, and 19 wetlands enjoying the largest number of species, from 64 to 90. The most important for waterbirds were 18 wetlands of the region (Fig. 10), where the number of birds exceed 1% of the average number of all the registered birds. The cumulative share of birds in these wetlands was about 82.41%, of which 38.80% were registered with the Syvash (Eastern Syvash — 19.05%, Central Syvash — 14.74% and Western Syvash — 5.02%). There are several reasons for this. Firstly, it is connected to a vast area of this waterbody. Secondly, it boasts a wide variety of biotopes (wide shallow areas, spits, islands, reed beds etc.) that ensures favorable conditions for feeding and resting for the birds of different taxonomic groups. Utlyukskii Liman is the runner up site — 8.75% (its shallow part — 7.88% and its deeper part — 0.87%). Lower part of the Ukrainian Danube Delta (4.74%), Molochnyi Liman (4.19%), Dzharylgachskii Bay (3.68%) and Obitochnaya Spit (3.23%) are listed in descending order. Information on other important wetlands can be viewed in the above mentioned picture.

Conclusions

The current publication is the first attempt to summarize the results of several synchronized August Waterbird Censuses in the waters of the Azov-Black Sea coast of Ukraine during the post-breeding period and early autumn migrations. The results allowed estimating the composition, number and spatial distribution of 116 bird species at high taxa level.

Species composition in the surveyed wetlands depended on the type, area, coverage of the wetlands, as well as weather conditions of different years. Despite significant differences in species abundance of birds in selected wetlands (4–90), the average number of registered species of birds among the surveyed wetlands during all censuses (57.9±4.5 (2004) — 50.2±2.8 (2015)) and in the total sample of all wetlands (34.8±3.5 — 32.3±2.8) proved to be similar, with no significant differences between years (Student's t-test ranging from 1.555 to 0.635). The range of values for the total number of registered waterbirds was also significant (617–1790 thousand individuals) for one census. Despite the different number of surveyed wetlands over the years, no large variance in the average number of birds recorded in one area was observed, and it amounted to 32–37 thousand individuals of waterbird species. Thus, due to the scale of the surveyed areas, the synchronous bird censuses in August enable adequate assessment of the number of wetland birds, an impartial estimation of the total ecological capacity of the Black Sea wetlands for birds. The obtained results emphasize the unique importance of the coast in the protection of local and migratory populations of waterbird species on the African-Eurasian Flyways.

The obtained data on birds' number is quite significant even on the scale of whole Europe. First and foremost, it concerns migratory and post-breeding concentrations of waders, terns and gulls. However, it is also crucial in terms of molting, feeding and resting sites for a number of species, such as *Fulica atra, Podiceps nigricollis, Tadorna tadorna,* as well as a large number of rare species of birds protected by various international agreements. Among the recorded species, 19 have a special conservation status in Europe (European Red List of Birds, 2015), and 40 species of birds are listed in the Red Data book of Ukraine (2009).

The most valuable for birds of 81 surveyed wetlands were 18 water bodies, mainly limans and lagoons. The most important among them is the Syvash, with 37.5% of all counted birds. Among the deltas of large rivers, a special place belongs to the outer Danube Delta.

The existing methodological shortcomings of August Censuses (e.g. different coverage of wetland by counts in different years) significantly reduce the prospects of analyzing trends in the

abundance of bird species. However, there are plans to do that at a later stage. Based on the results of this publication, certain arrangements and operational capacities for August Censuses are also planned to be improved.

Acknowledgements

The authors would like to express their gratitude to all ornithologists and organizations that took part in the synchronous censuses of different years and provided their materials for the ROM Bulletins mentioned in the text of the article. Their efforts and enthusiasm made it possible to obtain information about the number of birds in such a vast area.

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ОБЩИЙ АНАЛИЗ РЕЗУЛЬТАТОВ АВГУСТОВСКИХ УЧЁТОВ ВОДОПЛАВАЮЩИХ ПТИЦ ЗА 2004–2015 ГОДЫ НА АЗОВО-ЧЕРНОМОРСКОМ ПОБЕРЕЖЬЕ УКРАИНЫ

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Резюме

Данная публикация является первой попыткой обобщить результаты синхронных августовских учётов водно-болотных птиц на Азово-Черноморском побережье Украины и предоставить подробное описание видового состава, их численности и пространственного размещения. Учёты птиц в августе важны как для оценки численности гнездящихся видов, так и ранних осенних мигрантов. В целом, в 2004, 2006, 2009, 2012 и 2015 гг. силами многих орнитологов было проведено пять учётов в синхронные сроки, в результате чего были выявлены 5 491 395 птиц 116 видов. Учёты охватывали 81 водно-болотное угодье разных типов. Общее число птиц из года в год варьировало от 617 242 до 1 789 696 особей. Самыми многочисленными видами были *Fulica atra* (19.01% от общего числа всех птиц), *Philomachus pugnax* (15.04%), *Larus ridibundus* (8.86%), *Phalacrocorax carbo* (8.84%), *Anas platyrhynchos* (5.10%) и *Tadorna tadorna* (4.99%). Наиболее многочисленной таксономической группой по данным всех учётов оказались

Charadriiformes — 50.31% зарегистрированных птиц 57 видов. Обсуждается важность двух наиболее ценных угодий в регионе: Центрального и Восточного Сивашей для размещения водно-болотных птиц в августе. Здесь концентрировалось 37.5% всех учтённых водно-болотных птиц. Высокая доля среди зарегистрированных видов, включённых в Красную Книгу Украины (40 из 116), свидетельствует о важности охваченных учётами водно-болотных угодий в охране местных и мигрирующих популяций.

Поступила в редакцию 29 сентября 2019 г.