

## Avifauna of the Lake Systems in the Delta of the Syr Darya River (Lake Cartma)

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### Abstract

The change in the indicator of specific variety and the quantitative structure of the population of birds in the system of lakes of the Syr Darya River delta (Lake Cartma) were analyzed by the authors. Since 2012, Syr Darya River lake system has been included in the Convention on the Wetlands of International Importance Especially as Wildlife Habitat, also called Ramsar Convention. Change in the level of the Syr Darya River directly affects water security of Lake Cartma. The object of the research is water objects, restored according to the program "Syr Darya Control and Northern Aral Sea" Project (SYNAS). Investigations were carried out for the purpose of studying the avifauna of Lake Cartma. Defining the status of residence of bird species in the restored zone of a coastal strip was a basic task. 59 bird species from 10 groups with total quantity of 3147 individuals were noted. According to the abundance of species of Lake Cartma, limnophiles are dominated (waders). The degree of dominance of avifauna species, their share in total quantity of bird species were considered in detail. The lake is characterized by a comparatively small number of birds and low population density of waterfowl. There were five species, listed in the Red Book of the Republic of Kazakhstan. Information is new for the studied object.

**Keywords:** The North Aral Sea, Lake Systems of Syr Darya River Delta, Wetlands, Avifauna, Lake Cartma.

### Introduction

One of the most important environmental problems of our time is the regression of the Aral Sea. Beginning in the 1960's, this phenomenon has not reached its apogee. The level of the reservoir has been fluctuating for about 60 years. However, except for some episodes with temporary stabilization, the overall trend shows a noticeable decline. Within this period, several stages were distinguished, such as, the separation of the Northern Aral Sea from the main reservoir in 1988, the separation of the Large Sea into the eastern and western Aral, and so on [1]. This study was conducted in the water area and the surrounding areas of Lake Cartma, which was separated from the eastern part of the Large Aral Sea, in the early 1990's [2]. Lake Cartma, the flood zone

of the Large Aral Sea, is located on the territory of the Aral region of the Republic of Kazakhstan. In the period until 2009, it had been occasionally drained. The current hydrological state is supported by the Syr Darya River through the Karateren Canal, as a result of the construction of the Aklak Dam [2-3]. In the biodiversity of the Northern Aral Sea (NAS) and the system of lakes of the Syr Darya River delta, avifauna is functioned as an indicator of the ecological state of water bodies and the Aral Sea region as a whole [3-4]. The contributing factor is the transit location of water bodies on the main migration route of birds, from wintering grounds of North Africa and South-East Asia to the nesting area in Central and Northern Kazakhstan, Siberia. Due to this, the areas of North Aral Sea and lakes of the Syr Darya River delta are used as a stopping point [5, P. 222]. After all, birds according to B.K. Shtegman (1938), "are extremely conservative in their distribution" [6].

After the putting in operation of the Kokaral dam and the Aklakhydro system, bird counts were carried out in the water area and the surrounding areas of the Northern Aral Sea, the Kamystybas, Akshatau, Aksai, Kuandarya lake systems. The avifauna of the coastal left-bank reservoirs, especially of Lake Cartma, had not been taken into account until 2014 [1, 3 -5, 7-10]. It is important to note the important environmental part of the SYNAS program (Syr Darya Control and Northern Aral Sea). As a result of restoration, the wetlands of the Northern Aral Sea and the system of lakes of the Syr Darya River delta were included in the list of key ornithological sites, protected by the international Ramsar Convention [8]. The fauna and especially the bird population of the Aral Sea and the delta of the Syr Darya River are well studied [1, 3-5, 7-11]. Therefore, the identification of characteristic features of the bird population of the investigated object is very important in ornitho-geographical terms.

### Methods

The investigations were carried out in the water area and surrounding areas of Lake Cartma. The maximum area of the reservoir is 8.0 km<sup>2</sup>. During the survey period (from June 28 to July 3, 2016), the water level was 51.69 m, according to the Baltic System (BS), the area of the lake was 6.2 km<sup>2</sup> [2]. The coastline was about 12 km. The banks were

shallow, slightly indented. The southeastern and eastern parts of the reservoir were flooded and the approaches to it were occupied by thick reedbed (*Phragmites australis*), from 2 to 4m in height. Due to the inaccessibility of this site for full monitoring, it was decided to route along the Northern, north-western and southern parts of the reservoir [3-4].

The wetland ecosystems of the reservoir are represented by high reedbed (*Phragmites australis*) with hydrophytic herbage (*Typha angustifolia*, *Scirpus lacustris*, *Scirpus tabernaemontanii*), air-water (*Sparganium simplex*, *Alisma plantago-aquatica*) and submerged-aquatic (*Potamogeton perfoliatus*, *Najas marina*) macrophytes [1, 3].

The material was collected in late June - early July, 2016, when the species composition and the number of nesting birds are relatively stable. The work of A.S. Bogolyubov [12] and Yu.S. Ravkin [13], adjusted for the open area, was a methodological basis for conducting route surveys. 8-fold binoculars and photographic equipment were used in the work. Birds were counted on permanent, but not strictly fixed, linear routes, located along the shore of the reservoir with weekly replication. Route counts, adjusted for open terrain, with the length of 10 km, lying parallel to the shore of the lake, in 20 meters from the water's edge, was divided into 2 sections of five kilometers each: the first section located on the northern part of the lake and passed counter-clockwise along the line northeast – north - north-west; the second section continued the previous route and covered the west coast of the lake along the line north-west – west-south-west [12-13].

The scale of abundance score, proposed by A.P. Kuzyakin [14, p. 55-59] was used for the description of birds' distribution. Graduation of dominance degree, proposed by A.P. Kuzyakin [12], provided for three main units, namely: dominants, the percentage ratio of which was from 10 to 100%, corresponding in abundance to very numerous species, their number was 100-999 individuals per 1 km<sup>2</sup>; secondary - 1-9% (numerous - 10-99 individuals per 1 km<sup>2</sup>); and third-rate - 0.1-0.9% (common - 1-9 individuals per 1 km<sup>2</sup>). Due to the presence in the counts of such species, the abundance and percentage ratio of which were beyond the classification, it seemed more reasonable to add the following grades: 0.01-0.09% (rare - 0.1-0.9 individuals per 1 km<sup>2</sup>), 0.001- 0.009% (very rare - 0.01-0.09 individuals per 1 km<sup>2</sup>). In the process of determining the species, the authors were guided by the determinants and

reference books of V.K. Ryabitsev and co-authors [15], "Birds of Kazakhstan" [16-18], as well as foreign sources [19-33]. Types of avifauna were presented according to B.K. Shtegman [6].

### Results and Discussion

The analysis of scientific works, carried out after the restoration of the Northern Aral Sea shows, that the field studies were carried out within the framework of a comprehensive study of the lake systems of the Syr Darya delta in 2005, 2011, 2012, 2013, but there was not the task to count the birds of Lake Cartma [1, 3 -5, 7-11, 34] and to study the patterns of ornithocenosis formation.

In the scientific literature, up to 2014, there has been no data on the diversity of the avifauna of Lake Cartma, but there was general regional data on the avifauna of lakes in the delta of the Syr Darya River [5, 9-11, 34].

To date, according to the classification of the avifauna of Northern Eurasia, the territory of our study is located within the boundaries of the following areas: a flat region of the western province of a desert subregion; the Aralo-Balkhash District of the western province of the temperate-island subregion [35].

**Species Diversity.** The results of surveys the species composition and the number of birds are presented in Table 1. 59 species of birds, belonging to 10 orders were defined: ciconiiformes (*Ciconiiformes*); anseriformes (*Anseriformes*); birds of prey (*Falconiformes*); fowl-like birds (*Galliformes*); gruiformes (*Gruiformes*); shore birds (*Charadriiformes*); pigeons (*Columbiformes*); coraciiformes (*Coraciiformes*); upupiformes (*Upupiformes*); perching birds (*Passeriformes*) [19-25].

Three groups of birds are represented in the avifauna of the lake (see Table 1). The main group, which includes the largest number of species, is the birds of wetlands (egrets, dabbling and diving ducks, coots, waders, gulls, terns, etc.) [32-33]. The second group consists of the representatives of the order perching birds (*Passeriformes*), the habitat of which, in one way or another, is connected with adjoining grass and shrub complexes and nearby settlements, such as wagtails, warblers, swallows, corvidae species, wheatears, etc. [16-18]. Among the representatives of predatory birds, there are harriers, buzzards, eagles, falcons [26-31].

Table 1 Results of Bird Counts of Lake Cartma

№	Species	Number of individuals	Share from TNSS, %
1.	<i>Egretta alba</i> L.	3	0.1%
2.	<i>Ardeacinerea</i> L.	4	0.1%
3.	<i>Ardeapurpurea</i> L.	16	0.5%
4.	<i>Plegadisfalcinellus</i> L.(RB)	28	0.9%
5.	<i>Anseranser</i> L.	2	0.1%
6.	<i>Cygnus olor</i> Gmelin	7	0.2%
7.	<i>Tadorna tadorna</i> L.	2	0.1%
8.	<i>Anas platyrhynchos</i> L.	40	1.3%
9.	<i>Anas crecca</i> L.	17	0.5%
10.	<i>Anas querquedula</i> L.	51	1.6%
11.	<i>Nettion rufina</i> Pall.	60	1.9%
12.	<i>Aythya nyroca</i> Guldenstadt (RB)	8	0.3%
13.	<i>Circus aeruginosus</i> L.	6	0.2%
14.	<i>Buteo rufinus</i> Cretzschmar	7	0.2%
15.	<i>Aquila heliaca</i> Savigny (RB)	1	0.03%
16.	<i>Falco naumanni</i> Fleischer	2	0.1%
17.	<i>Phasianus scolchicus (turcestanicus)</i> Lorenz (RB)	2	0.1%
18.	<i>Grus grus</i> L.	71	2.3%
19.	<i>Fulica atra</i> L.	205	6.5%
20.	<i>Burhinus oedicephalus</i> L.	43	1.4%
21.	<i>Charadrius dubius</i> Scopoli	4	0.1%
22.	<i>Chettusia gregaria</i> Pall. (RB)	1	0.03%
23.	<i>Vanellus vanellus</i> L.	6	0.2%
24.	<i>Vanello chettusia leucura</i> Lichtenstein	270	8.6%
25.	<i>Himantopus himantopus</i> L.	200	6.4%
26.	<i>Tringa ochropus</i> L.	7	0.2%
27.	<i>Tringa glareola</i> L.	2	0.1%
28.	<i>Tringa nebularia</i> Gunnerus	2	0.1%
29.	<i>Actitis hypoleucos</i> L.	3	0.1%
30.	<i>Xenus cinereus</i> Guldenstadt	5	0.2%
31.	<i>Calidris minuta</i> Leisler	7	0.2%

32.	<i>Limicolafalcinellus</i> Pontoppidan	1	0.03%
33.	<i>Lymnocyptesminimus</i> Brunnich	1	0.03%
34.	<i>Gallinagogallinago</i> L.	2	0.1%
35.	<i>Glareolapratincola</i> L.	20	0.6%
36.	<i>Laruscachinnans</i> Pall.	38	1.2%
37.	<i>Laruscanus</i> L.	4	0.1%
38.	<i>Chlidoniasniger</i> L.	96	3.1%
39.	<i>Chlidoniasleucopterus</i> L.	600	19.1%
40.	<i>Gelochelidon nilotica</i> Gmelin	14	0.4%
41.	<i>Hydroprogneaspia</i> Pall.	27	0.9%
42.	<i>Sternahirundo</i> L.	27	0.9%
43.	<i>Sterna albifrons</i> Pall.	16	0.5%
44.	<i>Columba livianeglecta</i> Hume	43	1.4%
45.	<i>Meropsersicus</i> Pall.	13	0.4%
46.	<i>Upupa epops</i> L.	2	0.1%
47.	<i>Ripariariparia</i> L.	142	4.5%
48.	<i>Hirundo rustica</i> L.	544	17.3%
49.	<i>Motacillaflava</i> L.	112	3.6%
50.	<i>Motacillafeldegg</i> Michahelles	72	2.3%
51.	<i>Motacillapersonata</i> Gould	246	7.8%
52.	<i>Picapicabactriana</i> Bonaparte	2	0.1%
53.	<i>Corvusfrugilegus</i> L.	6	0.2%
54.	<i>Corvuscornixsharpii</i> Oates	4	0.1%
55.	<i>Corvusruficollis</i> Lesson	9	0.3%
56.	<i>Acrocephalus scirpaceus</i> Hermann	2	0.1%
57.	<i>Acrocephalusstentoreus</i> Hemprich et Ehrenberg	2	0.1%
58.	<i>Oenanthe deserti</i> Temminck	4	0.1%
59.	<i>Emberiza schoeniclus</i> L.	16	0.5%
Total		3147	100

Note. RB – is the species, listed in the Red Book of the Republic of Kazakhstan.

59 species, with a total number of 3,147 individuals were defined in the process of counts in 2016. 5 species are listed in the Red Book of the Republic of Kazakhstan (see Table 1).

**The structure of the bird population, according to the relative abundance of species.** There is

2 dominant species (whose share in the general population exceeds 10%), and their density is 36.4% (see Table 1). White-winged Black Tern (*Chlidoniasleucopterus* L.) is the dominant species with a share of 19.1%. European swallow

(*Hirundorustica L.*) is a codominant species (17.3%) [15-16].

The share of secondary species (degree of dominance within the range of 1-9%) is 15, with a density of 53.7%. Among the secondary species, white-tailed lapwing dominates (8.6%) [17-18].

The third-rate species (0.1-0.9%) are the basis of the ornithocenosis, in terms of the number of species. There were 43 species, with a density of 9.9% [19-21].

It should be noted the species, listed in the Red Book of Kazakhstan and defined during the surveys. There were glossy ibis (*Plegadisfalcinellus*), Ferruginous Duck (*Aythya nyroca*), imperial eagle (*Aquila heliaca*), Phasianuscolchicus (*turcestanicus*), sociable plover (*Chettusiagregaria*) [15, 22-24].

To a greater extent, differences in bird communities are manifested when analyzing the structure of the lake's ornithofauna by origin, according to the concept of fauna types of B.K.Shtegman [6]. There are as transpalearctic species, as the species of Arctic, Siberian, European, Mediterranean, Mongolian, Chinese, Holarctic origins, i.e. mixed ornithogeographical type.

#### Summary

1. The counts of the birds of Lake Cartma were initiated with the purpose of scientific justification of the dynamics of avifauna population in certain phases of the period of water bodies' restoration.
2. Observations of the avifauna of the studied area in the summer (nesting) period have been conducting for the third year in a row.
3. As a result of scientific expedition, a comparatively rich species and quantitative diversity of avifauna was defined.
4. Studied species of birds are the representatives of a mixed ornitho-geographical type.

#### Conclusion

Thus, as a result of the research, preliminary data on the diversity of the ornithocenosis of Lake Cartma were obtained. A total of 59 species of birds from 10 orders were defined. The development of aquatic vegetation, favorable conditions of the hydrological regime: depth, transparency and water temperature contribute to the active colonization of the studied area. It should be noted the facts of dense reed weediness and the presence of dense thickets of typha, which provides protection for most birds from humans, dogs and predators. The relative poverty of the fauna is explained by the fact, that the lake systems of the Syr Darya River delta and the Aral Sea are currently under restoration and natural succession. Probably, the intensive siltation of reservoirs and the absence of direct communication between the lake and the Large Aral Sea play its role. However, Lake Cartma, like other reservoirs of the 2263

Syr Darya delta lake system, is gradually being restored, and takes a significant part in maintaining the biodiversity of the Aral Sea region, and also serves as a place of birds' consolidation during the migration period.

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