

An Exponential Increase in the Abundance of the Dalmatian Pelican (*Pelecanus crispus*) in the Kurgan and Tyumen Regions

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Abstract—This paper presents the results of a total census of inhabited Dalmatian Pelican nests, which was carried out in spring 2017 using a drone aircraft for the waterbodies of the Kurgan and Tyumen regions. The dynamics of the species numbers in the area studied over the last 50–70 years and the factors affecting these dynamics are analyzed.

Keywords: Dalmatian Pelican, *Pelecanus crispus*, the Kurgan region, the Tyumen region, population dynamics, environmental factors

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The Dalmatian Pelican (*Pelecanus crispus*) is a globally rare species, which is in a “close to vulnerable position” (BirdLife International, 2017). From the 1930s to the end of the 1960s, its only breeding site on the territory of Western Siberia (within Russia) was Chernoe Lake, that is, at the boundary between the Kurgan and Tyumen regions. It was the breeding territory for approximately 30, 18, and 70 pairs in 1954, 1958, and 1963, respectively (Azarov, 1996). In the early 1970s, Dalmatian pelicans appeared at two more lakes in the Tyumen region (Bolshoe Beloe and Tundrovo lakes); in 1978 there were 105 breeding pairs at all three lakes: 24 at Chernoe Lake, 52 at Bolshoe Beloe Lake, and 29 at Tundrovo Lake (Azarov and Ivanov, 1981). In 1983, the number of birds in the area of Chernoe and Bolshoe Beloe lakes was estimated at approximately 500 individuals, including the non-breeding ones (Blinova and Blinov, 1997). In 1986–1987, Tundrovo and Bolshoe Beloe lakes were the breeding territories for 40–50 and 60–80 pairs, respectively (Azarov, 1996); in 2001–2002, they were the breeding territory for 215–220 pairs (Primak, 2001) and approximately 100 pairs (Gashev et al., 2003). According to aircraft censuses, in 2004 these three lakes were the breeding territory for about 500 pairs, of which approximately 180, 90, and 240–250 pairs bred at Chernoe Lake, Bolshoe Beloe Lake, and Tundrovo Lake, respectively (Tarasov and Primak, 2005). In 2011, the numbers of the species at Chernoe Lake were estimated at approximately 300–400 pairs (Tarasov, 2011), but this value was manifestly overestimated. In 2012, Bolshoe Beloe Lake was inhabited by approximately 100 pairs as before (Tarasov and Primak, 2013).

In some years, pelicans also bred at other waterbodies of the region. Thus, in the years 1993–1999, a pelican colony existed at Nyashino Lake in the Beloozerskii Game Reserve (Tarasov and Primak, 2013); there were reports about the episodic breeding of the species at Bolshoi Kushluk Lake in the Berdyuzh’e district (Azarov, 1996), Mergen Lake in the Ishim district (Primak, 1998), and Bolshoe Kabanye Lake in the Kazanskoe district (Primak, 2000).

In the Kurgan region, up to 20–30 pelican pairs bred at several waterbodies, in addition to Chernoe Lake: in the 1990s, a colony existed at Shchuchye Lake at the interface between the Mokrousovo and Chastoozer’e districts (in 1993, approximately 100 birds stayed there, but it is not known how many of them bred) (Yakimenko and Gavrilin, 1995). According to the census information, 5–10 pairs also episodically bred in those years in the Chastoozer’e district at Labza and Bolshoe Butyrino lakes (Tarasov et al., 2003), in the Kargapol’e district at Bolshaya Kavyka Lake (Tarasov and Davydov, 2008), in the Polovinnoe district at Yarovoe and Bolshoe Kobyl’e lakes (Tarasov, 2011) and approximately 150–200 pairs bred in the 2000s in the Kurtamysh district at Malye Donki Lake (Tarasov and Zvigintsev, 2013). In the middle of the 2000s, a large colony formed at Manyass Lake in the Vargashi district: in 2000 the birds were absent and in 2012–2013 there were already about 200 breeding pairs in this area (Tarasov, 2012; Zvigintsev, 2013). In 2012, 19 pairs settled at Krutali Lake in the Ketovo district (*Krasnaya kniga...*, 2012).

Based on the data presented, the abundance of the species in the Kurgan and Tyumen regions in the late

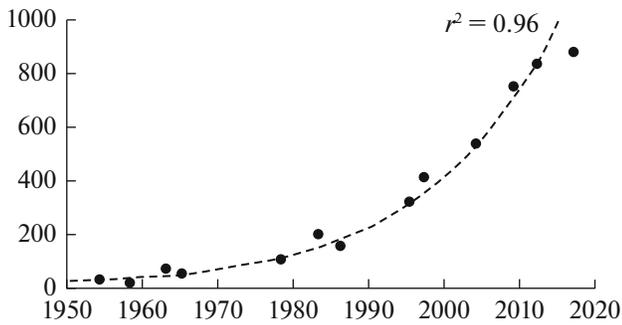


Fig. 1. Long-term dynamics of the number of breeding pairs of the Dalmatian Pelican on the lakes of the Kurgan and Tyumen regions.

20th century was at the level of 300–400 breeding pairs, and in 2004–2012 it was already twice as high: 600–800 pairs (Fig. 1; the exponential curve was constructed in the Microsoft Excel program). Since one-time counting of birds in all colonies had never been carried out, these figures were partially reconstructed using the moving average method.

From May 1 to May 6, 2017, we carried out surveys of pelicans with the help of the Phantom 3 drone aircraft (with an increased flight range of up to 6 km) at all lakes where large colonies had previously been discovered: Manyass, Chernoe, Bolshoe Beloe, Tundrovo, and Malye Donki.

Manyass Lake. In the southern part of the waterbody, on May 1 before sunset, we counted 280 individuals, of which 131 were sitting on nests. Nests were arranged on three closely spaced small islands, and the distance between the most remotely spaced nests was no more than 100 m (Fig. 2a). If we assume that all birds from this settlement were near nests at that time, it consisted of 131 breeding pairs and 18 nonbreeding individuals. Therefore, the proportion of the latter did not exceed 6%. It was not possible to determine the proportion of nonbreeding individuals in the northern part of the waterbody, as well as at other lakes, because they were examined in the morning when only the incubating individuals were present in the colonies. According to our earlier observations (Tarasov and Primak, 2005), there were no nonbreeding birds in the colonies of pelicans, although it is known that their proportion can be quite significant. So, at Saltaim Tennis Lake (the Krutinka district, the Omsk region) in the period from 1985 to 2013, only one-third of individuals had nests, an average of 70 birds (35 pairs) out of 185 birds (according to Yakimenko and Gavrilin, 1995; Soloviev et al., 2006; Soloviev S.A. and Soloviev O.S., 2013).

In the northern part of the waterbody, at a distance of 2 km from the first colony, five groups of nests were found, which were located at a distance of 150–280 (on average, 230 ± 50) m from one another, and the distance between the most remotely spaced nests was

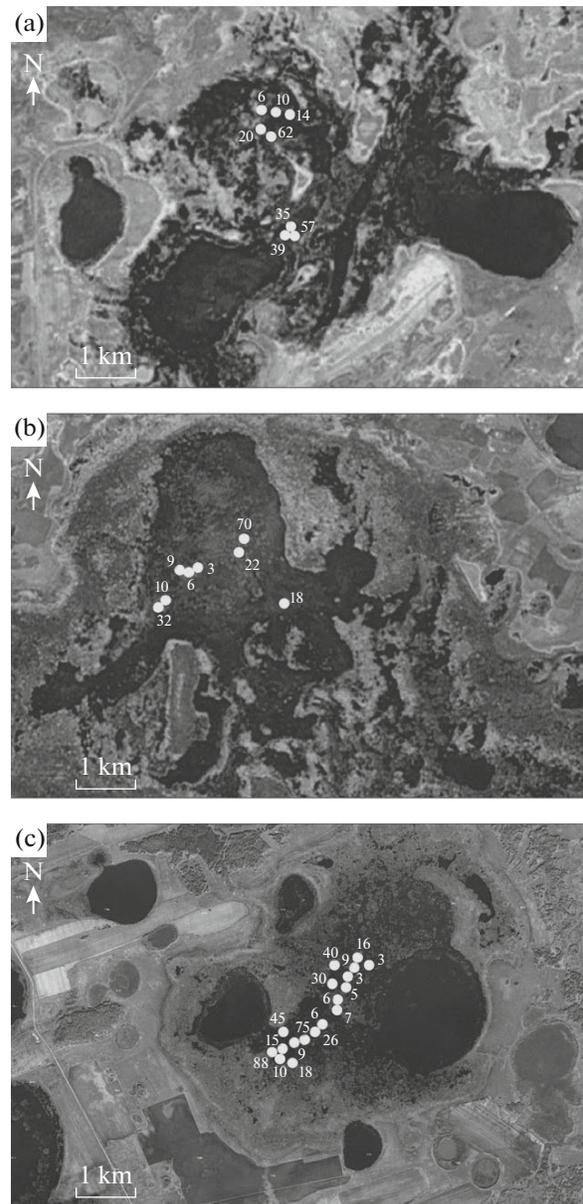


Fig. 2. Sizes of the Dalmatian Pelican colonies at (a) Manyass Lake, (b) Chernoe Lake, and (c) Tundrovo Lake in 2017. The number of inhabited nests is designated with ciphers.

approximately 550 m. On the morning of May 2, we counted 119 individuals there, and only seven of them were not sitting on nests (it follows from this that almost all non-incubating birds had flown away in search of food). Thus, in total, there were 243 inhabited nests (breeding pairs) at this lake and 30–40 more nonbreeding individuals (perhaps they were already mature, but had not yet started egg laying). The observations on the breeding of Dalmatian pelicans at this waterbody in 2012–2013 showed that egg laying took place from April 25 to May 15 (Tarasov, 2012; Zvigintsev, 2013), so we can assume that not all mature indi-

viduals in the colony had built nests and laid eggs in the first days of May. In this case, the number of pairs that bred there could be slightly more (by 15–20) than the number of nests we counted and could be approximately 260 pairs.

At Chernoe Lake in the morning hours on May 4 and 5, we counted 170 nests with incubating birds and only six individuals that were not sitting on nests. The colony was located in the northwestern part of the lake (approximately 7 km from its center) and consisted of six settlements that fit into a circle of 3 km in diameter (Fig. 2b). We examined the rest of this vast waterbody less carefully and can assume that some more nests may have been located in other places, for example, at a distance of 5 km to the southeast from the colony found, where pelicans bred in 2011 (Tarasov, 2011). However, based on conversations with local fishermen and hunters from the village of Zhiryakovo and the settlements of Kurtan and Shelepovo, we found out that the entire colony was concentrated in the northwestern part of the lake in the previous years; therefore, we think that the probability of underestimating bird numbers is insignificant.

We surveyed Bolshoe Beloe Lake in the evening of May 5; no pelicans were found. In April 2016, the rangers of the Beloozerskii Federal Nature Reserve, in the territory of which this waterbody is located, were for some reason made redundant, which led to the destruction of the cordon of the reserve located on the shore of this lake, where the rangers had been on duty around the clock. Most likely, the pelicans left the waterbody due to the weakening of its protection. Later, the former director of the reserve M.A. Kirgintsev informed us that seven pairs of pelicans had nevertheless stayed to breed at this lake.

At Tundrovo Lake, 430 nests with incubating birds and 160 individuals that were not sitting on nests were found on the morning of May 6. Nests were located on small islands in sparse groups of 2–80 nests along a line that had a length of 2.3 km from southwest to northeast (Fig. 2c). There were approximately 30 conditional “groups,” but it was impossible to distinguish them one from another clearly, since the placement and number of nests in them were entirely determined by the configuration and size of the islands suitable for nesting, and the nests were either scattered at a distance of several tens of meters or located close to each other. Apparently, the birds tend to occupy the same nests every year rather than rebuild them, since 2/3 of the nests were concentrated in the southwestern part of the lake, where the colony had also been located 15–20 years before. In 2001 and 2004 there were more than 20 settlements of 3–70 pairs that were located along a 350–400 m long arc (Primak, 2001; Tarasov and Primak, 2005). Another third of the pairs now breed in the central part of the lake, and this part of the colony has been obviously settled relatively recently.

We surveyed Malye Donki Lake in the evening of May 6, and we did not find any pelicans. Four years before, in May–June 2013, we had thoroughly examined this lake and other waterbodies in its surroundings that were potentially suitable for breeding and had also not found pelican breeding sites, although local hunters and rangers claimed that these birds had bred there in the 2000s in the amount of 150–200 pairs (Tarasov and Zvigintsev, 2013).

So, in the first days of May 2017, we estimated the number of inhabited nests at the lakes of the Kurgan and Tyumen regions at 850 nests, of which 303 and 547 were found in the Kurgan region and the Tyumen region, respectively. It should be noted that Pink Pelicans (*P. onocrotalus*) can breed in small numbers together with Dalmatian Pelicans (thus, their proportion at Manyass Lake was approximately 10% in 2012), but the drone aircraft did not allow to determine the species identity of a bird sitting on the ground. Nevertheless, we believe that all the nests we counted belonged to Dalmatian pelicans, since, according to our observations, Pink pelicans start laying eggs much later, only in mid-May (Tarasov, 2012). Some of the mature individuals (presumably approximately 5%) could not yet have had time to complete the construction of nests and lay eggs at the moment of the censuses and, accordingly, could not be counted. In this case, the total number of Dalmatian pelicans breeding in the region was 860–900 pairs. This is approximately the seventh part of the world population of this species, which is estimated at 5700–6700 breeding pairs (BirdLife International, 2017).

For the last 50–70 years, the population of the Dalmatian Pelican in the region under consideration has shown exponential growth (Fig. 1), which indicates that the established environmental conditions are favorable for its existence. We believe that the most likely of these conditions are the following:

—Global climate warming over the past few decades has strengthened the aridization of more southern areas and, obviously, forces out the birds from drying waterbodies into the northern part of their breeding range.

—The extension of the frost-free period of the year connected with climate warming has allowed birds to start the breeding season earlier and finish it later. According to our observations, eggs appear in pelican nests in the third decade of April, i.e., in the same period as more than half a century ago in the Volga delta and at the Syr-Darya (according to Dolgushin, 1960).

—The absence of human disturbance. The waterbodies where pelicans breed are almost never visited by people, since they are located within nature conservation areas. The only exception is Chernoe Lake, which is not protected, but is also extremely rarely visited by people because of its huge size and a complex labyrinth of islands, floodplains, floating bogs and

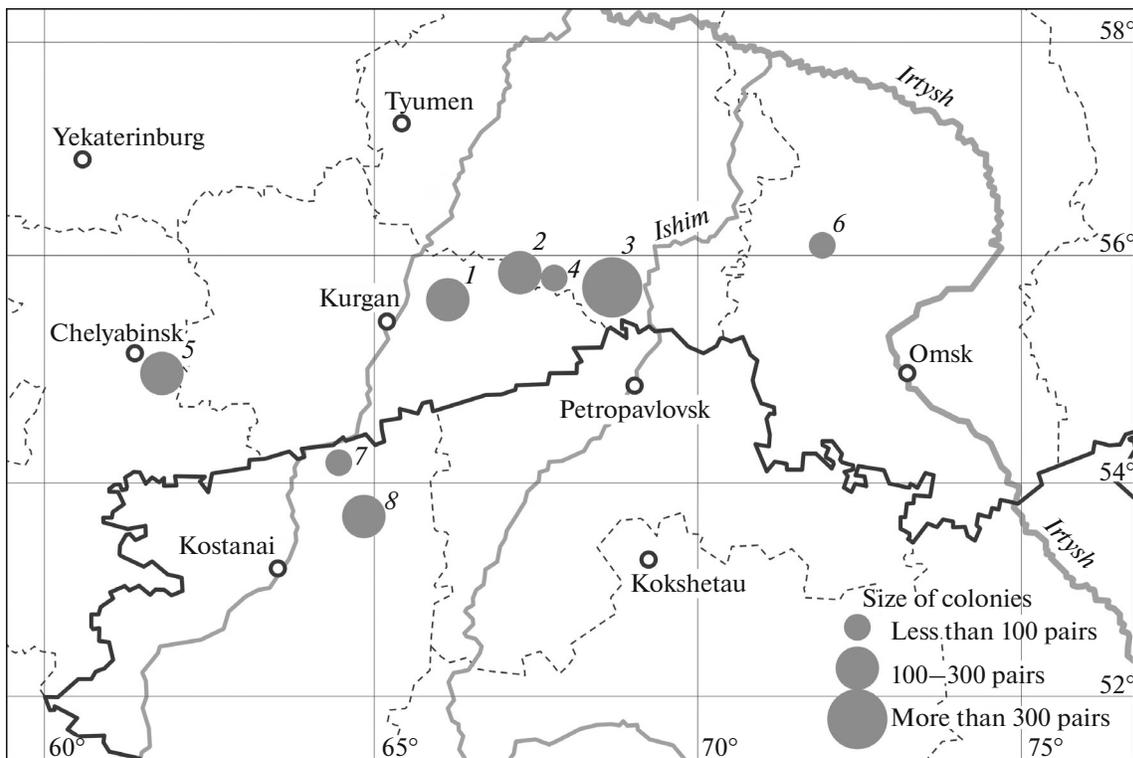


Fig. 3. The location and sizes of the main colonies of the Dalmatian Pelican on the waterbodies of the Kurgan region, the Tyumen region, and adjacent regions: 1, Manyass Lake (2017); 2, Chernoe Lake (2017); 3, Tundrovo Lake (2017); 4, Bolshoe Beloe Lake (2015); 5, Donguzly Marsh (2016); 6, Saltaim-Tenis Lake (2016); 7, Karakamys Lake (2000); 8, Shoshkaly Lake (2000).

open stretches of the lake, which constantly change their configuration because of wind. These waterbodies are not used for fish farming, and people do not move on them by motorboats, of which these birds are apparently especially intolerant.

The dynamics of the species numbers in the neighboring areas of the Urals and Western Siberia in the last 2–3 decades also show steady growth, which is consistent with our observations. So, in the Chelyabinsk region, Dalmatian pelicans first began to breed in 1994 at Kurlady Lake and later they appeared at Donguzly Marsh (Fig. 3) and Selezyan Lake; approximately 30 pairs bred there in 2000–2004, and in 2014–2016 their number had already increased to 250–300 pairs (Gordienko and Zakharov, 2005, 2017). At Saltaim-Tenis Lake in the Omsk region breeding has been known since 1984 (Yakimenko and Gavrilin, 1995); this was the breeding territory for an average of 36 pairs until 1994, 14 pairs in 1995–2008, and 70 pairs in 2009–2016 (Kassal, 2017). However, the artificial raising of the water level in the lake by 1.5 m that was performed in 2016–2017 with the purpose of fish farming led to the situation that a part of nests were flooded, others were destroyed by waves, and the colony ceased to exist (Nefedov, 2017; Soloviev, S.A., and Soloviev, O.S., 2018), which incidentally had already happened there before (in 2000 and 2007; Kassal, 2014). There were reports of an increase in the species

numbers and the appearance of new colonies in the eastern part of Western Siberia in the Novosibirsk region (Yurlov, 2008) and in the Altai territory (Bespyasov, 2012).

In the same period, the redistribution of colonies from the southern to the northern regions took place in the Kostanai region of Kazakhstan. In the middle of the dry 1990s, Dalmatian pelicans stopped breeding along the shoals of Sarykopa Lake and Naurzum Lake, and in 1998–2000 their colonies were found at the northern borders of the region (see Fig. 3), at Karakamys Lake (28–40 pairs) and Shoshkaly Lake (250–300 pairs) (*Vazhneishie vodno-bolotnye...*, 2002).

It should be noted that the process of dispersion of this species is slow due to the fact that the attempts of birds to settle in new waterbodies in most cases end in failure or last no more than 1–2 years (see above) and do not lead to the emergence of permanent breeding sites, which may be due to the factor of disturbance. The long-term existence of colonies is possible only in protected areas (game reserves) with rare exceptions, which explains the extremely local character of the distribution of breeding birds inside the nesting range. This local distribution of colonies on a relatively small number of waterbodies makes this species extremely vulnerable because of the constant risk of “death” (i.e., destruction) of each individual colony (which is confirmed by the fate of the birds that bred at Bolshoe

Beloe Lake and Saltaim-Tenis Lake), although it is convenient for monitoring them.

According to the available data, in the event of a colony extinction, the birds continue to stay somewhere nearby or attempt to breed there, but they do not settle in other colonies. Therefore, we are not inclined to attribute the growth in the size of, for example, the colony at Tundrovo Lake with immigration of individuals from the former colonies at Bolshoe Beloe Lake and Saltaim-Tenis Lake, although this cannot be asserted without bird marking.

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COMPLIANCE WITH ETHICAL STANDARDS

Conflict of interests. The authors declare that they have no conflict of interest.

Statement on the welfare of animals. This article does not contain any studies involving animals performed by any of the authors.

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