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Influence of Water Level Reduction in The Caspian Sea on The breeding Behaviour of Sedentary Bird Populations in Gizilaghaj Bay

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THIS STUDY evaluated the effect of water level reduction in the Caspian Sea in 2000-2022 years on the breeding behaviour of sedentary bird populations in Gizilaghaj Bay. Water level fluctuation in water bodies affects the productivity of many waterfowl and shorebird populations. The diversity of biotopes in Gizilaghaj Bay creates fertile conditions for the reproduction of birds belonging to different ecological groups. Migratory-nesting bird populations from Africa and South-East Asian countries create intra-species and inter-species competition for sedentary bird populations in the Gizilaghaj Bay, located on the southwestern coast of the Caspian Sea. A decrease in water level causes the interaction and communication of bird populations belonging to different ecological groups during the breeding period and leads to the change of nesting places on biotopes. Since the water level fluctuation directly affects the trophic relationships of the birds, it is possible to evaluate the nesting conditions by changing their habitat. 41 species of sedentary bird populations belonging to 11 orders, 21 families, and 29 genera were recorded in the Gizilaghaj Bay during the breeding period. Of these, 3 species are "floating" in the water area of the bay, 15 species breed in reed swamp, 8 in tamarisk swamp, 2 in Juncus swamp, 11 in trees (shrubs), 10 in soil, 7 on shores, and 4 species in old buildings. The decrease in water level in Gizilaghaj Bay has a different effect on the nesting places of sedentary bird populations in biotopes such as reed, tamarisk, Juncus swamp, and the water area of the bay. Studying the effect of water level fluctuation on the breeding behaviour of sedentary birds is important for solving the problem of preserving natural biological diversity.

Keywords: Bay, Breeding behaviour, Diversity, Population, Sedentary birds.

Introduction

The International Convention on Biological Diversity dated June 5, 1992, and the Convention on the Protection of Water Bodies of International Importance and Migratory Birds were adopted [1]. Law of the Republic of Azerbaijan "On Animal World" dated June 4, 1999, Collection of environmental laws of the Republic of Azerbaijan, Decree of the President of the Republic of Azerbaijan dated December 21, 2002, on the protection of biological diversity and its genetic fund, in 2006 the National Strategy and Action Plan for the protection and sustainable use of biodiversity in the Republic of Azerbaijan was developed, in 2010 the "Gabala Agreement" on the protection of biological diversity were signed [2, 3]. By the implementation of the adopted convention, order and legislative acts, it is required to conduct research related to the protection of natural habitats (as well as Gizilaghaj State Nature Sanctuary) of animals.

The effect of the water level reduction in the Caspian Sea on the breeding behaviour of birds in Gizilaghaj Bay has not been studied.

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The influence of water level fluctuation on the breeding behaviour of shorebirds, waterfowl and birds belonging to other ecological groups has also been poorly studied in the world [4- 9]. In the scientific literature, the latest bioecological information about some species of sedentary birds in the Gizilaghaj Bay is provided in the works of several investigators [10-19] and others.

The main goal of the research is to study the effect of water level changes on the breeding behaviour of sedentary bird population.

Current natural-geographic conditions of Gizilaghaj Bay

A sanctuary has been created in 1926, an ornithological reserve in 1929, and a national park in 2018 attached to the Gizilaghaj Bay of the Caspian sea. Only 1/5 of the total area of Gizilaghaj Bay, which was in the 20s of the last century remained [20]. Gizilaghaj Bay consists of Greater and Lesser Gizilaghaj Bays. In 1931, the total area of Greater Gizilaghaj Bay was 850 km^2, the water volume was 3.5 km^3, the average depth was 4.1 m, and the maximum depth was 4.5 m. In 1946, most of the area became dry as a result of water reflux, the area of the bay was reduced to 712 km^2, the water volume was 1.5 km^3, the average depth was 2.1 m, the maximum depth was 2.8 m, the length of the coastline - 116.0 km, the width - 24.0 km. In 1965, the length of the coastline was 92.0 km, its width was 24.0 km, the area of the bay was 40.5 thousand hectares, it occupied approximately 46.0 % of the bay, and its depth reached 1.5-2.5 m [21].

The maximum length of Lesser Gizilaghaj Bay is 16.7 km, the width is 6.5 km, the length of the coastline is 38.9 km, the water volume is 0.15 km^3, and the depth is 0.5-2.5 meters. The water level in the Lesser Gizilaghaj Bay depends on the water level in the Caspian Sea, the annual amount of precipitation and the volume of water entering the bay from the Talysh Mountains through rivers. Lesser Gizilaghaj Bay is connected to Greater Gizilaghaj Bay through three canals – The Fish passing canal, Crash canal, and Spawning canal. Regulation of the water level between both bays was carried out until the mid-1980s through the sluices built on these canals. Later, the destruction of the sluices caused changes in the water level and salinity between the Lesser and Greater Bay, as well as the flora and fauna [21].

The first instrumental observations in the Caspian sea began in 1837 in Baku. Based on observation data of the "Neft dashlari" Hydrometeorological Station of the Caspian Sea, the sea level is determined due to the height calculated from the conventionally accepted horizon in the absence of surface waves and currents on the sea. The sea surface level is the surface perpendicular to the direction of gravity. Reper is the height of any area determined by sea level. Niveler and tamasas are used during observation. The "0" graph of a point is the lowest level it is located on. The most commonly used tamasa is QM-3. Level gauges tamasas are made of metal or wood and have lengths of 4 m, 6 m, 8 m, 10 m, 12 m, 28 m. Level changes are made according to the daily average, monthly average, annual average and multi-year average. Repetition and maintenance of the level are calculated by the

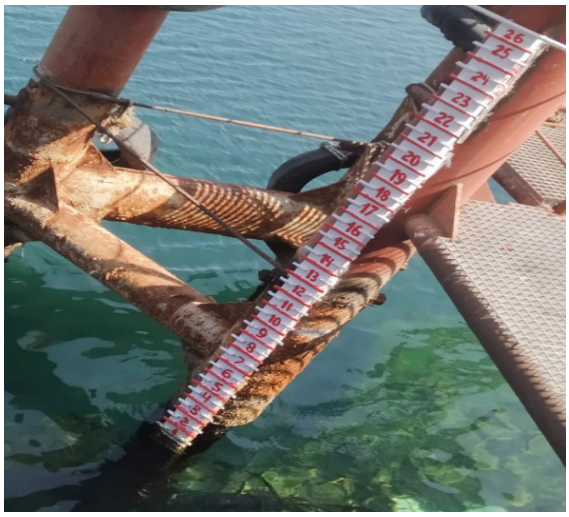

Fig. 1. Tamasa is used to measure the water level at the Sea Hydrometeorological Station of the "Neft dashları" in the Caspian Sea.

current or daily average rate in the required period (month, season, year, etc.) (Fig. 1).

Over the past 177 years, the sea level has changed dramatically three times. In the years 1929-1977, it fell by 3.0 meters, in 1978-1995 it rose by 2.5 meters, and starting from 1996 until today [22], the sea level is falling again. At present, the sea level is 28.05 meters above the world ocean level. The greatest variability occurred in 1862 (-24.0 m) and 1977 (-29.0 m) [21], and in 1996-2022, the sea level dropped by more than 2.0 meters (Table 1).

According to international predictions, the water level will continue to drop by 9.0-18.0 meters by the end of the century. If the probabilities are correct, a large part of the North Caspian Sea

TABLE 1. Water level change at the "Neft Dashları" Marine Meteorological Station in the Caspian Sea (1995-2022) [10]

Years	Months													
	1	2	3	4	5	6	7	8	9	10	11	12	Annual average, cm	Baltic system
1995	149	153	158	163	165	175	179	169	155	151	150	149	160	- 26,40
1996	148	147	149	152	150	154	147	133	124	119	118	115	138	- 26,62
1997	116	118	115	120	123	135	142	132	119	117	120	123	123	- 26,77
1998	110	110	102	102	124	139	141	132	124	118	115	118	120	- 26,80
1999	112	110	114	114	119	124	127	128	123	124	109	105	117	- 26,83
2000	109	108	109	105	112	122	124	120	111	105	105	101	111	- 26,89
2001	90	89	92	98	107	116	121	114	108	94	84	93	101	- 26,99
2002	92	90	95	99	105	118	124	120	107	99	97	98	104	- 26,96
2003	95	91	94	103	109	121	125	123	115	105	108	105	108	- 26,92
2004	99	105	108	109	116	122	131	130	124	115	109	110	115	- 26,85
2005	103	113	115	117	124	139	145	143	129	125	122	120	125	- 26,75
2006	117	115	115	117	126	131	134	123	113	102	103	101	116	- 26,84
2007	98	103	102	107	117	129	129	124	114	101	104	101	111	- 26,89
2008	107	105	108	113	119	130	128	123	114	106	100	104	113	- 26,87
2009	101	98	103	111	114	122	124	120	107	107	107	102	110	- 26,90
2010	100	99	99	105	113	122	122	112	98	90	85	80	102	- 26,98
2011	80	80	77	79	87	95	96	91	76	70	72	67	81	- 27,19
2012	66	71	71	73	81	89	93	73	67	72	74	64	75	- 27,25
2013	58	62	62	68	75	89	92	90	76	69	58	60	72	- 27,28
2014	57	57	56	62	68	75	75	62	53	71	75	33	62	- 27,38
2015	31	33	33	42	44	50	52	42	31	16	9	12	33	- 27,67
2016	14	9	21	31	37	49	57	51	43	32	29	25	33	- 27,67
2017	23	23	23	27	37	46	47	47	39	37	25	21	33	- 27,67
2018	25	21	22	28	32	43	50	41	28	16	15	6	27	- 27,73
2019	9	7	7	13	18	26	29	19	6	-4	-8	-6	10	- 27,90
2020	-6	-1	1	5	13	28	28	21	12	-5	-9	-11	6	- 27,94
2021	-15	-9	-13	-10	-3	5	6	-3	-12	-30	-38	-45	-14	- 28,14
2022	-41	-42	-39	-39	-32	-23	-24	-34	-47	-57	-63	-67	-42	- 28,42

may become land, with a decrease of 1/3 of the total area of the sea.

Material and Methods

Studies were carried out during the breeding period, in the water area of Gizilaghaj Bay, in wetlands and dry areas, by route method, on foot, with motorized and non-motorized boats, and by car (38057/09// - 49002/16// Fig. 2). Binoculars and a Carl Zeiss telescope were used. Breeding behaviour of sedentary bird populations in Lesser Gizilaghaj Bay were studied in May, June and July (Fig. 3-5). 5,000 km by car, 850 km by motorboat, 144 km by non-motorized boat, and 451 km on foot have been travelled.

The main group of biotopes where the populations of sedentary birds nest in the Gizilaghaj Bay as follows (Fig. 6):

1. Tamarisk swamp
2. Reed swamp
3. Juncus swamp
4. The water area of the Lesser Gizilaghaj Bay ("floating" biotope)
5. Coastal dunes

Fig. 2. The geographic location of the study area: 1-Tezekend village, 2-Gumbashi village, 3- Spawning canal, 4-Crash canal, 5-Fish passing canal

Fig. 3. *Circus aeruginosus* chicks in the nest (photo taken by Karimova N.)

Fig. 4. ***Haliaeetus albicilla*** **(photo taken by Taghiyev A.)**

Fig. 5. Bird watching in the study area (photo taken by Karimova N.)

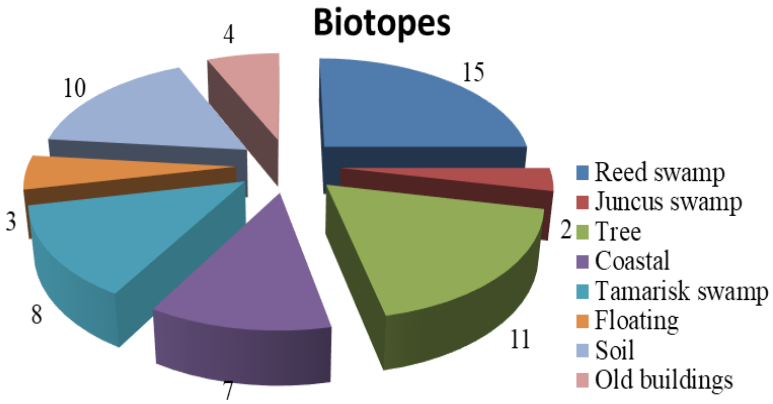

Fig. 6. The main biotopes where sedentary bird populations nest in the Gizilaghaj Bay

6. The forest strip in the Vilash river delta (tree)
7. Dry areas near the Bay (soil)
8. Old buildings

Results and Discussion

During the research, the number of pairs and nests formed by resident bird populations in biotopes were recorded to study the effect of water level changes on the breeding behaviour of birds in Gizilaghaj Bay. Because it is difficult to analyze the nest in some species, bioethical rules such as not damaging the nest while approaching and not disturbing the species and the chicks in the nest too much, have been taken into account. A total of 9306 pairs of sedentary bird populations and their nests were recorded. Of these, 301 pairs of *Tachybartus ruficollis*, 114 pairs of *P. nigricolis*, 81 - *P.cristatus*, 48 - *Ph.carbo*, 857 - *Microcarbo pygmaeus*, 11 - *Botarus stellaris* , 634 - *Nycticorax nycticorax* , 84 - *Ardea alba*, 1674 - *Egretta garzetta*, 64 - *Ardea cinerea*, 257 - *Anas platyrhynchos*, 32 - *Circus aeruginosus*, 14 - *Accipiter nisus*, 4 - *Haliaeetus albicilla*, 8 - *Falco naumanni*, 93 - *Falco tinnunculus*, 116 - *Francolinus francolinus*, 27 - *Porphyrio porhyrio*, 463- *Rallus aquaticus*, 593 - *Fulica atra*, 27 - *Vanellus vanellus*, 25 - *Tringa totanus*, 126 - *Columba livi*a, 11 - *Asio flammeus*, 6 - *Athena noctua,* 31 - *Alcedo attis*, 704 - *Galerida cristasa*, 63 - *Calandrella brachydactila*, 307 - *Melonocorypha calandra*, 214 - *Anthus compestris*, 868 - *Sturnus vulgaris*, 54 - *Pica pica*, 112 - *Corvus cornix*, 147 - *Cettia cetti*, 121 - *Muscicapa striata*, 48 - *Turdus merula*, 44 - *Panurus biarmicus*, 288 - *Remiz pendulinus*, 118 - *Passer hispaniolensis*, 480 - *Passer montanus*, 37 - *Emberiza schoeniclus*.

Decrease in the water level in the Caspian Sea affects the change in the water level in Gizilaghaj Bay. Thus, the water level in the part of the bay north of the Spawning canal (Pirman) is different from the part in the south. Since the rain and snow water from the Talysh mountains is directed to the northern (Pirman) area of the bay through the Vilash River, the water level is high during the breeding season of birds. The water level in the part of the bay located south of the Spawning canal is directly proportional to the lowering of the water level in the Caspian Sea. Because the southern part of the bay is higher than the sea level compared to Lesser Gizilaghaj Bay. Therefore, the water in the southern part of the bay (the territory of the Lesser Kyzylagac Bay) mainly flows through the Fishing canal and partly through the Crash canal to the Greater Gizilaghaj Bay, and from there to the Caspian Sea.

The influence of natural and anthropogenic factors caused by the diversity of water levels in Gizilaghaj Bay (high in the north, low in the south) has a different effect on species nesting in different biotopes ("floating" in the water, nesting in the dry areas near the bay and around the water basins) (Table 2). It should be noted that the salinity of water in the bay is slightly lower than the general salinity of the Caspian Sea, where desalination has occurred. The average salinity was 9-11 ppm during the breeding period of birds. Depending on the volume of water coming from Vilash, sometimes large floods occur in the northern part (Pirman). The decrease in the water level in the southern part of the bay creates favourable conditions for poachers hunting medicinal leech (*Hiruda medicinalis orientalis* Utevsky & Trontelj, 2005). As a result, disturbing factors (noise, etc.) caused by poachers hunting medical leeches also cause some sedentary birds to change their nesting places. In addition to the change in water level, reeds (*Phragmites australis* (Cav)Trin. ex Steud.) began to rot massively in Gizilaghaj Bay in 2008 and later covered large areas. Tall, dense, old reeds remain in the southern part of the bay, mainly in the area called Dannik and around some lakes, and in the northern Pirman area around large lakes near the Akkusha [17, 18, 19].

Although the number of "floating" nests of the species *Tachybaptus ruficollis, Podiceps nigricollis*, and *Podiceps cristatus* that are built in the southern part of the Lesser Gizilaghaj Bay (in a large open water area without reeds, tamarisk and Juncus), which is rich in aquatic plants (brown and blue-green algae) were decreased significantly in the 2010-2022 years, they were recorded. Nests built on the water surface are 0.5-15.0 cm high, their circle is 25.0-60.0 cm and vary depending on the species. Since the water level has dropped, the nesting places have been recorded around lakes with a depth of 70-110 cm away from the coast. Due to the formation of dense algae jungle without reeds, tamarisk and Juncus, *Podiseps cristatus* "floating" nests in open water are not destroyed because large waves cannot be generated in windy weather (there are usually no strong winds during this period). This

TABLE 2. Changes in the nesting place of birds in Gizilaghaj bay.

№	Species	North (Pirman)				South			
		The border to the Gizilaghaj village and other areas of the bay		Areas of the bay near Akkusha post		The border of Tezekend, Gumbashi villages and other areas of the bay		The area of the bay called Dannik	
		Until 2010	2010-2022 years	Until 2010	2010-2022 years	Until 2010	2010-2022 years	Until 2010	2010-2022 years
1	*Tachybaptus ruficollis*	+	-	+	+	+	+	+	+
2	*Podiceps nigricollis*	+	-	+	+	+	+	+	+
3	*Podiceps cristatus*	+	-	-	+	+	+	+	+
4	*Phalacrocorax carbo*	+	-	+	+	+	-	+	+
5	*Microcarbo pygmaeus*	+	-	+	+	-	-	+	+
6	*Botarus stellaris*	-	-	+	+	+	-	+	+
7	*Nycticorax nycticorax*	+	-	+	+	+	-	+	+
8	*Ardea alba*	+	-	+	+	+	-	+	+
9	*Egretta garzetta*	+	-	+	+	+	-	+	+
10	*Ardea cinerea*	+	-	+	+	+	-	+	+
11	*Anas platyrhynchos*	+	+	+	+	+	-	+	+
12	*Circus aeruginosus*	+	+	+	+	+	+	+	+
13	*Accipiter nisus*	+	+	-	-	-	-	-	-
14	*Haliaeetus albicilla*	-	+	-	-	-	-	-	-
15	*Falco naumanni*	+	+	-	-	-	-	-	-
16	*Falco tinnunculus*	+	+	-	-	-	-	-	-
17	*Francolinus francolinus*	+	+	+	+	+	+	+	+
18	*Porphyrio porphyrio*	+	-	+	+	+	-	+	+
19	*Rallus aquaticus*	+	-	+	+	+	-	+	+
20	*Fulica atra*	+	+	+	+	+	+	+	+
21	*Vanellus vanellus*	+	+	+	+	+	+	+	+
22	*Tringa totanus*	+	+	+	+	+	+	+	+
23	*Columba livia*	+	+	+	+	+	+	+	+
24	*Asio flammeus*	+	+	+	+	+	+	+	+
25	*Athene noctua*	+	+	-	-	+	+	-	-
26	*Alcedo atthis*	+	+	+	+	+	+	+	+
27	*Galerida cristata*	+	+	+	+	+	+	+	+
28	*Calandrella brachydactila*	+	+	+	+	+	+	+	+
29	*Melanocorypha calandra*	+	+	+	+	+	+	+	+
30	*Anthus compestris*	+	+	+	+	+	+	+	+
31	*Sturnus vulgaris*	+	+	+	+	+	+	+	+
32	*Pica pica*	+	+	+	+	+	+	+	+
33	*Cettia cetti*	+	+	+	+	+	+	+	+
34	*Muscicapa striata*	+	+	+	+	+	+	+	+
35	*Corvus cornix*	+	+	+	+	+	+	+	+
36	*Turdus merula*	+	+	-	-	-	-	-	-
37	*Panurus biarmicus*	+	+	+	+	+	+	+	+
38	*Remiz pendulinus*	+	+	+	+	+	+	+	+
39	*Passer hispaniolensis*	+	+	+	+	+	+	+	+
40	*Passer montanus*	+	+	+	+	+	+	+	+
41	*Emberiza schoeniclus*	+	+	+	+	+	+	+	+

vegetation (dense algae jungle) has no role in bird nutrition. Since this period is the breeding period, birds prefer food of animal origin rather than plant origin.

Very few large, open-water areas are in the Pirman (north) part of the bay. Most of the area is covered with new reeds in place of old and decayed reeds. *Tachybaptus ruficollis*, *Podiceps nigricollis*, and *Podiceps cristatus* were nested in almost most of the bay until 2010, even though aquatic plants (algae) formed jungles near the surface of the water. In 2010-2022, their nests were not found in other areas, except for the areas near the Akkusha post. The reason can be various: safety, too few open water areas, decay of old reeds, etc [18, 19].

Until 2010, *Phalacrocorax carbo, Microcarbo pygmaeus, Nicticorax nicticorax, Ardea alba, Egretta garzetta, Ardea cinerea* were nesting in reeds and tamarisk jungles in the southern part of the bay on the border with the villages of Tezekend and Gumbashi. In 2010-2022, as a result of the decrease in the water level and the rotting of reeds, their nests were recorded in the form of a colony in old, large, dense reeds and tamarisk jungles, in the southern part of the bay only in the area called Dannik. They were deprived of nesting in other areas.

Although the water level is high in the northern (Pirman) area of the bay near the coast with the village of Gizilaghaj and Neftchala district, the old, dense, large reeds are rotting, Phalacrocorax carbo, Microcarbo pygmaeus, Nicticorax nicticorax, Egretta alba, Egretta garzetta, Ardea cinerea were deprived of nesting in the new sparse reeds growing in the area. These birds nest in the old, large, dense reeds and tamarisk around the large lakes in the area near the Akkusha of the northern part of Gizilaghaj Bay.

A total of 11 nests of the *Botarus stellaris* species were recorded in old reed beds in the northern part of Gizilaghaj Bay near the Akkusha and in the southern part called Dannik. Their nests were not found in other areas of the bay. A dabbling duck (Anas platyrhynchos) nests have been recorded throughout the bay, albeit in small numbers. Only in the south of the bay, the border with the villages of Tezekend and Gumbashi and the areas close to it, no nests were recorded. There is a lot of human intervention in these areas, and until 2010, people took the eggs from the nests of this bird and placed them in the nests of domestic chickens laying in their backyards for hatching. One of the reasons for the decline of nests of Anas platyrhynchos is the massive rotting of reeds since 2008. Nests of *Circus aeruginosus* were recorded on both intact and decayed reed remains around large lakes (90-150 cm water depth) before 2010 and between 2010-2022 years in the entire area of Gizilaghaj Bay. *Accipiter nisus, Haliaeetus albicilla, Falco naumanni,* and *Falco tinnunculus* build nests in different types of tall trees (higher than 10 m) in the forest strip formed in the delta of the Vilash river on both the northern and southern border of Gizilaghaj Bay. Nests of these species were not recorded in tall trees growing singly in other areas of the bay without a forest belt. Until 2010, *Haliaeetus albicilla* did not nest in the forest strip. In 2010-2022, 4 individuals and one nest of this species were recorded. *Francolinus francolinus* nests in the widespread blackberry bushes in the area and, rarely, in places where there are relatively tall grasses not exceeding 50 cm in height (on the ground). Before 2010 and during 2010-2022, there was no drastic change in nesting places and numbers. The vastness of the territory and the abundance of blackberry bushes are the main natural factor that ensures the preservation of the breeding behaviour of the species. Francolinus francolinus also feeds on fruits that fall to the ground from blackberry bushes. *Porphyrio porphyrio* used to nest in most of the dense, tall, impassable reed beds of the Gizilaghaj Bay. The drop in the water level and the decaying of the reeds caused the nesting place of this species to remain in the old reed bed, surrounded by lakes, in the Dannik area of the southern part of the Lesser Gizilaghaj Bay during the 2010-2022 years. Although the water level is high in the northern part of the bay, due to decaying reeds, the nesting sites remain in the dense, tall, old reed beds around the lakes near Akkusha. It does not nest in other areas in the north. Although *Rallus aquaticus* was nested in reed beds in the border areas near Gizilaghaj village in the northern part of the bay until 2010, no nests were recorded in this area during 2010-2022 years. Their nests were recorded in the areas near the Akkusha of the northern part of the bay. In the southern part of the bay, the nests were not recorded in 2010-2022 due to the drop in the water level and the rotting of the reed beds in the border areas with the villages of Tezekend and Gumbashi. However, until 2010, there were many nests in this area. In addition to nesting *Fulica atra* in tall, dense reeds, which remained in very few areas until 2010 and later in 2010-2022, this

species' nests were recorded among newly formed reeds on the stumps of decayed reeds.

The nesting places of *Vanellus vanellus, Tringa totanus, Galerida cristata, Calandrella brachydactila, Melanocorypha calandra,* and *Antus compestris* species were recorded on the dry coastline area, mostly between two bays with rich vegetation. The reason for this is the reduction of wetlands as a result of the decrease in water level, as well as the increase of natural and anthropogenic factors. Although the number of nests of each species declined before 2010 and between 2010 and 2022 years, there was no dramatic change in nesting places. During the research period, a total of 11 nests of the *Asio flammeus* species were recorded in the reed swamp areas of the southern part of the bay, in the area called "Guest House" and in Dannik, and the northern part in the border areas with Gizilaghaj village and nearby territories. There was no change in nesting places. Athene noctua was recorded in the southern part of the bay, in the "Guest house", in the disused building near the Spawning Canal, and farms in the Gizilaghaj village (6 nests in total). Among the sedentary bird populations, *Alcedo attis* nested in rivers and canals with plenty of water and vegetation in the northern part of Gizilaghaj Bay until 2010 and also from 2010 to the 2022 year. In the southern part of the bay, nests were recorded in the canal connecting the Lesser Gizilaghaj Bay with the Greater Gizilaghaj Bay, in the Fishing canal and on the walls of the Spawning canal. Until 2010 and in 2010-2022, there was no change in the nesting biotopes of the species Emberiza schoeniclus.

In 2010-2022, there was no change in the nesting places of *Cettia cetti, Muscicapa striata,* and *Panurus biarmicus* species in the respective biotopes of the bay. *Turdus merula* nests in a wooded area in the Vilash river delta. *Remiz pendulinus* nests in trees growing in the humid area of Gizilaghaj Bay and in the forest area formed in the delta of the Vilash river, as well as in the branches of willows and other trees that grow along the canals. There was no change in the nesting places of this species. Nests in single trees growing in dry, low-moisture areas are 2.5-3.0 m above the ground, and nests in the branches of willows and other trees hanging over water are at a distance of 1.0-1.5 m from the water surface.

Pica pica and *Corvus cornix* nest in the wooded area formed in the Vilash river delta, mostly in trees growing along the canals in the bay's northern and southern parts. Compared to the time before 2010, *Pica pica* has moved away from settlements to more aquatic, terrestrial and wetland areas of the bay, and nesting populations of the species have increased. There was no drastic change in the nesting place of *Corvus cornix* until 2010 and in subsequent years.

Passer hispaniolensis, and *Passer montanus* also nest in trees surrounded by thick blackberry bushes, mainly in the forest strip and humid areas of the Vilash river delta. Nests of these birds are not found in the open field, in trees not surrounded by blackberry bushes. The nesting places of these species have not changed. *Columba livia,* and *Sturnus vulgaris* species nest in various old buildings with very little human intervention (abandoned houses, etc.) in the area. There was no significant change in their nesting places.

Conclusion

In the bay, water level fluctuation and reed decay affect the breeding behaviour (changing the nesting place) and feeding habit of the species whose nests are "floating" and in reeds (*Ph. carbo*, *Microcarbo pygmaeus*, *Botarus stellaris*, *Nycticorax nycticorax*, *Ardea alba*, *Egretta garzetta*, *Ardea cinerea*), but not breeding period.

With the exception of *Tachybartus ruficollis*, *P. nigricolis*, and *P.cristatus*, most of the species migrate from the southern part of Gizilaghaj Bay (except for the Dannik area) to the northern part - the coastline of the Caspian Sea.

Conflicts of interest

There are no conflicts to declare.

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