Monitoring of waterfowls during the wintering time in the ROSPA0063 Buhusi – Bacau – Beresti Dam Lakes (Romania)

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Abstract
Part of Nature 2000 network, the ROSPA0063 Buhusi – Bacau – Beresti Dam Lakes is situated around the confluence of Siret and Bistrita Rivers, including five large dam lakes: Lilieci, Bacau, Galbeni, Racaciuni and Beresti, which cover a surface about 5600 hectares. Our field monitoring activities began during the 2011' spring and are still on-going, including not just these five lakes but also the northern Garleni Lake for which we prepare the documentation to be included in the Nature 2000 site. We present the dynamic of specific diversity and effectives of waterfowls during the whole wintering season for the last six years. This area shelters large groups about thousands and tens thousands of waterfowls in migration, but also during the wintering time. The size of lakes is quite different and the suitable habitats cover very different surfaces on the six lakes, so the diversity and effectives of waterfowls are different from one location to other. The greatest wintering diversity was recorded on Lilieci Lake, while the biggest waterfowl populations were recorded on Racaciuni and Lilieci Lakes.

Keywords: waterfowls, wintering time, Nature 2000 network, dam lakes.

Introduction

Part of Nature 2000 network (HG no 1284/2007), the ROSPA0063 Buhusi – Bacau – Beresti Dam Lakes is situated around the confluence of Siret and Bistrita Rivers ($27^0$7'12" eastern longitude, $46^0$14'50" northern latitude). The Nature 2000 site covers a surface about 5580 hectares and includes five large dam lakes: Lilieci, Bacau, Galbeni, Racaciuni and Beresti. In the vicinity of the northern sector, there exists another small dam lake - Garleni Lake, for which we prepare the documentation to be included in the Nature 2000 site.

The size, general aspects and surfaces covered by suitable habitats for bird fauna are very different from one lake to other. Lilieci Lake (338.8 ha and about 4 kilometres in length) is situated on the valley of Bistrita River; the left bank is tall and steep, while along the right bank and in the tail area the habitats are suitable for birds (reed beds, bulrush, meadow forest with willows and poplars, pastures with shrubs and cultivated lands). Bacau Lake (216.9 ha and 2.3 km in length) is situated on the valley of same river, on the territory of Bacau city; the suitable habitats for birds covers smaller surfaces, in the tail area (reed beds and meadows with shrubs), on the small island from the northern sector (meadow forest with poplars and willows) and along the north-western bank (reed beds and bulrush). Galbeni Lake (1063.8 ha and 6.3 km in length) is situated around the confluence of Bistrita and Siret

Rivers; the suitable habitats cover about 60% from the whole surfaces being one mosaic of canals, islets with small and young meadow forests, gravel pits islets and sandy banks, reed beds, bulrush and wet meadows). Racaciuni Lake (1702.4 ha and 13 km in length) is situated on the valley of Siret River and represents the largest dam lake in the site, but the suitable areas for birds are situated in the northern third part of the area where the waters are not deep, forming a mosaic of islets and canals, reed beds, bulrush and wet meadows. Beresti Lake (2253.7 ha and 15 km in length, but just the northern middle sector is part of the Nature 2000 site) is situated on the valley of Siret River; this lake is under one very strong clogging phenomenon and the northern sector is a labyrinth of compact reed beds and canals. Garleni Lake (200 ha) is not part of the site, but is one very important area for birds; situated on the valley of Bistrita River about 4.5 km north from Lilieci Lake, is under clogging phenomenon and the suitable habitats for birds represent near 92% of the whole surfaces (reed beds and open waters, meadow forests, dry and wet meadows with shrubs).

Despite the large surfaces covered by suitable habitats, the breeding birds' diversity and effectives present low values, especially due the huge and very high level of anthropogenic activities in the area. This area shelters large groups about thousands and tens thousands of waterfowls in migration period, but also during the wintering time. Part of lakes and surrounding canals are not frozen completely during the worst winters. The diversity and effectives of bird fauna are different from one location to other, related to the size, presence and surface of suitable habitats for birds, but especially, the level of human pressure in the area.

The Regional Centre of Ecology Bacau (CRE Bacau) is the caretaker of this Nature 2000 site.

The first studies on the bird fauna in the area were done in the early '80s (Rang, 2002), but more systematic studies were conducted in the late '90s (Feneru, 2002), the designation of the Nature 2000 site being by the specialists from the Romanian Ornithological Society (SOR/Birdlife Romania) – Muller & co, 2005, Papp & Fantana (editors), 2008.

Methods and period of study

Our field monitoring activities began during the 2011' spring like one preliminary study (Gache, 2012) that had followed just three lakes (Bacau, Galbeni and Racaciuni). Starting from January 2012, we included the hole perimeter of the Nature 2000 site in the national program "Census of wintering waterfowls" coordinated by the SOR/Birdlife Romania, but also in one permanent activity of birds' monitoring like part of the management plan for this area, giving support to the caretaker in order to implement and realignment of the most appropriate conservation measures. Our field activities are still on-going, including not just these five lakes (starting from 2012) but also the northern Garleni Lake (starting from January 2015).

During the winter, we used the methods of transect for the all lakes, following the banks of it: northern bank for Garleni Lake, western and southern banks for Lilieci and Galbeni Lakes, western and eastern banks for Bacau Lake, northern and western banks for Racaciuni and Beresti Lakes. We visited the whole area one per month (from November to February) in the second decade, by car and we had stopped in some fixed points along transects in order to count the groups of birds from the area. When these groups were no more than 200 birds, we counted all of them using

binoculars and telescope, while we used the strips counting estimation method when the groups were larger.

Results and discussions

During our monitoring activity, the dam lakes have frozen up to 45 – 100% of the whole surface in late January 2012, during the first decade in January 2013, in middle January in 2016 and 2017. Usual, the larger unfrozen surface is present on the tail territory of Lilieci Lake and just Beresti Lake can be complete frozen in middle January, while the canals and the sector of small river bed around the confluence point had never freeze during our study. For this reason, we met aquatic birds in the area even during the harshest winters. The ice bed melts in middle February or even in middle March (2012).

During the wintering time (November - February), we recorded about 59 bird species on the investigated territory, but just the aquatic bird species reunited under the generic name of waterfowls, two heron species and four raptor species are presented in the table 1 with the minimum and maximum recorded or estimated effectives (individuals) during one day of observation in the area.

Some of these species were met just once or twice in the area during our monitoring activity, being rare species not only in the area, but in Romania, too: *Somateria mollissima* (one male present inside one group of white-fronted geese – *Anser albifrons*, on Bacau Lake, 13 November 2011), *Melanitta fusca* (one male and two females on Beresti Lake, 13 January 2014, respectively, one pair on a canal nearest Garleni Lake, in January 2017) and *Clangula hyemalis* (three females on Beresti Lake, 13 January 2014). The black-throated loon (*Gavia arctica*) appears constantly in the area, but just in passage, especially during the October, the largest group (22 individuals) being recorded in the area of Galbeni Lake, on the 15th October 3013. Despite their status of summer visitors/very rare winter presences in Romania, two heron species – *Ardea alba* and *Ardea cinerea* – are constant wintering presence in the area with small effectives; even during the very cold winters, we met three – five individuals in the vicinity of reed beds or along the unfrozen canals.

During the study period, the first winter visitors have appeared in the area in second decade of November. One interesting exception was the winter of 2013, when we met the first groups of winter visitor bird species in the late October. During our monitoring activity on the territory of Lilieci Lake, at the 30th October 2013, we counted 106 whooper swans (*Cygnus cygnus*), a large group about 720 Eurasian teals (*Anas crecca*) and 360 tufted ducks (*Aythya fuligula*), respectively, 25 white-fronted geese (*Anser albifrons*). The weather was very nice and warm for this period of year in the year; we could hear the sounds of green frogs (*Pelophylax sp*.) and the dragonflies were still flying in the area. More than that, we have listened the territorial songs of skylarks (*Alauda arvensis*) like in the early spring.

The biggest effectives and birds' diversity were met in November-December, when we could count even about 46,000 individuals of waterfowls on the whole investigated territory. During the second decade of January, we counted the waterfowls from these lakes like part of national program "Census of wintering waterfowls". We must mention that during this census activity we also paid our attention to the presence of raptor bird species in the area. We can notice the constant wintering presence of one – two individuals of white-tailed eagle (*Haliaeetus albicilla*) on the territory of Lilieci, Bacau and Racaciuni Lakes,

respectively, of common and rough-legged buzzards (*Buteo buteo* and *Buteo lagopus*) with effectives of 5 – 7 individuals on the whole territory.

Table 1. Diversity of bird fauna during the wintering time on the territory of ROSPA0063 *Buhusi – Bacau – Beresti Dam Lakes*

No	Species	Lilieci	Garleni	Bacau	Galbeni	Racaciuni	Beresti
1.	Cygnus olor	88 - 708	18 - 411	12 - 146	5 - 196	26 - 123	4 - 202
2.	Cygnus cygnus	8 - 187	112 - 126	5 - 158	-	4 - 68	0 – 15
3.	Anser anser	-	-	32 - 126	-	-	-
4.	Anser albifrons	-	-	56 - 230	-	0 - 680	-
5.	Anas platyrhynchos	62 - 12800	172 - 830	22 - 2000	19 - 4360	18 - 25200	18 - 154
6.	Anas strepera	0 - 10	-	0 - 4	-	-	-
7.	Anas acuta	-	-	-	-	0 - 18	-
8.	Anas penelope	-	-	0 - 228	0 - 62	12 – 380	-
9.	Anas crecca	32 - 470	-	0 - 430	12 - 300	43 - 1500	-
10.	Aythya marila	0 - 16	-	0 – 9	0 - 17	0 – 38	-
11.	Aythya fuligula	68 - 318	0 - 78	38 – 297	12 - 32	16 - 218	-
12.	Aythya ferina	12 - 720	-	78 – 182	16 - 400	45 – 590	-
13.	Bucephala clangula	38 – 260	40 - 109	12 - 108	-	8 - 318	-
14.	Clangula hyemalis	-	-	-	-	-	0 - 3
15.	Somateria mollissima	-	-	0 - 1	-	-	-
16.	Melanitta fusca	-	0 - 2	-	-	-	0 – 3
17.	Mergus merganser	2 – 6	0 - 16	-	0 - 12	0 - 24	-
18.	Mergellus albellus	0 - 7	0 - 8	0 - 2	0 – 13	0 – 148	0 - 36
19.	Phalacrocorax carbo	3 – 108	0 - 1	4 – 88	5 – 158	0 – 152	-
20.	Ardea alba	0 – 3	-	3 – 17	0 – 8	2 – 11	-
21.	Ardea cinerea	1 – 6	-	0 – 5	0 - 13	2 - 13	-
22.	Haliaeetus albicilla	0 – 1	-	0 – 1	-	0 - 2	-
23.	Buteo buteo	1 – 3	-	0 – 4	1 - 6	1 – 6	1 – 2
24.	Buteo lagopus	1 – 2	0 - 1	0 - 3	1 – 2	2 – 5	0 – 1
25.	Accipiter gentilis	0 – 2	-	-	0 - 1	0 - 2	-
26.	Fulica atra	0 - 116	46 – 386	12 – 810	12 – 312	0 – 6300	-
27.	Larus cachinnans	12 – 63	-	4 – 90	12 – 2380	16 – 310	8 – 12
28.	Chroicocephalus ridibundus	23 – 72	-	6 – 32	5 – 420	4 – 212	6 – 21
29.	Podiceps cristatus	-	-	-	0 – 6	-	-
30.	Podiceps grisegena	-	-	-	-	0 - 6	-
31.	Tachybaptus ruficollis	4 – 14	-	0 – 22	0 - 12	0 - 12	0 - 12

In middle January 2012, the lakes were not frozen and we recorded the greatest diversity (12 waterfowl species), but also the biggest effectives (about 7,950 individuals of waterfowls) on the territory of Racaciuni Lake (figures 1 and 2), dominant species being *Anas platyrhynchos* (about 5,925 individuals), *Aythya ferina* (about 590 individuals) and *Anas crecca* (335 individuals). Also then and there, we recorded the biggest effectives of smew (*Mergellus albellus*) in the area during our monitoring study: 111 individuals. On the territory of Bacau Lake, we met one very unusual winter presence in the area – five pairs of gadwall (*Anas strepera*), that is a summer visitor and breeding species in Romania and in this area, too.

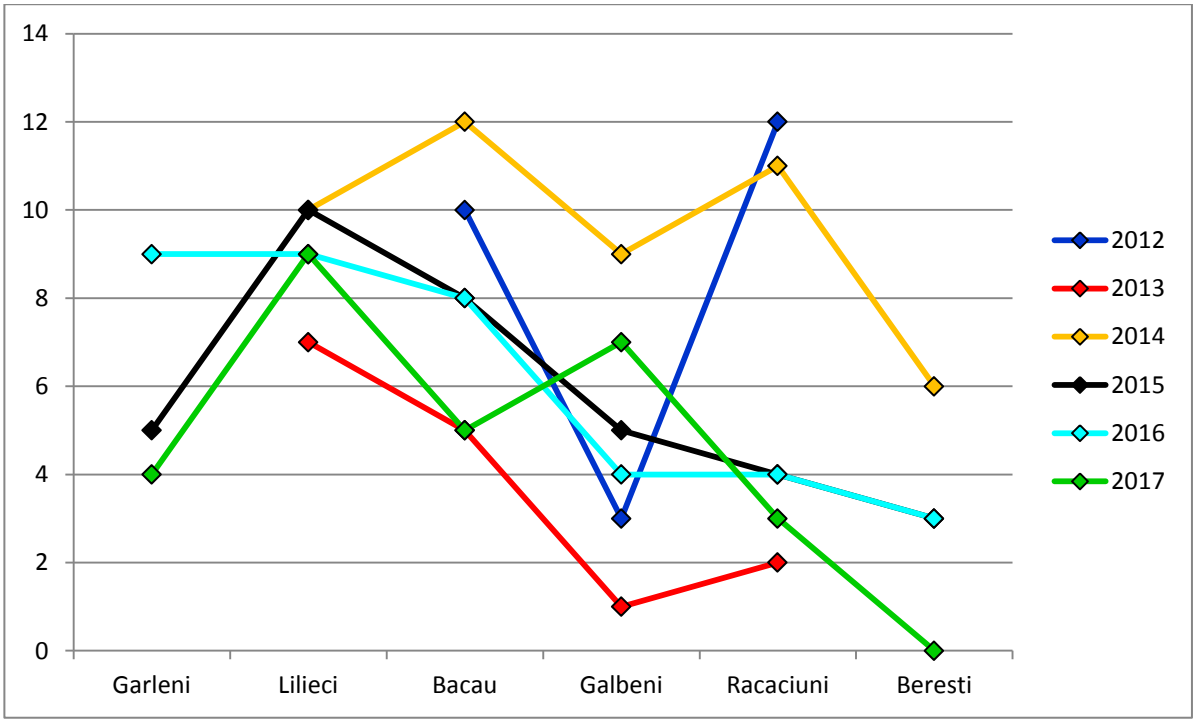

Figure 1. Diversity of waterfowls (number of species) on the territory of Buhusi – Bacau – Beresti Lakes during the Census of wintering waterfowls (middle January 2012 - 2017)

In the beginning of January 2013, the dam lakes were frozen up to 90% (Lilieci Lake) – 95 % (Bacau Lake) till 100% (Galbeni and Racaciuni Lakes). On the territory of Lilieci Lake, we recorded the greatest diversity (7 waterfowl species), but the biggest effectives were present on the territory of Bacau Lake – figure 2. The birds were concentrated in the north-eastern sector of Lilieci Lake, on a long and narrow strip left unfrozen under the eastern high cliff of the river, respectively, on the open waters near the island and canals on the territory of Bacau Lake. The ducks were the dominant species in the area with 643 individuals (*Anas platyrhynchos*, *Aythya fuligula*, *Bucephala clangula* and *Mergus merganser*), followed by the swans (*Cygnus cygnus* and *Cygnus olor*) (8, respectively, 128 individuals); there were present 14 little grebes (*Tachybaptus ruficollis*) and 16 coots (*Fulica atra*), too.

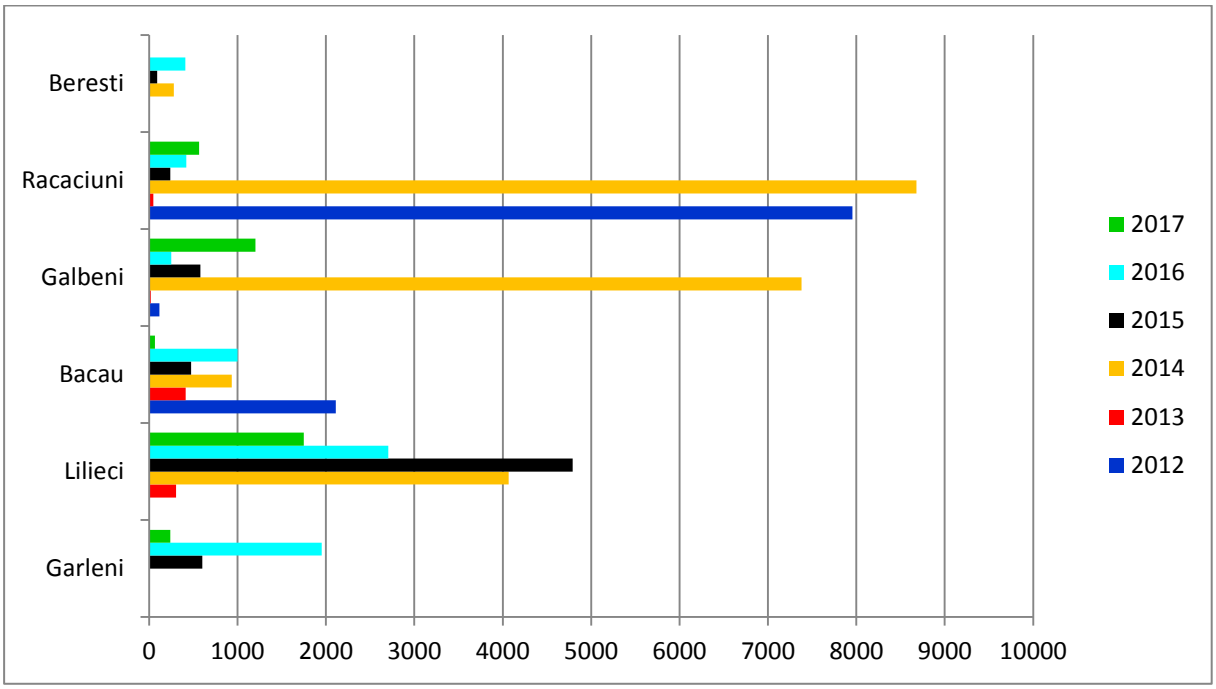

Figure 2. Effectives of waterfowls (individuals) on the territory of Buhusi – Bacau – Beresti Lakes during the Census of wintering waterfowls (middle January 2012 - 2017)

The next winter was the mildest one during our monitoring activity, allowing us to record the biggest effectives of waterfowls not only during whole wintering time but also in the middle January 2014 (figure 2), probably very close to the first winter of monitoring, when we visited juts three lakes (Racaciuni, Bacau and Galbeni, the last one being covered with water just in October 2011, after about five years of hydrotechnical arrangements in order to strengthen the dam). On the 7th December 2013, we visited the whole five lakes from the territory of Nature 2000 site counting and estimating about 46,100 waterfowl birds. The dominant was the mallard (*Anas platyrhynchos*) with about 40,300 individuals. The other duck species were present with about 2,330 individuals (*Anas crecca*, *Anas penelope*, *Aythya fuligula*, *Aythya ferina*, *Aythya marila*, *Bucephala clangula*, *Mergus merganser* and *Mergellus albellus*). In the same day, we counted 755 swans (*Cygnus olor* and *Cygnus cygnus*) in the area, about 2600 coots (*Fulica atra*) and 188 cormorants (*Phalacacrocrax carbo*) on the site's territory.

For the midwinter census of waterfowls, we visited the area on the 13th January 2014, recording the biggest effectives on the Racaciuni Lake territory (about 8,700 individuals) and the greatest diversity – 12 species – in the perimeter of Bacau Lake (figure 1). Then, we met the biggest effective of common goldeneye (*Bucephala clangula*) for the whole monitoring period – 484 individuals and the biggest wintering presence of the grey heron (*Ardea cinerea*) – 18 individuals for this site.

During the second decade of January 2015, the fog was a constant meteorological phenomenon in the area, so, we assume that the effectives or waterfowls were underestimated during the midwinter census of this year. The ice covered between 5 - 10% of lakes' surfaces (Garleni, Lilieci and Bacau Lakes) till 70 – 100% (Racaciuni and Beresti Lakes). We mention the biggest wintering effective of little grebes (*Tachybaptus ruficollis*) in the area for the whole study period – 30 individuals.

The ice-bed began to form in late December 2015, so, in middle January, the dam lakes were frozen up to 90 – 95%, excepting Garleni Lake were the ice covered about 75%. The greatest diversity of waterfowls was recorded on the Garleni and Lilieci Lakes (figure 1), on the second one, being recorded the biggest effectives, too – figure 2. We counted about 2,430 swans (from which, 569 individuals of whooper swan) and about 3,800 ducks, dominant species being the mallard, with about 2,482 individuals.

The last winter was very cold and a very thick ice-bed covered completely the dam lakes Garleni, Racaciuni and Beresti, while on Galbeni Lake, we found just o very small unfrozen area in front of the hydropower plant in the middle January 2017. The birds were concentrated along the canals – especially between Galbeni and Racaciuni Lakes, but also in vicinity of Garleni Lake and on the territory from the tail of Lilieci Lake where we recorded the greatest diversity and the biggest effectives of waterfowls, too. We met large flocks of ducks searching for food on the agricultural lands from the vicinity of Galbeni and Racaciuni Lakes.

Somewhat unusual at first glance, the geese are not significant and constant wintering presence on the territory of ROSPA0063 Buhusi – Bacau – Beresti Dam Lakes, especially if we relate to the situation from Prut River valley, the other important hydrological basin in the eastern Romania. We recorded just two geese species – *Anser anser* and *Anser albifrons* – with effectives of tens or hundreds only during the migration time, especially in the autumn, but the geese leave the area being very rare present like winter visitors in the perimeter of Lilieci and Bacau Lakes. The biggest effective of geese was recorded on the 13th November 2011, in the perimeter of Racaciuni Lake – 680 white-fronted geese. We believe that the high level of human pressure, especially, through the hunting games represent the reason of this absence in the area.

Looking for the importance of each investigated lake, the Lilieci Lake seems to be the most suitable perimeter for wintering waterfowls on the Nature 2000 site area. During the years, the birds' diversity and the wintering effectives presented near constant values, while on the territory of Racaciuni Lake, we recorded the most obvious oscillations in the values recorded by specific diversity and wintering populations of waterfowls from one winter to other. From the five lakes that form the territory of ROSPA0063 Buhusi – Bacau – Beresti Dam Lakes, the Beresti Lake present the lower importance during the wintering time. Usual, this lake is completed frozen in late December or in very early January. Despite its position inside the city, Bacau Lake shelters a good diversity of wintering waterfowls, but the effectives are not very important due the small suitable feeding surface.

Between the wintering visitors in the area, there are present some species included in the Romanian Red Book of Vertebrates (Botnariuc & Tatole, eds, 2005). We notice the constant presence of one critical endangered species – *Haliaeetus albicilla*, two endangered species – *Ardea alba* and *Corvus corax*, but also of three vulnerable species – *Bucephala clangula* and *Mergellus albellus*.

For the wintering time, we must mention like very high the influence of human pressure on the birds' presence in the area through the hunting games – official, outside of the Nature 2000 area – especially in the vicinity of Racaciuni Lake. There, the caretaker gathered more than 2,800 cartridges tubes in one ecological cleaning event in middle March 2012. In fact, the birds fly away till the middle sector of open waters, just if the car is stopping on the western concreted bank of this lake, that make impossible the counting of birds by binoculars, without telescopes on the territory of Racaciuni Lake. The fish poaching activity disturbs the waterfowls feeding in the area and put the diving ducks (*Aythya sp*., *Bucephala sp*. etc.) in risk of death

by swimming to exhaustion and drowning, being caught in the abandoned immersed nets (we met this situation on the 13th November 2011 in the perimeter of Racaciuni Lake). Another human activity with impact on the wintering presence of birds in the area is the extraction of osiers, especially in the perimeter of Racaciuni and Galbeni Lakes.

Conclusions

We recorded 25 aquatic bird species that are wintering presence on the territory of ROSPA0063 Buhusi – Bacau – Beresti Dam Lakes.

During the mild winter, groups of 22,000 – 46,000 waterfowls are feeding and resting in the area, but also in the worst winter, we recorded at least 1,000 waterfowls on the unfrozen surfaces.

The northern lake of the site, Lilieci Lake is the most important for the wintering waterfowls in this territory.

We met like winter visitors on the territory of Nature 2000 site five bird species included in the Romanian Red Book of Vertebrates.

The hunting games, fish poaching and osiers' extraction represent the most important threatening risks for the wintering waterfowls in this area.

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