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The Species of birds from the protected area ROSPA0062 – the dam basins from the Argeş River – observed during the World Championship of Kaiac-Canoe Sprint Juniors and Youth U23 (Bascov Basin, 2017)

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SUMMARY. In this paper we present the results of the researches performed on the dam basins from ROSPA0062 - The dam basins from the Argeş River during the World Championship of Kaiac-Canoe Sprint Juniors and Youth U23, held on the Bascov Basin, part of this protected area. 55 species of birds were registered. Even if in 2017 the general situation was better than in 2013, when a similar study was carried on during a period when there were no sportsmen on any basin, the situation was completely different on Bascov Basin. There was a similar number of species, albeit only 35.71% of all were common in the two sets of observations, but, regarding their abundences, these were lower than in 2013 with over 90%, the most affected being the species dependent on wetlands. The human impact is obvious as the nautical base from Bascov Basin is a permanent factor of stress for the birds from the area. The very small number of species from the Annex I of the Birds Directive observed here stregthens the previously mentioned facts.

Keywords: anthropogenic pressure, birds, dam basin, protected area.

Introduction

The avifauna of the dam basins from the Argeş River was well studied along the time, although a lot of data in regard remained unpublished (Mătieş, unpublished data). The first work on the theme appeared at the end of the ’60 after the ending of the Vidraru Basin construction (Mătieş, 1969). It was followed by references in two papers (Munteanu and Mătieş, 1983, Munteanu *et al.*, 1989) that covered the birds from several wetlands from Romania and some particular information has been published later (Gava, 1997). The studies were intensified after 2004 (Gava *et al.*, 2004a,b, 2007,

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2011, Mestecăneanu *et al.*, 2004, 2010, 2013, Conete *et al.*, 2006, 2011, 2012, Conete, 2011, Mestecăneanu and Gava, 2015a,b, 2016a,b,c, 2017 etc.). The avifauna of the Bascov Basin was particularly studied, in the context of the big negative influence caused by the human impact (Conete *et al.*, 2005a,b, 2008, Mestecăneanu and Gava, 2014a,b).

We consider that the present study will prove the changes of the local ornithofauna in the future.

Materials and methods

The Vâlcele (640 ha), Budeasa (643 ha), Bascov (140 ha), Piteşti (150 ha) and Goleşti (680 ha) basins appertain to the ROSPA0062 – The dam basins from the Argeş River (in Romanian, „Lacurile de acumulare de pe Argeş"), together with the Zigoneni Basin, the last one upstream among them. They are part of the Natura 2000 Network, according to the Government Decision No. 1284/2007. Previously, these basins have been declared protected wetlands at local level (conform to the Decision No. 4/1974 of the Popular Council of the Argeş County).

The Bascov Basin (initially, 162 ha) is arranged for nautical sports since 1982 (cf. http://informatiioferte.blogspot.com/2014/06/complexul-sportiv-national-bascov.html, accessed June 12, 2018). It was registered by the Argeş Natural Monuments Commission and the officials of the Argeş County Museum as ornithological reservation and proposed to validation through the Decision No. 30/26.02.2004 of the Argeş County Council. As a result, the Government Decision No. 2151/2004 (No. service of Natural Monuments Commission, Cj 93/19.03.2003) declared it as avifaunistic protection area, comprising the water surface between the Bascov and Budeasa dams (cf. Management Plan of Natura 2000 Site, ROSPA0062 Lacurile de acumulare de pe Argeş, https://lege5.ro/).

The five basins, where the research was accomplished, have been put into operation between 1970 and 1983 and were chiefly created for production of electrical energy, attenuation of the floods, and supplying with water of the objectives from the area (cf. http://www.baraje.ro).

As the name of the whole protected area mentions, these dam reservoirs are situated on the Argeş River (Fig. 1), that drains a major part of the Southern versant of the Făgăraş Mountains and the corresponding lower relief. The Argeş and the Cândeşti Hills border their left side and the Cotmeana Piedmont, the right side. Piteşti is the point where the Romanian Plain begins, so the Goleşti Basin is situated into an area that has the full plain features.

The climate is temperate-continental with hilly influence, in the North, and kinds of plain, in the South. The annual average temperature of the air is 9-10 ^{0}C. The water is a few degrees warmer than the air, so its annual average temperature fluctuates between 6.4 ^{0}C, in the Argeş Gorges and 9 ^{0}C, at Piteşti. It is usual to see an ice bridge during the harsh winters between the first half of January and the last part of February (Barco and Nedelcu, 1974).

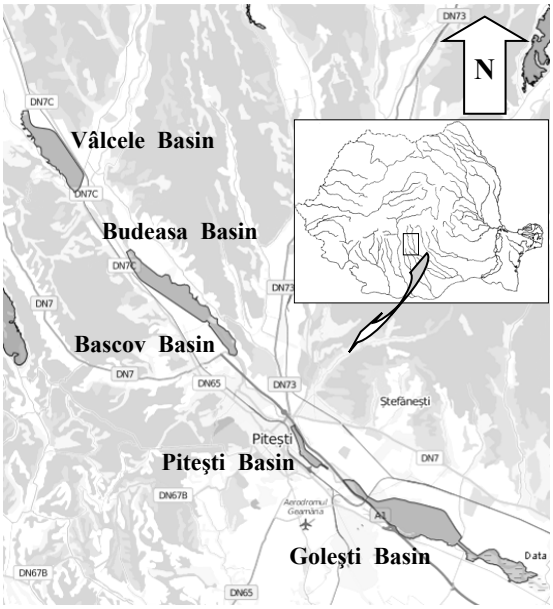

Figure 1. The map of the area (by http://biodiversitate.mmediu.ro, modified).

During both observations (2013 and 2017), the weather was sunny and warm. In 2017, there were quite big waves on the Goleşti, Bascov and Budeasa Basins, caused by the blowing wind, at gust, up to 3-4 on Beaufort scale, and, in 2013, the wind was 0, and no significant waves on the basins.

The vegetation of the basins corresponds to the diverse stages of the basins silting. It is typical for the wetlands of Romania and it grows mainly to the end of the lakes and on some parts of the banks, partially provided with bevels. There are small areas of reedbeds (*Phragmites* sp., *Typha* sp.). Other wetland plants from the genera *Myriophyllum*, *Sparganium*, *Mentha*, *Polygonum* emerge in the shallow waters. The banks are populated with species of *Carex*, *Juncus*, *Salix*, *Alnus*, *Populus* etc.

The observations were performed on July 29, 2017 during the World Championship of Kaiac-Canoe Sprint Juniors and Youth U23 from the Bascov Basin, and the obtained data was compared with the ones gathered on July 19, 2013, when the sportsmen were absent from the area. The same tracks of the itinerary method and point of observations were used during both of the days of research and the attention was focused on the aquatic species. The period of monitoring was 8:00 – 14:00. The birds were visually and auditory identified. Two binoculars (10x50) and a spotting scope (14-45x50) were used.

The avian scientific terms are the same availed in the Hamlin Guide (Bruun *et al.*, 1999).

Regarding the methods of the data processing, we used analytics ecological indicators (the density, the abundance, the constancy, the dominancy) and synthetics ecological indicators (the Dzuba index of ecological significance, the Bray–Curtis and Jaccard indices). They served for the identification of the species with the biggest weight in the ecosystem under the aspect of the energetical exchanges with the environment, of the characteristic or occasional species of the avicoenose, and of the ecological relations between the species. The Shanon–Wiener and Simpson indices (Stan, 1995, Gomoiu and Skolka, 2001) were also used, for the calculation of the diversity and the corresponding evenness and the standard procedure (Kelemen and Szombath, 1975, Gache, 2002) was applied to establish the index of relation, which shows the importance of the species or of the group of species in the respective coenose. The power function was used, too. It reflects the Theory of Island Biogeography (MacArthur and Wilson, 1967, in David, 2008) that supposes that the growth rate of the species increases as the surface increase. The correlations between parameters were explained by Zamfirescu and Zamfirescu (2006).

Results and discussion

On July 29, 2017, 55 species from 12 orders – Podicipediformes (with 2 species), Pelecaniformes (with 2 species), Ciconiiformes (with 4 species), Anseriformes (with 6 species), Falconiformes (with 1 species), Galliformes (with 1 species), Gruiformes (with 2 species), Charadriiformes (with 12 species), Columbiformes (with 2 species), Apodiformes (with 1 species), Coraciiformes (with 1 species) and Passeriformes (the richest, with 20 species) were observed on the basins of interest from the Argeş River. Among them, 30 species are dependent on wetlands and belong to 7 orders (Table 1).

Table 1.

The species of birds observed on the basins between Vâlcele and Goleşti, some ecological indexes and their protection by the Birds Directive.

No	Species	Vâlcele Basin	Budeasa Basin	Bascov Basin	Pitești Basin	Goleşti Basin	Abundance	Class of constancy	Class of dominancy	Class of Dzuba index of ecological significance	Class of dominancy*	Class of Dzuba index of ecological significance*	Birds Directive (2009/147/EC)
1	*Podiceps cristatus* (Linnaeus, 1758)*	+	+	+		+	153	C4	D3	W3	D3	W3	
2	*Podiceps nigricollis* Brehm, 1831*					+	2	C1	D1	W1	D1	W1	
3	*Phalacrocorax carbo* (Linnaeus, 1758)*	+	+		+	+	175	C4	D3	W3	D4	W3	

No	Species	Vâlcele Basin	Budeasa Basin	Bascov Basin	Pitești Basin	Goleşti Basin	Abundance	Class of constancy	Class of dominancy	Class of Dzuba index of ecological significance	Class of dominancy*	Class of Dzuba index of ecological significance*	Birds Directive (2009/147/EC)
4	*Phalacrocorax pygmeus* (Pallas, 1773)*		+		+	+	31	C3	D1	W2	D1	W2	AI
5	*Egretta garzetta* (Linnaeus, 1766)*	+	+		+	+	33	C4	D1	W2	D1	W2	AI
6	*Ardeola ralloides* (Scopoli, 1769)*				+		1	C1	D1	W1	D1	W1	AI
7	*Ardea cinerea* Linnaeus, 1758*	+	+		+		17	C3	D1	W2	D1	W2	
8	*Nycticorax nycticorax* (Linnaeus, 1758)*				+	+	12	C2	D1	W2	D1	W2	AI
9	*Cygnus olor* (Gmelin, 1789)*		+				1	C1	D1	W1	D1	W1	
10	*Anas platyrhynchos* Linnaeus, 1758*	+	+	+	+	+	208	C4	D4	W4	D4	W4	
11	*Anas querquedula* Linnaeus, 1758*	+					3	C1	D1	W1	D1	W1	
12	*Anas crecca* Linnaeus, 1758*				+		14	C1	D1	W1	D1	W1	
13	*Tadorna tadorna* (Linnaeus, 1758)*				+		6	C1	D1	W1	D1	W1	
14	*Aythya ferina* (Linnaeus, 1758)*					+	206	C1	D4	W3	D4	W3	
15	*Buteo buteo* (Linnaeus, 1758)	+					1	C1	D1	W1			
16	*Coturnix coturnix* (Linnaeus, 1758)					+	1	C1	D1	W1			
17	*Gallinula chloropus* (Linnaeus, 1758)*				+		1	C1	D1	W1	D1	W1	
18	*Fulica atra* Linnaeus, 1758*		+	+	+	+	672	C4	D5	W5	D5	W5	
19	*Vanellus vanellus* (Linnaeus, 1758)*				+		28	C1	D1	W2	D1	W2	
20	*Actitis hypoleucos* (Linnaeus, 1758)*					+	5	C1	D1	W1	D1	W1	
21	*Tringa ochropus* Linnaeus, 1758*				+	+	3	C2	D1	W1	D1	W1	
22	*Tringa glareola* Linnaeus, 1758*				+		2	C1	D1	W1	D1	W1	AI
23	*Tringa nebularia* (Gunnerus, 1767)*				+		1	C1	D1	W1	D1	W1	
24	*Himantopus himantopus* (Linnaeus, 1758)*				+		17	C1	D1	W1	D1	W2	AI
25	*Larus michahellis* Naumann, 1840*	+	+		+	+	205	C4	D4	W3	D4	W3	
26	*Larus ridibundus* Linnaeus, 1766*	+	+	+	+	+	1,521	C4	D5	W5	D5	W5	
27	*Larus minutus* Pallas, 1776*	+					1	C1	D1	W1	D1	W1	AI
28	*Chlidonias niger* (Linnaeus, 1758)*					+	1	C1	D1	W1	D1	W1	AI
29	*Chlidonias hybridus* (Pallas, 1811)*			+	+		3	C2	D1	W1	D1	W1	AI
30	*Sterna hirundo* Linnaeus, 1758*		+	+		+	6	C3	D1	W2	D1	W2	AI

No	Species	Vâlcele Basin	Budeasa Basin	Bascov Basin	Pitești Basin	Goleşti Basin	Abundance	Class of constancy	Class of dominancy	Class of Dzuba index of ecological significance	Class of dominancy*	Class of Dzuba index of ecological significance*	Birds Directive (2009/147/EC)
31	*Columba palumbus* Linnaeus, 1758	+					2	C1	D1	W1			
32	*Streptopelia turtur* (Linnaeus, 1758)	+					2	C1	D1	W1			
33	*Apus apus* (Linnaeus, 1758)					+	8	C1	D1	W1			
34	*Alcedo atthis* (Linnaeus, 1758)*					+	1	C1	D1	W1	D1	W1	AI
35	*Upupa epops* Linnaeus, 1758					+	2	C1	D1	W1			
36	*Riparia riparia* (Linnaeus, 1758)		+			+	10	C2	D1	W2			
37	*Hirundo rustica* Linnaeus, 1758	+	+	+		+	28	C4	D1	W2			
38	*Delichon urbica* (Linnaeus, 1758)	+	+	+		+	8	C4	D1	W2			
39	*Motacilla flava* Linnaeus, 1758	+	+			+	5	C3	D1	W1			
40	*Motacilla alba* Linnaeus, 1758	+	+	+		+	7	C4	D1	W2			
41	*Lanius collurio* Linnaeus, 1758	+				+	3	C2	D1	W1			AI
42	*Pica pica* (Linnaeus, 1758)	+			+	+	7	C3	D1	W2			
43	*Corvus monedula* Linnaeus, 1758					+	40	C1	D2	W2			
44	*Corvus frugilegus* Linnaeus, 1758					+	20	C1	D1	W2			
45	*Acrocephalus palustris* Bechstein, 1798*				+	+	2	C2	D1	W1	D1	W1	
46	*Sylvia curruca* (Linnaeus, 1758)	+					1	C1	D1	W1			
47	*Phylloscopus collybita* Vieillot, 1817	+				+	3	C2	D1	W1			
48	*Parus caeruleus* Linnaeus, 1758	+			+		7	C2	D1	W1			
49	*Parus major* Linnaeus, 1758		+		+		2	C2	D1	W1			
50	*Aegithalos caudatus* (Linnaeus, 1758)				+		6	C1	D1	W1			
51	*Passer domesticus* (Linnaeus, 1758)	+				+	10	C2	D1	W2			
52	*Passer montanus* (Linnaeus, 1758)	+		+		+	40	C3	D2	W2			
53	*Fringilla coelebs* Linnaeus, 1758				+	+	4	C2	D1	W1			
54	*Carduelis chloris* (Linnaeus, 1758)					+	2	C1	D1	W1			
55	*Carduelis carduelis* (Linnaeus, 1758)				+		1	C1	D1	W1			

Legend: * - species dependent on wetlands; + - presence; C1 – occasional species, C2 – accessory species, C3 – constant species, C4 – euconstant species; D1, W1 – subrecedent species, D2, W2 – recedent species, D3, W3 – subdominant species, D4, W4 – dominant species, D5, W5 – eudominant species; AI – Annex I.

The species richness observed in 2017 on the basins was bigger than in 2013 (55 versus 48 species) and, also, the number of individuals (3,551, versus 2,859); the months when the observations were made, both in 2013 and 2017 were warmer and drier than normal (http://www.ier.ro/webfm_send/5189, http://www.stirimeteo.com/, http://www.asas.ro/wcmqs/). The situation was similar in the case of the species dependent on wetlands. Their number was bigger in 2017 (30) than in 2013 (27) and, also, their strength (3,331 and 2,594 individuals respectively). Some factors like the time of starting of the migration, that varies each year depending on the weather conditions, the increasing silting of the basins, which in the first phase leads to an enhancement of the species diversity, or the direct human derange, which can be considered less evident in 2017, than in 2013, except the Bascov Basin, may be involved here. So, in 2017, additional to the athletic competition from the Bascov Basin, there were 11 fishermen (with a car) on Goleşti Basin, 9 fishermen and a boat on Piteşti Basin, and 1 kiteboarding man on Budeasa Basin. In 2013, there were 25 fishermen on Goleşti Basin, 6 fishermen on Piteşti Basin, 3 fishermen on Bascov Basin, 20 fishermen on Budeasa Basin and 6 fishermen on Vâlcele Basin.

The most of the species were registered on the Piteşti, respectively Goleşti Basin (Fig. 2). Also, the Piteşti Basin had the most of the individuals (including the ones of the dependent on wetlands species), while the Bascov Basin was the last in all situations. By comparison, in 2013, the Bascov Basin was the last regarding the number of species, including the dependent on wetlands ones. Regarding the number of individuals, at that time it was overpassed by the one of the Vâlcele Basin that, despite its larger size, had the lowest values. The Vâlcele Basin is placed upstream and its vegetation is very poor and situated toward its end. It must also be mentioned that the overall antropogenic pressure, in 2013, was the lowest on the Goleşti and Piteşti Basins, and the highest on the Budeasa Basin (Mestecăneanu and Gava, 2016c).

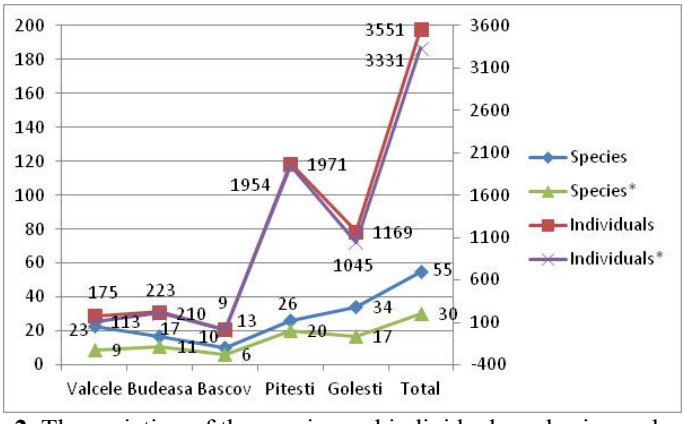

Figure 2. The variation of the species and individuals on basins and per total (* - values for the species dependent on wetlands).

As a result, the density of species and density of individuals were the biggest on the Piteşti Basin. The lowest density of species was registered on Budeasa, respectively Vâlcele Basins and the lowest densities of individuals (both for all species and for the species dependent on wetlands) were registered on the Bascov Basin, where the density of species is comparable to the one from 2013; here, the density of individuals is bigger in 2013 when the athletes were absent, that in 2017 when they were present (Table 2).

The correlation between the surface of the basins and the number of all species was 0.44 (positive and moderate correlation), the correlation between the surface of the basins and the number of species dependent of wetlands was 0.04 (positive and very weak correlation), the correlation between the surface of the basins and the number of individuals was –0.26, and the correlation between the surface of the basins and the number of individuals of species dependent of wetlands was –0.31 (negative and weak correlations). These mean that to some extent the number of species grew as the surface of the basins increased and the number of individuals decreased as the surface of the basins increased. That shows that, at the moment of research, there were other factors more important than the area of the basins that influenced the dynamics of the birds on the basins.

Table 2.

The density of the species and individuals on every basin and per total.

Basin	**Vâlcele (2017)**	**Budeasa (2017)**	**Bascov (2017)**	**Bascov (2013)**	**Piteşti (2017)**	**Goleşti (2017)**	**Total (2017)**
No. species/ha	0.04	0.03	0.07	0.06	0.17	0.05	0.02
No individuals/ha	0.27	0.35	0.09	0.99	13.14	1.72	1.58
No. species/ha*	0.01	0.02	0.04	0.03	0.13	0.03	0.01
No individuals/ha*	0.18	0.33	0.06	0.88	13.03	1.54	1.48

Legend: * - values for the species dependent on wetlands.

Applying the power regression on the relation between the surface of the every dam reservoir and their species richness or their total number of individuals, we detect a positive and quite small (in the case of species) and a moderate (in the case of individuals) slope, but, also, we notice a low (23.47%) or a very low (6.78 %) correlation between the variables (Fig. 3, Fig. 4). The slopes are quite similar in the case of the species and individuals dependent on wetlands, but the correlation between the variable is even lower (3.71%, respectively 5.83%). These suggest that the species rate of accumulation grows slowly as the reservoirs surface increases and the individuals' rate of accumulation grows moderately as the reservoirs surface increases. Consequently, the basins can sustain more species and more

individuals than those that were observed. Because the predictions of the Theory of Island Biogeography can be applied only to the groups of the creatures whose existence is strictly conditioned by a particular type of habitat (Usher, 1987), in this case it should best be applied to the breeding species dependent of wetlands, although at the end of July it is impossible to tell them apart without any doubts.

From the point of view of the similarities between the avifauna of the basins, in 2017, we stated that the smallest similarity was between the Bascov and Piteşti avicoenosis, even if the basins have an almost identical area. It must be noted, however, that the real aquatic surface of the Bascov Basin is lower than the initial one because of the islands formed inside. On the other hand, the actual area of the Piteşti Basin decreased because of silting, too. Also, even if the Piteşti Basin is situated near the Piteşti town, the overall anthropogenetical pressure is lower here than on the Bascov Basin, as it has been observed in 2013 (Mestecăneanu and Gava, 2014b). The similarity was the biggest between Budeasa and Vâlcele, two big and consecutive reservoirs (each ca. 640 ha area and 6 km distance among them), except the Jaccard index for all species, when the biggest one was established between Bascov and Budeasa; the two lakes are united, but very different in terms of as area. Otherwise, the similarity between the Bascov Basin and the other basins was small or medium (Tables 3, 4). It must highlighted that the Bray–Curtis index is based on the presence/absence of the species in the samples and on their number of individuals and the Jaccard index is based only on the presence/absence of the respective species in the samples (Gomoiu and Skolka, 2001).

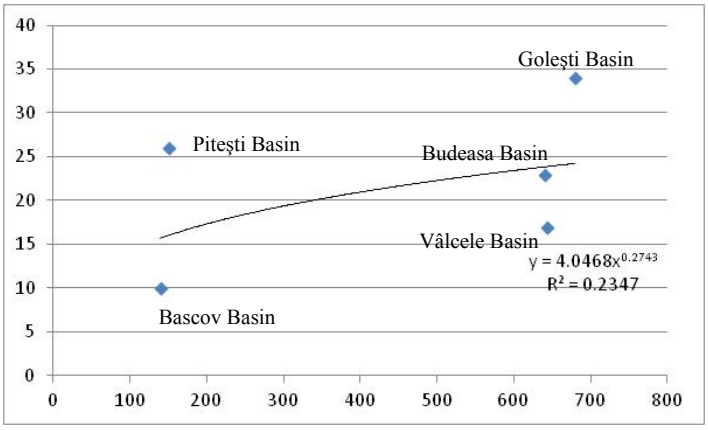

Figure 3. The relation between the surface of the basins and their species richness.

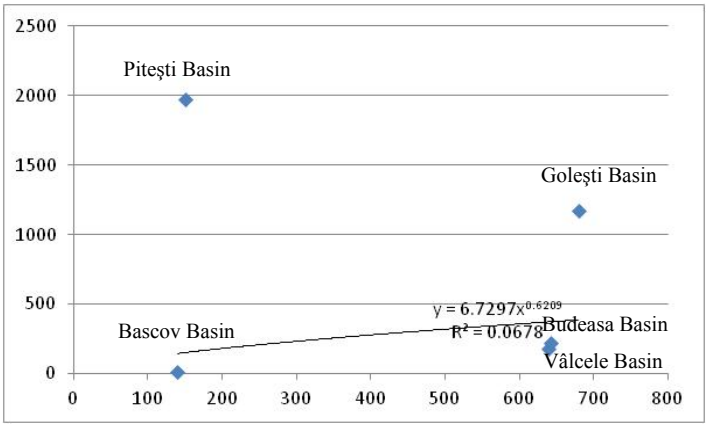

Figure 4. The relation between the surface of the basins and the strengths of all species.

Table 3.

The similarity matrix (by Bray–Curtis) between the avicoenosis (cenosis of species dependent on wetlands) of the dam reservoirs.

Similarity	Vâlcele	Budeasa	Bascov	Piteşti	Goleşti
Vâlcele	-	45.7 (52.6)	9.5 (8.1)	2.8 (2.7)	19.3 (17.7)
Budeasa	-	-	9.3 (7.3)	9.6 (9.7)	24.1 (25.1)
Bascov	-	-	-	0.5 (0.5)	1.8 (1.3)
Piteşti	-	-	-	-	24.3 (25.2)
Goleşti	-	-	-	-	-

Table 4.

The similarity matrix (by Jaccard) between the avicoenosis (cenosis of species dependent on wetlands) of the dam reservoirs.

Similarity	Vâlcele	Budeasa	Bascov	Piteşti	Goleşti
Vâlcele	-	37.9 (53.8)	26.9 (25.0)	19.5 (26.0)	35.7 (30.0)
Budeasa	-	-	42.1 (41.6)	26.7 (34.7)	37.8 (47.3)
Bascov	-	-	-	12.5 (18.1)	25.7 (27.7)
Piteşti	-	-	-	-	25.0 (37.0)
Goleşti	-	-	-	-	-

Comparing the similarities between the samples on every basin from July 19, 2013 and July 29, 2017, by Bray-Curtis, it results that the lowest similarity was undoubtedly for the Bascov Basin, regardless if all species or only the species dependent on wetlands were taken into account. By Jaccard, the similarities for the Bascov Basin were in the range of the other similarities of the basins, which varied between 33.33% and 53.84%. That means a relatively big heterogeneity of the species between the years of observations, generally with big differences of strengths

and with less than 50% regular species between samples. It is the consequence of the period of passage for many species, mainly of shores and waders, and probable it should be attenuated through more sessions of monthly observations. The effect of the athletes on the number of individuals was observable in this case, too (Table 5).

In 2017, the Shanon–Wiener ecological diversity was between 1.09 (1.03, in the case of the species of wetland) for Piteşti and 2.25 for Vâlcele and Bascov (1.81, in the case of the species of wetland for Goleşti) and the Simpson ecological diversity was between 1.85 (1.82, in the case of the species of wetland) for Piteşti and 26.00 (12.00, in the case of the species of wetland) for Bascov. From the evenness point of view, the smallest evennesses were on the Piteşti dam basin: 0.33 (0.34), for the Shanon–Wiener index, and 0.07 (0.09) for the Simpson index. The biggest ones were on the Bascov dam basin: 0.98 (0.97) for the Shanon–Wiener index and 0.65 (0.75) for the Simpson index (Table 6). The natural and the artificial conditions from each basin are reflected here. The values of diversity from the Bascov Basin catch the attention, but these are not the result of a big number of species represented by a big number of individuals, but inversely, these express a relatively low number of species, each with few individuals, as the evenness shows. The low values from Piteşti prove that here there was a small number of species that summed the majority of the individuals. It must be said that the Shannon–Wiener index takes into account both the number of species and the number of individuals of each species and the Simpson index takes into account the number of individuals of the species in relationship with the number of individuals of all observed species.

Table 5.

The similarities between the avicoenosis on every dam reservoirs and per total.

Similarity	Bray Curtis	Jaccard
Bascov 2013 – Bascov 2017	9.21	35.71
Bascov 2013* – Bascov 2017*	7.51	37.5
Budeasa 2013 – Budeasa 2017	38.68	41.66
Budeasa 2013* – Budeasa 2017*	39.78	53.84
Golesti 2013 – Golesti 2017	40.42	39.53
Golesti 2013* – Golesti 2017*	39.58	45.83
Pitesti 2013 – Pitesti 2017	39.52	34.88
Pitesti 2013* – Pitesti 2017*	40.35	40.74
Valcele 2013 – Valcele 2017	45.27	35.71
Valcele 2013* – Valcele 2017*	50.26	33.33
Total 2013 – Total 2017	51.74	53.73
Total 2013* – Total 2017*	51.60	51.35

Legend: * - values for the species dependent on wetlands.

According to the constancy we remark that the occasional species were the most numerous (28 species, 50.91%, respectively 16 species dependent on wetlands, 53.33%), while the constant species were the less numerous (6 species, 10.91%, respectively 3 species dependent on wetlands, 10%). About the dominance, the most

numerous were the subrecedent species (46 species, 83.64%, respectively 23 species dependent on wetlands, 76.67%), the other groups being poorly represented. In the case of Dzuba ecological index of ecological significance, also the subrecedent species were the most (33 species, 60.00%, respectively 16 species dependent on wetlands, 53%). The dominant species were the least represented (1 species, 1.82 %, respectively 1 species dependent on wetlands, 3.33%), (Table 1, Figs. 5, 6, 7).

Table 6.

The ecological diversity and the evenness of the avifauna from the dam basins.

Basin	Shanon Wiener index	Hsmax	Shanon Wiener eveness	Simpson index (1/λ)	S	Simpson eveness
Vâlcele	2.25	3.14	0.72	6.33	26.32	0.24
Vâlcele*	1.51	2.20	0.69	3.45	9.69	0.36
Budeasa	1.98	2.83	0.70	5.07	18.32	0.28
Budeasa*	1.78	2.40	0.74	4.52	11.55	0.39
Bascov	2.25	2.30	0.98	26.00	40	0.65
Bascov*	1.74	1.79	0.97	12.00	16	0.75
Piteşti	1.09	3.26	0.33	1.85	26.33	0.07
Piteşti*	1.03	3.00	0.34	1.82	20.19	0.09
Goleşti	2.19	3.53	0.62	5.16	34.98	0.15
Goleşti*	1.81	2.83	0.64	4.16	17.26	0.24
Overall	2.09	4.01	0.52	4.27	55.84	0.08
Overall*	1.80	3.40	0.53	3.76	30.26	0.12

Legend: * - values for the species dependent on wetlands.

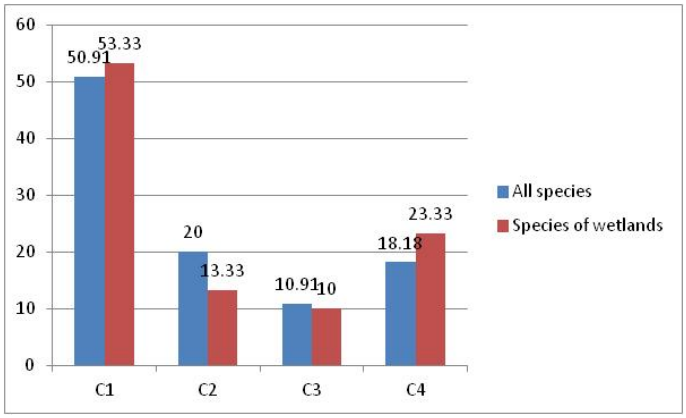

Figure 5. The distribution of the species by categories of constancy
(C1 – occasional species, C2 – accessory species, C3 – constant species, C4 – euconstant species).

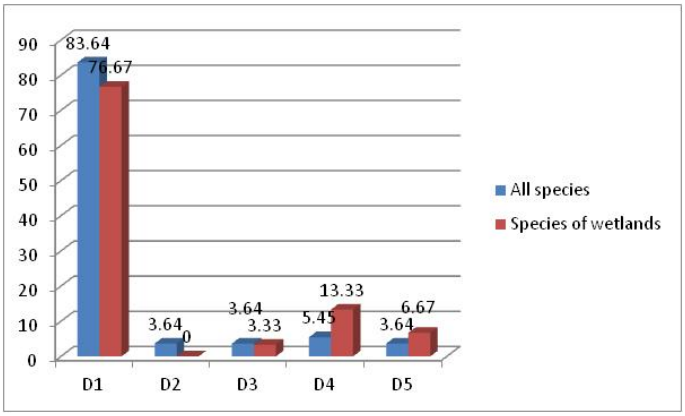

Figure 6. The distribution of the species by categories of dominance (D1 – subrecedent species, D2 – recedent species, D3 – subdominant species, D4 – dominant species, D5 – eudominant species).

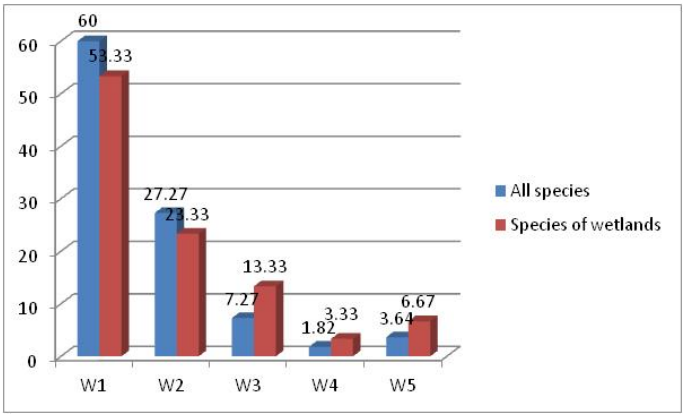

Figure 7. The distribution of the species by categories of Dzuba index of ecological significance (W1 – subrecedent species, W2 – recedent species, W3 – subdominant species, W4 – dominant species, W5 – eudominant species).

The only eudominant species were *Larus ridibundus* and *Fulica atra* (3.64% of all species, respectively 6.67% of the species dependent on wetlands). The Piteşti Basin was preferred by *Larus ridibundus*, while the Goleşti Basin was preferred by *Fulica atra* (Fig. 8). The depth of the water, the food and the lower degree of anthropogenic pressure contributed to this.

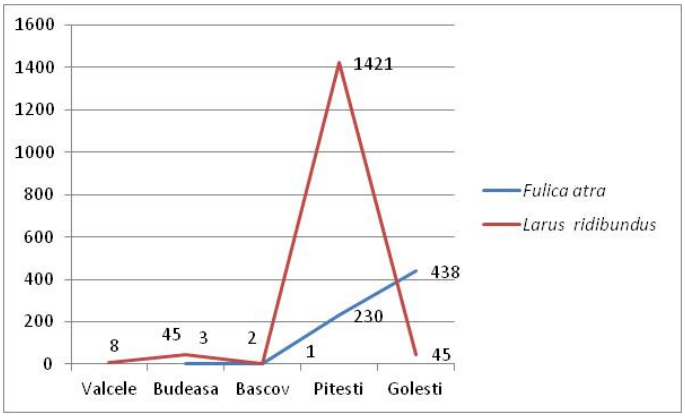

Figure 8. The variation of strengths of the eudominant species on every dam reservoir.

As a result of the facts previously shown, by the index of relation between the orders, Charadriiformes (with 1,993 individuals) and Gruiformes (with 673 individuals) were the overdominant orders, Anseriformes (with 438 individuals) was the dominant order and the other orders were complementary (Fig. 9). At the level of the species dependent on wetlands, Charadriiformes remained the only overdominant order. Gruiformes and Anseriformes were the dominant orders, the others being complementary (Fig. 10).

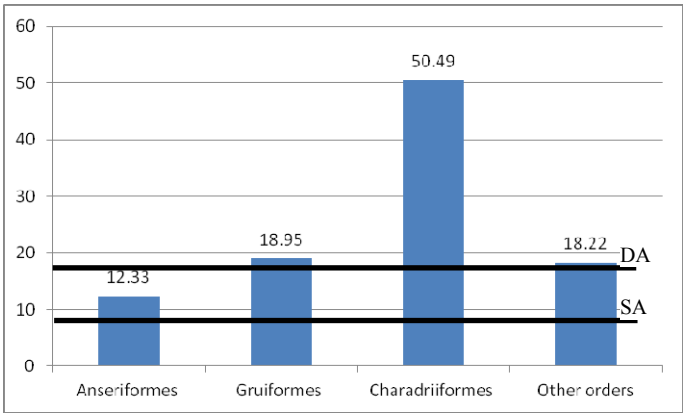

Figure 9. The participation of the orders to the formation of the avicoenose (SA – the static axis, DA – the dominance axis).

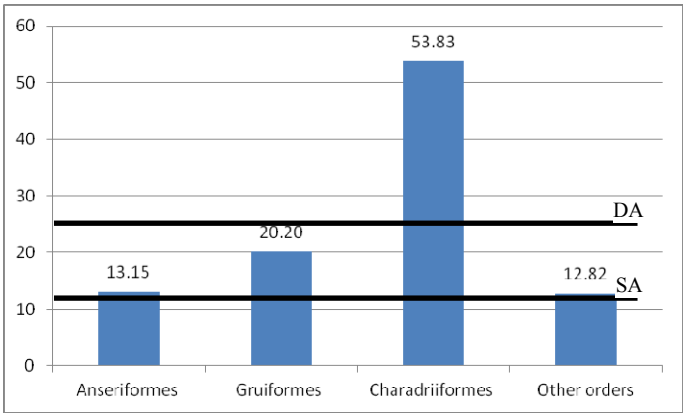

Figure 10. The participation of the orders to the formation of the coenose of species dependent on wetlands (SA – the static axis, DA – the dominance axis).

Inside the Charadriiformes, *Larus ridibundus* was the overdominant species, with 84.83% of the individuals *Larus michahellis* was the dominant species, with 11.43% of the individuals, the others (3.74% of the individuals) being complementary. Inside the Gruiformes order, formed only by two species, *Fulica atra* was the dominant species, with 99.85% of individuals, and *Gallinula chloropus* was the complementary species, with 0.15%.

Some species were observed in 2017 with chicks or independent juveniles: *Podiceps nigricollis* (with 2 well developed juveniles on the Goleşti Basin), *Fulica atra* (with 3 medium juveniles on the Piteşti Basin), *Larus michahellis* (with many pairs that breed in the city of Piteşti), *Larus ridibundus*, *Tringa glareola*, *Phalacrocorax pygmaeus*, *Phalacrocorax carbo*, *Egretta garzetta*, *Ardea cinerea*, *Vanellus vanellus*, etc. but a few did not breed in the area. It is generally known that the artificial basins are places less attractive for the birds in the breeding season than the natural ones (Munteanu and Mătieş, 1983).

12 species (21.81% of all, (*Phalacrocorax pygmeus*, *Egretta garzetta*, *Ardeola ralloides*, *Nycticorax nycticorax*, *Tringa glareola*, *Himantopus himantopus*, *Larus minutus*, *Chlidonias niger*, *Chlidonias hybridus*, *Sterna hirundo*, *Alcedo atthis* and *Lanius collurio*) are in the AI of the Birds Directive (2009/147/EC) and 2 of them (16.66%, *Chlidonias hybridus* and *Sterna hirundo*) were observed on the Bascov Basin. Measures for the habitat protection intended to make sure their survival and reproduction in their area of distribution must be taken (http://ec.europa.eu/environment/nature/legislation/birdsdirective/index_en.htm). *Tringa glareola* and *Larus minutus* were surely in passage; the specimens of the others seen either in migration or had a certain status of breeding in the area, being observed in the characteristic habitat.

Other aspects of the avicoenose from the Bascov Basin

As we have seen, the birds' fauna of the Bascov Basin was very poor, so that a total of only 14 species were recorded here during both dates of research (Table 7). 9 species were recorded in the sample from 2013 (when the athletes were absent), and, 10, in the one from 2017 (when they were present). Instead, the number of individuals was clearly bigger in 2013 (139, versus 13), when *Fulica atra* numbered almost 100 individuals and *Larus ridibundus* almost 20 (Mestecăneanu and Gava, 2014a). In 2017, these counted only 1, respectively 2 individuals and this was obviously a consequence of the athletes' competition that determined the birds to hide or to move somewhere else. In 2017, the number of individuals was smaller than in 2013 (by 90.64%) and, also, the number of individuals of the species dependent on wetlands (by 92.74%); similarly, the strength of *Fulica atra* was smaller (by 98.95%) in 2017 than in 2013 and, also, the strength of *Larus ridibundus* (by 89.47%).

Table 7.

The avicoenose of the Bascov Basin.

No.	Species	19.07.2013 (without athletes)	29.07.2017 (with athletes)
1.	*Podiceps cristatus**	0	2
2.	*Egretta garzetta**	1	0
3.	*Ciconia ciconia**	1	0
4.	*Anas platyrhynchos**	0	1
5.	*Fulica atra**	96	1
6.	*Larus ridibundus**	19	2
7.	*Chlidonias hybridus**	0	1
8.	*Sterna hirundo**	7	2
9.	*Hirundo rustica*	0	1
10.	*Delichon urbica*	4	1
11.	*Motacilla alba*	2	1
12.	*Pica pica*	3	0
13.	*Passer domesticus*	6	0
14.	*Passer montanus*	0	1
	Number of species	9	10
	Number of individuals	139	13
	Number of species*	5	6
	Number of individuals*	124	9

Legend: * - species dependent on wetlands.

As resulted from the Jaccard similarity, too, 5 species (35.71% of all, *Fulica atra*, *Larus ridibundus*, *Sterna hirundo*, *Delichon urbica*, and *Motacilla alba*) were common in the two days of observations. In the absence of the athletes, 4 additional species (28.57% of all, *Egretta garzetta*, *Ciconia ciconia*, *Pica pica* and *Passer domesticus*) were seen and when the athletes were present, 5 species (35.71% of

all, *Podiceps cristatus, Anas platyrhynchos*, *Chlidonias hybridus*, *Hirundo rustica* and *Passer montanus*). 8 species (57.14 of all) were dependent on wetlands and only 3 of them (37.5%) were observed both in 2013 and 2017; 5 species (62.5%) have been registered only in 2013 and 6 (75%) only in 2017. The few individuals of the latter seemed to be less sensitive to the stress provoked by people, but, because the rest of the basin was occupied by the boats, they were located toward the dam, and, here, it is noticeable the presence of a pair of *Podiceps cristatus* in nest. This was the only confirmed breeding species in the area, fact that vouches the idea that the presence of the athletes on the water obstructs mainly the formation of a rich aquatic breeding avifauna, a topic that was discussed on other occasions, too (Mestecăneanu and Gava, 2014a,b, 2016c etc.).

Conclusions

The avifauna of the basins between Vâlcele and Goleşti from ROSPA0062 – The dam basins from the Argeş River, observed in the breeding season (or passage season for some species) was relatively poor: 55 species (30 dependent on wetlands), from 12 orders. It reflects both the natural and anthropogenic conditions from the date of study, seasonal or permanent. Even if on the Bascov Basin a sportsmen competition was in progress, the general qualitative and quantitative situation of the birds from all basins was better in 2017 than in 2013, when a similar study was effected in the same month, when the athletes were not present in the area.

The majority of the species was formed of occasional or subrecedent species. *Anas platyrhynchos* and *Larus ridibundus* were the only species observed on all basins, and *Larus ridibundus* and *Fulica atra* had the most individuals. Therefore, they determined the hierarchy of the orders, where the Charadriiformes and the Gruiformes were the most important.

Because of the strongly anthropogenic characters of the dam basins, a few species with chicks were observed.

Among the 55 observed species, only 12 species belong to the Annex I of the Birds Directive, some of them being in passage.

Like on other occasions, independently of the fact that a human derange occurred or not at the time of the observations, the avifauna of the Bascov Basin proved to be the most modest of all. The number of species or their strengths, the density of species and individuals, the similarity between the basins, the index of diversity and the evenness sustain this assertion. This is an effect of the anthropogenic pressure, mainly because of the frequent trainings and competitions of the athletes on water and, also, the presence of the permanent stands and installations that mark the corridors of navigation. All of these intensively influence the breeding, too, only a few pairs of aquatic species having success in raising chicks year by year.

Comparing the two sets of observations, the one from 2013 and the one from 2017, obtained in relatively similar climatic conditions, it results that the avifauna of the Bascov Basin was negatively influenced by the presence of the sportsmen and the spectators at the time of contest, less in terms of make up of the species, but especially in terms of strengths. Especially the birds dependent on wetlands were affected and they had to hide or to leave the area in search for less disturbed spaces. It is unlikely that part of the individuals flew to Piteşti Basin, situated at over 4 km distance, where the strengths were the biggest of all basins, and probably some of them went to the nearby Budeasa Basin.

The dam basins where the research was performed can sustain a richer avifauna than that recorded, particularly the Bascov Basin. In the circumstances in which this basin belongs to an important birds area, included in Natura 2000 Network, it is advisable, from the birds' protected point of view, to move the nautical base (although it is one of national importance) on another basin less relevant for the avifauna, outside of the conservation area.

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