THE AVIFAUNA FROM VÂLCELE, BUDEASA, BASCOV, PITEŞTI, AND GOLEŞTI DAM RESERVOIRS OBSERVED IN THE HIEMAL SEASON (2013 AND 2014)

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Abstract. In this paper there are rendered the results of the researches performed in the hiemal season (2013 and 2014) on the avifauna from Vâlcele, Budeasa, Bascov, Piteşti, and Goleşti dam reservoirs from the Argeş River, included in ROSPA0062 „Lacurile de acumulare de pe Argeş". The 64 observed species belong to 14 orders, Passeriformes being the richest (with 31 species). The number of species and individuals depends on the local and regional weather conditions and the distribution on dam reservoirs depends on the conditions of habitat and the anthropogenic factors. The Jaccard index illustrates that the biggest similarity was between avicoenoses from Piteşti and Budeasa Dam Reservoirs and the Bray-Curtis index that the biggest similarity was between the avicoenoses from Vâlcele and Budeasa Dam Reservoirs. By dominancy and Dzuba ecological significance index, 3 species (4.69% of all) were eudominant species: *Anas platyrhynchos*, *Aythya farina*, and *Larus ridibundus*. The most individuals of *Anas platyrhynchos* and *Aythya ferina* were counted on Goleşti Dam Reservoir and *Larus ridibundus* was the most abundant on Piteşti Dam Reservoir. Anseriformes was the only overdominant order and, inside it, *Anas platyrhynchos* and *Aythya ferina* were the overdominant species. Regarding the protection, 7 species: *Gavia arctica*, *Phalacrocorax pygmeus*, *Egretta alba*, *Cygnus cygnus*, *Mergus albellus*, *Alcedo atthis*, and *Picus canus*, 10.93%, are in Annex I of the Birds Directive (2009/147/CE). Other considerations about the ecology and the protection of the birds are made in the paper.

Keywords: ROSPA0062, birds, hiemal season, protection.

Rezumat. Avifauna lacurilor de acumulare Vâlcele, Budeasa, Bascov, Piteşti şi Goleşti observată în sezonul hiemal (2013 şi 2014). În această lucrare sunt prezentate rezultatele cercetărilor efectuate în sezonul hiemal (2013 şi 2014) asupra avifaunei lacurilor de acumulare Vâlcele, Budeasa, Bascov, Piteşti şi Goleşti de pe râul Argeş, cuprinse în ROSPA0062 „Lacurile de acumulare de pe Argeş". Cele 64 de specii observate aparţin la 14 ordine, Passeriformes fiind cel mai bogat (cu 31 de specii). Numărul de specii şi exemplare depinde de condiţiile de vreme locale şi regionale, iar distribuţia pe lacurile de acumulare depinde de condiţiile de habitat şi de factorii antropici. Indicele Jaccard arată că cea mai mare similaritate a fost între avicenozele lacurilor Piteşti şi Budeasa, iar indicele Bray-Curtis, arată că cea mai mare similaritate a fost între avicenozele lacurilor Vâlcele şi Budeasa. După dominanţă şi indicele de semnificaţie ecologică Dzuba, 3 specii (4,69% din total) au fost eudominante: *Anas platyrhynchos*, *Aythya ferina* şi *Larus ridibundus*. Majoritatea exemplarelor de *Anas platyrhynchos* şi *Aythya ferina* au fost numărate pe lacul Goleşti, iar *Larus ridibundus* a fost cel mai abundent pe lacul Piteşti. Anseriformes a fost singurul ordin supradominant, iar în interiorul său, *Anas platyrhynchos* şi *Aythya ferina* au fost speciile supradominante. În ceea ce priveşte protecţia, 7 specii sunt în Anexa I a Directivei Păsări (2009/147/CE): *Gavia arctica*, *Phalacrocorax pygmeus*, *Egretta alba*, *Cygnus cygnus*, *Mergus albellus*, *Alcedo atthis* şi *Picus canus*, 10.93%. Alte consideraţii despre ecologia şi protecţia păsărilor sunt făcute în lucrare.

Cuvinte cheie: ROSPA0062, păsări, sezonul hiemal, protecţie.

INTRODUCTION

The avifauna of the dam reservoirs from the upper and middle course of the Argeş River has been the subject of many researches since the end of reservoirs construction (MĂTIEŞ, 1969; MUNTEANU & MĂTIEŞ, 1983). In the last two decades, the study became more intense (CONETE et al., 2008; CONETE et al., 2011; GAVA, 1997; GAVA et al., 2004a; GAVA et al., 2004b; GAVA et al., 2007; GAVA et al., 2011; MESTECĂNEANU et al., 2004; MESTECĂNEANU et al., 2010; MESTECĂNEANU et al., 2013) and a part of the results was valued in a PhD thesis (CONETE, 2011). The present paper shows some outcome of the last researches in the area. They continue the work that was started here by Mircea Măties and show an image of the present day condition of birds.

MATERIAL AND METHOD

The study was conducted on the dam reservoirs (from upstream to downstream): Vâlcele (408 ha), Budeasa (412 ha), Bascov (162 ha), Piteşti (122 ha), and Goleşti (649 ha). They are part of the series of reservoirs that was built on the upper and middle course of the Argeş River starting with 1965 (Fig. 1). Currently, these dam reservoirs are included in the protected area ROSPA0062 „Lacurile de acumulare de pe Argeş" and they are component of the Nature 2000 network. The area is situated in the south of the Southern Carpathians between Cotmeana Platform, in the West, Argeş Platform, in the North, Cândeşti Platform, in the East, and Piteşti High Plain (part of the Romanian Plain), in the South.

The vegetation of the dam reservoirs is influenced by the process of silting. It occupies surfaces that vary from dam reservoir to dam reservoir and, generally, it is disposed in the upstream and in the median sections of each reservoir, along its banks. It is typical of wetland areas, primarily with reed bed, bulrush, alder, and willow. The neighbouring hills are covered with broad leaf forests (beech, hornbeam, diverse species of oak, etc.) and, rarely, with artificial coniferous forests. Also, there are orchards. The meadows are covered with crops (cereals, fodder, green goods, etc.). Generally, the settlements are placed at the foothills or in the meadows.

The area belongs to the land of the continental climate with hilly characteristics. The average of the annual temperature of the water changes between 6.4 ^{0}C, in the Argeş Gorges, and 9 ^{0}C, at Piteşti. In winters with accentuate continental influence, in January, when it appears more intensely, the temperature decreases in the low areas below 0 ^{0}C and the bridge of ice is formed (BARCO & NEDELCU, 1974).

As a technique of field work, the itinerary method was used and, where the field conditions were inadequate, it was combined to one of the fixed point of observations. The study was carried in the hiemal season (February, November, December 2013 and January 2014) and between 10 and 20 of every month one day field trip was performed on all dam reservoirs. The same track on one bank of the dam reservoirs (the most favourable for the observation of water birds) was used every time. Binoculars (10x50), a spotting scope (14-45x50) and a photo device (42x optical zoom) were used.

The scientific nomenclature and classification of the birds are compatible with the Hamlin Guide (BRUUN et al., 1999).

Figure 1. The map of the area (original) with the position of the reservoirs.

RESULTS AND DISCUSSIONS

In the hiemal season (2013 and 2014), 64 bird species were observed on the dam reservoirs from the middle and upper course of the Argeş River. They belong to 14 orders: Gaviiformes, Podicipediformes, Pelecaniformes, Ciconiiformes, Anseriformes, Falconiformes, Galliformes, Gruiformes, Charadriiformes, Columbiformes, Strigiformes, Coraciiformes, Piciformes and Passeriformes. Passeriformes was the richest (with 31 species) and it is followed by Anseriformes (with 13 species) and Charadriiformes (with 4 species). Gaviiformes, Galliformes, Gruiformes, Columbiformes, and Strigiformes were the least represented (each with 1 species). The number of species varied between 31 (in December) and 46 (in November). In February, 45 species and, in January, 38 species were registered. The number of individuals was the highest in February (19,017 individuals). In December, it was registered the smallest number (6,571 individuals) and, in November and January, numbers are a little bigger (11,568, respectively 10,529 individuals), (Table 1). Generally, these reflect the migratory dynamics of the birds in relation with the local and regional weather conditions. However, we did not find a good correlation between the number of species/number of individuals and the mean of the average temperature of the air registered at Piteşti (cf. rp5.ru). It was: -0.43/-0.04 for the mean of the average temperatures of the air for 7 days before the days of observation, -0.55/-0.04 for the mean of the average temperatures of the air for 14 days before the days of observation and -0.71/-0.15 for the mean of the average temperatures of the air for 30 days before the days of observation. These show that: 1) regardless of the period, the correlation between the number of species and mean of the average temperature of the air is better than the correlation between the number of individuals and mean of the average temperature of the air; 2) in the considered periods,

there was an inverse rapport between the mean of the average temperatures of the air and the number of species/number of individuals (that means that lower was the mean of the average temperatures higher was the number of species/number of individuals, and inverse); 3) the variation in number and in strength of the species depends on the mean of the average temperatures of the air on long previous period rather than on short previous period. For the temperatures of the air registered in Piteşti in the days of observation (at 8:00), the correlation was -0.16/0.45 (weak/acceptable correlation: the decrease of the temperature of the air determined a slight increase of the number of species/ the decrease of the temperature of the air determined the decrease of the number of individuals). Consequently, the temperature of the air at the day of observations (at 8:00) did not have a significant influence on the presence of the species and their strengths. The influence would have been bigger if the mean of the average temperatures of the air had determined the freezing of big surfaces of the dam reservoirs. At the moment of observations, the ice covered only below 5% of surface of every dam reservoir, in January, and 5% of surface of Piteşti Dam Reservoir and 30% of surface of Vâlcele Dam Reservoir, in February, in the rest of situations the surface of water being free of ice. Other factors, represented by the anthropogenic pressure (the hunting, mainly on Vâlcele, Budeasa and Goleşti Dam Reservoirs, fishing, mainly on Bascov dam reservoir, and the nautical sports performed on Bascov Dam Reservoir and rarely on Piteşti Dam Reservoir) could be taken into consideration (CONETE, 2011).

The variation in number and strength of the species on every dam reservoir was rather similar to one at the general level (Table 2). There are two exceptions: the Bascov Dam Reservoir and the Piteşti Dam Reservoir, where in December or January were registered, comparatively, big numbers of species and strengths. They do not change the global situation, where mainly Goleşti Dam Reservoir imposes the rule (with 60.93% of all species from the dam reservoirs and 48.23% of the 47,685 individuals that represent the total number of individuals for all dam reservoirs). Notable is the percentage distribution on every dam reservoirs: the number of species and the number of individuals, generally, grows from upstream to downstream, fact also observed on other dam reservoirs from our country and from the Argeş River, when the richest populations of aquatic birds were recorded during passages and in winter time (MUNTEANU & MĂTIEŞ, 1983). Partially, it depends on the surface of every dam reservoir (Vâlcele represents 23.27% of the total surface of the reservoirs, Budeasa, 23.50% of the total surface, Bascov, 9.24% of the total surface, Piteşti, 6.95% of the total surface, and Goleşti, 37.02% of the total surface). The correlation between the number of species and the surface was 0.37 (positive and acceptable correlation) and the correlation between the number of individuals and the surface was 0.65 (positive and moderate correlation) (COLTON, 1974).

What with the ones above mentioned, regarding the ratio number of species/surface of dam reservoir, we state that it grows also from upstream to downstream, the exception being Goleşti Dam Reservoir (Table 3). Regarding the ratio number of individuals/surface of dam reservoir, we remark that there is not a clear relation between them: it grows from upstream to downstream, except Bascov and Goleşti or Piteşti Dam Reservoirs. As we also saw in other paper (CONETE et al., 2012a), from here, combined with the ones showed above, we draw the conclusion that despite of the vicinity of Piteşti, Piteşti Dam Reservoir (situated upstream of Goleşti Dam Reservoir) is a preferred place for the birds.

Besides the anthropogenic factors, showed above, it results that in the general equation of the presence of the species on the dam reservoirs, the position of every dam reservoir on the course of the Argeş River, in rapport with the Southern Carpathians and the valleys of the neighbourhood rivers (including the Danube) is also important and has repercussions on the species north-south or east-west migration, fact remarked in other occasions, too (CONETE et al., 2012b; MESTECĂNEANU & GAVA, 2013). Actually, the presence of the mountainous barrier is the one that determined this type of migration (MĂTIEŞ, 1969). The availability of the propitious habitats, which determine the trophic resources and the places of shelter, is another major aspect. Habitats of wetlands are more representative on Bascov and Piteşti Dam Reservoirs. These addictions were stated by other authors on diverse dam reservoirs from Romania, too (MUNTEANU, 2000; MITRULY, 2002).

On the subject of the similarity between the avicoenoses from the dam reservoirs, by Jaccard index the biggest similarity is between Piteşti and Budeasa (63.82%) and the smallest between Vâlcele and Bascov (20.93%), (Table 4, Fig. 2). By Bray-Curtis index, the highest similarity was between Vâlcele and Budeasa (66.84%) and the lowest between Goleşti and Bascov (5.04%), (Table 5, Fig. 3). The differences result from the fact that the Jaccard index is based only on the presence/absence of the respective species in the samples and the Bray-Curtis index is based on the presence/absence of the species in the samples and on their number of individuals.

Table 1. The occurrence in the hiemal season, some ecological indexes and the conservation status of the species.

No.	Species	Month				Absolute abundance	Class of constancy	Class of dominancy	Class of Dzuba index of ecological significance	Birds Directive (2009/147/CE)	Bern Convention	Bonn Convention
		November	December	January	February							
	I. Order **Gaviiformes**											
1	*Gavia arctica* (Linnaeus, 1758)*		+			3	C1	D1	W1	AI	AII	AII
	II. Order **Podicipediformes**											
2	*Podiceps cristatus* (Linnaeus, 1758)*	+	+	+	+	160	C4	D1	W2		AIII	

3	*Tachybaptus ruficollis* (Pallas, 1764)*	+	+	+	+	90	C4	D1	W2		AII	
	III. Order **Pelecaniformes**											
4	*Phalacrocorax carbo* (Linnaeus, 1758)*	+	+	+	+	395	C4	D1	W2		AIII	
5	*Phalacrocorax pygmeus* (Pallas, 1773)*	+	+	+	+	74	C4	D1	W2	AI	AII	AII
	IV. Order **Ciconiiformes**											
6	*Egretta alba* (Linnaeus, 1758)*	+	+	+	+	36	C4	D1	W1	AI	AII	AII
7	*Ardea cinerea* Linnaeus, 1758*	+	+	+	+	29	C4	D1	W1		AIII	
	V. Order **Anseriformes**											
8	*Cygnus olor* (Gmelin, 1789)*	+	+	+	+	944	C4	D2	W3	AII/B	AIII	AII
9	*Cygnus cygnus* (Linnaeus, 1758)*			+	+	21	C2	D1	W1	AI	AII	AII
10	*Anser albifrons* (Scopoli, 1769)*		+		+	660	C2	D2	W2	AII/B, AIII/B	AIII	AII
11	*Anas platyrhynchos* Linnaeus, 1758*	+	+	+	+	16531	C4	D5	W5	AII/A, AIII/A	AIII	AII
12	*Anas strepera* Linnaeus, 1758*			+	+	22	C2	D1	W1	AII/A	AIII	AII
13	*Anas penelope* Linnaeus, 1758*	+	+	+	+	164	C4	D1	W2	AII/A, AIII/B	AIII	AII
14	*Anas crecca* Linnaeus, 1758*	+	+	+	+	2186	C4	D3	W3	AII/A, AIII/B	AIII	AII
15	*Anas clypeata* Linnaeus, 1758*			+		3	C1	D1	W1	AII/A, AIII/B	AIII	AII
16	*Tadorna tadorna* (Linnaeus, 1758)*	+		+	+	50	C3	D1	W1		AII	AII
17	*Aythya fuligula* (Linnaeus, 1758)*	+	+	+	+	2708	C4	D4	W4	AII/A, AIII/B	AIII	AII
18	*Aythya ferina* (Linnaeus, 1758)*	+	+	+	+	6958	C4	D5	W5	AII/A, AIII/B	AIII	AII
19	*Bucephala clangula* (Linnaeus, 1758)*	+	+	+	+	469	C4	D1	W2	AII/B	AIII	AII
20	*Mergus albellus* (Linnaeus, 1758)*			+	+	7	C2	D1	W1	AI	AII	AII
	VI. Order **Falconiformes**											
21	*Buteo buteo* (Linnaeus, 1758)	+	+	+	+	12	C4	D1	W1		AII	AII
22	*Falco tinnunculus* Linnaeus, 1758	+			+	2	C2	D1	W1		AII	AII
	VII. Order **Galliformes**											
23	*Phasianus colchicus* Linnaeus, 1758		+	+	+	10	C3	D1	W1	AII/A, AIII/A	AIII	
	VIII. Order **Gruiformes**											
24	*Fulica atra* Linnaeus, 1758*	+	+	+	+	3932	C4	D4	W4	AII/A, AIII/B	AIII	
	IX. Order **Charadriiformes**											
25	*Tringa ochropus* Linnaeus, 1758*		+	+	+	5	C3	D1	W1		AII	AII
26	*Larus argentatus* Pontoppidan, 1763*	+	+	+	+	1436	C4	D3	W3	AII/B	AIII	
27	*Larus canus* Linnaeus, 1758*	+	+	+	+	1997	C4	D3	W3	AII/B	AIII	
28	*Larus ridibundus* Linnaeus, 1766*	+	+	+	+	6598	C4	D5	W5	AII/B	AIII	
	X. Order **Columbiformes**											
29	*Streptopelia decaocto* (Frivaldszky, 1838)	+		+		2	C2	D1	W1	AII/B	AIII	
	XI. Order **Strigiformes**											
30	*Athene noctua* (Scopoli, 1769)	+				1	C1	D1	W1		AII	
	XII. Order **Coraciiformes**											
31	*Alcedo atthis* (Linnaeus, 1758)*	+				1	C1	D1	W1	AI	AII	
	XIII. Order **Piciformes**											
32	*Picus canus* Gmelin, 1788			+		1	C1	D1	W1	AI	AII	
33	*Dendrocopos major* (Linnaeus, 1758)	+				2	C1	D1	W1		AII	
	XIV. Order **Passeriformes**											
34	*Galerida cristata* (Linnaeus, 1758)	+			+	4	C2	D1	W1		AIII	
35	*Anthus spinoletta* (Linnaeus, 1758)	+	+	+		13	C3	D1	W1		AII	
36	*Anthus pratensis* (Linnaeus, 1758)	+				2	C1	D1	W1		AII	
37	*Motacilla cinerea* Tunstall, 1771*				+	1	C1	D1	W1		AII	
38	*Motacilla alba* Linnaeus, 1758				+	2	C1	D1	W1		AII	
39	*Lanius excubitor* Linnaeus, 1758	+				1	C1	D1	W1		AII	
40	*Sturnus vulgaris* Linnaeus, 1758	+				16	C1	D1	W1	AII/B		
41	*Garrulus glandarius* (Linnaeus, 1758)	+		+		2	C2	D1	W1	AII/B		
42	*Pica pica* (Linnaeus, 1758)	+	+	+	+	143	C4	D1	W2	AII/B		
43	*Corvus monedula* Linnaeus, 1758	+	+	+	+	788	C4	D2	W3	AII/B		

44	*Corvus frugilegus* Linnaeus, 1758	+	+	+	+	676	C4	D2	W3	AII/B		
45	*Corvus corone cornix* Linnaeus, 1758	+	+	+	+	9	C4	D1	W1	AII/B		
46	*Corvus corax* Linnaeus, 1758	+	+	+	+	31	C4	D1	W1		AIII	
47	*Troglodytes troglodytes* (Linnaeus, 1758)			+	+	2	C2	D1	W1		AII	
48	*Prunella modularis* (Linnaeus, 1758)	+				1	C1	D1	W1		AII	
49	*Erithacus rubecula* (Linnaeus, 1758)	+	+			2	C2	D1	W1		AII	
50	*Turdus merula* Linnaeus, 1758		+	+		2	C2	D1	W1	AII/B	AIII	
51	*Parus caeruleus* Linnaeus, 1758	+		+	+	23	C3	D1	W1		AII	
52	*Parus major* Linnaeus, 1758	+		+	+	11	C3	D1	W1		AII	
53	*Remiz pendulinus* (Linnaeus, 1758)*	+				3	C1	D1	W1		AIII	
54	*Passer domesticus* (Linnaeus, 1758)	+			+	21	C2	D1	W1			
55	*Passer montanus* (Linnaeus, 1758)	+	+	+	+	127	C4	D1	W2		AIII	
56	*Fringilla coelebs* Linnaeus, 1758	+	+	+		38	C3	D1	W1		AIII	
57	*Coccothraustes coccothraustes* (Linnaeus, 1758)				+	1	C1	D1	W1		AII	
58	*Carduelis chloris* (Linnaeus, 1758)	+				8	C1	D1	W1		AII	
59	*Carduelis spinus* (Linnaeus, 1758)	+				7	C1	D1	W1		AII	
60	*Carduelis carduelis* (Linnaeus, 1758)	+	+	+	+	28	C4	D1	W1		AII	
61	*Carduelis cannabina* (Linnaeus, 1758)	+	+		+	20	C3	D1	W1		AII	
62	*Emberiza schoeniclus* (Linnaeus, 1758)*	+	+		+	5	C3	D1	W1		AII	
63	*Miliaria calandra* (Linnaeus, 1758)	+			+	14	C2	D1	W1		AIII	
64	*Emberiza citrinella* Linnaeus, 1758	+	+	+	+	175	C4	D1	W2		AII	
Number of species		46	31	38	45							
Number of individuals		11568	6571	10529	19017							

Legend:
* - birds that depend on wetlands; + – presence; C1 – accidental species, C2 – accessory species, C3 – constant species, C4 – euconstant species; D1, W1 – subrecedent species, D2, W2 – recedent species, D3, W3 – suddominant species, D4, W4 – dominant species, D5, W5 – eudominant species; AI, AII, AIII – annexes of the Birds Directive, Bern Convention and, respectively, Bonn Convention, A, B – parts of the annexes.

Table 2. The distribution of species and strengths on dam reservoirs and months.

Dam reservoir	Parameter	November	December	January	February	All period	Percents of total (%)
Vâlcele	No. of species	25	18	15	18	33	51.56
	No. of individuals	1239	1218	990	1098	4545	9.53
Budeasa	No. of species	25	16	13	24	36	56.25
	No. of individuals	1189	872	717	4989	7767	16.28
Bascov	No. of species	8	10	10	7	19	29.68
	No. of individuals	37	215	136	219	607	1.27
Piteşti	No. of species	23	17	30	24	41	64.06
	No. of individuals	1894	3012	2523	4339	11768	24.67
Goleşti	No. of species	25	22	24	28	39	60.93
	No. of individuals	7209	1254	6163	8372	22998	48.23

Table 3. The ratio number of species/surface and number of individuals/surface for every dam reservoir.

Dam reservoir	Number of species/surface	Number of individuals/surface
Vâlcele	0.08	11.13
Budeasa	0.09	18.85
Bascov	0.11	3.74
Piteşti	0.33	96.45
Goleşti	0.06	35.43

Table 4. The similarity matrix (by Jaccard) between the avicoenosis of the dam reservoirs.

Similarity	Vâlcele	Budeasa	Bascov	Piteşti	Goleşti
Vâlcele	*	43.75	20.93	29.82	41.17
Budeasa	*	*	37.50	63.82	56.25
Bascov	*	*	*	33.33	34.88
Piteşti	*	*	*	*	50.94
Goleşti	*	*	*	*	*

Taking into account only the species that depend on wetlands, there is an increase almost linear of the number of species (the minimum being in November – 20 species and the maximum in February – 25 species). The number of individuals varied by a concave line, with the minimum value in December (6,252 individuals) and the maximum value in February (18,441 individuals). In the first case, the curve differs from that of the total number of species, thanks to the non-aquatic or amphibious species, and, in the second case, the curve is almost similar, the importance of the number of individuals of the other species being rather low (Fig. 4).

According to the constancy (Fig. 5), 26 species (40.63% of all) were euconstant species (*Podiceps cristatus*, *Tachybaptus ruficollis*, *Phalacrocorax carbo*, *P. pygmeus*, *Egretta alba*, *Ardea cinerea*, *Cygnus olor*, *Anas platyrhynchos*, *A. penelope*, *A. crecca*, *Aythya fuligula*, *A. ferina*, *Bucephala clangula*, *Buteo buteo*, *Fulica atra*, *Larus argentatus cachinnans/michahellis*, *L. canus*, *L. ridibundus*, *Pica pica*, *Corvus monedula*, *C. frugilegus*, *C. corone cornix*, *C. corax*, *Passer montanus*, *Carduelis carduelis*, and *Emberiza citrinella*), 16 species (25.00% of all) were accidental species (*Gavia arctica*, *Anas clypeata*, *Athene noctua*, *Alcedo atthis*, *Picus canus*, *Dendrocopos major*, *Anthus pratensis*, *Motacilla cinerea*, *M. alba*, *Lanius excubitor*, *Sturnus vulgaris*, *Prunella modularis*, *Remiz pendulinus*, *Coccothraustes coccothraustes*, *Carduelis chloris*, and *C. spinus*), 13 species (20.31% of all) were accessory species (*Cygnus cygnus*, *Anser albifrons*, *Anas strepera*, *Mergus albellus*, *Falco tinnunculus*, *Streptopelia decaocto*, *Galerida cristata*, *Garrulus glandarius*, *Troglodytes troglodytes*, *Erithacus rubecula*, *Turdus merula*, *Passer domesticus*, and *Miliaria calandra*) and 9 species (14.06% of all) were constant species (*Tadorna tadorna*, *Phasianus colchicus*, *Tringa ochropus*, *Anthus spinoletta*, *Parus caeruleus*, *P. major*, *Fringilla coelebs*, *Carduelis cannabina*, and *Emberiza schoeniclus*).

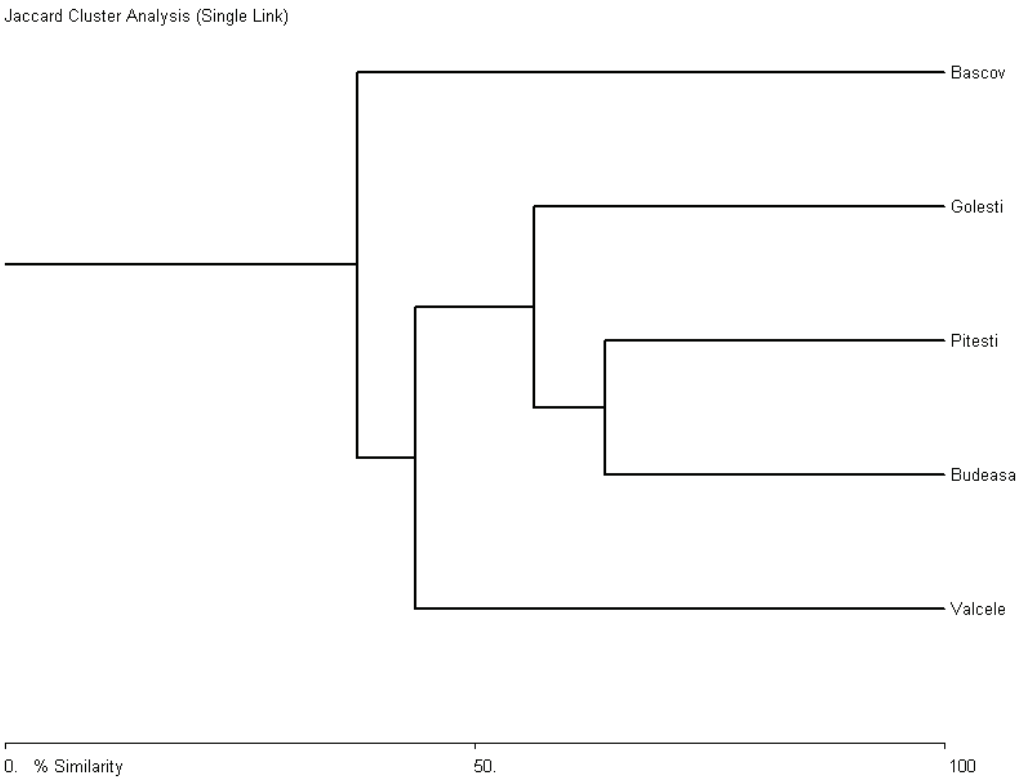

Figure 2. The Jaccard Cluster Analysis (Single Link).

Table 5. The similarity matrix (by Bray-Curtis) between the avicoenosis of the dam reservoirs.

Similarity	Vâlcele	Budeasa	Bascov	Piteşti	Goleşti
Vâlcele	*	66.84	17.58	29.35	30.75
Budeasa	*	*	14.21	44.98	44.87
Bascov	*	*	*	9.68	5.0413
Piteşti	*	*	*	*	38.73
Goleşti	*	*	*	*	*

Depending on the dominancy (Fig. 6), 52 species (81.25% of all) were subrecedent species (*Gavia arctica*, *Podiceps cristatus*, *Tachybaptus ruficollis*, *Phalacrocorax carbo*, *P. pygmeus*, *Egretta alba*, *Ardea cinerea*, *Cygnus cygnus*, *Anas strepera*, *A. penelope*, *A. clypeata*, *Tadorna tadorna*, *Bucephala clangula*, *Mergus albellus*, *Tringa ochropus*, *Alcedo atthis*, *Motacilla cinerea*, *Remiz pendulinus*, *Emberiza schoeniclus* etc.), 4 species (6.25% of all) were recedent species (*Cygnus olor*, *Anser albifrons*, *Corvus monedula* and *C. frugilegus*), 3 species (4.69% of all) were subdominant species (*Anas crecca*, *Larus argentatus cachinnans/michahellis*, and *L. canus*), 3 species (4.69% of all) were eudominant species (*Anas platyrhynchos*, *Aythya ferina*, and *Larus ridibundus*), and 2 species (3.13% of all) were dominant species (*Aythya fuligula* and *Fulica atra*).

By Dzuba ecological significance index (Fig. 7), 43 species (67.19% of all) were subrecedent species (*Gavia arctica*, *Egretta alba*, *Ardea cinerea*, *Cygnus cygnus*, *Anas strepera*, *A. clypeata*, *Tadorna tadorna*, *Mergus albellus*, *Tringa ochropus*, *Alcedo atthis*, *Motacilla cinerea*, *Remiz pendulinus*, *Emberiza schoeniclus etc.*), 10 species (15.63% of all) were recedent species (*Tachybaptus ruficollis*, *Phalacrocorax carbo*, *P. pygmeus*, *Anser albifrons*, *Anas penelope*, *Bucephala clangula*, *Pica pica*, *Passer montanus*, and *Emberiza citrinella*), 6 species (9.38% of all) were subdominant species (*Cygnus olor*, *Anas crecca*, *Larus argentatus cachinnans/michahellis*, *L. canus*, *Corvus monedula*, and *C. frugilegus*) 3 species (4.69% of all) were eudominant species (*Anas platyrhynchos*, *Aythya ferina*, and *Larus ridibundus*) and 2 species (3.13%) were dominant species (*Aythya fuligula* and *Fulica atra*).

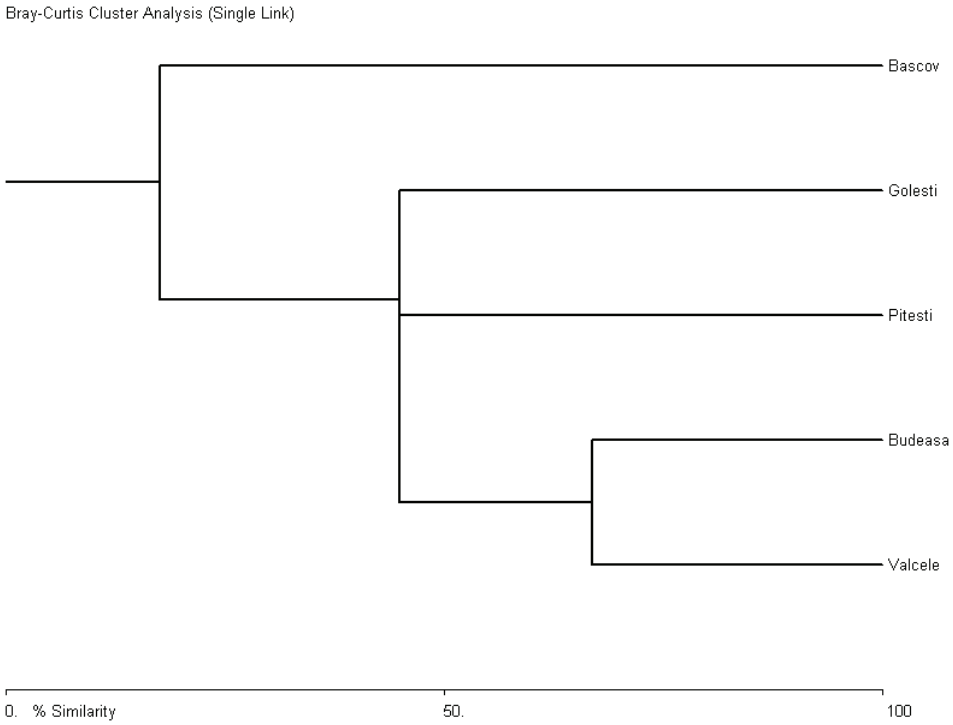

Figure 3. The Bray-Curtis Cluster Analysis (Single Link).

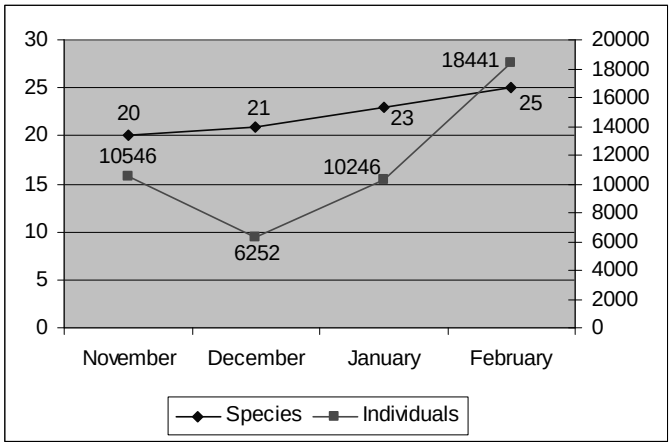

Figure 4. The monthly variation of the number of the individuals and of the number of species that depend on the wetlands.

The eudominant species evolved separately from the number of individuals point of view: if the strengths of *Anas platyrhynchos* and *Aythya ferina* decreased from November to December and then increased from December to February, the strength of *Larus ridibundus* increased from November to January and decreased from January to February. The minimum values of the first were 1,807, respectively 333 individuals (in December) and the maximum values were 6,875, respectively 3,820, in February. The latter had the minimum value in November (1,002 individuals) and the maximum value in January (2,868 individuals), (Fig. 8). Their number of individuals marks the general evolution of the number of individuals on the dam reservoirs, together summing 30,087 individuals, which means 63.09% of all individuals. The fluctuations show the migratory displacements of the respective species. Generally, the situation is similar on the dam reservoirs from our country: the principal position in their avifauna is occupied by *Anas platyrhynchos* (MUNTEANU & MĂTIEȘ, 1983).

Regarding their distribution on the dam reservoirs, most individuals of *Anas platyrhynchos* and *Aythya ferina* were counted on Goleşti Dam Reservoir (9,882, respectively 4,600 individuals). The least were registered on Bascov Dam Reservoir (51, respectively 17 individuals). *Larus ridibundus* was the most abundant on Piteşti Dam Reservoir (4,259 individuals). It was not noted on Vâlcele Dam Reservoir. The second place as number of individuals was: Budeasa Dam Reservoir, for *Anas platyrhynchos*, Piteşti Dam Reservoir for *Aythya ferina* and Goleşti Dam Reservoir, for *Larus ridibundus* (Fig. 9).

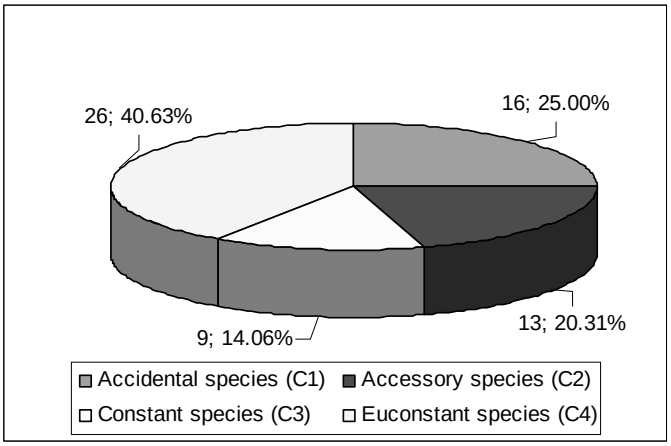

Figure 5. The species distribution according to the index of constancy.

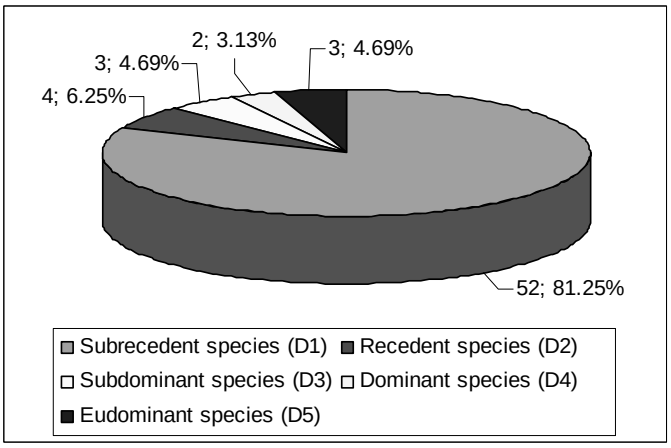

Figure 6. The species distribution according to the index of dominancy.

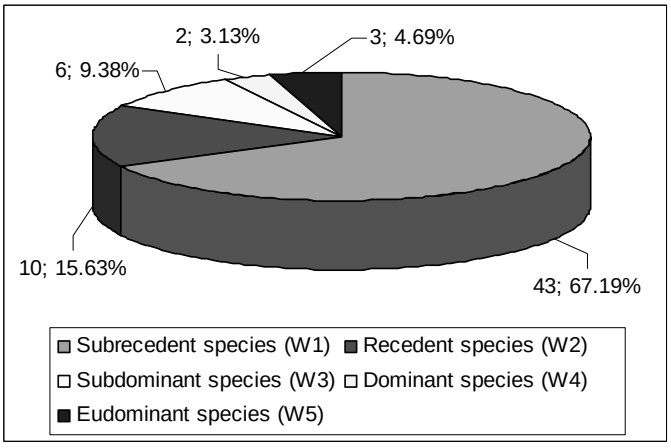

Figure 7. The species distribution according to the index of Dzuba ecological significance.

Based on the index of relation, Anseriformes was the only overdominant order. It numbered 30,723 individuals. Chaardriiformes was the only dominant order, it numbering 10,036 individuals. Every other order was complementary. The static axis (As) is 7.14 and the dominance axis (Ad) is 14.28 (Fig. 10).

Regarding the monthly dynamics of the orders, it is noticeable that Anseriformes was always overdominant. Its importance decreases in December and January, when the Charadriiformes order is, on its turn, overdominant. In all the

months, there was not any dominant order. The other orders and Charadriiformes (only in November and February) were all the time complementary. The static axis (As) is 7.14 and the dominance axis (Ad) is 14.28, too (Fig. 11).

The species situation for Anseriformes (the only overdominant order) is: *Anas platyrhynchos* and *Aythya ferina* – overdominant species, *A. fuligula* – dominant species, *Cygnus olor*, *C. cygnus*, *Anser albifrons*, *Anas strepera*, *A. penelope*, *A. crecca*, *A. clypeata*, *Tadorna tadorna*, *Bucephala clangula* and *Mergus albellus* – complementary species. The static axis (As) is 7.69 and the dominance axis (Ad) is 15.38 (Fig. 12). *Anas platyrhynchos* numbered 16,531 individuals, *Aythya ferina*, 6,958 individuals and *A. fuligula*, 2,708 individuals.

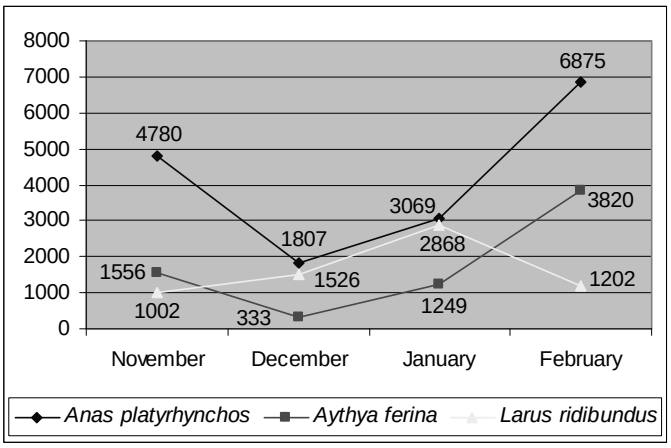

Figure 8. The monthly variation in number of the eudominant species.

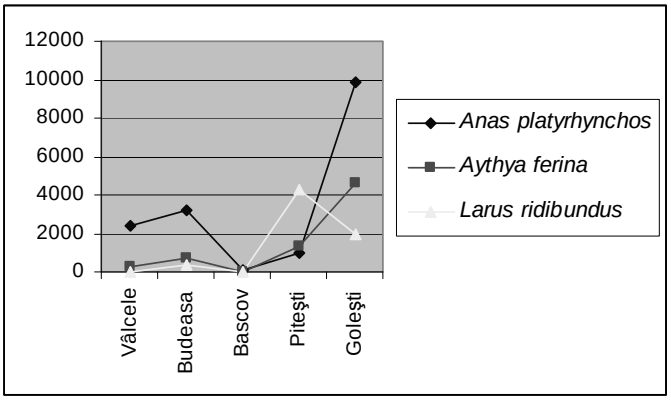

Figure 9. The distribution of the strengths of the eudominant species on the dam reservoirs.

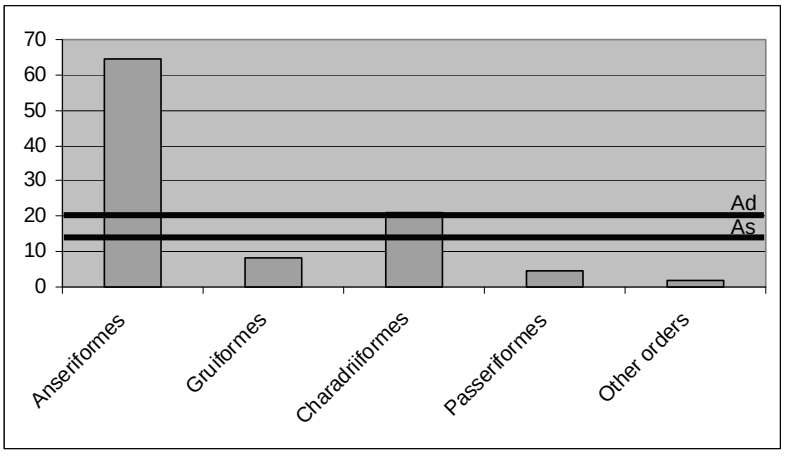

Figure 10. The participation of the orders to the formation of the avicoenose.

Concerning the monthly dynamics of the species of Anseriformes (Fig. 13), we mention that *Anas plathyrhynchos* was always the overdominant species. *Aythya ferina* was also overdominant species, but only in November, January and February. *Anser albifrons*, in December, *Anas crecca*, in November, *Aythya fuligula*, in November and January, and *A. ferina*, in December, were dominant species. In the rest of time, the species were complementary. The static axis (As) is 7.69 and the dominance axis (Ad) is 15.38, too.

From the protection point of view (Table 1), 7 species (*Gavia arctica*, *Phalacrocorax pygmeus*, *Egretta alba*, *Cygnus cygnus*, *Mergus albellus*, *Alcedo atthis*, and *Picus canus*, 10.93%) are in Annex I of the Birds Directive (2009/147/CE), 31 species (*Gavia arctica*, *Tachybaptus ruficollis*, *Phalacrocorax pygmeus*, *Egretta alba*, *Cygnus cygnus*, *Tadorna tadorna*, *Mergus albellus*, *Buteo buteo*, *Falco tinnunculus*, *Tringa ochropus*, *Athene noctua*, *Alcedo atthis*, *Picus canus*, *Dendrocopos major*, *Anthus spinoletta*, *Anthus pratensis*, *Motacilla cinerea*, *M. alba*, *Lanius excubitor*, *Troglodytes troglodytes*, *Prunella modularis*, *Erithacus rubecula*, *Parus caeruleus*, *P. major*, *Coccothraustes coccothraustes*, *Carduelis chloris*, *C. spinus*, *C. carduelis*, *C. cannabina*, *Emberiza schoeniclus*, and *E. citrinella*, 48.43%) are in the Annex II and 26 species (*Podiceps cristatus*, *Phalacrocorax carbo*, *Ardea cinerea*, *Cygnus olor*, *Anser albifrons*, *Anas platyrhynchos*, *A. strepera*, *A. penelope*, *A. crecca*, *A. clypeata*, *Aythya fuligula*, *A. ferina*, *Bucephala clangula*, *Phasianus colchicus*, *Fulica atra*, *Larus cachinnans*, *L. canus*, *L. ridibundus*, *Streptopelia decaocto*, *Galerida cristata*, *Corvus corax*, *Turdus merula*, *Remiz pendulinus*, *Passer montanus*, *Fringilla coelebs*, and *Miliaria calandra*, 40.62%) in Annex III of the Bern Convention and 19 species (*Gavia arctica*, *Phalacrocorax pygmeus*, *Egretta alba*, *Cygnus olor*, *C. cygnus*, *Anser albifrons*, *Anas platyrhynchos*, *A. strepera*, *A. penelope*, *A. crecca*, *A. clypeata*, *Tadorna tadorna*, *Aythya fuligula*, *A. ferina*, *Bucephala clangula*, *Mergus albellus*, *Buteo buteo*, *Falco tinnunculus*, and *Tringa ochropus*, 29.68%) are in Annex II of the Bonn Convention. The species from Annex I of the Birds Directive shall be the subject of special conservation measures concerning their habitat in order to ensure their survival and reproduction in their area of distribution (http://eur-lex.europa.eu/). The species from Annex II of the Bern Convention are strictly protected species and species from Annex III are protected species (http://conventions.coe.int/). The species from Annex II of the Bonn Convention are migratory species, which have an unfavourable status of protection and that demand international agreements for their protection (http://eur-lex.europa.eu/legal-content/).

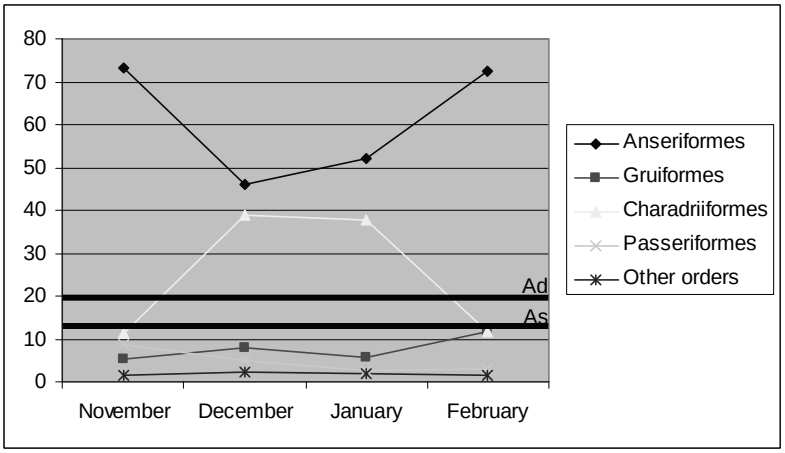

Figure 11. The monthly dynamics of the orders.

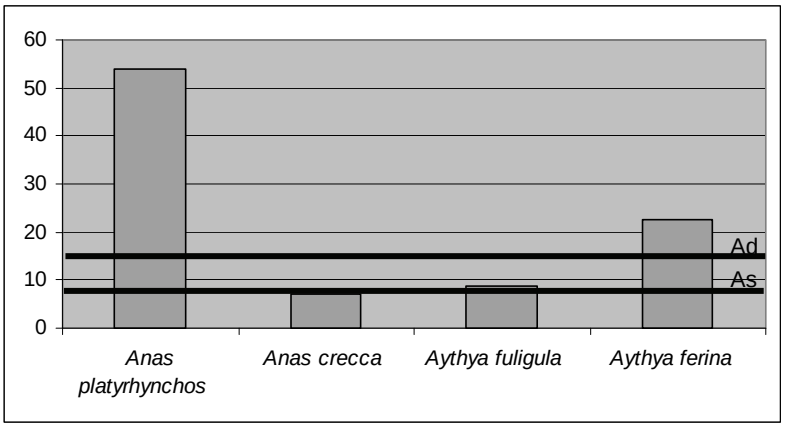

Figure 12. The participation of the species to the formation of the Anseriformes coenose.

CONCLUSIONS

- During the hiemal period (February, November, December 2013 and January 2014), on the dam reservoirs Goleşti, Piteşti, Bascov, Budeasa and Vâlcele, 64 bird species and 47,685 individuals were registered;
- The identified species belong to 14 orders Passeriformes being the richest (with 31 species);
- In February, it was registered the biggest number of species (45 species) and the highest number of individuals (19,017 individuals);

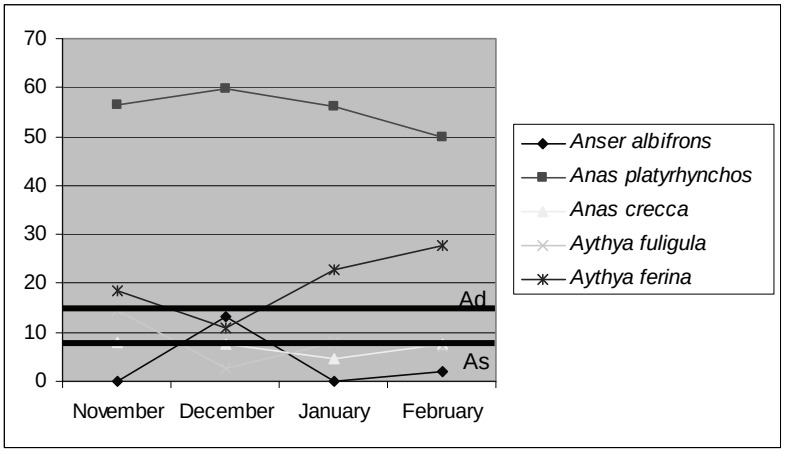

Figure 13. The monthly dynamics of the species of Anseriformes.

- Taking into account only the species that depend on wetlands, the maximum of the species number was also in February (25 species) as well as the maximum of the number of individuals (18,441 individuals);
- As we expected, the migratory dynamics of the birds is in relation with the local and regional weather conditions and the distribution on the dam reservoirs depends on the anthropogenic pressure (hunting, mainly on Vâlcele, Budeasa and Goleşti Dam Reservoirs, fishing, mainly on Bascov Dam Reservoir, and the nautical sports performed on Bascov Dam Reservoir and rarely on Piteşti Dam Reservoir), the surface of every dam reservoir, the position of each dam reservoir on the course of the Argeş River, in rapport with the Southern Carpathians and the valleys of the neighbourhood rivers (including the Danube), and the availability of the propitious habitats, which determine the trophic resources and shelters;
- The number of species and the number of individuals, generally, grows from upstream to downstream;
- Despite the vicinity with Piteşti, Piteşti Dam Reservoir is a place that the birds prefer;
- By Jaccard index the biggest similarity is between Piteşti and Budeasa (63.82%) and the smallest between Vâlcele and Bascov (20.93%). By Bray-Curtis index, the highest similarity is between Vâlcele and Budeasa (66.84%) and the lowest between Goleşti and Bascov (5.04%);
- According to the constancy, 26 species (40.63% of all) were euconstant species, 16 species (25.00% of all) were accidental species, 13 species (20.31% of all) were accessory species and 9 species (14.06% of all) were constant species;
- Depending on the dominancy, 52 species (81.25% of all) were subrecedent species, 4 species (6.25% of all) were recedent species, 3 species (4.69% of all) were subdominant species, 3 species (4.69% of all) were eudominant species, and 2 species (3.13% of all) were dominant species;
- By Dzuba ecological significance index, 43 species (67.19% of all) were subrecedent species, 10 species (15.63% of all) were recedent species, 6 species (9.38% of all) were subdominant species, 3 species (4.69% of all) were eudominant species and 2 species (3.13%) were dominant species;
- The eudominant species were *Anas platyrhynchos*, *Aythya ferina* and *Larus ridibundus*. The maximum values of the strengths were in February for *A. platyrhynchos* and *A. ferina* (6,875 individuals, respectively 3,820 individuals and in November for *L. ridibundus* (1,002 individuals);
- The most individuals of *Anas platyrhynchos* and *Aythya ferina* were counted on Goleşti Dam Reservoir (9,882, respectively 4,600 individuals) and the most numerous individuals of *Larus ridibundus* were counted on Piteşti Dam Reservoir (4,259 individuals);
- In the hiemal period, Anseriformes was the only overdominant order; it was the overdominant order every month, too;
- In the same period, *Anas platyrhynchos* and *Aythya ferina* were the overdominant species inside the Anseriformes order;
- *Anas plathyrhynchos* was every month the overdominant species and *Aythya ferina* was the overdominant species in November, January and February;
- 7 species (*Gavia arctica*, *Phalacrocorax pygmeus*, *Egretta alba*, *Cygnus cygnus*, *Mergus albellus*, *Alcedo atthis*, and *Picus canus*, 10.93%) are in Annex I of the Birds Directive (2009/147/CE), 31 species are in Annex II and 26 species in Annex III of the Bern Convention and 19 species are in Annex II of the Bonn Convention.

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