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Ornithological observations on the Goleşti Basin (Argeş River, Romania) between February 2013 and January 2014

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SUMMARY. The results of the researches performed between February 2013 and January 2014 on the birds of the Goleşti reservoir from ROSPA0062 Lacurile de acumulare de pe Argeş are shown in this paper. The 91 observed species belong to 13 orders, Passeriformes being the richest (with 31 species). 53 species are totally or partially dependent on wetlands. The monthly variation of the number of species and individuals reflects both natural and artificial processes. A few species (*Anas platyrhynchos*, *Aythya fuligula*, *Aythya ferina*, *Larus ridibundus*) were noticeable because of their frequency and abundance and this is why they dictated the general dynamics of the local avifauna. As a result, the Anseriformes and Charadriiformes are the overdominant orders at general level. 21 species are included in the Annex I of the Birds Directive. The qualitative and quantitative alterations observed over time do not show necessarily the climatic changes, because the conditions of the basin did not remain constant.

Keywords: anthropogenic pressure, avifauna, basin, Special Protected Area.

Introduction

The avifauna of the reservoirs from Romania has been the subject of many works since the construction of the artificial lakes. In these papers the influence of the latter on the birds was constantly highlighted (Munteanu, 1978, Munteanu, 2000, Gache, 2002, Mitruly, 2002, Rang, 2002 etc.).

The first thematic study about the middle and upper hydrographic basin of the Argeş River was performed before the construction of the reservoirs (Mătieş, 1969). Their own avifauna was subsequently studied, when their major importance as places of stopover or wintering was revealed (Munteanu and Mătieş, 1983). Other data about them was published later, in a synthesis work on the aquatic birds from the winter quarters from Romania (Munteanu *et al.*, 1989) and in 1997 it was suggested

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the possibility for some of these locations to become Important Bird Area (Gava, 1997). The research about the reservoirs' ornithofauna between Vâlcele and Goleşti has been intensified after 2004 (Gava *et al.*, 2004a,b, 2007, 2008, 2011, 2012, Mestecăneanu *et al.*, 2004, 2006b, 2008, 2010, 2013, Conete *et al.*, 2006, 2008, 2010, 2011, Mestecăneanu and Gava, 2013, 2015a,b, 2016a,b,c, 2017 etc.) and, in this context, some papers were dedicated to the birds from the Goleşti Basin (Mestecăneanu *et al.*, 2005, 2006a, Conete *et al.*, 2009, 2012). Also, a PhD Thesis referred to the birds from the area (Conete, 2011).

Materials and methods

The Goleşti Basin is a component of the protected site ROSPA0062 Lacurile de acumulare de pe Argeş ("The Basins from the Argeş River"), included in Natura 2000 Network. It is the southern element of this series of basins that begins at Zigoneni, i.e. upstream, and continues downstream with the reservoirs Vâlcele, Budeasa, Bascov and Piteşti (Fig. 1). Its features are: type – gravity dam/earth; kind of sealing – uphill embankment, concrete; height – 32 m; length – 7,866 m; volume – 78.5x10^6 m^3; area – 680 ha; length of the lake – 7 km; object – water supply, electricity, flood prevention, irrigation; area of catchment – 3100 km^2; discharge flow – 3,760 m^3/s; spill type – overflowing with the edges; gift in use - 1983 (cf. http://www.baraje.ro).

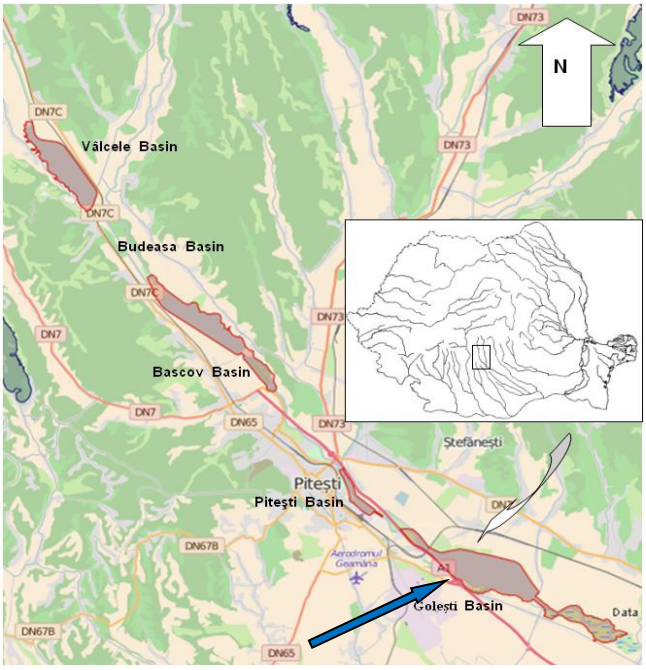

Figure 1. The map of the area with the place of the Goleşti Basin, marked with blue arrow.

The climate of the area is temperate-continental, with traits of plain. The average annual temperature of the air is 10ºC; in January, it is 2.7 ºC and in July it is nearly 21 ºC (Mâciu *et al.*, 1982). The average annual temperature of the water is bigger with 1-3 ºC then the one of the air and it is ca. 9 ºC at Piteşti, 8 km far away from Goleşti. In the harsh winters, the ice bridge is formed in the first half of January and disappears in the last part of February (Barco and Nedelcu, 1974).

The vegetation is composed by species of the genera *Carex*, *Juncus*, *Phragmites* that, together with a few mature alders, grow toward the end of the lake where the right bank is covered with grass and other herbaceous species: *Agrimonia eupatoria* L., *Carex sylvatica* Huds., *Urtica dioica* L., *Lysimachia nummularia* L. and woody vegetation: *Alnus glutinosa* (L.), *Prunus spinosa* L., *Crataegus monogyna* Jacq., *Rubus caesius* L. etc. The floating vegetation emerges mainly in the upstream extremity: *Myriophyllum verticilatum* L., *Sparganium erectum* L., *Mentha aquatica* L., *Polygonum mite* L., *Lemna minor* L. etc. Toward the banks, *Typha* sp. can be found (Stancu, 2014).

Between the water surface and the forest of *Quercus* from the right bank, there is a bare band of gravel. Except the treed upstream end, the left bank and the dam have no vegetation because of the concrete bevel.

The area from vicinity is cultivated mainly with cereal crops, cabbage and grass.

The fish fauna is diverse: *Alburnus alburnus* Linnaeus, 1758, *Barbus barbus* (Linnaeus, 1758), *Barbus meridionalis petenyi* (Heckel, 1847), *Carassius auratus gibelio* (Bloch, 1782), *Gobio gobio* (Linnaeus, 1758), *Squalius cephalus* (Linnaeus, 1758), *Rutilus rutilus* (Linnaeus, 1758), *Rhodeus amarus* (Bloch, 1782), *Pseudorasbora parva* (Temminck & Schlegel, 1846), *Cobitis taenia* Linnaeus, 1758, *Esox lucius* Linnaeus, 1758, *Perca fluviatilis* Linnaeus, 1758, *Lepomis gibbosus* (Linnaeus, 1758), *Sander lucioperca* (Linnaeus, 1758) (Truţă and Dumitru, 2015). Many of the species represent the food source for the ichthyophagous birds.

There is a restricted road to the public circulation on the bevel of the dam. A motorway goes alongside the right end of the basin. Toward South (Recea and Cătanele), East (Udeni-Zăvoi) and West (Piteşti and Bradu) there are human settlements, situated under 500 m distance (Fig. 2).

The itinerary method combined to the one of fixed points of observations was used. Monthly, one field trip was performed, generally between the 10-th and 20-th day. Our main goal was to count the birds from the water surface and, in order to do that, we walked on the bevel – a place with good visibility. The amount of the birds found in big number was two times estimated, resulting mean values, and the strengths of the weakly represented species were precisely numbered. A particular care was to avoid as possible the double counting. The birds were visually and auditory identified. Two binoculars (10x50), a spotting scope (14-45x50) and a camera (42x optical zoom) were used.

The scientific norm and classification of the birds are compatible with the Hamlin Guide (Bruun *et al.*, 1999).

Figure 2. Aerial view of the Goleşti Basin, by Google Earth.

Results and discussion

During the above mentioned interval of time, 91 species of birds were identified. They represent less than a half of the 199 species recorded here during the preceding study (Conete *et al.*, 2012) and this is mainly explained by the fact the period of monitoring was much shorter (a year versus eight years). So, if we eliminate the 86 subrecedent species from the Dzuba index of ecological significance point of view (that means rare and very rare species, represented by few individuals) previously recorded, we obtain a figure which is closer to the one registered now.

The species currently observed belong to 13 orders (Gaviiformes – 1 species, Podicipediformes – 4 species, Pelecaniformes – 3 species, Ciconiiformes – 7 species, Anseriformes – 13 species, Falconiformes – 6 species, Galliformes – 2 species, Gruiformes – 2 species, Charadriiformes – 20 species, Cuculiformes – 1 species, Apodiformes – 1 species, Coraciiformes – 1 species, Piciformes – 1 species and Passeriformes, the most numerous – 31 species), 4 (Columbiformes, Strigiformes, Caprimulgiformes and Piciformes) less than during 2003-2010.

53 species are totally or partially dependent on wetlands (Table 1). They belong to 9 orders: Gaviiformes – 1 species, Podicipediformes – 4 species, Pelecaniformes – 3 species, Ciconiiformes – 7 species, Anseriformes – 13 species, Falconiformes – 1 species, Gruiformes – 2 species, Charadriiformes, the best represented – 20 species, and Passeriformes – 2 species.

The number of species was the biggest in April (35) and August (40), corresponding to the migration periods (Table 2). A relatively big number was recorded in May – July (between 26 and 30 species), in the breeding period for the most of the species, while in the hiemal season, their number was, generally the

lowest (between 22 and 28). For the species dependent on wetlands, the principal maximum was in February (18 species) and the secondary one, in August (15 species); in April was registered the third peak (10 species). In the breeding period, the number of species was generally low (minimum 4 species, in May), while in the hiemal season the number of species increased from November (5 species) to February (18 species, as previously shown).

The 45,961 individuals counted along the year had a different dynamics (Table 2). The biggest strength was noticed in February (8,372 individuals) while lower peaks were recorded in August (7,505 individuals) and November (7,209 individuals). The maximum is over 45% of the one registered on all the basins from the Argeş River, upstream Piteşti, before 1980 (Munteanu and Mătieş, 1983), a number which is very close to that recorded currently only on five basins from the segment of the Argeş River between Vâlcele and Goleşti (Mestecăneanu and Gava, 2016a). The lowest values were between April and June (the minimum, in May – 184 individuals), but a small number was also registered in December (1,254 individuals). As regard the strength of the species dependent on wetlands, which totalised 44,078 individuals, the dynamics varied identically, but the values were lower than the firsts with 69 (in December) to 382 individuals (in the passage from September), that show that the input of the non-wetland species was small (it must be more significant, our attention being focused on the other group of species). The scarcity of individuals from April to June was also noticed on all the basins from the upper and middle course of the Argeş River until 1980, when 84 aquatic species were counted (Munteanu and Mătieş, 1983).

These reflect the migration periods, mainly for the birds dependent on wetlands, and, also, show that the Goleşti Basin is a very attractive place of wintering, when a moderate number of species provides a relative big number of individuals. As well as over 30 years ago (Munteanu and Mătieş, 1983), even now the basin is not good for breeding, because of the limited perimeter of aquatic and amphibious vegetation, but, in the future the situation is expected to become more favourable as a consequence of the developing of the natural silting and afforesting processes. Beside the intrinsic factors (the fluctuation of the water level, the variation of the food supply and shelters, in the cold time in relation with the gradual freezing or thawing of the water surface, that determine the migration etc.), the local dynamics of the avifauna can be negatively influenced by the anthropogenic elements (fishing, hunting, pasturage and other intrusions), as we discussed before (Mestecăneanu and Gava, 2015b, 2016a, c) but also positively, because large interventions on the surrounding dam lakes (the complete desiccations or the presence of many boats on the water, for instance) determine many birds to move, and thus to increase temporarily the number of individuals and species from here.

A correlation with the surface covered with ice cannot be made, because this was reduced (ca. 5%) and it was formed only in January. Instead, a simple correlation between the number of species dependent on wetland and the number of

fishermen can be obtained: it is -0.14 (negative and weak correlation) while the one between the number of individuals for the same species and the number of fishermen is -0.35 (negative and acceptable correlation, by Colton, 1974). That means that the fishermen affect to a certain extent the presence of the birds in the area, even if they were observed both on banks and on boats only in 75% of samples, with a maximum density (in April and October) of 0.04 persons/ha.

Table 1.

The occurrence along the year and some ecological indexes.

No.	Species	January	February	March	April	May	June	July	August	September	October	November	December	Absolute abundance	Class of constancy	Class of dominancy	Class of Dzuba index
	I. **Gaviiformes**																
1	*Gavia arctica* (Linnaeus, 1758)*												+	1	C1	D1	W1
	II. **Podicipediformes**																
2	*Podiceps cristatus* (Linnaeus, 1758)*	+	+	+	+	+	+	+	+	+	+	+	+	760	C4	D2	W3
3	*Podiceps grisegena* Boddaert, 1783*								+					2	C1	D1	W1
4	*Podiceps nigricollis* Brehm, 1831*				+									2	C1	D1	W1
5	*Tachybaptus ruficollis* (Pallas, 1764)*		+								+			13	C1	D1	W1
	III. **Pelecaniformes**																
6	*Phalacrocorax carbo* (Linnaeus, 1758)*	+		+		+	+	+	+	+	+	+	+	301	C4	D1	W2
7	*Phalacrocorax pygmeus* (Pallas, 1773)*	+		+								+	+	52	C2	D1	W1
8	*Pelecanus crispus* Bruch, 1832*						+		+					13	C1	D1	W1
	IV. **Ciconiiformes**																
9	*Ixobrychus minutus* (Linnaeus, 1766)*							+						1	C1	D1	W1
10	*Egretta garzetta* (Linnaeus, 1766)*				+	+	+	+	+					90	C2	D1	W1
11	*Egretta alba* (Linnaeus, 1758)*		+		+					+				4	C1	D1	W1
12	*Ardeola ralloides* (Scopoli, 1769)*					+								1	C1	D1	W1
13	*Ardea cinerea* Linnaeus, 1758*	+	+		+			+	+	+	+			79	C3	D1	W2

No.	Species	January	February	March	April	May	June	July	August	September	October	November	December	Absolute abundance	Class of constancy	Class of dominancy	Class of Dzuba index
14	*Nycticorax nycticorax* (Linnaeus, 1758)*					+	+	+						13	C1	D1	W1
15	*Ciconia ciconia* (Linnaeus, 1758)*						+	+						2	C1	D1	W1
	V. **Anseriformes**																
16	*Cygnus olor* (Gmelin, 1789)*	+	+	+	+	+	+	+	+	+		+	+	173	C4	D1	W2
17	*Cygnus cygnus* (Linnaeus, 1758)*		+											9	C1	D1	W1
18	*Anser albifrons* (Scopoli, 1769)*	+											+	660	C1	D2	W2
19	*Anas platyrhynchos* Linnaeus, 1758*	+	+	+	+	+	+	+	+	+	+	+	+	13812	C4	D5	W5
20	*Anas penelope* Linnaeus, 1758*		+	+									+	50	C1	D1	W1
21	*Anas querquedula* Linnaeus, 1758*				+				+	+				278	C1	D1	W2
22	*Anas crecca* Linnaeus, 1758*	+	+	+	+				+	+	+	+	+	20023	C3	D3	W3
23	*Anas clypeata* Linnaeus, 1758*						+		+					19	C1	D1	W1
24	*Tadorna tadorna* (Linnaeus, 1758)*		+						+			+		49	C1	D1	W1
25	*Aythya fuligula* (Linnaeus, 1758)*	+	+	+	+			+	+	+	+	+		5209	C3	D5	W4
26	*Aythya ferina* (Linnaeus, 1758)*	+	+	+	+		+	+	+	+	+	+		10770	C4	D5	W5
27	*Aythya nyroca* Güldenstädt, 1770*							+						2	C1	D1	W1
28	*Bucephala clangula* (Linnaeus, 1758)*	+	+	+									+	252	C2	D1	W2
	VI. **Falconiformes**																
29	*Buteo buteo* (Linnaeus, 1758)	+	+		+						+		+	19	C2	D1	W1
30	*Circus aeruginosus* (Linnaeus, 1758)*				+									3	C1	D1	W1
31	*Falco subbuteo* Linnaeus, 1758						+							1	C1	D1	W1
32	*Falco vespertinus* Linnaeus, 1766									+				1	C1	D1	W1
33	*Falco tinnunculus* Linnaeus, 1758			+	+	+		+	+			+		11	C2	D1	W1
	VII. **Galliformes**																
34	*Phasianus colchicus* Linnaeus, 1758	+	+								+			14	C1	D1	W1
35	*Coturnix coturnix* (Linnaeus, 1758)					+								1	C1	D1	W1

No.	Species	January	February	March	April	May	June	July	August	September	October	November	December	Absolute abundance	Class of constancy	Class of dominancy	Class of Dzuba index
	VIII. **Gruiformes**																
36	*Gallinula chloropus* (Linnaeus, 1758)*					+								1	C1	D1	W1
37	*Fulica atra* Linnaeus, 1758*	+	+	+	+	+	+	+		+	+	+	+	9831	C4	D3	W3
	IX. **Charadriiformes**																
38	*Vanellus vanellus* (Linnaeus, 1758)*			+			+		+	+				39	C2	D1	W1
39	*Charadrius dubius* Scopoli, 1786*				+				+					8	C1	D1	W1
40	*Gallinago gallinago* (Linnaeus, 1758)*								+					1	C1	D1	W1
41	*Limosa limosa* (Linnaeus, 1758)*								+					1	C1	D1	W1
42	*Calidris alpina* (Linnaeus, 1758)*								+					1	C1	D1	W1
43	*Calidris minuta* (Leisler, 1812)*								+					2	C1	D1	W1
44	*Actitis hypoleucos* (Linnaeus, 1758)*							+	+					25	C1	D1	W1
45	*Tringa ochropus* Linnaeus, 1758*	+	+		+				+					10	C2	D1	W1
46	*Tringa glareola* Linnaeus, 1758*								+					22	C1	D1	W1
47	*Tringa nebularia* (Gunnerus, 1767) *								+					4	C1	D1	W1
48	*Philomachus pugnax* (Linnaeus, 1758)*								+					4	C1	D1	W1
49	*Recurvirostra avosetta* Linnaeus, 1758*				+									7	C1	D1	W1
50	*Himantopus himantopus* (Linnaeus, 1758)*								+					30	C1	D1	W1
51	*Larus argentatus* Pontoppidan, 1763*	+	+	+	+	+	+	+	+	+	+	+	+	2236	C4	D2	W3
52	*Larus canus* Linnaeus, 1758*	+								+		+	+	2025	C2	D2	W2
53	*Larus ridibundus* Linnaeus, 1766*	+	+	+	+	+	+	+	+	+	+	+	+	13163	C4	D5	W5
54	*Larus minutus* Pallas, 1776*								+					4	C1	D1	W1
55	*Chlidonias niger* (Linnaeus, 1758)*								+					9	C1	D1	W1

No.	Species	January	February	March	April	May	June	July	August	September	October	November	December	Absolute abundance	Class of constancy	Class of dominancy	Class of Dzuba index
56	*Chlidonias hybridus* (Pallas, 1811)*						+	+						24	C1	D1	W1
57	*Sterna hirundo* Linnaeus, 1758*				+	+	+	+						30	C2	D1	W1
	X. **Cuculiformes**																
58	*Cuculus canorus* Linnaeus, 1758					+								1	C1	D1	W1
	XI. **Apodiformes**																
59	*Apus apus* (Linnaeus, 1758)					+								32	C1	D1	W1
	XII. **Coraciiformes**																
60	*Upupa epops* Linnaeus, 1758			+	+									5	C1	D1	W1
	XIII. **Passeriformes**																
61	*Galerida cristata* (Linnaeus, 1758)		+							+				6	C1	D1	W1
62	*Alauda arvensis* Linnaeus, 1758			+	+	+	+							10	C2	D1	W1
63	*Riparia riparia* (Linnaeus, 1758)					+	+		+					251	C1	D1	W1
64	*Hirundo rustica* Linnaeus, 1758				+	+	+	+	+	+				204	C2	D1	W2
65	*Delichon urbica* (Linnaeus, 1758)						+	+						90	C1	D1	W1
66	*Anthus trivialis* (Linnaeus, 1758)				+									9	C1	D1	W1
67	*Anthus spinoletta* (Linnaeus, 1758)										+			40	C2	D1	W1
68	*Motacilla flava* Linnaeus, 1758				+	+	+	+	+					32	C2	D1	W1
69	*Motacilla alba* Linnaeus, 1758			+	+			+	+	+	+			136	C2	D1	W1
70	*Sturnus vulgaris* Linnaeus, 1758			+	+	+	+			+	+	+		371	C3	D1	W2
71	*Pica pica* (Linnaeus, 1758)	+	+	+	+	+	+	+	+	+	+	+	+	391	C4	D1	W2
72	*Corvus monedula* Linnaeus, 1758	+	+	+		+	+	+	+	+	+	+	+	1260	C4	D1	W2
73	*Corvus frugilegus* Linnaeus, 1758	+	+	+	+	+	+		+	+	+	+	+	1104	C4	D1	W2

No.	Species	January	February	March	April	May	June	July	August	September	October	November	December	Absolute abundance	Class of constancy	Class of dominancy	Class of Dzuba index
74	*Corvus corone cornix* Linnaeus, 1758	+	+	+		+			+	+		+	+	21	C3	D1	W1
75	*Corvus corax* Linnaeus, 1758	+	+	+	+						+	+	+	41	C3	D1	W1
76	*Prunella modularis* (Linnaeus, 1758)										+			5	C1	D1	W1
77	*Acrocephalus palustris* Bechstein, 1798*						+							30	C1	D1	W1
78	*Sylvia communis* Latham, 1787					+								4	C1	D1	W1
79	*Phylloscopus collybita* Vieillot, 1817								+					17	C1	D1	W1
80	*Oenanthe oenanthe* (Linnaeus, 1758)				+									6	C1	D1	W1
81	*Luscinia luscinia* (Linnaeus, 1758)								+					2	C1	D1	W1
82	*Remiz pendulinus* (Linnaeus, 1758)*							+						8	C1	D1	W1
83	*Passer domesticus* (Linnaeus, 1758)			+			+			+		+		245	C2	D1	W1
84	*Passer montanus* (Linnaeus, 1758)						+		+					211	C1	D1	W1
85	*Fringilla coelebs* Linnaeus, 1758										+			47	C1	D1	W1
86	*Carduelis chloris* (Linnaeus, 1758)				+						+			35	C1	D1	W1
87	*Carduelis spinus* (Linnaeus, 1758)											+		7	C1	D1	W1
88	*Carduelis carduelis* (Linnaeus, 1758)			+		+					+		+	65	C2	D1	W1
89	*Carduelis cannabina* (Linnaeus, 1758)		+		+							+	+	24	C2	D1	W1
90	*Miliaria calandra* (Linnaeus, 1758)		+	+	+	+	+				+	+		34	C3	D1	W1
91	*Emberiza citrinella* Linnaeus, 1758	+									+	+		188	C1	D1	W1

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 dynamics of the species and their strengths.

Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Number of species	24	28	27	35	28	30	26	42	24	26	25	22
Number of individuals	6,163	8,372	2,316	607	184	542	1,582	7505	3,278	6,949	7,209	1,254
Number of species*	8	18	7	10	4	6	6	15	6	6	5	6
Number of individuals*	6,036	8,300	2,189	523	49	354	1,477	7,228	2,896	6,767	7,074	1,185

Legend: * - birds that depend on wetlands.

Reffering to the ecological indexes, regarding the constancy, 57 species (62.64%) were occasional (C1), 16 species (17.58%) were accessory (C2), 7 species (7.69%) were constant (C3) and 11 species (12.09%) were euconstant (C4), (Table 1, Fig. 3). The euconstant species were: *Podiceps cristatus*, *Phalacrocorax carbo*, *Cygnus olor*, *Anas platyrhynchos*, *Aythya ferina*, *Fulica atra*, *Larus argentatus*, *Larus ridibundus*, *Pica pica*, *Corvus monedula*, and *Corvus frugilegus*. *Podiceps cristatus*, *Anas platyrhynchos*, *Larus argentatus*, *Larus ridibundus* and *Pica pica* were observed every month, *Cygnus olor*, *Fulica atra*, *Corvus monedula*, and *Corvus frugilegus* were observed 11 times and *Phalacrocorax carbo* and *Aythya ferina* were observed 10 times (Table 1). *Pica pica*, *Corvus monedula*, and *Corvus frugilegus* (all residents, omnivorous, from Corvidae family) are the only non-wetland birds, while the others are birds adapted to the wetlands. *Larus argentatus* was represented by two subspecies: *L. cachinnans* and *L. michahellis* (different species, by other classifications), where the last, which breeds in Piteşti, was encountered all year round.

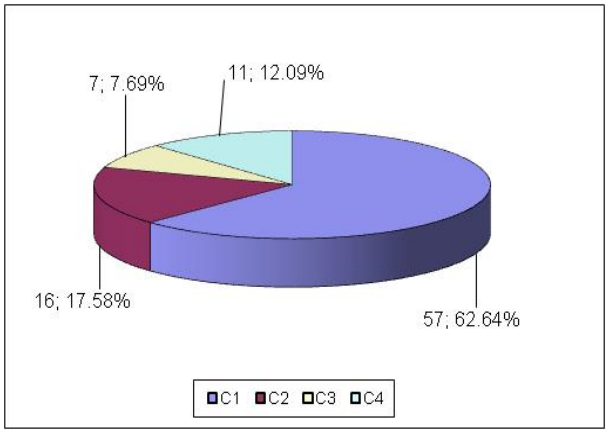

Figure 3. The species distribution according to the index of constancy (C1 – accidental species, C2 – accessory species, C3 – constant species, C4 – euconstant species).

By the dominance (Table 1, Fig. 4), the majority of the species (81) were subrecedent (89.09%). Only 4 (4.40%) were recedent, 2 (2.20%) were subdominant, and 4 (4.40%) were eudominant. It is surprising the absence of the dominant species. The distribution of the assembly suggests a large discrepancy between a big number of species represented by few individuals and a small number of species represented by many individuals, as we saw in other occasion, too (Mestecăneanu and Gava, 2016a). The group of the eudominant species is constituted by three species of Anseriformes (*Anas platyrhynchos*, *Aythya fuligula*, and *Aythya ferina*) and one species of Charadriiformes (*Larus ridibundus*). They are species with a vast range of food items (omnivorous, the first three, and zoofagous-polyfagous, the last one), and except *Aythya fuligula*, mainly winter visitor, the others are preponderantly partial migratory in our country (Bruun *et al*., 1999). Before 1980, *Anas platyrhynchos* was the most abundant species on the Argeş basins, too; it was followed by *Anas crecca*, *Anas querquedula*, *Vanellus vanellus* and then by *Larus ridibundus* (Munteanu and Mătieş, 1983).

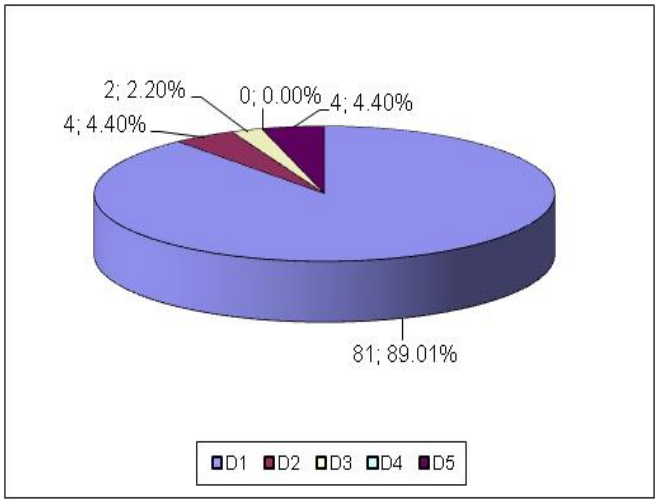

Figure 4. The species distribution according to the index of dominancy (D1 – subrecedent species, D2 – recedent species, D3 – subdominant species, D4 – dominant species, D5 – eudominant species).

By the Dzuba index of ecological significance, that takes into consideration both constancy and dominance, the most of the species (72) were subrecedent (89.09%); 11 (12.09%) were recedent, 4 (4.40%) were subdominant, 1 (1.10%, *Aythya fuligula*) was dominant and 3 (3.30%, *Anas platyrhynchos*, *Aythya ferina*, and *Larus ridibundus*) were eudominant (Table 1, Fig. 5).

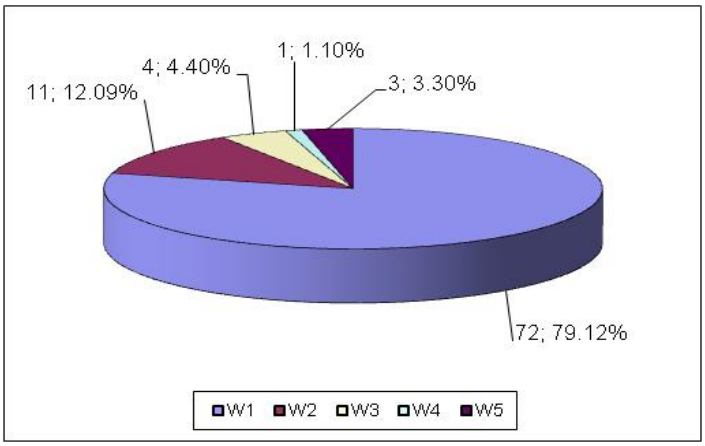

Figure 5. The species distribution according to the index of Dzuba ecological significance (W1 – subrecedent species, W2 – recedent species, W3 – subdominant species, W4 – dominant species, W5 – eudominant species).

Anas platyrhynchos had the biggest strength in February (4,100 individuals) and November (3,212 individuals), but big numbers were also registered in January (2,100) and October (2,000). The fewest individuals were observed in May (8 individuals) and generally between April and July (bellow 119). Even if it was a constant presence, the species is only probable breeding in the area. *Aythya ferina* had the biggest strengths in October (2,530 individuals) and February (2,350 individuals). The lowest numbers were registered from March to June, and in September. In May the figure was zero, the species being only possible breeding. Unexpectedly, the strength was null in December, too, when also the general number of all the observed species was low, by comparison to the one recorded in the other months of the hiemal season and on the other basins from the Argeş River at this time, fact that suggests a massive derange just before our visit. *Larus ridibundus* had the maximum strength in August (3,184 individuals) and in January (1,150 individuals). During the rest of the year it was lower, inclusively in December, usually one of the best represented months. Although it was registered in every field trip, it is only a possible breeder in the area (Fig. 6).

Regarding the density of these species (Table 3), we observe that *Anas platyrhynchos* attains 6.06 individuals/ha in February and 4.42 individuals/ha in November, *Aythya ferina* reaches 3.72 individuals/ha in October and 3.46 individuals/ha in February, and *Larus ridibundus* arrives to 4.68 individuals/ha in August and 1.69 individuals/ha, in January. All of them have 9.59 individuals/ha in February and 8.21 individuals/ha in August. In the same time, all the recorded species attain 12.31 individuals/ha in February and 11.04 individuals/ha in August, while the species dependent on wetlands have 12.21 individuals/ha in February, respectively 10.40 individuals/ha in August. Big values also

characterised October and November. Beside the very obvious migration of *Larus ridibundus* noticed in August, the increasing of the ratio stated now can be related to some species of Anseriformes and Charadriiformes: because they find shelter and food, the first ones gather on the basin for moulting from inadequate waters of the area and the second ones halt here in migration. Over 30 years ago, this density had maximum 15 individuals/ha (Munteanu and Mătieş, 1983), but the considered area is not clearly mentioned.

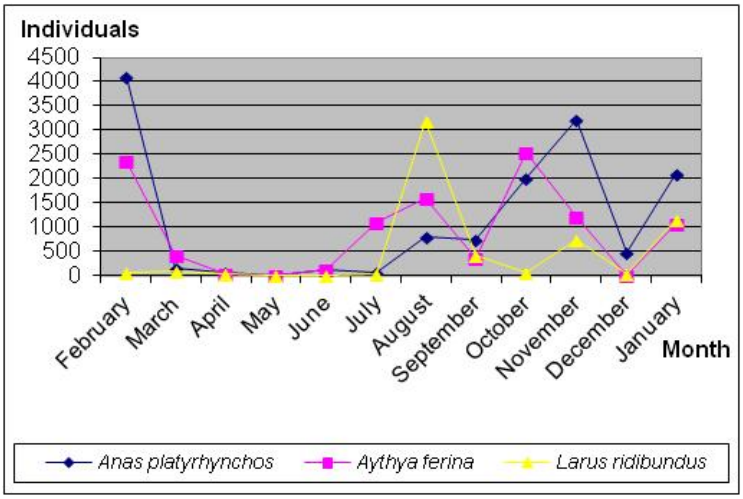

Figure 6. The monthly variation of the strength for the eudominant species from the Dzuba index point of view.

Table 3.

The monthly and yearly number of individuals/ha for some species.

Period	January	February	March	April	May	June	July	August	September	October	November	December	Total
Anas platyrhynchos	3.09	6.03	0.22	0.07	0.01	0.18	0.08	1.18	1.10	2.94	4.72	0.69	20.31
Aythya ferina	1.54	3.46	0.62	0.06	0.00	0.19	1.62	2.35	0.51	3.72	1.76	0.00	15.84
Larus ridibundus	1.69	0.10	0.11	0.04	0.00	0.01	0.06	4.68	0.62	0.08	1.10	0.02	8.52
Eudominant species	6.32	9.59	0.95	0.17	0.01	0.38	1.75	8.21	2.24	6.74	7.59	0.71	44.67
All species	9.06	12.31	3.41	0.89	0.27	0.80	2.33	11.04	4.82	10.22	10.60	1.84	67.59
Wetland species	8.88	12.21	3.22	0.77	0.07	0.52	2.17	10.63	4.26	9.95	10.40	1.74	64.82

By the index of relation (IR), as a result of the specific dominance, Anseriformes and Charadriiformes were the overdominant orders, the first with 72.02% and the second with 15.77%. There were not dominant orders, because the others are complementary (Fig. 7).

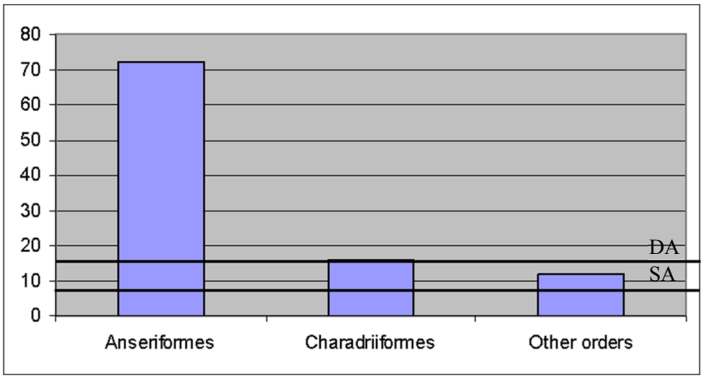

Figure 7. The participation of the orders to the formation of the avicoenose, by the index of relation – IR (SA – the static axis, DA – the dominance axis).

The monthly dynamics (Fig. 8) shows Anseriformes permanently placed in the overdominant zone, except May, when it was complementary. Charadriiformes was overdominant in August, September and January, dominant in March, April, November and December, and complementary in the rest of the year. Together, the other orders were overdominant in May, especially due to the Passerifiormes, but also in March, April, June, July and September, on the background of the smaller strengths of Anseriformes and Charadriiformes.

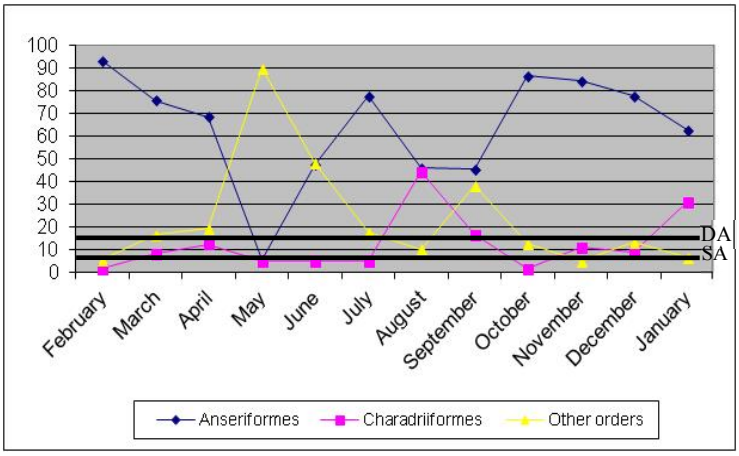

Figure 8. The monthly dynamic of the orders, by the IR (SA – the static axis, DA – the dominance axis).

Within the Anseriformes order (Fig. 9), *Anas platyrhynchos*, *Aythya ferina* and *Aythya fuligula* were the overdominant species, while the others are complementary, and within the Charadriiformes order (Fig. 10), *Larus ridibundus* and *Larus argentatus* were the overdominant species, *Larus canus* was the dominant species and the others were complementary.

The monthly dynamics of the species do not reveal continuous overdominant species (Fig. 11, Fig. 12). However, most of the time, *Anas platyrhynchos* and *Aythya ferina*, respectively *Larus ridibundus* and *Larus argentatus*, were in the overdominance zone. *Aythya fuligula* was overdominant in March, April and October, November, and *Larus canus* only in January. Notable is the group of the other species which was also overdominant in April, May, August, September and December (due to the presence of *Anser albifrons*), among the Anseriformes, and between April and July (due to *Recurvirostra avosetta*, *Sterna hirundo*, *Vanellus vanellus*, or *Chlydonias hybridus*), among the Charadriiformes.

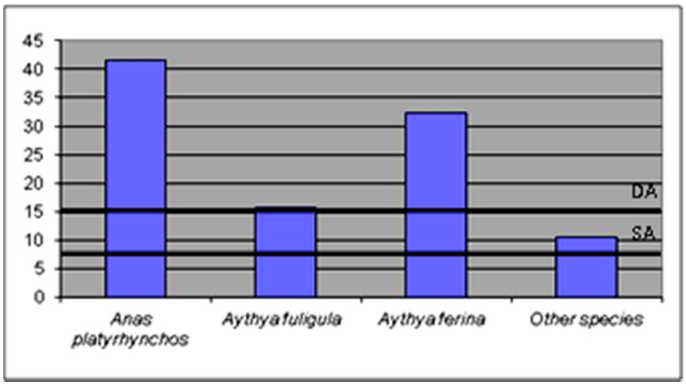

Figure 9. The participation of the species to the Anseriformes coenose, by the IR (SA – the static axis, DA – the dominance axis).

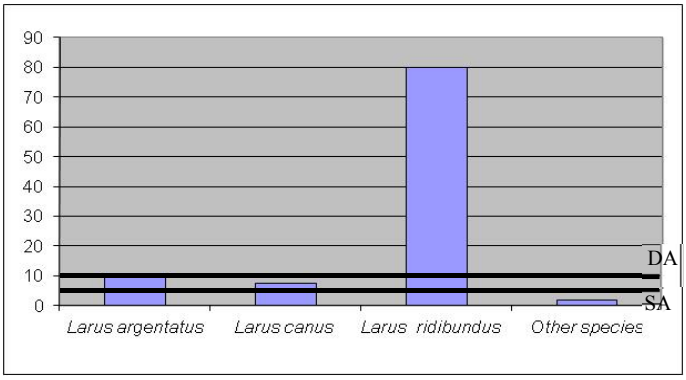

Figure 10. The participation of the species to the formation of Charadriiformes coenose, by the IR (SA – the static axis, DA – the dominance axis).

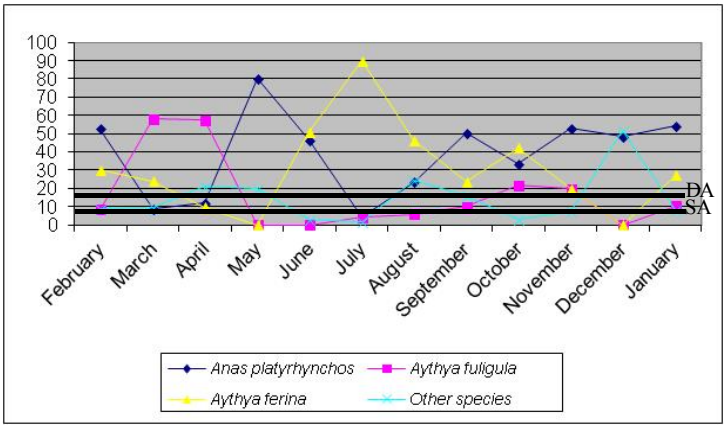

Figure 11. The monthly dynamic of the species inside the Anseriformes order, by the IR (SA – the static axis, DA – the dominance axis).

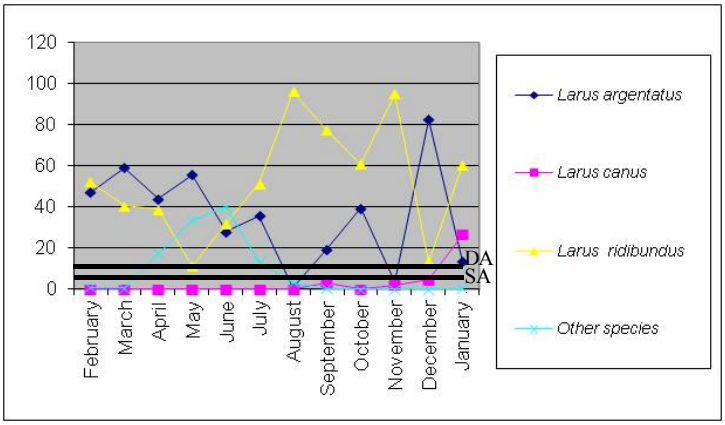

Figure 12. The monthly dynamic of the species inside the Charadriiformes order, by the IR (SA – the static axis, DA – the dominance axis).

Regarding the protection, 21 species (23.07%: *Gavia arctica*, *Phalacrocorax pygmeus*, *Pelecanus crispus*, *Ixobrychus minutus*, *Egretta garzetta*, *Egretta alba*, *Ardeola ralloides*, *Nycticorax nycticorax*, *Ciconia ciconia*, *Cygnus cygnus*, *Aythya nyroca*, *Circus aeruginosus*, *Calidris alpina*, *Tringa glareola*, *Philomachus pugnax*, *Recurvirostra avosetta*, *Himantopus himantopus*, *Larus minutus*, *Chlidonias niger*, *Chlidonias hybridus*, and *Sterna hirundo*) included in the Annex I by the Birds Directive – the Council Directive 2009/147/EC were observed in the perimeter of the basin. All of them are species dependent on wetlands and represent 39.62%.

Measures for the habitat protection to assure their survival and reproduction in their area of distribution must be applied (http://ec.europa.eu/environment/nature/legislation/). Among them, *Phalacrocorax pygmeus*, *Egretta garzetta* and *Sterna hirundo* are accessory. *Phalacrocorax pygmeus* was observed mainly in the hiemal season, and *Egretta garzetta* and *Sterna hirundo* were registered in the breeding period; they are possible, respectively probable breeding species on the basin. Regarding the dominance, all the species from the Annex are subrecedent. The most abundant were *Egretta garzetta* (90 individuals) and *Phalacrocorax pygmeus* (52 individuals).

Conclusions

The avifauna observed between February 2013 and January 2014 on the Goleşti Basin was diverse, with 91 species that belong to 13 orders. Among them, 53 are totally or partially dependent on wetlands.

The dynamics of the species and their strengths shows maximums that correspond to the migration and wintering times. Because of the unsatisfactory conditions, the breeding period was characterised by few species and individuals. The fluctuations reflect both the natural processes and the human pressure, a negative correlation between the fishing and the birds' number being shown.

It seems to be an increase of the number of the individuals in relation to the strengths recorded in the zone of the basins over 30 years ago, but the fact is unclear because of the different method and area of data collecting. Some acts of euthrophication, the installation of vegetation and the climatic changes can be included here.

Several species (*Anas platyrhynchos*, *Aythya fuligula*, *Aythya ferina*, *Larus ridibundus*) were noticed due to their frequency and abundance. They trigger the dynamics of the local avifauna. As result, Anseriformes and Charadriiformes were the overdominant orders. The overdominant species were *Anas platyrhynchos*, *Aythya ferina* and *Aythya fuligula* inside the Anseriformes order, and *Larus ridibundus* and *Larus argentatus* inside the Charadriiformes order.

21 species are included in the Annex I by the Birds Directive; some of them are frequent species during winter (*Phalacrocorax pygmeus*), respectively summer (*Egretta garzetta* and *Sterna hirundo*). All of these and the big number of species and individuals justify the necessity of considering Goleşti Basin a protected area and the reason to diminish the negative anthropogenic impact as a priority in the future.

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