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RESEARCH STUDY ON THE BREEDING AVIFAUNA OF THE BASCOV RESERVOIR

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Abstract
The author conducted an ornithological study in the Bascov Reservoir area (a square of 2x2 km) and observed 102 breeding species; 83 (81%) of them are certain breeding species and 19 (19%) are probable breeding species. The results of the research were cumulated with those found in the Atlas of the breeding species of Romania. By relating them with the Atlas data, we noted that 83 of the 100 breeding species cited in the Atlas were again recorded during our study. Nineteen new breeding species were identified. Among the species dependent on wetlands, mention should be made of Ixobrychus minutus, Anas platyrhynchos, Fulica atra, Gallinula chloropus, Aythya ferina, etc., with relatively large numbers of individuals. The analysis showed a relatively larger number (66) of euconstant and constant species, which confirmed the wealth of food resources in the area during the nesting period. The specific richness on the Bascov Lake is represented by 119 species, a number that is consistent with the availability of the food resources and nesting places, as well as the somewhat fluctuating presence of predators (stray dogs), and the anthropocentric disturbance (sound and chemical pollution, etc.). The yearly increase in the number of reed clusters, the expansion of the surface of the islets, the emergence of bushes and trees, the ageing of the existing trees have led to a certain yearly increase in the number of breeding individuals in 45 species. But the anthropogenic influence in the area has eventually contributed to a decrease in the number of birds, both as a number of species and as a number of individuals. The study has also shown that in the farmland bird species the number of individuals is in decline. Most of the breeding species - 75 (representing 74%) in the area under research are migratory. Eighteen breeding species (17.64%) are listed in Annex I of the Birds Directive. The presence of the key breeding species in the area under research must be considered an important argument for the real protection of the respective area. We consider that the informational stress (the persistent noise pollution) as well as chemical pollution (chemical fertilizers, pesticides, detergents, etc.) affect in a certain measure not only the success rate of bird breeding but also the normal development of their offspring, at least in those species that are sensitive to the presence of humans. Under these circumstances, there may be unfortunate consequences on the orientation of birds during migration, in spite of the fact that they showed a considerable plasticity of the avian magnetic compass.

Keywords: breeding birds, ability to adjust.

1. INTRODUCTION

The Argeș River is the most important running water course in the Argeș county and a main affluent of the Danube River, originating at the confluence of the Buda and Capra streamlets (Barco & Nedelcu, 1974). A series of reservoirs was created on its course a few decades ago, resulting in a collection of successive dams (Fig. 1): Vidraru, Oiești, Curtea de Argeș, Vâlcele, Bascov, Pitești, Goleşti, etc. The reservoirs that were built had a significant impact on the surrounding landscape and influenced the structure and the temporal and spatial dynamics of the bird species living in the area (Mătieș, 1969; Munteanu & Mătieș, 1983; Gava, 1997; Gava et al, 2004; Conete, 2011).

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Due to silting the newly created reservoirs have become favourite areas for some bird species. Some come here to nest, most of them to spend the winter, and other species stop here during their passage, because the middle valley of the Argeş River is a continuation of the Rucăr – Bran corridor, one of the corridors used by migratory birds to cross the Carpathians (Mătieş, 1969). Thus, this area comprises one of the most important aquatic ecosystems of the Argeş River basin and subsequently, the highest concentrations of birds.

The attractiviteness of the reservoirs (anthropic aquatic ecosystem) for the avifauna is different. It is based on the water surface area, but also on the heterogeneity of the habitats adjacent to the reservoirs under research (Conete, 2014). In accordance with the degree of availability of the food resources and of nesting places, as well as with the more or less significant presence of predators, and, especially with the anthropogenic disturbance, the greatest wealth of breeding species was recorded on the lakes upstream of Pitesti (Conete, 2011). The greater the habitat diversity and the structural complexity or heterogeneity in a given area, the higher the specific diversity of the bird species (David, 2008; Laiolo, 2002; Rahbek et al, 2006; Conete, 2011).

The Bascov Reservoir, together with the following reservoirs: Zigoneni, Vâlcele, Budeasa, Piteşti and Goleşti, is part of the Argeş River Reservoirs (ROSPA0062 – „Lacurile de acumulare de pe Argeş"), a site that is included in the Natura 2000 network (Gava et al, 2007; Papp & Fântână, 2008; Conete, 2011). The construction of the Nature 2000 network is the result of the Habitats Directive and the Birds Directive, the legislation designed to protect the most threatened habitats and the species from Europe (Papp & Fântână, 2008). The great number of individuals and species observed here every winter is the foremost justification for its inclusion in this network. The Bascov Lake was also designated to be a protected natural area (avifaunistic special protection area) at the local level under the government resolution no. 30/2004 of the Argeş County Council (HG nr. 30/ 2004), due to its avifauna rich in species, predominantly Passeriformes.

The decline in the number of wild birds in Europe has been the result of the degradation of their habitat, the destruction of their nesting places, and the reduction in their natural food resources. These facts imposed special conservation measures (Munteanu, 2009). The reservoirs are important because they shelter many other protected species of the fauna (Gava, 1997; Gava et al, 2004; Conete et al, 2008; Conete, 2010). From this point of view, our research is in line with these efforts, as it has contributed to an increase in the knowledge regarding the birds in the area, especially the nesting birds.

2. MATERIALS AND METHODS

The Bascov Lake has a surface of 162 ha, and a maximum depth of 10. It is located at about 2 km upstream of the northern limit of the Municipality of Pitesti. The site is located in the administrative division of the Budeasa-Bascov village, at a distance of approximately 100 km from the source of the river. It is placed in the hill area, which is covered mainly with deciduous forests, orchards and agricultural crops. Due to the intense process of sedimentation and silting, three islets with a total surface of 28 ha (Fig. 1; Fig.2), with reed areas (at their edges), woods and groves were formed over the last 30 years of exploitation. The islets formed in the middle of the lake, as well as the banks and the upstream area are bordered by a typical lake vegetation stretching across vast areas (*Phragmites* and *Typha*), by authentic alder groves, bushes and willows, etc. (*Salix*, *Alnus*, *Populus etc.*), which offer favourable habitats for many bird species throughout the year. There are no dykes on the left bank of the lake, but the banks are high. On the right bank of the lake a sports training centre has been set up for the olympic games, with stands for spectators, accommodation for athletes, a hotel and restaurants (Conete, 2011).

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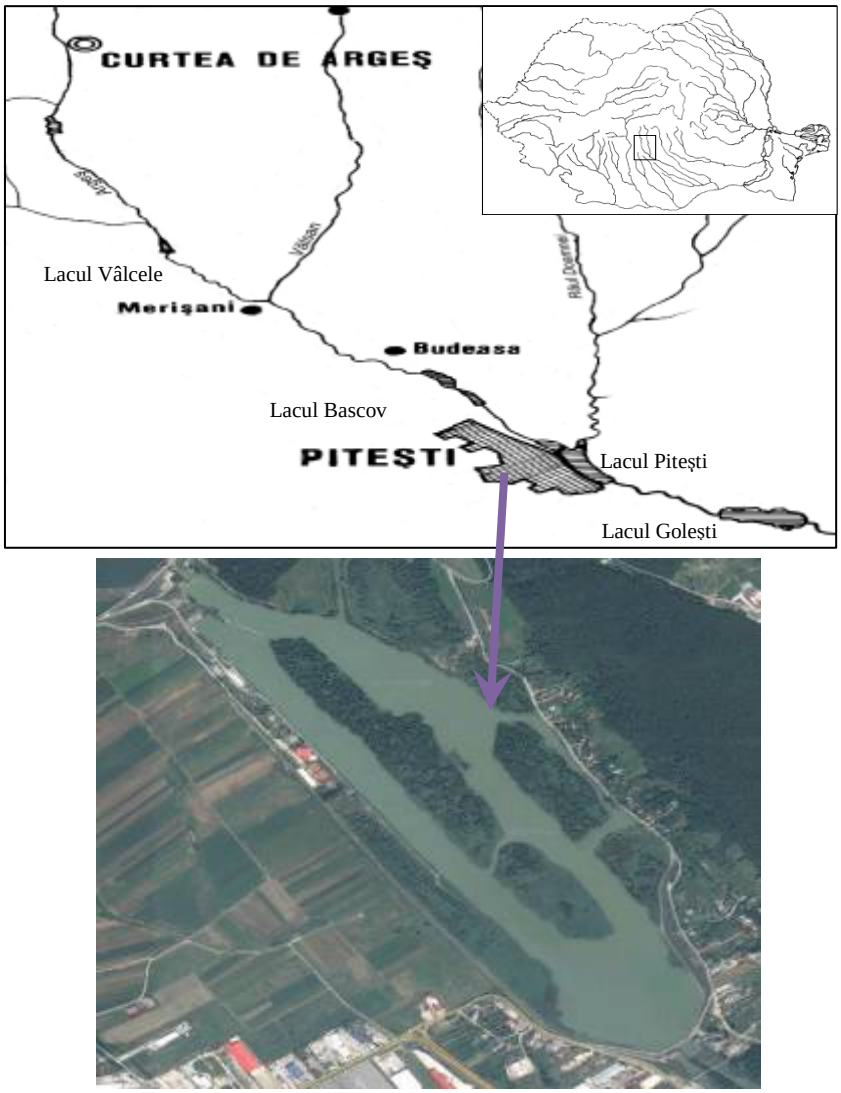

Figure. 1 The upper and middle hydrographical basin of the Argeş River. The Bascov Lake.

Initially, the process of silting and that of islet formation favoured the development of biodiversity; but the aggressive and permanent human intervention on these islets and near them, the training sessions and the noise pollution generated have finally led to a decline in the number of birds on this lake, both in the number of species and in the number of individuals. In 2007 the bottom of the Bascov Lake was dredged and, as a consequence, in the next years we recorded an increase in the number of diving ducks (pochards): *Aythya ferina*, *Aythya nyroca*, and *Aythya fuligula*. The hills, which border the lake on the left-hand side, are covered with vast areas of deciduous forests (oak, linden, beech, hornbeam, etc.) and orchards with fruit trees, which support a relatively rich avifauna taking into account its small surface. This rich avifauna can also be observed on the lake, where the birds come in search of food. Towards the end of the lake, on the left-hand bank there is a cluster of conifers, made up of trees of the *Pinus* species.

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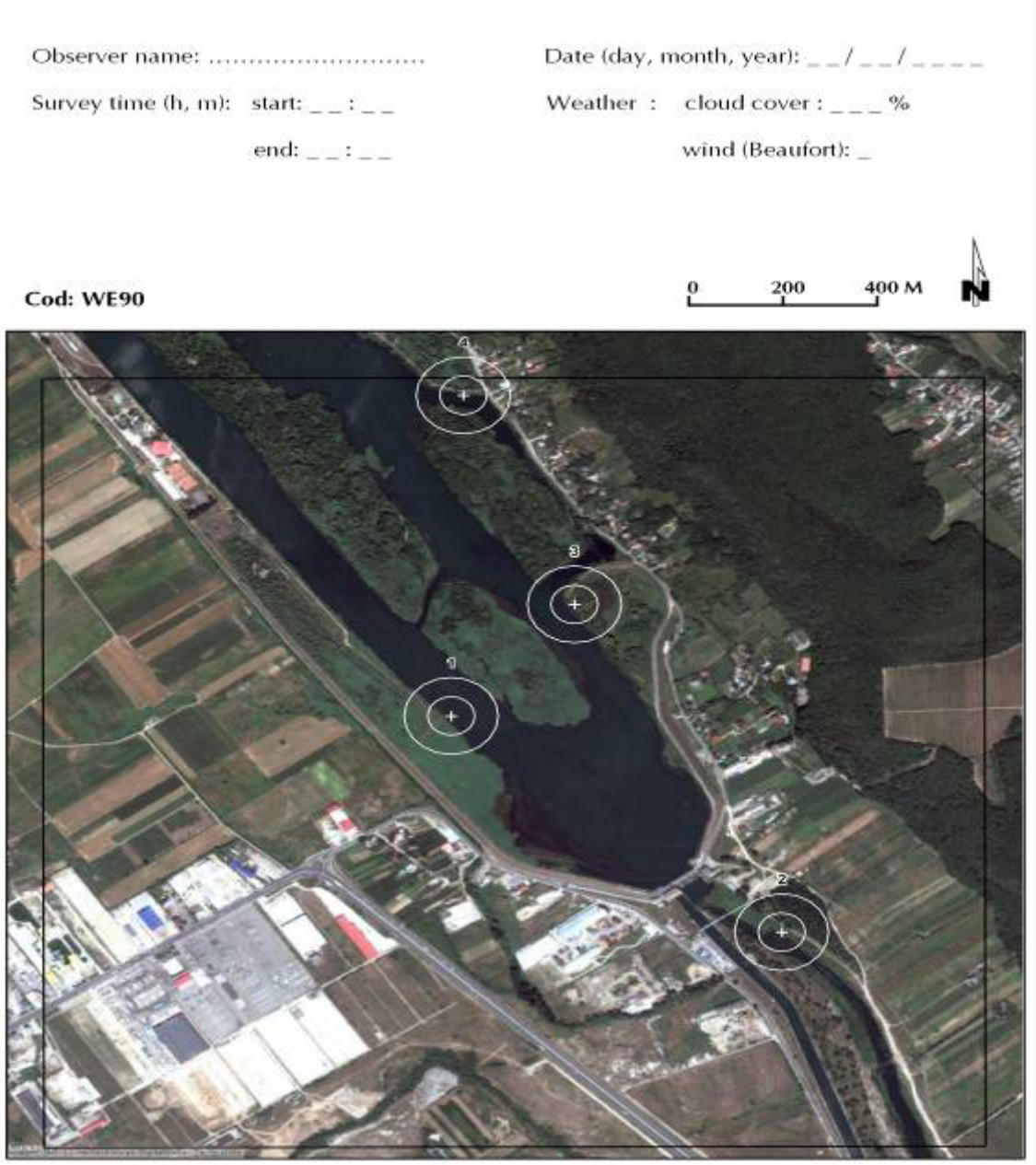

Figure 2. Square with pre-established points on the Bascov Lake

From the physical and chemical point of view, it is first-class water. The climate is temperate-continental. Its vegetation is characteristic of the water areas; it is represented by species of the genera: *Ceratophillum*, *Myriophyllum*, *Carex*, *Juncus*, *Phragmites*, *Typha*, *Salix*, *Alnus*, *Populus*, *Rosa*, *Rubus*, etc. The fauna is rich, the vertebrates (besides the bird species) being represented by fish (*Esox lucius*, *Cyprinus carpio*, *Perca fluviatilis*, *Leuciscus cephalus*, *etc.*), amphibians (*Hyla arborea*, *Bombina variegata*, *Rana ridibunda*, *Salamandra salamandra etc.*), reptiles (*Emys orbicularis*, *Natrix natrix*, *Natrix tesselata*, *Lacerta viris*, *Anguis fragilis*) and mammals (*Talpa europaea*, *Erinaceus europaeus*, *Apodemus agrarius*, *Arvicola terrestris*, *Ondatra zibethica*, etc.) (Conete, 2010).

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The research on the nesting avifauna in the area of the Bascov reservoir was conducted in the period April – July 2013 and the work was resumed and analyzed in April – July 2014. In the period 2013-2014 we also observed other phenological aspects.

The species were identified with the naked eye, by their auditory sounds and using a camera. The counting was done using a terrestrial telescope (10 x 45) and binoculars (10 x 50), with the help of the illustrated *"Hamlyn Guide"* to the Birds of Romania and Europe (Bruun-Delin-Svensson, 1999). To observe the species, we travelled to the site every month, around 5 a.m., according to the *General monitoring programme for acquatic and lake-nesting species* (http://monitorizareapasarilor.cndd.ro). We employed the itinerary method, the method of the fixed point observation, and we also resorted to observations on the lake and in the rush bed, sometimes using a boat. We walked on the banks of the reservoir in order to watch the avifauna of the entire water surface and the avifauna in its neighbourhood. Observation and counting were difficult in some areas, because the birds were hidden in the reed beds. In such cases, we employed the auditory method. Using a GPS system we also recorded their track in the square and at the established points.

The assessment area, which includes the Bascov Lake, is a square of 2x2 km (Fig. 2) inevitably comprising moist sites – wetlands (rivers, lakes, swamps, etc.). We used four field notebooks with four maps (one for each of the four travels/year), and a colour map of the square (Proiect). The main targets of this method are the birds characteristic of wetlands. The points we selected were obligatorily located in moist sites or in their vicinity (*Carex*, *Phragmites*, *Typha*, river, etc.).

3. RESULTS AND DISCUSSIONS

In the area under research, during the period of the prevernal, vernal and estival study in 2014 we identified 102 breeding species, belonging to 14 orders, 39 families and 74 genera (Table 1).

Table 1. List of breeding birds identified in the area under research

No.	Species	The Atlas of the breeding birds of Romania	Personal research	The minimum and the maximum of the estimated number (pairs)	Constancy during the breeding	Birds Directive	Breeding bird population trends
1.	*Tachybaptus ruficollis**	CB	CB	3- 6	C3		\
2.	*Podiceps cristatus**	CB	CB	1-2	C4		-
3.	*Ixobrychus minutus**	PB	CB	10-15	C4	AI	-
4.	*Nycticorax nycticorax**		CB	6-10	C4	AI	+
5.	*Ardeola ralloides**		PB	1-2	C2	AI	+
6.	*Ciconia ciconia**	CB	CB	2-3	C3	AI	-
7.	*Cygnus olor**		CB	1-1	C3	AII\2	-
8.	*Anas platyrhynchos**	CB	CB	14-24	C4	AII\1, AIII\1	-
9.	*Anas querquedula**	PB	PB	1-3	C3	AII\1	-
10.	*Aythya ferina**	PB	CB	3-10	C4	AII\1, AIII\2	+
11.	*Aythya nyroca**		PB	1-1	C2	AI	\

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12.	*Accipiter gentilis*	PB	PB	0-1	C2		-
13.	*Accipiter nisus*		PB	0-1	C2		-
14.	*Accipiter brevipes*	PB					
15.	*Circus aeruginosus**		CB	1-1	C3	AI	+
16.	*Buteo buteo*	CB	CB	1-2	C3		+
17.	*Falco tinnunculus*	PB	CB	1-1	C3		+
18.	*Falco vespertinus*	PB					
19.	*Falco subbuteo*		PB	0-1	C2		-
20.	*Perdix perdix*	CB	CB	1-3	C2	AII\1, AIII\1	\
21.	*Coturnix coturnix*	PB	CB	6-12	C3	AII\2	-
22.	*Phasianus colchicus*	CB	CB	4-10	C3	AII\1, AIII\1	+
23.	*Rallus aquaticus**	PB	CB	1-2	C2	AII\2	-
24.	*Crex crex*	PB					
25.	*Gallinula chloropus**	CB	CB	9-12	C4	AII\2	-
26.	*Fulica atra**	CB	CB	16-22	C4	AII\1, AIII\2	+
27.	*Charadrius dubius**	CB					
28.	*Vanellus vanellus **	PB	CB	6-14	C3	AII\2	+
29.	*Actitis hypoleucos**		PB	1-1	C2		+
30.	*Sterna hirundo**		CB	1-2	C4	AI	+
31.	*Chlidonias hybridus**		CB	1-1	C3	AI	+
32.	*Columba palumbus*	CB					
33.	*Columba oenas*	CB					
34.	*Streptopelia decaocto*	CB	CB	7-15	C4	AII\2	+
35.	*Streptopelia turtur*	CB	PB	1-2	C1	AII\2	\
36.	*Cuculus canorus*	CB	CB	2-3	C4		+
37.	*Otus scops*	PB	CB	1-2	C2		\
38.	*Athene noctua*	CB	CB	1-2	C1		-
39.	*Strix aluco*	PB					
40.	*Asio otus*	PB					
41.	*Caprimulgus europaeus*	CB	PB	0-1	C1	AI	\
42.	*Alcedo atthis**	CB	CB	2-3	C3	AI	+
43.	*Merops apiaster*	PB	PB	3-8	C2		-
44.	*Coracias garrulus*	CB	PB	0-1	C1	AI	\
45.	*Upupa epops*	CB	CB	1-2	C2		-
46.	*Jynx torquilla*	CB					
47.	*Picus canus*	CB					
48.	*Picus viridis*	CB	CB	2-3	C3		+
49.	*Dendrocopos major*	CB	CB	3-6	C2		+
50.	*Dendrocopos syriacus*	CB	CB	3-7	C3	AI	-
51.	*Dendrocopos medius*	CB	CB	1-3	C2	AI	-
52.	*Dendrocopos minor*	CB	CB	2-3	C3		+
53.	*Galerida cristata*	CB	CB	6-12	C3		\
54.	*Lullula arborea*	CB	CB	2-3	C3	AI	-
55.	*Alauda arvensis*	CB	CB	8-16	C4	AII\2	\
56.	*Riparia riparia*	CB	CB	9-16	C4		+
57.	*Hirundo rustica*	CB	CB	3-9	C4		-
58.	*Delichon urbica*	CB	CB	10-18	C4		+
59.	*Anthus campestris*		CB	1-2	C2	AI	-
60.	*Anthus trivialis*	PB	PB	1-3	C2		-

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61.	*Motacilla flava*	CB	CB	8-14	C4		-
62.	*Motacilla alba*	CB	CB	10-14	C4		-
63.	*Troglodytes troglodytes*	PB	CB	3-6	C2		+
64.	*Erithacus rubecula*	CB	CB	3-7	C3		-
65.	*Luscinia luscinia*	PB	PB	1-2	C2		+
66.	*Luscinia megarhynchos*	CB	CB	3-8	C4		-
67.	*Phoenichurus phoenichurus*	PB					
68.	*Phoenichurus ochruros*	CB	CB	3-7	C3		+
69.	*Saxicola rubetra*	PB	PB	0-1	C1		-
70.	*Saxicola torquata*	PB	CB	2-4	C3		+
71.	*Oenanthe oenanthe*	PB	CB	1-2	C2		-
72.	*Turdus merula*	CB	CB	6-12	C3	AII\2	+
73.	*Turdus philomelos*	CB	CB	2-5	C1	AII\2	-
74.	*Turdus viscivorus*		PB	1-2	C2	AII\2	-
75.	*Locustella fluviatilis**	CB	CB	3-5	C3		-
76.	*Locustella luscinioides**		CB	2-6	C3		+
77.	*Acrocephalus schoenobaenus**	CB	CB	8-16	C4		+
78.	*Acrocephalus scirpaceus**	CB	CB	7-12	C4		+
79.	*Acrocephalus arundinaceus**	CB	CB	5-10	C4		\
80.	*Acrocephalus palustris**		CB	6-10	C4		+
81.	*Hippolais icterina*	CB	PB	1-1	C1		\
82.	*Sylvia nisoria*	PB	PB	0-1	C1	AI	-
83.	*Sylvia curruca*	CB	CB	6-16	C4		+
84.	*Sylvia communis*	CB	CB	3-7	C4		-
85.	*Sylvia borin*		PB	1-2	C1		+
86.	*Sylvia atricapilla*	CB	CB	4-10	C4		-
87.	*Phylloscopus collybita*	CB	CB	8-20	C4		+
88.	*Muscicapa striata*	CB	CB	2-5	C2		-
89.	*Ficedula albicollis*		CB	2-3	C2	AI	-
90.	*Aegithalos caudatus*	CB	CB	6-10	C3		+
91.	*Parus palustris*	PB	CB	2-6	C2		-
92.	*Parus lugubris*	CB					
93.	*Cyanistes caeruleus*	CB	CB	5-9	C4		+
94.	*Parus major*	CB	CB	8-12	C4		+
95.	*Sitta europaea*	CB	CB	2-4	C2		\
96.	*Certhia familiaris*		CB	1-3	C2		+
97.	*Remiz pendulinus**		CB	1-2	C2		+
98.	*Oriolus oriolus*	CB	CB	3-6	C4		-
99.	*Lanius collurio*	CB	CB	6-9	C4	AI	+
100.	*Lanius excubitor*	PB	CB	1-2	C2		-
101.	*Garrulus glandarius*	CB	CB	3-8	C3	AII\2	+
102.	*Pica pica*	CB	CB	12-22	C4	AII\2	+
103.	*Corvus monedula*	CB					
104.	*Corvus corone cornix*	CB	CB	2-3	C3	AII\2	\
105.	*Corvus corax*	CB	CB	1-1	C3		+
106.	*Sturnus vulgaris*	CB	CB	10-18	C4	AII\2	+
107.	*Passer domesticus*	CB	CB	14-24	C4		-
108.	*Passer montanus*	CB	CB	10-22	C4		+
109.	*Fringilla coelebs*	CB	CB	6-14	C4		-
110.	*Serinus serinus*	CB					

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111.	*Carduelis chloris*	CB	CB	4-10	C4		-
112.	*Carduelis carduelis*	CB	CB	8-12	C4		+
113.	*Carduelis cannabina*	CB	PB	2-3	C2		\
114.	*Pyrrhula pyrrhula*	PB					
115.	*Coccothraustes coccothraustes*	CB					
116.	*Emberiza cirlus*	PB					
117.	*Emberiza citrinella*	CB	CB	6-12	C3		-
118.	*Miliaria calandra*	CB	CB	3-6	C3		\
119.	*Emberiza schoeniclus**		CB	4-7	C4		+

Note:
Breeding: CB - certain breeding species; PB – probable breeding species; C1 – accidental species, C2 – accessory species, C3 – constant species, C4 – euconstant species; Birds Directive: AI – Annex I; AII/1 – annex II, part 1; AII/2 – annex II, part 2; AIII/1 – annex III, part 1; AIII/2 – annex III, part 2;
Population trends: - – stable; + – increasing; \ – decreasing.
* - water dependent species.

The analysis of the avifauna as a whole, shows that out of the 185 species identified in the area of the Bascov Lake, 102 (representing 55%) are breeding species, and 83 species (representing 45%) are non-breeding species (which have not found here favourable conditions for breeding).
The results emphasize the dominance of the breeding species in the area (Table 1, Fig. 3). Eighty-three (81%) of the breeding species are certain breeding species, while 19 species (19%) are probable breeding species; 28 breeding species are dependent on wetlands (Table 1).

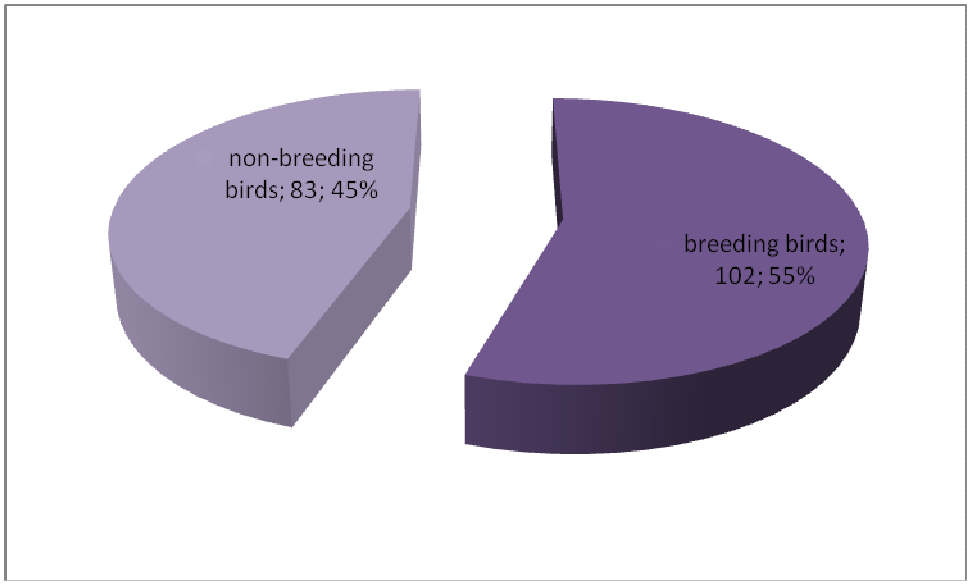

Figure 3. The percentage representation of breeding and non-breeding bird species

The results of the research were compared and cumulated (the KX 2 square with the side of 50 km, according to the U.T.M. system) with the data from the Atlas of the Breeding Birds of Romania (Munteanu et al, 2002).
By contrasting our data with those in the Atlas, we discovered that out of the 100 breeding species (certain or probable) cited in the Atlas, we found only 83 (71 certain breeding and 12 probable breeding), but we also identified 19 new breeding species, among which 12 are certain breeding species (*Nycticorax nycticorax, Cygnus olor, Circus aeruginosus, Sterna hirundo, Remiz*

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pendulinus, Anthus campestris, etc.) and 7 probable breeding species *(Ardeola ralloides, Aythya nyroca, Actitis hypoleucos, Accipiter nisus, Sylvia borin,* etc.). It should also be noted that the species *Aythya ferina, Falco tinnunculus, Rallus aquaticus, Coturnix coturnix, Vanellus vanellus, Otus scops, Saxicola torquata, Oenanthe oenanthe, Lanius excubitor, Parus palustris, etc.,* which are recorded in the Atlas of the Breeding Birds of Romania as probable breeding species, were found to be certain breeding species (Table 1).

Cumulated with the data in the Atlas of the Breeding Birds of Romania, the total number of the breeding birds in the area amounts to 119 species (Table 1).

We estimated the number of breeding individuals for each species and noticed that in the case of those species dependent on wetlands (Table 1), larger numbers of individuals were recorded for those breeding mostly in reed areas: *Ixobrychus minutus, Anas platyrhynchos, Fulica atra, Gallinula chloropus, Aythya ferina, Acrocephalus schoenobaenus, Acrocephalus scirpaceus,* etc. Other species nest on the banks, in the vegetation of the canals (*Sterna hirundo*), in holes in the banks (*Alcedo atthis, Riparia riparia, etc.*), or on the floating vegetation (*Podiceps cristatus, Chlidonias hybridus*); others can nest in trees (*Nycticorax nycticorax*) or on electric poles (*Ciconia ciconia*).

Although the left side of the lake does not have dykes on its entire surface, it still has high bank areas. Here we recorded only a few limicolous species whose number may increase considerably during autumnal season, if the water level is low. The secluded areas, which are less accessible to humans, as well as the body of woods formed on the islets, the groves and the woods on the left bank of the lake are used as nesting places by the little grebe, crested grebe, little bittern, mallard, moorhen, warblers, coot and numerous Passeriformes. In the upstream area of the lake, on the left bank, there is a small pine forest (*Pinus nigra*) which is the nesting place of many bird species, many of them searching for food on the lake. It is also the nesting place of a pair of kestrels. Many species that are common to these habitats (the quail, grey partridge, skylark, crested lark, yellow wagtail, tawny pipit, corn bunting, etc.) build their nests on the agricultural lands located near the right bank of the lake. The hills that border the lake on the left side are covered with vast deciduous forests and orchards with fruit trees, which support a relatively rich avifauna (comparative to its small size). The birds can also be seen on the lake, where they come to find food. We noticed a decrease in the number of farmland birds.

The relatively large number of breeding species in the area under research is the result of the variety of the existing habitats on the three islets, the ecotone areas, but also of the neighbouring areas located on the left bank of the lake (dense reed areas, a mosaic of *Phragmites,* bushes and trees, partially drained meadows, dry meadows, alder and willow forests, pine forests, bodies of old forests, open areas, etc.). The higher the habitat diversity and the structural heterogeneity of the area under research, the higher the ecological diversity.

The bird populations in the Bascov Lake area fluctuate in number dependent on the season. Thus, in winter, we recorded a considerable decrease in the number of species, but an increase in the number of individuals. The study showed an increase in most of the populations of these breeding species during the passage period, or during winter. The vicariation phenomenon is also present in some of them (*Tachybaptus ruficollis, Podiceps cristatus, Anas platyrhynchos,* and *Fulica atra,* etc.).

After calculating the constancy (ecological indices), 37 breeding species, representing 36% of the breeding avifauna (*Ixobrychus minutus, Nycticorax nycticorax, Anas platyrhynchos, Aythya ferina, Fulica atra, Sterna hirundo, Cuculus canorus, Motacilla alba, Phylloscopus collybita, Acrocephalus schoenobaenus, Lanius collurio, Emberiza schoeniclus,* etc.) were euconstant (C4), 29 species (28%, *Ciconia ciconia, Circus aeruginosus, Falco tinnunculus, Vanellus vanellus, Alcedo atthis,*

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Dendrocopos syriacus, Dendrocopos minor, Saxicola torquata, Turdus merula, Locustella luscinioides, Aegithalos caudatus, Corvus corax, etc.) were constant (C3), 27 species (27%, *Ardeola ralloides, Accipiter nisus, Anthus campestris, Remiz pendulinus, Lanius excubitor,* etc.) were accessory species (C2) and 9 species (9 %, *Streptopelia turtur, Coracias garrulus,* etc.) were accidental (C1) (Table 1, Fig. 4).

We noticed the relatively increased number (66) of euconstant and constant species, which confirm the richness of resources in the area during the breeding period. Dependent on the degree of availability of the food resources and nesting places, the more or less significant presence of the predators and the anthropogenic disturbance (especially noise pollution), on the Bascov Lake the specific species richness value for the breeding birds reached 119 species.

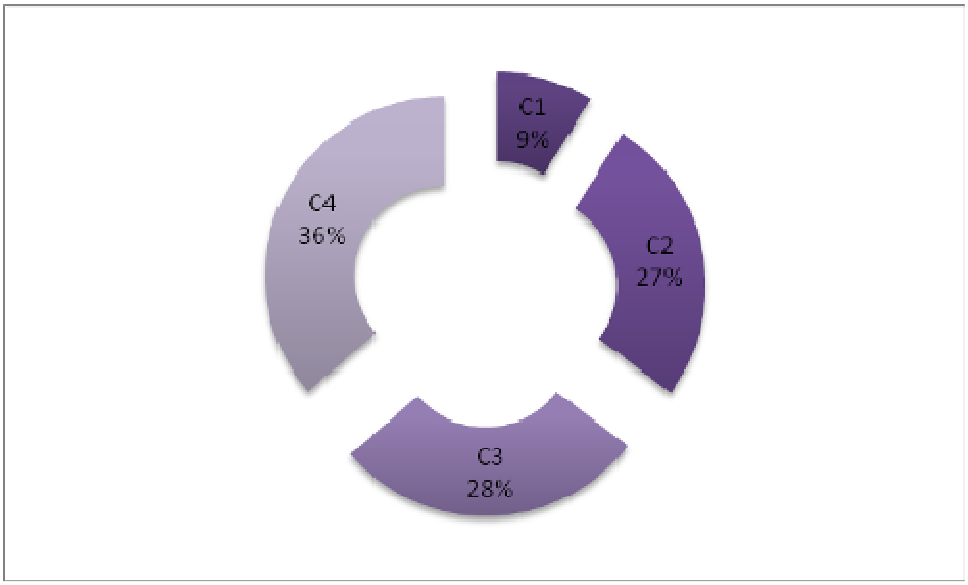

Figure 4. Distribution of bird species by their constancy: C1 – accidental species, C2 – accessory species, C3 – constant species, and C4 – euconstant species.

Eighteen breeding species (17.64 % - Table 1) are listed in Annex I of the Birds Directive (http://eur-lex.europa.eu).

As regards the evolution trend in the number of individuals breeding in the area of the Bascov reservoir, we discovered that a major part of these species - 42 (41%) did not have significant variations throughout the observation period. Numerous species (45) exhibited increasing trends in their number of breeding individuals (44%), due to the growing attractiveness of the area, resulting from the silting of the lake and the emergence and growth of hard vegetation (rush and reed areas), willow and alder woods, while the species exhibiting decreasing trends in their number of breeding individuals were underrepresented (15% of the total) on the Bascov Lake as a consequence of the anthropogenic influence (Table 1, Fig. 5). To determine trends for breeding birds we also took into account the result that we obtained in the period 2003-2010 (Conete, 2011).

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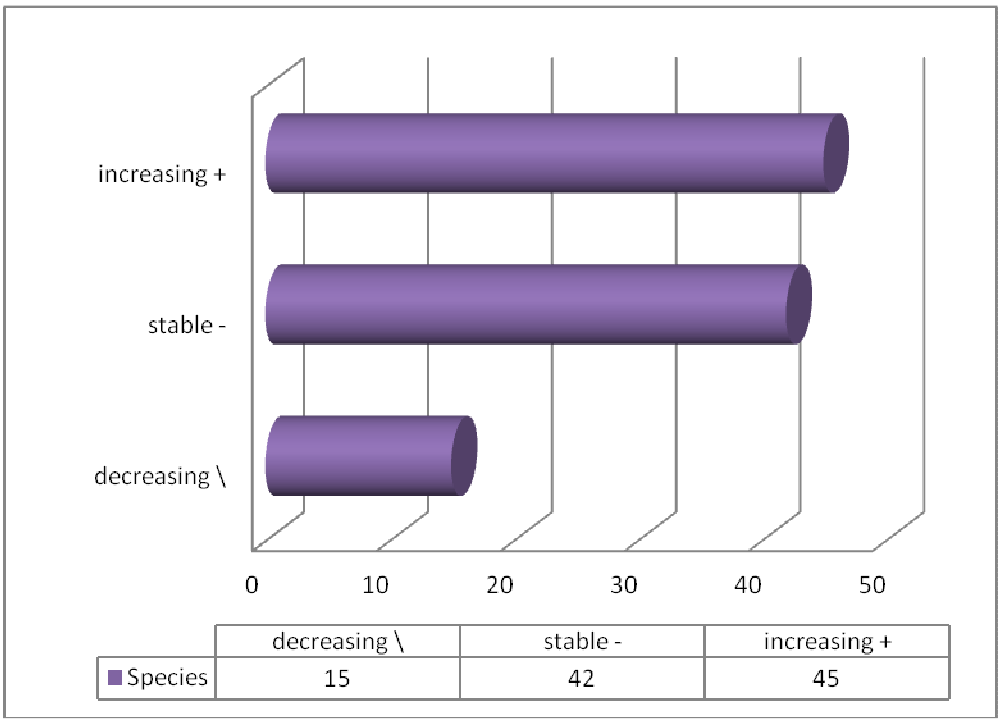

Figure 5. Distribution of species according to the evolution trend in the number of breeding individuals: - – stable (42); + – in creasing (45); \ – decreasing (15).

The presence or absence of a breeding species is in close connection with its ecological requirements, with the structural peculiarities of the ecosystem and the anthropogenic influence. There are more factors that may determine these trends. Among the most important we should mention: the silting of the lake, which results in the emergence of new nesting and feeding sites for birds, the diversification of the aquatic food sources, and the existence of agricultural land and forested hills located in their vicinity. The number of breeding individuals has recorded a yearly increase in 45 species due to the diversification of the structure of the phytocenosis, the growing number of rush and reed clusters, as well as of silt islets, the expansion of the islet surface, the emergence and growth of trees and shrubs, and the ageing of the existing trees.

The species with a constant number of breeding individuals and those with an increasing number of individuals found favourable nesting and feeding conditions, while those with decreasing numbers of individuals were affected first by the anthropogenic influence manifested through direct disturbance (fishermen, occasional visitors, water sports competitions – kayak and canoe training sessions and races, etc.)

A major problem that led to the decline in the number of individuals is the presence of predators (stray dogs) and that of the athletes who undertake daily training sessions near the places where the birds live. They are usually accompanied by 2-3 motorboats which create an unbearable noise, particularly in the morning and in the evening. Other negative factors are the reed bed fires during the nesting period, the clearing of the brushwood vegetation, of the groves, the tree shelterbelts or of other forested areas (as these are nesting and feeding sites for many species), the draining of the reservoir, the rise and fall of the water level during the breeding period, intensive agriculture, the use of pesticides, etc. They all contribute to the decline mentioned above.

Regarding the evolution trends in the number of individuals of key breeding species (listed in Annex I of the Birds Directive) we can notice that the species *Ixobrychus minutus, Ciconia ciconia, Dendrocopos syriacus, Lullula arborea, Anthus campestris, Ficedula albicollis, etc.* exhibited a steady number

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throughout the observation period, while the species *Nycticorax nycticorax, Ardeola ralloides, Circus aeruginosus, Sterna hirundo, Chlidonias hybridus, Alcedo atthis* recorded a increasing trend or other recorded a decreasing trend (*Aythya nyroca, Coracias garrulus*, etc.).

It is necessary to monitor the evolution trends in the number of individuals in the breeding species (trends of breeding birds) at least in the case of the key species to ensure the real and effective conservation of the avifauna diversity. The presence of key breeding species in the area under research is to be interpreted as an important argument for the necessity of real protection measures.

In order to reduce and eliminate the effects caused by anthropogenic factors we need to take measures to protect not only those areas that are already acknowledged as breeding areas, but also those that are potential breeding areas. The measures should be accompanied by some codes of good practice at both scientific and economic levels (Munteanu et al, 2015).

Even though at first the silting process and the formation of islets favoured an increase in biodiversity, the aggressive and permanent intervention of humans on these isles and in their neighbourhood, the sports training sessions, noise pollution and chemical pollution have finally led to a reduction in the number of birds on this lake, both as a number of species and as a number of individuals.

Thus, despite the natural conditions that are favourable to nesting (due to heavy silting and to the formation of the three islets, etc.), the breeding and non-breeding avifauna will gradually decline in abundance in the years to come as a direct consequence of the presence of fishermen and local people at the site, of uncontrolled grazing, sports training sessions, etc. The expansion of the lake surface allotted to sports games added to this decline. A national sports training center for the olympic games has been set up here. On the right side of the lake there are stands for spectators, accommodation facilities for the athletes, a hotel and restaurants. The sports competitions take place only on a section of the right side of the lake, but lately, the athletes have used the whole surface of the lake for their training sessions. There are usually more than twenty kayak and canoe boats and the coaches use motor boats. They have an obvious and continuous contribution to the disturbance of the birds, even though this lake is part of the site Natura 2000 network ROSPA 0062 - „Lacurile de acumulare de pe Argeş".

Today, the bird species living in the area of the Bascov Reservoir are constantly subjected to informational aggression (sound aggression). Most of the breeding species - 75 (representing 74%) in the area under research are migratory.

Migratory birds have the surprising capacity to be sensitive to the Earth's magnetic field, both to its direction and to its very low intensity (below 100 μT). The hypothesis with strongest support from evidence is that this mechanism derives from the quantum spin dynamics of transient photoinduced radical pairs, although the origin of the avian magnetic compass sensor remains an open problem (Omar et al, 2011; Gauger et al, 2011). The avian magnetic compass works in a fairly narrow functional window around the intensity of the local geomagnetic field, but adjusts to intensities outside this range when birds experience these new intensities for a certain time (Winklhofer et al, 2013). Apart from the radical-pair mechanism, birds have a second type of magnetoreception pathway, which is based on magnetite and linked to the trigeminal nerve (Wiltschko & Wiltschko, 2013). We consider that both **informational stress** (sound stress, persistent noise pollution) and **chemical pollution** (chemical fertilizers, pesticides, detergents, etc.) can affect not only the success of breeding/ nesting, which is closely linked to the spring migration, but in the long term, it can also affect the normal development (growth) of the offspring migratory birds, at least in those species that are sensitive to the presence of humans. Later on this might have an impact on the behaviour of the migratory birds (some of them abandoning migration), because of its negative effects on the

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avian magnetic compass, in spite of the fact that the birds show a considerable plasticity in this respect.

Consequently, some birds (in flight) will no longer be able to accurately detect the direction and the intensity of the Earth's magnetic field (particularly its weak oscillations, the micropulsations of the geomagnetic field - influenced by cosmic rhythms – the sun, the moon, etc.). Perhaps some of the problems (disturbance) related to their synchronization (connected with their electrical brain activity, biomagnetism, etc), recognition (there is a clear connection between the geomagnetic field and the biomagnetic fields), reception, filtering, adaptation (which involves phylogenetic and ontogenetic memories, global warming, climate change, etc.) and information transfer and processing (chemical imbalances can occur) at the brain level imply the "dulling of their senses", somewhat independent from the ambient light regime and the background noise during the migration period.

4. CONCLUSIONS

During the nesting season we recorded 102 breeding species belonging to 14 orders, 39 families and 74 genera. Eighty-three (81%) are certain breeding species, and 19 (19%) are probable breeding species; 28 breeding species are dependent on wetlands.

Cumulated with the data in the Atlas of the Breeding Birds of Romania, the total list of breeding birds observed in the area under research comprises 119 species. Thus, the biodiversity of the breeding species is relatively high.

We identified 19 new breeding species, out of which 12 are certain breeding species and 7 are probable breeding species.

Most of them are constant and euconstant species (66 species), the results reflecting the abundance of resources in the area during the nesting period. The species that nest in reed beds, which are species dependent on wetlands, can be distinguished by their larger number of individuals. On the other hand, the number of farmland birds is decreasing. Eighteen breeding species (17.64%) are listed in Annex I of the Birds Directive.

The species that exhibited increasing trends in their number of breeding individuals represent a significant percentage (44 %), because the attractiveness of this lake has continuously increased as a result of silting, the emergence of hard vegetation (rush and reed areas), and the presence of willow and alder woods. However, the anthropogenic influence is still very strong.

The bird species from the area under research are almost continuously subjected to an informational aggression (sound aggression) and a chemical pollution (chemical fertilizers, pesticides, detergents, etc.), which can affect not only the success of their breeding (nesting), but also, in the long term, the normal development of migratory birds. Later on, this could have a powerful impact on their behaviour, affecting the avian magnetic compass (with some of them even abandoning migration).

It is necessary to monitor the evolution trends in the number of individuals of the breeding species, at least for the key species, to ensure the effective conservation of the avifaunal diversity, as a point of reference and as an instrument for the regional biodiversity conservation strategies.

The Bascov Lake is on the route of some important migratory passages. Therefore, it acquires an even greater importance when many natural moist sites (wetlands) disappear, as it provides not only food resources and nesting places for some species, but also feeding and resting places for the aquatic bird species during the passage and the hiemal season.

By adopting effective and ethical emergency measures for the protection of birds and their habitats, the list of breeding species presented here will surely be expanded. We consider that it is necessary to encourage those economic activities that are in harmony with nature and do not harm the animals or the humans by changing their life balance.

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