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ECOLOGICAL RESEARCH ON AVIFAUNA FROM THE SITE NATURE 2000 ROSPA0062 – "LACURILE DE ACUMULARE DE PE ARGEŞ". THE SEROTINAL SEASON

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Abstract
The present paper provides the results of the ecological research conducted on the avifauna of the reservoirs located in the middle valley of the Arges River during the serotinal season. The serotinal season was one of the richest in species (we identified 169 species belonging to 15 orders, 45 families and 99 genera) as it is the season when the autumn agglomeration specific to migration is formed; 66 species are dependent on wetlands. We also performed an analysis of the avifauna based on ecological indices (I_R, constancy, dominancy, the Dzuba index of ecological significance, etc.).
The Anseriformes, Passeriformes and Charadriiformes were overdominant. According to the dominance index and the Dzuba index of ecological significance, there were 5 characteristic species (eudominant and dominant): Anas platyrhynchos, Aythya ferina, Fulica atra, Phalacrocorax carbo and Larus ridibundus. The high number of subrecedent species (122 species) emphasizes a high fluctuation of bird species in the area under research, especially on the Goleşti Lake, also due to the fact that these lakes are on the route of the Rucăr-Bran migration corridor. We also notice in the serotinal season (as well as in the hiemal and prevernal seasons) the great importance of the reservoirs for birds. These reservoirs are immense stretches of water, whose value should be considered in correlation with their large valleys, where there are various agricultural crops and large areas of forest. This high habitat heterogeneity explains the presence of a high number of bird species during migration, even though there is a strong anthropogenic influence in the area under research. 33 species are enlisted in Annex 1 of the Birds Directive.

Keywords: Argeş River, birds, serotinal season.

1. INTRODUCTION

The Argeş hydrographyc basin is located in the S-SE of Romania and is delimited by the Făgăraş Mountains in the north and the Danube River whose tributary it is at Oltenița in the south (figure 1) (Barco and Nedelcu, 1974).

A series of reservoirs has been built on its stream after 1960 for the production of electric energy, as a water supply source for the cities and industrial objectives in the area, and the irrigation of the surrounding agricultural terrains. Over the time, the newly created lakes (Vâlcele, Budeasa, Bascov, Piteşti, Goleşti) have become the preferred nesting areas for certain bird species, many of them coming here for wintering or just passing by during their passage, as it is a well known fact that the middle basin of the Argeş River is an extension of the Rucăr – Bran Corridor, one of the corridors used by migrating birds to get across the Carpathians (Mătieş, 1969; Munteanu and Mătieş, 1983; Gava, 1997; Conete, 2011; Conete, 2014; Conete, 2015, etc).

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The results of our research study, corroborated with the actions of the Romanian Ornithological Society have led to the declaration of the area as ROSPA0062 site – " Lacurile de acumulare de pe Argeş", an integrating part of the Natura 2000 network. Due to the strong anthropic influence in the studied area, multiple efforts are necessary from the local factors and nature lovers to preserve the natural values with their entire biodiversity. The importance of artificial wetlands for birds increases as a result of degradation of natural wetlands (Munteanu, 2009; Sebastián-González et al., 2010; Conete and Dorobăț, 2017, etc).
Thus, the economic interests should not be given priority over those problems related to the conservation of nature, birds and their habitats.

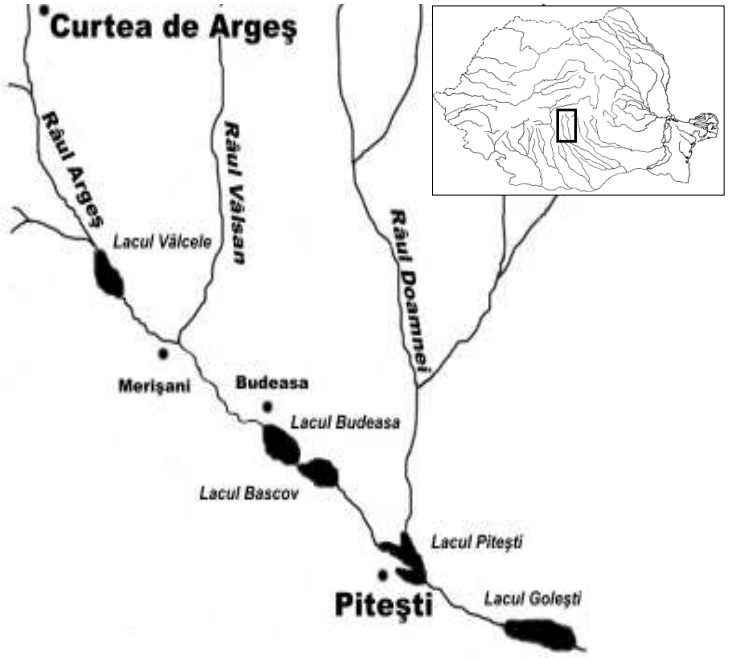

Figure 1. The middle basin of the Argeş River

2. MATERIALS AND METHODS

The monitored area consists of some of the most important aquatic ecosystems alongside the Argeş Valley: Vâlcele (408 ha), Budeasa (412 ha), Bascov (162 ha), Piteşti (122 ha) and Goleşti (680 ha) (Fig. 2), important areas for wintering (high concentrations of aquatic birds), passage and nesting for many bird species. This site is a mozaic of habitats, comprising large stretches of water, sections of rivers, and fragments of forest, which alternate with permanent pastures, orchards, bushes and agricultural plots. This high heterogeneity of habitats attracts a high number of species, especially during migration, due to the fact that this series of lakes is an extension of the Rucăr-Bran Corridor and close to another migration route, known as the Olt Pass Route. As regards the climate, the region is located in the continental hill climate, at the meeting point of two types of climate: the tempered climate of the hills and choline of Muscel and the more arid one of the Eastern Plain (Barco and Nedelcu, 1974). The vegetation of the area adjacent to the lakes is typical of the

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southern hill area. The hills and the meadows are covered in deciduous forests (beech, durmast), stands of softwood trees, orchards of fruit trees and agricultural lands. The vegetation of the lakes is represented by reed and rush beds, sedge, willows, alder, aspen, horsetail, buttercup – Meadow etc. Permanent field observations were performed in the area of these lakes, starting from January 2003 to 2011, covering all the six phenological seasons. This paper refers only to the serotinal season. The observations were made on the banks of each lake, monitoring the avifauna of the nearby areas. We used the itinerary method, trails alongside the banks and the dams, the fix point observation method, but also observations on the move, on the lakes and rush beds, sometimes using the boat (especially to monitor the avifauna of the newly created islets on the Bascov Lake). The observations were made with the naked eye, using binoculars (10 x 30), a spotting scope (20 – 50 X 60), a camera and by auditory means. The birds were identified with the Hamlin Guide (Bruun et al., 1999).

During the serotinal season we recorded 80.274 individuals.

Figure 2. The division of the middle basin of Arges in 10x10 km² areas according to the UTM (Universal Transverse Mercator) network and their numbering (after Lehrer & Lehrer, 1990 – modified by Conete, 2011)

3. RESULTS AND DISCUSSIONS

The serotinal avifauna from the middle basin of the Arges River is composed of 169 species (81.64 % of the total avifauna recorded throughout the 6 seasons) belonging to 15 orders, 45 families and 99 de genera; the best represented as a number of individuals is the order Anseriformes; 66 species depend on wetlands during this season.

Migration is triggered during the serotinal season when the summer guest species leave the area in favour of the winter guests and the migratory birds. Ample movement from one lake to another is also observed during this season. Thus, during this period, the autumn assemblage specific to

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migration takes place. In particularly the migration of Anseriformes starts, generating agglomeration on large aquatic surfaces, such as the Goleşti, Budeasa, Vâlcele Lakes, etc. Autumn migration unfolds much slower than that in spring, with the birds frequenting those territories that offer abundant food and shelter. During the passage, the nesting population of warblers in the area is completed by large numbers of some migratory bird populations.

As regards their taxonomic classification, the avifauna of the serotinal season is represented by the following orders: Passeriformes (78 species), Charadriiformes (25 species), Anseriformes (11 species), Falconiformes (10 species), Ciconiiformes (9 species), Piciformes (8 species), followed by Podicipediformes, Gruiformes, Coraciiformes, Columbiformes and Strigiformes with four species each, Pelecaniformes and Galliformes with three species each, and Cuculiformes and Apodiformes with only one species each.

Table 1. shows the I_R values for the 15 orders that compose the avifauna of the lakes under research during the serotinal season throughout our research period; the value for the static axis is 6.66 and the value for the dynamic axis is 13.33 (figure 3).

Table 1. The values of the index of relation I_R for the orders of birds identified in the area during the serotinal season

No.	Orders	Participation
1.	**Podicipediformes**	2.37
2.	**Pelecaniformes**	8.07
3.	**Ciconiiformes**	1.14
4.	**Anseriformes**	39.25
5.	**Falconiformes**	0.27
6.	**Galliformes**	0.20
7.	**Gruiformes**	11.36
8.	**Charadriiformes**	13.91
9.	**Columbiformes**	0.41
10.	**Cuculiformes**	0.01
11.	**Strigiformes**	0.04
12.	**Apodiformes**	0.17
13.	**Coraciiformes**	0.10
14.	**Piciformes**	0.13
15.	**Passeriformes**	22.56
16.	**Total**	100.00
17.	**Other orders**	4.85

In the overall analysis of the serotinal season, it was observed that the orders Anseriformes, Passeriformes and Charadriiformes were overdominant, the orders Gruiformes and Pelecaniformes were dominant, while the other orders (Podicipediformes, Ciconiformes, Falconiformes, Gruiformes, Coraciiformes, Columbiformes, Strigiformes, etc.) were complementary (table 1, figure 3).

Regarding the ecological indices (fig. 4), the constancy value, respectively, during the serotinal season, on all the five lakes under research, 26 species (*Phalacrocorax carbo, Tachybaptus ruficollis, Ixobrychus minutus*, *Egretta garzetta, Anas platyrhynchos, Anas crecca, Aythya ferina, Gallinula chloropus, Fulica atra, Larus ridibundus, Sterna hirundo, Streptopelia decaocto, Riparia riparia, Hirundo rustica, Pica pica*, *Motacilla alba, Acrocephalus schoenobaenus, Acrocephalus arundinaceus, Phylloscopus collybita, Parus major, Passer montanus,* etc.) representing 15.29% of the serotinal avifauna were euconstant (C4), 26 species (15.29%, *Podiceps*

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cristatus, Phalacrocorax pygmeus, Cygnus olor, Nycticorax nycticorax, Anas querquedula, Actitis hypoleucos, Coturnix coturnix, Vanellus vanellus, Alcedo atthis, Apus apus, Delichon urbica, Lanius collurio, Locustella luscinioides, Sylvia curruca, etc.) were constant (C3), 32 species (18.82%, *Aythya fuligula, Himantopus himantopus, Circus aeruginosus, Buteo buteo, Sylvia atricapilla,* etc.) were accessory (C2) and 86 species (50.59%, *Podiceps grisegena, Pelecanus crispus, Ardeola ralloides, Platalea leucorodia, Aythya nyroca, Circus pygargus, Philomachus pugnax, Turdus iliacus, Aegithalos caudatus,* etc.) were accidental (C1).

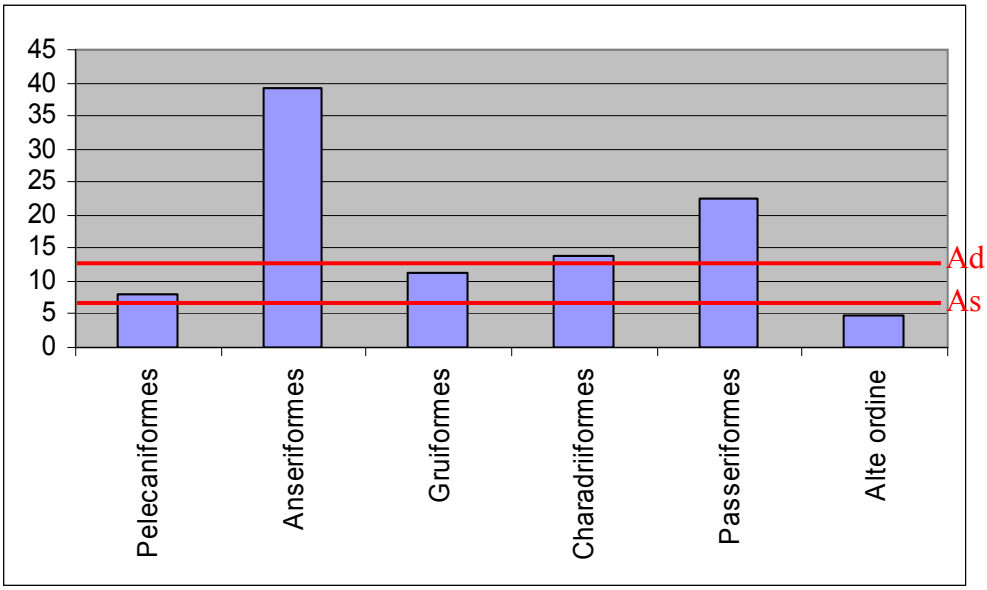

Figure 3. The average global participation of the different orders in the avifauna of the serotinal season

Regarding dominance, during the serotinal season, on the reservoirs under research, three species representing 1.76% (*Anas platyrhynchos, Aythya ferina,* and *Fulica atra)* were eudominant (D5), two species (representing 1.18% of the total species that compose the serotinal avifauna - *Phalacrocorax carbo, Larus ridibundus*) were dominant (D4), five species (2.94%, *Anas crecca, Larus cachinnans/michahellis, Sturnus vulgaris,* etc.) were subdominant (D3), six species (3.53%, *Tachybaptus ruficollis, Delichon urbica, Corvus monedula,* etc.) were recedent (D2), and 154 species (90.59%, *Podiceps grisegena, Phalacrocorax pygmeus, Aythya nyroca, Ardeola ralloides, Ixobrychus minutus, Numenius arquata, Dendrocopos minor, Dendrocopos medius, Remiz pendulinus, Acrocephalus palustris, Emberiza schoeniclus,* etc.) were subrecedent (D1).
According to the Dzuba index of ecological significance, during the serotinal season, 3 species, representing 1.76% (*Anas platyrhynchos, Aythya ferina,* and *Fulica atra)* were eudominant (W5), 2 species (1.18%, *Phalacrocorax carbo, Larus ridibundus*) were dominant (W4), 8 species (4.71%, *Tachybaptus ruficollis, Aythya fuligula, Larus cachinnans/ michahellis, Corvus frugilegus, Sturnus vulgaris,* etc.) were subdominant (W3), 35 species (20.59%, *Podiceps cristatus, Phalacrocorax pygmeus, Ixobrychus minutus, Egretta garzetta, Nycticorax nycticorax, Cygnus olor, Anas querquedula, Vanellus vanellus, Sterna hirundo, Alauda arvensis, Galerida cristata, Phylloscopus collybita, Parus caeruleus,* etc.) were recedent (W2) and 122 species (71.76%, *Podiceps grisegena, Pelecanus crispus, Ardea purpurea, Ciconia ciconia, Anas penelope, Aythya nyroca*, *Netta rufina,*

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Accipiter brevipes, Falco tinnunculus, Limosa limosa, Calidris alpina, Charadrius dubius, Coracias garrulus, Lanius minor, Coccothraustes coccothraustes, etc.) were subrecedent (W1).
Thus, according to the Dzuba index of ecological significance, during the serotinal season, in the area of the reservoirs under research, we can observe five characteristic species (eudominant and dominant): *Anas platyrhynchos, Aythya ferina, Fulica atra, Phalacrocorax carbo* and *Larus ridibundus*.

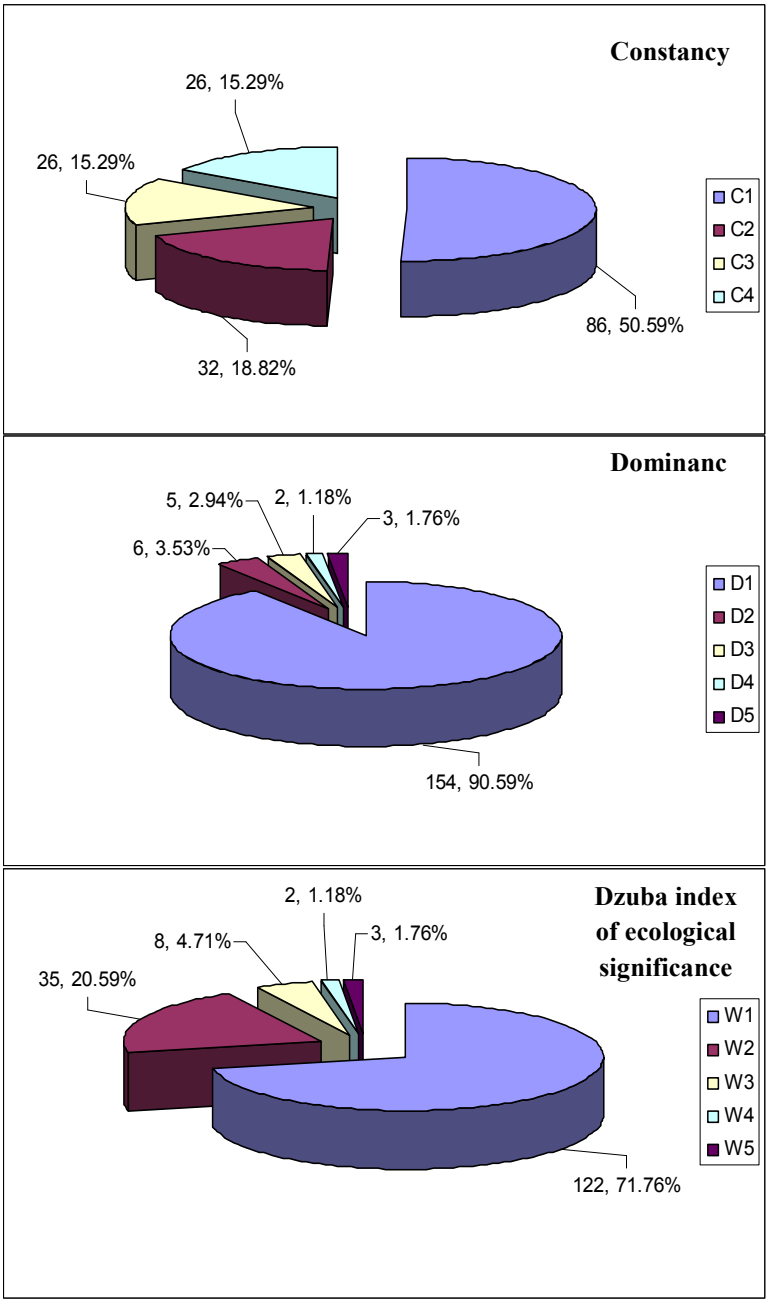

Figure 4. The distribution by categories of the ecological indices of the avifauna in the studied reservoir areas during the serotinal season (Legend: C1 – accidental species, C2 – accessory species, C3 – constant species, C4 – euconstant species, D1, W1 – subrecedent species, D2, W2 – recedent species, D3, W3 – subdominant species, D4, W4 – dominant species, D5, W5 – eudominant species.)

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Comparing the results with those of the research conducted in the 1980s, we notice that the proportion of the main species has varied within restricted limits (Munteanu and Mătieş, 1983). Thus, in the past, the species *Anas platyrhynchos, Anas crecca, Anas querquedula, Vanellus vanellus* and *Larus ridibundus* stood out with the highest proportions. In the present, the highest proportions are recorded for the species *Anas platyrhynchos, Aythya ferina, Fulica atra, Larus ridibundus, Anas crecca, Phalacrocorax carbo* and *Aythya fuligula*. The species *Sturnus vulgaris* also appears among the dominant species in the vernal season (Conete, 2011).

The high number of accidental species during the serotinal season (86 species), along with the very high number of subrecedent species according to the Dzuba index of ecological significance (122 species), emphasizes a very high bird fluctuation in the area under research, especially on the Goleşti Lake (mainly Anseriformes, Charadriiformes, Passeriformes, Falconiformes, etc.), as a result of the fact that these lakes are located on the route of the Rucăr-Bran migration corridor. We want to draw the attention to the important value of the reservoirs under research for birds not only during the serotinal season, but also during the hiemal and prevernal seasons (Conete, 2014; Conete and Dorobăț, 2017), the more so as they should be evaluated in correlation with their large valleys (especially those of the Goleşti, Bascov, Budeasa and Vâlcele Lakes), where there are various agricultural crops and large areas of forest.

Generally, the avifauna of the reservoirs presents a high population number during the migration period and throughout winter, a fact that was also pointed out by Munteanu and Mătieş (1983), Kiss (1999), Gava (1997), Gache (2002), Mitruly (2002), Conete (2011), etc., for the aquatic basins in Banat, Moldova, Transilvania, Muntenia, etc.

4. CONCLUSIONS

During the serotinal season we identified 169 species belonging to 15 orders, 45 families and 99 genera; 66 species are dependent on the wetlands. The orders Anseriformes, Passeriformes and Charadriiformes were overdominant. The comparison between the six seasons reveals that the highest specific richness characterizes the prevernal season/ spring migration (186 species – 89.86%) and serotinal/autumn migration (169 species – 81.64%) (Conete, 2011; Conete and Dorobăț, 2017, etc).

During this season, the autumn assemblage specific to migration takes place and in particular the migration of the Anseriformes starts, generating agglomeration on large aquatic surfaces, such as the Goleşti, Budeasa, Vâlcele Lakes, etc. We found 5 eudominant and dominant species *Anas platyrhynchos, Aythya ferina, Fulica atra, Phalacrocorax carbo* and *Larus ridibundus***.** The comparison of the data with those obtained for the prevernal season, when there were only four characteristic species (*Anas platyrhynchos*, *Aythya ferina, Fulica atra,* and *Larus ridibundus*) reveals that there are no major changes. The comparison between our results and those of the research conducted in the 1980s, shows that the proportion of the main species has varied within restricted limits.

The high number of subrecedent species (122 species) emphasizes the existence of a very high bird fluctuation in the studied area, especially on the Goleşti Lake, as a result of the fact that these lakes are located on the route of the Rucăr-Bran migration corridor. We want to draw the attention to the important value of these reservoirs (which are vast stretches of water) for birds during the serotinal season (as well as during the hiemal and prevernal seasons), the more so as they should be evaluated in correlation with their large valleys with various agricultural crops and large areas of forest. This high habitat heterogeneity explains the high number of bird species, especially during migration, even though the anthropic influence is very strong in the area.

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Thus, the studied lakes have a great importance for birds, especially as feeding and resting places, during passage or during the hiemal season, when a real agglomeration of birds is formed. In this regard, the protection of the biodiversity of these lakes is absolutely necessary.
We consider that the number of bird species may grow in the next years if we adopt effective and concrete protection measures for birds and their habitats.

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*** http://www.baraje.ro/

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