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# CONTRIBUTIONS TO THE STUDY OF THE AVIFAUNA FROM THE SITE NATURE 2000 ROSPA0062 – "THE RESERVOIRS ON THE ARGEŞ RIVER" - THE WINTERING QUARTERS FROM THE MIDDLE BASIN OF THE ARGEŞ RIVER. THE HIEMAL SEASON.

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***Abstract***
*In the present paper we present the results of our ecological research on the avifauna of some reservoirs (a site of the Nature 2000 Network) from the middle basin of the Argeş River, during the hiemal season in the period 2003 – 2010. The hibernal/hiemal season is the poorest in species of the six seasons (118 species belonging to 14 orders, 32 families and 68 genera, of which 49 species are dependent on wetlands), but the richest in the number of individuals (448,064). We also perform an analysis of the avifauna according to ecological indices ($I_{R.}$ constancy, dominancy, the Dzuba index of ecological significance, etc.). The Anseriformes were overdominant. It is the only season in which the order Passeriformes is complementary. Great agglomerations of Anseriformes are constantly present during the hiemal season; the specific composition and the number of individuals of the different species vary continuously on each of the reservoirs in relation to the weather conditions, the accessibility of food, etc. The highest number of Anseriformes species was observed on the Budeasa Reservoir (19 species) and the lowest on the Bascov Reservoir (12 species). The correlation between temperature and the total number of individuals of the bird species is negative. As the temperature increases, the number of individuals decreases and vice versa. The most important wintering quarter is, during our research, the Goleşti Reservoir, with impressive concentrations of waterbirds. Mention should be made of five characteristic species (eudominant and dominant) present in the area of the reservoirs in the hiemal season: Anas platyrhynchos, Aythya ferina, Fulica atra, Aythya fuligula and Larus ridibundus. The high number of subrecedent species (102) emphasizes the great fluctuation of bird species in the area as a result of the fact that these reservoirs are on the course of some European migration routes and ensure favourable conditions (halting, sheltering and feeding places) for many species of migratory birds and especially because they are, first of all, important wintering quarters. 23 species are enlisted in Annex 1(AI) of the Birds Directive.*

*Key words: waterbirds, wintering quarters, Argeş River.*

## 1. INTRODUCTION

The area under research is located in the middle basin of the Argeş River, at the contact of the Cândeşti and Cotmeana plateaux and the High Plain of Piteşti (Barco & Nedelcu, 1974). After 1960 a series of reservoirs (Fig. 1) were built on the Argeş Valley. They have had a significant impact on the landscape as they influenced the composition as well as the spatial and temporal dynamics of the bird species in the area. Over time, the new created reservoirs have become, through silting, favourite areas for some bird species (Mătieş, 1969; Munteanu & Mătieş, 1983; Gava, 1997; Mestecăneanu et al, 2003; Gava et al, 2004; Conete & Mestecăneanu, 2004; Conete, 2011, etc.).

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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 some of the most important aquatic ecosystems of the Argeş River basin and consequently the highest concentrations of birds. The attractiviteness of the five reservoirs (anthropic aquatic ecosystem) for the avifauna is different; it is based on the area of the water surface, but also on the heterogeneity of the habitats adjacent to the reservoirs under research.
Our research contributes to the improvement of the knowledge regarding the birds in the area, especially those in the hydrographic basin of the Argeş River, and together with the actions of the Romanian Ornithological Society (SOR), it led to declaring the area as a ROSPA0062 site – "The reservoirs on the Argeş River", an integral part of the Nature 2000 network in Romania. The high number of individuals and species observed here every winter fully justifies this endeavour. To sum up, from the ornithofaunistic point of view, the reservoirs under research represent extremely important habitats at the level of the Argeş Valley (Conete et al., 2012)
The decrease in their population in many European countries takes place at the same time with the degradation of their habitats. These facts imposed special conservation measures (Dehorter & Tamisier, 1998; Botnariuc & Tatole, 2005; Munteanu D., 2009; Conete, 2011). In this context, the artificial wetlands can contribute to this aim (Zhijun et al., 2004). The reservoirs are important because they shelter many other protected species of the fauna (Conete et al., 2008).

## 2. MATERIALS AND METHODS

The research was conducted in the area of the following reservoirs: Vâlcele (408 ha), Budeasa (412 ha), Bascov (162 ha), Piteşti (122 ha) and Goleşti (649 ha), which represent important wintering, feeding, passage and brooding areas for many bird species (Fig.1).

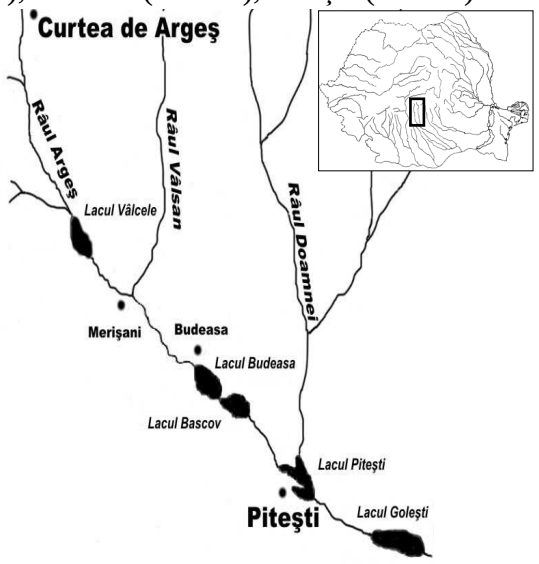


**Figure 1. The middle basin of the Argeş River**

Regarding the climate, the region is continental, specific to the hill region, situated at the boundary of two climatic types: the temperate climate of the hills and mounds of the Muscel region and the more arid climate of the Eastern Plain. The average annual temperature of the air varies around $9^{o}$ C (Barco & Nedelcu, 1974). The average annual temperature of the water of the Argeş River is 1-$2^{o}$ C lower than that of the air and varies between $6.4^{o}$ C in the Argeş Pass and $9^{o}$ C in Piteşti. In the winters with a powerful continental influence, at the beginning of January, in the low areas the temperature decreases below $1^{o}$ C leading to the formation of ice bridges. The coldest month of January in the period 2003-2010 was in 2006, when the average monthly temperature was –3.7°C, and the warmest month of January was recorded in 2007, with a value of 4.8°C. In the period 2003-2010 the minimum temperature value was -20.7°C (24.01.2006).
The vegetation in the reservoir areas is typical of the hill área in the south. The hills and meadows are covered with deciduous forests, orchards with fruit trees and agricultural cultures. Vast areas contain secondary stepped grasslands, replacing the durmast forests, which contain both mesophilic and xerophytic plants. As regards the vegetation of the reservoirs, this is represented by *Phragmites*, *Typha*, *Carex*, *Juncus*, *Salix* sp., *Alnus incana*, *Populus alba*, *Rosa canina*, *Rubus* sp., etc. The

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process of silting permitted the establishment of reedbeds - *Phragmites*, *Typha* and of other typical wetland plants (Conete, 2011). It was Dan Munteanu**,** the well–known ornithologist who began the study of the reservoirs in the area (1961). Mircea Mătieş also had an important contribution regarding the spread and migration of bird species through the upper and middle basins of the Argeş River. He published together with Dan Munteanu a series of materials of great value (Conete, 2013).

Our field observations on these reservoirs were permanent, starting in January 2003 and ending in June 2010, but this paper will refer only to the hiemal aspect (2003-2010).

The study was conducted on the shores of each lake where we observed both the aquatic avifauna and the avifauna of the adjacent areas. We used the itinerary method and the method of the fixed point observations, and the observations within the lakes and rush-bed, sometimes using a boat. We recorded both sight and sound observations. The former were made with the naked eye, using binoculars (10 x 30) or a spotting scope (20 – 50 X 60). The birds were identified using the Hamlin Guide (Bertel et al., 1999).

The hiemal (hibernal) season is the longest ornithological season and can be studied between November and February. We organized 137 field surveys.

## 3. RESULTS AND DISCUSSIONS

The hibernal/hiemal aspect in the period 2003-2010 has the lowest number of species of the six seasons, but the highest number of individuals (we recorded 448,064 individuals during our research period). Thus, in this period, in the middle basin of the Argeş River we observed 118 species, representing 57 % of the avifauna identified on the reservoirs during all the six seasons – 207 species (Conete, 2011). The 118 species identified belong to 14 orders, 32 families and 68 genera; 49 species depend on wetlands. The highest percentage was recorded for the following orders: Passeriformes (49 species), Anseriformes (21 species), Charadriiformes (10 species), Falconiformes (9 species), Piciformes (8 species), followed by Podicipediformes, Ciconiiformes each of them with 4 species, Gaviiformes, Pelecaniformes, Galliformes, Gruiformes with two species and Coraciiformes with only one species.

In the hiemal season, the studied reservoirs do not freeze completely, no matter how low the temperatures are. In the years with a milder winter (2004, 2007, 2008, 2009), the reservoirs froze only on small surfaces, thus attracting a large number of birds. A large part of the Bascov Reservoir was covered with ice in the more severe winters, but after the dredging (desilting) work (in the summer of 2007) the frozen surface has been smaller. Yet, ice fishing was practised at the end of the lake.

The most spectacular concentrations of birds in the hiemal aspect are found on the Goleşti, Budeasa and Vâlcele Reservoirs (situated more upstream than the other lakes - Fig.1). These observations, corroborated with their surface area show that they are the most important wintering quarters for the aquatic birds in the area. The concentration phenomenon in some important populations of aquatic birds was also observed by Munteanu, Mătieş, 1983; Weber, 1999; Kiss, 1999; Gache, 1998, 2002; Zhijun şi col., 2004 (Conete, 2011). The Piteşti Reservoir has a smaller surface and cannot support bird concentrations comparable with those found on the above-mentioned lakes, even though in the very cold winters it freezes only in the cove area, towards the beach. However, this lake is important for the large number of individuals from the species *Cygnus olor* and *Tadorna tadorna* present here in the hiemal season. Most of the species that appear in the hiemal aspect are winter guests and mainly sedentary and passage species; few are partially migratory and two species are classified as accidental, and are rarely seen in winter. The two accidental species are *Branta*

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*ruficollis* and *Melanitta fusca*; the latter was recorded on the Budeasa and Piteşti reservoirs, during 3 observation sessions (4 individuals on Budeasa Reservoir on 1 December 2009).

Of the aquatic species present in this period we can mention (most of them winter guests): *Anas acuta, Anas penelope, Aythya ferina, Aythya fuligula, Bucephala clangula* (especially on the Vâlcele Lake), and *Tadorna tadorna,* which remain on these lakes for a long time. On some of them the number of individuals is very large (on the Piteşti Lake and Goleşti Lake). The species *Egretta alba* appears as a winter guest in the region of the lakes we studied, even though it is considered a summer guest, which is rarely present in Romania in winter. *Anser albifrons* is present during the whole period of the hiemal aspect (we observed a total of 4,052 individuals/ 23 observation sessions; the most numerous individuals were observed on the Goleşti Reservoir – more than 1,700).

The species *Anas platyrhynchos, Aythya ferina, Anas crecca, Fulica atra, Larus ridibundus* and *Cygnus olor* are constantly present throughout the year in the middle basin of the Argeş River, as they brood here . A part of the brooding individuals leave these lakes at the end of the breeding period. Their place is taken by a much higher number of birds belonging to some populations that breed in regions located at the north of our country. They arrive in the studied perimeter starting from September or even later, depending on weather conditions.

According to the index of relation ($I_R$), the analysis of orders for the whole area during the hiemal season indicate that the Anseriformes was the only overdominant order, and the very high value of the index of relation (69, 42) for this order can be also explained through the fact that we surprised the autumn migration of some species of the order Anseriformes (*Anas platyrhynchos, Aythya ferina, Anas crecca, Anser albifrons,* etc.). The orders Charadriiformes and Gruiformes were dominant, and the order Passeriformes and the other orders were complementary. It is the only season in which the order Passeriformes is complementary (Tab. 1, Fig. 2).

***Tabel 1. The values of the index of relation/ $I_R$ for the orders of birds identified in the area during the hiemal season***

| No. | Orders | Participation |
|---|---|---|
| 1 | Gaviiformes | 0.01 |
| 2 | Podicipediformes | 1.23 |
| 3 | Pelecaniformes | 2.10 |
| 4 | Ciconiiformes | 0.13 |
| 5 | Anseriformes | 69.42 |
| 6 | Falconiformes | 0.10 |
| 7 | Galliformes | 0.04 |
| 8 | Gruiformes | 10.31 |
| 9 | Charadriiformes | 11.26 |
| 10 | Columbiformes | 0.08 |
| 11 | Strigiformes | 0.01 |
| 12 | Coraciiformes | 0.02 |
| 13 | Piciformes | 0.05 |
| 14 | Passeriformes | 5.23 |

We have presented the dynamics of the population of Anseriformes during the hiemal season because the reservoirs from the middle hydro-geographic basin of the Argeş River represent an important winter quarter for waterbirds, especially for the order Anseriformes, due to the high number of individuals present here in this season (over 15,000 individuals).

We have calculated $\mathbf{I_R}$ of the population of Anseriformes, during the hiemal season, on the five lakes from the middle basin of the Argeş Valley first for the whole area and then for each lake.

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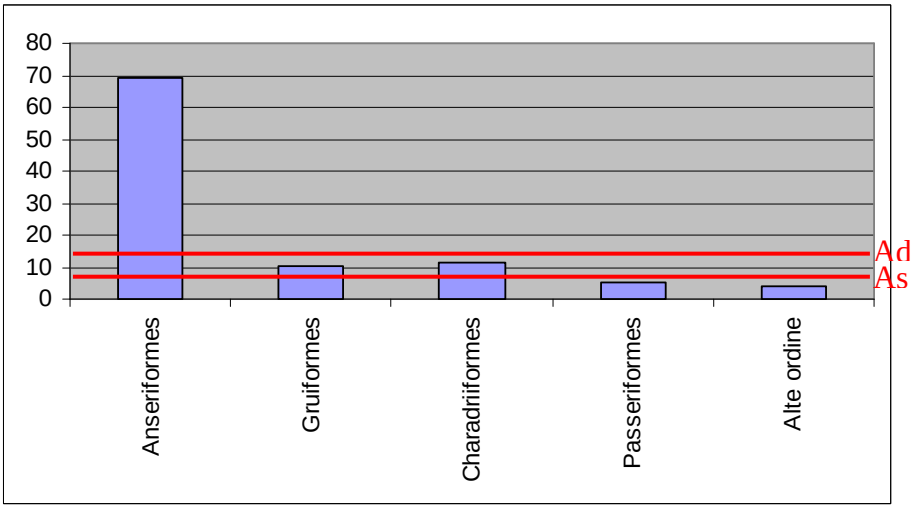


***Figure 2. The average global participation of the different orders in the avifauna of the hiemal season.***

In the hiemal season, for the whole area, the static axis (As) is 4.76 and the dominance axis (Ad) is 9.52 (Fig.3, Fig.4). Representing the $I_R$ values in a coordinates system with As – the static axis and Ad – the dominance axis, we showed the numerical variations for each species in the entire interval (November-February).

In the hiemal season 2003-2010, only *Anas platyrhynchos* maintained a constant position in the overdominance area; in the winter of 2004 the number of individuals from this species increased very much due to the arrival of individuals coming from the north where the temperatures decreased considerably. The temperatures recorded in January were very low upstream and that is why the Goleşti Reservoir (situated in the most downstream location and only partially covered with ice) sheltered thousands of individuals; *Aythya ferina* is dominant in 2003 and 2004 and then it became overdominant (2005 - 2010). *Aythya fuligula* oscillated between dominance and overdominance (2006, 2008, 2009); *Anas crecca* was constantly dominant, except for the winter of 2010 when we recorded a massive presence of this species on the Piteşti Reservoir. *Cygnus olor* is present in the complementarity zone, except for the winter of 2003, when it became dominant. The group of the other species (*Cygnus cygnus*, *Anser albifrons*, *Anas strepera*, *Anas acuta*, *Anas penelope*, *Anas querquedula*, *Tadorna tadorna*, *Aythya marila*, *Aythya nyroca*, *Bucephala clangula*, *Melanitta fusca*, *Mergus albellus*, etc.) was permanently complementary, except for the winter of 2010 when it was dominant, due especially to the massive presence of the species *Bucephala clangula* on the Vâlcele Reservoir. We can observe similarities between the chart of *Anas platyrhynchos* and that of *Anas crecca* in the hiemal season of 2010, both species being surface ducks (Fig3).

Therefore, throughout the whole observation interval, according to the $I_R$, on the five lakes we studied, of the 21 Anseriformes species, *Anas platyrhynchos* and *Aythya ferina* are overdominant species in the hiemal in the Anseriformes coenose, each finding here good sheltering and feeding conditions. Both *Aythya fuligula* and *Anas crecca* are in the dominance zone, while *Cygnus olor* and the other Anseriformes species are complementary species (Fig.4).

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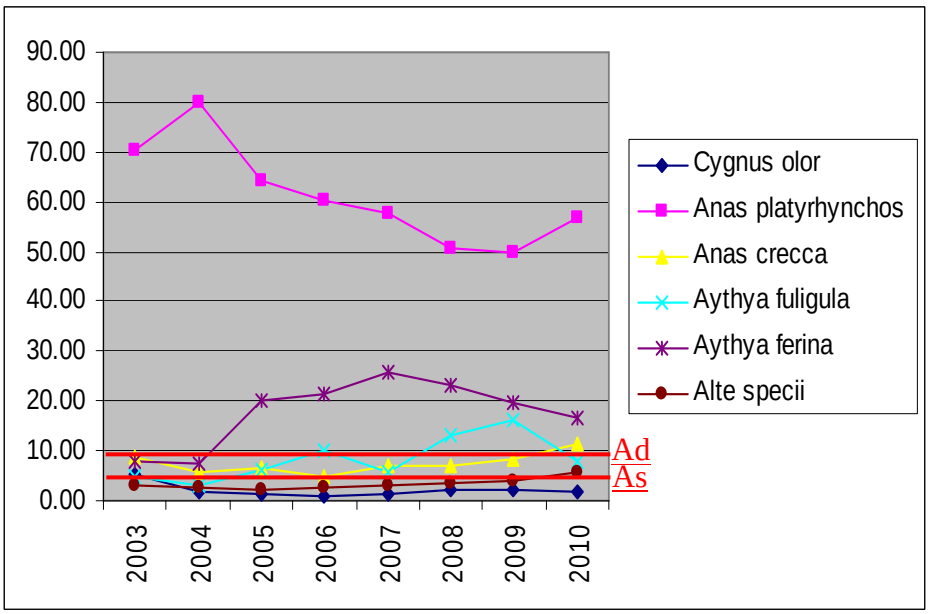


***Figure 3. The dynamics of some Anseriformes species present in the hiemal season, calculated for the whole area; Alte specii – other species.***

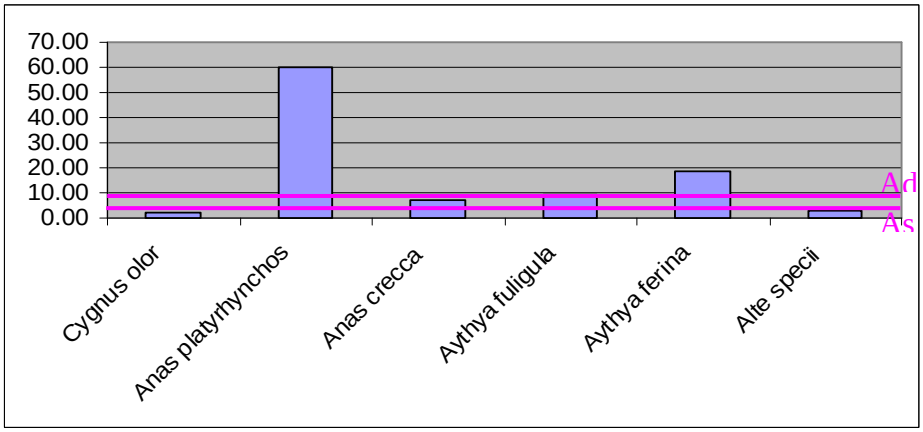


***Figure 4. The global participation of some Anseriformes species in the structure of the avifauna present on all the studied reservoirs; Alte specii – other species.***

As regards the analysis of the hiemal season on **the Goleşti Reservoir**, the population of Anseriformes is made up of 16 species, presented in Table 2. Thus, on the Goleşti Reservoir *Anas platyrhynchos* maintained a steady presence in the overdominance zone; in the winter of 2004 the value reaches the maximum limit of its presence as their number increased massively due to the arrival of individuals from the north (Tab. 2).

The Goleşti Reservoir, situated in the most downstream location and only partially covered with ice sheltered thousands of birds; *Aythya ferina* was a dominant species in the winters of 2003 and 2004 (probably migrating southwards because of the climatic conditions) and then it became overdominant during the whole research period (from the winter of 2005 to the winter of 2010), a situation concordant with that revealed by the analysis of the five reservoirs in the winter season. The difference consists in the fact that *Aythya fuligula* was a dominant species only in the winters of 2006

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and 2010. Afterwards, overdominance occurred in the winter of 2008 and 2009, milder winters, when the Goleşti Reservoir did not freeze in the middle region where the diving ducks prefered to look for food. *Anas crecca* is found at the superior limit of the complementarity zone; the only exception is the winter of 2010, when they were dominant. The other species are constantly complementary (Fig. 5).

***Table 2. The IR values of the Anseriformes species present in the avifauna of the Goleşti Reservoir in the hiemal season***

| No. | Species | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | Interval |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | *Cygnus olor* | 2.24 | 0.37 | 0.25 | 0.20 | 0.29 | 0.82 | 0.63 | 0.17 | 0.56 |
| 2 | *Cygnus cygnus* | 0.08 | 0.02 | 0.02 | 0.02 | 0.03 | 0.03 | 0.04 | 0.00 | 0.03 |
| 3 | *Anser albifrons* | 1.06 | 0.41 | 0.03 | 1.76 | 1.45 | 1.87 | 1.40 | 0.00 | 1.11 |
| 4 | *Anas platyrhynchos* | 80.29 | 86.74 | 68.37 | 61.64 | 57.54 | 54.19 | 53.71 | 61.22 | 64.75 |
| 5 | *Anas acuta* | 0.01 | 0.00 | 0.01 | 0.00 | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 |
| 6 | *Anas penelope* | 0.38 | 0.43 | 0.17 | 0.00 | 0.27 | 0.49 | 0.41 | 1.70 | 0.38 |
| 7 | *Anas querquedula* | 0.00 | 0.00 | 0.00 | 0.12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 |
| 8 | *Anas crecca* | 5.49 | 4.28 | 5.17 | 3.81 | 5.09 | 4.16 | 4.70 | 8.16 | 4.80 |
| 9 | *Tadorna tadorna* | 0.00 | 0.02 | 0.03 | 0.04 | 0.05 | 0.05 | 0.10 | 0.08 | 0.05 |
| 10 | *Aythya marila* | 0.03 | 0.01 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 |
| 11 | *Aythya fuligula* | 3.34 | 1.88 | 4.00 | 10.35 | 4.91 | 15.96 | 17.73 | 7.14 | 8.91 |
| 12 | *Aythya ferina* | 6.82 | 5.63 | 21.73 | 21.90 | 30.22 | 22.11 | 20.72 | 19.05 | 18.98 |
| 13 | *Aythya nyroca* | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 |
| 14 | *Bucephala clangula* | 0.22 | 0.17 | 0.18 | 0.10 | 0.11 | 0.26 | 0.47 | 2.31 | 0.35 |
| 15 | *Mergus merganser* | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.01 |
| 16 | *Mergus albellus* | 0.02 | 0.04 | 0.04 | 0.03 | 0.01 | 0.04 | 0.06 | 0.16 | 0.04 |

On the whole, on the Goleşti Reservoir in the winter season, *Anas platyrhynchos* and *Aythya ferina* were overdominant species, *Aythya fuligula* was the only dominant species; *Anas crecca* and the other species were complementary (Tab. 2, Fig. 6). We underline the fact that throughout the whole research interval, the $I_R$ values for the Anseiformes on the five reservoirs we studied are mainly influenced by the high $I_R$ values of the Goleşti Reservoir during the hiemal season. This can be explained through the impressive numbers recorded during this season on this reservoir characterized by a huge surface area and a great depth.

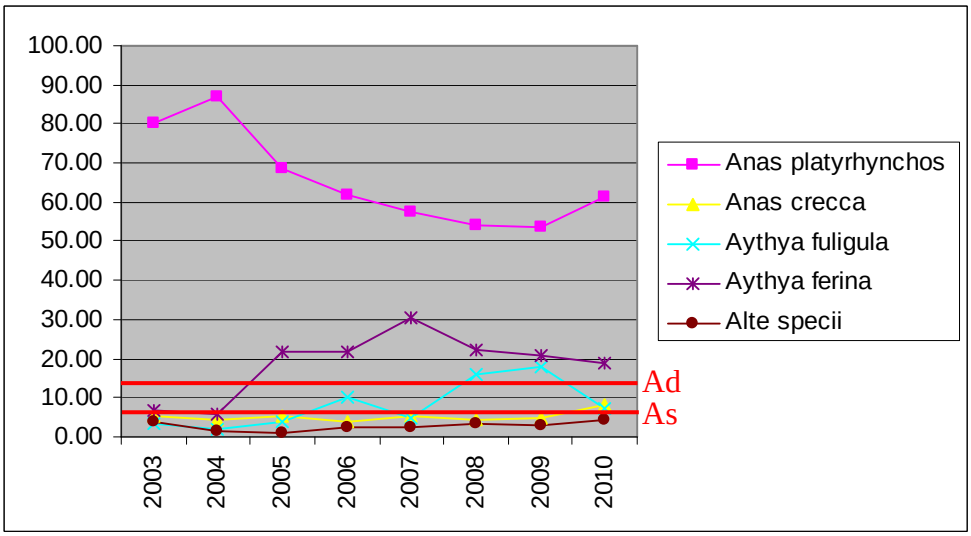


***Figure 5. The dynamics of some Anseriformes species from the Goleşti Reservoir in the hiemal season; Alte specii – other species.***

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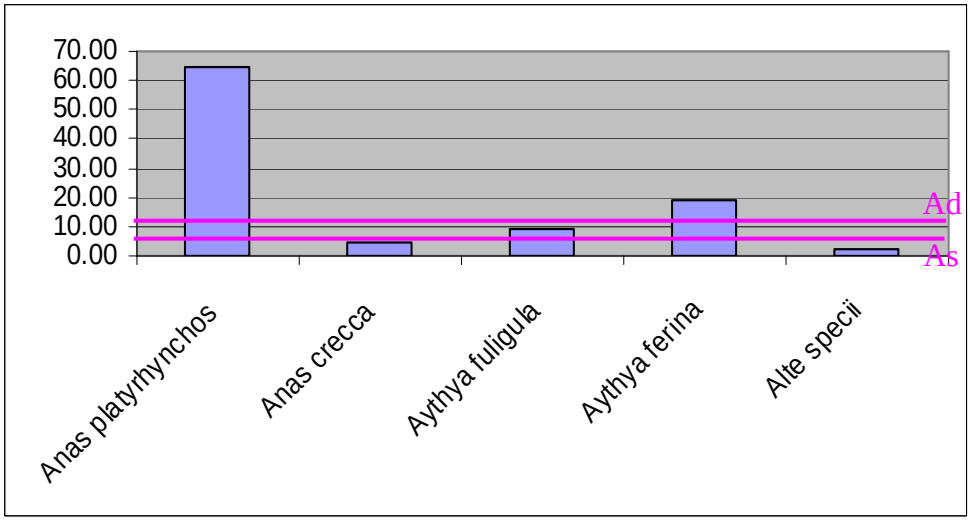


***Figure 6. The global participation of the different Anseriformes species in the structure of the avifauna of the Goleşti Reservoir; Alte specii – other species.***

On the Piteşti Reservoir in the hiemal season we could distinguish the presence of 17 Anseriformes species (Table 3). If we analyze Figure 7, paying special attention to the index of relation, we can observe that *Anas platyrhynchos* continued to be an overdominant species in the Anseriformes coenose throughout the research period, while *Anas crecca* and *Aythya ferina* oscillated between dominance and overdominance. In the winter of 2003 the $I_R$ values for both species ranged in the dominance zone and then they came to be overdominant.

*Anas crecca*, which is a surface duck, continued to be overdominant throughout the whole period of our study; on the other hand, the number of individuals from the species *Aythya ferina* decreased considerably in the winter of 2010 during January and February (there is also a negative correlation, evident from the comparison between the variation lines of the *Aythya ferina* and *Anas crecca*), because the area of the reservoir near the dam, an area with a great depth, was covered with ice (Fig.7).

*Cygnus olor* is at the upper limit of the dominance zone, oscillating between dominance (2005, 2006, 2007, 2008) and overdominance (2003, 2004, 2009, 2010). In the hiemal season, the Piteşti Reservoir sheltered the highest number of mute swans of all the studied reservoirs. *Aythya fuligula* is also at the upper limit of the dominance zone, even though in the winter of 2006 (on the 13 January 2006, 30% of the surface of the Pitesti reservoir was covered with ice, exactly in the area near the dam) the species entered the complementarity zone. The other Anseriformes species are constantly found in the complementarity zone. (Tab. 3, Fig. 7)

On the whole, on the Piteşti Reservoir, *Anas platyrhynchos*, *Anas crecca* and *Aythya ferina* were overdominant species, *Cygnus olor* and *Aythya fuligula* were dominant species and the other species were complementary (Table 3; Fig.7; Fig. 8).

The low and marshy shores of the lake have a very rich food offer, attracting an important number of species of passage (*Charadriidae* and *Scolopacidae*) in November as well. In the hiemal season, even though it has the smallest surface, the Piteşti Reservoir is, as the other studied reservoirs, a resting, sheltering and feeding place for the Anseriformes. We would like to emphasize the large

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number of mute swans present here, larger than the numbers present on the other reservoirs under research. Large numbers of larids, rails and podicipediformes could also be observed.

***Table 3. The IR values of the Anseriformes species present in the avifauna of the Piteşti Reservoir in the hiemal season***

| No. | Species | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | Interval |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. | *Cygnus olor* | 25.18 | 18.51 | 7.92 | 9.59 | 8.29 | 6.91 | 11.60 | 12.64 | 11.42 |
| 2. | *Cygnus cygnus* | 1.17 | 0.16 | 0.27 | 0.55 | 0.13 | 0.36 | 0.17 | 0.00 | 0.32 |
| 3. | *Branta ruficolis* | 0.00 | 0.00 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 |
| 4. | *Anas platyrhynchos* | 44.89 | 29.84 | 38.60 | 44.13 | 54.81 | 33.09 | 32.82 | 36.76 | 38.22 |
| 5. | *Anas strepera* | 0.00 | 0.16 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 |
| 6. | *Anas acuta* | 0.20 | 0.12 | 0.17 | 0.00 | 0.00 | 0.00 | 0.04 | 0.00 | 0.06 |
| 7. | *Anas penelope* | 0.00 | 0.87 | 0.68 | 0.00 | 1.18 | 0.72 | 0.00 | 1.16 | 0.57 |
| 8. | *Anas crecca* | 10.56 | 19.70 | 17.64 | 18.20 | 15.33 | 18.43 | 20.49 | 26.69 | 18.46 |
| 9. | *Tadorna tadorna* | 0.15 | 0.29 | 0.00 | 0.00 | 0.00 | 0.11 | 0.13 | 1.36 | 0.20 |
| 10. | *Aythya marila* | 0.10 | 0.08 | 0.03 | 0.00 | 0.10 | 0.00 | 0.00 | 0.00 | 0.03 |
| 11. | *Aythya fuligula* | 7.92 | 6.92 | 21.71 | 5.04 | 3.79 | 8.59 | 11.92 | 10.57 | 9.87 |
| 12. | *Aythya ferina* | 8.66 | 21.76 | 12.06 | 22.04 | 15.62 | 30.32 | 22.27 | 9.67 | 19.82 |
| 13. | *Aythya nyroca* | 0.10 | 0.33 | 0.24 | 0.00 | 0.13 | 0.09 | 0.10 | 0.00 | 0.13 |
| 14. | *Bucephala clangula* | 0.59 | 0.87 | 0.47 | 0.11 | 0.45 | 1.20 | 0.33 | 1.01 | 0.67 |
| 15. | *Melanitta fusca* | 0.00 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 |
| 16. | *Mergus merganser* | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 |
| 17. | *Mergus albellus* | 0.39 | 0.33 | 0.17 | 0.33 | 0.19 | 0.20 | 0.13 | 0.15 | 0.21 |

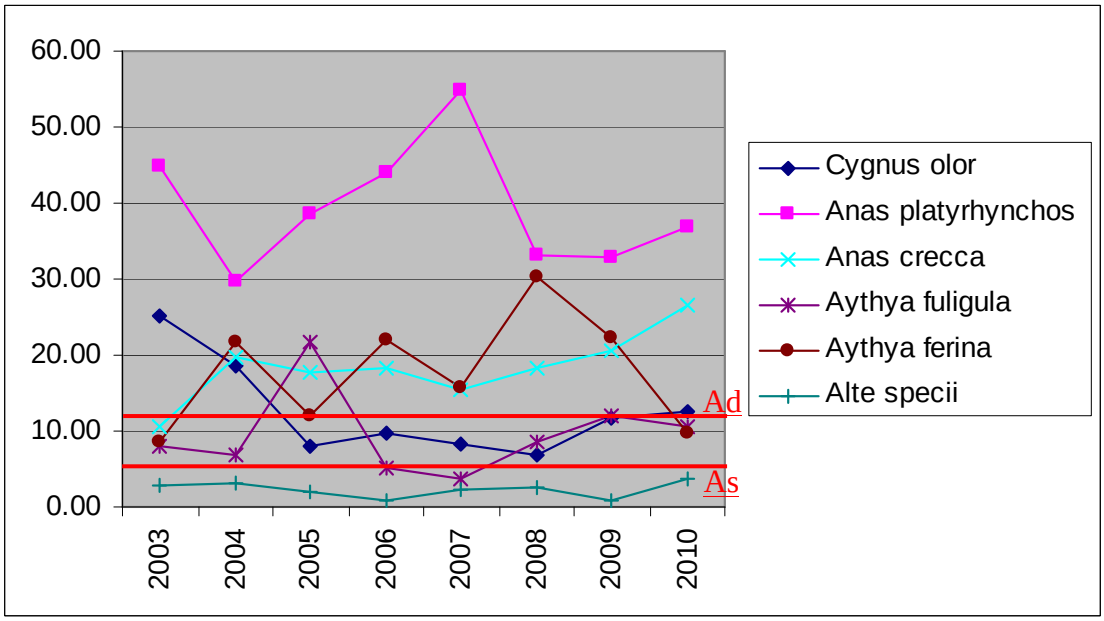


***Figure 7. The dynamics of some Anseriformes species present on the Piteşti Reservoir in the hiemal season ; Alte specii – other species.***

The hiemal season on the Bascov Reservoir is marked by the presence of 12 Anseriformes species (Table 4). According to the index of relation, the dynamics of some Anseriformes species (Fig.9) show that *Anas platyrhynchos* was permanently overdominant, while *Anas crecca* was a dominant species in 2003. The latter became overdominant in 2004, 2005 and 2006, oscillated between dominance and overdominance in 2007, 2008 and 2009 and became complementary in the winter of

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2010. The same year, *Anas penelope*, which was constantly complementary, became overdominant. During our research period, *Cygnus olor* oscillated between overdominance (the winters of 2003 and 2009), dominance (2006, 2008) and complementarity (2004, 2005 and 2007).

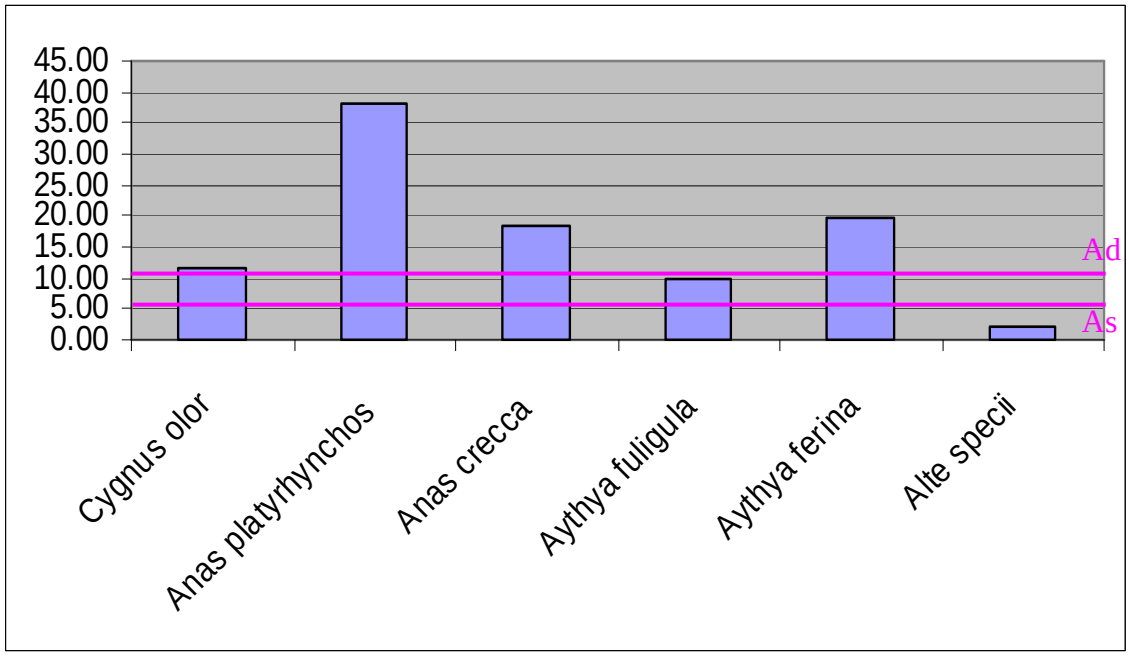


***Figure 8. The global participation of some species in the structure of the population of Anseriformes present on the Piteşti Reservoir in the hiemal season ; Alte specii – other species.***

***Table 4. The IR values of some species of Anseriformes present in the avifauna specific to the Bascov Reservoir in the hiemal season***

| No. | Species | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | Interval |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. | *Cygnus olor* | 29.59 | 5.69 | 3.67 | 11.71 | 1.97 | 12.66 | 19.70 | 11.61 | 11.83 |
| 2. | *Cygnus cygnus* | 2.15 | 2.14 | 0.76 | 2.62 | 0.42 | 6.51 | 2.97 | 0.79 | 2.31 |
| 3. | *Anas platyrhynchos* | 47.73 | 46.98 | 46.64 | 61.54 | 74.44 | 52.44 | 55.02 | 43.54 | 55.24 |
| 4. | *Anas acuta* | 0.00 | 0.71 | 0.00 | 0.35 | 0.00 | 0.00 | 0.00 | 0.00 | 0.09 |
| 5. | *Anas penelope* | 1.91 | 5.34 | 6.12 | 2.27 | 6.32 | 0.00 | 3.72 | 29.82 | 6.03 |
| 6. | *Anas crecca* | 12.17 | 27.76 | 21.10 | 18.88 | 14.75 | 11.93 | 17.10 | 5.28 | 16.08 |
| 7. | *Aythya marila* | 0.00 | 0.00 | 0.00 | 0.00 | 0.42 | 0.00 | 0.00 | 0.00 | 0.07 |
| 8. | *Aythya fuligula* | 2.15 | 3.56 | 11.01 | 0.00 | 0.00 | 1.08 | 0.00 | 2.90 | 2.47 |
| 9. | *Aythya ferina* | 3.10 | 4.98 | 6.27 | 0.35 | 0.56 | 10.85 | 0.62 | 2.64 | 3.40 |
| 10. | *Aythya nyroca* | 0.00 | 0.00 | 0.15 | 0.52 | 0.00 | 0.36 | 0.12 | 0.53 | 0.21 |
| 11. | *Bucephala clangula* | 0.48 | 1.78 | 3.06 | 1.05 | 1.12 | 2.89 | 0.50 | 2.90 | 1.64 |
| 12. | *Mergus albellus* | 0.72 | 1.07 | 1.22 | 0.70 | 0.00 | 1.27 | 0.25 | 0.00 | 0.62 |

The other species *(Aythya ferina, Aythya fuligula, Cygnus cygnus, Bucephala clangula,* etc.*)* oscillated between dominance and complementarity (Fig. 9).

On average, as shown in Figure 10, we can observe that in the hiemal population of Anseriformes present on the Bascov Reservoir there is only one overdominant species, *Anas platyrhynchos; Anas crecca* and *Cygnus olor* are dominant species and all the other nine species are complementary (Fig. 10) .

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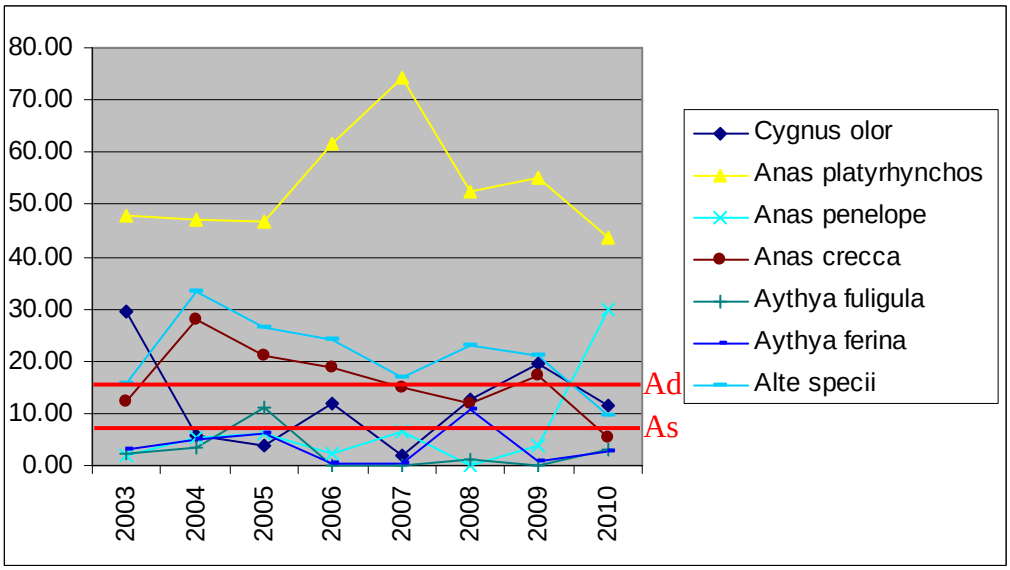


***Figure 9. The dynamics of some Anseriformes species found on the Bascov Reservoir in the hiemal season; Alte specii – other species.***

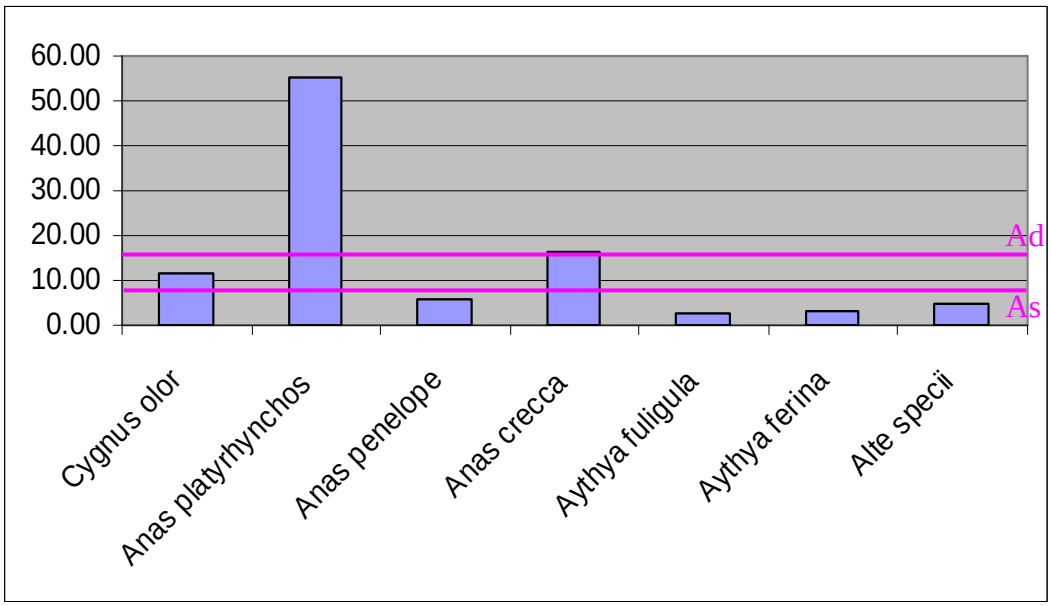


***Figure 10. The average global participation of some species in the structure of the population of Anseriformes present on the Bascov Reservoir in the hiemal aspect ; Alte specii – other species.***

Compared with the other lakes, on the Bascov Reservoir we recorded the lowest number of species (Tab.4). This situation is influenced by the anthropic factor, the reduced surface of the reservoir and the lack of low shores which usually attract the waders. The greatest ecological diversity in summer, the large number of families and brooding birds (despite the lower number of species) are all due to the variety of habitats found on the three islets, the ecotone areas, but also to the neighbouring areas on the left shore of the reservoir (with compact rush-bed, a blend of *Phragmites*,

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bushes and trees, partially drained meadows, dry meadows, alder, willow and pine forests, areas of old forest, open areas, etc.)

The hiemal season on the **Budeasa Reservoir** is marked by the presence of 19 Anseriformes species (Table 5).

During the interval of study, on the Budeasa Reservoir only *Anas platyrhynchos* was a constant overdominant species in the Anseriformes coenose; in 2005 we recorded the upper limit of its hiemal presence (with an IR value of 69.96). We can observe that is a big difference between the number of individuals of *Anas platyrhynchos* and the number of individuals of other species of Anseriformes. The other overdominant species, *Aythya ferina*, became dominant in the winters of 2004 and 2005, when a large part of the surface froze (in the winter of 2005 many individuals took shelter on the Goleşti Reservoir, because it is located more downstream than the other reservoirs). *Aythya fuligula* was a dominant species throughout the research period, except for the winter of 2009, when the values showed it came to be overdominant. *Anas crecca* oscillated between dominance, overdominance (2003 and 2009) and complementarity (the winter of 2005). The other species were constantly complementary species; the only exception was *Anas penelope*, which in 2003, due to its massive presence, became dominant (Tab.5, Fig. 11).

If we analyze the average IR value for the hiemal season throughout the research interval we can observe that the population of Anseriformes is composed of two overdominant species: *Anas platyrhynchos* and *Aythya ferina*, two dominant species: *Anas crecca* and *Aythya fuligula* (both of them at the upper limit of the dominance zone) and 14 complementary species (with *Anas penelope* at the upper limit of the complementarity zone) (Fig. 12).

***Table 5. The IR values for the Anseriformes species making up the avifauna of the Budeasa Reservoir in the hiemal season***

| No. | Species | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | Interval |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. | *Cygnus olor* | 7.01 | 0.96 | 0.94 | 2.78 | 1.88 | 3.02 | 2.62 | 2.59 | 2.94 |
| 2. | *Cygnus cygnus* | 0.51 | 0.29 | 0.04 | 0.28 | 0.35 | 0.53 | 0.40 | 0.20 | 0.37 |
| 3. | *Branta ruficolis* | 0.00 | 0.00 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 |
| 4. | *Anser albifrons* | 0.00 | 0.96 | 0.00 | 0.56 | 0.00 | 0.00 | 0.00 | 0.00 | 0.11 |
| 5. | *Anas platyrhynchos* | 41.50 | 62.17 | 69.96 | 49.52 | 52.76 | 50.82 | 45.59 | 52.77 | 50.68 |
| 6. | *Anas strepera* | 0.00 | 0.00 | 0.00 | 0.14 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 |
| 7. | *Anas acuta* | 0.04 | 0.19 | 0.00 | 0.06 | 0.06 | 0.03 | 0.02 | 0.14 | 0.05 |
| 8. | *Anas penelope* | 6.76 | 3.86 | 2.90 | 3.65 | 5.63 | 3.86 | 4.33 | 2.49 | 4.37 |
| 9. | *Anas crecca* | 21.07 | 9.20 | 2.94 | 9.78 | 11.26 | 10.48 | 13.68 | 10.21 | 11.99 |
| 10. | *Anas clypeata* | 0.04 | 0.00 | 0.24 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 |
| 11. | *Netta rufina* | 0.00 | 1.69 | 0.00 | 0.20 | 0.00 | 0.37 | 0.17 | 0.00 | 0.23 |
| 12. | *Aythya marila* | 0.22 | 0.34 | 0.00 | 0.00 | 0.06 | 0.00 | 0.10 | 0.00 | 0.08 |
| 13. | *Aythya fuligula* | 9.57 | 8.39 | 10.16 | 10.34 | 11.01 | 7.09 | 13.79 | 10.90 | 10.49 |
| 14. | *Aythya ferina* | 12.31 | 8.63 | 10.20 | 18.54 | 14.60 | 22.20 | 16.69 | 18.73 | 16.32 |
| 15. | *Aythya nyroca* | 0.02 | 0.19 | 0.00 | 0.00 | 0.04 | 0.00 | 0.02 | 0.07 | 0.03 |
| 16. | *Bucephala clangula* | 0.69 | 2.60 | 2.24 | 3.76 | 1.88 | 1.49 | 2.28 | 1.70 | 1.99 |
| 17. | *Melanitta fusca* | 0.00 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.05 | 0.00 | 0.02 |
| 18. | *Mergus merganser* | 0.00 | 0.19 | 0.04 | 0.00 | 0.04 | 0.06 | 0.02 | 0.07 | 0.04 |
| 19. | *Mergus albellus* | 0.24 | 0.24 | 0.35 | 0.39 | 0.42 | 0.06 | 0.23 | 0.14 | 0.24 |

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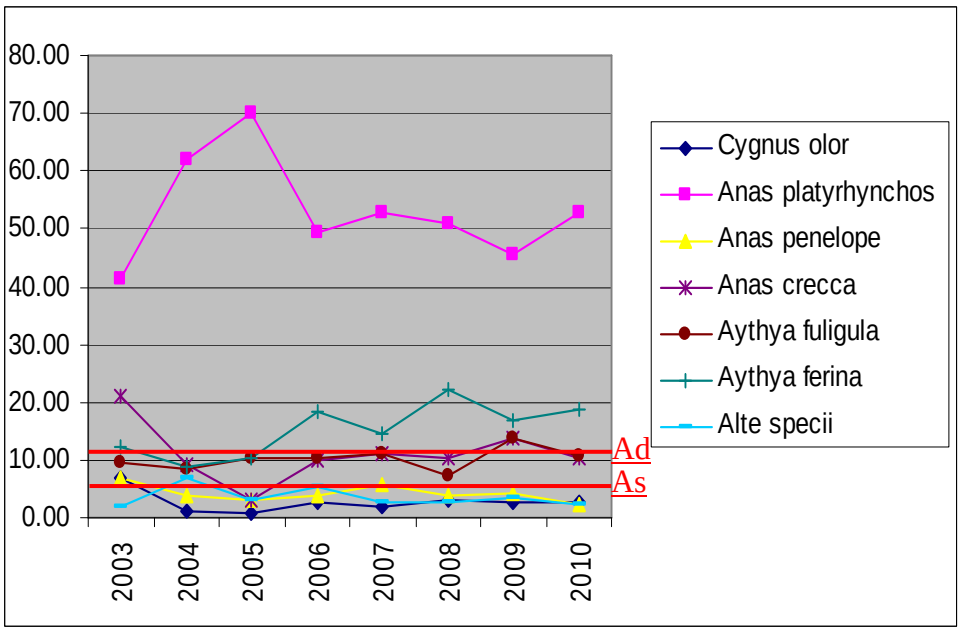


***Figure 11. The dynamics of some Anseriformes species present on the Budeasa Reservoir in the hiemal season; Alte specii – other species.***

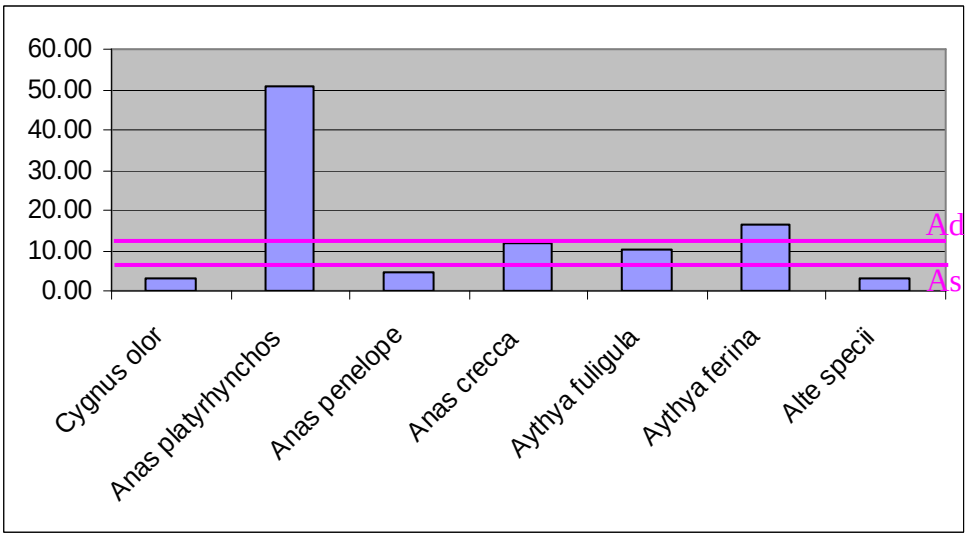


***Figure 12. The average global participation of some species in the structure the avifauna present on the Budeasa Reservoir; Alte specii – other species.***

The hills and meadows found in the surroundings of the Budeasa Reservoir are covered with deciduous forests, orchards with fruit trees and agricultural crops. A large number of species from these habitats usually find food in the reservoir area. At the rear of the Budeasa Reservoir compact surfaces of reed and stands of alders and willows, either permanently flooded or not flooded. The low unimpounded shores of the reservoir, some muddy or sandy (especially in the more droughty periods or when the reservoir is emptied) have a very rich food offer, attracting a large number of species of passage.

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The reservoir has a large water surface, feeding habitats for a large number of species and individuals: Anatidae, Laridae, Sternidae, Ardeidae, Podicipedidae and Ralidae (towards the middle of the reservoir and towards the dam we observed many individuals from the species *Cygnus olor, Aythya ferina, Aythya fuligula, Podiceps cristatus and Fulica atra*). In the middle of the Budeasa Reservoir there are three high voltage electricity pylons made of metal, which the cormorants (*Phalacrocorax carbo* - 200 – 700 individuals, more rarely *Phalacrocorax pygmeus*) use throughout the year as a resting place. In the same way as the Goleşti Reservoir, the Budeasa Reservoir is first of all a real wintering quarter and a resting, sheltering and feeding place during the hiemal season (for the Eurasian/ the mallard, common teal, the mallard, the common pochard, the tufted duck, the mute swans, the coot, the great crested grebe and the little grebe, cormorants and larids); real interspecific communities of thousands of individuals are formed here.
In the hiemal season, on the Vâlcele Reservoir we could observe the presence of 14 Anseriformes species (Table 6).
Throughout the research period on the Vâlcele Reservoir, the population of Anseriformes has a completely changed aspect when compared with the other reservoirs, as it is situated upstream. Mention should be made of the fact that there are no data for the winter of 2003; in January the largest part of its surface was frozen and under a strong anthropic influence.

***Table 6. The IR values for the Anseriformes species making up the avifauna of the Vâlcele Reservoir in the hiemal season***

| No. | Species | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | Interval |
|---|---|---|---|---|---|---|---|---|---|
| 1. | *Cygnus olor* | 3.32 | 4.08 | 0.50 | 0.91 | 1.71 | 3.23 | 0.88 | 2.64 |
| 2. | *Cygnus cygnus* | 0.98 | 0.70 | 0.00 | 0.00 | 2.69 | 1.28 | 0.34 | 0.87 |
| 3. | *Anser albifrons* | 0.60 | 0.86 | 0.00 | 0.00 | 0.00 | 0.92 | 0.00 | 0.55 |
| 4. | *Anas platyrhynchos* | 36.35 | 37.87 | 96.48 | 83.59 | 46.45 | 33.18 | 53.92 | 44.26 |
| 5. | *Anas strepera* | 0.00 | 3.42 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.70 |
| 6. | *Anas acuta* | 0.45 | 0.10 | 0.00 | 0.00 | 0.00 | 0.07 | 0.00 | 0.10 |
| 7. | *Anas penelope* | 12.07 | 5.79 | 0.00 | 0.00 | 0.00 | 1.65 | 2.45 | 3.88 |
| 8. | *Anas crecca* | 5.96 | 8.41 | 1.51 | 10.64 | 14.67 | 16.95 | 20.59 | 13.61 |
| 9. | *Aythya marila* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.07 | 0.00 | 0.02 |
| 10. | *Aythya fuligula* | 12.22 | 10.52 | 0.00 | 3.95 | 1.22 | 13.99 | 4.90 | 9.60 |
| 11. | *Aythya ferina* | 21.87 | 21.65 | 0.00 | 0.00 | 17.11 | 17.94 | 5.88 | 15.07 |
| 12. | *Aythya nyroca* | 0.15 | 0.10 | 0.00 | 0.00 | 0.00 | 0.20 | 0.10 | 0.12 |
| 13. | *Bucephala clangula* | 5.88 | 6.39 | 1.51 | 0.91 | 14.67 | 9.94 | 10.78 | 8.24 |
| 14. | *Mergus albellus* | 0.15 | 0.10 | 0.00 | 0.00 | 1.47 | 0.59 | 0.15 | 0.32 |

The observations led us to the conclusion that *Anas platyrhynchos* was the only dominant species in the Anseriformes coenose, with the upper limit of its hiemal presence recorded in 2006 (the IR value – 96.48, as shown in Table 6). *Aythya ferina* oscillated between overdominance (the winters of 2004, 2005, 2008 and 2009) and complementarity (the winters of 2003, 2006, 2007 and 2010). *Anas crecca* oscillated between overdominance (the winters of 2008, 2009 and 2010), dominance (the winter of 2007) and complementarity (the winters of 2003 and 2006). *Bucephala clangula* oscillated between overdominance (the winter of 2008), dominance (the winters of 2009 and 2010) and complementarity (the winters of 2003, 2004, 2005, 2006 and 2007). *Aythya fuligula* oscillated between dominance (the winters of 2004, 2005 and 2009) and complementarity, the same way as *Anas penelope*, the rest of the species being constantly registered in the complementary zone (Fig. 13).
On average, we can notice that during the hiemal season, according to the **$I_R$ values,** the population of Anseriformes present on the Vâlcele Reservoir consisted of three overdominant species (*Anas platyrhynchos, Aythya ferina* and *Anas crecca)* and two dominant species (*Aythya fuligula* şi

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*Bucephala clangula*); the other nine species are enclosed in the group of complementary species (Fig. 14).

This is the only reservoir under research where the species *Bucephala clangula* appeared as dominant. The dyamics of population of Anseriformes species on the Vâlcele Reservoir is high and must be analyzed in relation with the anthropic activity (the hunting pressure) in progress in the feeding and resting places of the wintering birds. The variations of the population of Anseriforms are caused by weather conditions and by the size of the surface covered with ice; this reservoir is located more upstream than the others.

We have calculated the $I_R$ values of Anseriformes for each reservoir to reveal the importance of the avifauna.

The concrete and effective conservation of the diversity of the avifauna (mainly of the biodiversity) must be based on current data regarding the populations of the species (Underhill, Gibbons, 2004).

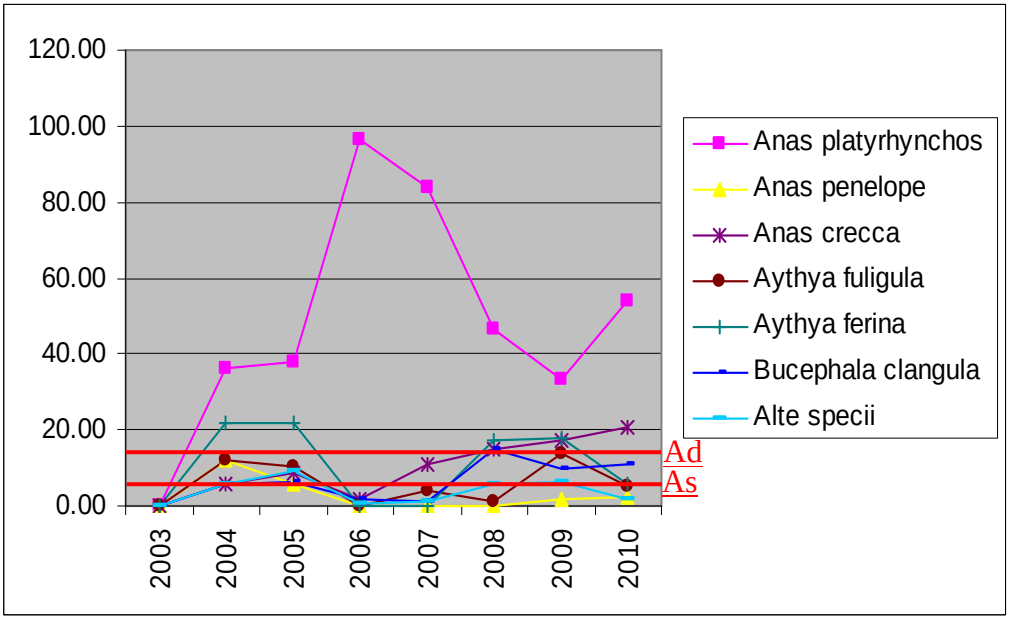


***Figure 13. The dynamics of some Anseriformes species in the hiemal season on the Vâlcele Reservoir; Alte specii – other species.***

In reference to the ecological indices (Fig. 15 ) relating to constancy, in the hiemal season, in the area of the five reservoirs under research, 15 species representing 11.90% (*Phalacrocorax carbo, Tachybaptus ruficollis, Egretta alba, Cygnus olor, Anas platyrhynchos, Anas crecca, Aythya ferina, Gallinula chloropus, Pica pica, Carduelis carduelis, etc*) were euconstant (C4), 22 species (17.46%, *Podiceps cristatus, Ardea cinerea, Anas penelope, Buteo buteo, Motacilla cinerea, Corvus corone cornix, Turdus pilaris, Emberiza schoeniclus* and *Emberiza citrinella*) were constant (C3), 22 species (17.46% *Gavia arctica, Phalacrocorax pygmeus, Cygnus cygnus, Circus cyaneus, Falco columbarius, Alcedo atthis, Lanius excubitor,* etc.) were accesory (C2) and 67 species (53.17%, *Gavia stellata, Podiceps grisegena, Branta ruficollis, Anas acuta, Buteo lagopus, Carduelis flammea,* etc.) were accidental (C1).

With regard to dominance in the hiemal season, in the area of the five studied reservoirs, three species were eudominant (Fig. 15), representing 2.38% (*Anas platyrhynchos, Aythya ferina* and *Fulica atra*) (D5), 2 species (1.59%, *Aythya fuligula* and *Larus ridibundus*) were dominant (D4), 3

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species (2.38%, *Anas crecca, Larus cachinnans/michahellis* and *Larus canus*) were subdominant (D3), 2 species (1.59%, *Phalacrocorax carbo* and *Cygnus olor* ) were recedent (D2), and 116 species (92.06%, *Gavia arctica, Podiceps cristatus, Anser albifrons, Cygnus cygnus, Mergus albellus, Corvus frugilegus, Regulus regulus, Passer montanus,* etc.) were subrecedent (D1).

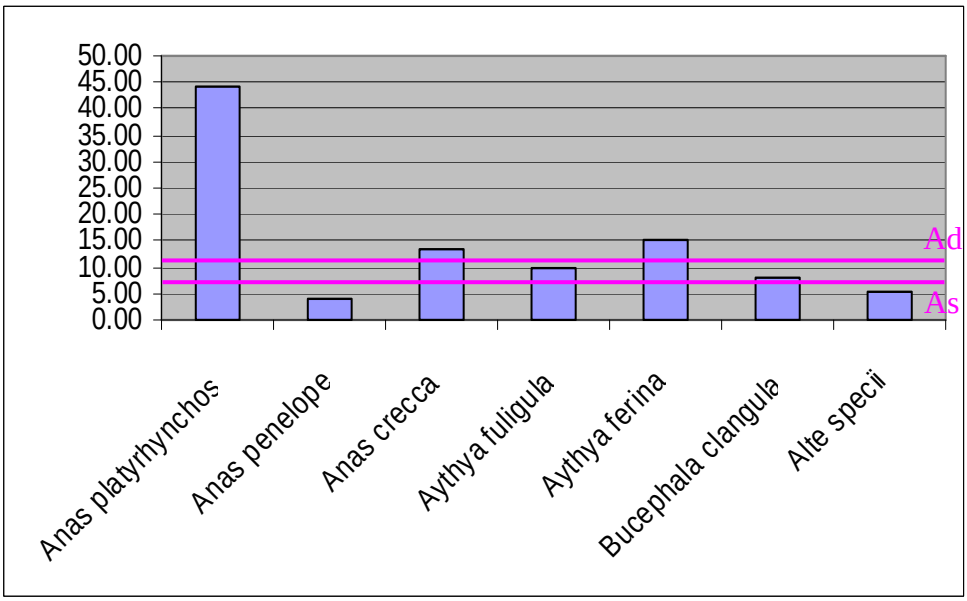


***Figure 14. The average global participation of some species in the structure of the avifauna present on the Vâlcele Reservoir in the hiemal season; Alte specii – other species.***

If we analyze the Dzuba index of ecological significance (Fig.15), in the hiemal season, in the area of the five reservoirs, three species representing 2.38% (*Anas platyrhynchos, Aythya ferina* and *Fulica atra*) were eudominant (W5), 2 species (1.59%, *Aythya fuligula* and *Larus ridibundus*) were dominant (W4), 5 species (3.97%, *Phalacrocorax carbo, Cygnus olor, Anas crecca, Larus cachinnans/michahellis* and *Larus canus*) were subdominant (W3), 14 species (11.11%, *Podiceps cristatus, Anas penelope, Bucephala clangula, Carduelis spinus,* etc.) were recedent (W2) and 102 species (80.95%, *Gavia stellata, Podiceps nigricollis Aythya nyroca, Falco columbarius, Picus viridis, Bombycilla garrulus, Emberiza schoeniclus,* etc.) were subrecedent (W1).
According to the Dzuba index of ecological significance, we can conclude that in the hiemal season, in the area of the five reservoirs there are five characteristic species (eudominant and dominant): *Anas platyrhynchos, Aythya ferina, Fulica atra, Aythya fuligula* and *Larus ridibundus.*
When compared with the research conducted in the 1980s, we notice that the variation in the percentages calculated for the main species was rather limited. In the past, the species *Anas platyrhynchos, Anas crecca, Vanellus vanellus* and *Larus ridibundus* had the highest percentages, while in the present the highest percentages are recorded for the species *Anas platyrhynchos, Aythya ferina, Fulica atra, Larus ridibundus, Anas crecca, Phalacrocorax carbo* and *Aythya fuligula*; in the vernal season *Sturnus vulgaris* also appears as a dominant species (W4).
We have laid a greater emphasis on the hiemal aspect because the reservoirs from the middle area of the Arges Valley are important for their avifauna, especially in winter.

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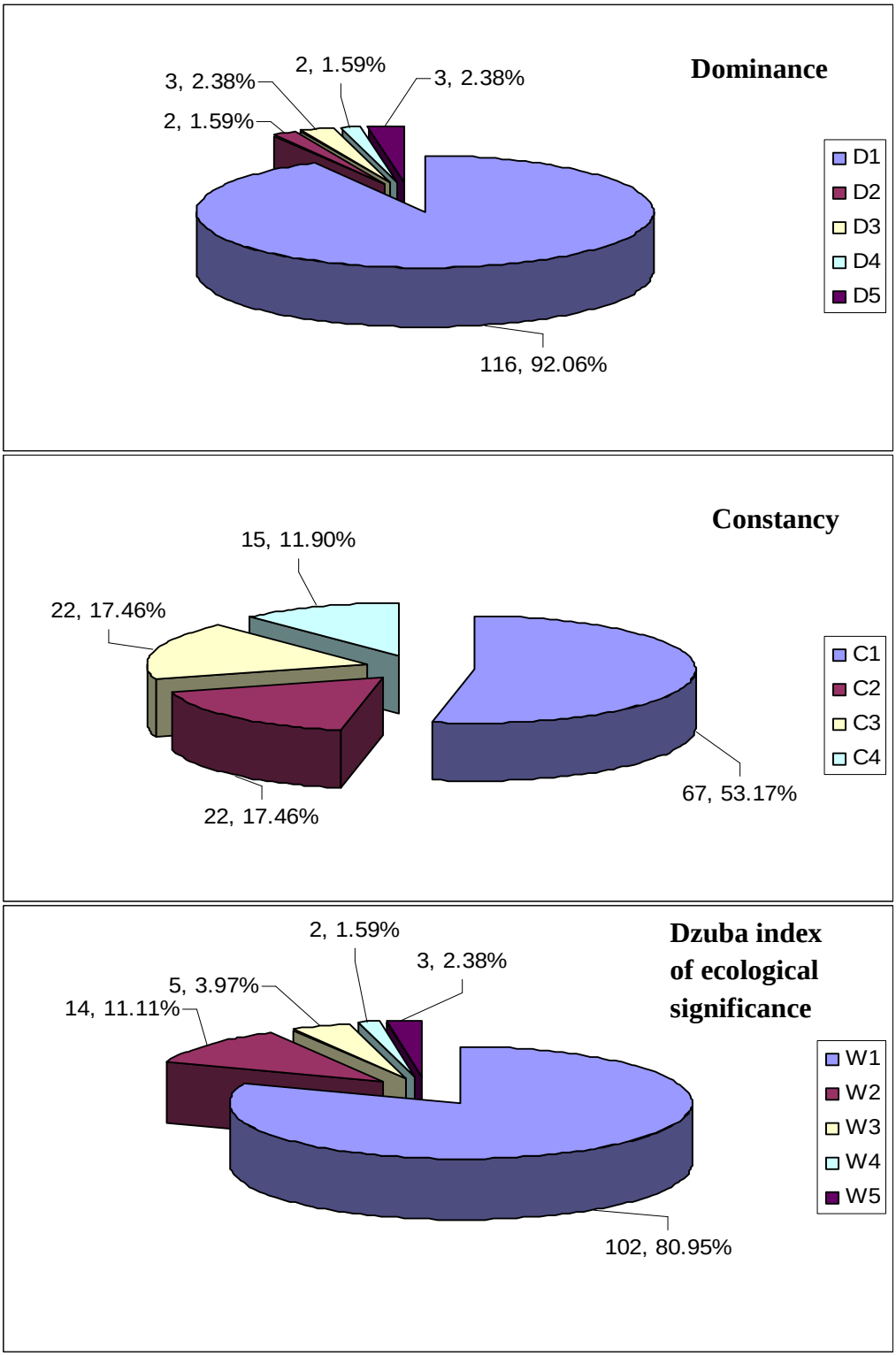


***Figure 15. The distribution on categories of the ecological indices of the avifauna in the studied reservoir areas during the hiemal season***. (**Legend:** *C1 – accidental species, C2 – accessory species, C3 – constant species, C4 – euconstant species, D1, W1 – subrecedent species, D2, W2 – recedent species, D3, W3 – subdominant species, D4, W4 – dominant species, D5, W5 – eudominant species*.).

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During the four months of the hiemal season these reservoirs become real wintering quarters, more than 15,000- 20,000 individuals being recorded here; the reduced number of species is compensated by the high number of individuals of some of these species.

The total number of bird species recorded in the hiemal season in the period 2003 – 2010, in the research area as well as the number of eudominant (*Anas platyrhynchos*, *Aythya ferina* and *Fulica atra*) and dominant species (*Aythya fuligula* şi *Larus ridibundus*) recorded in the same period were the highest in December and February (over 110,000 individuals), but high total numbers (of over 50,000 individuals) were also observed in the area starting from September and October and ending in March, in the passage and wintering periods (Tab. 6). Generally, the reservoirs are highly populated during the migration period and during winter, a fact also highlighted by Munteanu, Mătieş, 1983; Kiss, 1999; Gache, 2002; Mitruly, 2002; Conete, 2011; Mestecăneanu, 2011, etc. for the aquatic basins from Banat, Moldavia, Transylvania, Muntenia, etc.

The correlation between temperature and the total number of bird species is negative - the higher the temperature is, the lower the number of birds and the lower the temperature, the higher the number of birds. The highest number of individuals for the species *Anas platyrhynchos*, *Aythya ferina* and *Aythya fuligula* was recorded in December and for the species *Fulica atra* and *Larus ridibundus* in January (Tab. 6).

***Table 6. The monthly variation of the number of all the recorded bird species and of the number of eudominant and dominant species observed in the research area in the hiemal season correlated with the monthly variation of the average temperature recorded at the Weather Station in Pitesti in the period 2003 – 2010***

| **Month** | **XI** | **XII** | **I** | **II** |
|---|---|---|---|---|
| Total number | 101.134 | 126.464 | 108.268 | 112.198 |
| Number of *Anas platyrhynchos* | 39.126 | 51.114 | 49.943 | 47.193 |
| Number of *Aythya ferina* | 17.344 | 20.411 | 8.606 | 10.858 |
| Number of *Fulica atra* | 8.897 | 11.274 | 13.659 | 12.262 |
| Number of *Aythya fuligula* | 7.988 | 9.914 | 3.104 | 7.291 |
| Number of *Larus ridibundus* | 1.379 | 1.663 | 4.032 | 3.076 |
| Average temperature of the air ($^0$C) | 6.388 | 1.463 | -0.29 | 0.563 |

The temperature of the air is an important factor which determines the variation of the total numbers of bird species. The freezing and defreezing of the water surface in the northern wintering quarters or of the water from the neighbouring areas play a major role in the massive arrival and departure of the eudominant and dominant species. Of them, *Anas platyrhynchos* stands out due to its impressive variation, especially in the hiemal season.

Low temperatures cause the freezing of the reservoirs in the north or the increase of the surface covered with ice and as a result, the individuals from the species *Anas platyrhynchos* go south. From the point of view of the avifauna, many hibernal species (aquatic species) are important for Romania. They winter in great numbers in the area.

From the point of view of the Birds Directive, 23 species are listed in Annex I (species that require special conservation measures regarding their habitat, in order to ensure the survival and reproduction in their distribution area) (http://eur-lex.europa.eu/legal).

The number of protected species observed here is higher in winter, a fact that justifies the official recognition of the reservoirs as Important Bird Areas (Conete, 2011).

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## 4. CONCLUSIONS

In the hiemal season, the avifauna of the reservoirs from the middle basin of the Argeş River is spectacular as a consequence of the arrival of many Anseriformes, which form large agglomerations of birds; the hiemal season is the richest of the six seasons regarding the number of individuals (448,064), but the poorest in species - 118 species belonging to 14 orders.

The analysis of the $I_R$ values for the five reservoirs on the whole and separately shows us that the large agglomerations of Anseriformes (which were permanently overdominant) are constantly present during the hiemal season. Nevertheless, the specific composition and the number of individuals from different species vary continuously on the five reservoirs, depending on the weather conditions, the position of the reservoir on the course of the river, the surface area of the water, the depth of the reservoir, the quality of the water, the diversity and accessibility of food, the heterogeneity of the landscape, the anthropic impact, predators, but also depending on the vulnerability and the adaptation degree of the bird species to the anthropic influence.

The dynamics of the number of Anseriformes is high in the area and so is anthropic activity (especially hunting and fishing) performed in their feeding, resting and halting places. The birds change their feeding or resting places under the influence of the anthropic pressure, particularly because of the hunting pressure, a case in which they move in massive numbers from one reservoir to another, in search of some safer resting places (where there is a minimum safety distance).

The highest number of Anseriformes species was observed on the Budeasa Reservoir (19 species) and the lowest on the Bascov Reservoir (12 species). The Piteşti Reservoir sheltered the highest number of mute swans of all the studied reservoirs. The Vâlcele Reservoir is the only reservoir under research where the species *Bucephala clangula* appeared as dominant.

The most spectacular agglomerations of birds during the hiemal season are found on the Goleşti, Budeasa and Vâlcele reservoirs (especially in the mild winters), which are authentic wintering quarters for the aquatic birds in the area, but during our research period the most important proved to be the Goleşti Reservoir. This is situated downstream and it is different from the other reservoirs because it has a larger surface area and a greater depth, sheltering big numbers of Anseriformes, represented by huge agglomerations during the passage and wintering periods. On the Goleşti Reservoir there is an obvious influence of the avifauna specific to the lower course of the Danube, as a result of the fact that the birds are interconnected with those present on the Danube through the lower course of the Argeş River.

The high number of subrecedent species emphasize the high fluctuation of bird species in the area, because during the hiemal season the reservoirs offer the best life conditions for a reduced number of eudominant and dominant species - *Anas platyrhynchos, Aythya ferina, Fulica atra, Aythya fuligula* and *Larus ridibundus,* present in great numbers compared to the other species with a broad spectrum of ecological possibilities, and a preference for a wide variety of wet habitats. The temperature of the air is an important factor, determining the variation of the total number of individuals. The freezing and defreezing of the water surface area in the northern wintering quarters or of the water from the neighbouring areas also play a major role in the massive arrival and departure of the eudominant and dominant species. The maximum number of birds was recorded in December (126,464 individuals). The correlation between temperature and the total number of individuals of the bird species is negative. As the temperature increases, the number of individuals decreases and vice versa.

The studied reservoirs have a major importance for the avifauna. They are part of the ROSPA0062 - The Reservoirs on the Argeş River, a site included in the Nature 2000 Network. It is also part of the Important Avifauna Areas Program. Thus, in the area were identified rare and protected species (*Phalacrocorax pygmeus, Branta ruficollis, Aythya nyroca* and *Haliaeetus albicilla*), and 23 species

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(19,49 % *Gavia arctica, Egretta alba, Cygnus cygnus, Alcedo atthis, Picus canus*, etc.) are enlisted in Annex I of the Birds Directive. The high number of protected bird species identified here justifies the local, national and international importance of these bird areas, since these reservoirs are located on some European migration routes and ensure favourable conditions for many migratory bird species chiefly through their role of wintering quarters.

We consider that in the future, through the expansion of the research area and the adoption of effective protection measures for birds and their habitats, more bird species might be added on the list presented in this paper. We think 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.

**5. REFERENCES**

Barco, A., Nedelcu, E. (1974). Județul Argeş. Editura Academiei, Bucureşti.

Botnariuc, N., Tatole, V. (2005). Cartea Roşie a Vertebratelor din România. Academia Română. Muzeul Național de Istorie Naturală „Grigore Antipa", Bucureşti, 260 p.

Bertel, B., Delin, H., Svensson, L., Singer, A., Zetterstrom, D., Munteanu, D. (1999). Hamlyn Guide. Păsările din România si Europa. Determinator ilustrat. Publicație S.O.R., Octopus Publishing Group Ltd. 320 p.

Conete Denisa (2011). Cercetări ecologice asupra avifaunei unor lacuri de baraj din zona mijlocie a văii Argesului. PhD thesis. Universitatea din Bucuresti.

Conete Denisa, Gava, R., Mestecăneanu, A. (2008). Statutul de protecție al păsărilor din zona lacurilor de acumulare de pe râul Argeş. *Scripta Ornithologica Romaniae, 3,* 68-75.

Conete Denisa, Gava, R., Mestecăneanu, A. (2009). Ecological Research about the Avifauna of the Piteşti Basin (Hydrographic Basin of Argeş River). Research People and Actual Tasks on Multidisciplinary Sciences. *Proceedings of the Second International Conference. Bulgarian National Multidisciplinary Scientific Network of the Professional Society for Research Work.* Lozenec, Bulgaria (10-12 June 2009), 3, 201-205.

Conete Denisa, Mestecăneanu, A., Gava, R. (2012). Ornithological researches on the Goleşti Dam Lake (Argeş County, Romania) during 2003 – 2010. *Analele Universității din Oradea, Fascicula Biologie,* XIX (1), 84-92.

Conete Denisa, Gava, R., Mestecăneanu, A. (2012). Ornithological researches on the Piteşti Basin during 2003 – 2011. *Scientific Papers. Current Trends in Natural Sciences, 1 (1),* 60-67.

Conete Denisa (2013). Brief historical review of ornithological research on the middle basin of the Arges River. *Studii şi Comunicări, Ştiințele Naturii, Muzeul Județean Argeş, XXI,* 47-57.

Conete Denisa, Mestecăneanu, A. (2004). Cercetări privind avifauna zonei lacului de acumulare Budeasa în perioada 2002-2004, *Analele Universității Oradea, Fascicolul Biologie, 11,* 49 – 54.

Dehorter, O., Tamisier, A. (1998). Hunting vulnerability and wintering strategy among waterfowl in Camargue, France. *Wildlife Biology, 4,* 13-21.

Gache Carmen (2002). Dinamica avifaunei în bazinul râului Prut, *Publicațiile S.O.R., 15.*

Gava, R. (1997). Acumulările hidroenergetice de pe râul Arges, posibile Arii de Importanță Avifaunistică. *Lucrările simpozionului Arii de Importanță Avifaunistică din România, publicațiile S.O.R., 3,* 39-41.

Gava, R., Mestecăneanu, A., Conete Denisa (2004). The reservoirs of the Argeş River valley – important bird areas. *Limnological Reports, Internat. Assoc. Danube. Res., Novi Sad, Sebia and Muntenegro. 35,* 619-631.

Măties, M. (1969). Cercetări avifenologice de-a lungul bazinului mijlociu şi superior al Argeşului între 1 ianuarie – 31mai 1968. *Studii si Comunicări, Muzeul Județean Argeş, 2,* 73-90.

Mestecăneanu, A., Conete Denisa, Gava R. (2003). Date despre prezența a 12 ordine de păsări (Aves), cu dinamica anseriformelor pe lacul Piteşti în iarna 2002 – 2003. *Studii şi Comunicări, Ştiințele Naturii, Muzeul Olteniei, Craiova. 19,* 195-201.

Munteanu, D. (2004). Ariile de Importanță Avifaunistică din România, Ed. Alma Mater, Cluj-Napoca.

Munteanu, D. (2009). Păsări rare, vulnerabile şi periclitate în România. Cluj-Napoca, Ed Alma Mater.

Munteanu D., Mătieş M. (1983). Modificări induse de lacurile de acumulare în structura şi dinamica avifaunei. *Analele Banatului. Ştiințele Naturii. Muzeul Banatului, Timişoara, 1,* 217- 225.

Svensson, L., Mullarney, K., Zetterstrom, D. (2009). Collins Bird Guide. The Most Complete Guide to the Birds of Britain an Europe. 2-nd edition. Printer, Trento, Italy.

Underhill, L., Gibbons, D., (2004). Mapping and monitoring bird populations:their conservation uses. In NORRIS K., PAIN. D. J., (eds.) *Conservind bird biodiversity. General Principles and their Application*, Cambridge Univ. Press, New York.

Current Trends in Natural Sciences (on-line)
ISSN: 2284-953X
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Current Trends in Natural Sciences (CD-Rom)
ISSN: 2284-9521
ISSN-L: 2284-9521

Zhijun, M., Bo, L., Bin, Z., Kai, J., Shimin, T., Jiakuan, C. (2004). Are artificial wetlands good alternatives to natural wetlands for waterbirds ? – A case study on Chongming Island, China, *Biodiversity and Conservation, Netherlands*, 13, 333-350.

***http://eur-lex.europa.eu/legal-content/RO/TXT/HTML/?uri=CELEX:32009L0147&from=RO (accessed: November 28, 2014).