

# THE INFLUENCE OF THE HABITATS AND ANTHROPOGENIC PRESSURE ON BIRDS, OBSERVED DURING FEBRUARY 2013 – JANUARY 2014 ON THE DAM RESERVOIRS FROM THE ARGEȘ RIVER BETWEEN VÂLCELE AND GOLEȘTI

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## Abstract

*The habitats and the anthropogenic pressure are two major causes that affect the presence of birds in every place where they live. The species from the dam reservoirs from the Argeș River do not constitute an exception, the more so as these water bodies are created by people and are situated in an area with a dense network of human settlements. Even if the aspects were discussed with other occasions, we propound here another approaching. Some considerations regarding the main forms of anthropogenic pressure (the hydrotechnical factor, the anthropogenic disturb, the pollution with rubbish, the fishing and the nautical sporting activities) exercised on the birds from the area are made. The anthropogenic disturb appeared to be the most important factor on the general scale, in opposition with the fishing and the nautical sporting activities, which, although have strong impact at local level, seem to be the least significant ones. Of the five accumulation lakes taken into consideration (Vâlcele, Budeasa, Bascov, Pitești and Golești), Budeasa is the best affected and Golești, the least one. The habitats have a considerable importance, regarding the land cover, and a smaller one, from a phytocoenologic perspective.*

*Keywords: anthropogenic pressure, birds, Natura 2000.*

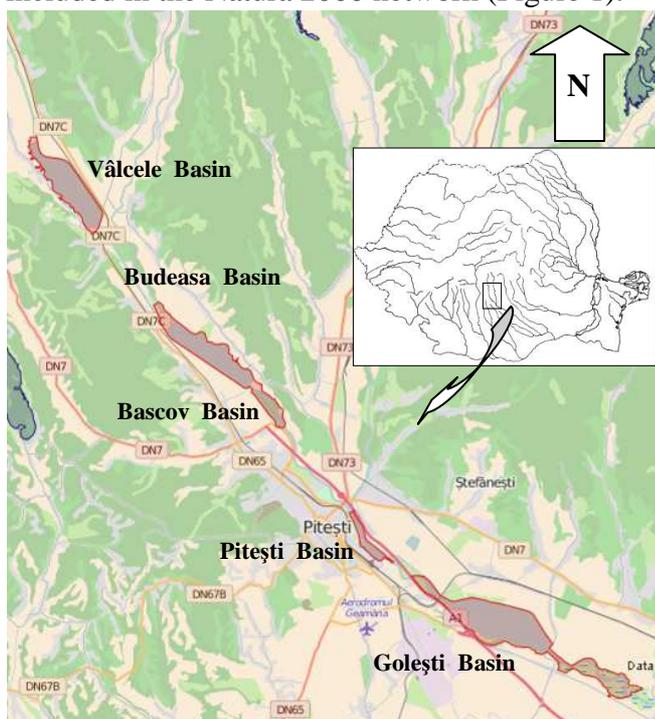
## 1. INTRODUCTION

The study of the birds' fauna from the dam reservoirs from the upper and middle course of the Argeș River started immediately after the ending of their construction (Mătieș, 1969; Munteanu and Mătieș, 1983). It was continued until now (Gava, 1997; Mestecăneanu et al., 2003; Conete and Mestecăneanu, 2004; Gava et al., 2004a; Gava et al., 2004b; Conete et al., 2005; Gava et al., 2007; Mestecăneanu et al., 2010; Conete, 2011; Gava et al., 2011; Mestecăneanu et al., 2013; Mestecăneanu and Gava, 2013; Mestecăneanu and Gava, 2014a, etc.). These works refers, especially, to the dynamics of the birds along the ecological seasons or of the whole year, while others were focused on the species breeding in the area (Mestecăneanu et al., 2004; Conete, 2010; Conete et al., 2011; Conete, 2015) and others were interest in the birds protection and the human impact on the species that populate these places (Conete et al., 2006; Conete and Mestecăneanu, 2008; Conete et al., 2008; Gava et al., 2008; Mestecăneanu et al., 2008; Mestecăneanu and Gava, 2014b).

In this paper, we propose another manner of data interpretation, which refers to the influence of the habitats and anthropogenic pressure on the birds observed in the area.

## 2. MATERIALS AND METHODS

The dam reservoirs (Vâlcele – 640 ha, Budeasa – 643 ha, Bascov – 140 ha, Pitești – 150 ha, and Golești – 680 ha), where the research study was conducted, belong to a series of accumulation lakes that were built on the course of the Argeș River after 1965 (cf. <http://www.baraje.ro>). They are situated in the south of the Făgăraș and Iezer – Păpușa Mountains, between Argeș Platform in the North, Cotmeana Platform in the West, Cândești Platform in the East, and Pitești High Plain in the South, and are components of the protected area ROSPA0062 Lacurile de acumulare de pe Argeș, included in the Natura 2000 network (Figure 1).



**Figure 1. The map of the area**  
(by <http://biodiversitate.mmediu.ro>, modified)

The vegetation is typical of wetland areas from the southern part of Romania. From a phytocoenology viewpoint there were identified nine plant associations (Stancu, 2014): *Lemnetum minoris* Müller et Görs 1960, *Potamo – Ceratophylletum submersi* Pop 1962, *Juncetum bufonii* Felföldy 1942, *Phragmitetum australis* Schmale 1939, *Typhetum angustifoliae* Pignatti 1953, *Typhetum latifoliae* Lang 1973, *Polygono hydropiper-Bidentetum* Lohm. 1950, *Hordeetum murini* Libbert 1932 em Passarge 1964 and *Conietum maculati* I. Pop 1968. They represent habitats for the birds, they occupy variable surfaces and generally, they are situated upstream and in the median parts of each reservoir, along the banks. The terrain from the area has different functions (by CORINE Land Cover 2012 - CLC 2012, cf. <http://land.copernicus.eu/>): 112 – discontinuous urban fabric, 121 – industrial or commercial units, 122 – road and rail networks and associated lands, 142 – sport and leisure facilities, 211 – non-irrigated arable land, 222 – fruit trees and berry plantations, 242 – complex cultivation patterns, 243 – land principally occupied by agriculture, with significant areas of natural vegetation, 311 – broad leaved forest, 321 – natural grasslands, 324 – transitional woodland-shrub, 331 – beach, dunes, sands, 511 – water courses, 512 – water bodies, etc. (Figure 2). Because of the geographic accuracy of the product (25 ha minimum mapping unit, 100 m minimum mapping width, 100 m positional accuracy, >85% thematic accuracy), some disaccords from reality appeared (i.e. the lack of land covers: 312 – coniferous forest and 142 – sport and leisure facilities, in the area of the Bascov Basin, or 121 – industrial or commercial units and 512 – water bodies, in the area of the Pitești Basin).

The continental climate with hilly traits is characteristic to the area: in the north there are mountain influences, in the south there are plain influences. The water has 9 °C average annual temperatures at Pitești; it is few degrees colder upstream and 1 °C warmer downstream. In winters (mainly in January) a bridge of ice is formed when the temperature decreases for a longer period of time below 0 °C (Barco and Nedelcu, 1974).

The birds were observed through the itinerary method, combined to that of the fixed point of observations (where the field conditions were inadequate) between February 2013 and January 2014. One day field trip was accomplished on all dam reservoirs from 10 to 20 of each month and the same

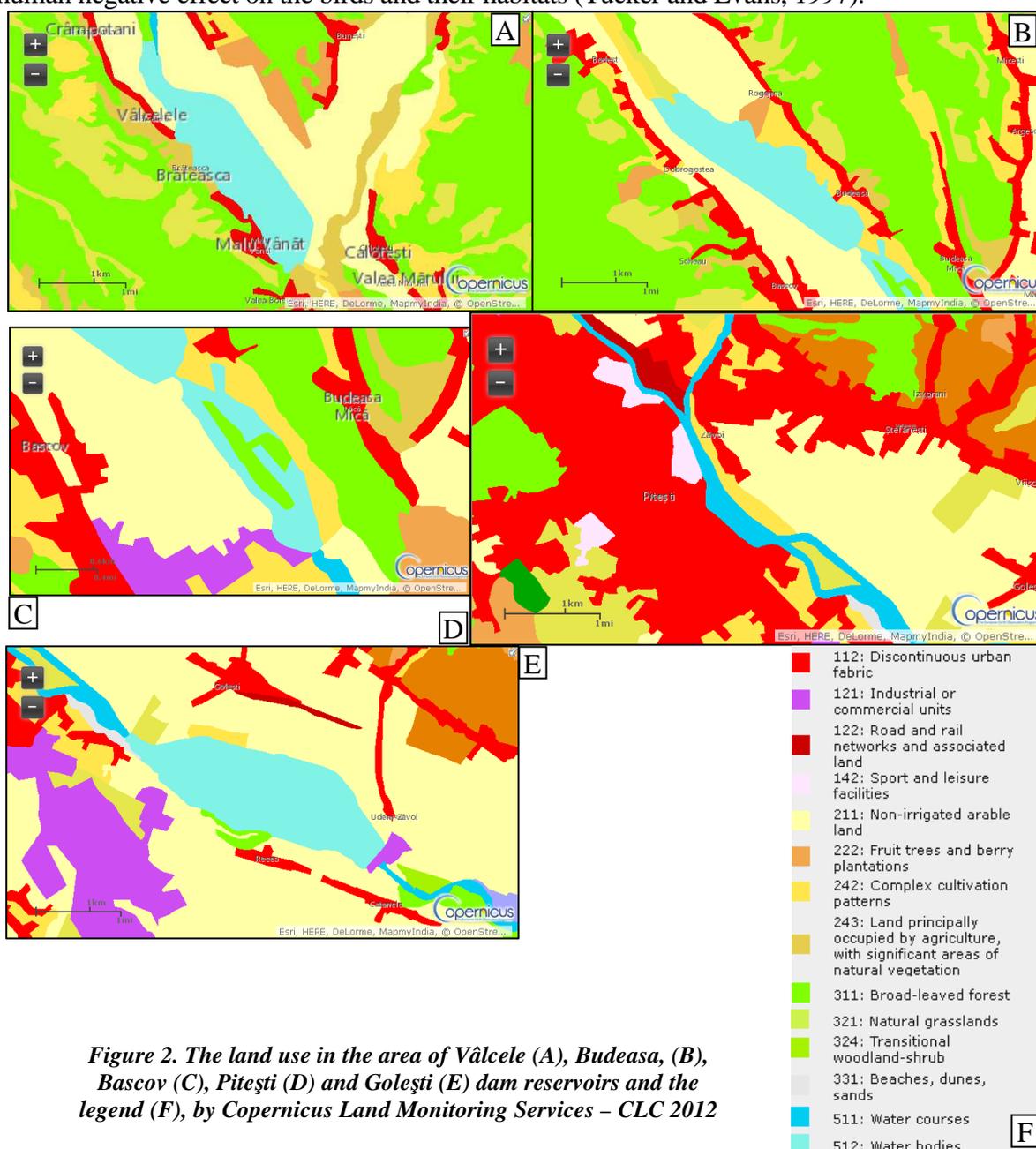
path (the most favorable for the observation of water birds from the banks) was crossed every time. Binoculars (10x50), a spotting scope (14–45x50) and a photo device (42x optical zoom) were used. The scientific norm of the birds is compatible with the Hamlin Guide (Bruun et al., 1999). The human pressure was noticed each time. The hydrotechnical factor, the hunting, the fishing, the anthropogenic derange, the pollution with rubbish, and the training of the athletes on the water surface were taken into consideration (by Ion et al., 2011, modified). A mark was conferred for each component. For the hydrotechnical factor: 0 – natural lake, 1 – natural lake with upstream possibility of water control / non-natural upstream banks, 2 – artificial dam reservoir, 3 – artificial basin with ground digs, covered by vegetation, 4 – artificial basin, with partial concrete digs, 5 – artificial basin with complete concrete digs. For the hunting: 0 – strictly banned hunting, 1 – strictly banned hunting, with rare cases of poaching, 2 – strictly banned hunting, with frequent case of poaching, 3 – permitted hunting, but rarely practiced, 4 – permitted and regular hunting, 5 – permitted hunting, regularly practiced, without control and out of the legal period. For the fishing: 0 – banned fishing, 1 – leisure fishing, 2 – leisure fishing without control or illegal fishing; 3 – fish farm, with periodically dried basins, 4 – fish farm, with basins annually and partially dried for the fish extraction, 5 – fish farm, with basins annually and completely dried for the fish extraction. For the anthropogenic derange: 0 – the basin is far away from localities and the main roads, 1 – the basin is situated far away from localities and close to the main roads, 2 – the basin is situated near the localities (bellow 3 km) with restricted access, 3 – the basin is situated near the localities (bellow 3 km) with unrestricted access, 4 – the basin is situated inside / immediately close to the locality, with restricted access, 5 – the basin is situated inside / immediately close to the locality, with unrestricted access. For the pollution with rubbish: 0 – the rubbish is deposited more than 1 km away, 1- the rubbish is deposited between 50 m and 1 km, 2 – the rubbish is deposited on the banks, 3 – the rubbish is deposited in the water and on the banks (only biodegradable garbage), 4 – the rubbish is deposited in the water and on the banks (non-biodegradable garbage), 5 – the rubbish is deposited in the water and forms patches on its surface. For the nautical sportive activity: 0 – there is not activity (0/12 observations), 1- very rare activity (1-2/12 observations), 2 – rare activity (3-4/12 observations), 3 – moderate activity (5-8/12 observations), 4 – frequent activity (9-10/12 observations), 5 – very frequent activity (11-12/12 observations). The final mark: 0-0.99 – very good quality, 1-1.99 – good quality, 2-2.99 – medium quality, 3-3.99 – low quality, 4-5 – very low quality.

### 3. RESULTS AND DISCUSSIONS

Between February 2013 and January 2014, 129 birds' species and 85,318 individuals were observed on the dam reservoirs Vâlcele, Budeasa, Bascov, Pitești, and Golești. The number of species was the biggest in the passage time (April and August) and the number of individuals was the biggest from August to February, the maximum – in February. It is obvious the importance of these reservoirs for the aquatic birds as refuge in the migration and in winter, fact enounced from the first years after the ending of the dams construction (Munteanu, 1978). The biggest number of species was counted on Golești (91) and Pitești (86), followed by Vâlcele (65), Budeasa (60) and Bascov (38); because of the method of collecting data, that implies one track of observations on the left bank of the basin, focused principally on the aquatic species, the birds from the Bascov islands, covered with dense forest vegetation, were partially evaluated. Other considerations on the birds' ecology and dynamics were discussed on other occasion (Mestecăneanu and Gava, in press).

Considering the habitats used by the birds, we stated that these, from a phytocoenologic perspective, did not influence significantly the number of species and their strengths. In the first case (of the number of species), the correlation was -0.03 and in the second one (of the strengths), it was 0.01. This was also observed on other reservoirs from Romania and it was considered to be the product of the versatility of

the most bird species adapted to many types of vegetation. As result, the wetland heterogeneity barely influences the occurrence of the birds' species and, in many cases, the fragmentation of the habitats even can lead to a diversity decrease (Ion et al., 2011), because it is known that the majority of the birds require specialized habitats (Gill, 2007). The different human pressure on each dam reservoir can be also an explication of this situation, which is different from that of the natural lakes. The abandonment or the destroying of the nests, the reduction of the efficiency of the environment use, the increasing of the energetic consume and even the avoiding of the favourable habitats represent the consequences of the human negative effect on the birds and their habitats (Tucker and Evans, 1997).

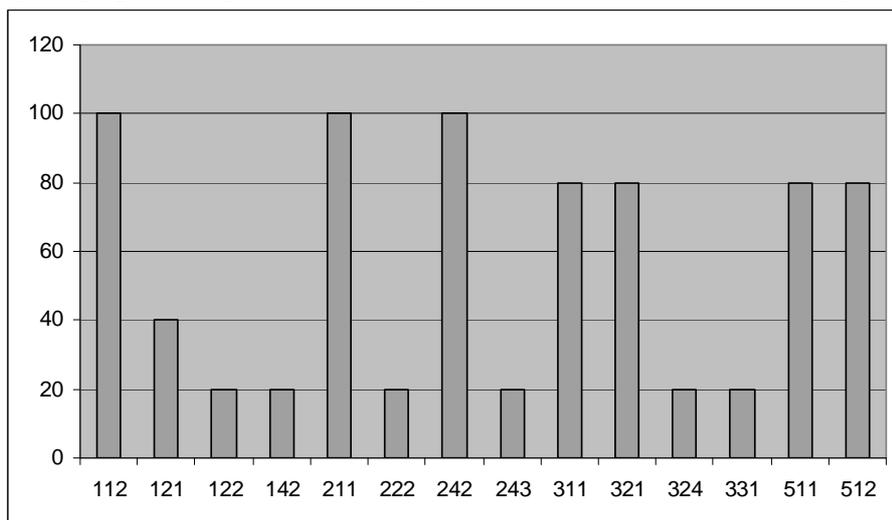


**Figure 2. The land use in the area of Vâlcele (A), Budeasa, (B), Bascov (C), Pitești (D) and Golești (E) dam reservoirs and the legend (F), by Copernicus Land Monitoring Services – CLC 2012**

Starting from the premise that birds are influenced by the land cover up to 500 m area around the dam basins, we found a positive and moderate correlation (0.51) between the number of the land covers and the number of species from the dam reservoirs and, also, a positive and moderate correlation (0.68) between the number of the land covers and the strengths of species from these

dam reservoirs. It means that the number of species and their strengths increased as the number of the land covers increased (and it is more obvious in the case of the strengths). The fact that the land cover establishes in good proportion the qualitative and quantitative diversity of the birds was observed on the basins from Moldova region, too (Ion et al., 2011). It must be noted that the land covers on small surfaces (roads, diverse scarce constructions, vineyards, etc.) were not taken into consideration.

Regarding the relative frequency of the land covers categories from the dam reservoirs (and up to 500 m area around them) we state a frequency of 100% for the discontinuous urban fabric, the non-irrigated arable land and the complex cultivation patterns and, for these reasons, in the area were signalled some birds which are met in the settlements or cultivated areas (*Falco subbuteo*, *Falco tinnunculus*, *Phasianus colchicus*, *Coturnix coturnix*, *Streptopelia decaocto*, *Athene noctua*, *Apus apus*, *Galerida cristata*, *Alauda arvensis*, *Pica pica*, *Corvus monedula*, *Passer domesticus*, etc.). It is noticeable that the water bodies appear only in 80% of the cases (Figure 3), because the Pitești Dam Reservoir was assimilated in CLC 2012 as a water course. Also, remarkable is the dominance of the human impact on the natural formations, also observed in other regions. The accessible forms of relief, the temperate climate of the area, the productive soil (Ion et al., 2011), but also the adequate hydrographical regime and the rhythm of construction from the last years determines this state of facts.



**Figure 3. The relative frequency of the land covers categories for the dam reservoirs.**

**(112 – discontinuous urban fabric, 121 – industrial or commercial units, 122 – road and rail networks and associated lands, 142 – sport and leisure facilities, 211 – non-irrigated arable land, 222 – fruit trees and berry plantations, 242 – complex cultivation patterns, 243 – land principally occupied by agriculture, with significant areas of natural vegetation, 311 – broad leaved forest, 321 – natural grasslands, 324 – transitional woodland-shrub, 331 – beach, dunes, sands, 511 – water courses and 512 – water bodies)**

On the subject of the human impact on the birds' species, at the general level, the anthropogenic derange was observed as being the most important factor. Its mark is 4.6 from 5. The hydrotechnical factor is a constant for each dam basin and it was marked with 4. The pollution with rubbish has medium values (3.2), as well as the hunting (3). The fishing is performed in every dam basin, but has a relatively reduced impact (2). Finally, even if the training of the athletes on the water surface highly influence the biodiversity of the Bascov Dam Reservoir, in the big picture this represents the smallest

factor of negative human influence on the birds. Its average is 1 (Figure 4).

Individually, from the qualitative point of view, the Budeasa Dam Reservoir seems to be the most affected by the anthropogenic pressure (3.33), the least affected being the Golești Dam Reservoir (2.66). The mean for all the dam reservoirs is 2.96 and, as a result, the general quality of the reservoirs is intermediate to low. It is noticeable that, this calculation shows that no basin has good or very good conditions of life for the birds (Figure 5). The human impact on the Bascov Dam

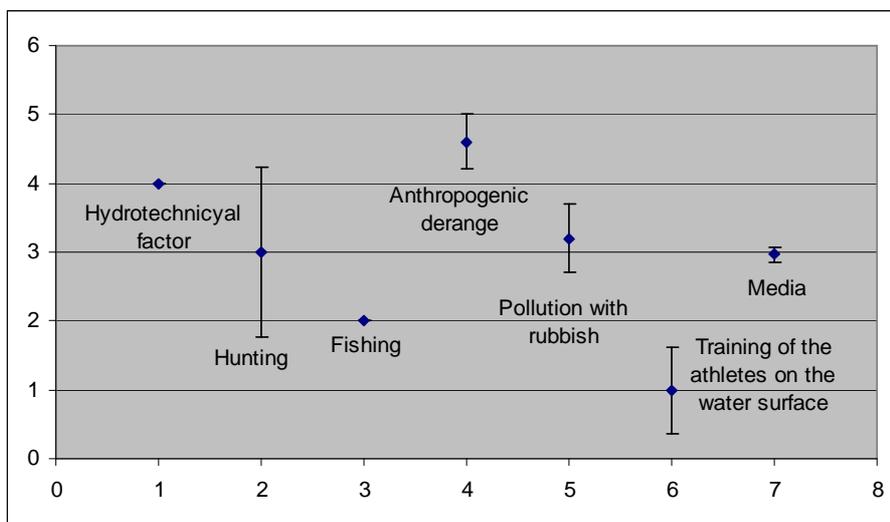


Figure 4. The evaluation of the human impact on the studied wetland

is accentuated by the clearing of the forests and the river coppices from upstream and by the exploitation of gravel and the riverbeds improvements. In its turn, the negative human impact on the Pitești Dam Reservoir was signalled since 2008 (Conete and Mestecăneanu, 2008), when the attention was focused especially on the building of the motorway and the mall from vicinity as well as on the beginning of the works for the construction of an entertainment centre on the water and on

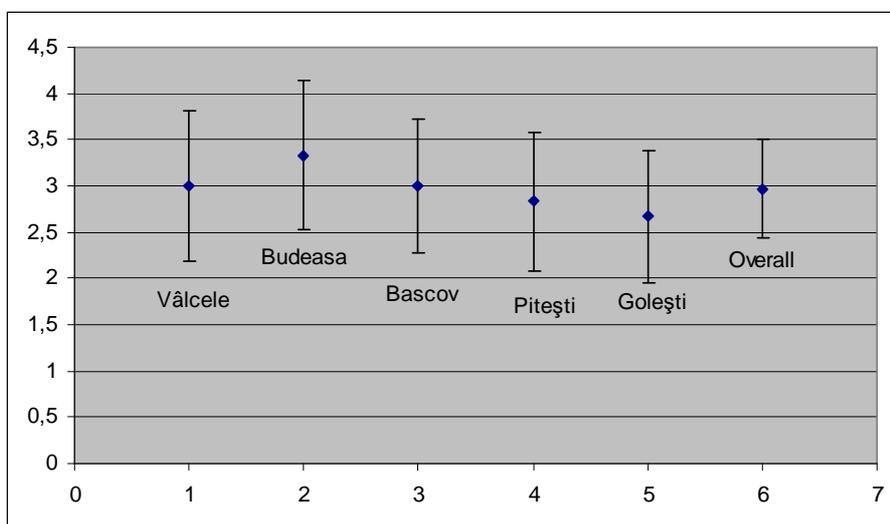


Figure 5. The evaluation of the quality of each dam reservoir and overall, according to the main factors of the human impact

one of the banks; in the meantime the works were partially stopped (we refer here to the construction of a light aircraft runway). Not the least, the problem of the anthropogenic impact on all the dam reservoirs from Vâlcele to Golești was largely discussed in a PhD thesis (Conete, 2011). By comparison with wetlands from Moldova region (Ion et al., 2011), we find that in our case the hydrotechnical factor, the hunting, the anthropogenic derange and the pollution with rubbish have bigger values while the fishing has a lower value. In addition, it was noticed the training of the athletes on the water surface. The final mark is bigger with 0.6 points and, consequently, the studied dam reservoirs from the Argeș River seem to have generally a worse quality than those from Moldova.

Concerning the hydrotechnical factor, all the dam basins are very similarly built: the type of dam – gravity and earth dams, the position and the type of waterproofing – front wall and concrete, type of

Reservoir is pretty big, as well as the human impact on the Vâlcele Dam Reservoir; the impact on the Pitești basin appears a bit lower.

The anthropogenic pressure on the Bascov Dam Reservoir was reflected in detail in a previous work (Mestecăneanu and Gava, 2014b) where the most important impact on birds on long term was considered to be the silting of the basin. This is a natural phenomenon, but it

is accentuated by the clearing of the forests and the river coppices from upstream and by the exploitation of gravel and the riverbeds improvements. In its turn, the negative human impact on the Pitești Dam Reservoir was signalled since 2008 (Conete and Mestecăneanu, 2008), when the attention was focused especially on the building of the motorway and the mall from vicinity as well as on the beginning of the works for the construction of an entertainment centre on the water and on one of the banks; in the meantime the works were partially stopped (we refer here to the construction of a light aircraft runway). Not the least, the problem of the anthropogenic impact on all the dam reservoirs from Vâlcele to Golești was largely discussed in a PhD thesis (Conete, 2011).

By comparison with wetlands from Moldova region (Ion et al., 2011), we find that in our case the hydrotechnical factor, the hunting, the anthropogenic

bed – unrocky and rocky soil, type of evacuation – sluice dam. They serve to the production of electrical energy, the water supply of different objective from the area, the irrigations and the floods attenuation (and the last only Vâlcele, Budeasa and Golești). The concrete breasts partially surround the reservoirs; in the rest of the perimeter, there are ground banks, where the vegetation develops. The gradual silting of the reservoirs is in process. An important feature of these basins is the fluctuant level of the water, determined by the abundant rains, the briskly melting of the snow or the drainage for maintenance purposes.

The cartridges found on the banks and the behaviour of the birds indicates the fact that hunting is practiced on the dam reservoirs Vâlcele, Budeasa and Golești. Usually, the birds react moderately if a car moves on the belt road, but immediately swim or fly away if this stops. The response is more drastically if they spot a human being on the banks. Contrary, on the Pitești Dam Basin, where the hunting is banned, normally the birds do not react in such a way if they observe people, as their presence is not associated to a significant threat. Beside the direct action, it must be said that the leads can kill the birds after a long time after the shooting, because of their toxicity.

The fishermen were present there almost every time and on every basin. The maximum number was registered in July. The greatest number was recorded on the Golești (147) and Bascov (122) reservoirs but, in relation with the unity of surface, the biggest average monthly value is on the Bascov Dam Reservoir: 0.072 fishermen/ha, followed by: Golești (0.018 fishermen/ha), Pitești (0.017 fishermen/ha), Budeasa (0.005 fishermen/ha) and Vâlcele (0.003 fishermen/ha), so, at the general level, the average monthly rapport is 0.013 fishermen/ha. On the Bascov Dam Reservoir (the first in the top), by Colton (1974), a negative correlation with fair degree of linear relationship (-0.49) was established between the number of species and the number of fishermen and a negative correlation with weak linear relationship (-0.06) was established between the strengths of species and the number of fishermen. The influence of the fishermen on the dynamics of birds is relatively low, because the fishermen stay grouped mainly on the middle part of the eastern bank, next to the road. Although on the other basins, the influence is more reduced, the fishermen can locally disturb the feeding or breeding birds. Therefore, it is more preferable that they stay grouped on a small surface rather than scattered across the bank. However, some birds (principally *Fulica atra*) become trustful and accept the human in the surrounding area. The fish hooks and the fishing lines left in the water are another trouble, because they can hurt or even kill the birds.

The anthropogenic derange is manifested on all reservoirs. It is stronger on Vâlcele, Budeasa, Bascov, and Pitești, where there are settlements on the banks, and weaker on Golești, where the settlements are relatively farther situated. The Pitești Dam Reservoir is the most prone to this form of human impact, because it is almost completely encircled by the buildings. The audio and visual associated effects have here the biggest influence, as well as the traffic and people walking on the banks. A particular mention requires the platforms or pontoons specially installed on the shores by some terrain owners (more frequently met on the Budeasa and rarely on Vâlcele) that permit them to fish or navigate on the basins with small watercrafts. Also, the two beaches that function on the shores from Budeasa, respectively Pitești Dam Reservoirs and the pasturage, the cutting of the red beds and the stubbing of the arboreal and arbustive vegetation for domestic uses are connected to the anthropogenic derange.

The pollution with rubbish is bound directly to the anthropogenic derange, too. Although in the last years actions for garbage collection were initiated, the rubbish (plastics, metals, caoutchouc, etc.) is still deposited in the water and on the banks and, sometimes it forms small floating patch. After the abundant rains, when the tributary streams overflow the lands from environs, the garbage can be trained and accumulated in the front of the dugs.

The athletes trained on the Bascov and Pitești accumulation lakes. Their number was the biggest in April (16) and May (15). In relation with the unity of surface, on the Bascov Dam Reservoir, the monthly mean is 0.024 athletes/ha and, on the Pitești Dam Basin, it is 0.008 athletes/ha, so, at the general level, the average monthly rapport is 0.002 athletes/ha. On the Bascov Dam Reservoir, a positive correlation with weak linear relationship (0.05) was found between the number of species and the number of athletes on the water surface and a negative correlation with moderately strong linear relationship (-0.53) was established between the strengths of species and the number of athletes on the water surface. Instead, on the Pitești Dam Reservoir, a positive correlation with moderately strong linear relationship (0.71) was found between the number of species and the number of athletes on the water surface and a negative correlation with fair degree of linear relationship (-0.37) was found between the strengths of species and the number of athletes on the water surface. It must be emphasised that the value from the first case (0.71) does not express the affinity of the species with the athletes but the fact that the sportsmen training broadly overlapped on the birds' period of passage. As results, the number of species from the basins seems to not depend negatively on the presence of the athletes on the water surface, contrary to the number of individuals. However, by comparison of the data from the Pitești Dam Reservoir on many months (April 2004, April 2006, April 2013, June 2004, June 2005, June 2013, October 2010, October 2013, October 2014, October 2015), we observed that the occurrence of the athletes on the water surface, in the period when the dynamics of the birds is not influenced by the freezing of the water, determined the decreasing of the number of species with 3.96% and the decreasing of the number of individuals with 21.13%. It was ascertained that: the presence of the athletes on the water surface is particularly reflected in the aquatic species strengths; the others, when they are disturbed, search for shelter in the dense vegetation; when the rowers approach, some birds fly on short distances and others move hundreds of meters or leave the surface in searching for more peaceful place; the athletes contribute to the blocking of a rich aquatic breeding avifauna installation. On the other hand, it was observed that on the Bascov Dam Basin, where there are permanently fixed corridors of training for the athletes on the water surface, generally the birds do not remain. These arrangements, combined with the effect of the training athletes, in the context of vicinity with the village, represent for this reservoir a determinant aspect that, practically, transforms it into a place with a very low quality for the aquatic birds.

#### 4. CONCLUSIONS

The following conclusions can be drawn:

- From a phytocoenologic outlook, the habitats from the dam basins do not influence significantly the number of species and their strengths;
- The number of species and, preponderantly, their strengths increase as the number of the land covers from the reservoirs and up to 500 m around them increases;
- The discontinuous urban fabric, the non-irrigated arable land and the complex cultivation patterns are the most frequent land covers in the area; this fact permitted to many birds from the settlements or cultivated areas to appear here;
- The human impact dominates on the natural formations;
- At a general level, the anthropogenic derange is considered the most important factor of human impact on the birds' species; it is followed by the hydrotechnical factor, the pollution with rubbish, the hunting, the fishing and the training of the athletes on the water surface;
- The Budeasa Dam Reservoir is the most affected by the anthropogenic pressure and the Golești Dam Reservoir is the least affected;

- The general quality of the dam reservoirs from the anthropogenic pressure point of view is intermediate to low;
- The hydrotechnical factor is a constant for each dam basin, because all of them are relatively equally built (they are artificial basins, with partial concrete dugs), generally having the same purposes and a similar way of functioning;
- The hunting is practiced on Vâlcele, Budeasa and Golești dam basins and it is acknowledged by the used hunting cartridges found on the banks and by the panic of the birds in the presence of humans;
- The influence of the fishermen on the dynamics of birds is relatively low, but the fishermen can locally disturb the feeding or breeding birds;
- The anthropogenic derange manifests on all reservoirs, stronger on Vâlcele, Budeasa, Bascov, and Pitești, where there are settlements on the banks, and weaker on Golești, where the settlements are relatively farther situated;
- The pollution with rubbish is still important on all dam basins, because the garbage is deposited in the water and on the banks and sometimes it forms small floating patch;
- The athletes training on the water surface determined the decreasing of the number of species with few percents and a more substantial decrease of the number of individuals on the Pitești Dam Basin; combined with the permanently fixed corridors, in the context of vicinity of the village, they transformed the Bascov Dam Basin into a place with a very low quality for the aquatic birds.

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