ECOLOGICAL RESEARCHES ABOUT THE AVIFAUNA OF THE BUDEASA BASIN (ARGEŞ RIVER, ROMANIA) IN THE HIEMAL AND PREVERNAL ASPECTS (2008-2009)

Denisa CONETE[*], Adrian MESTECĂNEANU[**], Radu GAVA[*]

[*] *University of Piteşti, Faculty of Science, Department of Biology, Piteşti, Romania*
[**] *Argeş County Museum, Piteşti, Romania*
Corresponding author: Denisa Conete, University of Piteşti, Faculty of Science, Department of Biology, 1 Târgu din Vale, 110040 Piteşti, Romania, tel. & fax.: 0040348453260, e-mail: denisa_conete@yahoo.com

Abstract. The authors present a list of 77 species of birds identified in the hiemal and prevernal aspects (2008-2009) in the area of the Budeasa Lake, situated in the middle hydrographical basin of the Argeş River. Their main habitat, phenology, biogeographic origin, presence in the hiemal and prevernal seasons, constancy and their status of conservation are analysed in the paper. There are two overdominant species among those studied in the hiemal aspect: *Anas platyrhynchos* and *Aythya ferina* (both of them found favourable condition for food and shelter here), *Anas crecca* and *Aythya fuligula* are in the zone of dominance and the others species are in the zone of complementary species. *Anas platyrhynchos* remains the overdominant species every month. Many exemplars come here from the North because of the favourable weather conditions, such as freezing and low temperatures.

Keywords: bird species, ecological researches, Budeasa Basin, Argeş River, Romania.

INTRODUCTION

Romania is the only country in Europe that has 5 biogeographical regions (there are 2544 m from the sea level to the top of the Făgăraş Mountains [1]) and this fact leads to a high level of biodiversity [21]. Many of these habitats could also be found in the hydrographical basin of the Argeş River, one of the main tributary of the Danube, which has its springs in the highest peak of the Romanian Carpathians, i.e. the Moldoveanu Peak; its mountain and submountain areas are zone of a great faunistic importance, because many protected species in Romania could be found here, e.g. glacial relict species: *Romanychthys valsanicola* [7] and *Lissotriton montandoni* [6].

The Budeasa Basin belongs to a series of dam lakes built some decades ago on the upper and middle course of this river. Besides their important hydroenergetic role, the impact of these basins upon the landscape is significant by influencing the composition and the spatial and temporal dynamics of the bird species of the area [9, 10, 11, 15, and 16].

The lakes are part of the "Argeş River Basins", a sit included in the Important Bird Area Program and in the Nature 2000 Network.

The Important Birds Area Program is a worldwide effort meant to identify the most important areas that must be protected as well as the species of birds live here. Natura 2000 network is the European Union's main instrument for the conservation of the nature [21].

Data concerning the biodiversity from Romania are still missing at European level [13].

Efforts were made for gathering more accurate data about the biodiversity [9, 20, and 24] and to adopt efficient measures of protection [19].

MATERIALS AND METHODS

The Budeasa Basin is situated upstream of Piteşti and the Bascov Basin (Fig. 1). It is 5.5 km long and it has a surface of 412 ha. It is surrounded by a road.

It is placed in the hilly area, mainly covered by deciduous forests and orchards. Its vegetation is characteristic for the water areas: *Ceratophyllum*, *Myriophyllum*, *Carex*, *Juncus*, *Phragmites*, *Typha*, *Salix*, *Alnus*, *Populus*, *Rosa*, *Rubus*, etc. The fauna is rich, too. There are fish species (*Esox lucius*, *Abramis brama*, *Cyprinus carpio*, *Perca fluviatilis*, *Leuciscus cephalus*, *Chondrostoma nasus*), amphibians (*Hyla arborea*, *Bombina variegata*, *Bombina bombina*, *Rana ridibunda*, *Rana esculenta*, *Salamandra salamandra*), reptiles (*Emys orbicularis*, *Natrix natrix*, *Natrix tessellata*, *Lacerta viridis*, *Anguis fragilis*) and mammals (*Neomys fodiens*, *Apodemus agrarius*, *Arvicola terrestris*, *Lutra lutra*, *Ondatra zibethica*, etc.) [14]. The birds are present all the year.

Figure 1. The upper and middle hydrographic basin of the Argeş River (modified [1]).

Physically and chemically the water is of the first class quality.

The climate is temperate-continental [1].

The ecological study was effectuated between November 2008 and May 2009. For the birds identification the itinerary and the fix point observations methods were used [2, 12]. Two

observations were effectuated every month, mainly in the morning. Binoculars 10 x 50 and field guides were used [18, 22].

RESULTS

There were recorded 77 bird species (Table 1) belonging to 11 orders, 28 families and 50 genera; 42 of them are aquatic or amphibious species (Fig. 2). The best represented are the following orders: **Passeriformes** (with 37 species), **Anseriformes** (with 12 species) and **Charadriiformes** (with 11 species). These are followed by: **Ciconiiformes** (with 5 species) and **Podicipediformes**, **Falconiformes**, **Pelecaniformes**, **Cuculiformes**, **Gruiformes**, **Piciformes** and **Coraciiformes**.

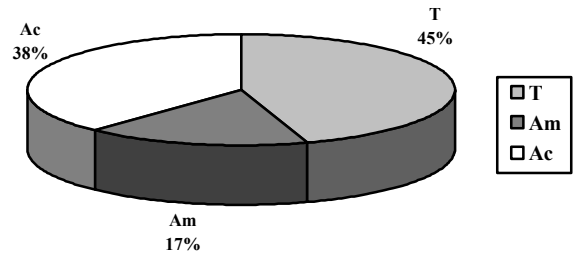

Figure 2. The bird species distribution according to habitat (T – terrestrial species; Am – amphibious species; Ac – aquatic species).

According to the biogeographic origin (Table 1 & Fig. 3), the bird species from the Budeasa Basin are grouped as it follows: 31 species (41 % - *Podiceps nigricollis, Ixobrychus minutus*, *Gallinula chloropus*, *Alcedo atthis*, etc.) European origin (E), 25 species (33 % - *Buteo buteo, Falco tinnunculus*, *Fulica atra*, *Riparia riparia,* etc.) Transpalearctic origin (Tp), 9 species (12 % - *Cygnus cygnus, Tringa erythropus*, *Larus canus,* etc.) Siberian origin (S), 5 species (6 % - *Netta rufina*, *Phalacrocorax pygmeus*, *Egretta garzetta,* etc.) Mediterranean origin (M), 5 species (6 % - *Vanellus vanellus*, *Charadrius dubius,* etc.) Mongol origin (Mo), 1 species (1 % - *Casmerodius albus*) Chinese origin (Ch) and 1 species (1 % - *Aythya marila*) Arctic origin (A).

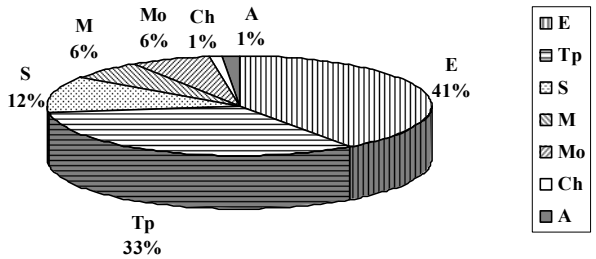

Figure 3. The bird species distribution by the biogeographic origin (E – European species; Tp – Transpalearctic species; S – Siberian species; M – Mediterranean species; Mo – Mongol species; Ch – Chinese species; A – Arctic species).

The occupied habitat is thus represented (Table 1 & Fig. 2): 35 species (45 % - *Buteo buteo, Dendrocopos major*, *Galerida cristata*, *Lanius excubitor*, etc.) in terrestrial habitat (T), 13 species (17 % - *Gallinula chloropus, Vanellus vanellus*, *Tringa ochropus*, *Motacilla cinerea,* etc.) in amphibious habitat (Am) and 29 species (38 % - *Podiceps cristatus*, *Nycticorax nycticorax, Ardea cinerea*, *Cygnus cygnus*, *Aythya marila,* etc.) in aquatic habitat (Ac).

The constancy (Table 1 & Fig. 4): 11 species (14% - *Podiceps cristatus, Phalacrocorax carbo,* etc.) are euconstant species (Euc), and 10 species (13 % - *Casmerodius albus, Fringilla coelebs*, etc.) are constant species (C). The most numerous are the accessory species (Ac) - 28 species (37 % - *Emberiza citrinella, Mergellus albellus,* etc.) and the accidental species (Acc) - 28 species (36 %: *Riparia riparia, Lanius excubitor,* etc.).

A percentage of 44%, i.e. 34 of the 77 bird species identified on the Budeasa Basin, are included in the annexes of the Birds Directive (Table 1); 9 of them are included in the Annex I (*Phalacrocorax pygmeus*, *Casmerodius albus*, *Cygnus cygnus*, *Sterna hirundo,* etc.). Special measures were provided in order to protect life and to offer the possibility of species reproduction in this area.

We calculated the index of relation (Table 2) for the estimation of the quantitative dynamics of the 11 Anseriformes species observed in the hiemal aspect. The statistic axis (As) is 9.09 and the dominancy axis (Ad) is 18.18 (Table 2 & Fig. 5). Two species are overdominant: *Anas platyrhynchos* and *Aythya ferina* (both have favourable condition for food and shelter here). *Anas crecca* and *Aythya fuligula* are dominant, their values being similar; *Cygnus olor, Bucephala clangula,* and *Anas penelope* and the group of the other species (*Netta rufina, Aythya marila, Cygnus cygnus* and *Mergellus albellus*) are complementary species.

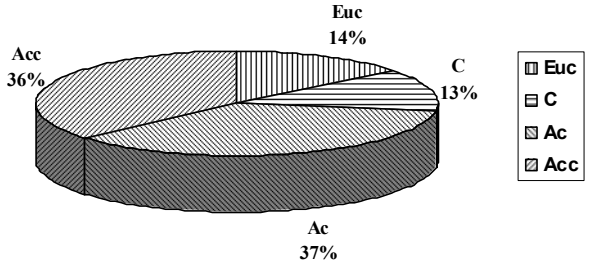

Figure 4. The bird species distribution by the constancy (Euc – euconstant species; C – constant species; Ac – accessory species; Acc – accidental species).

It is obvious that *Anas platyrhynchos* remains the overdominant species each month. *Aythya ferina* moves from the zone of overdominancy in November in the complementary zone in December, when it can be found even bellow the statistic axis. Then, it rises again in the zone of overdominancy in January. It becomes dominant species in February. *Aythya fuligula* moves from the upper limit of the complementary zone (where it is found almost during the whole period of time) only in January, when it becomes overdominant species. *Anas crecca* moves from the complementary zone (where it can be found in November) above of dominancy axis in November and February, while in January it is dominant species. The other species (*Cygnus olor, Bucephala clangula, Anas penelope,* etc.) are complementary every month (Table 2 & Fig. 6).

Table 1. The avifauna of the Budeasa Basin – the hiemal and prevernal aspects.

No.	Species	Principal habitat	Phenology	Bio-geographic origin	Presence in the hiemal season	Presence in the prevernal season	Constancy	Birds Directive
1	2	3	4	5	6	7	8	9
1.	*Podiceps cristatus*	Ac	Ov, Ri	Tp	p	p	Euc	N/A
2.	*Tachybaptus ruficollis*	Ac	Ov, Ri	E	p	p	C	N/A
3.	*Podiceps nigricollis*	Ac	Mp	E	p	a	Acc	N/A
4.	*Phalacrocorax carbo*	Ac	Ov, Ri	Tp	p	p	Euc	AI
5.	*Phalacrocorax pygmeus*	Ac	Ov, Ri	M	a	p	Acc	AI
6.	*Ixobrychus minutus*	Am	Ov	E	a	p	Ac	AI
7.	*Egretta garzetta*	Ac	Ov	M	a	p	Ac	AI
8.	*Casmerodius albus*	Ac	Ov, Ri	Ch	p	a	C	AI
9.	*Ardea cinerea*	Ac	Ov, Ri	Tp	p	p	C	N/A
10.	*Nycticorax nycticorax*	Ac	Ov	M	a	p	Ac	AI
11.	*Cygnus olor*	Ac	Mp	E	p	p	C	AII/2
12.	*Cygnus cygnus*	Ac	Oi	S	p	a	Acc	AI
13.	*Anas platyrhynchos*	Ac	Mp, Oi	Tp	p	a	Ac	AII/1, AIII/1
14.	*Anas querquedula*	Ac	Ov, P	Tp	p	p	Euc	AII/1
15.	*Anas crecca*	Ac	P, Oi, Ov	Tp	p	p	C	AII/1, AIII/2
16.	*Anas penelope*	Ac	P, Oi	S	p	p	C	AII/1,AIII/2
17.	*Aythya marila*	Ac	Oi	A	p	a	Acc	AII/2, AIII/2
18.	*Aythya fuligula*	Ac	Oi, Ov	S	p	p	Euc	AII/1, AIII/2
19.	*Aythya ferina*	Ac	Mp	E	p	p	Euc	AII/1, AIII/2
20.	*Netta rufina*	Ac	Ov, Ri	M	p	a	Acc	AII/2
21.	*Bucephala clangula*	Ac	Oi	S	p	a	Ac	AII/2
22.	*Mergellus albellus*	Ac	Oi	S	p	a	Ac	N/A
23.	*Buteo buteo*	T	Mp	Tp	p	p	Ac	N/A
24.	*Falco tinnunculus*	T	Mp	Tp	p	p	C	N/A
25.	*Gallinula chloropus*	Am	Ov	E	a	p	Acc	AII/2
26.	*Fulica atra*	Ac	Mp	Tp	p	p	Euc	AII/1, AIII/2
27.	*Vanellus vanellus*	Am	Ov	Mo	p	p	Ac	AII/2
28.	*Charadrius dubius*	Am	Ov	Mo	a	p	Acc	N/A
29.	*Actitis hypoleucos*	Am	Ov	Tp	a	p	Acc	N/A
30.	*Tringa ochropus*	Am	P	S	a	p	Acc	N/A
31.	*Tringa erythropus*	Am	P	S	a	p	Acc	AII/2
32.	*Larus cachinnans/michahellis*	Ac	S	Tp	p	p	Euc	AII/2
33.	*Larus canus*	Ac	Oi	S	p	p	Ac	AII/2
34.	*Chroicocephalus ridibundus*	Ac	Mp	Tp	p	p	Euc	AII/2
35.	*Chlidonias hybridus*	Ac	Ov	M	a	p	Acc	N/A
36.	*Chlidonias niger*	Ac	Ov	E	a	p	Acc	N/A
37.	*Sterna hirundo*	Ac	Ov	E	a	p	Acc	AI
38.	*Cuculus canorus*	T	Ov	Tp	a	p	Acc	N/A
39.	*Alcedo atthis*	Ac	Mp	E	a	p	Ac	AI
40.	*Dendrocopos major*	T	S	Tp	a	p	Acc	N/A
41.	*Galerida cristata*	T	S	Mo	p	a	Acc	N/A
42.	*Alauda arvensis*	T	Mp	Mo	p	p	Ac	AII/2
43.	*Hirundo rustica*	T	Ov	Tp	a	p	Acc	N/A
44.	*Riparia riparia*	T	Ov	Tp	a	p	Ac	N/A
45.	*Anthus spinoletta*	T	Ov	Tp	p	a	Ac	N/A
46.	*Motacilla flava*	T	Ov	Tp	a	p	Ac	N/A
47.	*Motacilla cinerea*	Am	Ov, Ri	E	p	a	Acc	N/A
48.	*Motacilla alba*	T	Ov	E	a	p	Ac	N/A
49.	*Lanius excubitor*	T	Mp, Oi	Tp	p	a	Acc	N/A
50.	*Sturnus vulgaris*	T	Mp	E	p	p	C	AII/2
51.	*Pica pica*	T	S	E	p	p	Euc	AII/2
52.	*Corvus monedula*	T	S	E	p	a	Acc	AII/2
53.	*Corvus corone cornix*	T	S	E	p	p	C	AII/2
54.	*Corvus corax*	T	S	Tp	p	p	Ac	N/A
55.	*Locustella luscinioides*	Am	Ov	E	a	p	Ac	N/A
56.	*Acrocephalus schoenobaenus*	Am	Ov	E	a	p	Acc	N/A
57.	*Acrocephalus scirpaceus*	Am	Ov	E	a	p	Acc	N/A
58.	*Acrocephalus arundinaceus*	Am	Ov	E	a	p	Ac	N/A
59.	*Sylvia atricapilla*	T	Ov	E	a	p	Acc	N/A
60.	*Sylvia communis*	T	Ov	E	a	p	Ac	N/A
61.	*Phylloscopus collybita*	T	Ov	Tp	a	p	Ac	N/A
62.	*Saxicola torquatus*	T	Ov	Mo	p	a	Acc	N/A
63.	*Turdus merula*	T	Mp	E	a	p	Ac	AII/2
64.	*Turdus pilaris*	T	Mp, Oi	S	p	a	Acc	AII/2
65.	*Turdus viscivorus*	T	Mp	E	a	p	Acc	AII/2
66.	*Cyanistes caeruleus*	T	S	E	p	p	Euc	N/A

1	2	3	4	5	6	7	8	9
67.	*Parus major*	T	S	E	p	p	Ac	N/A
68.	*Aegithalos caudatus*	T	S	Tp	p	p	Ac	N/A
69.	*Passer domesticus*	T	S	Tp	p	p	Ac	N/A
70.	*Passer montanus*	T	S	Tp	a	p	Acc	N/A
71.	*Fringilla coelebs*	T	Mp	E	p	p	C	N/A
72.	*Carduelis chloris*	T	S	E	a	p	Ac	N/A
73.	*Carduelis spinus*	T	Mp, Oi	E	p	a	Acc	N/A
74.	*Carduelis carduelis*	T	S, Oi	E	p	p	Euc	N/A
75.	*Miliaria calandra*	T	Mp	E	p	p	Ac	N/A
76.	*Emberiza schoeniclus*	Am	Mp	Tp	a	p	Ac	N/A
77.	*Emberiza citrinella*	T	S	E	a	p	Ac	N/A

Note: Habitat: Ac – aquatic habitat; Am – amphibious habitat; T – terrestrial habitat; Phenology: Oi – winter visitor; Ov – summer visitor; Ri – scarce in winter; Mp – partial migrant; P - passage migrant; S – resident; Biogeographic origin: S - Siberian; A – Arctic; Tp – Transpalearctic; E – European; M – Mediterranean; Mo – Mongol; Ch – Chinese; Presence in the hiemal and prevernal seasons: p - presence; a - absence; Constancy: Euc – Euconstant species; C – Constant species; Ac – Accesory species; Acc – Accidental species; Birds Directive: AI – Annex I; AII/1 – annex II, part 1; AII/2 – annex II, part 2; AIII/1 – annex III, part 1; AIII/2 – annex III, part 2; N/A - . not available.

Table 2. The values of the index of relation for some Anseriformes species (in the EURING code: Cygolo – *Cygnus olor*; Anapla – *Anas platyrhynchos*; Anacre – *Anas crecca*; Aytfer – *Aythya ferina*; Aytful – *Aythya fuligula*; Buccla – *Bucephala clangula*; Anapen – *Anas penelope*) from the hiemal aspect.

Species	November	December	January	February	Interval
Cygolo	1.51	4.61	2.12	2.49	2.69
Anapla	50.21	55.30	25.67	54.73	47.12
Anacre	1.93	18.43	16.05	19.90	12.29
Aytfer	27.04	9.22	22.46	14.93	19.12
Aytful	7.72	6.91	28.88	7.96	12.02
Buccla	0.77	0.92	4.49	0.00	1.50
Anapen	8.88	2.30	0.00	0.00	3.82
Other species	1.93	2.30	0.32	0.00	1.43

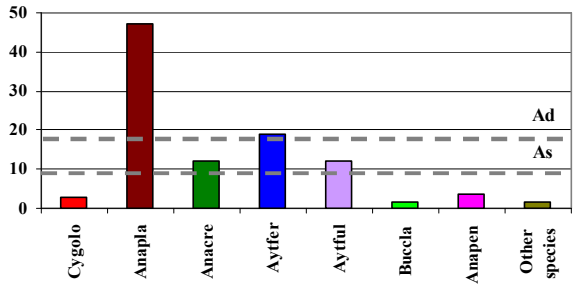

Figure 5. The global participation of the Anseriformes species to the formation of the avifauna in the hiemal period (Cygolo – *Cygnus olor*; Anapla – *Anas platyrhynchos*; Anacre – *Anas crecca*; Aytfer – *Aythya ferina*; Aytful – *Aythya fuligula*; Buccla – *Bucephala clangula*; Anapen – *Anas penelope*; As - statistic axis; Ad – dominancy axis).

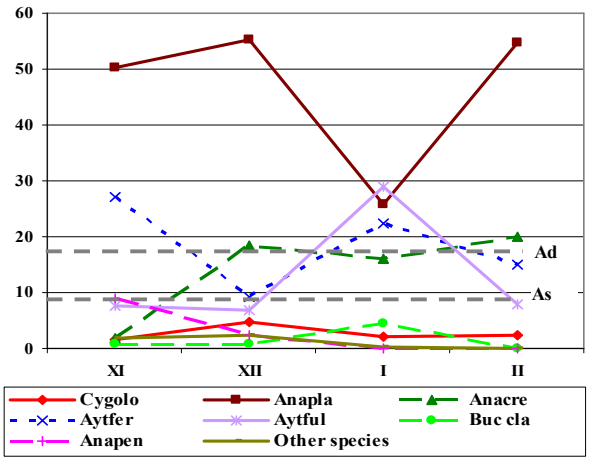

Figure 6. The dynamics of the Anseriformes species from the Budeasa Basin in the hiemal aspect (Cygolo – *Cygnus olor*; Anapla – *Anas platyrhynchos*; Anacre – *Anas crecca*; Aytfer – *Aythya ferina*; Aytful – *Aythya fuligula*; Buccla – *Bucephala clangula*; Anapen – *Anas penelope*; As - statistic axis; Ad – dominancy axis; XI – November; XII – December; I – January; II - February).

DISCUSSIONS

The results gathered after the research of the avifauna from the Budeasa Basin (hiemal and prevernal aspects, 2008 - 2009) lead to the conclusion that it is fairly rich and varied (77 species), by comparison to those of the other lakes from its vicinity. In the same period of time, there were seen 58 bird species on the Bascov Basin and 75 bird species on the Piteşti Basin; but 84 bird species were recorded on the Goleşti Basin. The Passeriformes, Anseriformes and Charadriiformes orders had the biggest number of species in all these basins. There were no surprises regarding the biogeographic origin: the most numerous were the European and Transpalearctic species, a similar situation being recorded on the other basins from the upstream and downstream. Regarding habitat: the most of the species live in the terrestrial habitat, but there is an important number of species in the aquatic habitat, while less species were recorded in the amphibious habitat. This could be said regarding all the artificial lakes from the upper and middle hydrographical basin of the Argeş River [3, 4, and 5]. Compared with the avifauna of the Danube Delta (a natural ecosystem) the percentage of the terrestrial species decreased from almost 59% to 45%, as well as that of the amphibious species from 25% to 17%, while the percentage of the aquatic species increased from 17% to 38% [23].

The constancy: the big number of the accidental and accessory species indicates that a huge fluctuation of the bird species is recorded on the Budeasa Basin, because the lake is placed on the Rucăr-Bran migratory route. This fact was remarked also by Matieş which concluded that the hydographic basin of the Argeş River is one of the main ways of passage for many

birds that cross the Carpathian Mountains [17]. The period of the migration, especially the moments of the start of the passage, are the richest for the diversity. The overlapping of the trophic resources, places of breeding, places of rest (favourable factors for the avifauna) provide a high level of biodiversity in the anthropic aquatic basins and it also establishes the premises for the periodic standing in this places (often in important effectives) for some of the aquatic species (in winter, *Anas platyrhynchos* find favourable condition for food and shelter here; even 1000 exemplars could be met, when the temperatures are low and many exemplars come here from the North).

Considering the global participation of the anseriformes species to the formation of the avifauna in the hiemal period, the presence of the mallard (*Anas platyrhynchos*) in the overdominant zone and the presence of the common teal (*Anas crecca*) in the dominance zone are both noticeable. This seems to be a general feature for the anseriforms' dynamics in this season in many water areas of Romania [8].

In the future it is necessary to continue the ornithological studies on the basins from the upper and middle course of the Argeş River, in order to adopt efficient measures for birds and their habitat preservation.

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