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Long-term monitoring of aquatic birds wintering in the Romanian Prut river basin

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ABSTRACT. Beginning with the winter of 1992, we performed a continuous ornithological survey in different wintering areas along the Prut River basin. We took in our attention the most important dam lakes, fishponds and some observatory points on the Prut River valley. We created a database about the trend and the actual situation of waterfowls' population in this part of Romania, identifying the best sites for birds' during the cold season and monitoring the activities that disturb the birds' life, estimating the human pressure level in these areas. The wintering avifauna is formed by 100 birds' species (43.85% from the total avifauna of Prut River basin – 228 species), 31 being aquatic birds – 21 species belonged to the order Anseriformes. The hiemal appearance (November – February/March in the last years of our study) of Prut River basin showed thousands of geese and ducks that represents the numerically most representative birds' group of the winter avifauna, followed by Coot (*Fulica atra*). We followed the global contribution of these species to the total wintering waterfowls' population, during the whole period of study.

Key words: Prut River basin, wintering areas, monitoring of birds

INTRODUCTION

Beginning with the winter of 1992, we did a continuous ornithological survey in different wintering areas along the Prut River basin. We took in our attention the most important dam lakes (Stâncă - Ștefănești, Podu Iloaiei, Belcești – Tansa, Hălăceni, Brateș), fishponds (Larga Jijia, Cârja – Mața – Rădeanu, Vlădești) and some observatory points on the Prut River valley. We created a database about the trend and the actual situation of waterfowls' population in this part of Romania, identifying the best sites for birds' during the cold season and monitoring the activities that disturb the birds' life, estimating the human pressure level in these areas.

In its hiemal appearance (November – February for the first part of our study, till 1997, but November – March, in the last part of our study), the avifauna is influenced by two factors: meteorological conditions (temperature, especially) and the condition of the aquatic surfaces in the area. During October, the water is evacuated for fishing from majority of ponds and, in normal circumstances, this situation facilitating the installation of the ice bridge soon after the atmosphere temperature decreases below - 5° – 10° C, even for a few days only, remaining covered by ice till the beginning of April (especially in the last years).

In the first years of study – excepting the unusually cold winters of the years 1995 and 1996 – the most important wintering quarters for waterfowls in the Romanian basin of the River Prut were the dam lakes: Stâncă-Ștefănești on the Prut's valley, Hălăceni on the Miletin's valley, Belcești - Tansa and Podu Iloaiei in Bahlui river basin. The Brateș Lake not freezes during winter due it deep and the waves but the constant presence of the waves has a negative influence on the waterfowls' presence. After a summer chemical treatment in order to improve the water's quality, beginning with the 1996's winter, Podu Iloaiei Lake was frozen every year. In the last years, the water's level of some dam lakes (Belcești - Tansa and Hălăceni) decreased very much due the excessive drying summers, so, these lakes were frozen in the second part of the winter (usually, in January). In the last three winters, the Stâncă - Ștefănești dam Lake was frozen also (in 2005, only in February), but the small lake behind the dam keep free water due the hydro-power station's activity.

METHODS

Our field observations began in 1992 and we are presenting our results for the winters 1992 – 2004. We used the method of transects making directly observations by binoculars and telescope (10 x 50, respectively, 40 x 60). We counted the all birds when the groups were no bigger than 200 exemplars or using the bands counting methods for the more large groups. Transects were established during our first

visits and we kept them during whole study. The principal transects choised covering the all perimeter for the small lakes, respectively, the most long dam and some secondary dams in order to have a global image for the fishponds. For the Stâncă – Ștefănești accumulation Lake, that is a border water between Romania and Moldova Republic, we did survey the western shore, but we done also observations from the middle part of the dam.

The quantitative analyse used the index of relation (IR) – Kelemen & Szombath, 1975 – that expresses the ratio among one species effective and the total effective of a reviewed population; it offers an image of the global contribution of the envisaged species to the total population, while its graph shows the numerical fluctuations of each species during a season or during the whole study.

$$IR = NA/N \times 100$$

where: NA – number of exemplars belonging to species A; N – number of the all exemplars counted.

We followed the quantitative fluctuations of each species during the whole study period using the graphs of static axe (As) and the dominance axe (Ad) for the order Anseriformes, where the species situated under the static axe are complementary species, the species situated upper the dominance axe are super-dominant species and those situated between these two axes are dominant species :

$$As = 100 / N$$

$$Ad = 2 \times As,$$

where: N – number of the counted species.

In order to have an image of the dynamic of the wintering population of waterfowls during the whole period of study, we used the index of middle level (NM) of the order Anseriformes:

$$NM = Nt / Na$$

where: Nt – the all birds counted in winter period of each year; Na – number of the years.

RESULTS AND DISCUSSIONS

The recorded wintering avifauna is formed by 100 birds' species (43.85% from the total avifauna of Prut River basin – 228 species), 33 being aquatic birds – 21 species belonged to the order Anseriformes. The other orders recorded were Gruiformes / Suborder Ralli – 2 species and Ciconiiformes – 10 species having the following representation (Sibley & Monroe, 1990): Suborder Charadrii / Superfamily Laridae – 3 species, Suborder Ciconii / Parvorder Podicipedidae – 4 species, Parvorder Sulidae – Superfamily Phalacrocoracidae – one species and Parvorder Ciconiidae – Superfamily Procellariidae, Family Gaviidae – 2 species.

The hiemal appearance (November – February/March in the last years of our study) of Prut River basin showed thousands of geese and ducks that represents the numerically most representative birds' group of the winter avifauna, followed by Coot (*Fulica atra*).

The divers were observed very rare in this region because, usually, they just are crossing through this area. We saw only one winter (2002) an exemplar of Black-throated Diver (*Gavia arctica*) remaining to wintering on Stâncă-Ștefănești Lake. The grebes represent constant presences during the winter, especially in the Stâncă-Ștefănești Lake's perimeter where we recorded every time four species with small groups: *Podiceps cristatus* - no more than 14 exemplars, *Podiceps auritus* - 8 exemplars, on 15.01.2004, the biggest effective recorded, *Podiceps grisegena* (3 - 4 exemplars) and *Tachybaptus ruficollis* (2 - 4 exemplars).

Between the waterfowls, the Ferruginous Duck - *Aythya nyroca* and the Coot - *Fulica atra* are remaining just to the beginning of December in the most part of the Romanian Prut River basin. During the winter's months, we recorded this last species only in Stâncă-Ștefănești dam lake's area with hundreds exemplars (the biggest effective – 632 individuals on 18.01.2001). The largest effective of Shelduck - *Tadorna tadorna* was recorded in this territory at the beginning of the hiemal aspect: 42 de exemplars, Hălăeni, 15.11.1997. We notice the first simultaneous presence of the three merganser species in the Romanian Prut River basin – *Mergus merganser* (8 males and 6 females), *Mergus serrator* (2 pairs) and *Mergus albellus* (7 males and 9 females), at Stâncă-Ștefănești, on 14.01.2003. Starting with the 2000's winter, the

Goldeneye - *Bucephala clangula*, was present each year in Stânca-Ștefănești Lake's perimeter, the effective increasing every winter - from 19 pairs in 2000 to 89 pairs in 2004.

Between the wintering rare anseriforms species in the study territory, we notice the presence of the Whooper Swan (*Cygnus cygnus*) - 6 exemplars, Borșa swampy, 08.12.1996, the Red-breasted Goose (*Branta ruficollis*) - 2 exemplars, Hălenci Lake, 11.12.1999, the Bean Goose (*Anser fabalis*) - 18 exemplars, Hălenci Lake, 02.12.1994, the Eider (*Somateria mollissima*) - one pair, Stânca-Ștefănești Lake, 17.12.1992 and the Red-breasted Merganser (*Mergus serrator*) - two pairs, 14.01.2003, respectively, one pair, 15.01.2004, Stânca-Ștefănești Lake.

During the cold season, we can counting also tens of gulls (especially, *Larus cachinnans* and *Larus ridibundus*, but we recorded also small groups of Lesser Black-backed Gull - *Larus fuscus*, the biggest effective being of 6 individuals, on the Hălenci Lake, on 03.01.2001). In November, the gulls are present with hundreds and thousands exemplars, especially in the middle part of the area, in Vlădeni wetland area.

Between other species recorded during the hiemal aspect in the Romanian Prut River basin, we mention the Great White Egret (*Egretta alba*) present till the beginning of December (5 exemplars, Larga Jijia, 5.12.1992) and the Grey Heron (*Ardea cinerea*) that can be seen sometimes during the whole winter - one exemplar, Bivolari, 10.01.1993 or another one exemplar, Santa Mare, 8.02.1997. In the southern part of the basin, these two species have a constant presence with small groups - no larger than 5 exemplars, on the old streams formed by the Prut River in Vlădești-Oancea perimeter. A special presence was did in 1997's winter - two exemplars of White Stork (*Ciconia ciconia*) remained in Trifești village's area for whole winter, nourishing in some sulfurous freshwaters that are not frozen anytime.

The limicoline birds are also present at the beginning of the hiemal aspects, the Lapwing - *Vanellus vanellus* and the Curlew - *Numenius arquata* being recorded till the first days of December including in the middle part of the study territory (for example, appreciatively 500 Curlews were presence on the Hălenci Lake at 3.12.2002, but the tardiest signalisation of this species for the River Prut basin was did on the same lake at 3.01.2001, when we saw two exemplars in the tail of the lake, close to the village). For the beginning of the November, we mention also the biggest effective of the Avocet - *Recurvirostra avosetta*, but in the southern part of the area: 26 exemplars, Vlădești, 6.11.1998.

We followed the global contribution of the anseriforms species to the total wintering waterfowls' population, for the whole period of study. Between the wintering rare anseriforms species in the study territory, we notice the presence of the Whooper Swan (*Cygnus cygnus*) - 6 exemplars, Borșa swampy, 08.12.1996, the Red-breasted Goose (*Branta ruficollis*) - 2 exemplars, Hălenci Lake, 11.12.1999, the Bean Goose (*Anser fabalis*) - 18 exemplars, Hălenci Lake, 02.12.1994, the Eider (*Somateria mollissima*) - one pair, Stânca-Ștefănești Lake, 17.12.1992 and the Red-breasted Merganser (*Mergus serrator*) - two pairs, 14.01.2003, respectively, one pair, 15.01.2004, Stânca-Ștefănești Lake.

Among the 11 species of anseriforms that were censuses during the first six winters of study (1992 - 1997) within the territory (table 1), *Anser anser* and *Anas platyrhynchos* represented super-dominant species within the hiemal population of this order, *Anser albifrons* and *Anas crecca* were dominant species while *Aythya ferina* reached the upper limit of the complementary species group; significant values were also realised by *Aythya nyroca* and *Anas penelope* (Fig. 1).

Table 1
IR values for the anseriforms species present in wintering areas in Prut River basin (1992 - 1997)

No.	Species	1992	1993	1994	1995	1996	1997
1.	<i>Cygnus olor</i>	0.12	0.22	0.04	-	0.19	0.20
2.	<i>Anser anser</i>	38.65	28.43	33.22	6.35	11.77	22.71
3.	<i>Anser albifrons</i>	18.01	20.69	14.02	11.29	11.65	18.37
4.	<i>Anas platyrhynchos</i>	21.85	36.33	32.23	44.13	40.18	28.30
5.	<i>Anas penelope</i>	0.45	0.73	0.25	3.74	0.51	7.31
6.	<i>Anas crecca</i>	15.17	7.42	11.12	16.59	11.98	6.22
7.	<i>Anas clypeata</i>	0.15	0.04	0.55	0.42	0.32	0.68
8.	<i>Aythya fuligula</i>	0.98	0.38	0.80	0.70	0.63	0.73
9.	<i>Aythya nyroca</i>	2.65	0.83	2.68	10.59	1.57	1.87
10.	<i>Aythya ferina</i>	1.93	4.85	4.86	5.64	21.14	13.52
11.	<i>Aythya marila</i>	-	0.03	0.05	0.49	-	-

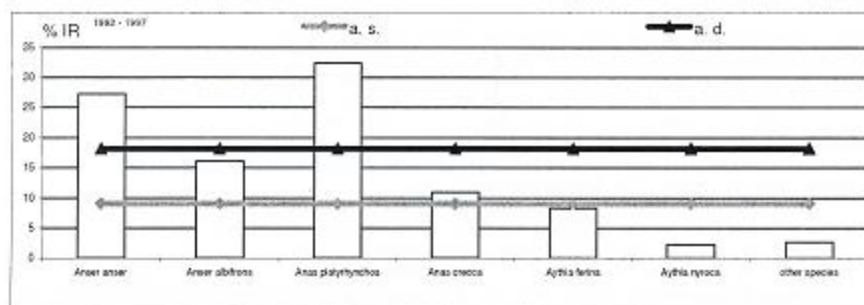


Fig. 1. The global contribution of the anseriforms species to the wintering waterfowls' population in Prut River basin (1992 - 1997)

During these six years, only the Mallard (*Anas platyrhynchos*) was constantly superdominant species, the Greylag Goose (*Anser anser*) getting off in the dominant species group during the winters of the years 1995 and 1996 that were very cold, requiring the aquatic birds' migration to the south. The White-fronted Goose (*Anser albifrons*) was constantly dominant species; the Teal (*Anas crecca*) oscillated between the dominant and complementary species groups (1993, 1997). The Pochard (*Aythya ferina*) was a complementary species, forcing up to the dominant species group in the winters 1996 and 1997; the Ferruginous Duck (*Aythya nyroca*) was dominant species only in 1995 when this species' presence had a very great value in the beginning of November (in 1995, we recorded the biggest value of IR for whole period of study: 10.59%). The other species are strictly complementary species: *Cygnus olor* was not recorded in 1995 when all the aquatic surfaces were frozen in November; *Aythya marila*, *Aythya fuligula* and *Anas clypeata* have very low values of IR, being observed only in November or in February - March.

In the last part of our study (1998 - 2004), we recorded 15 anseriforms species with a constant presence in the Romanian Prut River basin (table 2). Among them, *Anser albifrons* and *Anas platyrhynchos* represented super-dominant species within the hiemal population (figure 2). There was not any dominant species, but *Anser anser* reached the upper limit of the complementary species group. We found significant values for *Anas crecca* and *Aythya ferina*. Other species formed the complementary species group, with small effectives presented in the study area during the winter, part of them only in the last years: *Cygnus olor*, *Anas penelope*, *Anas acuta*, *Anas clypeata*, *Aythya fuligula*, *Aythya nyroca*, *Aythya marila*, *Bucephala clangula*, *Mergus merganser* and *Mergus albellus*.

Table 2

IR values for the anseriforms species present in wintering areas in Prut River basin (1998 - 2004)

No.	Species	1998	1999	2000	2001	2002	2003	2004
1.	<i>Cygnus olor</i>	0.13	0.07	0.21	0.31	0.03	0.03	0.22
2.	<i>Anser anser</i>	5.06	5.60	7.43	4.11	4.98	4.17	5.73
3.	<i>Anser albifrons</i>	53.98	48.56	52.33	42.68	33.05	45.76	40.48
4.	<i>Anas platyrhynchos</i>	36.67	41.45	36.77	44.97	55.04	43.48	46.94
5.	<i>Anas penelope</i>	0.49	0.43	0.31	0.64	0.43	0.26	0.44
6.	<i>Anas acuta</i>	0.04	0.03	0.05	0.05	0.04	0.13	0.05
7.	<i>Anas crecca</i>	1.45	1.69	1.02	1.37	1.72	1.40	1.56
8.	<i>Anas clypeata</i>	0.32	0.24	0.24	0.43	0.91	0.89	0.20
9.	<i>Aythya fuligula</i>	0.35	0.32	0.31	0.41	0.03	0.34	1.09
10.	<i>Aythya nyroca</i>	0.32	0.45	0.35	0.66	0.49	0.36	0.29
11.	<i>Aythya ferina</i>	1.14	1.10	0.81	3.88	0.43	2.52	2.29
12.	<i>Aythya marila</i>	-	0.007	0.01	-	0.03	0.03	0.06
13.	<i>Bucephala clangula</i>	-	-	0.09	0.37	0.47	0.43	0.48
14.	<i>Mergus merganser</i>	-	-	0.005	0.01	0.03	0.03	0.02
15.	<i>Mergus albellus</i>	-	-	-	0.05	0.04	0.11	0.07

If we regards to the dynamic during these last seven years, we can see that this situation was near constant - only in 2000's winter, the Greylag Goose (*Anser anser*) was a dominant species. In 2001, the Pochard (*Aythya ferina*) had the maximum value of IR (3.88%) for this part of study. The great level of IR

value for the White-fronted Goose (*Anser albifrons*) is due to the migration survey during the first decade of November when this species can be recorded with thousands exemplars in the Romanian Prut River basin (for example, on 2.11.2000, on the Jijia ponds were counted 19.270 exemplars). In the winter months, this species is present with flocks not so large (varying between 1200 exemplars and 4900 exemplars).

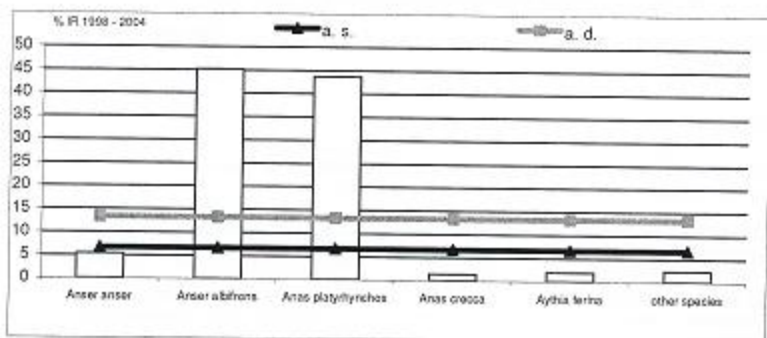


Fig. 2. The global contribution of the anseriforms species to the wintering waterfowls' population in Prut River basin (1998 - 2004)

We notice the constant presence of four new species, despite their small effectives - *Anas acuta*, *Bucephala clangula*, *Mergus merganser* and *Mergus albellus*. If we follow their effectives, we see that during the last two winters, the Goldeneye (*Bucephala clangula*) and the Tufted Duck (*Aythya fuligula*) had bigger effectives than the Ferruginous Duck (*Aythya nyroca*), while the Pintail (*Anas acuta*), Goosander (*Mergus merganser*) and Smew (*Mergus albellus*) had similar effectives.

The winter was very cold in the eastern Romania during this period and all the aquatic surfaces, including the rivers, were covered by ice-bridges no late than the beginning of January (excepting the 2004's winter, when these "bridges" appeared in first days of February 2005). We can discuss about a prolonged winter, starting no later than the first decade of December, but sometimes in the last decade of November and finishing in the first days of April (especially in 2002 and 2004's winters). In this way, the passage species appears later in territory, being observed in large groups till the 20th April - for example, the largest quantitative presence of the Pintail - *Anas acuta* in the Romanian Prut River basin was recorded on the Fălcu swampy 17.04.2003: 352 exemplars.

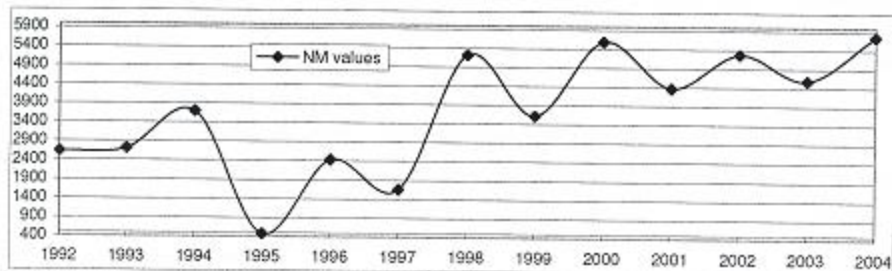


Fig. 3. The dynamic of the index of middle level (NM) for the anseriforms wintering population in Prut River basin (1992 - 2004)

During the 1992 - 2004's winters, the index of the middle level of the anseriforms population in the wintering areas from the Romania Prut River basin presented great oscillations - Fig. 3. The smallest value of this index was recorded in 1995's winter when the ice-bridge covered all the aquatic surfaces in the first week of November and the rivers were completed frozen in the first days of December. The birds were constrained migrating to the south. In fact, in the autumn of 1995, we recorded the highest level of

the middle level index for anseriforms population in migration period for all these thirteen years of study. The 1996's winter was also very cold, but the frost began in December; more of this, the Prut River and the central part of the dam lake Stâncă-Ștefănești remained free of ice.

The increasing of the middle level index values in the second part of our study can be explained by the monitoring of the November passage of the White-fronted Goose (*Anser albifrons*) in the Romanian Prut River basin, but also by the constant presence of large groups of waterfowls on the small lake behind the dam from Stâncă-Ștefănești that keep free water due the hydro-power station's activity, respectively, on the Prut River course where large surfaces remaining without ice due the great deep of water, especially in the large meanders.

CONCLUSIONS

Our ornithological study viewing the wintering avifauna began in 1992's winter, covering the most important wintering sites from the Romanian Prut River basin.

We recorded 100 birds' species (43.85% from the total avifauna of Prut River basin – 228 species), 33 being aquatic birds.

The hiemal appearance (November – February/March in the last years of our study) of Prut River basin showed thousands of geese and ducks that represents the numerically most representative birds' group of the winter avifauna, followed by Goot (*Fulca atra*).

We followed the global contribution of the anseriforms species to the total wintering waterfowls' population, for the whole period of study.

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In the last part of our study (1998 - 2004), we recorded 15 anseriforms species with a constant presence in the Romanian Prut River basin. Among them, *Anser albifrons* and *Anas platyrhynchos* represented super-dominant species within the hiemal population. There was not any dominant species, but *Anser anser* reached the upper limit of the complementary species group. We found significant values for *Anas crecca* and *Aythya ferina*.

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