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WINTER AND PASSAGE AVIFAUNA OF THE APA LAKE (SATU MARE COUNTY)

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ABSTRACT. The paper presents the results of the observations during October 2006 - April 2010, the aquatic birds which inhabit the Apa lake, SatuMare county, during all the cold season. 54 species of 10 orders and 19 families that spend the winter or part of it on the lake have been identified, 6 of these species abound or are common, most of them, 48 species, are only occasional visitors. 14 of the species observed are strictly protected. Most birds were observed during the coldest weather and most species during the spring passage. Minimum protective measures have been recommended in order to protect the birds.

Keywords: aquatic birds, cold season, abundance, numerical variation, human activity.

INTRODUCTION

Apa Lake is one of the largest lakes and one of the few refuges for wintering waterfowl in the area. This study aims to provide a more complete overview of aquatic or aquatic-dependent birds, which inhabit the lake during the cold season, trying to offer a more complete picture of the situation of winter avifauna of the Apa lake. The paper lists the species observed during the period studied and some considerations concerning the evolution of frequency and number of species of interest during this period.

MATERIALS AND METHODS

Data were collected from surveys made between October 2006 - April 2010, corresponding during the cold season (October to April / May), each year. Observations have been made using the telescope and binoculars, all day, from the shore and the boat, with a total no. 842 observation hours (average 210,5/ season), the lake surface being completely covered. It is essential to use the boat for full coverage of the lake surface, because free access can only cover about 15-20% of the circumference on the northwestern bank, the remainder being private with restricted access.

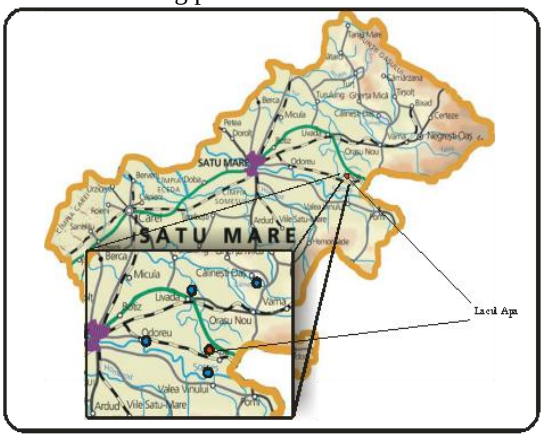

Fig.1 Location of Apa lake.

RESULTS AND DISCUSSIONS

Location, description

Apa lake is located in the south east of Satu Mare County, about 35 km from the municipality Satu Mare, the administrative territory of the municipality Apa. The lake is located near the south-eastern extremity of Somes Plain, between the coordinates: N (47 ° 47'03 "N, 23 ° 10'33" E), S (47 ° 46'28 "N - 23 ° 10 ' 17 'E), E (47 ° 46'27 "N - 23 ° 11'17" E), V (47 ° 46'55 "N - 23 ° 10'07" E). The lake is irregular, the surface is about 130 hectares, with the water depth of 20-25 m. The lake has artificial origin, being formed from groundwater flooding the excavations carried out over time, to remove the gravel. This explains the origin and some characteristics of the lake, much different from other lowland lakes.

Fig.2 Satellite map of the lake.

Steep banks of deep water, lack of shallow water areas, very few organic sediments, very small aquatic vegetation, represented by several pieces of (*Myriophyllum sp*), reed (*Phragmites*) and cattail (*Typha*), close to the shore, very clear water and relatively constant level, are specific characteristics of the lake. The most important characteristic that makes the lake interesting for the present study is that the lake water temperature drops slowly in the fall, the lake remains unfrozen even after all other lakes, and often rivers, in the area, are frozen and defrosts in spring thawing rapidly. Thus throughout the study period the lake was completely ice covered only about 37-38 days in the winters 2007 - 2008 and 2008-2009, and in the 2006- 2007 and 2009-2010 winters, it was only partially frozen.

Observed Birds systematic The aquatic or aquatic environment dependent species recorded in the studied period are listed in systematic order (Szabo- Szeley et al., 2006) in Table 1.

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Table 1

Studied birds Systematic

I. GAVIIFORMES				
1	**1. Gaviidae**	*Gavia arctica*	Linnaeus, 1758	**Black-throated Diver**
II. PODICIPEDIFORMES				
2	**2. Podicipedidae**	*Tachybaptus ruficollis*	Pallas, 1764	**Little Grebe**
3		*Podiceps cristatus*	Linnaeus, 1758	**Great Crested Grebe**
4		*Podiceps grisegena*	Boddaert, 1783	**Red-necked Grebe**
5		*Podiceps nigricollis*	Brehm, 1831	**Black-necked Grebe**
III. PELECANIFORMES				
6	**3.Phalacrocoracidae**	*Phalacrocorax carbo*	Linnaeus, 1758	**Cormorant**
IV. CICONIFORMES				
7	**4. Ardeidae**	*Ixobrychus minutus*	Linnaeus, 1766	**Litte Bittern**
8		*Nycticorax nycticorax*	Linnaeus 1758	**Night Heron**
9		*Ardea alba*	Linnaeus, 1758	**Great White Egret**
10		*Ardea cinerea*	Linnaeus, 1758	**Grey Heron**
11	**5. Ciconidae**	*Ciconia ciconia*	Linnaeus, 1758	**White Stork**
V. ANSERIFORMES				
12	**6. Anatidae**	*Cygnus olor*	Gmelin, 1789	**Mute Swan**
13		*Anser albifrons*	Scopoli, 1769	**White-fronted Goose**
14		*Anas penelope*	Linnaeus, 1758	**Wigeon**
15		*Anas crecca*	Linnaeus, 1758	**Teal**
16		*Anas platyrhynchos*	Linnaeus, 1758	**Mallard**
17		*Anas querquedula*	Linnaeus, 1758	**Garganey**
18		*Anas clypeata*	Linnaeus, 1758	**Shoveler**
19		*Aythya ferina*	Linnaeus, 1758	**Pochard**
20		*Aythya nyroca*	Güldenstädt, 1770	**Ferruginous Duck**
21		*Aythya fuligula*	Linnaeus, 1758	**Tufted Duck**
22		*Bucephala clangula*	Linnaeus, 1758	**Golden eye**
23		*Mergus serrator*	Linnaeus, 1758	**Red-breasted Merganser**
VI. ACCIPITRIFORMES				
24	**7. Accipitridae**	*Circus aeruginosus*	Linnaeus, 1758	**Marsh Harrier**
25	**8. Pandionidae**	*Pandion haliaetus*	Linnaeus, 1758	**Osprey**
VII. GRUIFORMES				
26	**9. Rallidae**	*Rallus aquaticus*	Linnaeus, 1758	**Water Rail**
27		*Gallinula chloropus*	Linnaeus, 1758	**Moorhen**
28		*Fulica atra*	Linnaeus, 1758	**Coot**
VIII. CHARADRIIFORMES				
29	**10. Recurvirostridae**	*Himantopus himantopus*	Linnaeus, 1758	**Black-winged Stilt**
30	**11. Charadriidae**	*Charadrius dubius*	Scopoli, 1786	**Little Ringed Plover**
31		*Charadrius hiaticula*	Linnaeus, 1758	**Ringed Plover**
32		*Vanellus vanellus*	Linnaeus, 1758	**Lapwing**
33	**12. Scolopacidae**	*Tringa erythropus*	Pallas, 1764	**Spotted Redshank**
34		*Tringa totanus*	Linnaeus, 1758	**Redshank**
35		*Tringa nebularia*	Gunnerus, 1767	**Greenshank**
36		*Tringa ochropus*	Linnaeus, 1758	**Green Sandpiper**
37		*Tringa glareola*	Linnaeus, 1758	**Wood Sandpiper**
38		*Actitis hypoleucos*	Linnaeus, 1758	**Common Sandpiper**
39	**13. Laridae**	*Larus cacchinnans/ michahellis (complex)*	Pallas, 1811/ Naumann, 1840	**Caspian Gull/Yellow-legged Gull**
40		*Larus canus*	Linnaeus, 1758	**Common Gull**
41		*Larus fuscus*	Linnaeus, 1758	**Lesser Black-backed Gull**
42		*Larus minutus*	Pallas, 1776	**Little Gull**
43		*Larus ridibundus*	Linnaeus, 1766	**Black-headed Gull**
44	**14. Sternidae**	*Sterna hirundo*	Linnaeus, 1758	**Common Tern**
45		*Chlidonias hybrida*	Pallas, 1811	**Whiskered Tern**
46		*Chlidonias leucopterus*	Temminck, 1815	**White-winged Black Tern**
47		*Chlidonias niger*	Linnaeus, 1758	**Black Tern**
IX. CORACIIFORMES				
48	**15. Alcedinidae**	*Alcedo atthis*	Linnaeus, 1758	**Kingfisher**
X. PASSERIFORMES				
49	**16. Hirundinidae**	*Riparia riparia*	Linnaeus, 1758	**Sand Martin**
50	**17. Sylviidae**	*Locustella luscinoides*	Savi, 1824	**Savi`s Warbler**
51		*Acrocephalus arundinaceus*	Linnaeus 1758	**Great Reed Warbler**
52		*Acrocephalus scirpaceus*	Hermann, 1804	**Reed Warbler**
53	**18. Remizidae**	*Remiz pendulinus*	Linnaeus, 1758	**Penduline Tit**
54	**19. Emberizidae**	*Emberiza schoeniclus*	Linnaeus, 1758	**Reed Bunting**

As shown in Table. 1, a number of 54 species were identified, belonging to 10 orders and 19 families, most species belonging to the family Anatidae (12), Scolopacidae (6), Laridae (5) Podicipedidae (4), Sternidae (4) Ardeidae (4), typical for the aquatic environment(Ardelean.2003). Out of the recorded species, a total of 14 species are strictly protected by European legislation, as contained in Annex I EC Birds Directive (*Gavia arctica, Ixobrychus minutus, Nycticorax nycticorax, Ardea alba, Ciconia ciconia, Aythya nyroca, Circus aeruginosus, Pandion haliaetus, Himantopus himantopus, Tringa glareola, Sterna hirundo, Chlidonias hybrida, Chlidonias niger, Alcedo atthis*).

Recorded species abundance and numerical variation analysis

The total number of individuals observed during each season with encounter rate/100 field hours (ER) (Bibby et al., 1998) calculated for each species for each season as well as for the whole period of 4 years is shown in Table 2. In the column 7 are presented the relative abundance categories obtained for the whole period studied, and the diagram in Fig. 3, illustrates the share of the categories in the total of the observed.

Table 2

Number of individuals and encounter rates/100 hours(ER)

0	1	2		3		4		5		6	7
Nr. crt.	Species	2006-2007 (201 field hours)		2007-2008 (212 field hours)		2008-2009 (219 field hours)		2009-2010 (210 field hours)		ER 2006-2010	Relative abundance
		Number of individuals	ER	Number of individuals	ER	Number of individuals	ER	Number of individuals	ER		
1	*Gavia arctica*	11	5,4	20	9,4	20	9,1	16	7,6	7,9	U
2	*Tachybaptus ruficollis*	7	3,4	34	16,0	42	19,1	55	26,1	16,3	F
3	*Podiceps cristatus*	75	37,3	97	45,7	33	15,0	39	18,5	28,9	F
4	*Podiceps grisegena*			8	3,7					0,9	R
5	*Podiceps nigricollis*			6	2,8					0,7	R
6	*Phalacrocorax carbo*	70	34,8			116	52,9	65	30,9	29,8	F
7	*Ixobrychus minutus*			3	1,4			1	0,4	0,4	R
8	*Nycticorax nycticorax*	3	1,4	8	3,7					1,3	U
9	*Ardea alba*	2	0,9	9	4,2	1	0,4	2	0,9	1,6	U
10	*Ardea cinerea*	9	4,4	24	11,3	6	2,7	25	11,9	7,6	U
11	*Ciconia ciconia*	3	1,4	1	0,4			3	1,4	0,8	R
12	*Cygnus olor*	4	1,9							0,4	R
13	*Anser albifrons*	6	2,9	36	16,9	2700	1232,8	460	219	380,2	A
14	*Anas penelope*	10	4,9	21	9,9	64	29,6	16	7,6	13,1	F
15	*Anas crecca*							50	23,8	5,9	U
16	*Anas platyrhynchos*	2498	1242,7	3336	1573,5	3384	1545,2	6931	3300,4	1917,9	A
17	*Anas querquedula*	114	56,7	68	32,0	53	24,2	54	25,7	34,3	C
18	*Anas clypeata*			14	6,6					1,6	U
19	*Aythya ferina*			12	5,6	6	2,7			2,1	U
20	*Aythya nyroca*	9	4,4	15	7,0			2	0,9	3	U
21	*Aythya fuligula*	3	1,4							0,3	R
22	*Bucephala clangula*	1	0,4					4	1,9	0,5	R
23	*Mergus serrator*	1	0,4			1	0,4			0,2	R
24	*Circus aeruginosus*	11	5,4	8	3,7	8	3,6	8	3,8	4,1	U
25	*Pandion haliaetus*	3	1,4	2	0,9	2	0,9			0,8	R
26	*Rallus aquaticus*			1	0,4	1	0,4	1	0,4	0,3	R
27	*Gallinula chloropus*	1	0,4	3	1,4	3	1,3			0,8	R
28	*Fulica atra*	210	104,4	500	235,8	256	116,8	909	432,8	222,6	A
29	*Himantopus himantopus*							2	0,9	0,2	R
30	*Charadrius dubius*	5	2,4	14	6,6	9	4,1	6	2,8	4	U
31	*Charadrius hiaticula*	3	1,4							0,3	R
32	*Vanellus vanellus*	83	41,2	13	6,1	807	368,4	22	10,4	109,8	A
33	*Tringa erythropus*	6	2,9							0,7	R
34	*Tringa totanus*	4	1,9							0,4	R
35	*Tringa nebularia*	3	1,4	5	2,3					0,9	R
36	*Tringa ochropus*	1	0,4	17	8,0			6	2,8	2,8	U
37	*Tringa glareola*	1	0,4	1	0,4	2	0,9			0,4	R
38	*Actitis hypoleucos*	2	0,9	7	3,3	10	4,5	6	2,8	2,9	U
39	*Larus cacchinnans/mich.*			3	1,4	23	10,5	9	4,2	4,1	U
40	*Larus canus*	4	1,9	4	1,8	24	10,9			3,8	U
41	*Larus fuscus*			1	0,4					0,1	R
42	*Larus minutus*					1	0,4			0,1	R
43	*Larus ridibundus*	127	63,1	138	65,0	229	99,5	176	83,8	79,5	C
44	*Sterna hirundo*	6	2,9	50	23,5	15	6,8	4	1,9	8,9	U
45	*Chlidonias hybrida*			8	3,7					0,9	R
46	*Chlidonias leucopterus*					4	1,8			0,4	R
47	*Chlidonias niger*					6	2,7			0,7	R
48	*Alcedo atthis*	10	4,9	24	11,3	63	28,7	44	20,9	16,7	F
49	*Riparia riparia*	26	12,9	104	49,0			2	0,9	15,6	F
50	*Locustella luscinoides*							4	1,9	0,4	R
51	*Acrocephalus arundinaceus*			7	3,3			3	1,4	1,1	U
52	*Acrocephalus scirpaceus*							1	0,4	0,1	R
53	*Remiz pendulinus*	43	21,3	2	0,9	20	8,2	111	52,8	20,9	F
54	*Emberiza schoeniclus*	19	9,4	7	3,3	7	3,1	4	1,9	4,3	U
Total	*Number of species*	37		39		31		33			
	Number of individuals	3394		4631		8016		9041			

The relationship between encounter rate values and relative abundance categories: <1,0 = Rare(R); 1,0 – 10,0 = Uncommon(U); 10,0 – 30,0 = Frequent(F); 30,0 – 100, 0 = Common(C); 100,0 + = Abundant(A).

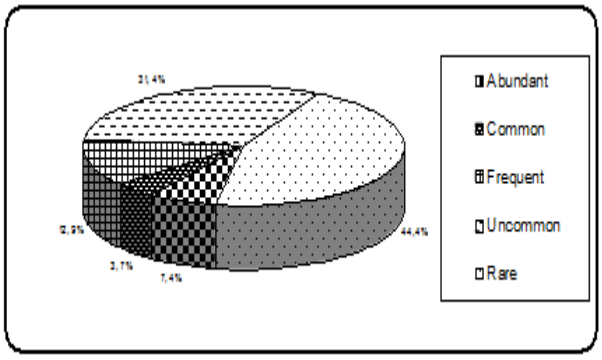

Fig. 3 The share of the abundance categories in the total of the observed.

As apparent from Table 2, from the total of 54 species observed during the period studied, only 6 species can be considered abundant (7,4%) or common(3,7%) for the Apa lake in winter. This can be explained by the specific of the lake, which does not provide a very good shelter for large groups of aquatic birds, like waders and birds that need large expanses of reeds and aquatic vegetation, which are only occasional visitors. But the species that prefer deep and clear open waters, are well represented (loons, grebes, ducks). The largest groups have been recorded for the common species: *Anas platyrhynchos*, *Fulica atra*, *Larus ridibundus*, which are present almost constantly on the lake in winter, *Anser albifrons*, *Vanellus vanellus*, in migration. However the numerical variation for the recorded populations is very large even for these species.

The detailed comments for each of the 4 seasons studied are exemplified below (table no. 3, 4, 5, 6) and the evolution of the number of species and number of individuals appears in the diagrams of Fig.4,5,6,7.

Studia Universitatis "Vasile Goldiş", Seria Ştiinţele Vieţii
Vol. 24, issue 1, 2014, pp.157-168

Table 3

Status of species and individuals recorded in the 2006-2007 season.

Nr. crt.	Species	19.11.2006	24.11.2006	26.11.2006	03.12.2006	10.12.2006	17.12.2006	30.12.2006	07.01.2007	12.01.2007	14.01.2007	21.01.2007	04.02.2007	18.02.2007	25.02.2007	05.03.2007	17.03.2007	25.03.2007	31.03.2007	06.04.2007	13.04.2007	15.04.2007	Total
1	*Gavia arctica*	1	4	2	2	2																	11
2	*Tachybaptus ruficollis*	1	1	1	1		1										2						7
3	*Podiceps cristatus*	4	4	4	2		2		4	5	5	5	5	5	4		4	4	4	4	4	6	75
4	*Phalacrocorax carbo*	32									7	4	11	30	11	7							70
5	*Nycticorax nycticorax*																			1	1	1	3
6	*Ardea alba*																			2			2
7	*Ardea cinerea*																	2			5	2	9
8	*Ciconia ciconia*																				2	1	3
9	*Cygnus olor*																3	1					4
10	*Anser albifrons*																3	3					6
11	*Anas penelope*																	10					10
12	*Anas platyrhynchos*		12	170	700	700	300	350	6	12		5	30	30	55	6	22	20	22	20	18	20	2498
13	*Anas querquedula*																30	60	6	6	6	6	114
14	*Aythya nyroca*									1										2		6	9
15	*Aythya fuligula*																					3	3
16	*Bucephala clangula*																					1	1
17	*Mergus serrator*																					1	1
18	*Circus aeruginosus*				1				1		1	1	1	1		1	1		1	2			11
19	*Pandion haliaetus*	1															1			1			3
20	*Gallinula chloropus*																					1	1
21	*Fulica atra*			12		6	6	10	40	42	40	38	6	4	3	3					1		210
22	*Charadrius dubius*																				3	2	5
23	*Charadrius hiaticula*																			2	1		3
24	*Vanellus vanellus*																	25	28				83
25	*Tringa erythropus*																		4	2			6
26	*Tringa totanus*																		2	2			4
27	*Tringa nebularia*																			1	1	1	3
28	*Tringa ochropus*																				1		1
29	*Tringa glareola*																			1			1
30	*Actitis hypoleucos*																			1	1		2
31	*Larus canus*						4																4
32	*Larus ridibundus*				1				1	1	1	1	1	2	6		10	48	32	7	8	8	127
33	*Sterna hirundo*																				3	3	6
34	*Alcedo atthis*				1	1	1		1	1	1	1		1	1	1							10
35	*Riparia riparia*																					26	26
36	*Remiz pendulinus*																		20	22	1		43
37	*Emberiza schoeniclus*	7			12																		19
Total	species	6	4	5	8	4	6	2	6	6	6	7	6	7	6	5	9	9	9	16	15	16	37
	Individuals	46	21	189	720	709	314	360	53	62	55	55	54	73	81	18	76	173	119	76	56	88	3394

Table 4

Status of species and individuals recorded in the 2007-2008 season

Nr. crt.	Species	04.11.2007	11.11.2007	18.11.2007	25.11.2007	02.12.2007	16.12.2007	30.12.2007	Fr	02.02.2008	Fr	24.02.2008	09.03.2008	16.03.2008	22.03.2008	30.03.2008	08.04.2008	13.04.2008	25.04.2008	29.04.2008	20.05.2008	25.05.2008	Total
1	*Gavia arctica*	2	4	4	4	2	4																20
2	*Tachybaptus ruficollis*	5	2	2	6	6	6	4								1	1	1					34
3	*Podiceps cristatus*	4	4	2	2	2							2		5		22	4	14	12	10	14	97
4	*Podiceps grisegena*																2		2	2		2	8
5	*Podiceps nigricollis*																2			4			6
6	*Ixobrychus minutus*																				1	2	3
7	*Nycticorax nycticorax*																1				7		8
8	*Ardea alba*											5	1	1					1		1		9
9	*Ardea cinerea*			2		1	3						4	2			5	5			2		24
10	*Ciconia ciconia*																			1			1
11	*Anser albifrons*																36						36
12	*Anas penelope*											17					2	2					21
13	*Anas platyrhynchos*				35	35	32	2500		150		400	40	30	2	30	30	22	8	8	6	8	3336
14	*Anas querquedula*													8	32	18	8	2					68
15	*Anas clypeata*																14						14
16	*Aythya ferina*																6	6					12
17	*Aythya nyroca*						1	2				4				4	4						15
18	*Circus aeruginosus*							1					2		1		1	1	1		1		8
19	*Pandion haliaetus*																	2					2
20	*Rallus aquaticus*							1															1
21	*Gallinula chloropus*																1			1	1		3
22	*Fulica atra*	4	18	18	32	90	64	150		24		24	32	24		4	4	4	2	2	2	2	500
23	*Charadrius dubius*																4	2	2	2	2	2	14
24	*Vanellus vanellus*											9			2		2						13
25	*Tringa nebularia*															2	1	1	1				5
26	*Tringa ochropus*															3	4	2	3	3	1	1	17
27	*Tringa glareola*																					1	1
28	*Actitis hypoleucos*																3	2		2			7
29	*Larus cacchinnans/ mich.*																1					2	3
30	*Larus canus*											2							2				4
31	*Larus fuscus*																					1	1
32	*Larus ridibundus*		4		1	1	1	1				26	2		1	5	6	2	39	5	5	39	138
33	*Sterna hirundo*																30	4	4	4	4	4	50
34	*Chlidonias hybrida*																				8		8
35	*Alcedo atthis*	2	3	2	2	2	2	1		1		1			1	1		2	1	1	1	1	24
36	*Riparia riparia*																			24	40	40	104
37	*Acrocephalus arundinaceus*																				2	5	7
38	*Remiz pendulinus*																				2		2
39	*Emberiza schoeniclus*		7																				7
Total	species	5	7	6	7	8	8	8	0	3	0	9	7	5	7	9	24	17	13	14	18	15	39
	individuals	17	42	30	82	139	113	2660	0	175	0	488	83	65	44	68	190	64	80	71	96	124	4631

Studia Universitatis "Vasile Goldiş", Seria Ştiinţele Vieţi9
Vol. 24, issue 1, 2014, pp. 157-168

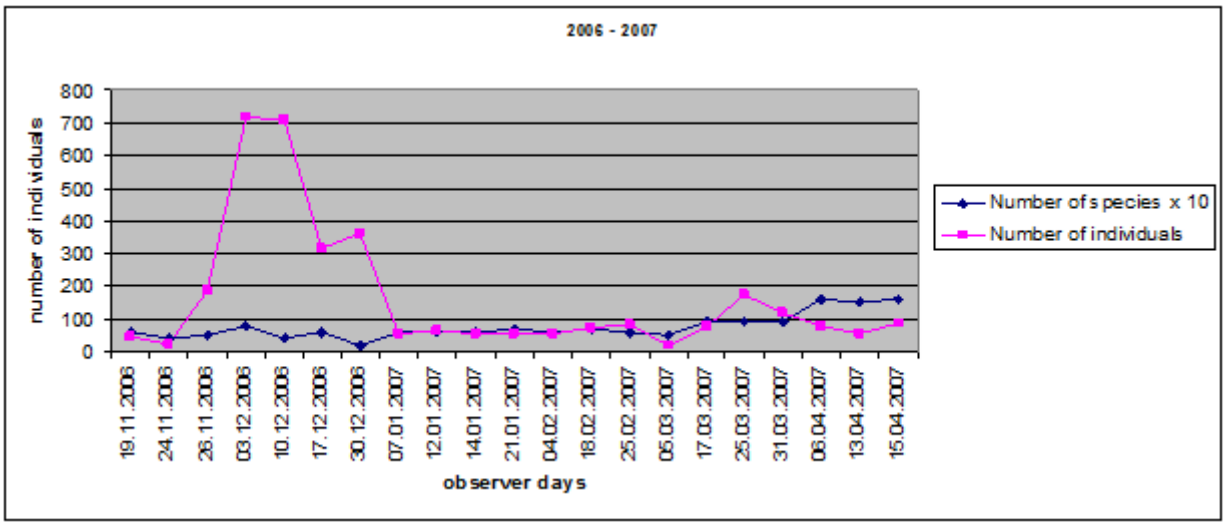

Fig. 4 Change in number of species and individuals found in the 2006-2007 season

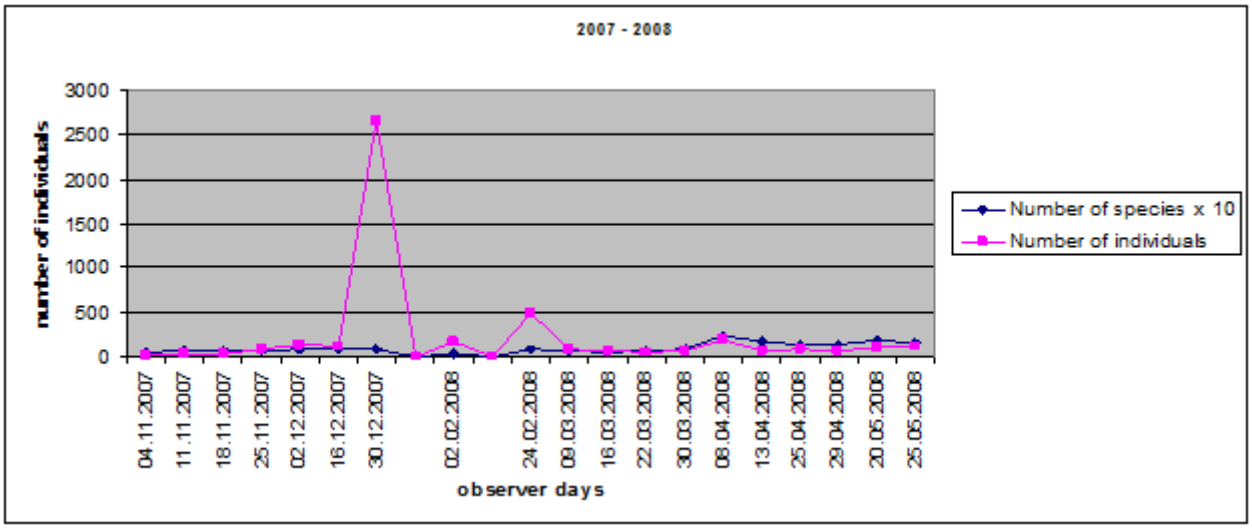

Fig 5. Change in number of species and individuals found in the 2007-2008 season

Table 5.

Status of species and individuals recorded in the 2008-2009 season.

Nr. crt.	Species	11.10.2008	19.10.2008	01.11.2008	08.11.2008	27.11.2008	01.12.2008	11.12.2008	14.12.2008	21.12.2008	11.01.2009i	Fr	08.02.2009	16.02.2009	22.02.2009i	08.03.2009	15.03.2009	22.03.2009	05.04.2009	15.04.2009	17.04.2009	25.04.2010	Total
1	*Gavia arctica*				4	2	3	3	4	4													20
2	*Tachybaptus ruficollis*	5	8	11	8	2	2	3	1	1									1				42
3	*Podiceps cristatus*	2	1	1	1			4	2	2			2				2	2	5	5	2	2	33
4	*Phalacrocorax carbo*			45		38	14	2	1							8	1		7				116
5	*Ardea alba*													1									1
6	*Ardea cinerea*					1	1		1					1		1	1						6
7	*Anser albifrons*																1200	1500					2700
8	*Anas penelope*															32	32						64
9	*Anas platyrhynchos*		6 0	60	60	800	800	4	5	22	900		40	90	45	300	100	40	22	12	12	12	3384
10	*Anas querquedula*																24	18	6	5			53
11	*Aythya fenina*																	6					6
12	*Mergus serrator*																		1				1
13	*Circus aeruginosus*								1				1	2			1	1	1		1		8
14	*Pandion haliaetus*																		1		1		2
15	*Rallus aquaticus*										1												1
16	*Gallinula chloropus*																		1	1	1		3
17	*Fulica atra*		6	20	28	14	8	60	60	60	7		2			12	12	22	18	11	10	6	356
18	*Charadrius dubius*																		2	2	3	2	9
19	*Vanellus vanellus*												1				800		1	1	3	1	807
20	*Tringa glareola*																			1	1		2
21	*Actitis hypoleucos*																		4	2	2	2	10
22	*Larus cacchinnans/ mich.*		1	1	1								5			4	4		2	2	1	2	23
23	*Larus canus*																	16	8				24
24	*Larus minutus*	1																					1
25	*Larus ridibundus*	3	6	12	2	3	3						2				60	60	60	9	7	2	229
26	*Sterna hirundo*																		4	3	4	4	15
27	*Chlidonias leucopterus*																			4			4
28	*Chlidonias niger*																				6		6
29	*Alcedo atthis*	4	4	7	7	4	4	2	2	2							1	2	9	5	5	5	63
30	*Remiz pendulinus*																		12	2	4	2	20
31	*Emberiza schoeniclus*		5		2																		7
Total	species	5	8	8	9	8	8	7	9	6	3	0	7	4	1	6	13	10	18	15	16	11	31
	individuals	15	91	157	113	864	835	78	77	91	908	0	53	94	45	357	2238	1667	165	65	63	40	8016

Studia Universitatis "Vasile Goldiş", Seria Ştiinţele Vieţii
Vol. 24, issue 1, 2014, pp. 157-168

Table 6.

Status of species and individuals recorded in the 2009-2010 season

Nr. crt.	Species	10.10.2009	18.10.2009	08.11.2009	15.11.2009	22.11.2009	29.11.2009	13.12.2009	28.12.2009	10.01.2010	22.01.2010	31.01.2010	03.02.2010	07.02.2010	28.02.2010	01.03.2010	28.03.2010	11.04.2010	18.04.2010	25.04.2010	**Total**
1	*Gavia arctica*	1		2	2	1	2	2	2	2	2										**16**
2	*Tachybaptus ruficollis*	2		8	10	6	5	5	2	2	2	1	2	2	2	2	2	2			**55**
3	*Podiceps cristatus*	2	3	4	2	2	2	4	1	1	1						2	2	5	8	**39**
4	*Phalacrocorax carbo*			3				7	8		2			5	17	12	4	7			**65**
5	*Ixobrychus minutus*																			1	**1**
6	*Ardea alba*			1													1				**2**
7	*Ardea cinerea*	1	2	2	1		1				1		1		1	1	8	3	1	2	**25**
8	*Ciconia ciconia*																1			2	**3**
9	*Anser albifrons*			22	11	14	9	5	9								350	40			**460**
10	*Anas penelope*																8	8			**16**
11	*Anas crecca*																50				**50**
12	*Anas platyrhynchos*	32	6 0	150	35	36	74	90	900	900	1000	1000	1100	1000	350	130	42	20	8	4	**6931**
13	*Anas querquedula*		7													5	32		8	2	**54**
14	*Aythya nyroca*																	2			**2**
15	*Bucephala clangula*														4						**4**
16	*Circus aeruginosus*														1	1	2	1	1	2	**8**
17	*Rallus aquaticus*												1								**1**
18	*Fulica atra*	4	4	20	30	65	69	75	72	80	80	80	80	80	50	50	35	28	4	3	**909**
19	*Himantopus himantopus*																2				**2**
20	*Charadrius dubius*																		4	2	**6**
21	*Vanellus vanellus*															1		18	2	1	**22**
22	*Tringa ochropus*	2															2	2			**6**
23	*Actitis hypoleucos*																1	4		1	**6**
24	*Larus cacchinnans/ mich.*	1								1					1	2	2	2			**9**
25	*Larus ridibundus*	6	24		3			1	2	1	1	2			4	6	60	42	12	12	**176**
26	*Sterna hirundo*																		2	2	**4**
27	*Alcedo atthis*	5	2	4	2	2	3	2	1	1	1	1					6	6	5	3	**44**
28	*Riparia riparia*																			2	**2**
29	*Locustella luscinoides*																		4		**4**
30	*Acrocephalus arundinaceus*																			3	**3**
31	*Acrocephalus scirpaceus*																			1	**1**
32	*Remiz pendulinus*	20	20	22	4			4									21	14	6		**111**
33	*Emberiza schoeniclus*						4														**4**
Total	species	11	8	11	10	7	9	10	9	8	9	5	5	4	9	10	19	17	13	17	**33**
	individuals	76	122	238	100	126	169	195	997	988	1090	1084	1184	1087	430	210	631	201	62	51	**9041**

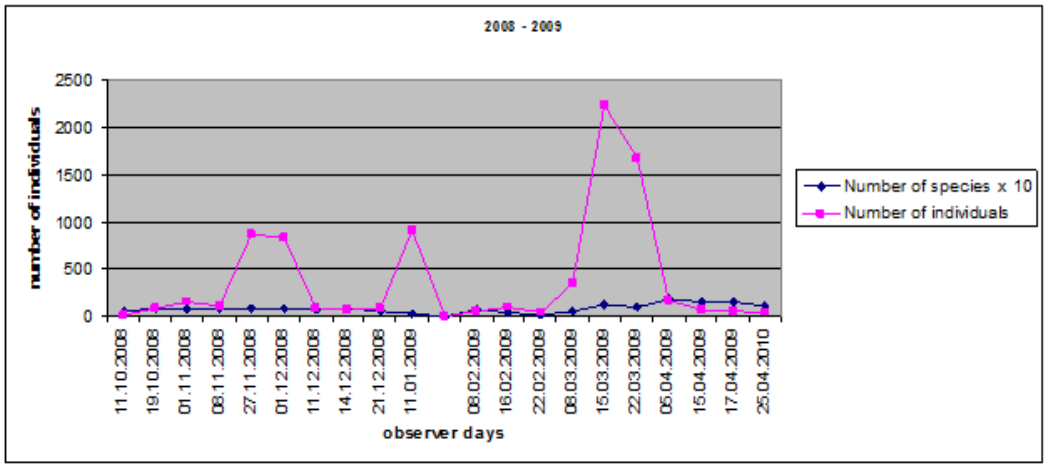

Fig 6. Change in number of species and individuals found in the 2008-2009 season

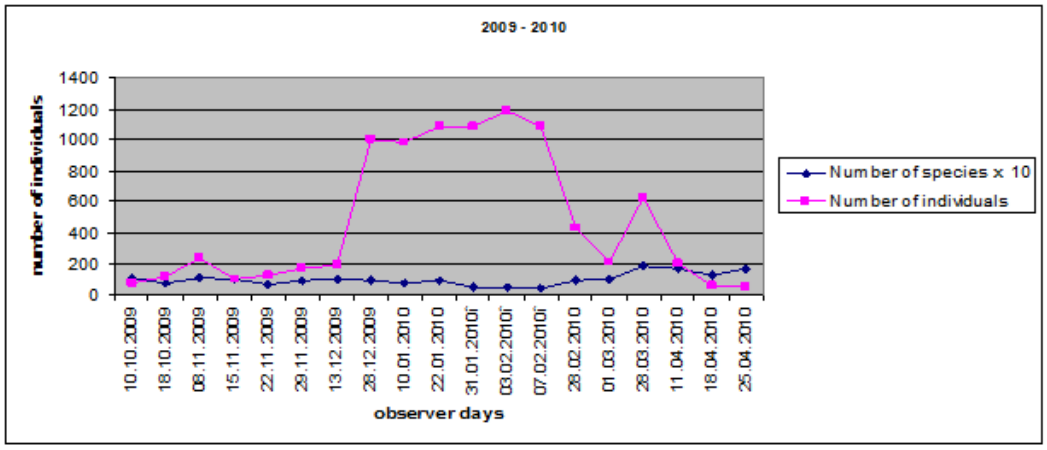

Fig 7. Change in number of species and individuals found in the 2009-2010 season

The analysis of the data included in tables and the related graphs shows that the number of the species and the total number of specimens is similar across seasons, although the trend differs somewhat from one category to another. Thus, in case of the number of recorded species, a relatively small number of them can be seen during the fall and winter, with a clear upward trend with the spring passage, when is recorded the highest number of species in each year, consisting of birds that are resting on the lake during migration, a situation illustrated in the contrastive chart in Fig.8.

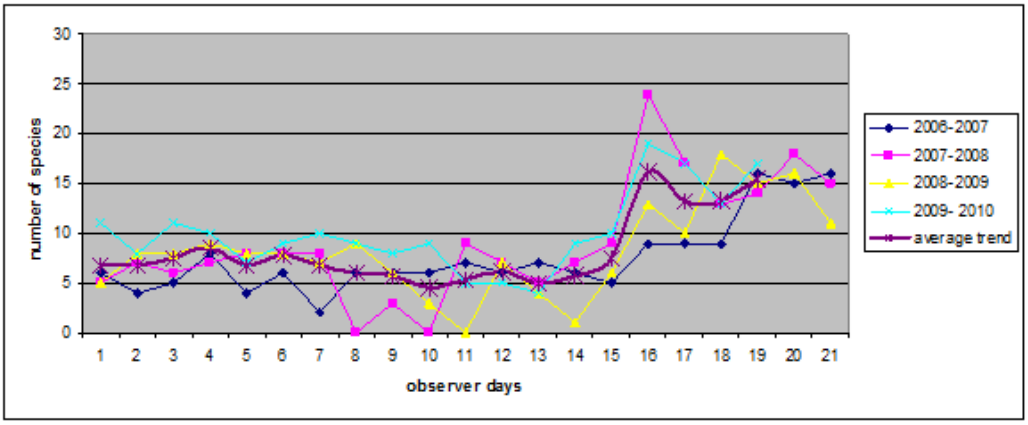

Fig 8. Change in total number of species recorded between 2006-2010.

Studia Universitatis "Vasile Goldiş", Seria Ştiinţele Vieţii
Vol. 24, issue 1, 2014, pp. 157-168

Regarding the number of individuals each year a surge of herds is seen, which coincides with the coldest periods of the year, when other waters of the area are frozen and a large number of water bird seek refuge on the lake. These agglomerations are formed almost exclusively from *Anas platyrhynchos* and *Fulica atra*, leaving the lake only when fully frozen. Diagram in Fig.9 illustrates the evolution of the comparative number of individuals in the study period.

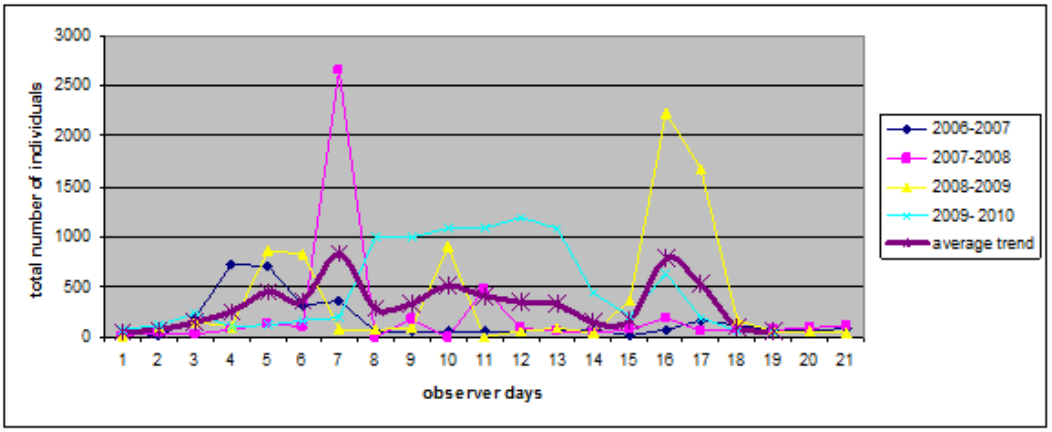

Fig 9. Change in total number of individuals recorded between 2006 - 2010.

Given the presence and evolution of the number of birds, the aquatic species visiting the Apa lake in winter can grouped into 4 categories.

1- birds that can be seen daily or almost daily, whether they are permanent for long periods or visit the lake very often: *Gavia arctica*, *Tachybaptus ruficollis*, *Podiceps cristatus*, *Anas platyrhynchos*, *Fulica atra*, *Larus ridibundus*, *Alcedo atthis*. Black-throated Diver (*Gavia arctica*) seems to be the most interesting of this category. The observations about this species fit into a pattern that is repeated each year with minor variations. (Fig.10)

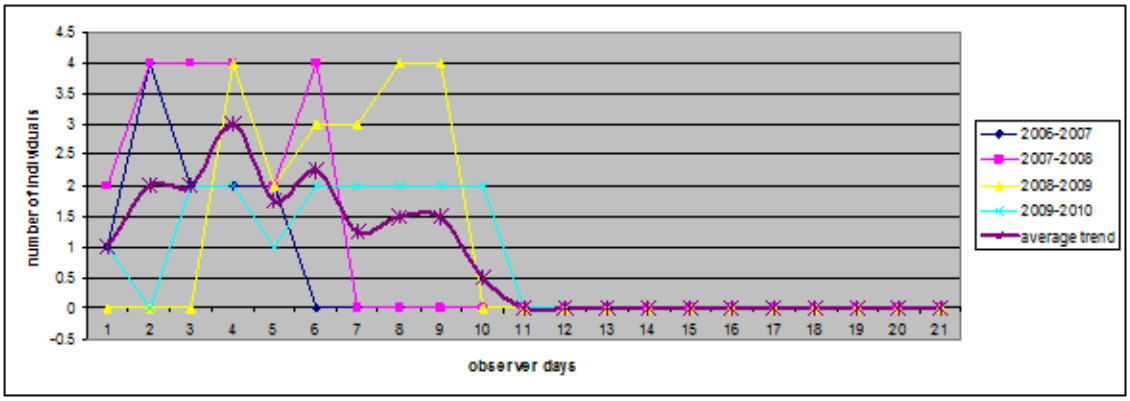

Fig 10. Change in number of Gavia arctica recorded between 2006 – 2010.

The first birds appear with sharp cooling weather in October-November and remain until about the time when the lake freezes, then they leave, and do not appear until the following autumn, even if the lake does not freeze completely. No specimen outside this pattern was observed during the studied period.

2- birds that occur at intervals more or less regular, sometimes in large numbers: *Phalacrocorax carbo*, *Anas querquedula*, *Vanellus vanellus*, *Anser albifrons*, *Circus aeruginosus*, *Larus cachinnans/ michahellis*, *Ardea cinerea*, *Remiz pendulinus*, *Emberiza schoeniclus*.

3- birds that appear occasionally, rarely, at distant irregular intervals of time. It is the largest category , most species observed on the lake belong to this category*: Podiceps grisegena*, *Podiceps nigricollis*, *Cygnus olor*, *Bucephala clangula*, *Aythya fuligula*, *Mergus serrator*, *Anas clypeata*, *Pandion haliaetus*, *Larus fuscus*, *Larus minutus*, *Chlidonias hybrida*, *Chlidonias leucopterus*, *Himantopus himantopus*,, etc The very rare and irregular appearance of these species makes it impossible to fit them into a pattern. However, as it can be seen, most such occurrences take place during the spring passage.

4- relatively common migratory bird species during summer, but absent in winter and therefore they appear with a few records*: Ixobrychus minutus*, *Riparia riparia*, *Acrocephalus arundinaceus*.

The influence of human activity on birds

Despite the size of the lake away from any other large expanses of ponds, lake Apa does not provide much better living conditions for waterfowl. The absence of these conditions is based both on the natural causes already mentioned above, and cases caused by permanent anthropogenic pressure exerted on the lake fauna (Ardelean et al,.2003). In addition to the residences built after 1990 and to the gradually unobtrusive banks, the human activities turn the lake throughout the warm season (from April-May to September-October, depending on the weather) into a huge resort for water sports of all kinds with high power motor boats, ski jets crossing the water, congestion at day time, noise and very loud music which pours from the speakers day and night, an environment unsuitable for most aquatic species. However there are some aquatic species which resist this treatment and nest on the lake, in relatively small number housed by the few clusters of existing reed along the banks (*Anas platyrhynchos, Fulica atra, Ixobrychus minutus, Gallinula chloropus, Alcedo atthis, Riparia riparia, Acrocephalus arundinaceus*).

Under these conditions the lake is accessible for birds with cooling time (from October until April-May), the inconvenience of human activities significantly decreases, being reduced to a few fishing boats present on the lake especially on weekends.

Other threats to the waterfowl here is poaching, hunting more or less legal, that is practiced in the area, even from inside the properties from the shore. Sport fishing, although to a lesser extent, also contributes to the discomfort of the birds by the boats present on the lake, or by the lost hooks and wires, life-threatening the birds. In the period 2006 - 2010, there were at least three cases of birds dying from these causes: 1 *Gavia arctica* shot from a car inside the pit, on 25.11.2007, one specimen of *Fulica atra*, smothered by a ball of plants and fishing wire, found on 29. 04. 04. 2008, and one from the same species, whose digestive system was blocked with the same material, that it had swallowed, on 11/01/2009.

Under these circumstances, given the importance that the lake has as a refuge and stopover for waterfowl, enforcing some minimum protective measures (prohibiting hunting around the lake, stopping poaching, educating the fishermen) would be welcome.

CONCLUSIONS

Despite the significant and almost permanent anthropogenic pressures, pit lake Apa is an important refuge for many water birds, which find shelter here during the winter season, as for long periods it is the only unfrozen water in the area and an occasional resting place for migratory species during the spring passage. In the period studied there were a total of 54 aquatic species that are host or visit the lake during the cold season, 6 out of these species were abundant or common, most, 46 species are only occasional visitors. Out of the observed species, 14 are strictly protected species. The largest number of birds are observed in the coldest periods of the year and most species during the spring passage. To protect the birds it would be necessary to establish minimum protective measures, especially in winter.

Fig 11. Mallards on the lake in winter.

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