WASTE WATER TREATMENT PLANTS'S PONDS FROM ORADEA – POTENTIAL SPA FOR NATURA 2000 NETWORK

Dorina RADOVEȚ[1], Zenaida LUNCAN[1] & Călin MOCAN[1]

[1]Environmental Protection Agency - Bihor County, 25A Decebal Bulevard, Oradea, Bihor, County Romania,
e-mail: apm@apmbh.ro, protectia_naturii@apmbh.ro

Abstract. Because of restriction of the humid zones in Europe and in our countries in the migration corridor, the conditions on the Waste Water Treatment Plants's ponds from Oradea had favourized the attraction of a bigger number of migratory birds, which they found in those lakes zone the food and nestle place. By Romanian Ornithological Society, was identified 132 beards species, from the total number of species 55 are in summer bread range, 11 are in winter range, 17 are page visitors, and 49 are sedentary species, 28 species from the total number are named on Directive on the Conservation of Wild Birds (79/409/EEC) list. This is the major reason for proposal the Waste Water Treatment Plants's ponds from Oradea as potential SPA for Natura 2000 Network.

The Oradea Purge Station make the object of an ISPA Project "Purge Rehabilitation Station and The Canalization System of Oradea City", with 2 years unrolling, from September 2005 – autumn 2007.

The retechnologisation purpose the introduction, beside the mechanical stage and biological stage, already existing of an finished stage of a biological purged water, which will diminuate visible the eutrophyzation degree of the waters and will favourize the reinstallation of vegetation and favourable condition for the mentioned beards.

Key words: *protected beards, waste water treatment plants's ponds, Natura 2000 Network*

INTRODUCTION

The city of Oradea is situated in the Northwestern part of Romania, close to the Hungarian border, in the contact zone of the Tisa river plain with the last outposts of the Apuseni Mountains and the Western limit of the Vad depression. The city territory is limited at Northwest by the town of Episcopia Bihorului which now will be included in Oradea own territory, to the North by the Paleu fields, to the East by the village of Oşorhei, to the South by the village of Sânmartin and to the Est by the village of Sântandrei and Borş.8

Residence of Bihor County, by geographical location can be named as "entrance gate" in Romania from the West sid. Oradea Municipality is the administrative, social, and cultural centre of the county and has a population of 206,614 inhabitants, which represents 34.4% of the entire county's population.2

Oradea Municipality is situated at 120-150m altitude with geographical coordination:

- Parallel 47°05'36'' – 47°01'45'' – North latitude;
- Meridian 21°53'18'' – 22°00'00'' – East longitude.

Oradea Municipality was mentioned in 1113 for the first time, in the documents of the time. Oradea, located on the Quik Criş Valley, at the connection point of the Oradea hills with the Western plains, is one of the most significant economic, social, and cultural centers in northwestern Romania.2

Oradea Municipality with 115.19 km^2 is one of the big cities from the west of country, with strong industry, is an important economical center, and a principal knot for national and international road traffic and railway.

Climate

The city of Oradea is exposed to open air circulation mainly Western and Southwestern which explains the temperate - moderated plain climate, even mild, specific to the area. This is clearly evident in the average yearly relatively high air temperature of 10,4°C. Also the average temperatures of July (21,0°C) and January (- 1,4°C) illustrate the same moderate character of the climate. The resultant yearly average thermal amplitude is 22,4°C, which is much less than in other plain regions of Romania in the South or East, were the Eastern European continental climate influence is left stronger. The coldest month of the year is January (-1,4°C) due to the entrance of cold polar or arctic air combined with the reduced cyclonic activity. Winters when cyclonic activity was intense over Europe have led to a very mild climate in Oradea. It was the case of 1984, when January average air temperature registered +6,1°C, being considered the warmest winter ever since temperature registration begun in Oradea.

Also especially cold winters were registered, like in 1964, when the average air temperature went down to -9,8°C as a result of polar and arctic air masses intrusion. In such synoptically conditions also the lowest absolute air temperatures were registered: - 29°C at the 24 January 1942, which is the lowest ever registered, - 25,3°C (1954) and -22,5°C (1987). Generally as an expression the above-mentioned influences Oradea winters are relatively short and not very old, the number of days with lower than zero temperatures being smaller than 26. 8

This is the explanation for *Cygnus olor olor* (swan) presence in Oradea on Quik Crişul in February 2005, which is a summer visitor, but because of warm climatically conditions stayed in winter (fig. 1).

Spring is early and relatively warm (10,6°C) due to the predominant Western air circulation and to the extension of the Azores anticyclone over the Southern part of the European continent.

On the other hand summers are moderate, average temperature for July is 21,0°C. The extent of the Azores anticyclone, which brings hot air also to Romania, makes hot and dry summers as in 1936, 1952, 1961 and 1992. The highest temperatures have been registered linked to such conditions: 39,5°C (1936 and 1943), 39,3°C (1952) and 39,0°C (1992). The coolest summer was in 1962 when the average air temperature for July was only 18,8°C. generally summers are very long in Oradea, which is also shown by the number of days with temperatures more than 25°C – 91 days, and tropical days are some 30 out of the above (more than 30°C).

The influence of oceanic air mass is left trough the precipitation amount and pattern. A relatively high average yearly quantity (585,5 mm) is left in Oradea comparatively with similar plain regions in the East or South of Romania, subject equally around the year. There is more in spring (32% of the average yearly quantity) which is important for the agriculture. The rainiest month are June (83,2 mm) and Mai (55,5 mm) and the driest March (29,7 mm) and January (35,6mm).one can easily distinguish a spring precipitation maximum (Mai - June) and a less accentuated fall maximum.

Linked to the air masses circulation, there were also rainy years in Oradea when the average yearly precipitations quantity was overrun (1940, 1941, 1944, 1974, 1978, 1980). One of the rainiest years was 1974, when the total quantity was 800,6 mm.

There were also dry years, when the precipitation quantity was only 2/3 of the yearly average registered in Oradea. Such were 1953 (417,9 mm), 1961 (430,4 mm), 1973 (448,2 mm) and 1983 (481,3 mm).

At the beginning of the summer and end of spring there are frequent torrential rains, short but rich in precipitation. But in reality the main characteristic of the precipitations regime in Oradea is the even distribution throughout the year, reflected also by the number of rainy days – 121.

As a result of the mild climate the main part of the precipitation falls as rain, the number of snow covers the ground only for 42 days a year, but not continuously. The first snows appear at the end of November and the last in the first of March.

The city geographical setting and the main baric centers development leads to a dominant Southern wind, especially in winter. Though oceanic influences are evident in Oradea, the Western wind has a reduced frequency, even if Western circulation is dominant in the high atmosphere. In summer, the air channeling through the Criş river valley to the plains makes the dominant wind direction to be Eastern. Wind speed is moderate, average value begin under 4 m/s and situation of calm are frequent especially in winter and fall. The above data are gathered from the meteorological station situated outside the city of Oradea on the second terrace of the Criş.8

The Quick Criş River (Crişul Repede)

The hydrographic network of Oradea is formed mainly by the Criş (in fact called Quick Criş for a delimitation from two other Criş rivers in the same region – White and Black Criş rivers; the region is also called "Criş County"). Other small creeks are flowing – some permanently like Pețea Creek, others seasonally like Wild Creek and Paris Creek.

The symbol river of the city – the Quick Criş – has its origin in the Huedin Depression but gets most of its main effluents from the Vlădeasa Mountains (Sebeş Drăgan and Iad Valley) so in Oradea the flow is 25,7 cm/s. the annual variations of the river flow is due to clime. So in the first months of the year the flow is high due to rains in January and especially February. Starting with March and Parallel with snow meltdown the Quick Criş flow is constantly increasing with a peak in April. As a result of spring rain the flow is still high in May and June, and in July it starts decreasing up to September, when the lowest flow value usually appears. Together with the autumn rains the flow starts to slowly grow in November and more evidently in December.

Out of the total flow of the Quick Criş, the highest proportion is in spring (May and June, 41%) and the smallest in fall (September and October, 11%), in the other seasons the values being similar (summer, 21% and winter 26,9%).

Compared with normal years when the yearly flow is close to the average yearly flow, there have been exceptional years. In the condition of heavy spring rains overlapped with massive snow meltdown in the mountains, largest flow values were registered in Oradea in 1932 (820 cm/s), 1980 (633 cm/s) and 1981 (616

cm/s). Lack of rain was also responsible for the lowest average yearly flow – 9,96 cm/s in 1961. In the same year in September and October the average flow was very low (1,50 cm/s) much lower than the average yearly flow for those months (11,0 cm/s). A similar situation was in 1990 when the average flow was below half of the average yearly value (10,7 cm/s). The highest monthly average flows are registered in April (43,3 cm/s) and in May (39,1 cm/s) because of spring rains and snow meltdown up in the mountains. By contrast the lowest average monthly flows happen in the rainless autumn months – September (11,8 cm/s) and October (11,6 cm/s). in direct link to the flow the total suspension transported by the Quick Criş varies, the yearly average is 8,40 kg/s. the same variation and influence is linked to the mineral content of the river water. It is greater in summer and autumn when the flow is smaller and lower in spring when the flow increases. Generally the Quick Criş is classified in the average mineralized water rivers range, with the hardness 6.

The water temperature reproduces with a slight attenuation the environment temperature tendencies. During March there is a visible increase in the river temperature – and maximal values are attained in July and August. The maximum water temperature in Oradea was registered at 9th of August 1961 (31,0°C). Water freezing appears in mid December and can last up to mid February, with a period between 30 and 70 days of ice. But the ice bridge is formed only in the beginning of January and lasts until the end of the same month. Compared with this general situation there are years in which the ice bridge does not appear at all as in cold years it is thick and lasts longer.8

Oradea Plains Ecosystem

The natural wild plain ecosystem of the Oradea plains have been submerged by the human habitat since immemorial times, as the area has historically been heavily populated. Agriculture has covered the available fields since the first millennia BC, the soil is rich and the vegetal layer relatively thick.

Typically, only along roads and railroads a thin stripe of wild vegetation can be met. The avifauna is using the fruit trees cultivated in gardens, being mainly common to this region of Europe.

The Criş River is regulated by an upstream dam, and along its course through Oradea and then further into Hungary it is regulated by artificial falls and corseted by man made longitudinal bank terraces and embankments.

The fauna is reduced to endemic birds, with a nice completion of African storks, which are very well integrated in the rural habitat.8

General Waste Water Treatment Plants's Description

Municipal spot dispose from a purge station of cities water from the Oradea localities: Sânmartin, Băile Felix, Băile 1 May, canny and of cellophane residual from the platform number of 30 industrial units.

The purge station it is placed on the straight coast Quik Crişul river, at South from road national E 60 and it is delimited from the SCCP farm, an evacuation canal CET 1, Quik Crişul and place of Chemical Artificial Factory.

History of this purge station it was realized query 1910-1914 being extended from - long years. Query 1965-1968 it was achieved the modernization of the station thru a mechanic-biologic line by putting on in function of first radial decanter with 45m diameter, with 2 mud fermentation system with 3000 m3 either, and the lake surface increasing at 50ha.

In 1974 it was put in function the biologic purge stair with active mud, the first aeration tank with a 4000 m^3 volume, with a second afferent decanter with 45m diameter. From 1974 the purge station was developed continuously, today occupying a 5 ha field surface for the drying layers of the mud and approximately 40 ha for the biologic purge lakes. The total volume of the aeration tanks has reached 36000 m^3, and the capacity of 8 fermentation system of the available mud it was 30000 m^3. The designed and hydraulic capacity of the purge Station is $Q_{zi\ max}$ = 2200 l/s and $Q_{orar\ max}$ = 2420 l/s $Q_{h\ max}$ = 4.000 l/s.

Once with the increase of the population number in 1970, from 138.000 people, in 1975 to 155.000 people, and actually is over 250.000 people, because of the accentuated industrialization, the required drink water, it has also increased the resulted residual water, which has conducted to a continuously development of the needful purge capacities.

Starting with the 1986 year the station had enter in an ample modernization process and bringing to 2200 l/s capacity, for preventing the ecological risks and for the producing of damages which may lead in the emissary pollution, the Quik Crişul river being a barrier river with quality parameters must be respected thru legislation in law. In this purpose were started a financed programs series by allocation from the state budget, locally and from other own sources of RA Water - Channel, programs which they reached over 9 millions US dollars value, also other financed international organism:

- The International Development Agency UIDA – with a program in 1.3 million US dollars;
- The European Community European thru ISPA program with approximately 23.96 million US dollars, 16 million representing unrefondible fond, 6 mil. Accorded credit by BERD and 1,8 mil. Contribution of Local Budget.

These programs have as main objective the Transfrontual Reducing of Pollution in tributary tank of the Danube. The program was developed in two components:

- The rehabilitation of de canalization system of Oradea City on 60 km lengthiness;
- The rehabilitation of the Purge Station of Oradea City.

In the actual mechanic stage it was bring to capacity. It was put in function the new pomp station of decanted water, reequipped, having 4.000 l/s capacity, by putting in function of this capacity, this assure resume of designed debit on biological stage.

The situation from the present

Purge Station at the actual hour, a field surface of approximately 65 ha, from that zone 20 ha was constructed with technologic objects, approximately 40 ha with biological purge lakes.

The used water from the downtown zones are canalized in 6 pomp stations, from is pumped in the gravitational collectors.

The used water from the downward zones of the city are 6 pump canalized stations, from where are pumped in the gravitational collectors. The station was connected to the two main collectors: oviform of 70/105 cm and bell form of 165/260 cm which collect the used manager and industrial water of Oradea city and neighbour communities. The rule of the station is to purge the used bio-mechanic water, and also to stabilize the resulted mud after the purge process.

Near the purge station exist a compensatory tank of the debit in the torrential rain periods, debits what come back in the main collector and they are assumed in the purge station. To compensate the absence of capacity, the preventing accidental pollutions, downstream de purge station exists biological lakes – approximately 50 ha, from the water exit into Quik Crişul river, in controlled mode and with the Medium Protection Agency and The Crisuri Rivers Direction approbation.

The Purge Station containing the following:

- The debit compensate tank – rule to uniform the debit variations and to take over supplementary debits in the case of abundant rainy periods or some stinginess of purge station.
- Mechanical stage – rule to purge the used water entered in the station.
- Biological stage – rule to purge the used water, including the aeration, decanting tanks, with active mud.
- Biological lakes – rule to purge the natural used water released in those after eschewing the mechanic and/or biological stages in the case of some supplementary debits or a miser in the Purge Station. The conditions on biological lakes 3, 4, 5 and 6, had befriended attracting of a bigger number of migratory and sedentary birds, whom find in these lakes the food and a place to nestle.

The natural biological purge it has placed in biological lakes, with a surface of approximately 57 ha and with a useful volume of 1 mil m^3. Bringing the water in lakes it is made thru admission floodgate of the lakes 3, 4, 6, and the evacuation of the water it is made in the evacuation vain of the 4 and 6 lake, the 5 and 6 lake communicating between them.

The 3 lake is functioning with a discontinuous alimentation, the rest being continuously feed. The lakes feeding it is made thru by-pass conduct of the purge station, in case of disabling and from the purge station of decanted water, in the case of some debits whom exceed 2.200 l/s of the biological stage capacity.1

RESULTS AND DISSCUSIONS

The Avifauna in Waste Water Treatment Plants's Ponds from Oradea

In Waste Water Treatment Plants's ponds from Oradea by Romanian Ornithological Society was identified 132 beards species.9 From the total number of species 55 are in summer bread range, 11 are in winter range, 17 are page visitors, and 49 are sedentary species (fig. 2). All species are mentioned in Law nr. 462/2001 lists as species which needs protection.7

From the total number of identified species:

11 species are winter range: *Anas penelope Penelope, Anas crecca crecca, Anas clypeata, Aythya fuligula fuligula, Aythya marila marila, Clangula hymalis, Bucephala clangula clangula, Mergus albellus albellus, Mergus merganser merganser, Larus canus canus*;

17 passage visitors: *Anser albifrons albifrons, Anas acuta acuta, Circus cyaneus cyaneus, Buteo rufinus rufinus, Pluvialis squatarola squatarola, Calidris minuta minuta, Calidris ferruginea ferruginea, Calidris alpine alpina, Philomachus pugnax pugnax, Gallinago gallinago, Limosa limosa limosa, Tringa erythropus erythropus, Tringa stagnatilis stagnatilis, Tringa nebularia nebularia, Tringa ochropus ochropus, Tringa glareola glareola, Phaloropus lobatus*.

41 sedentary species: *Phalacrocoras carbo sinensis, Anas platyrhynchos platyrhynchos, Aythya ferina ferina, Aythya nyroca nyroca, Buteo buteo buteo, Perdix perdix perdix, Phasianus colchicus colchicus, Porzana porzana porzana, Porzana parva parva, Larus ridibundus ridibundus, Larus argintatus cachinnans, Sterna hirundo, Chlidonias hybridus, Chlidonias Níger, Chlidonias leucopterus, Streptopelia decaocto decaocto, Athene noctua indígena, Asio otus otus, Alcedo atthis ispida, Upupa epops epops,*

Galerida cristata cristata, Alauda arvensis cantarella, Motacilla flava flava, Motacilla alba alba, Troglodytes troglodytes troglodytes, Erithacus rubecula rubecula, Saxicola torquata rubicolas, Turdus merula merula, Sylvia curruca curruca, Regulus regulus regulus,, Panurus biarmicus russicus, Parus caeruleus caeruleus, Parus major major, Remiz pendulinus pendulinus, Garrulus glandarius glandarius, Pica pica pica, Corvus monedula spermologus, Corvus frugilegus frugilegus, Corvus corone cornix, Corvus corax corax, Sturnus vulgaris vulgaris.

Anser albifrons albifrons, Anas acuta acuta are passage visitors traverse our country especially in autumn, but in warm winter are staying here.

Limosa limosa limosa, Tringa erythropus erythropus, Tringa stagnatilis stagnatilis are passage visitors, rarely stays in summer breading range.

55 summer breading range: *Podiceps ruficolis ruficolis, Podiceps cristatus cristatus, Podiceps griseigena griseigena, Podiceps nigricolis nigricolis, Botaurus stellaris stelaris, Ixobrychus minutus minutus, Nycticorax nycticorax nycticorax, Ardeola ralloides, Egretta garzetta garzetta, Egretta alba alba, Ardea cinerea cinerea, Ardea purpurea purpurea, Ciconia ciconia ciconia, Platalea leucorodia leucordia, Cygnus olor olor, Tadorna ferruginea ferruginea, Tadorna tadorna tadorna, Anas strepera strepera, Anas querquedula querquedula, Aythya ferina ferina, Circus aeruginosus aeruginosus, Circus pygargus pygargus, Falco tinnunculus tinnunculus, Falco subbuteo subbuteo, Falco cherrug cherrug, Rallus aquaticus aquaticus, Gallinula chloropus chloropus, Fulica atra atra, Himantopus himantopus himantopus, Recurvirostra avosetta avosetta, Charadrius dubius curonicus, Vanellus vanellus vanellus, Numenius arquata arquata, Tringa tetanus tetanus, Tringa hypoleucos hypoleucos, Larus minutus, Gelochelidon nilotica nilotica, Cuculus canorus canorus, Apus apus, Riparia riparia riparia, Hirundo rustica rustica, Delichon urbica urbica, Anthus campestris campestris, Luscinia megarhynchos megarhynchos, Phoenicurus ochruros gibraltariensis, Oenanthe oenanthe, Locustella luscinioides luscinioides, Acrocephalus shoenobaenus, AcrocephalusPalustris, Acrocephalus scirpaceus, Acrocephalus arundinaceus arundinaceus, Sylvia communis communis, Sylvia atricapilla atricapilla, Phylloscopus collybita collybita, Lanius collurio collurio.*

From the summer breading range species because of the warm winters stays here: *Botaurus stellaris stelaris, Rallus aquaticus aquaticus, Cygnus olor olor, Aythya ferina ferina* sau devin parțial păsări de pasaj *Pandion haliaetus haliaetus*

A special case is *Anas strepera strepera,* which can be in summer bread range, passage visitor or can stay all the year in our county. The summer bread range and passage visitor population spend the winter in Asia and India.5

From the total number of species 10 of them are named in the Red List: Nycticorax nycticorax nycticorax, Ardeola ralloides, Egretta garzetta garzetta, Egretta alba alba, Ardea purpurea purpurea, Circus pygargus pygargus, Buteo rufinus rufinus, Himantopus himantopus himantopus, Recurvirostra avosetta avosetta, Upupa epops epops.

Starting with 2005 the Natura 2000 network will be implemented in Romania until the adhesion term. The Natura 2000 network is A Major Pillar of Biodiversity Action in Europe - A COMBINATION OF SPECIES AND OF HABITATS PROTECTION the EU wide ecological network of protected areas established under 1992 Habitats Directive" comprised of:

- Special Areas of Conservation under Habitats Directive
  - *for c. 200 habitat types*
  - *for c. 700 species of plants and animals*
- Special Protection Areas under Birds Directive
  - *for 181 vulnerable bird species*
  - *for migratory bird species*

The implementation steps are:

- Transposition in national legislation
- Inventory of species and habitats
- Site identification and delimitation
- Site designation
- Administration
- Conservation
- Public Awareness
- Funding

From the total of species the most of them are included in the lists of Directive On The Conservation Of Wild Birds (79/409/EEC) and Habitats Directive (92/43/EEC).

The Birds Directive relates to the conservation of all species of naturally occurring birds in the wild state in the European territory of the Member States to which the Treaty applies. It covers the protection, management and control of these species and lays down rules for their exploitation. The species mentioned in

Annex I shall be the subject of special conservation measures concerning their habitat in order to ensure their survival and reproduction in their area of distribution.

In this connection, account shall be taken of:

(a) species in danger of extinction;

(b) species vulnerable to specific changes in their habitat;

(c) species considered rare because of small populations or restricted local distribution;

(d) other species requiring particular attention for reasons of the specific nature of their habitat.

Trends and variations in population levels shall be taken into account as a background for evaluations.4

Habitats Directive (92/43/EEC) is for the conservation of natural habitats and of wild fauna and flora. A coherent European ecological network of special areas of conservation shall be set up under the title Natura 2000. This network, composed of sites hosting the natural habitat types listed in Annex I and habitats of the species listed in Annex II, shall enable the natural habitat types and the species' habitats concerned to be maintained or, where appropriate, restored at a favorable conservation status in their natural range.6

From the Standard Data Form for Waste Water Treatment Plants's ponds from Oradea - potential SPA for Natura 2000 Network it can be observed the high number of beards which are need protection in this location (table 1 and 2)

Because of restriction of the humid zones in Europe and in our countries in the migration corridor, the conditions on the Waste Water Treatment Plants's lakes had favourized the attraction of a bigger number of migratory birds, which they found in those lakes zone the food and nestle place.

The Oradea Purge Station make the object of an ISPA Project "Purge Rehabilitation Station and The Canalization System of Oradea City", with 2 years unrolling, from September 2005 – autumn 2007.

Pursuant to this project, the biological lakes 3, 4, 5 and 6 it will be decolmatated, and the thatch remain those perimeter in 50 m width. It would be disturbed the birds nestle – sedentary birds species. The birds will can find hideaway in the place of Quik Crişul river.

The retechnologisation purpose the introduction, beside the mechanical stage and biological stage, already existing of an finished stage of a biological purged water, which will diminuate visible the eutrophyzation degree of the waters and will favourize the reinstallation of vegetation.

CONCLUSIONS

On Waste Water Treatment Plants's ponds from Oradea exists a real trejor from avifaunistical point of view, pentru a limita factorii care exercită o anumita presiune asupra păsărilor, este necesar sa se instituie Oradea un regim de protecție – desemnarea ca potențial SPA, chiar dacă este vorba de un biotop cu intervenție antropică, scopul fiind salvarea avifaunei acvatice, periclitată în totalitatea ei pe mari întinderi ale continentului european.

BIBLIOGRAPHY

Georgescu M., Georgescu G.C., (1996), *Enciclopedie Zoocinegetică*, Ed. Albatros, Bucereşti, pp. 469.

***** Apaterm Autonomous Regia of Oradea (2002), presentation of Waste Water Treatment Plants from Oradea in the Authorization file.

***** Bihor Councty Council (2004), *Bihor County Steps toward Europe*, pp.85.

***** Direcția Apa-Canal Oradea (2005) Raportul anual privind starea mediului – 2005.

***** Directive On The Conservation Of Wild Birds (79/409/EEC) adopted at 2 April 1979.

***** Habitats Directive (92/43/EEC) for the conservation of natural habitats and of wild fauna and flora.

***** Mmga (2001), Legea nr. 462 din 18 iulie 2001 pentru aprobarea Ordonanței de Urgență a Guvernului nr. 236/2000 privind regimul ariilor naturale protejate, conservarea habitatelor naturale, a florei şi faunei sălbatice.

***** Proiectant S.C. Edilcons S.R.L.Oradea (2002), Studiul de impact pentru investiția „Reabilitarea rețelei de canalizare şi a stației de epurare a apelor uzate a Municipiului Oradea", pp.62.

***** S.O.R., Milvus Grup, (2002) Lista avifaunistică "Apaterm"/2002.

Fig. 1 *Cygnus olor olor* (swan) in Oradea on Crişul Repede february 2005 -
- summer visitor which because of warm climatically conditions stayed in winter (foto APM Bihor).

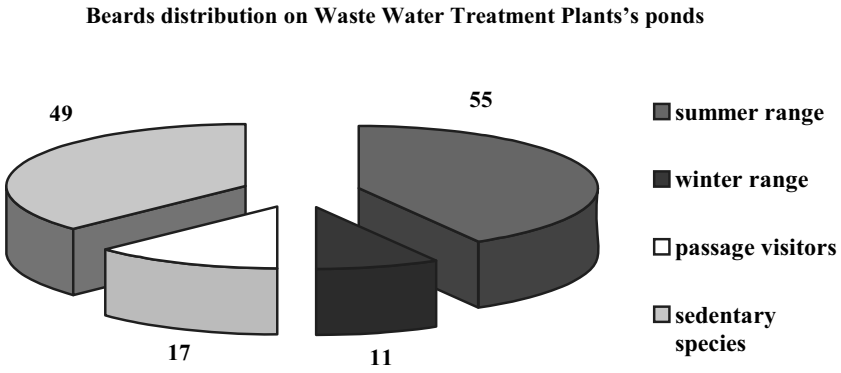

Fig. 2 The avifauna in Waste Water Treatment Plants's ponds from Oradea.

Table 1. Standard Data Form for Waste Water Treatment Plants's ponds from Oradea - potential SPA for Natura 2000 Network: 3.2.a. BIRDS listed on Annex I of Council directive 79/409/EEC.

Cod				Name		Population			
						Resident	Migratory		
							Bread	Winter	Stage
A	0	2	1	*Botaurus stellaris stelaris*			X		
A	0	2	2	*Ixobrychus minutus minutus*			X		
A	0	2	3	*Nycticorax nycticorax nycticorax*			X		
A	0	2	4	*Ardeola ralloides*			X		
A	0	2	6	*Egretta garzetta garzetta*			X		
A	0	2	7	*Egretta alba alba*			X		
A	0	2	9	*Ardea purpurea purpurea*			X		
A	0	3	1	*Ciconia ciconia ciconia*			X		
A	0	3	4	*Platalea leucorodia leucordia*			X		
A	3	9	7	*Tadorna ferruginea ferruginea*			X		
A	0	6	0	*Aythya nyroca nyroca*		X			
A	0	6	1	*Aythya fuligula fuligula*			X	X	
A	0	8	1	*Circus aeruginosus aeruginosus*			X		
A	0	8	4	*Circus pygargus pygargus*			X		
A	4	0	3	*Buteo rufinus rufinus*					X
A	1	1	9	*Porzana porzana porzana*		X			
A	1	2	0	*Porzana parva parva*		X	X		
A	1	3	1	*Himantopus himantopus himantopus*			X		
A	1	3	2	*Recurvirostra avosetta avosetta*			X		
A	1	6	6	*Tringa glareola glareola*					X
A	1	8	9	*Gelochelidon nilotica nilotica*			X		
A	1	9	3	*Sterna hirundo*		X			
A	1	9	6	*Chlidonias hybridus*		X			
A	1	9	7	*Chlidonias niger*		X			
A	2	2	9	*Alcedo atthis ispida*		X			
A	2	5	5	*Anthus campestris campestris*			X		
A	3	3	8	*Lanius collurio collurio*			X		
A	3	4	2	*Garrulus glandarius glandarius*		X			

Table 2. Standard Data Form for Waste Water Treatment Plants's ponds from Oradea - potential SPA for Natura 2000 Network: 3.2.b. Regularly occurring Migratory Birds not listed on Annex I of Council directive 79/409/EEC

Cod				Name		Population			
						Resident	Migratory		
							Bread	Winter	Stage
				Podiceps ruficolis			X		
A	0	0	5	*Podiceps cristatus*			X		
A	0	0	6	*Podiceps griseigena*			X		
A	0	0	8	*Podiceps nigricolis*			X		
A	0	2	8	*Ardea cinerea*			X		
A	0	3	6	*Cygnus olor*			X	X	
A	0	4	1	*Anser albifrons*					X
A	0	4	8	*Tadorna tadorna*			X		
A	0	5	0	*Anas penelope*				X	
A	0	5	1	*Anas strepera*		X	X		X
A	0	5	2	*Anas crecca*				X	
A	0	5	4	*Anas acuta*					X
A	0	5	5	*Anas querquedula*			X		
A	0	5	6	*Anas clypeata*				X	
A	0	5	9	*Aythya ferina*		X	X		
A	0	6	2	*Aythya marila*				X	
A	0	6	4	*Clangula hyemalis*				X	
A	0	6	7	*Bucephala clangula*				X	
A	0	6	8	*Mergus albellus*				X	
A	0	7	0	*Mergus merganser*				X	
A	0	8	2	*Circus cyaneus*					X
A	0	8	6	*Accipiter nisus*				X	
A	0	9	4	*Pandion haliaetus*			X		X
A	0	9	6	*Falco tinnunculus*			X		
A	0	9	9	*Falco subbuteo*			X		
				Falco cherrug			X		
A	1	1	8	*Rallus aquaticus*		X	X		
A	1	2	3	*Gallinula chloropus*			X		
A	1	2	5	*Fulica atra*			X		
A	1	3	6	*Charadrius dubius*			X		
A	1	4	1	*Pluvialis squatarola*					X
A	1	4	2	*Vanellus vanellus*			X		
A	1	4	5	*Calidris minuta*					X
A	1	4	7	*Calidris ferruginea*					X
A	1	4	9	*Calidris alpina*					X
A	1	5	1	*Philomachus pugnax*					X
A	1	5	3	*Gallinago gallinago*					X
A	1	5	6	*Limosa limosa*			X		X
A	1	6	0	*Numenius arquata*			X		
A	1	6	1	*Tringa erythropus*			X		X
A	1	6	2	*Tringa totanus*			X		

Table 2 (continued)

Cod				Name		Population			
						Resident	Migratory		
							Bread	Winter	Stage
A	1	6	3	*Tringa stagnatilis*			X		X
A	1	6	4	*Tringa nebularia*					X
A	1	6	5	*Tringa ochropus*					X
				Tringa hypoleucos			X		
				Phaloropus lobatus					X
A	1	7	7	*Larus minutus*			X		
A	1	8	2	*Larus canus*				X	
A	2	1	2	*Cuculus canorus*			X		
A	2	2	6	*Apus apus*			X		
A	2	3	2	*Upupa epops*			X		
A	2	4	9	*Riparia riparia*			X		
A	2	5	1	*Hirundo rustica*			X		
A	2	5	3	*Delichon urbica*			X		
A	2	7	8	*Oenanthe oenanthe*			X		
A	2	9	2	*Locustella luscinioides*			X		
A	2	9	5	*Acrocephalus schoenobaenus*			X		
A	2	9	6	*Acrocephalus palustris*			X		
A	2	9	7	*Acrocephalus scirpaceus*			X		
A	2	9	8	*Acrocephalus arundinaceus*			X		
A	3	0	9	*Sylvia communis*			X		
A	3	1	1	*Sylvia atricapilla*			X		
A	3	1	5	*Phylloscopus collybita*			X		