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TULCEA

Monitoring services and distribution of the European mink, elaboration and publishing of the European mink Handbook

Danubeparks Programme

Contract of services no. 2494 of 05.02.2010 (DDNI: 412/2010)
Financier: Danube Delta Biosphere Reserve Authority

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The name of the phase I: The monitoring of European mink (*Mustela lutreola*) distribution within the Danube Delta Biosphere Reserve

The objectives of the phase I:

1. Realization of the map of recent and present distribution of the European mink in DDBR;

2. European mink present status cognition in the DDBR and assessment of the present natural and anthropic limitative factors;

3. Achievement of a set of recommendations on short and long term for the European mink conservation in the DDBR.

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SUMMARY

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The activities of the Contract of services no. 2494 of 05.02.2010 (412 of 2010) entitled "**Monitoring services and distribution of the European mink, elaboration and publishing of the European mink Handbook**" financed by: **Danube Delta Biosphere Reserve Authority**, are carried on under the auspices of the **SEE Programme 2007-2013 Danube River Network of Protected Areas – Development and Implementation of Transnational Strategies for the Conservation of the Natural Heritage at the Danube River.**

Phase I: The monitoring of European mink (*Mustela lutreola*) distribution within the Danube Delta Biosphere Reserve

The objectives of the phase I, which carrys on between 05.02.2010–05.10.2010, are as follows:
1. Realization of the map of recent and present distribution of the European mink in DDBR;

2. European mink present status cognition in the DDBR and assessment of the present natural and anthropic limitative factors;

3. Achievement of a set of recommendations on short and long term for the European mink conservation in the DDBR.

The expected results of the phase I are as follows:
- Achievement of a coherent Monitoring Plan applicable on the DDBR conditions;
- The European mink occurrence identification in as many ecological periods, in an enough number that allowing the assessment of population size;
- European mink capturing (the capturing depending by a set of meteorological, hydrological and tropho-biological factors, etc. and the number of captured individuals was over 20 exemplary in some winters, but later, in spite of a sustained effort was caught none mink for a period of 2 winters);

1. Introduction

The European mink is one of the most rare and endangered mammals existing on our continent. Until recently, this was not acknowledged on EU level, but since 2002, it is listed as a strictly protected species with priority within the Annexes II of Habitat Directive.
Excessive hunting and the destruction of the species' habitats in previous years have generated the collapse of species' effectives almost everywhere in Europe. Currently the species remains only in few fragmented populations in Belarus (two micro populations), France and Spain (a border population continues), three small populations in Russia (one in contact with the Belarusian) and in Danube Delta (Brink 1972, Davidson *et al.* 2000 Gotea and Kranz, 2000, Krantz *et al.*, 2002 after Sidorovich1997, Stubbe 1993, Youngman 1982). Thus, it appears that there are enclaves of European mink micro populations within the area of compact spreading of the American shape (Fig. 1.).

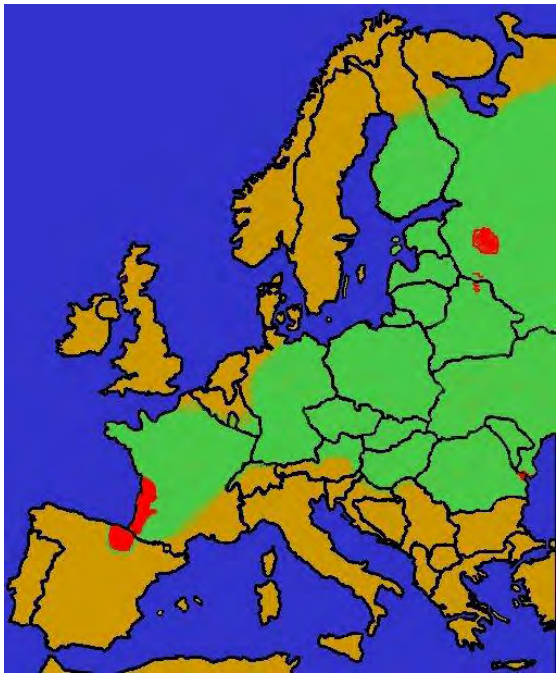


Fig. 1. The European mink's historical (with green) and recent (with red) spreading area on continent (after Kranz *et al*. 2001).

Due to the low number of the remained effectives and the habitats destruction, but not at least due to it entry into the biotopes of the American mink, it saving in these countries (except Romania) presents particular difficulties. As can be seen, in Romania, respectively on DDBR's territory is one of the last refuges of the populations of this species.
To increase chances of preventing species extinction, an essential condition is the knowledge of the distribution, the status (population trends, density etc.) and the current limit factors. Intensive researches of situation of the European mink within DDBR were initiated in 2000. The first captures took place in 2003. Except the year 2009, catching expeditions took place each year, usually in March.
With substantial financial support of this project, besides catching expeditions were, also, launched permanent monitoring activities of the minks and the results were not late to appear: an impressive number of observations achieved mainly by the staff of the Danube Delta National Institute for Research and Development- Tulcea.

2. Material and methods

2.1. Study area: Danube Delta Biosphere Reserve. Covered areas: Fig.2.

Legend at page no. 6

Fig. 2. The areas where investigations took place regarding the presence of the European mink in 2009 (marked in red) and 2010 (marked and shaded with green in riverine-marine delta and in black in the rest part of the DDBR's territory). Those with oblique lines of shading were investigated between June and August current year, those with vertical lines of shading during January to May this year.

Map's legend for fig. 2:

Marked in red, the areas investigated in 2009

1. Sulina branch's sailing line and adjacent terrestrial and water fringe habitats between M. 26-28.
2. Old Danube's sailing line and adjacent terrestrial and water fringe habitats.
3. Caraorman channel's sailing line- Crisan and adjacent terrestrial and water fringe habitats.
4. Caraorman Forest.
5. Sulina branch's sailing line and adjacent terrestrial and water fringe habitats downstream Gorgova.
6. St. George's sailing line between Nufaru and the St. George Ceatal.
7. The Danube's sailing line, upstream and downstream Mila 36 Channel.
8. Somova - Parcheş Complex (lakes and channels) - the Danube's sailing line.
9. Chilia Branch, the Danube's sailing line - Channel M 36.
10. Musura shallow water – Sulina basin.
11. Sacalin shallow water.

Marked in green, the areas investigated in riverine-marine delta in 2010

K. Ceamurlia - D.Veche - Magearu – Musura.
U. Iacub Lake and partial the Crişan-Caraorman Channel.
X. Letea Forest
Y. Offshore bar between Sulina and St. George.

Marked in black, the investigations within the riverine and lagoon delta in 2010

A. M36 Channel- Trofilca (channels M36, Trofilca, Sireasa and other secondary ones, Cotețe, Purcelu and Carasu lakes).
B. Draghilia – Sontea – Nebunu - Păpădia (channels Sontea, Draghilia, Păpădia Veche and Nouă, Arhipenco etc, Meşteru, Lung, Tătaru, Nebunu, Martinca, Rădăcinos, Alb lakes, etc, different backwaters, a part of Sulina Branch, Rusca partially).
C. Candura (Candura – Şontea Nouă -, Stipoc channels, Pantelei, Huncea lakes and other areas).
D. Băclăneşti – Fortuna – Ligheanca (Şontea, Războiniţa, Olguţa, Văcaru channels and other secondary ones, Băclăneşti, Fortuna, Ligheanca, Văcaru, Văcărel lakes, different backwaters).
E. Maliuc (Maliuc fishpond, Fortuna reconstructed polder, partial Păpădia polder, Crânjală and Ciobănica Channels, Sulina Branch partially etc.).
F. Gorgova - Litcov (Litcov, Babinţii Mari, Malafeica, Ceamurlia channels, partial Crişan Channel, Perivolovca Channel, Rotund, Gorgova, Gorgovăţ, Potcoava, Obretinciuc, Obretinul Mic lakes and many backwaters).
G. Dunărea Veche -Dovnica – 3 Iezere (Ceamurlia fishpond, Dovnica, Bogdaproste channels etc., Dunărea Veche, 3 Iezere, Amiază, Bogdaproste lakes, Ulasova lake partially etc.).
H. Matiţa – Merhei (Dovnica, Miazăzi channels and other secondary ones, Miazăzi, Matiţa, Merheiul Mare, Merheiul Mic, Hrecisca lakes şi and many backwaters).
I. Murighiol – Uzlina – Perivolovca (partially Sf. Gheorghe Branch, Uzlina, Perivolovca, Taranova channels, Uzlina, Taranova, Isac, Isăcel, Chiril, Murighiol, Sărături Murighiol lakes, different backwaters).
J. Dunavăţ – Mustaca – Dranov – Crasnicol.
L. Razim – Enisala
M. Popina Island
N. Fundea Bay
O. Sălcioara / includes Razim lakeside from Enisala to Doloşman.
P. and S. Holbina Bay - Periteaşca - Coşnei.
Q. Jurilovca - Goloviţa – Leahova – littoral/includes lagoons' sides from Doloşman to Lunca and partially Grindul Lupilor**.**
R. Zmeica Lake
T. Stipoc-Războiniţa.
V. Babina Islet.

2.2. Study period: according to the project's demands, the study period is between February 5 and November 5 this year. Because we possess valuable data from last year we decided to use them in this project, too. We also want to extend the monitoring to the end of the project (March 5, 2011).

2.3. Used vehicles: ships Antipa, Merişor and Vişţea, as well as 6 motor boats (6-15 HP). Also, for the terrestrial routes the DDNI's cars were used.

2.4. Monitoring methods.

2.4.1. Capturing. The traps used to capture are selective, according to Berne Convention's demands(*** 1993), manufacturing in Austria. Their dimension is 50 x 16 x 16 cm and are single entry cage traps (Fig. 3), baited with sardines in vegetable oil (from tins of Moroccan origin). This kind of bait was successfully

used previously in Danube Delta, also in France and Spain. Traps were installed in places where based on my experience I considered that the minks are present. Because the water level was very high in March, also the temperatures were much lower as in the previous years, the state of the captured animals was pretty poor. Thus, in the second expedition from March were done two checks, one of them in the evening and the other in the morning. The captured animals weren't anesthetized, but were placed in cotton bags, where were weighed, photographed and sexed. Further hair was cut from tail's tip for the recapturing. All operations lasted between 4-5 minutes, the minks were released at the capture place. Trapping was carried out only in March, with a batch of 41 traps, in 5 zones within Danube Delta Biosphere Reserve (Annex 1).

Fig. 3. Selective traps used to capture European minks during 2003 - 2010 in the Danube Delta Biosphere Reserve

2.4.2. Observation. Minks' monitoring by direct or indirect observation (tracks and faeces) was made by 6 laboratory assistants stationed in DDBR (Partizani, Vulturu, Maliuc, Murighiol, Sălcioara and Jurilovca) as well as by DDNI's researchers on the occasion of the works field within the project, but also within other projects. Interview method was used at the locals, then by checking the information.

3. Results

Activity 1. The monitoring of European mink distribution within the Danube Delta Biosphere Reserve

3.1. Achievement of a coherent Monitoring Plan applicable on the DDBR conditions

If the achievement of a monitoring plan is drafted (based on experience) in a relatively short time, the implementation of this plan involves human and financial resources for a long period of time. During the project's development, were available both types of resources, but with the end of the project, the only way to continue the Monitoring Plan is to introduce itself in the recurrent tasks of the field staff from DDBRA and from the Environment Guard. Depending on financial possibilities, the field staff from DDNI will continue the monitoring of the minks on an extended area, also after the project will be finished.

As we mentioned in the chapter *Material and methods*, minks' monitoring was done by direct or indirect observation (tracks and faeces). The monitoring was performed during the working hours, from Monday to Friday, by 6 laboratory assistants from the department of Ornithology - Hunting, stationed in DDBR (Partizani, Vulturu, Maliuc, Murighiol, Sălcioara and Jurilovca) as well as the researchers from DDNI on the occasion of the works field within the project, but also within other projects. Interview method was used at the locals, then by checking the information. Also, the staff of the other DDNI's departments was asked, again later the information were verified.

Both researchers and laboratory assistants have noted the exact location of the mink's observation (including live GPS point, or then using *Google Earth*), the date and the time of observation, the observation type (direct or indirect). There were also noted the type of the activity (ex. feeding, travel, rest, etc.), the observation's environment (ex. swimming in the channel, lake, stationary or dynamic on dam, canal bank, reed islet, tree etc.). They noted details regarding the type of vegetation from the observation place, possible nearby disturbing factors. Linking with hydrological and meteorological conditions is done later.

We suggest to the acquirer (DDBRA), on this way to initiate the Monitoring Plan and the charging of the ecologist agents to monitor the European mink within DDBR. Data obtained by the ecologist agents can be processed by DDNI or by DDBRA.

3.2. The monitoring of the European mink distribution by capturing. In the present material, we are treating both the situation of the captures from this year and those from 2003-2008.

In March 2010 two expeditions were made. In the first expedition were set traps in the areas of Crasnicol Channel, Litcov Channel - Gorgova Lake and Mila 36 Channel - Tulcea Branch (Annex 1.1.1.-1.1.3). In the second expedition were investigated the Dovnica Channel, Bogdaproste, Ceamurlia channel belt, Ghermandi Channel, Sulina Branch Mila 8.5 - 10 and the area of Gârla Vătafu (Annex 1.1.3.-1.1.5.). Overall, in March 2010 were captured 25 European minks (Table 1), with an effort to catch much lower compared with previous years (approximately 41 traps / day). There were captured 16 males and 9 females.

As we mentioned in the previous chapter, the animals were captured (Fig. 4), then were placed in cotton bags (Fig. 5), where were weighed (Fig. 6), photographed (Fig. 7) and were sexed (Fig. 8). Further, hair was cut from the tail's tip (Fig. 9) for the recapturing and immediately after these, the minks were released at the capture place (Fig. 10).

For the first time in DDBR, we have two recaptures of European mink, one with a displacement of about 1 km – beginning of Dovnica Channel, respectively Ceamurlia enclosure - and the other in the same place, Ghermandi Channel (shaded rows of Tab.1).

During 2003 - 2008 were captured other 45 European minks (Tab. 2) as follows: 2003-28 minks; 2004-7 minks; 2005- none; 2006 - two minks; 2007-6 minks; 2008 - two minks. In 2009 capturing activities weren't made.

It follows a number of 70 minks that were captured during 2003-2010 (Tab.1 and 2).

Tab.1. European minks that were captured within DDBR in March 2010 (* and **, captured and recaptured individuals)

Crt. no.	Zone	Sex	Weight (g)	Date	Geographical coordinates	Observations
1	Channel belt-Crasnicol	M	530	03.03	N 44° 57' 39.1" E 029° 19' 54.9	Middle age willow forest, rich in vegetation
2	Channel belt -Crasnicol	M	980	04.03.	N 44° 57' 29.5" E 029° 20' 25.5"	Middle age willow forest, rich in vegetation
3	Crasnicol Channel	M	740	04.03.	N 44° 57' 03.6" E 029° 19' 34.2"	Old willow forest
4	Litcov Channel	M	940	06.03.	N 45° 08' 18.5" E 029° 15' 33.7"	Young willow forest
5	Litcov Channel	F	440	06.03.	N 45° 08' 22.9" E 029° 15' 35.4"	Old willow forest
6	Litcov Channel	F	500	06.03.	N 45° 08' 22.9" E 029° 15' 35.5"	Young willow forest
7	Litcov Channel	M	972	07.03.	N 45° 08' 30.6" E 029° 15' 31.0"	Old willow forest
8	Litcov Channel	M	780	08.03.	N 45° 08' 18.5" E 029° 15' 33.7"	Area with very much reed
9	Litcov Channel	F	600	08.03.	N 45° 08' 22.9" E 029° 15' 35.4"	Old willow forest
10	Litcov Channel	F	420	08.03.	N 45° 08' 30.6" E 029° 15' 31.0"	Old willow forest
11	Litcov Channel	F	560	08.03.	N 45° 08' 38.9" E 029° 15' 50.0"	Old willow forest
12	Litcov Channel	M	920	08.03.	N 45° 08' 33.7" E 029° 16' 47.7"	Old willow forest
13	Dovnica Channel	F	400	17.03.	N 45° 13' 15.6" E 029° 24' 43.0"	Area with very much thin reed and Dutch rush
14*	Dovnica Channel	M	840	18.03.	N 45° 13' 27.7" E 029° 24' 46.1"	Area with very much thin reed and Dutch rush, with a single willow. First individual recaptured, the second day (14A*)
15	Dovnica Channel	F	500	18.03.	N 45° 13' 09.2" E 029° 24' 41.2"	Area with very much thin reed and Dutch rush
16	Channel belt Ceamurlia	M	920	18.03.	N 45° 12' 23.2" E 029° 24' 02.8"	Area is covered by old willows fallen down and cut with chainsaw
17	Dovnica Channel	M	900	18.03.	N 45° 13' 52.8" E 029° 24' 54.5"	Old willow forest
18	Dovnica Channel	F	440	18.03.	N 45° 13' 26.2" E 029° 24' 47.7"	Area with old willows and reed
19	Dovnica Channel	M	980	19.03.	N 45° 13' 07.9" E 029° 24' 40.9"	Area with *Salix cinerea* and reed
14A*	Channel belt Ceamurlia	M	820	19.03.	N 45° 12' 23.2" E 029° 24' 02.8"	Old willow forest, trees cut with chainsaw. The first recapturing.
20	Dovnica Channel	M	820	20.03.	N 45° 12' 53.3" E 029° 24' 38.8"	Old willow forest and thick reed
21	Sulina Branch, Mila 9	M	840	21.03.	N 45° 10' 25.5" E 029° 28' 13.2"	Area with rubble dam and old willows. Trap covered by rubbles, on the rubble dam of Sulina branch.
22	Sulina Branch, Mila 9	F	560	21.03.	N 45° 10' 26.1" E 029° 27' 59.9"	Area with rubble dam and old willows. Trap covered by rubbles, on the rubble dam of Sulina branch.
23	Channel belt Ceamurlia	M	800	21.03.	N 45° 10' 59.1" E 029° 28' 37.8"	Old willow forest and thick reed
24**	Ghermandi Channel	M	780	21.03.	N 45° 11' 41.0" E 029° 30' 58.7"	Area with old willows and Dutch rush. The second individual recaptured, the second day (24**)
25	Sulina Branch – Gârla Vătafu	M	760	21.03.	N 45° 10' 18.1" E 029° 30' 34.2"	Area with young willows with *Amorpha fruticosa* and thin reed. Trap set at 09 AM, at 15 PM found with mink in it.
24**	Ghermandi Channel	M	820	22.03.	N 45° 11' 41.0" E 029° 30' 58.7"	Area with old willows and Dutch rush. The second recapturing.

Tab.2. European minks that were captured within DDBR during 2003/2008

Crt. no.	Crt. no.	Zone	Sex	Weight (g)	Date	Observations
1	1	Enisala	M	800	02.03.03	alive
2	2	Dovnica	M	500	04.03.03	alive
3	3	Dovnica	M	830	05.03.03	alive
4	4	Dovnica	F		05.03.03	dead
5	5	Dovnica	M	810	06.03.03	alive
6	6	Dovnica	M	820	07.03.03	alive
7	7	Dovnica	M	865	08.03.03	alive
8	8	Fortuna	M	1250	10.03.03	alive
9	9	Fortuna	M	1000	12.03.03	alive
10	10	Fortuna	M	1100	13.03.03	alive
11	11	Fortuna	M	900	13.03.03	alive
12	12	Fortuna	M	1150	14.03.03	alive
13	13	Fortuna	M	1150	14.03.03	alive
14	14	Dunavat Channel	F	550	19.03.03	alive
15	15	Dunavat Channel	M	1100	19.03.03	alive
16	16	Dunavat Channel	M	1060	19.03.03	alive
17	17	Dunavat Channel	M	990	20.03.03	alive
18	18	Dunavat Channel	F	450	21.03.03	alive
19	19	Dunavat Channel	F	400	21.03.03	alive
20	20	Dunavat Channel	F	410	21.03.03	euthanized
21	21	Dunavat Channel	F	490	21.03.03	alive
22	22	Uzlina	M		23.03.03	escaped before weighing
23	23	Uzlina	M	1100	24.03.03	alive
24	24	Uzlina	F	380	24.03.03	alive
25	25	Uzlina	F	480	24.03.03	alive
26	26	Perivolovca Channel	M	890	25.03.03	alive
27	27	Perivolovca Channel	M	620	25.03.03	alive
28	28	Ivancea Channel – Roşu	F	490	04.04.03	alive
29	1	Draghilia Channel	M	950	10.03.04	alive
30	2	Draghilia Channel	M	1050	12.03.04	alive
31	3	Draghilia Channel	M	1025	12.03.04	alive
32	4	Draghilia Channel	M	1025	12.03.04	alive
33	5	Sulimanca Channel	M	800	17.03.04	vie
34	6	Sulimanca Channel	M	840	18.03.04	alive
35	7	Sulimanca Channel-Babina Channel	M	1050	18.03.04	alive
36	1	Fortuna-Maliuc	M		17.03.06	balance out of order
37	2	Fortuna-Maliuc	M		17.03.06	escaped without weighing
38	1	Dranov-Crasnicol	M	950	28.02.07	alive
39	2	Dranov-Crasnicol	M	450	01.03. 07	alive
40	3	Dranov-Crasnicol	M	850	02.03. 07	alive
41	4	Dranov-Crasnicol	M	850	02.03. 07	alive
42	5	Perişor	M	790	05.03. 07	alive
43	6	Perişor	M	820	07.03. 07	alive
44	1	Sireasa Channel	M	1100	27.02.08	alive
45	2	Sireasa Channel	M	1120	29.02.08	alive

Fig.4. European mink that was captured with selective trap in March 2010, on Crasnicol Channel

Due to high water's levels (Annex 2) the areas where traps were set were restricted, having to look for channels with banks or higher dikes. Furthermore, water's levels reached record highs in March 2010 recorded the highest average (Annex 2, 6.2.3.) of all March period from 2003 to 2010; also, the daily values and averages of the first two decades of March 2010 were the highest, only daily values and the average of the third decade of March 2006 was higher (Annex 2, 6.2.2. and 6.2.1.).

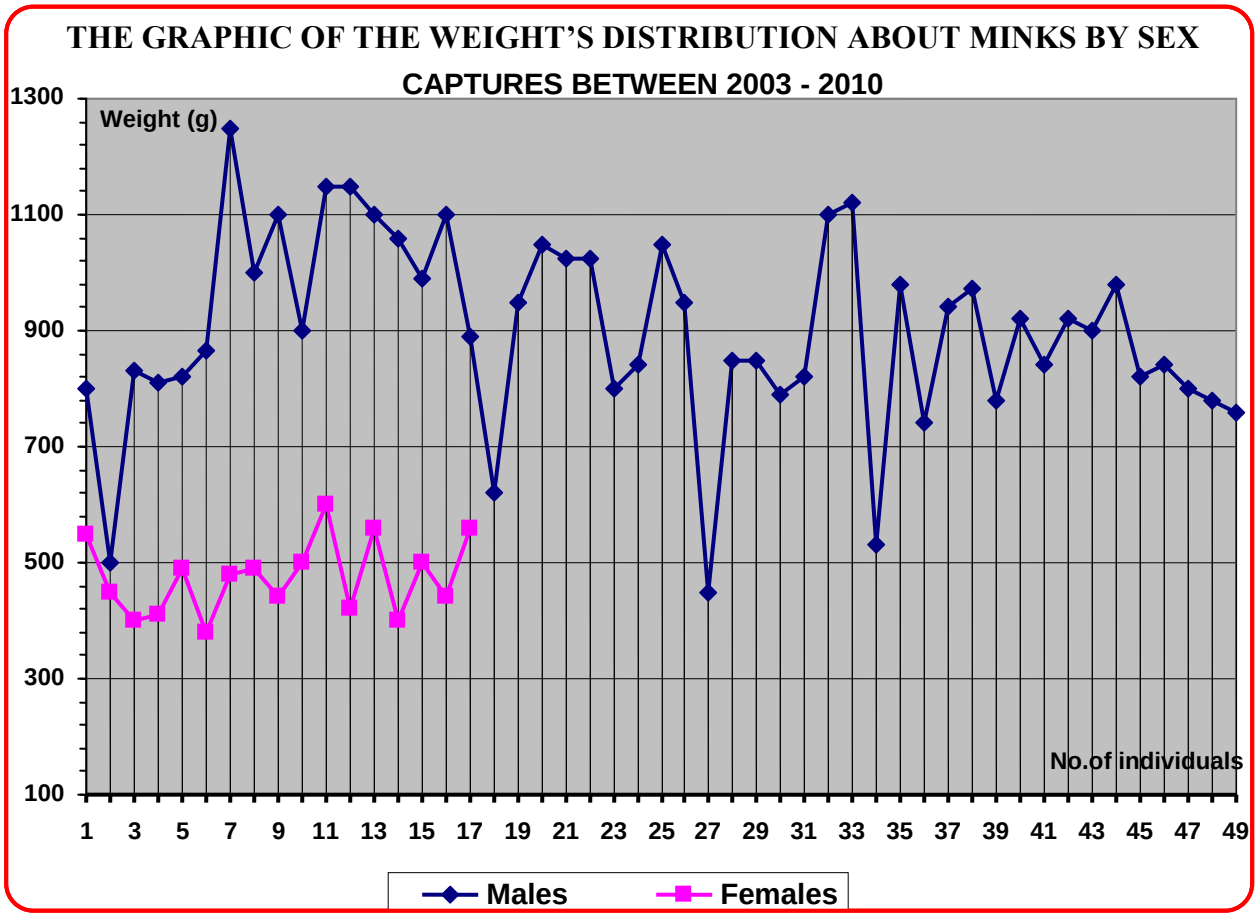
Although in March 2006 there were registered also very high water's levels (Annex 2), the number of captured minks was very low (two males). Number of traps was higher in 2006, but the number of capturing nights was higher in 2010. The only difference between those two years is given by the number of common rats (*Rattus norvegicus*), 5 captured in March 2010 and 28 in March 2006. So it is possible that the abundance or the lack of the gray rats to determine the success of the capturing activities of the European minks. The share of the other trophic resources is lower, most food species may be inactive or inaccessible, as rats are active all throughout the year. After the reserve of food is finished, rats are the main food species until the advent of frogs, tritons and others.

This hypothesis is strengthened by a convincing example. On March 16, 2010, when traps were set on the western bank of the Dovnica Channel, a mink in an advanced state of starvation smelled open sardines tins and following the smell, moved to 3-4 meters next to us directly to the tin, where it began to feed. After two minutes, in which four people approached at approx. 3 meters to photograph it, the mink took the tin into its teeth and entered into reeds and ate all the fish and oil from the tin.

Probably the same thing happens at capturing, starved minks vanquish their instinct for preservation and fall into traps.

Fig.5 -10 The mink is introduced in a cotton bag, it is weight, photographed, sexed and marked by cutting the hair from the tail's tip and it is released at the capturing place

Another important aspect is given again by the waters' level, although it could say that delta's flooding would cause the congestion of minks in few areas remaining above water. However, the number of captured minks was not much higher (double maximum) compared with previous years, in the same areas. To verify the hypothesis has intensified the researches into completely flooded areas. Were observed, including in March, several minks in flooded areas, where the nearest land was to several kilometers. But the males cover in this period up to 1 km per day or even less (but 4-5 up to 7 km in the warmer periods of the year, as it is mentioned in the specialized literature. Decreased activity at certain times, especially early winter, it is, also, explained by the existence of accumulated stores (Stubbe, 1993).
Again, we observed in field the persistence of the minks into completely flooded areas, which determine us to believe that in the event of massive flooding, the minks remain in their territories. Moreover, Kranz (*in verbis*) believes that the European minks within DDBR have fingers and claws longer than the others minks from other parts of Europe, as an adaptation to a semi arboreal life in the flood period.
However, frequent flooding and on a significant area has not caused the change of the species' mobility. As a result of our researches, the mass of captured minks corresponded to the mobility pattern: little variations of the females' mass, according to their relative immobility as well as the smaller number of captured females: 18 (not less than 52 males, Fig.11); instead, we recorded big variations of the captured males' mass (of course correlated with the trophic factors, the age and the health) which may partly be caused by their high dynamic in breeding period.



M1 – M18; F1 – F8 = year 2003; M 19 – M25 = year 2004; M 26 – M 31 = year 2007; M32 – M 33 = year 2008; M 34 – M 49; F9 – F 17 = year 2010

Fig.11. The weight's distribution at European mink by sex. Captures within DDBR during 2003 – 2010 (70 individuals were captured– 18 F and 52 M, only 66 were weight – 17 F and 49 M)

3.3. Monitoring of the European mink distribution through the presence's identification (without capturing).

If initially we wanted to achieve the monitoring through observation separately the cold season of the warm one, because of the very slight differences of the observation places between the two seasons we decided to achieve the monitoring all through the year. Similarly, because we possess valuable data from 2009, we decided to present in this report.

As we mentioned in the material and methods section, the vast majority of observations came from direct observations, however, we used, also, indirect data (tracks and faeces). The information of some collaborators or local peoples was checked, too.

According to specialized literature, the European mink is a predominantly nocturnal and crepuscular animal (Murariu and Munteanu 2005, MacDonalds and Barrett 1993). During winter, it is active in the evening and during the night, rarely looking for food during the day (Murariu and Munteanu 2005).

However, the last two - three years the number of the daytime minks' observations has greatly increased. The minks were observed all day long both in cold season (one mink was captured at 15 am after the trap has been set at 09 PM, Tab. 1) and in the warm one (Fig. 12). This behavior caused more discussions within the team. On one hand it is considered that the increased attention on this mammal advanced, hence the greater number of observations. It is possible that diminution of the interest of those who set the traps as well as the increase of the protection degree exerted by the authorities led to the pressure's diminution and, implicitly, the increase of daytime activities. It is, also, possible that trophobiologic changes (both trophic resource and mink's predators) led to these ethological changes.

Fig.12. Mink observed at feeding at daytime, Mila 9, June 2009

If between January - March 2010 were observed at least (bigger number of observations) 10 European minks (Table 3), in May-August period were observed at least 25 minks (Table 4). In the previous years, the vast majority of the minks were observed during winter.

In total, 35 minks were observed from January to August (Table 3, 4 and Fig. 13), to this number added those 25 captured ones (Table 1 and Fig. 13), resulting a total of 60 minks (Fig. 7). Additional investigations are necessary in the next years to determine if the large number of observations is

determined by the waters' level. The registration of similar observations in a year with low or medium rates of waters confirms our conviction that we are attending at an increase of population size of European minks within Danube Delta Biosphere Reserve.
A number of minimum 27 European minks were observed in 2009 by the DDNI's laboratory assistants, scientists and collaborators (Table 5 and Fig. 13).
We have to note again the large number of minks seen in 2009 and 2010 (although the mink has been intensively studied in the recent years - Kranz *et al.* 2001, 2003, 2004 and 2005 - we had not so many direct visual observations). This, at first instance, suggests that the population size has increased dramatically.

Tab.3. Observations of European mink within DDBR, January-March 2010

Crt. no.	**Location**	**Date**	**No. of individuals**
1	Cernovca Islet	January	1
2	Belâi (Alb) Lake	January	1
3	Crânjală Channel	February	1
4	Martinca Channel	February	1
5	Arhipenco Channel	February	1
6	Draghilia Channel	March	1
7	Belt channel - Ceamurlia	March	1
8	Sălcioara ponds	January - February	2
9	Călugăra	January - February	1
		TOTAL	**10**

Tab. 4. Observations of European mink within DDBR, April-August 2010

Crt. no.	**Location**	**Date**	**No. of individuals**
1	Martinca Lake	27.04.	1
2	Păpădia Vache Channel	May - June	2
3	Uzlina Lake	26.04., 14.06.	2
4	Trei Iezere Lake	23.05.	1
5	Sulina Branch, Mila 27	16.07.	1
6	Marcova	05.07.	1
7	Sălcioara ponds	12.07.	1
8	Bisericuţa	14.07.	1
9	Iancina	21.07.	1
10	Periteaşca	22.07.	2
11	Balta Uzlina	June-August	2
12	Jurilovca-Goloviţa	05.07.	1
13	Zmeica V Lake	07.07.	1
14	Leahova	13.07.	1
15	Doloşman	14.07.	2
16	Gr. Lupilor, Canalul 5	July	2
17	Lunca ponds	July	2
18	Portiţa	28.04., 12.07.	1
		TOTAL	**25**

Tab. 5. Observations of European mink within DDBR, 2009

Crt. no.	Location	Date	No. of individuals
1	Gr. Coşovei	January-February	1
2	Sulina Branch, M9	June	1
3	Băclăneşti Lake - N	01.08.09	1
4	Leahova Mică Lake - Portiţa	September	1
5	Buhaz Channel-Zăton	07.10.09	1
6	Marcova backwater	November	1
7	Draghilia Channel	November	1
8	Perivolovca Mică (Goloviţa-Zmeica) Channel	February, December	1
9	Area of Litcov Channel	2009	8
10	Bogdaproste Channel	October-November	3
11	Dunărea Veche-east meader	October-November	3
12	Dovnica Channel	October-November	2
13	Dunavăţ Channel	October-November	2
14	Lipovenilor Channel	October-November	1
		TOTAL	**27**

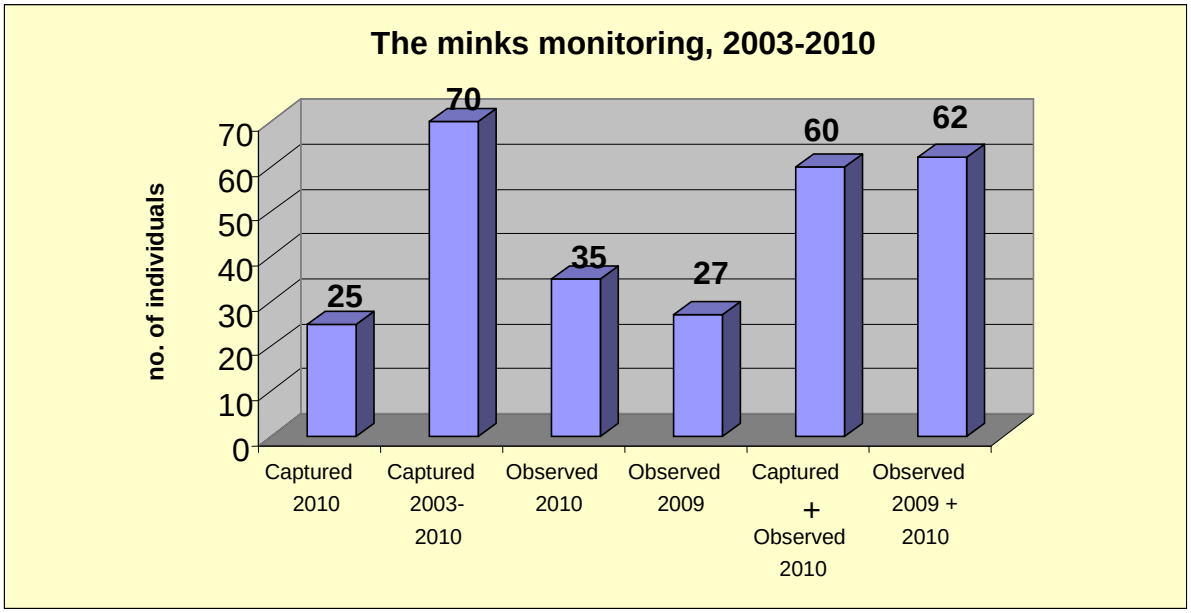


Fig.13. The monitoring through capturing (2003-2010) and minks observation within DDBR (2009-2010)

3.4. Realization of the map of recent and present distribution of the European mink in DDBR

From the recent bibliography (Botnariuc *et al*., 2005), Murariu D. mentions many locations where the European mink was recorded in DDBR and vicinity (these locations are not found in Fig. 16 – *The recent and current distribution of European mink in DDBR*): Malcoci, Danube Delta, Somova, Gorgova, Mila 23, Trei Iezere, Sontea, Obretinul Mare, Matita, Cuibina. In the rest part of the country (Fig. 14) there are indicated the locations where it was previously present: Burila Mare (Mehedinti), Bucharest, Braila, Brasov, Sibiu, Biscaria (Hunedoara), Covasna, most part alerts from the 30s; Gurghiu Valley (rivers Tarnava Mare and Mures), Bistrita Valley (Bistrita river and its tributaries from Maramures and Suceava counties) and along the Mare river from Retezat mountains. The distribution of the records is given in Fig. 14, the references can be found in Botnariuc *et al*., 2005.

The same author, Murariu D. (Murariu and Munteanu, 2005) repeat observations from previous work (Botnariuc and Tatole, 2005), where added and other locations (Fig. 15).

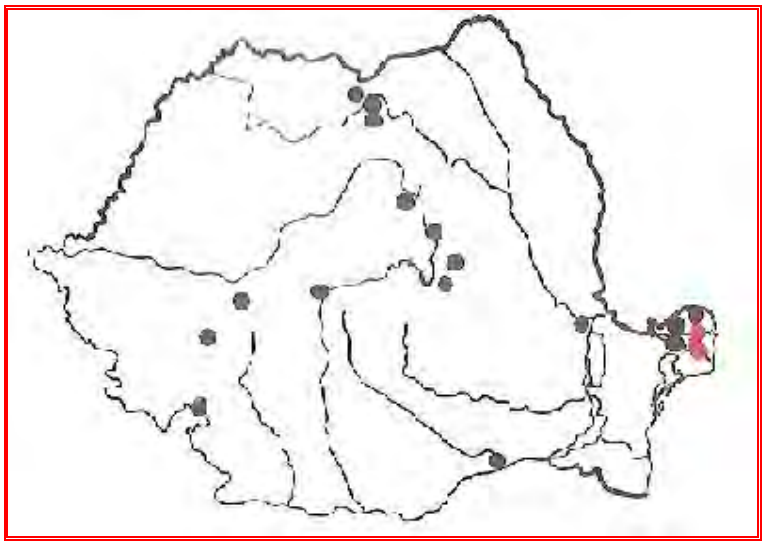


Fig. 14. The historic, recent and current distribution of European mink in Romania - map made by Murariu D. in Botnariuc *et al*. 2005 - (red points represent locations with sure presence, black points are locations where minks were present in the past, populations are now extinct)

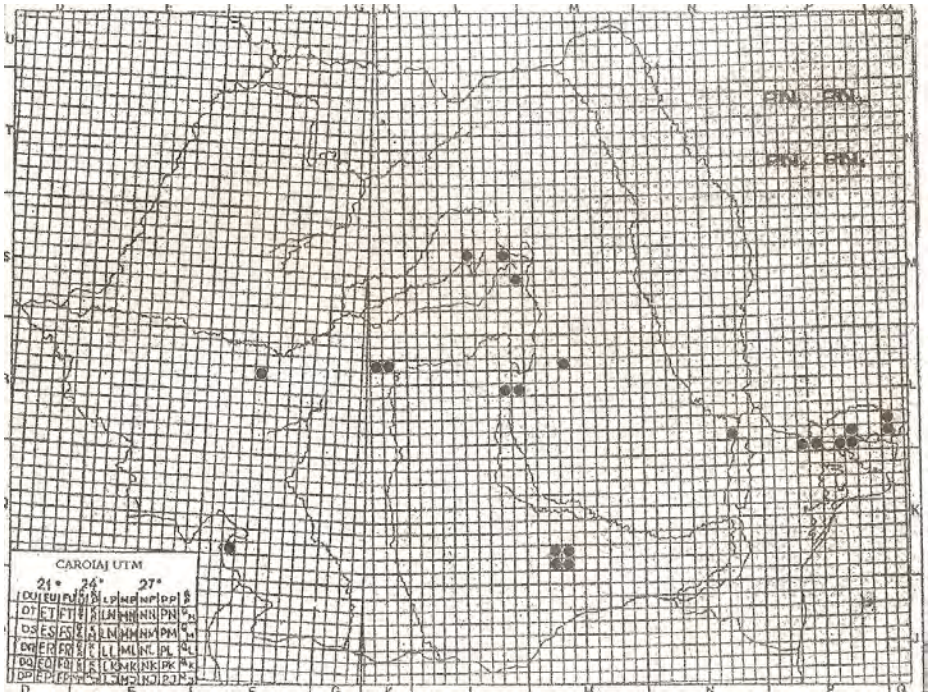


Fig.15. The historic, recent and current distribution of European mink in Romania - map made by Murariu D. (in original) Murariu and Munteanu, 2005

In the map of recent and current distribution of European mink in DDBR (Fig. 16) we have hatched only the areas where it was captured, observed directly and indirectly. A valuation of the distribution based on habitat affinity as well as by interviewing more sources than the ones used in present will be, also, available in the European mink Handbook (March 2011).
In the map in Fig. 16, the distribution was made based on captures during 2003-2010 and on direct and indirect observations between 2002 and 2010.

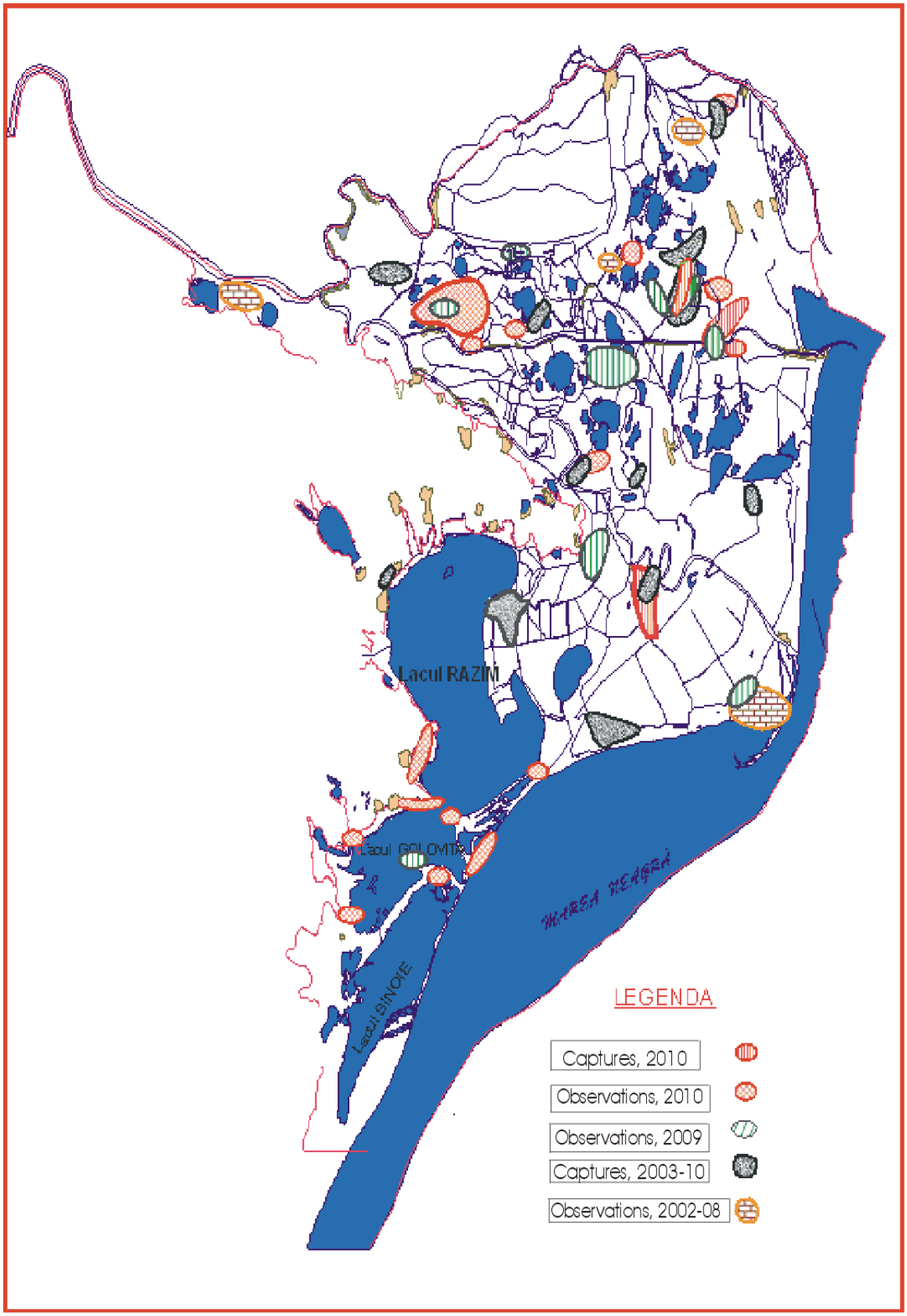


Fig.16. The recent and current distribution of European mink in DDBR

Habitats.

A review of the European mink remaining habitats shows a wide variety of potential habitats as well as a high adaptability. In France, the European mink is found mainly along the forests of some small water courses (Lodé *et al.* 2001). In Spain (Palazon and Ruiz-Olmo 1998) European minks are near small rivers and medium as the superior course of Ebro (width of 40 meters) or Ega (width of 10 meters). These areas are surrounded by agroecosystems. In Russia and the adjacent area of Belarus, the European minks are found in the vicinity of lakes of glacial origin and near small and medium rivers, mainly in wooded areas (Sidorovich 1997). Compared with minks' habitats in Western Europe, those from Russia and Belarus are very little disturbed by the anthropic factor.

In Danube Delta, minks are found predominantly in aquatic and reed ecosystems (Kranz *et al*., 2001). The same authors believe that the European minks are limited in the areas less affected by the anthropic factor. As a result of the recent researches, we found the minks at only few hundred meters from precincts of localities, on the Danube's stone dikes, dams of fishponds as well as in other strong anthropic areas.

It was considered that mink's preferred habitats in Danube Delta (from the information so far) are especially those with floating vegetation, hardly accessible and with dense vegetation, where is reed for several generations. It often sets in areas of forest with fallen willow trunks with hollows, possibly located near the edge of channels or close to the ponds. It can arrange couches in the galleries dug by it, in banks and dams.

Some other new information has been added to these ones. During the researches we found the minks on the lift platforms of several dredged channels, in the vicinity of localities' precincts, on the rubble dams of Sulina branch, on the fishpond's dams (both contour and the inside ones), etc.

Detailed data on habitats used by the European mink within Danube Delta Biosphere Reserve will be available in the European mink Handbook (March 2011).

In order to map the minks' habitats, besides the map of ecosystems (Gâştescu *et al.,* 1998) or of vegetation (Hanganu *et al*., 1993) of DDBR were taken into account several maps already created (GIS format) of Danube Delta Biosphere Reserve's habitats: NATURA 2000, EMERALD, CORINE, PALAEARCTIC HABITATS, EUNIS and of Romania's Habitats. There have been done several simulations, but the best designs were registered in the format of Romania's Habitats map (Doniţă *et al*., 1998). One of these simulations can be found in the Annex 4, but, of the 33 habitat types (legend of Annex 4, pg. 38) only three were selected which best reflects the distribution of the European minks:

- R5309 Danube communities with *Phragmites australis* and *Schoenoplectus lacustris*;
- R4421 shrubs of *Salix cinerea* with *Rubur caesius*;
- fishponds

These habitats were shaded in red on the map of the right part of Anexe 4. Nevertheless, there are at least two drawbacks. First of all, many areas are covered by the three habitats where is less probably to find minks (for example, almost all Rusca is covered). Secondly, there are at least other three habitats where minks were captured or observed: R1529 Ponto-Pannonian grasslands with *Hordeum hystrix*; R4406 Danube-Pannonian forests of white poplar (*Populus alba*) with *Rubus caesius*; R5308 floating Danube Communities with *Phragmites australis* and *Thelypteris palustris*. By the hatching of these last three habitats, the errors are bigger.

Further, it is working to correct the errors and we will offer a more accurate map of the distribution of the habitats used by the European mink in the Danube Delta Biosphere Reserve. This map will be available in the European mink Handbook (March 2011).

3.5. Knowing of the current state of European mink in DDBR and the valuation of the potential of the limiting current natural and anthropic factors

Due to a drastic reduction of the species' effectives almost allover the Europe, with the purpose to protect it, the European mink is listed in several national laws, European directives and international conventions, and regional, national and international red lists and red book. Below we select a part of them and the status of the European mink:

- according to the Red List of plants and animals within DDBR (Otel *at al*. 2000), the European mink is a vulnerable species (species on numerical wane, that can pass into the class *endangered* if the causative factors are not removed),
- present in the Red Book of Vertebrates from Romania (Botnariuc *et al.* 2005), status of endangered species,
- listed in Annex II of the Bern Convention (Annex II: European species strictly protected) - Romania joined by Law no. 13 of March 11, 1993, to the Convention regarding the conservation of wildlife and natural habitats in Europe, adopted at Berne on September 19, 1979 (*** 1979, 1993)
- The European mink is included in the European Council's Directive nr.92/43EEC,1992 (***1992) regarding the preservation of natural habitats, wild fauna and flora, species that required special areas of conservation (Annex II, the European mink is a priority species) and animal and plant species of community importance which requires strict protection (Annex IV). Admission: Annex II and IV, modified by the Council's Directive 2006/105/EC from November 20, 2006 of adapting the Directives 79/409/EEC, 92/43/EEC, 97/68/EC, 2001/80/EC and 2001/81/EC in the environment domain, as a result of the adhering of Bulgaria and Romania.
- According to IUCN (***1963), the European mink is at risk (valuation year: 2008). IUCN justification: this species is listed as endangered species (in danger) because the population is in an effective cut, presumptive as being bigger than 50% in the last three generations (15 years) due to habitats loss as well as to the effect of introducing new species and pathogens. There are considerable uncertainties about the present number of copies and the estimate of 50% is considered minimal, and providing more accurate data, the species certainly will be listed to critically endangered species.

European mink's protection is regulated by another set of legislation: Law 407/2006, Law 197/2007, Law 215/2008, Ordinance 57/2007 and 154/2008 (*** 2006, 2007, 2007, 2008 and 2008).

Effectives. Regarding the old data, although we not possess sufficient data from the 40s - 50s of last century, it is clear that the furs hadn't a very good market being considered as articles for bourgeoisies. The situation began to change at the middle of the 60s, in parallel with an economic recovery, when women fashion embraced again the using of game fur. During this period, with other small or medium-sized mammals such as otter, stoat and wildcat, and European mink population in the Danube Delta registered an area restriction, accompanied by the alarming decrease of the effectives. In the 60s, large-scale transformations of the delta as the enclosing of some polders, the execution of some reed enclosures, fishponds and channels for transporting reed barely begun, the agriculture introduction in the delta was incipient. The decrease of the effectives was generated mainly by the hunting, as a result of its increasing, poaching respectively, the mink being already protected. In this decade it is widespread the use of pedal traps for capturing the muskrat that capture anything unselectively, including mink. Also in this period the capturer activity is authorized, a concern which includes a number of local hunters for whom this occupation becomes the main source of income. Also, in parallel with large works for reed enclosures and fishponds appear a series of working points in the delta, pumping stations, barracks and ferries with dormitories, etc. whose staff is preoccupied with hunting based on traps. Fur's rise of prices persuades a number of professional fishermen, as besides their regular equipment to set traps for animals with valuable fur (Dragomir and Kiss, 1972). In conclusion, there were all the premises for the decline of species of mammals with valuable fur, especially otter and ermine. From the 60s are starting to appear numbers

regarding the harvest of furs, the game skins is according to law a state monopoly, which is turn to good account only by acquisition official authorities. Certainly a part of the furs went black market, but the purchasing numbers illustrates eloquently a very worrying decline in the Danube Delta of some mammals, especially in populations of otter and mink. If in 1956 it were delivered at state 3800 skins of mink, in 1960 only 2700 pieces, in 1965 just 1200, in 1980 only 80 furs were acquired (Almăşan, 1985). By the middle of the last century's last decade, trapping was still a relatively common occupation, the branch of hunting, delta's adjacent forestry and DDBRA giving in total per season approx. 120-150 permits for muskrats. There aren't real data regarding the captures of animals with fur, the skins revaluation is done on particular ways. Also in the present the captured minks get to furriers without any forms, their number can only be guessed.

In the 90s as a result of the annual spring evaluations of sedentary game species, the effectives of European mink population within DDBR is estimated at 300-400 exemplars. These data are the results of some estimates made in the collaboration between DDNI and AJVPS regarding the number of the existing minks within DDBR (Fig. 17).

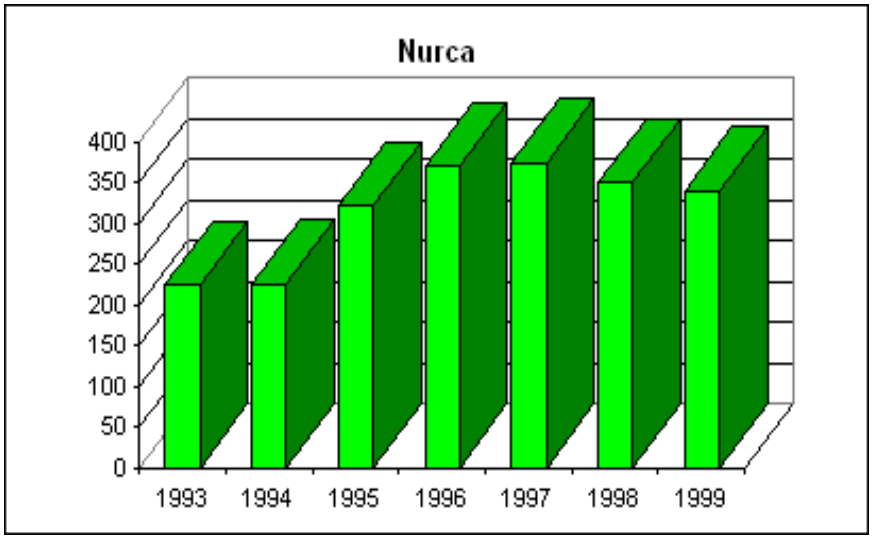


Fig.17. The effectives of European mink evaluated within Danube Delta's territory during 1993 - 1999 (after Marinov M. sen., annual summaries)

These numbers may be debatable, because the mink is an animal with a predominantly nocturnal lifestyle and the very large DDBR's size and heterogeneity do not allow the use of standard methods of population size's valuation. It will try to achieve this goal in the European mink Handbook. Moreover, as a result of several collaborations between researchers from Austria, Czech Republic, Romania, Ukraine and others, it was obtained a result regarding only mink population size in DDBR. Kiss B. considers population size at 400-500 individuals (*in verbis*). Instead, Kranz A. considers population about 1,400-1,500 individuals (*in verbis*). A first conclusion that can be drawn is that population size varies between the two assessments.

A second conclusion, as a result of the researches began in 2002, is that European mink is at least in a phase of population size's stagnation, possibly in the last two years even in a small increase. Of course, there are changes in population size from year to year.

Valuation of the potential of the limiting current natural and anthropic factors

The causes that are inducing the dynamic of the European mink population's size within DDBR are divided into natural causes, abiotic and biotic and those which are directly or indirectly caused by human intervention. Often, the action of those factors is conjugated and affects either through direct individuals' removing or through various other ways that have as a result the perturbation of the reproductive processes or other actions that cause large losses of energy that produce changes in the general status of individuals and implicitly of the population that includes its.

Natural factors.

Natural abiotic factors. The main natural abiotic factors that negatively affect the minks' state are the climatic and hydrological ones.

Hydrological factors. These have a rather indirect limited role, but combined with other factors may affect the certain periods the European minks within DDBR. Hydrological factors affect minks by three main ways:

- water high levels and floods; mink is very well adapted to these phenomena, as a proof is the fact that a big part of mink's food consists of fish (32%, Kiss J., annual summaries - Annex 3; 38%, Kranz *et al*., 2001) but, also, the presence of interdigital membrane. However, the persistence of water high levels may affect reproduction, or combined with low temperatures during winter and lack of food can cause a substantial mortality.
- variations of water level in a short period of time may affect the offspring.
- very low water levels may indirectly affect, by the access of less characteristic predators of wetlands (Red fox, Golden jackal, Western polecat - Fig. 18 - etc.), although we haven't clear data on their predatorism to DDBR's minks.

Fig. 17. Common ferret (*Mustela putorius*) that was captured in Nebunu area at a low water level

Climatic factors. Among the many climatic factors possibly limiting, we consider that regarding minks, the negative extreme temperatures have a bad influence. Mink, although has a lower activity during the winter, it is still active. Thus energy costs are much higher in periods with very low negative temperatures. Indirectly, very low negative temperatures determine the lack of food during early spring and linked to the consumption of food deposits and the lack of rats can cause starvation and even minks' death.

Natural biotic factors. We've already discussed above about the lack trophic resource at certain times, sequel, we will discuss about the (possible) predators, other competitors as well as parasites.

Predators. Otter, occupying the same habitat types is the main predator of European mink. Murariu states that even in the places where otters are installed it can be expected that no mink exists (Murariu and

Munteanu, 2005). Red fox and Western polecat are also predators of minks, although Kranz *et al*. (2001) states that in Spain the fox does not affect the European mink. At low water levels as well as on Danube's banks and at polders limit. Also, Murariu (Murariu and Munteanu, 2005) specifies that in forest habitats, the European mink is, also, hunted by Pine marten, Raccoon and Eagle owl. Locals circulated assumption that Raccoon and Golden jackal (relatively recently established) contribute to the reduction of the effectives of this species, confronted by we don't have concrete evidences. We note that Pine marten (*Martes martes*) was recently found in DDBR (more exemplars at Letea - Pocora - *in press* and 2 exemplars, one captured in March current year on Bogdaproste channel and one observed in the canton of Dovnica) but we do not know the relationships between it and mink. Although there are some alerts in Doloşman area, we don't have the proof of the recent presence of the Eagle owl (*Bubo bubo*) in DDBR, thus, the impact of this bird of prey upon the European mink in DDBR is non-existing. Also, we do not know the impact of other birds of prey upon the European minks.

Impact of competitors. In addition to the impact of American mink's competition (*Mustela vison*) and Western polecat (*Mustela putorius*), genetic erosion would be the most problematic for the European mink. After some people the European mink is even the food for the two species listed above.

If genetic erosion is excluded as a result of the interbreeding between the two mink species (American mink males are interbreed with European mink females, but the embryos are resorbed - Ternovskij, 1977; similarly, the European mink has 38 chromosomes, the American one 30 - Graphodatsky *et al*., 1976), it occurs as a result of interbreeding between European mink and Western polecat (Maran and Henttonen 1995, Maran *et al.* 1998, Davison *et al.* 2000, Michaux *et al.* 2003 etc.). Already Western polecats were captured within the delta, but we consider that number is low, and the impact is small.

Turning to the American mink, two actions are valid (in addition the transmission of some diseases that we will speak in the next paragraph): competition, but direct elimination, too. Regarding the competition, many articles reflect this, however, American mink is less sensitive to the habitats damage, similar, trophic spectrum is larger and the European mink's replacement by the American one in Europe may be due to this issue. Regarding the direct elimination, several Russian researches have refuted this possibility (Kranz, *in verbis*) and Maran and collaborators (1998; several European and American minks were observed for 10 months in a common area) although they observed a dominance of the American mink male on the European one, respectively of the American mink female on the European one, they haven't registered fatal attacks.

Should be mentioned that American mink may be considered a mixed factor: natural, but, also of human origin, even if indirectly, the original entry of the American mink being its artificial introduction in America in the 30s.

We emphasize that for quantifying the entering effect of American mink in delta area we do not have yet sufficient data and information. There are already data regarding the presence of American mink, at least in bordering areas of the Danube Delta. In this sense, it was identified an ex. of mink from Somova area (Cuzic *et al*., 2003) and we have oral information from other areas, too (Crisan, Murighiol, Bogdaproste channel etc.) in the winter of 2007-2008. We believe that the entering of the American mink in delta's biome had two ways. First, from Murighiol, where functioned for a period up to the early 90s a small farmer with valuable fur animals, having in care American minks, too where some escaped. A second way of entering would be from Ukraine, where - near the town Izmail – also, were bred in mass American minks (Kranz *et al*., 2004). The evidence in support of the two routes of entrance is the existence of the information regarding the existence of some big and black minks in Uzlina-Murighiol area and the capturing in 1999 of an American mink in Somova (Cuzic *et al*., 2003). Although the American mink's presence is confirmed, the decline of the European mink was not observed. Kranz (*in verbis*) believes that the American minks enter into delta, but in a low number, which not allow the formation of a distinct population, against the relatively numerous population of European mink. We would add that the American species prefers drier areas unlike the European one.

Although many publications suggest that American mink excludes by competition the European one (ex. Kranz *et al*., 2005), the disappearance's reasons of the latter in most European countries are not clear.

Some publications even give as enemies only the man and the American mink (Cuzic and Murariu, 2008). In several publications (Tumanov and Zverev 1986, Youngman 1990, Maran and Henttonen, 1995) it is mentioned that there are no evidences that American mink causing the disappearance of the European one, especially that the numerical reduction of the latter was not synchronous with the introduction or the escapes of American minks.

Parasites. If above, we specified that the researches could not prove that the American mink directly affects the European one, in this paragraph mention two papers (Chambrillon *et al*., 2003, Man□as *et al*., 2003) that prove that the European mink is seriously affected by a virus brought by the American mink. European mink populations in France and Spain were infected with a parvovirus (ADV), or Aleutian virus. If the American minks make mild sick, the European ones get very virulent forms with portals which are passing by 90%. Several serological samples collected from 3 European minks in the area of Sulimanca channel (Danube Delta) were tested, fortunately, the results were negative (Michaux *et al*., 2005).

Kiss (annual summary) confers a high importance on the fact that at the specimens studied so far in our researches it wasn't noted the existence of the parasitic worm *Troglotrematodus acutum*, worm that penetrates the cranium's bones in the frontal part of minks, causing them a slow death, infestation so widespread in other countries, in some areas up to 100% (Nesterov 1984, Vásárhelyi 1965).

Murariu (Murariu and Munteanu, 2005), without specifying the sources and the locations of collections, mention that no ectoparasites were reported. Instead, they found several groups of endoparasites: helmints. They were found in 56% of minks: 14 species of trematodes, 2 species of cestodes, 11 nematodes, including *Skrjabingylus* sp. was the most frequent in the infestations of frontal sinuses. Specify that I have received 3 corpes of minks, which are in testing, we hope that the results will be available in the European mink Handbook. (March 2011).

Sidorovich (1997) gives 17 helmints species found at the European minks in Belarus (1960-1995): *Euparyphium melis, Rossicotrema donicum, Opistorchis felineus, Metorchis albidus, Pseudamphistomum truncatum, Alaric alata, Spirometra erinacei, Taenia mustelae, Capillaria mucronata, C. putorii, Trichinella spiralis, Strongyloides martis, Skrjabingylus nasicola, Filaroides martis, Molineus patens, Ascaris devosi* and *Corynosoma strumosum.*

Anthropic factors.

It is considered that the disappearance of the European mink might have been initiated by the last glaciation, but it was aggravated by deforestation, marshes' draining and water's pollution (Youngman 1990). The beginning of the decline in Central Europe could be caused by the destruction of natural aquatic ecosystems, especially of the rivers' banks (Maran and Henttonen, 1995). In Finland, the decline began long before the major changes of the ecosystems including small rivers; the decline was caused by the forestry techniques. Even if the causes are detailed, there is still a common denominator: the changing of the environmental conditions (Maran and Henttonen, 1995).

In conclusion, the real and undisputed reason of the European mink's decline is primarily the destruction of natural habitats, especially wetlands on Pan European area, to which overlaps - at least in terms of the Danube Delta - hunting with weapon and unselective traps, especially those used for muskrats.

We already mentioned in subsection 3.5. that in 1956 delivered 3,800 skins of mink, in 1960 approx. 2,700 pieces, in 1965 approx. 1,200 (Almasan, 1985). Rösler (1991) notes that annually between 8,000 and 10,000 European minks were captured in Romania in the 60s. Also in other countries the European minks' harvestings were consistent. In Finland has reached 3,000 exemplars in the 20s, but in Russia, in the first decades of the last century harvested from 40,000 to 60,000 exemplars, with a record of 75,000 European minks in a year (Novikov, 1939) which is much more than the current livestock species are estimated!

In subsection 3.5. we already talked about the capturing activities on the mink, similarly to major aggressions on the delta that began in the 60s (limiting of some polders, execution of fishponds and channels for transporting reed, the penetration of the agriculture in the delta). In the same chapter, the development of the capturing activity was briefly described. After the middle of the last decade of last

century, the legal hunting using traps started to decline. After 2000, we have few data on poaching at animals with valuable fur in DDBR. We were informed about acts of poaching, especially otters. Thus, in early 2006, because of the long frost, which generated an ice bridge over the delta's waters, without access to water of the semi-aquatic mammals, a single agent in Mila 23 had bought over 120 otter skins. These are shot in the ice holes, killed by dogs specially trained, but also with traps.
Regarding the European mink, the effects of poaching can be seen on the city market, where we found commercializing articles made from native European mink, caps at the price of approx. 13-24 Euros/piece (Fig. 18). We note that this price has to bear the costs of both hunting for a minimum 4 minks per cap, fur tanning, making item, and seller's charges of travel and market.

Fig.18. Cap of European mink fur on Tulcea's market

We believe that this phenomenon still exists; however, it has small proportions, respectively the impact is low, at least for now.
There are many other anthropic limiting factors (at least potentially) in DDBR, but their effect can not be quantified. Thus, besides poaching, we remind the chaotic tourism in DDBR (which involves a high degree of disturbance across the delta, including protected areas), burning of reed, the disturbance produced by the circulation of ships or high speed boats, commercial fishing (the boom of fishermen' construction in the higher areas of the delta, areas usually used by minks), the dredging, respectively the sediments' deposit on the banks of canals, forestry technologies (substantial clearings) and agricultural (pesticides use). Water's pollution (pesticides, heavy metals), by accumulation, certainly have a serious impact on the health of European minks within DDBR. Populations breaking up could have a future impact, taking into account that the European mink wasn't found on the Prut and Danube Valleys.
Till now, European mink populations (the samples from 176 European minks from Europe were tested, of which 34 European minks were from the Danube Delta) don't seem to have been affected at genetic breaking up level. Few genetic differences were found, it was unable to achieve a clear pattern to correspond with the geographical distribution (Michaux *et al*., 2005).
There are few other anthropic factors that cause (or caused) loss of the European mink effectives in different parts of Europe, but they don't affect the minks from delta. Of these we illustrate the mortality caused by cars on roads (Lode *et al.* 2001), what wasn't registered at us yet.

4. Conclusions

In March this year have organized two expeditions to capture the European minks within DDBR, capturing 25 individuals (16 males and 9 females).
For the first time in DDBR we have two recaptures of European mink, one with a displacement of about 1 km - (capture at the beginning of Dovnica Chanhnel, respectively recapture at Ciamurlia enclosure - and one with capture and recapture in the same place, Ghermandi Channel).
During 2003 - 2008 have been captured another 45 European minks (2003 - 28 minks, 2004 - 7 minks, 2005 - none, 2006 - two minks, 2007 - 6 minks, 2008 - two minks), thus resulting a number of 70 minks captured during 2003-2010.
Because the minks started to feed with an increasing frequency during the day (combined with lack of food and unfavourable hydrological and climatic conditions) we had to change the method of mink's capturing activity: in addition to morning checking, we entered and evening checking.
It is possible that the abundance or the lack of gray rats to determine the success of the European minks' capturing activities; the share of other trophic resources in February and March is lower, most food species may be inactive or inaccessible, but the rats are active all the year.
In the period from January to August, 35 minks were observed, adding to them the 25 captured, resulting a total of 60 minks; the recording of similar observations in a year with low or medium water's levels will confirm our convictions that we are witnessing to an increase in European mink population's size within DDBR.
In 2009 it was noticed by the lab technicians, the researchers and collaborators of DDNI a minimum number of 27 European minks; the big number of minks seen in 2009-2010 should be noted and although the mink has been intensively studied in recent years, we had not so many direct visual observations. This suggests, at first instance, the idea that population's size has increased.
The European mink's recent and current distribution in DDBR map was made; only the areas where it was captured (2003-2010), observed directly and indirectly (2002-2010) were hatched. A valuation of the distribution and based on habitat affinity as well as by interviewing more sources than those used today will be available in the European mink Handbook.
Some authors consider that the European minks are limited in DDBR in the areas less affected by the anthropic factor, but with the recent researches, we found the minks at just few hundred meters of localities' precincts, on the Danube's stone dikes, the dams of the fishponds as well as in other strongly anthropic areas.
As a result of the collaboration of several researchers from Austria, Czech Republic, Romania, Ukraine and others, only the assessments of minks' population's size in DDBR were noticed. Kiss B. estimates the population size about 400-500 individuals, and Kranz A. estimates the population at 1400-1500 individuals. Large variations of the effectives, in the author opinion, are within the limits of the two researchers mentioned above.
As a result of the researches started in 2000, it shows that the European mink is at least in a phase of population's size stagnation, possibly in the last two years, even a slight increase.
The causes that determine the dynamics of the European mink population's size in DDBR divide by the natural ones, abiotic and biotic ones and those caused directly or indirectly by human intervention. Usually, the action of those factors is conjugated.
The hydrological and climatic factors have a limitative rather indirect role, but combined with other factors can affect in certain periods the European minks within DDBR.
Predators. The otter, occupying the same habitat types is the main predator of the European mink; Red fox and Western polecat are, also, the mink's predators and in the forest habitats the European mink is hunted by the Pine marten, Raccoon and Eagle owl. We don't know the impact of other birds of prey on the European minks and Golden jackal.

The genetic erosion is excluded as a result of the interbreeding between two species of minks (the embryos are resorbed; similar the European mink has 38 chromosomes, the American one 30), it occurs as a result of the cross-breeding between European mink and Western polecat.
Regarding the competition, many articles prove this, however, the American mink is less susceptible to the habitats' damage, similarly, the trophic spectrum is much higher, and the replacement of the European mink by the American one may be due to this fact, too. Regarding the direct elimination, several Russian researches denied this possibility and Maran and his collaborators have observed a dominance of the American minks on the European ones, but haven't been registered fatal attacks.
Recent parasitological researches of some minks in the Danube Delta have indicated that they were not infected by the Aleutian virus (brought by the American mink).
In conclusion, the real and undisputed reason of the European mink's decline is, primarily, the destruction of the natural habitats, especially Pan-European wetlands, to which overlaps - at least in terms of the Danube Delta - gun hunting and with unselective traps, particularly those used for muskrats.
After 2000, we have few data on poaching of animals with valuable fur in the Danube Delta Biosphere Reserve; certainly that this phenomenon still exists, however, it is limited in size and the impact is limited at least for now.
There are a multitude of other limitative anthropic factors (at least potentially) in the Danube Delta Biosphere Reserve, but their effect can not be quantified. Thus, in addition to poaching, we mention the chaotic tourism within DDBR (which involves a high degree of general disturbance throughout the delta, including the protected areas), burning of reed, the disturbance caused by the circulation of ships or high speed boats, commercial fishing (the boom of fishermen' construction in the higher areas of the delta, areas usually used by minks), the dredging, respectively the sediments' deposit on the banks of canals, forestry technologies (massive deforestations) and agricultural (use of pesticides). The water pollution (pesticides, heavy metals) has certainly a serious impact on the health of the European mink within DDBR.

5. Recommendations

In short term, the strengthen of the protection measures is required both in strictly protected areas in general, in buffer areas and in those of economic exploitation where there are found high abundance of the European minks, especially in areas with hunting traditions (Mila 23, Letea, Caraorman, Dunavăţul de Jos and Sf. Gheorghe).

Given that a number of limiting natural and anthropic factors affect the European minks within DDBR, to monitor the status of mink population and to take immediate action if it is necessary, we propose the development of the researches, either through new projects with external financing either by funding by DDBRA. Most projects usually last no more than three years, therefore, by funding of the minks' long-term monitoring by DDBRA can approach some modern research methods, including computerized evidence of the trails etc. By the repeated identification of an individual based on trails, it can be made more accurate assessments of the European mink population's size within DDBR.

Lately, we have noticed a fishermen' constructions boom on the highest banks of the delta's channels (Candura and Şontea channels for example), and these are usually used by minks. We recommend to DDBRA the demolition of the huts / houses recently built and the verification of the older (those on Trofilca, Dovnica channels and adjacent between Matiţa and Merhei and other dozens of channels). Many of new buildings, also old ones, no longer serve as temporary family housing, but housing true fishing brigades or working as tourist accommodation units. Not only minks are affected, but a number of other rare or vulnerable species.

Some of this report's data come from the rangers of the DDBRA and from the commissioners of the Environment Guard. These data have been checked and proved to be correct. We recommend to DDBRA and to the Environment Guard to introduce as job task to the field staff the mink' monitoring and data centralization. The monitoring data can decisively contribute to save the species, in view of the bleak previsions on the future of biodiversity in Europe and all over the Globe, too.

In long term, we propose another set of recommendations:

Given that we recently found evidence of the capturing action to European minks (as well as otters), it requires an intensified control of furs market to prevent the sale of the skins of protected species.

Enhancing of the environmental education among the population, target groups are children and, also the adults, especially hunters and fishermen.

We suggest the analysis of the idea to fund a refuge for European minks, in captivity conditions, where a nucleus of animals could be preserved and reproduced in order to save the species and the subsequent recolonizations. We remind that in long term, this action may fail, although it was wanted and still wanted to achieve this center through a project (POS or LIFE). The setting up of a mink breeding center can be done, of course, through a project, but its support can be done only by funding by DDBRA (including these expenses in the Management Plan of DDBRA).

We recommend to the colleagues within DDBRA an increased attention upon the hydrotechnical activities in the DDBR. We mention here the channels dredging. This summer, one of the most valuable birds colonies within delta (that from Nebunu) was affected by dredging, respectively the displacement of the trees at few metres of colony, even in full nesting season. Similarly, it is possible that the stopping up of the natural banks with the dredged mud could affect for a long period the European minks. Of course, decolmatate activity is necessary, but where it is absolutely necessary, in the best times and only after a study that clearly indicates that the benefits are more important than the impact of dredging.

A final recommendation in this report is to limit the aquatic tourist routes; these are already too many for the support capacity of the biodiversity within DDBR. Moreover, it is necessary to supervise the tourist activities, because currently, very few companies providing tourist services respect these routes, without take into consideration the private providers.

In March 2011 will be printed within this project an European mink Handbook, regarding the DDBR by the DDNI. Within this handbook will be proposed, besides the above and other limiting measures of the limitative factors.

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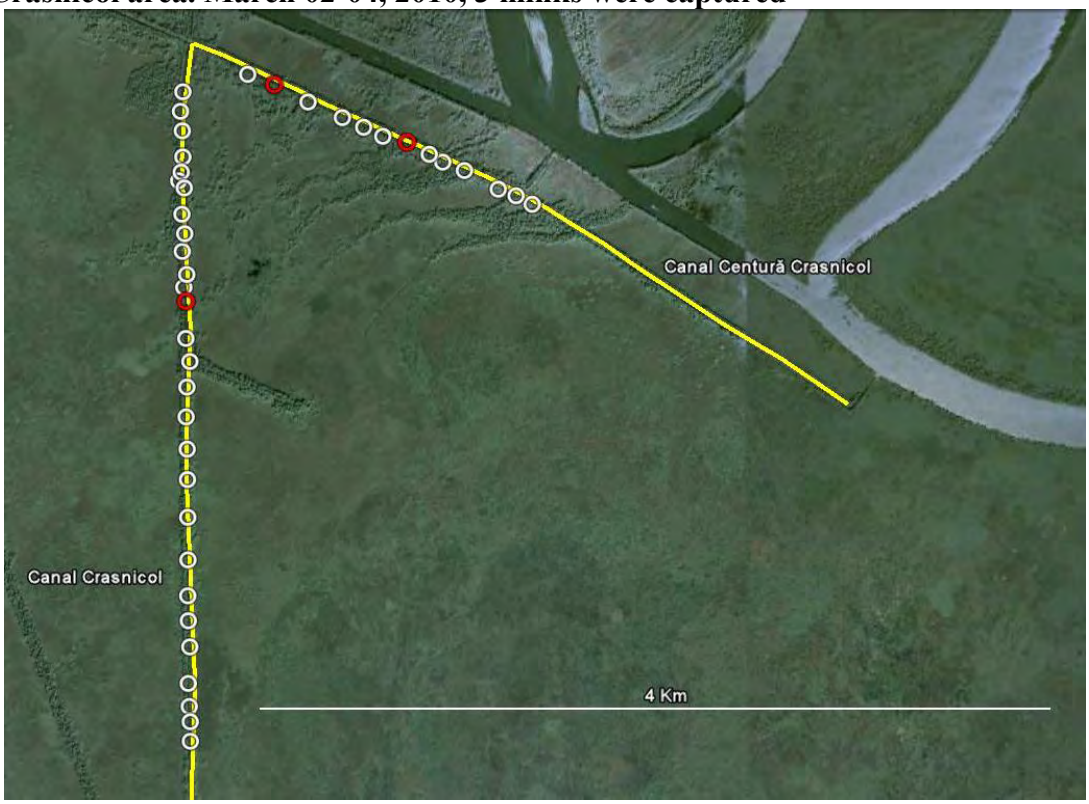
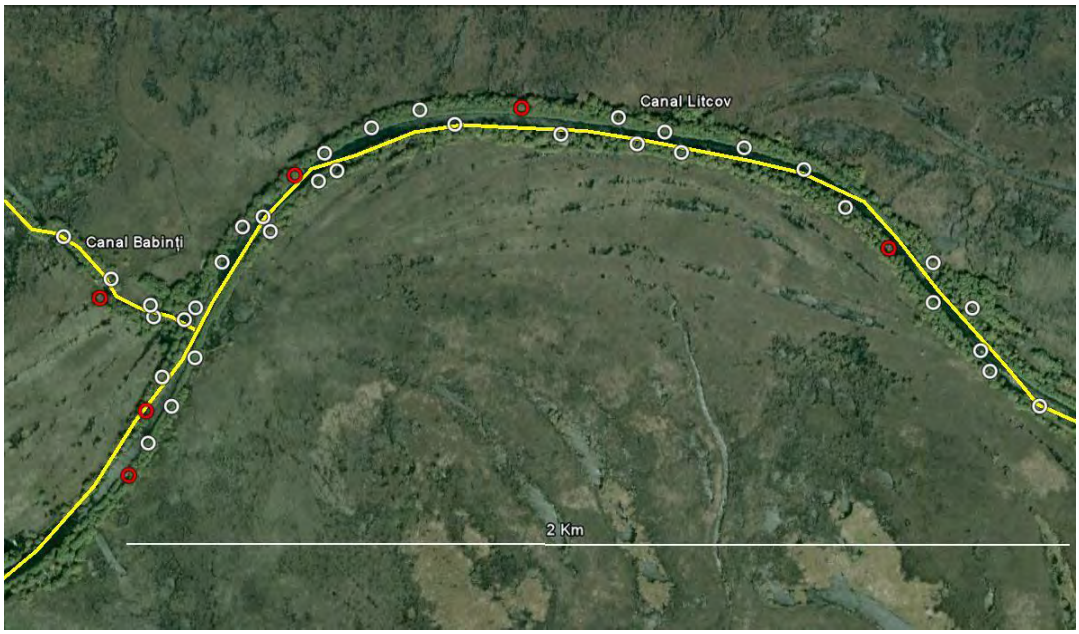
7. Annexes

7.1. Annex 1. The areas where developed European minks' capturing activities in the DDBR in March 2010

7.1.1. Crasnicol area. March 02-04, 2010, 3 minks were captured



7.1.2. Litcov area (Isac Lake – Babinţii Channel). March 05-08, 2010, 9 minks were captured



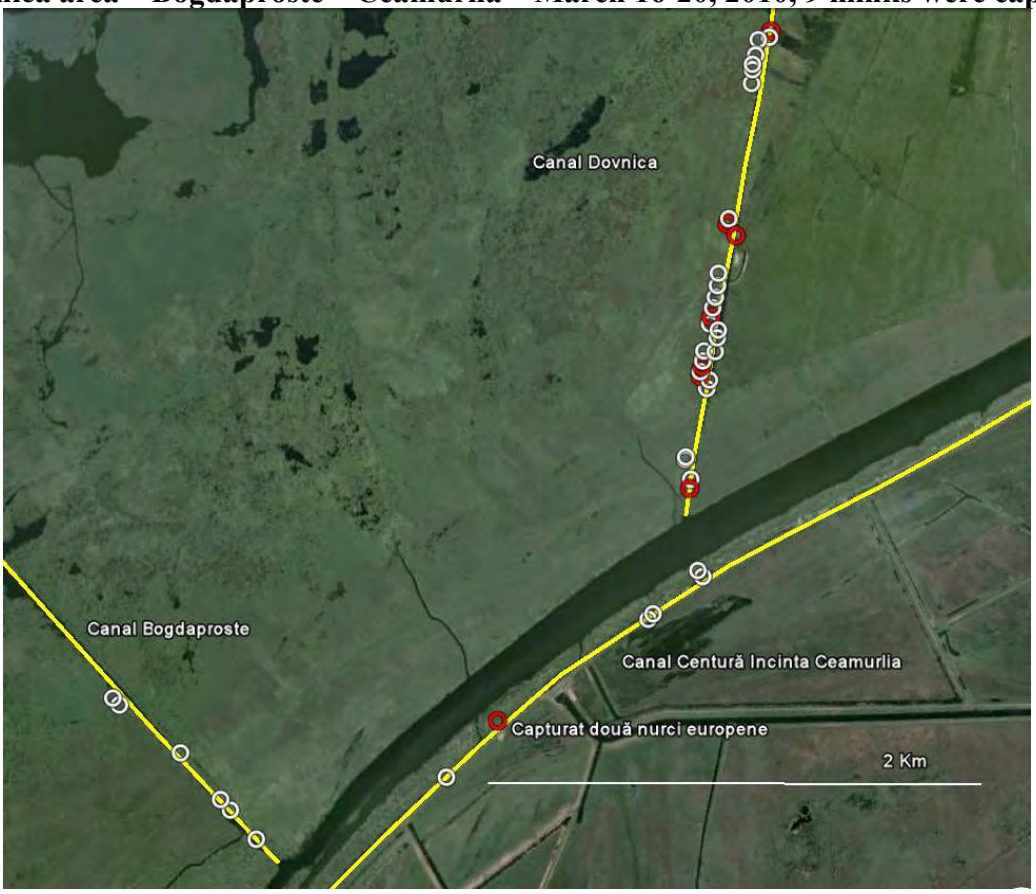
Legend:

O traps where the European mink was captured

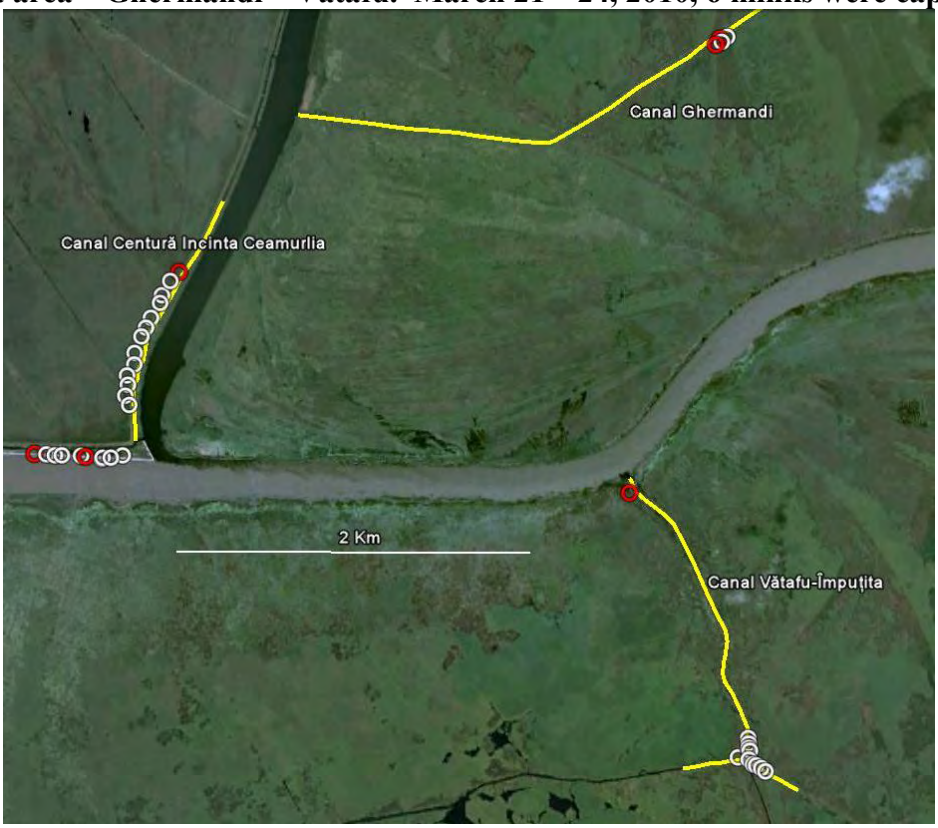
◎ traps where the European mink wasn't captured

7.1.3. Mila 36 Channel's area– Tulcea Branch. March 10-12, 2010, no mink was captured

7.1.4. Dovnica area – Bogdaproste – Ceamurlia – March 16-20, 2010, 9 minks were captured

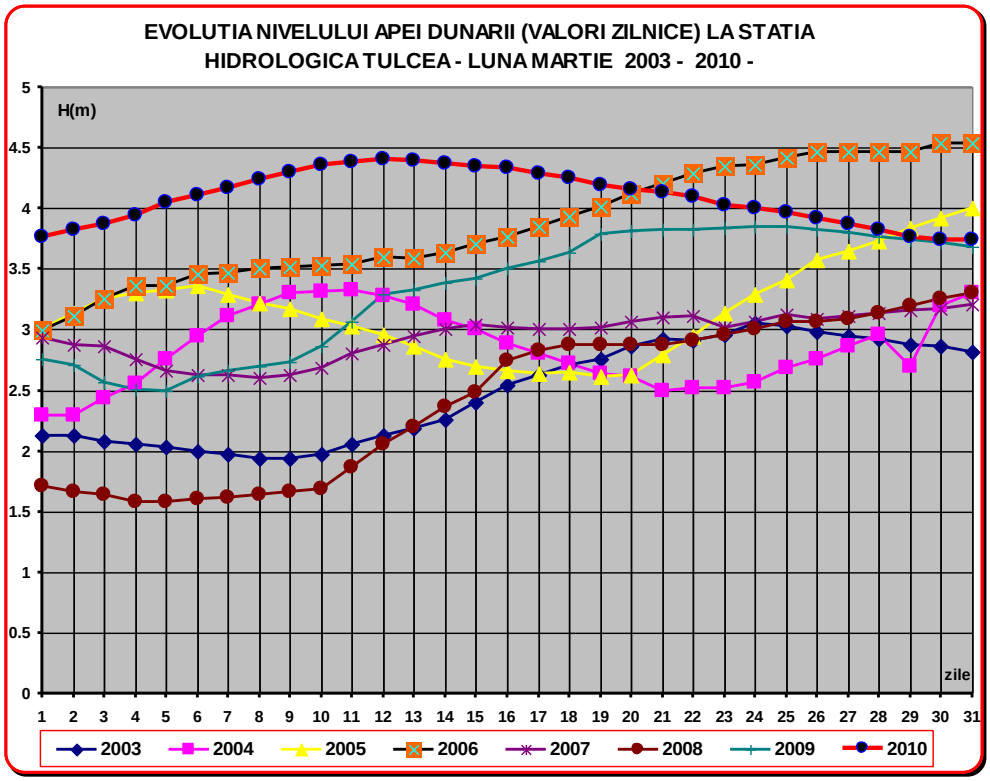


7.1.5. Ceamurlia area – Ghermandi – Vătafu. March 21 – 24, 2010, 6 minks were captured

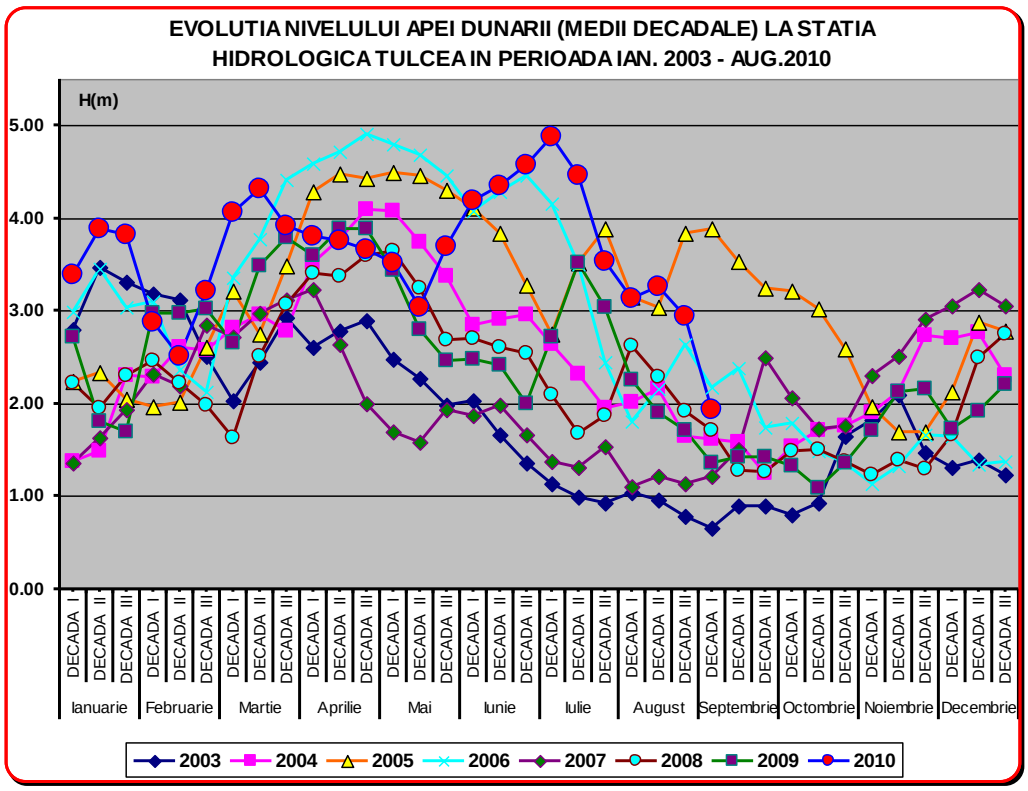


7.2. Annex 2. The evolution of Danube's water level at Tulcea Hydrological Station, 2003 - 2010

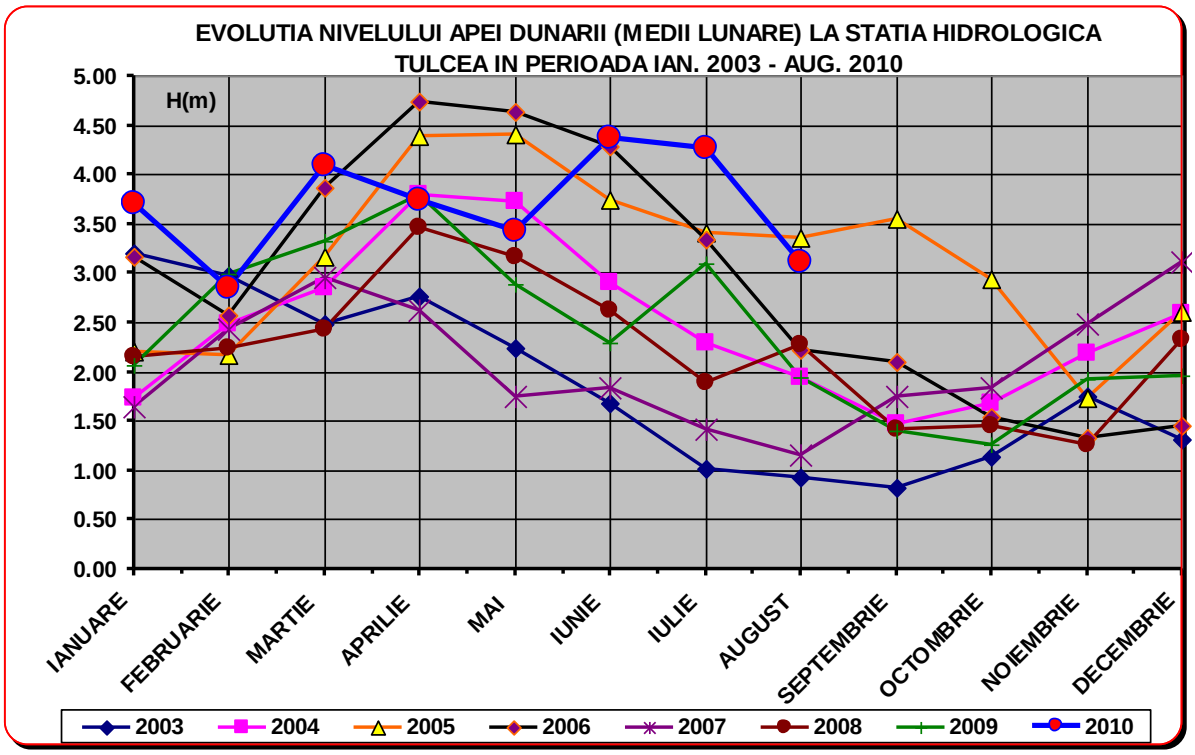
7.2.1. The evolution of Danube's water level (daily values) at Tulcea Hydrological Station, March 2003-2010



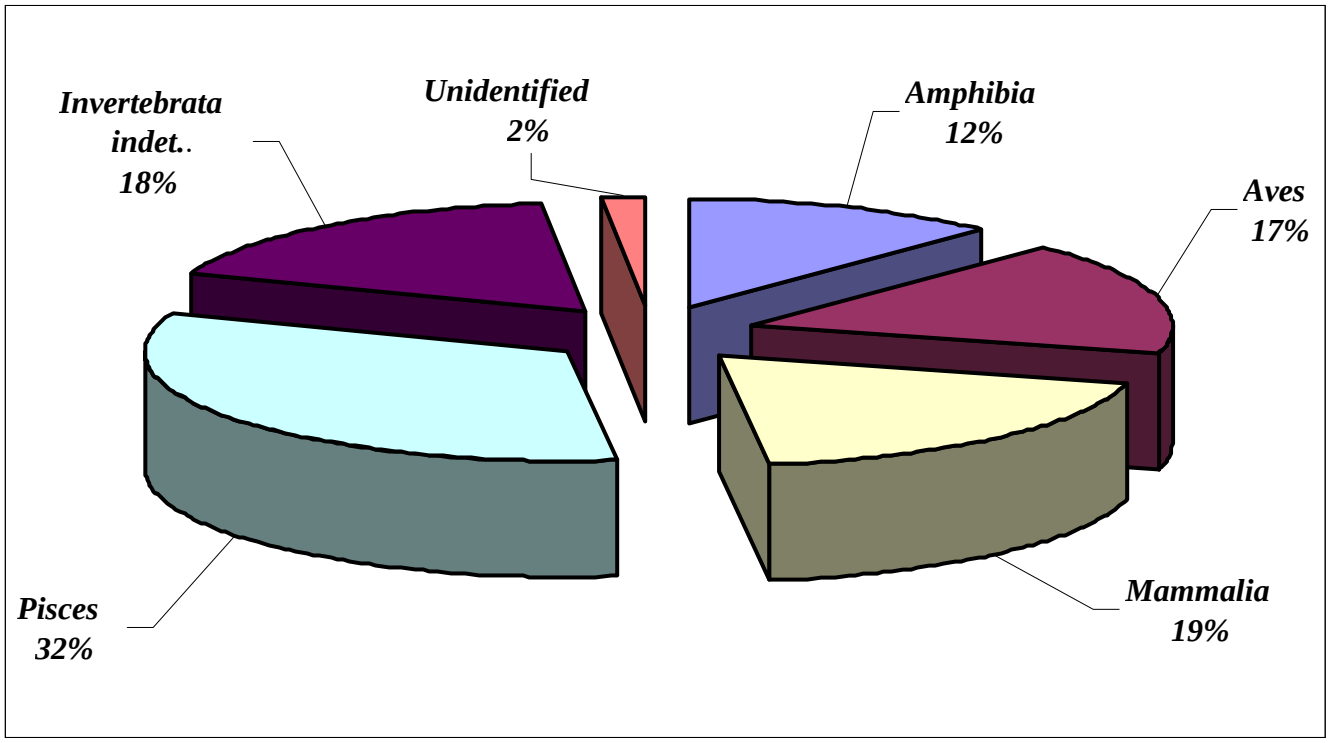
7.2.2. The evolution of Danube's water level (average/decade) at Tulcea Hydrological Station, January 2003- August 2010



7.2.3. The evolution of Danube's water level (average/month) at Tulcea Hydrological Station, January 2003- August 2010



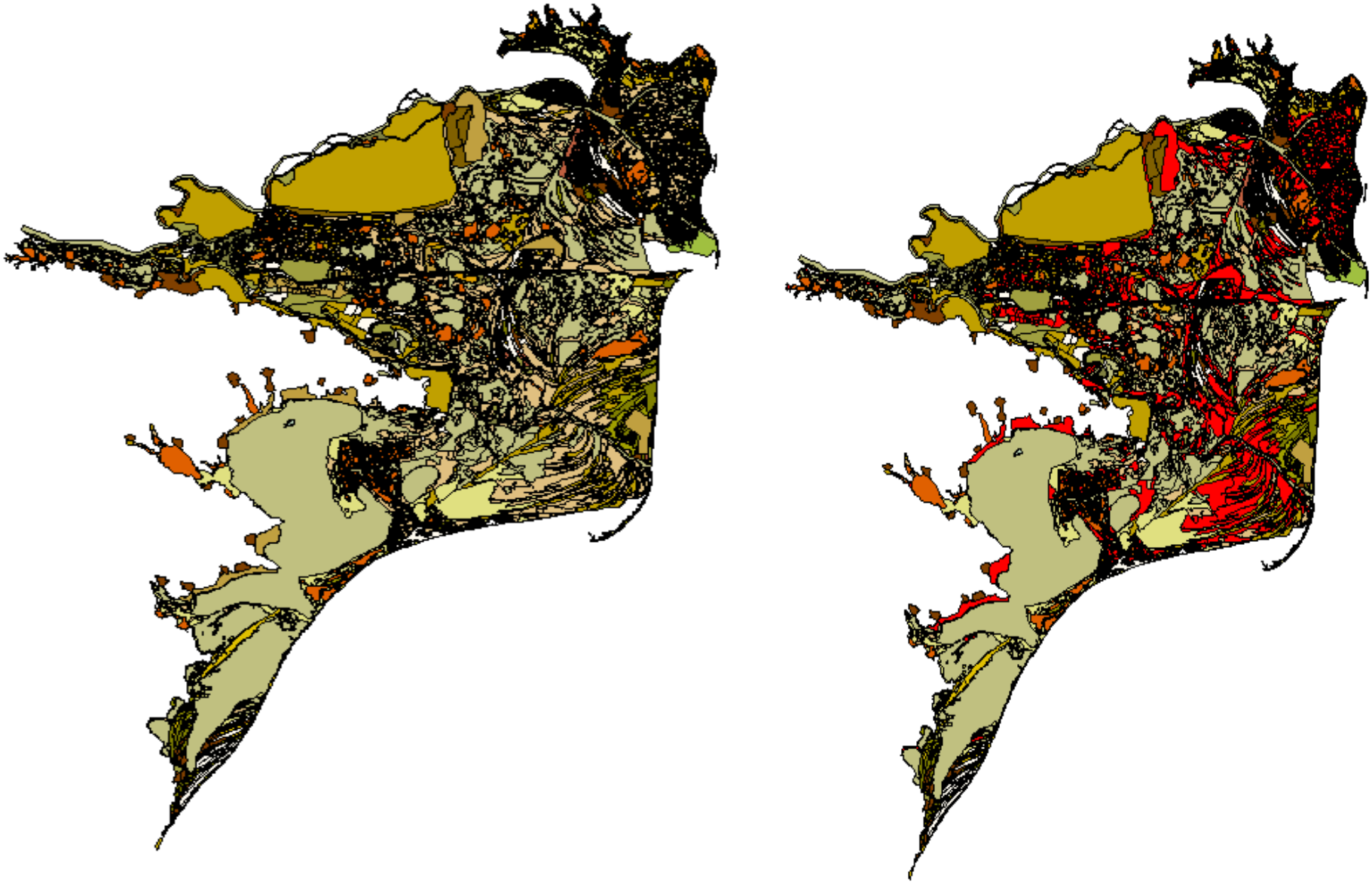
7.3. Annex 3. The main trophic components of the European mink's food (*Mustela lutreola*) applied to DDBR's conditions, based on the samples during 2002 – 2006 (n = 131). The relative frequency.



The analysis of the samples, done within the lab of Agentura Ochrany Přírody a Krajiny ČR, Otter Station Pavlov, Czech Republic, by Lukas Polednik and Katka Polednikova

7.4. Annex 4.

Map of DDBR's habitats (After the Habitats Map of Romania - Doniţă *et al*., 1998) processing by Mihai Doroftei.
In the left part the map of DDBR's habitats, in the right, in red, the habitats of the European mink within DDBR.



Legend for Anexe 4 (*)

* in the map on the right side of the Annex 4, the three habitats below were shaded in red (red shaded areas has the best reflection of the European mink's distribution within DDBR, but not all the habitats are covered, for more details see page 19):

- R5309 Danube communities with *Phragmites australis* and *Schoenoplectus lacustris*;
- R4421 shrubs of *Salix cinerea* with *Rubur caesius*;
- fishponds