

7 ■

Monitoring of European Mink (*Mustela lutreola*) in the Danube Delta Biosphere Reserve – Romania, 2003-2011. Current status and setting of goals for the European Mink conservation

MARINOV Mihai E.^{1,3}, KISS János Botond¹, TOMAN Aleš², POLEDNIK Lukaš², ALEXE Vasile¹, DOROFTEI Mihai¹, DOROȘENCU Alexandru¹, KRANZ Andreas²

¹ Danube Delta National Institute for Research and Development: 165 Babadag street, 820112 Tulcea, Romania

² ALKA Wildlife o.p.s.: Lidéřovice 62, 38001 Dačice. Czech Republic

³ University of Bucharest, Faculty of Biology, Splaiul Independenței, no. 91-95, sector 5, Bucharest, Romania

Address of author responsible for correspondence: **Marinov Mihai E.** – "Danube Delta" National Institute for Research and Development: 165 Babadag street, Tulcea - 820112, Romania; e-mail: mihaimejr@indd.tim.ro

ABSTRACT. The European mink (*Mustela lutreola* L.) is critically endangered. The Danube Delta Biosphere Reserve (DDBR) is one of the last refuges of this species. Within the DDBR the European mink is still widespread as indicated by 74 life captures in a number of expeditions between 2003 and 2011. No American mink (*Neovison vison*), a serious threat to the European mink, were trapped or observed during 2000 and 2011 in the DDBR. Trapping success varied both between years and between trapping areas, but up to know the underlying factors for these patterns are not understood. It may be a combination of generally changing mink densities in the Delta due to food availability or reproduction success and habitat quality as a local factor. In this context we discuss potential limiting factors and outline some aspects for a future management plan of the species.

Key words: DDBR, monitoring, research, captures, European Mink, *Mustela lutreola*, Romania

INTRODUCTION

The European mink (*Mustela lutreola* L.) is one of the most rare and endangered mammals existing on our continent. Between 1988 and 1994 the European mink was declared by IUCN as a *vulnerable* species; between 1994 and 2011, the species was declared as *endangered*. Due to continuing and fast decreasing numbers, in 2011, the IUCN has declared the European mink as *critically endangered* [11].

Habitat destruction, hunting and the impact of the American mink (*Neovison vison*), have generated the collapse of most populations throughout Europe. Besides the Danube Delta, the species remains currently in France and Spain, though the populations are declining. In Russia and the Ukraine, there may be several small populations left, but the situation is quite unclear there due to a lack of systematic surveys ([3]; [5]; [7]; [9]; [11]; [15]; [16]; [17]). Within the last two decades the fragmented populations in Belarus have disappeared (Sidorovich, 2011, *in verbis* in [11]) due to competition and aggression of the American mink. There are evidences that beside the European mink also the American mink occurs in the Ukraine part of the Danube Delta, American mink were evidenced after 2000 close to the town of Izmail [17] (central-western part of the Delta), whereas European mink were found in the very east of the Delta. In Spain, France and Russia the spread of the American mink is currently also considered as the main factor for the decline of *M. lutreola*.

In the Romanian Danube Delta a remarkable population decline was observed in the 1960s, when large-scale transformations of the delta were carried out in order to create land for agricultural purposes etc. which caused large scale habitat destruction. In the same time legal and illegal hunting as well as by-catch trapping in muskrat (*Ondatra zibethicus*) leg-hold traps contributed to the decline of European mink. Increasing prices of fur persuaded a number of professional fishermen to set traps for animals with valuable fur [10]. The population trend may be depicted with caution from the hunting bag statistics. Before 1990 the harvest of furs was a state monopoly. Certainly a part of the furs went on the black market, but the purchasing numbers illustrate a worrying decline in the Danube Delta of some mammals, especially in populations of otter (*Lutra lutra*) and mink. In 1956 3.800 skins of mink were delivered, in 1960 only 2.700 pieces, in 1965 just 1.200, in 1980 only 80 [2].

After 1990 the knowledge of European mink distribution and status went down due to the political, legal and economic transformations of Romania. In 2000 it was unclear if European mink still occur in the DDBR and in addition there were two alarming evidences for American mink one from Somova [4] in the west of the Delta and one from Murighiol in the southeast of the Delta. Hence, the aim of the study was to get some basic data on the occurrence of the European mink and the American mink within the Danube Delta Biosphere Reserve in Romania.

MATERIAL AND METHODS

Due to the fact that it is not possible to distinguish European and American mink by scats and tracks, life trapping was considered essential to identify the species by their remarkable fur color pattern around the mouth. European mink have a white patch which expands to the upper lip, whereas the white patch of the American mink is always restricted to the lower lip and throat and may even be very small or absent. In the last years mink could also visually be observed. Since the life trapping monitoring from 2003 until 2009 indicated just the presence of European, but no American mink within the DDBR, visual observations as well as finding of tracks and excrements were collected from 2009 onwards.

After some searching for tracks and scats in 2000, 2001 and 2002 [8], life trapping started in late February 2003. The end of February and March are considered as the best time for monitoring through life trapping. Mink get more active due to the mating season and food is still scarce before frogs become active. Except the year 2009, catching expeditions took place each year, usually in March.

The traps used to capture are selective, according to Bern Convention's demands. Their dimension is 50 x 16 x 16 cm and are single door cage traps (**Fig. 1**), baited with sardines in vegetable oil (from tins of Moroccan origin). This kind of bait was successfully used previously also in France and Spain. Normally traps were checked in the morning, but in 2010 traps were checked due to high diurnal activity in the morning and evening. The captured animals (**Fig. 2**) weren't anesthetized, but placed in cotton bags, where they were weighed, photographed and sexed. In 2010, when the population density was obviously very high, hair was cut from the tail's tip in order to identify them in the case of recapture. In addition hair samples were taken for genetic analysis [12]. The handling of captured mink lasted between 2-4 minutes; the mink were released at the capture place. Trapping was carried out with up to 41 traps, in different zones within DDBR.



Fig. 1. Selective traps used to capture European Mink in the Danube Delta

RESULTS AND DISCUSSIONS

Distribution

According to the results from trapping and visual observations the European mink may still be considered to occur in most parts of Danube Delta Biosphere Reserve. In some areas no mink were proven, but it remains unclear if this was due to the absence of the species there or failure to prove their presence. Year to year trapping results indicate significant changes in population densities. In addition there are obviously differences in mink numbers due to habitat differences.

In total, 74 mink were captured from 2003 to 2011 (**Fig. 3** and **Table 1**): 2003 – 28 mink; 2004 – 7 mink; 2005 – 0 mink; 2006 – 2 mink; 2007 – 6 mink; 2008 – 2 mink; 2010 – 25 mink; 2011 – 4 mink. No capturing expedition was carried out in 2009. In 2010 two individuals were recaptured, one with a displacement of about 1 km - (capture at the beginning of Dovnica Channel, respectively recapture at Ciamurlia enclosure - and one with capture and recapture in the same place, Ghermandi Channel).



Fig. 2. European Mink captured in March 2010 at Crasnicol Channel, Danube Delta

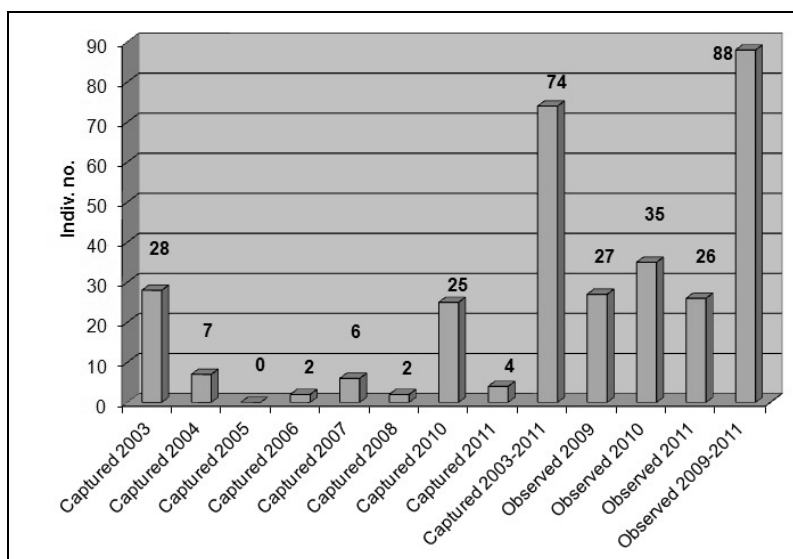


Fig. 3. The monitoring through capturing (2003-2011) and minks observation within DDBR (2009-2011)

Habitat

A review of the European mink remaining habitats shows a high heterogeneity as well as a high adaptability. In France, the European mink is found mainly along the forests of some small water courses [11]. In Spain ([1]; [14]) European mink are observed 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 agricultural land. In Russia and the adjacent area of Belarus, the European mink are respectively were found in the vicinity of lakes of glacial origin and near small and medium rivers, mainly in wooded areas [15]. In Danube Delta, mink are found predominantly in aquatic and reed ecosystems [8]. As a result of the recent research, we found mink also close to human settlements, on the Danube's stone dikes, dams of fishponds as well as in other areas visited frequently and modified by man.

Limiting factors

Limiting factors may act in two ways: either by increased mortality or by decreased natality. Up to now it was not possible to study those factors in the Danube Delta; however it may be worthwhile to discuss here some general aspects under special considerations of the Danube Delta.

Natality is influenced by the condition of the female which itself depends on food. Any factors which may affect the food base will cause changes in the number of born cubs. In addition breeding attempts between European and

American mink have fatal results: The two species cannot produce viable offspring, but any breeding attempt of a male American mink will block the European female for a particular year. Another problem may be caused by the polecat *Mustela putorius*. This species is closely related to the European mink and they may produce viable offspring. In case of very low mink densities breeding with polecat was observed and this may then turn out to accelerate the demise of the mink [5]. However, up to now there are no signs of American mink or polecat populations within the DDBR. Another aspect which may affect natality derives from chemical compounds which reduce fertility. Polychlorinated biphenyls (PCBs) accumulated to a certain level in the body are known to cause reproduction failure in mammals which are piscivorous. This was proven for the American mink and seals and is believed to be a main reason for the European wide decline of otters in the 20th century. Besides PCBs there are other chemical substances which may have such or similar effects on European mink too. The Danube Delta may be prone to such pollutants, because it accumulates pollutants from the entire Danube river basement.

Mortality is generally high within the first months of life, and then it decreases, but will again increase once an animal has passed the zenith of life. Fresh born mink up to independence from their mothers (late summer) are especially vulnerable to any kind of predation. In this respect wild boar and feral pig populations are of concern. They are wide spread and numerous in the Danube Delta. The same is true for feral dogs and cats which are also wide spread and may suffer from hunger and thus are searching for any kind of food in their range. Besides these threats, raccoon dogs (*Nyctereutes procyonoides*) do occur in sometimes high numbers in the Delta. It is not known if this nonnative carnivore from Eastern Asia may affect mink here or elsewhere. In theory raising water levels in the Delta may also kill young mink. The extent of such occasions will depend on the experience of the mother when selecting a natal place. Up to now we have no data which would indicate good or bad mink years due to special flood conditions in the Danube Delta. In contrary, the survival of European mink in the Danube Delta may be taken as an indication that they are very well adapted to this habitat including water level changes. Once mink become independent from their mothers mortality may still be much higher than amongst adult mink. This is due to a lack of experience in context of predators and the acquisition of food. Mink of any age are exposed to be killed by humans. Nowadays the mink is protected by law in Romania, but they may be killed as a by-catch. This may happen when mink enter muskrat traps or when they enter fish traps. Fykes are commonly used throughout the Delta and are believed to be a serious threat both for otters and mink. The extent of by-catch and mink mortality is however not known. A lack of available food is generally considered as a limiting factor in ecology. Unfortunately the diet of mink in the Danube Delta is not well studied. Preliminary diet studies indicate a dominance of fish. This would be in striking contrast to other studies in Western Europe and Belarus and Russia, where *M. lutreola* is specialized on amphibians. However, the mink may be affected by changing prey populations respectively their availability which may be restricted e.g. due to ice cover. In addition to restricted food, disturbance may have similar effects. In the last two decades tourism quickly developed within the Danube Delta and a significant amount of bank lines are covered 24 hours a day for months by recreational anglers. Their presence and the increasing use of noisy high speed boats may prevent European mink from feeding in some areas where food may otherwise be plentiful.

Table 1.

The European mink captured in the Danube Delta Biosphere Reserve during 2003 – 2011

No.	Zone	Sex	Weight (g)	Date	Observations
1	Enisala	M	800	02.03.03	captured alive
2	Downica	M	500	04.03.03	captured alive
3	Dovnica	M	830	05.03.03	captured alive
4	Dovnica	F		05.03.03	found dead in the trap
5	Dovnica	M	810	06.03.03	captured alive
6	Dovnica	M	820	07.03.03	captured alive
7	Dovnica	M	865	08.03.03	captured alive
8	Fortuna	M	1250	10.03.03	captured alive
9	Fortuna	M	1000	12.03.03	captured alive
10	Fortuna	M	1100	13.03.03	captured alive
11	Fortuna	M	900	13.03.03	captured alive
12	Fortuna	M	1150	14.03.03	captured alive
13	Fortuna	M	1150	14.03.03	captured alive
14	Dunavat Channel	F	550	19.03.03	captured alive
15	Dunavat Channel	M	1100	19.03.03	captured alive
16	Dunavat Channel	M	1060	19.03.03	captured alive
17	Dunavat Channel	M	990	20.03.03	captured alive
18	Dunavat Channel	F	450	21.03.03	captured alive
19	Dunavat Channel	F	400	21.03.03	captured alive
20	Dunavat Channel	F	410	21.03.03	captured critically hurt then euthanized
21	Dunavat Channel	F	490	21.03.03	captured alive
22	Uzlina	M		23.03.03	escaped before weighting
23	Uzlina	M	1100	24.03.03	captured alive
24	Uzlina	F	380	24.03.03	captured alive

25	Uzlina	F	480	24.03.03	captured alive
26	Perivolovca Channel	M	890	25.03.03	captured alive
27	Perivolovca Channel	M	620	25.03.03	captured alive
28	Ivancea Channel – Roșu	F	490	04.04.03	captured alive
29	Draghilia Channel	M	950	10.03.04	captured alive
30	Draghilia Channel	M	1050	12.03.04	captured alive
31	Draghilia Channel	M	1025	12.03.04	captured alive
32	Draghilia Channel	M	1025	12.03.04	captured alive
33	Sulimanca Channel	M	800	17.03.04	captured alive
34	Sulimanca Channel	M	840	18.03.04	captured alive
35	Sulimanca - Babina Ch.	M	1050	18.03.04	captured alive
36	Fortuna-Maliuc	M		17.03.06	balance out of order
37	Fortuna-Maliuc	M		17.03.06	escaped without weighting
38	Dranov-Crasnicol	M	950	28.02.07	captured alive
39	Dranov-Crasnicol	M	450	01.03.07	captured alive
40	Dranov-Crasnicol	M	850	02.03.07	captured alive
41	Dranov-Crasnicol	M	850	02.03.07	captured alive
42	Perișor	M	790	05.03.07	captured alive
43	Perișor	M	820	07.03.07	captured alive
44	Sireasa Channel	M	1100	27.02.08	captured alive
45	Sireasa Channel	M	1120	29.02.08	captured alive
46	Crasnicol	M	530	03.03.10	captured alive
47	Crasnicol	M	980	04.03.10	captured alive
48	Canal Crasnicol	M	740	04.03.10	captured alive
49	Litcov Channel	M	940	06.03.10	captured alive
50	Litcov Channel	F	440	06.03.10	captured alive
51	Litcov Channel	F	500	06.03.10	captured alive
52	Litcov Channel	M	972	07.03.10	captured alive
53	Litcov Channel	M	780	08.03.10	captured alive
54	Litcov Channel	F	600	08.03.10	captured alive
55	Litcov Channel	F	420	08.03.10	captured alive
56	Litcov Channel	F	560	08.03.10	captured alive
57	Litcov Channel	M	920	08.03.10	captured alive
58	Dovnica	F	400	17.03.10	captured alive
59	Dovnica	M	840	18.03.10	recaptured next day on Ceamurlia ch.
60	Dovnica	F	500	18.03.10	captured alive
61	Ceamurlia	M	920	18.03.10	captured alive
62	Dovnica	M	900	18.03.10	captured alive
63	Dovnica	F	440	18.03.10	captured alive
64	Dovnica	M	980	19.03.10	captured alive
65	Dovnica	M	820	20.03.10	captured alive
66	Sulina Branch, Mile 9	M	840	21.03.10	captured alive
67	Sulina Branch, Mile 9	F	560	21.03.10	captured alive
68	Ceamurlia	M	800	21.03.10	captured alive
69	Ghermandi	M	780	21.03.10	recaptured next day on the same place
70	Sulina Br – Gârta Vătafu	M	760	21.03.10	captured alive
71	Dovnica	M	1.126	04.03.11	captured alive
72	Dovnica	M	850	05.03.11	captured alive
73	Dovnica	M	950	05.03.11	captured alive
74	Iulia Channel	M	710	08.03.11	captured alive

Conservation management

The discussion of limiting factors above illustrates the dilemma which we face when outlining meaningful management actions. On the one hand we have enough data to realize that the Romanian Danube Delta is the last remaining stronghold of in situ population of European mink. On the other hand we face a significant lack of information on threats and limiting factors [16].

In this context it is of vital importance to increase the knowledge by more pointed research. This should focus on the following aspects: a) annual population monitoring in order to understand population dynamics and to detect any occurrence of American mink; b) study on the predator prey relationship (diet, abundance and availability of prey groups); c) study of habitat use under special consideration of disturbance; d) effect of predators and by-catch as potential limiting factors. Besides these research orientated activities an awareness program should be carried out that local people as well as Romanians in general understand the significance and importance of

European mink conservation and are more willing to accept necessary restrictions being in the Danube Delta. Since the population of European mink in the DDBR is so unique, we also recommend to start an ex-situ breeding program in order to guarantee a minimum population to survive any kind of ecological disaster which may hit in future the Danube Delta.

ACKNOWLEDGMENT. The authors are indebted, for their precious help to Mircea Staraș, Romulus Știucă, Grigore Baboianu, Erika Schneider, Radu Suci, Jenică Hanganu, Ion Munteanu, Titi Ceico, Attila Sandor, Ștefan Răileanu, Oțel Vasile, Ivanov Sorin, Timofei Arsene, Bucur Gheorghe, Băcescu Gheorghe, Cîrpăveche Paul, Anton Gal, Nicolae Iosif, Marilena Condac, Gabriel Lupu sen., Covaliov Silviu, Andi Mihalca, Vaclav Hlavac, Vaclav Beran, Poledníková Kateřina, Francisco Manas, Asuncion Maria Gomez, Petra Hlavačová, Stepan Zapotocny, Tiit Maran and many others.

REFERENCES

1. ALBIZUA (J. Z.), 2006 - Distribution and spatial ecology of semi-aquatic mustelids (*Carnivora: Mustelidae*) in Biscay. 191 p. PhD Thesis. Universidad del País Vasco, Facultad de Ciencia y Tecnología, Dpto de Zoología y Biología Celular Animal. Spania (http://www.carnivoreconservation.org/files/thesis/albizua_2006_phd.pdf)
2. ALMĂȘAN (H.), 1985 - Considerațiuni privind valorificarea resurselor cinegetice ale Deltei Dunării în condițiile menținerii echilibrului ecologic. IN: *Delta Dunării. Studii și comunicări ecologice*, vol. 1, pp. 71 – 76.
3. BRINK (F. H.), 1972 – Die Säugetiere Europas. 110 p. Verlag Paul Parey. Leipzig.
4. CUZIC (M.), MARINOV (M.), CUZIC (V.), 2003 – American mink (*Mustela vison*) – a new mammal species of the DDBR territory. IN: *Analele Științifice INCDDD*, vol. 9, pp. 52 – 54.
5. DAVIDSON (A.), BIRKS (J. D. S.), MARAN (T.), MACDONALD (D. W.), SIDOROVICH (V.), GRIFFITHS (H.), 2000 – IN: *Conservation implication of hybridization between polecats, ferrets and European mink (Mustela spp.). Mustelids in a modern world. Management and conservation aspects of small carnivore: human interactions.* Editat de H.I. Griffith. pp. 153 - 162.
6. DRAGOMIR (N. I.), KISS (J. B.), 1972 - Probleme ale cercetării cinegetice în Delta Dunării. IN: *Simpozionul "Noi orientări în cercetarea cinegetică"*. pp. 58 – 73. Academia R.S.R., Academia de Științe Agricole și Silvicult. București.
7. GOTEA (V.), KRANZ (A.), 2000 - The European mink (*Mustela lutreola*) in the Danube Delta. IN: *Small Carnivore Conservation*, vol. 21, pp. 23 - 25.
8. KRANZ (A.), POLEDNIK (L.), GOTEA (V.), 2002 – Conservation of the European mink (*Mustela lutreola*) in the Danube Delta. Background information and project plan. IN: *Analele Științifice INCDDD*, vol. 8, pp. 124 – 129.
9. KRANZ (A.), TOMAN (A.), KISS (J. B.), 2003 – The European mink in the Danube Delta – Distribution – Habitats – Threats. IN: *International Conference on the Conservation of the European mink – 5 – 8 November 2003*, Logrono – Spania, pp. 24 – 25.
10. KRANZ (A.), TOMAN (A.), POLEDNIKOVA (K.), POLEDNIK (L.), KISS (J. B.), 2004 – Distribution, status and conservation of the European mink (*Mustela lutreola*) in the Danube Delta. IN: *Analele Științifice INCDDD*, vol. 10, pp. 38 – 44.
11. LODE (T.), CORMIER (J. P.), JACQUES (D.), 2001 - Decline in endangered species as an indication of anthropic pressures: the case of European Mink *Mustela lutreola* western population. IN: *Environmental Management*, vol. 28, 4, pp. 727 - 735.
12. MARAN (T.), SKUMATOV (D.), PALAZÓN (S.), GOMEZ (A.), PÖDRA (M.), SAVELJEV (A.), KRANZ (A.), LIBOIS (R.) & AULAGNIER (S.), 2011 - *Mustela lutreola*. In: IUCN 2011. IUCN Red List of Threatened Species. Version 2011.2. <www.iucnredlist.org>. Downloaded on 29 February 2012.
13. MICHAUX (J. R.), HARDY (O. J.), JUSTY (F.), FOURNIER (P.), KRANZ (A.), CABIA (M.), 2005 – Conservation genetics and population history of an threatened European mink *Mustela lutreola*, with an emphasis on the west European population. IN: *Molecular Ecology*. 10.1111/j.1365-294X.2005.02597.x.
14. PALAZON (S.), RUIZ-OLMO (J.), 1998 – A preliminary study of the behaviour of the European mink *Mustela lutreola* in Spain, by means of radio-tracking. IN: *Symp. Zool. Soc. London*. Cambridge University Press, vol. 71, pp. 93 – 105.
15. SIDOROVICH (V.), 1997 - Mustelids in Belarus. Evolutionary ecology, demography and interspecific relationships. 263 p. Zolotoi uley publisher Minsk.
16. STUBBE (M.), 1993 - *Mustela lutreola* (Linne, 1761) - Europäischer Nerz. IN: *Handbuch der Säugetiere Europas*. pp. 627 - 653. Aula Verlag. Wiesbaden.
17. YOUNGMAN (P. M.), 1982 - Distribution and systematics of the European mink *Mustela lutreola*. IN: *Acta Zoologica Fennica*, vol. 166, pp. 1 - 48.

Manuscript received: February 10th 2012

Manuscript revised: March – April 2012

Corrected version of the manuscript accepted: June 2012

Printed: September 2012