

Recovery of *Mustela lutreola* in Estonia: captive and island populations  
Project N° LIFE2000NAAT/EE/7081

# FIRST PROGRESS REPORT

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WITH PAYMENT REQUEST

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## INTRODUCTION

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The three-year EU LIFE programme project LIFE2000NAT/EE/7081 entitled “Recovery of *Mustela lutreola* in Estonia: captive and island populations” was launched in September 2001. The project is run by holder non-profit nature conservation foundation “LUTREOLA” and by two partners: Tallinn Zoo and Hiiumaa Protected Areas Administration (successor of West-Estonia Archipelago Biosphere Reserve Hiiumaa Centre). Both partners act also as co-financers. In addition to them project has two more co-financers: Stichting Dierentuinen Helpen (Zoo Help; the Netherlands) and Centre Environmental Investments (Estonia).

The objective of the project is the following:

Ensuring the survival of *Mustela lutreola* in Europe and its recovery in Estonia – establishing viable captive and island populations of the species: (1) to establish, on the basis of the already existing breeding stock in Tallinn Zoo (Estonia), a viable captive population maintaining 90% of genetic diversity of the species for 25 years at least; (2) to establish a second viable island of *Mustela lutreola* in Estonian island Saaremaa in accessible to *Mustela vison*; to prepare a management plan for already established *Mustela lutreola* population in Hiiumaa Island. In the course of the project in 2001/2002 the action C1 has been modified (see page 12) and thus consequently also the objective. It now includes also further establishment of wild population in Hiiumaa Island.

The first year of the project has been mostly devoted to preparatory actions, but still some good results have been obtained from point of view of overall objectives. The report provides a review of actions undertaken, the current status of every action, the results obtained and problems met. It also shares light to some complications likely to arise and proposes ways to come over these within next years of the project.

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## SUMMARY

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The report covers a period of 01.09.2001 – 15.09.2002 of the project LIFE2000NAT/EE/7081 entitled: “Recovery of *Mustela lutreola* in Estonia: captive and island populations”. According to the initial project documentation it consisted of 8 actions. The results of action A2 revealed the irrelevance of action C1 and the project was modified after permission from European Commission by cancelling action C1, but adding the additional release (and post-release monitoring) of *Mustela lutreola* in Hiiumaa Island to action C3 and by adding financial support to action D1 (additional funding for feeding of mink).

The following results have been obtained in 01.09.2001 – 15.09.2002:

- ACTION A1 on Construction of infrastructure for the special breeding facility is fully completed, except of furniture and technical devices for shelter. **Project manager request for permit to postpone sub-action to install a security system for breeding facility.**
- ACTION A2 on detailed field survey in Saaremaa is fully completed, except the public presentation of results in Saaremaa. Main results: there is no viable populations of *Mustela vison* in Saaremaa; minimum 150 – 300 *Mustela lutreola* may persist in Saaremaa; released *Mustela lutreola* does not pose threat to local populations of *Astacus astacus*; very high number of *Vulpes vulpes* complicates the release of *Mustela lutreola*; low abundance of amphibians will cause a shift in *Mustela lutreola*'s diet.
- ACTION A3 preparation of management plan for Hiiumaa is in progress. The subcontracts have been concluded with experts to get update picture on the status of resources for *Mustela lutreola* in Hiiumaa and on the management background for maintenance of establishing *Mustela lutreola* population in favourable conservation status
- ACTION C1 postponed
- ACTION C2 preparation of *Mustela lutreola* for release is progress. The initial training and release scheme has been changed due to the moderate results achieved with release in 2001. The animals released in 2002 in Hiiumaa have been preconditioned according to new scheme. The results of spring release evidence that the new approach is successful
- ACTION C3 on release of *Mustela lutreola* in Saaremaa (and Hiiumaa) and post release monitoring is in progress. 39 individuals were released in spring 2002: 15 males and 24 females (half of them pregnant). 12 females were radio collared. The results of the release: no difference in survival of pregnant and non-pregnant

females, release with nest-boxes keeps animals close to water; at least three litters born from pregnant females in the wild. In September additional 15 (9.7) animals were released in Hiiumaa Island.

- ACTION D1 on husbandry and conservation breeding in breeding facility is progress. 62 young were born in 2002. The neonate death rate was 0%. In addition, 12 females were mated for release. The total population in breeding facility was 112 animals (as of 15.09.2002). The overall genetic and demographic parameters of the population have improved:  $\lambda = 2,0886$ ; No of Founders=21; Gene Diversity=0,9582; Inbreeding Coefficient= 0,014. The large-scale release of mink may jeopardize the genetic status, as valuable genes will be flushed out from Tallinn stock. Actions have been foreseen to avoid it.
- ACTION F1 on overall project management is in progress. The contracts with partners have been concluded with project manager, accounting assistant, coordinators of field activities and captive breeding. Also the contracts have been concluded with partners. Number of actions has been performed for informing public about the project and *Mustela lutreola* conservation. Since spring 2002 a species website for *Mustela lutreola* has been launched with special pages describing the project – [www.lutreola.ee](http://www.lutreola.ee).

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## A PREPARATORY ACTIONS/MANAGEMENT PLAN PREPARATION

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### A.1. CONSTRUCTION OF THE INFRASTRUCTURE FOR THE SPECIAL BREEDING FACILITY FOR *MUSTELA LUTREOLA* AT TALLINN ZOO

#### EXCPECTED RESULTS

The action was designed to improve the quality of the breeding facility, especially the requirements of husbandry and animal keepers. Because of that the following actions were foreseen:

1. Installation of stationary water (deadline 04.04.2003).
2. Waste water system (deadline 06.06.2003).
3. Installation of stationary electricity instead of temporary used so far (deadline 06.03.2002).
4. Installation of shelter with rooms for keepers (25.08.2002).
5. Installation of security system (15.12.2002).

According to the project description all these actions were the responsibility of the partner– Tallinn Zoo.

#### ACTIONS PERFORMED

1. **Installation of stationary water (deadline 04.04.2003) and waste water system** (deadline 06.06.2003).

Status: COMPLETED

Construction of stationary water and waste water system was performed jointly. Price offer was taken from three companies and Tallinn Zoo subcontracted for this purpose Jarhan Ltd. Still, part of the preparatory work was performed by Tallinn Zoo technical staff. The construction started in early spring (March) and ended in July.

New system provides water both for keepers and for husbandry of animals in warm and cold seasons. The wastewater system leads to the city wastewater system.

Additional action: As the breeding facility is set up in relatively low location, the ground is damp and high level of water in spring and autumn often causes husbandry and maintenance problems. Due to the fact that the land-reclamation work was relatively easy to perform along with digging canals for water pipes, it was decided to

undertake additional work and the dig canals also for land-reclamation pipes. Performance of this action allows easier development of the breeding facility in the future.

2. **Installation of stationary electricity instead of temporary used so far** (deadline 06.03.2002).

Status COMPLETED

There was some delay with the start of the installation of the electricity system due to some unexpected technical findings in the preparatory phase, which required changes in the initial plan. The price offer was asked from three companies and Tallinn Zoo subcontracted for this purpose AKO Elekter Ltd. Part of the preparations were performed by Tallinn Zoo. The new permanent lines provide the facility with sufficient amount of electricity for maintaining our captive stock of *Mustela lutreola*.

3. **Installation of shelter with rooms for keepers** (25.08.2002).

Status: COMPLETED

For optimum ratio of price and quality three companies selling new and old construction shelters were contacted and the price offer was asked. From those a company “EHITUSTOORIIST Ltd” was selected. This company offered an old Scandinavian-type shelter (3,4 x 6,2m) consisting of two rooms: rest room for keepers and the maintenance room. The latter contained the toilet, shower, boiler, sink, cloths-drier and lockers for keepers’ cloths. Although the shelter was old, the company renovated it in perfect manner. Also, the company provides 1-year warranty to the shelter – both to construction and the technical devices in it.

The shelter was delivered to the breeding facility 19.06.2002. Thereafter Tallinn Zoo was connecting the water and electricity, though small delay occurred due to the other urgent activities in Tallinn Zoo, where the technical stuff was urgently needed. Still, the shelter was ready for keepers for the end of August.

As of 30.09.2002 the shelter still misses the kitchen installation and furniture, but the search for suitable items is already underway.

4. **Installation of security system** (15.12.2002).

Status: **UNCOMPLETED - WISH TO POSTPONE THIS ACTION AND TO SUBSTITUTE WITH ENCHANCEMENT OF THE BREEDING FACILITY**

The security is of utmost importance when dealing with so rare and endangered species as *Mustela lutreola*. The impact of accidental burglary and vandalism could have fatal impact to the overall conservation effort. Therefore this action was included to the project.

However, since the writing of the proposal in 1999 more than two years has passed and the overall security situation inside Tallinn Zoo has improved remarkably. Right now 8 internal police has been employed by Zoo. They patrol the territory (including the off-display breeding facility) every fourth hour with dogs. There has not been any significant burglary or vandalism in Tallinn Zoo since three last years.

Once we started the preparatory actions for installation of the security system and consulted security systems about the details and best ways to do it we faced complications not identified during the earlier consultations with the companies. Namely number of animals are free-ranging in the territory of Tallinn Zoo like *Capreolus capreolus*, *Martes martes*. These animals tend stay close to our facility and even move on the territory of the facility. As most of the security systems applicable to our situation use photo-sensors, the free-ranging animals, but also falling leaves will cause such a number of false alarm calls which makes the security system practically unusable.

Both the overall safety gained in Tallinn Zoo within last years and complexity of installation of automatic the security system have led us to the conclusion that the cost-effectiveness of installing the system might be highly questionable. THEREFORE WE REQUEST A PERMIT FROM COMMISSION TO CANCEL THIS ACTION AND TO USE THE FUNDS ALLOCATED FOR SECURITY SYSTEM FOR THE FURTHER ENHANCEMENT OF THE BREEDING FACILITY – renovation of enclosures and the old shelter for keepers.

## **A.2. DETAILED FIELD SURVEY OF THE DISTRIBUTION OF *MUSTELA VISON* IN SAAREMAA AND THE AVAILABILITY OF HABITATS/FOOD RESOURCES FOR *MUSTELA LUTREOLA* IN SAAREMAA**

### EXPECTED RESULTS

1. Report including
  - a. distribution map of *Mustela vison*
  - b. plan for removal of *Mustela vison*
  - c. distribution map of suitable habitats for *Mustela lutreola* in Saaremaa

The results of the survey have to be incorporated to the 1<sup>st</sup> Progress Report.

### ACTIONS PERFORMED

Status: COMPLETED



In 25<sup>th</sup> of October 2001 a meeting was held in Saaremaa with local nature conservation authorities. The results of this meeting convinced us on the **need of adding some additional aims to the planned survey**. Namely, authorities expressed the concern of some local inhabitants think that the re-introduction of the *Mustela lutreola* in Saaremaa might have a negative impact to local *Astacus astacus* population. As the good population *Astacus astacus* is traditionally regarded as “species of national pride” among the inhabitants of Saaremaa, the concern of local people, though not scientifically substantiated, was fully understood by us. Therefore, the final list of objectives for survey is following:

1. Availability of suitable habitats for European mink in Saaremaa – Will it be enough for maintaining viable population of *Mustela lutreola* in Saaremaa?
2. Presence and distribution pattern of *Mustela vison* in Saaremaa: best methodology for and feasibility of removal operation?
3. Presence of other carnivores in Saaremaa as possible threat for success of release operation.
4. Evaluation of possible impact of released European mink to the local *Astacus astacus* population.

Two long sessions of fieldwork were conducted: 09. - 19.12.2001 and 17.02. – 03.03.2002. Besides that the results from two short pilot expeditions in 1999 –2001 and from additional two-day expedition in summer 2002 were used in analyses and drafting of final report.

Dr. Vadim Sidorovich was invited from Zoological Institute at Belarussian Academy of Science to supervise and consult the data collection during field expeditions. Madis Podra, coordinator of the field activities was attending the expeditions full time, Tiit Maran, the project manager, visited the expeditions every now and then.

The data of the survey was entered into Access-based database. Tiit Maran performed the analyses and the results were compiled into report. The report will be passed the local nature conservation authorities in Saaremaa, but also a meeting is planned to hold at the end of the year in Saaremaa to introduce the results for all interested stakeholders.

Main results and conclusions of the survey:

- **The *Mustela vison* does not inhabit the island**, though single specimen (most likely invaded from mainland) has been reported every now and then. The only realistic explanation is that these single migrants are not able to give start to viable population and just cease slowly by natural reason.
- By most conservative estimate the **minimum carrying capacity of the island is 150 – 300 animals** That is more than the size of minimum viable population.

- **The *Mustela lutreola* is not likely to have any detrimental effect to the local *Astacus astacus* population.** In fact, it is most likely that the effect will remain to insignificant level so that it could even not be observed.
- **Exceptionally high number of *Vulpes vulpes* (~8000 animals) in Saaremaa poses serious threat to release of *Mustela lutreola* in 2004.** That is because according to the results in Hiiumaa the main cause of mortality of released mink is the predation by *Vulpes vulpes* and feral dogs.
- **Low number of amphibians (especially *Rana temporaria*) in Saaremaa will probably cause a shift in the traditional diet of *Mustela lutreola* in Saaremaa.** The missing part of amphibians is likely to be replaced with *Arvicola terrestris* (numerous in Saaremaa) and with fish.

The overall conclusion: **THE RELEASE OF EUROPEAN MINK IS A REALISTIC PLAN AND HAS AT LEAST THE SAME LIKELYHOOD TO MEET SUCCESS AS THE OPERATIONS UNDERTAKEN IN HIIMUMAA ISLAND**

### **A.3. PREPARATION OF MANAGEMENT PLAN FOR *MUSTELA LUTREOLA* IN HIIMUMAA ISLAND**

#### EXPECTED RESULTS

1. Management plan (deadline 06.06.2003)

#### ACTIONS PERFORMED

Status – IN PROGRESS

The responsibility to prepare the management plan lies with the Administration of Protected Areas (APA) in Hiiumaa (the successor of the Hiiumaa Biosphere Reserve; see page 21 for details). The provisional meeting on the content and the working plan was held in May 2002. It was decided that the management plan should consist of three principal parts: background data, management data and the action proposed to conserve the species. The first part should mainly focus in compiling a set of update data on availability of food and habitat resources. Second part should identify the main threats for survival of *Mustela lutreola* in the island and the possible conflict areas with various stakeholders. Third part should provide the list of actions for maintenance of *Mustela lutreola* in favourable conservation status in Hiiumaa Island including also identification of core areas for special areas for conservation in NATURA 2000.

The actions for preparation of the plan were started in July. APA subcontracted Estonian experts to review the status of the crayfish and the fish populations in Hiiumaa rivers. The field expeditions were completed for mid-September, but the final reports will be prepared by experts for the beginning of 2003. Their reports will not only provide data on the status of the resources, but will also include the proposals how to improve their quality.

The amphibians are important food resource for *Mustela lutreola* therefore it is of utmost importance to have a good understanding on the status of the amphibian populations in Hiiumaa. However, this appears to be not easily achievable because of lack of reliable methodology to survey/monitor amphibians. Still, we have collected data on the spawning sites of amphibians in Hiiumaa and also checked most of the known mink habitats and estimated their quality from point of view of availability of amphibians. In summer, during the driest season these sites were revisited and the water level in the spawning ponds were checked to reveal the part of the pond actually producing frogs. Furthermore, in August we had a one-day field meeting in Hiiumaa with amphibian restoration specialist Lars Briggs (Amphi Consult, Denmark) and we agreed in further collaboration in the frame of preparation the management plan. Our collaboration should result in recommendations how to restore the spawning sites in Hiiumaa for *Rana temporaria* and *Rana arvalis*, but also in some 5 restored model sites in Hiiumaa in most critical locations.

We have agreed also in some work to collect management data. Principle agreement has reach to study the history of watercourses in Hiiumaa (as a background data to show the extent of modifications in water courses undertaken in the history) and analysis of legislation from point of view of keeping *Mustela lutreola* in favourable conservation status in Hiiumaa Island. Experts for these studies will be subcontracted at the end of 2002.

Our own judgement is that the preparation of the management plan is in schedule and it will be provided to the Ministry of Environment for acceptance in time.

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## C NON-RECURRING MANAGEMENT

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### C.1. REMOVAL OF *MUSTELA VISON* FROM SAAREMAA ISLAND

Status: MODIFIED AND DIVIDED BETWEEN ACTIONS C3 AND D1

Our survey performed under action A2 revealed that there is no viable population of *Mustela vison* in Saaremaa. That made the rationale of action C1 irrelevant and in our letter to European Commission (from February, 27. 2002; text of letter in Annex 1) we requested a permit to modify the action so that part of the funds will be used for additional release and monitoring acclimatization of *Mustela lutreola* in Hiiumaa (as a new activity in Action C3) and for additional funding of action D1. European Commission accepted our request with the letter from August 19, 2002 (copy of the letter in Annex 2).

Actions undertaken under this modification are reviewed as part of actions C2 and D1 respectively.

### C.2. PREPARATION OF *MUSTELA LUTREOLA* FOR RELEASE IN SAAREMAA ISLAND

EXPECTED RESULTS (Deadline 30.04.2004)

1. Animals prepared for release. They are trained in human avoidance, predator avoidance, prey catching and swimming/diving. Samples of DNA are taken, animals are equipped with microchips and vaccinated against rabies, some of the animals are radio-collared and they are treated against parasites.

ACTIONS PERFORMED

Status: IN PROGRESS

Initially this action was planned to precede immediately the release of the *Mustela lutreola* in Saaremaa in 2004. Yet, with the modification of actions (see under action C1) and with inclusion of action for additional release of animals in Hiiumaa (as a part of action C3) the performance of part of the action earlier seemed reasonable. That is because the animals to be released in Hiiumaa needed training as well and testing with new training methodology before release in Hiiumaa will help also to fine-tune the preconditioning for Saaremaa release.

Responsibility of this action lies in most part with Tallinn Zoo; only some minor actions were the responsibility of foundation “LUTREOLA”.

In February 2002 Tallinn Zoo bought 300 Trovan microchips, which should be a sufficient quantity for use in captivity as well as in the wild. In March, Thoiry Zoo (France) donated for the project the microchips reader, which makes the work with the microchips in the field much easier. So far the reader from Tallinn Zoo was used for this purpose, but this device could be moved from zoo only for a short periods.

As the post-release monitoring in March 2002 indicated that only 6 - 9 individuals of 41 animals released in 2001 survived and all the them were males (released females tend to have much higher mortality than males), we decided that the overall methodology of release (including the preconditioning) has to be revised and that in 2002 and 2003 new approaches have to be tested to increase survival of released animals. Yet, it has to be admitted that, from first glance surprisingly the high mortality of released animals is fully logical from biological point of view. According to our data from previous years the survival is 30 – 70% during adaptation period (~ 1 month). This combined with the level of yearly natural mortality of ~50% (estimate, no actual figures available) will result in a very high overall mortality leaving too few potential breeders to the wild for the next breeding season. Keeping this in mind, we decided that our preconditioning must be reshaped to increase the likelihood for survival. As the “bottleneck” seems to be females with higher mortality we decided to focus our actions mostly on them.

The following methodology was used for preconditioning and release in 2002:

1. Training of animals to catch the prey (fish, mice, amphibians) to be continued as before. Each animal was provided a repeated opportunity to catch all main types of prey.
2. For training of human avoidance the walls between the husbandry corridor and enclosures to were covered with plywood to reduce the eye contact with keepers. The keepers minimized their presence in part of facility with release animals.
3. For improvement of the predator avoidance training the usual training with dogs was supported with concurrent replay of *Mustela lutreola* alarm calls from midiplayer. The alarm-calls will be recorded earlier in the facility during aggressive encounters of mink.
4. As animals kept in large apart-standing enclosures with natural interior seemed to be doing better in the wild than animals from standard enclosures, we decided to build apart from standard breeding modules three additional large enclosures with natural interior. The idea behind of these enclosures is to put special emphasise in preparing some females particularly well and concurrently compare the impact of larger enclosures for the success of release. The construction of these enclosures was completed only in August, so they will be first time used in 2003 releases.
5. Release of pregnant females. In case of success the release of pregnant females will reduce the time until the potential birth of young in the wild, thus decreasing

also the mortality rate before the breeding season in the wild. We hoped that this would provide an opportunity to reduce the effect of overall mortality and to quickly increase wild-born animals. Yet, there is a danger that pregnant females might have higher mortality than non-pregnant. To find the difference in survival of pregnant *versus* non-pregnant females, it was decided to release equal number of pregnant and non-pregnant females.

6. According to our belief the high level mortality during adaptation period is in largely caused by animals leaving from riparian zone and moving through other, often highly unsuitable for them habitats. That will make them an easy prey for other carnivores (e.g. fox and feral dogs). To reduce likelihood of animal movements off from riparian zone, we decided to make special nest-boxes for all females selected for release. Their enclosures will be equipped with these nest-boxes appr. one month before release to allow mink to get used to them. Then the animals will be transported to Hiiumaa in the same nest-boxes and the nest-boxes will be buried to the bank of watercourse with animal inside. Thereafter the door of the enclosure will be opened and the animal can merge from the nest-box surface through special pipe leading close to the water. The rational behind this scheme was providing to the animals its own nest box in the new and strange environment might reduce the likelihood of unwanted migrations.

Appr. a month before release 12 females were equipped with radio-collars. The DNA sample was taken from all animals and also the animals were equipped with microchips.

The animals were vaccinated and treated against parasites according to standard routine in Tallinn Zoo.

7. It was decided to start also with autumn releases in September. The rational behind the autumn release is that this will reduce the costs of maintaining the surplus animals in captivity and at the same time will increase animals in the wild thus also increasing the likelihood survival higher number of animals until next breeding season. Also, according to our observations, the young tend to adapt to captivity and humans only after separation from mother. Before that the mother seems to be a mediator of the outer conditions to the pups. Therefore, it is likely that the young animals taken for release from mother just before the usual separation time are likely to have higher survival than those being separated and maintained in captivity for a while.

### **C.3. RELEASE OF *MUSTELA LUTREOLA* IN SAAREMAA ISLAND AND POST-RELEASE MONITORING<sup>1</sup>**

#### ACTION FORESEEN

1. Release of mink in spring and autumn
2. Post release monitoring of spring release
3. Final monitoring with snow and live-trapping in early spring 2002

#### ACTIONS PERFORMED

Status: IN PROGRESS

In late April and early May 39 *Mustela lutreola* were released in Hiiumaa (list of released animals in Annex 3). The selection of animals was made after analysing the genetic and demographic status of captive stock with various programmes included on software packages SPARKS (Gene and Demog) and Population Management 2000. The main principle of selection was that withdrawal of animals for release must have minimum negative impact for genetic and demographic quality parameters of captive population. Still, it has to be admitted that large-scale release of animals will have some impact to the all-European captive population. That is because the most valuable genes are kept in Tallinn Zoo. With removing animals from Tallinn population will flush out valuable genes raising the proportion of low-value genes kept in other zoos in Europe (e.g. EURONERZ, Germany). The decrease of the genetic diversity of captive population is of greatest concern and will be addressed in 2003. The most likely solution is the attempt to get more founders from Russia and to release the animals of low genetic value from the breeding facilities in Europe.

The sex ration of released animals was 15:24. Half of the females were pregnant and half of them (6 pregnant and 6 non-pregnant) were equipped with radio-collars (UK company BIOTRACK Ltd.). Pregnant females were released appr. 1 – 1,5 weeks after mating.

The criteria of site selection for release were the abundance of amphibians (occurring in high number and easily available for mink in spring) or other prey, but also availability of shelter in riparian area. All the females were released with nest boxes. The males were released according to standard hard release methodology.

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<sup>1</sup> With modification permitted with letter from European Commission from August 19, 2002 this action will also include the additional release and post-release monitoring in Hiiumaa.

The release was performed by coordinator in the field Madis Podra and project manager Tiit Maran. The animals were prepared for release by coordinator in captivity Merje Polma, project manager Tiit Maran and animal keepers.

The animals equipped with radio-collars were radio-tracked for two month. During the first month the location of animals were fixed once or twice a day, during the second month every second day. Unfortunately radio-collars created continuous problems as animals very often lost them. That is partly because of poor design of the collar and partly because the captive animals loose a lot of weight during the first weeks in the wild.

The results of the post release monitoring are compiled to Annex 3.

As the table indicates we could monitor only one of the radio-tagged mink in until the birth and the age when young start to move around.

As the mating dates of released pregnant mink were known for us, we could estimate very precisely time of birth in the wild. Yet, we were very cautious NOT to go close of pregnant females right after the birth. That is because according to experience with captive animals the female is likely to eat its young if disturbed immediately after delivering the young. The first attempt to check for litter was done only when the young were assumed to be of 1.5-month age – the time when they start to move around with mother. In 18.07.02 we radio-tracked the only pregnant female with collar and taking every possible precaution approached to its nest. After careful listening we could here the typical clucking sound mother is emitting when communicating with pups.

To find evidence about the young born from pregnant females in the wild we were looking for tracks in riverbeds. The exceptional draught in 2002 in Estonia made this job easy for us, as everywhere there were lots of muddy areas in riverbeds perfect for identifying the tracks. We found the tracks of female with cubs in two (or even three) streams.

**That means that all in all minimum three pregnant females delivered young in the wild and the pups survived at least to the age of 1 – 2 month.**

In short, the results of spring release are the following:

- The mortality of released animals 30 – 70 %
- We did not observe any significant difference in survival of pregnant *versus* non-pregnant females. Pregnant females even survived more, but this is probably due to the small sample size.
- Half of the females stayed close to nest-box for a month (that is the adaptation period).
- At least three litters were born in the wild and they survived after 1,5 to 2 month age, when we observed the signs of their activity in the wild.



Although the overall success of release can only be judged after winter, we still think that there is a reason for cautious optimism and we may proceed with the same methodology in 2003.

In September additional 15 (9 males and 7 females) animals were released in Hiiumaa. The result of this release can only be evaluated during monitoring in spring 2003

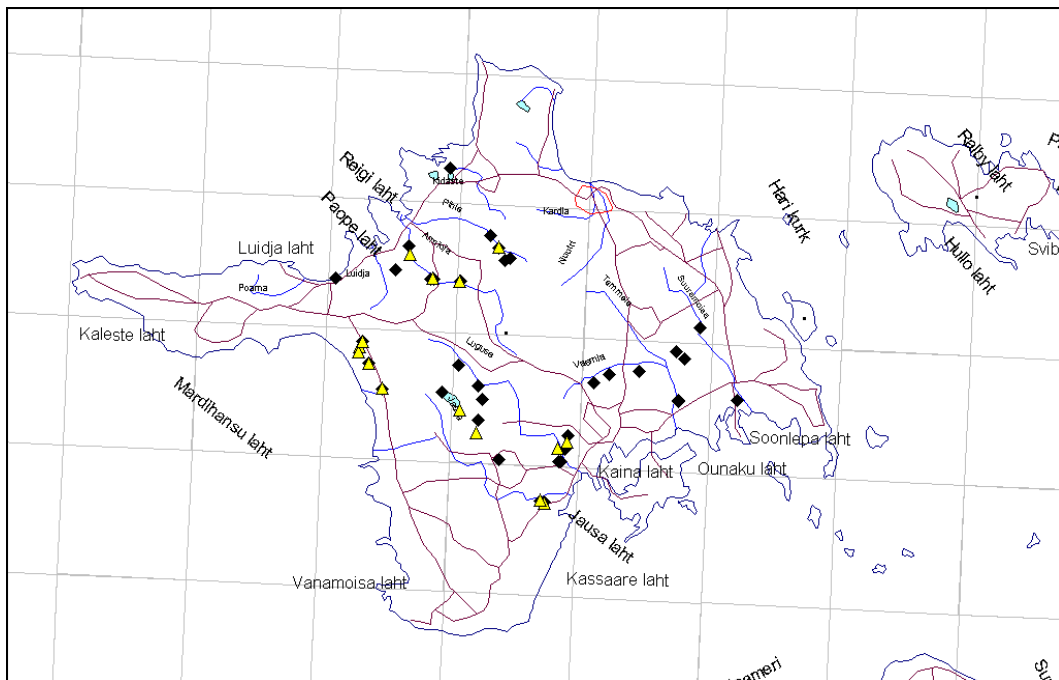


Figure 1. Sites of release of *Mustela lutreola* in Hiiumaa in 2002: black rout- release sites in spring; grey triangle - release sites in autumn

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## D RECURRING MANAGEMENT

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### D.1. HUSBANDRY AND CONSERVATION BREEDING OF *MUSTELA LUTREOLA* IN SPECIAL BREEDING FACILITY AT TALLINN ZOO (ESTONIA)

#### EXPECTED RESULTS

1. Low level of mortality in captive stock
2. Good breeding results
3. Good physical condition of mink in breeding facility
4. Good demographic and genetic parameters of the captive population

#### ACTIONS PERFORMED

Status: IN PROGRESS (CONTINUOUS ACTION)

The breeding in 2002 was performed according to plan prepared in January. Considering the capacity of breeding facility and the intentions to release animals in Hiiumaa, but also the genetics and demography of captive population in Tallinn Zoo as well as in elsewhere in Europe we decided to mate 17 females for conservation breeding. With the breeding success of 65% (like in 2001) the outcome was estimated to be around 40 –42 young.

The actually breeding was slightly higher reaching 62 young (Annex 4). The higher number of young was caused by exceptionally large litter sizes in 2002.

The neonate’s death rate (death in 30 days after birth) was 0%. All in all 7 animals died in 2002 (Annex 5) because of various, but common reasons in captivity.

In addition of mating performed because of the needs of conservation breeding, 12 females were mated for release.

The overall number of *Mustela lutreola* in Endangered Species Centre at Tallinn Zoo was 112 as of 15.09.2002 (Annex 6)

The overall genetic and demographic parameters of the populations and change from 2000/2001 to 2001/2002 are provided in table 1. The definitions for parameters used in table 1 are provided in Annex 7.

Table 1. Demographic and genetic parameters of *Mustela lutreola* captive population at Tallinn Zoo

<b>Demographic parameters</b>	<b>2000/2001</b>	<b>2001/2002</b>
<b>males</b>		
Population Growth Rate	1,6835	2,0886
Mean Generation Time	2,65	0,77
<b>females</b>		
Population Growth Rate	1,6969	2,0886
Mean Generation Time	1,26	0,77
<b>Genetic parameters</b>	<b>2000/2001</b>	<b>2001/2002</b>
Founders	19	21
Potential founders	2	1
Living descendants	102,31	101,42
Percent known	97,4	96,6
Gene Diversity	0,8966	0,9342
Potential Gene diversity	0,9544	0,9582
Gene Value	0,8935	0,9278
Founder Genome Equivalents	4,84	7,60
Potential Founder Genome Equivalents	10,98	11,96
Founder Genome Surviving	8,90	10,88
Potential Founder Genome Surviving	10,98	11,96
Mean Inbreeding Coefficient (F)	0,0318	0,0140

As is evident from table 1, the demography of the captive population has developed and the capacity to reproduce in population is better than in 2000/2001. However, the mean generation time has decreased, which in principle shows the quicker rotations of generations and, thus, also high danger of flushing out genes. Yet, the decreased mean generation time is caused by need to produce high number of young for release purpose and cannot be avoided in current stage of the project. Also, arbitrary lengthening the generation time might be a dangerous given the very short reproductive life-span of *Mustela lutreola* females - 3 - 4 years.

The genetic parameters of captive population have improved remarkably. That is mostly cause by contribution of the potential founder to the overall genetic pool of the population. Also, it is likely that right management decision may have to do with the improved genetic status of the population.

However, the status of population could even be more improved, but the high number of animals released in Hiiumaa set limits to the improvements. In fact, this and the continued releases in years coming poses serious threat for the overall status captive population and the number of valuable genes flushed out from Tallinn stock increases. To handle this problem we consider to additional actions for 2003:

- Obtaining 10 new founders from the wild (Russia) – negotiations about the arrangement of catching wild specimen and the transport is underway.
- Large-scale change of animals with second largest breeding facility in Europe (Euronorz, Germany) to transport part of Tallinn stock there and to bring their low-value animals to Tallinn for release purpose – the negotiations with Euronorz underway.

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## F OVERALL PROJECT MANAGEMENT

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### F.1. OVERALL PROJECT MANAGEMENT

#### ACTION FORESEEN

1. Reporting to EU LIFE program
2. Contracting partners, assistants and subcontractors
3. Organization of accounting
4. Supervision of performance of the actions
5. Public awareness
6. Setting up and updating the homepage
7. Organization of field actions

#### ACTIONS PERFORMED

Status: IN PROGRESS (CONTINUOUS ACTION)

1. Reporting to EU LIFE program

Project manager has been meeting the members of external team (Mats Eriksson and Marita Karling) twice in Estonia. At the end of 2001 a meeting was held at Tallinn Zoo, which provided possibilities for consultations in regards of various procedures of running project and reporting in EU LIFE Program. Also, at the end of the meeting the members of external team had an opportunity to visit the Endangered Species Centre at Tallinn Zoo. In August Mats Eriksson and Marita Karling visited Hiiumaa Island and the project team consisting of Tiit Maran and Madis Podra explained them the details of the field activities. Couple of days later Mats Eriksson

made a short visit to the breeding facility in Tallinn Zoo and had an opportunity review the progress in captive breeding and improvement of the facility.

## 2. Contracting partners, assistants and subcontractors

Foundation “LUTREOLA” has made a working contract with project manager and accounting assistant in force since September 1<sup>st</sup>, 2001. The contracts have been made for a year and will be renewed every year. The contracts were prolonged for 2003 in September 1, 2002.

Project manager made a set of contracts with both partners: Tallinn Zoo and West-Estonia Archipelago Biosphere Reserve Hiiumaa Centre<sup>2</sup>. With both partners a framework contract was concluded. The framework contract included the overall provisions and provisions in Administrative Provisions regulating the obligations and rights between partners and project holder. The framework contract also includes the provisions on reporting and accounting principles. In addition to framework-contracts separate subcontracts were concluded for each actions with partial or full responsibility of partners:

- Tallinn Zoo: subcontracts for actions
  - i. A1 – full responsibility of Tallinn Zoo in Construction of the infrastructure for special breeding facility at Tallinn Zoo
  - ii. C1 –partial responsibility in action for removal of *Mustela vison* from Saaremaa. *This subcontract may need modification because of the change of the action.*
  - iii. C2 – partial responsibility in action for release of *Mustela lutreola* in Saaremaa. Contract determines the part of funding born by partner (also a co-financer) and its tasks.
  - iv. C3 – partial responsibility in action for release of *Mustela lutreola* in Saaremaa. Contract determines the funding from partner (also a co-financer) and the tasks it has to undertake.
  - v. D1– full responsibility in action for husbandry and conservation breeding of *Mustela lutreola*. Subcontract covers the renting of breeding facility and the animals, also involvement of keepers, coverage of maintenance costs and the tasks of the partner

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<sup>2</sup> In the course of reforms in Estonia West-Estonia Archipelago Biosphere Reserve Hiiumaa Centre has been transformed to Hiiumaa Protected Areas Administration in 2002. The latter is the successor of Biosphere reserve and also the partner for foundation LUTREOLA in this project.

- vi. F1 – Partial responsibility for overall project management. Subcontract includes provisions about hiring the assistant of captive breeding, the tasks of the assistant, funding from partner (also co-financer), rent of the office and partial coverage of communication costs.

- Hiiumaa protected Areas Administration: subcontracts for actions

- i. A3 – Full responsibility in preparation of management plan for *Mustela lutreola* in Hiiumaa Island. Includes provisions on co-funding (partner is also a co-financer), tasks for partner etc.
- ii. F1 – Partial responsibility in overall project management. Included provisions on hiring an assistant on field activities and renting a working site for assistant.

### 3. Organization of accounting

Project manager/director of the foundation hired a part-time accountant, who is taking care of the financial records. Also, it was agreed with the auditor of the foundation to audit also the project from point of view of Administrative Provisions. The accounting for 2001 has already been audited and the final statement of the auditor was that the project has been run in accordance to Estonian laws. The audit on the accordance of Administrative Provisions will be made at the end of the project.

### 4. Supervision of performance of the actions

Project manager personally participate in most of the actions, or at least visit all sites regularly.

### 5. Public awareness

The project and actions related to the conservation of *Mustela lutreola* has been presented in several local and international meetings, but also in media:

- September 2001, 25-minute and 45-minute film on the recovery project of *Mustela lutreola* in Estonia made by Baierische Rundfunk(Germany) was completed.
- September 2001, EAZA Annual Conference in Prague. Presentations in Small Carnivore Expert Group and European mink EEP meeting, both devoted to the conservation of *Mustela lutreola* in Estonia, with emphasis also on EU LIFE Project.
- November 2001, Presentation in Saaremaa Island on Hunters Annual Conference about the *Mustela lutreola* conservation and EU LIFE Project.

- November 2001, Presentation in Island Tourist Guide Training Course in Hiiumaa Island on the project for establishment island populations for *Mustela lutreola*.
  - December 2001, Presentation in annual meeting of the Finnish Naturalist Society on the conservation of *Mustela lutreola* in Estonia (the role of EU LIFE Project was emphasised)
  - December 2001, Spanish Conference of Theriology. A presentation on the conservation of *Mustela lutreola* and the new EL LIFE project was made.
  - December 2001, Meeting in Tallinn Zoo for all employees was organised to inform them about the content and aim of the EU LIFE project.
  - March 2002, Presentation in Environmental Training Courses in Hiiumaa on the conservation of *Mustela lutreola*.
  - March 2002, two presentations in the Tallinn City campaign “Children in City and the nature” on the conservation of *Mustela lutreola*.
  - April 2002, in the Baltic Theriological Conference 1 oral presentation and 3 posters: on the EU LIFE project (presentation); on the results of release in Hiiumaa; on behavioural difference of captive and wild born *Mustela lutreola*; on results of release in Hiiumaa 2000-2001; on the feeding of released *Mustela lutreola* in Hiiumaa (posters).
  - July 2002, presentation on the meeting of Nature Conservation Authorities of Estonian Counties: Establishment of island populations for *Mustela lutreola* in Hiiumaa and plans for future.
  - July 2002, press release on the results of the release in 2002: first litters in the wild in Hiiumaa Island addressed to all major news agencies in Estonia
  - July 2002, interview to Estonian State Radio broadcast “Vikerraadio”
  - July 2002, interview to local Radio Station in Saaremaa Island
  - July 2002, interview to local city radio in Tartu
6. Setting up and updating the homepage
- *Mustela lutreola* web page has been launched in spring 2002 – [www.lutreola.ee](http://www.lutreola.ee). It contains a special sub-page/folder for the EU LIFE project: aims of the project, actions, partners and co-financers, summary of the project. The page

will be updated with the description of the actions in 2002 at the end of the year.

#### 7. Organization of field actions

Project manager has been involved in organization of field actions for field survey in Saaremaa and Hiiumaa. He has been organizing the transport accommodation, but also field equipment needed of effective field research. Project manager has also required all the necessary permits needed to perform field actions (e.g. permit for release of *Mustela lutreola*, permit to use leg-hold traps etc.).



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**ANNEXES**

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**ANNEX 1 - LETTER TO EUROPEAN COMMISSION WITH REQUEST  
TO MODIFY THE ACTION C1**

**LOODUSKAITSE SIHTASUTUS  
“LUTREOLA”  
FOUNDATION “LUTREOLA”**

REG. NO. 90005573

\*

IUCN SSC MUSTELID, VIVERRID & PROCYONID SPECIALIST  
GROUP

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March 4, 2002

European Commission,  
att.: Mr Bruno Julien  
Head of Unit DG.ENV.D.1  
BU-9 2/1  
B-1049 Brussels  
Belgium

Re: Change of the action No C1 “Removal of *Mustela vison*  
from Saaremaa Island” in the project  
LIFE2000NAT/EE/7081

Dear Sir or Madam:

According to the description our project (LIFE2000NAT/EE/7081: further quoted as ‘project’) includes the action C1: **Removal of *Mustela vison* from Saaremaa Island**. This action was planned to be the first step in establishing an island population of *Mustela lutreola* in Saaremaa Island and thus crucial for the overall performance of the project.

According to the pilot survey conducted before the start of the project the number of *Mustela vison* in Saaremaa Island was very low and its distribution highly localized. In the course of action A.2 we performed (autumn 2001 and winter 2002) detailed survey on the presence and possible distribution of *M. vison* in the island. Our results, though not yet compiled into report, indicate that ***Mustela vison* does not inhabit this island**. It is surprising, indeed, as from earlier data the presence of this species has been confirmed in the areas close to old mink farms. Therefore, the only acceptable explanation of the current absence of *Mustela vison* there, is the following: the presence of mink farms in Saaremaa Island was too short to provide sufficient number of escaped animals capable of establishing a feral population. Instead, the animals escaped just deceased with time. The potential risk of American mink to invade the island from mainland seems relatively low, as the mink have been in the mainland in high number since 1960s, but despite of that, the island has remained unoccupied, except the short period with the animals escaped from farms.

Nevertheless, the possible means and methods for monitoring of the potential invasion of American mink into islands will be addressed under action A3.

The absence of *Mustela vison* in the island will make the achievement of overall objectives of the project much easier. However, the content of action C1, as it is described now, becomes irrelevant. Therefore, we ask Your permission to cancel this action and instead of that to undertake other activities within the limits of funds (32 144 EURO) allocated for action C1:

- Additional release of the European mink in Hiiumaa Island.

This action would continue the work undertaken in this island since 1989. So far, 58 animals have been released there with pretty good results. The estimated survival of the released animals during adaptation remains appr. between 30% - 50%. Yet, for the full guarantee of success, we believe, it to be reasonable to release in 2002 additional 30 – 40 animals, and to radio track some females during breeding season to get firm evidence on breeding in the wild. The release of additional mink to Hiiumaa Island will be included to the action C3. Part of the budget allocated to the action C1 will be added to the budget of action C3. Also, the funds needed for preconditioning of mink before release will be allocated to this action. The modified budget will be as follows:

Budget item	Total costs € - new( <del>old</del> )
1. Personnel	0
2. Travel	29 820 (16 856)
3. External assistance	20 840 (9 560)
4. Durable goods	3 477 (3 477)
5. Land purchase/lease	
6. Consumable material	1 301( <del>400</del> )
7. Overheads	2 628 (2 628)
8. Other costs	
TOTAL	58 066 (32 921)

- Monitoring of the acclimatization of the *Mustela lutreola* in Hiiumaa Island. This action is closely related to the previous one. The rationale is to collect biological information on the status of the wild population after the removal of radio collars (once their batteries are exhausted) with live traps, but also other means. The costs of this activity will be incorporated into the new budget of action C3.
- Additional funding for action D1 to cover unpredicted increase in costs for food of captive *Mustela lutreola* population. As the prices of food have increased since the preparation of the project proposal in 2000, the performance of action D1 in the limits of its current budget is fairly complicated. Therefore we would appreciate the possibility to use part of the funds allocated for action C1 for supporting captive management in the frame of action D1. The proposed new, modified budget is as follows:

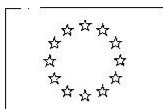
<b>Budget item</b>	<b>Total costs €- - new(<i>old</i>)</b>
1. Personnel	<b>19 097</b> ( <i>19 079</i> )
2. Travel	
3. External assistance	<b>3 360</b> ( <i>3 360</i> )
4. Durable goods	
5. Land purchase/lease	
6. Consumable material	<b>95 796</b> ( <i>88 797</i> )
7. Overheads	<b>4 260</b> ( <i>4 260</i> )
8. Other costs	<b>15 201</b> ( <i>15 201</i> )
<b>TOTAL</b>	<b>137 696</b> ( <i>130 697</i> )

We believe that this change will highly contribute to the success of the project but in more general terms, also to the survival of *Mustela lutreola*. Therefore we would appreciate permission from the Commission to modify the project according to the proposed plan.

Yours sincerely,

Tiit Maran  
Project Manager,  
Director of the foundation

**ANNEX 2 – LETTER FROM EUROPEAN COMMISSION WITH  
ACCEPTANCE OF THE MODIFICATION OF ACTION C1**



EUROPEAN COMMISSION  
DIRECTORATE-GENERAL  
ENVIRONMENT  
Directorate D - Implementation and enforcement  
ENV.D1 - LIFE

Brussels, 19-08-2002  
ENV.D.1/JMR/512407

Mr. Tiit Maran  
Director, Nature Conservation  
Foundation "Lutreola"  
Tallinn Zoo  
Paldiski Road 145  
EE-13522 Tallinn  
Estonia

Fax: 372 657 89 90

**Subject: Project LIFE00NAT/EE/7081 - 'Recovery of *Mustela lutreola* in Estonia: captive and island populations'**

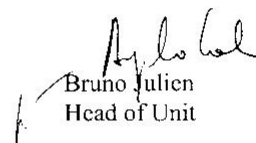
Dear Mr. Maran,

I have taken note of the request expressed in your letter of 4 March 2000, that the savings resulting from the absence of the American mink from Saaremaa Island should be used to release a larger number of European minks in this island, on the one hand, to accommodate the cost of unforeseen food expenses for the captive population, on the other.

The modifications envisaged would seem to be reasonable and justified. Since these would not involve a change exceeding 10% in each budget category concerned, they can be accepted by the Commission through this letter.

I wish you a continued success of your project.

Yours sincerely,

  
Bruno Julien  
Head of Unit

CC: Ms. Liina Eek, Ministry of the Environment, Department of Nature Protection  
Ms. Anja Finne, DG-ENV.B.2  
Nature Link International G.E.I.E.

**ANNEX 3 – MUSTELA LUTREOLA RELEASED IN HIUMAA IN 2003  
AND PROVISIONAL RESULTS**

ID	NICK NAME	SEX	Release date	Release site	Microchip ID	Mated	Death date	Cause of death
<b>SPRING RELEASE</b>								
<b>ANIMALS WITH RADIOCOLLARS</b>								
852	Virve	FEMALE	4-mai-02	Luguse kanal	00-0620-1462	YES		
904	Meribel	FEMALE	4-mai-02	Luguse jogi	00-0621-4760	YES		
906	Mirjam	FEMALE	15-mai-02	Vanajogi	00-0621-4D75	YES		
927	Ripley	FEMALE	27-mai-02	Luguse j.	00-0620-1F79			
935	Kuntia	FEMALE	27-mai-02	Vaemla j.	00-061F-31B6			
1014	Tsehhar	FEMALE	27-mai-02	Luguse	00-0618-1781		6/2/2002	bird of prey
952	Nonn	FEMALE	27-mai-02	Suuremoisa jogi	00-0620-1BCA		5/11/2002	feral dog
560	Inks	FEMALE	27-mai-02	Villivalla kanal	00-0621-3917		5/6/2002	fox
592	Flavia	FEMALE	27-mai-02	Siberi kanal	00-061F-6691		6/15/2002	gingivitis
853	Maimu	FEMALE	15-mai-02	Luguse, Kotkassoo	00-0620-5DC9	YES	5/22/2002	human
832	Sanna	FEMALE	4-mai-02	Armioja	00-061F-BD5A	YES	5/5/2002	predator
881	Liivi	FEMALE	4-mai-02	Jausa oja	00-061-B48F	YES	5/9/2002	predator
<b>ANIMALS WITHOUT RADIOCOLLARS</b>								
905	Krisna	FEMALE	20-apr-02	Vanajogi	00-061F-6C79	YES		
945	Loore	FEMALE	20-apr-02	Pihla oja	00-0621-3A0E			
925	Saskia	FEMALE	4-mai-02	Kidaste oja	00-061F-54C7	YES		
572	Mona	FEMALE	15-mai-02	Rebasselja oja	00-0621-55D3			
583	Irena	FEMALE	15-mai-02	Armioja	00-061F-ABDA	YES		
585	Saara	FEMALE	15-mai-02	Tihu	00-061F-70F9			
591	Tuuslar	FEMALE	15-mai-02	Armioja	00-0618-04F7			
598	Laulurasta	FEMALE	15-mai-02	Pihla oja	00-061F-3C76			
676	Ilkka	FEMALE	15-mai-02	Pihla oja	00-0621-429A			
895	Zoja	FEMALE	15-mai-02	Jausa oja	00-0617-F89F	YES		
928	Metsik	FEMALE	15-mai-02	Tihu/Luguse	00-0620-1E3E	YES		
934	Sonja	FEMALE	15-mai-02	Pihla oja	00-0618-0C85	YES		
933	Semper	MALE	20-apr-02	Armioja	00-061F-6CCB			
949	Nigul	MALE	20-apr-02	Luidja oja	00-0620-6761			
951	Niiles	MALE	20-apr-02	Joeranna oja	00-0620-1849			
879	Julius	MALE	4-mai-02	Suuremoisa jogi	00-0615-546E			



ID	NICK NAME	SEX	Release date	Release site	Microchip ID	Mated	Death date	Cause of death
926	Ringo	MALE	4-mai-02	Rebasselja oja	00-061F-B12F			
943	Punik	MALE	4-mai-02		00-0621-4C76			
944	Potter	MALE	4-mai-02	Luguse	00-0621-2C97			
950	Nukits	MALE	4-mai-02	Jausa oja	00-061F-56FE			
1012	sveik	MALE	4-mai-02	ngu oja	00-0621-5518			
1013	Jaroslav	MALE	4-mai-02	ngu oja	00-0621-2A51			
206	Rumpum pel	MALE	15-mai-02	Jausa oja	00-061F-BA5E			
850	Porks	MALE	15-mai-02	Vaemla jogi	00-0621-4899			
942	Lenny	MALE	15-mai-02	Villivalla kanal	00-0621-3489			
565	Pomm	MALE	4-mai-02	Siberi kraav	00-0618-5069		5/20/2002	predator
<b>AUTUMN RELEASE</b>								
1017	no name	FEMALE	7-sept-02	Tulimurru kn	00-0617-B6B4			
1018	no name	FEMALE	7-sept-02	Rebasselja oja	00-0617-7D38			
1019	no name	FEMALE	7-sept-02	Vanajogi	00-061F-65E2			
1020	no name	FEMALE	7-sept-02	Vanajogi	00-0613-3D6D			
1049	no name	FEMALE	7-sept-02	Luguse jogi	00-061F-60C2			
831	Helga	FEMALE	16-sept-02	Armioja	00-0618-5154			
834	Niru	FEMALE	16-sept-02	Vanajogi	00-0617-B8C9			
1016	no name	MALE	7-sept-02	Jausa jogi	00-0618-1960			
1031	no name	MALE	7-sept-02	Jausa jogi	00-0615-2EA0			
1046	no name	MALE	7-sept-02	Tihu kn	00-061F-5FAD			
1047	Karabas	MALE	7-sept-02	ngu oja	00-0615-3E77			
1048	no name	MALE	7-sept-02	ngu oja	00-061F-4FDA			
929	Jesper	MALE	16-sept-02	Vanajogi	00-0618-504D			
1070	no name	MALE	16-sept-02	Pihla oja	00-0617-DA17			
1071	no name	MALE	16-sept-02	Armioja	00-0615-2F4B			
932	Daniel	MALE	20-apr-20	Armioja	00-0621-794D			

## ANNEX 4 – BIRTH IN CAPTIVE BREEDING FACILITY IN 2002

EUROPEAN MINK Studbook Page 1  
 Restricted to: (Mustela lutreola novikovi)  
 Locations: TALLIN /  
 Dates: Between 01/01/2002 and 01/09/2002  
 Event: Births

Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	Name
1016	M	19 May 2002	775	910	TALLIN HIUMAA	19 May 2002 7 Sep 2002	14320	Birth ltf Release	
1017	F	19 May 2002	775	910	TALLIN HIUMAA	19 May 2002 7 Sep 2002	14321	Birth ltf Release	
1018	F	19 May 2002	775	910	TALLIN HIUMAA	19 May 2002 7 Sep 2002	14322	Birth ltf Release	
1019	F	19 May 2002	775	910	TALLIN HIUMAA	19 May 2002 7 Sep 2002	14323	Birth ltf Release	
1020	F	19 May 2002	775	910	TALLIN HIUMAA	19 May 2002 7 Sep 2002	14324	Birth ltf Release	
1021	F	19 May 2002	775	910	TALLIN	19 May 2002	14325	Birth	
1022	M	21 May 2002	776	939	TALLIN	21 May 2002	14326	Birth	
1023	F	21 May 2002	776	939	TALLIN	21 May 2002	14327	Birth	
1024	F	21 May 2002	776	939	TALLIN	21 May 2002	14328	Birth	
1025	F	21 May 2002	776	939	TALLIN	21 May 2002	14329	Birth	
1026	M	22 May 2002	774	959	TALLIN	22 May 2002	14330	Birth	
1027	M	22 May 2002	774	959	TALLIN	22 May 2002	14331	Birth	
1028	M	22 May 2002	774	959	TALLIN	22 May 2002	14332	Birth	
1029	F	22 May 2002	774	959	TALLIN	22 May 2002 24 Jun 2002	14333	Birth Death	
1030	M	26 May 2002	775	911	TALLIN	26 May 2002	14334	Birth	JUSS
1031	M	26 May 2002	775	911	TALLIN HIUMAA	26 May 2002 7 Sep 2002	14335	Birth ltf Release	
1032	M	26 May 2002	775	911	TALLIN	26 May 2002	14336	Birth	
1033	F	26 May 2002	775	911	TALLIN	26 May 2002	14337	Birth	
1034	F	26 May 2002	775	911	TALLIN TALLINN	26 May 2002 ~ Sep 2002	14338	Birth ltf Release	
1035	M	27 May 2002	774	918	TALLIN	27 May 2002	14339	Birth	

Compiled by: Tiit Maran thru Tallinn Zoo  
 Data current thru: 15 Sep 2002 foundation "lutreola" - EEP  
 Printed on 3 Oct 2002 using Sparks v1.52

## 1ST PROGRESS REPORT OF THE PROJECT LIFE2000/NAT/7081

"Recovery of *Mustela lutreola* in Estonia: captive and island populations".

EUROPEAN MINK Studbook Page 3  
 Restricted to: (Mustela lutreola novikovi)  
 Locations: TALLIN /  
 Dates: Between 01/01/2002 and 01/09/2002  
 Event: Births

Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	Name
1036	F	27 May 2002	774	918	TALLIN	27 May 2002	14340	Birth	
1037	?	27 May 2002	774	918	TALLIN	27 May 2002 27 Jun 2002	14341	Birth Death	
1038	?	27 May 2002	774	918	TALLIN	27 May 2002 27 Jun 2002	14342	Birth Death	
1039	?	27 May 2002	774	918	TALLIN	27 May 2002 1 Jul 2002	14343	Birth Death	
1040	F	27 May 2002	774	918	TALLIN	27 May 2002	14344	Birth	
1041	M	30 May 2002	775	915	TALLIN	30 May 2002	14345	Birth	
1042	M	30 May 2002	775	915	TALLIN	30 May 2002	14346	Birth	
1043	M	30 May 2002	775	915	TALLIN	30 May 2002	14347	Birth	
1044	M	30 May 2002	775	915	TALLIN	30 May 2002	14348	Birth	
1045	F	30 May 2002	775	915	TALLIN	30 May 2002	14349	Birth	
1046	M	31 May 2002	920	947	TALLIN HIUMAA	31 May 2002 7 Sep 2002	14350	Birth lrf Release	
1047	M	31 May 2002	920	947	TALLIN HIUMAA	31 May 2002 7 Sep 2002	14351	Birth lrf Release	
1048	M	31 May 2002	920	947	TALLIN HIUMAA	31 May 2002 7 Sep 2002	14352	Birth lrf Release	
1049	F	31 May 2002	920	947	TALLIN HIUMAA	31 May 2002 7 Sep 2002	14353	Birth lrf Release	
1050	F	31 May 2002	920	947	TALLIN	31 May 2002 4 Sep 2002	14354	Birth Death	
1051	M	5 Jun 2002	776	948	TALLIN	5 Jun 2002	14355	Birth	
1052	F	5 Jun 2002	776	948	TALLIN	5 Jun 2002	14356	Birth	
1053	F	5 Jun 2002	776	948	TALLIN	5 Jun 2002	14357	Birth	
1054	F	5 Jun 2002	776	948	TALLIN	5 Jun 2002	14358	Birth	

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 Locations: TALLIN /  
 Dates: Between 01/01/2002 and 01/09/2002  
 Event: Births

Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	Name
1055	M	6 Jun 2002	774	922	TALLIN	6 Jun 2002	14359	Birth	
1056	F	6 Jun 2002	774	922	TALLIN	6 Jun 2002	14360	Birth	
1057	M	13 Jun 2002	775	884	TALLIN	13 Jun 2002	14361	Birth	
1058	M	13 Jun 2002	775	884	TALLIN	13 Jun 2002	14362	Birth	
1059	F	13 Jun 2002	775	884	TALLIN	13 Jun 2002	14363	Birth	
1060	F	13 Jun 2002	775	884	TALLIN	13 Jun 2002	14364	Birth	
1061	F	15 Jun 2002	774	912	TALLIN	15 Jun 2002	14365	Birth	
1062	F	15 Jun 2002	774	912	TALLIN	15 Jun 2002	14366	Birth	
1063	F	15 Jun 2002	774	912	TALLIN	15 Jun 2002	14367	Birth	
1064	F	15 Jun 2002	774	912	TALLIN	15 Jun 2002	14368	Birth	
1065	F	15 Jun 2002	774	912	TALLIN	15 Jun 2002	14369	Birth	
1066	M	15 Jun 2002	775	885	TALLIN	15 Jun 2002	14370	Birth	
1067	F	15 Jun 2002	775	885	TALLIN	15 Jun 2002	14371	Birth	
1068	F	15 Jun 2002	775	885	TALLIN	15 Jun 2002	14372	Birth	
1069	F	15 Jun 2002	775	885	TALLIN	15 Jun 2002	14373	Birth	
1070	M	18 Jun 2002	773	871	TALLIN HIUMAA	18 Jun 2002 16 Sep 2002	14374	Birth lrf Release	
1071	M	18 Jun 2002	773	871	TALLIN HIUMAA	18 Jun 2002 16 Sep 2002	14375	Birth lrf Release	
1072	M	18 Jun 2002	773	871	TALLIN	18 Jun 2002	14376	Birth	
1073	F	18 Jun 2002	773	871	TALLIN	18 Jun 2002	14377	Birth	
1074	M	25 Jun 2002	774	777	TALLIN	25 Jun 2002	14378	Birth	
1075	M	25 Jun 2002	774	777	TALLIN	25 Jun 2002	14379	Birth	
1076	M	25 Jun 2002	774	777	TALLIN	25 Jun 2002	14380	Birth	

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Locations: TALLIN /  
Dates: Between 01/01/2002 and 01/09/2002  
Event: Births

Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	Name
1077	F	25 Jun 2002	774	777	TALLIN	25 Jun 2002	14381	Birth	

TOTALS: 27.32.3 (62)

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## ANNEX 5 DEATH IN 2002 IN BREEDING FACILITY

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 Restricted to: (Mustela lutreola novikovi)  
 Locations: TALLIN /  
 Dates: Between 01/01/2002 and 01/09/2002  
 Event: Deaths

Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	Name
918	F	2 Jun 2001	773	871	TALLIN	2 Jun 2001 18 Jun 2002	13902	Birth Death	SIRME
946	M	9 Jun 2001	773	853	TALLIN	9 Jun 2001 24 Jun 2002	13930	Birth Death	MONK
1029	F	22 May 2002	774	959	TALLIN	22 May 2002 24 Jun 2002	14333	Birth Death	
1037	?	27 May 2002	774	918	TALLIN	27 May 2002 27 Jun 2002	14341	Birth Death	
1038	?	27 May 2002	774	918	TALLIN	27 May 2002 27 Jun 2002	14342	Birth Death	
1039	?	27 May 2002	774	918	TALLIN	27 May 2002 1 Jul 2002	14343	Birth Death	
1050	F	31 May 2002	920	947	TALLIN	31 May 2002 4 Sep 2002	14354	Birth Death	

TOTALS: 1.3.3 (7)

**ANNEX 6 – MUSTELA LUTREOLA IN BREEDING FACILITY AS OF  
01.09.2002.**

Restricted to: EUROPEAN MINK Studbook Page 1  
 Locations: TALLIN / (Mustela lutreola novikovii)  
 Dates: As of 01/09/2002

Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	Name
133	F	21 Oct 1994	WILD	WILD	TVER TALLIN	21 Oct 1994 19 Dec 1995	113 11890	Capture Transfer	NETTY
150	F	27 May 1996	132	133	TALLIN	27 May 1996	12009	Birth	CAMILLE
151	F	27 May 1996	132	133	TALLIN	27 May 1996	12010	Birth	NUBLU
168	M	????	WILD	WILD	RUSSIA TALLIN	28 Nov 1996 25 Mar 1997	NONE 12135	Capture Transfer	VILLU
189	F	8 Jun 1997	168	133	TALLIN	8 Jun 1997	12425	Birth	SOPHIE
198	M	29 May 1997	168	150	TALLIN	29 May 1997	12415	Birth	MARCUS
201	F	29 May 1997	168	150	TALLIN	29 May 1997	12416	Birth	NMMEROOSI
204	F	1 Jun 1997	168	151	TALLIN	1 Jun 1997	12418	Birth	VZIKE-MY
205	F	1 Jun 1997	168	151	TALLIN	1 Jun 1997	12419	Birth	RUU
207	F	15 Jun 1997	168	174	TALLIN	15 Jun 1997	12434	Birth	SIISIKE
208	F	15 Jun 1997	168	174	TALLIN	15 Jun 1997	12435	Birth	LOTTA
211	F	16 May 1997	158	129	ROTTERDAM TALLIN	16 May 1997 16 Apr 1998	105609 12517	Birth Transfer	DIXI
212	F	16 May 1997	158	129	ROTTERDAM TALLIN	16 May 1997 22 May 2002	105610 14158	Birth Transfer	
213	F	16 May 1997	158	129	ROTTERDAM TALLIN	16 May 1997 22 May 2002	105611 14159	Birth Transfer	
580	F	1 Jun 1998	168	211	TALLIN	1 Jun 1998	12616	Birth	KATS
582	F	2 Jun 1998	132	192	TALLIN	2 Jun 1998	12669	Birth	MAGDALEENA
602	F	9 Jun 1998	132	189	TALLIN	9 Jun 1998	12633	Birth	TIBI
605	F	11 Jun 1998	132	133	TALLIN	11 Jun 1998	12636	Birth	RITIMI
615	F	11 Jun 1998	203	167	TALLIN	11 Jun 1998	12684	Birth	FLICKA
773	M	????	WILD	WILD	OBSHA TALLIN	???? 11 Feb 2000	NONE 13234	Capture Transfer	IVAN
774	M	????	WILD	WILD	ALESHNYA TALLIN	???? 11 Feb 2000	NONE 13235	Capture Transfer	KIRILL

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 Restricted to:  
 Locations: TALLIN /  
 Dates: As of 01/09/2002

Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	Name
775	M	????	WILD	WILD	OBSHA TALLIN	11 Feb 2000	NONE 13236	Capture Transfer	KOLJA
776	M	????	WILD	WILD	OBSHA TALLIN	11 Feb 2000	NONE 13237	Capture Transfer	VALERI
777	F	????	WILD	WILD	OBSHA TALLIN	11 Feb 2000	NONE 13238	Capture Transfer	VALENTINA
778	F	????	WILD	WILD	OBSHA TALLIN	11 Feb 2000	NONE 13239	Capture Transfer	MASHA
831	F	19 May 2000	776	585	TALLIN HIUMAA	19 May 2000 16 Sep 2002	13332 UNK ltf	Birth Release	HELGA
834	F	19 May 2000	776	585	TALLIN HIUMAA	19 May 2000 16 Sep 2002	13335 UNK ltf	Birth Release	NIRU
859	M	5 Jun 2000	774	583	TALLIN	5 Jun 2000	13360	Birth	EINSTEIN
860	M	5 Jun 2000	774	583	TALLIN	5 Jun 2000	13361	Birth	PROOK
861	F	5 Jun 2000	774	583	TALLIN	5 Jun 2000	13362	Birth	MILVI
869	M	7 Jun 2000	776	677	TALLIN	7 Jun 2000	13371	Birth	HAGAR
871	F	7 Jun 2000	776	677	TALLIN	7 Jun 2000	13373	Birth	OIE
877	M	9 Jun 2000	146	170	TALLIN	9 Jun 2000	13379	Birth	BRUTUS
878	M	9 Jun 2000	146	170	TALLIN	9 Jun 2000	13380	Birth	CAIUS
882	M	10 Jun 2000	146	167	TALLIN	10 Jun 2000	13384	Birth	NOA
883	M	10 Jun 2000	146	167	TALLIN	10 Jun 2000	13385	Birth	ULBIK
884	F	10 Jun 2000	146	167	TALLIN	10 Jun 2000	13386	Birth	NAAMA
885	F	10 Jun 2000	146	167	TALLIN	10 Jun 2000	13387	Birth	KAKSLILL
907	M	27 May 2001	776	833	TALLIN	27 May 2001	13891	Birth	MATI
908	M	27 May 2001	776	833	TALLIN	27 May 2001	13892	Birth	KONDOR
909	M	30 May 2001	773	834	TALLIN	30 May 2001	13893	Birth	NORRE

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 (Mustela lutreola novikovi)  
 Restricted to:  
 Locations: TALLIN /  
 Dates: As of 01/09/2002

Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	Name
910	F	30 May 2001	773	834	TALLIN	30 May 2001	13894	Birth	NESSI
911	F	30 May 2001	773	834	TALLIN	30 May 2001	13895	Birth	PAOPE
912	F	30 May 2001	773	834	TALLIN	30 May 2001	13896	Birth	NUUSTIK
914	F	3 Jun 2001	774	831	TALLIN	3 Jun 2001	13898	Birth	HILDA
915	F	3 Jun 2001	774	831	TALLIN	3 Jun 2001	13899	Birth	HIRSI
916	M	2 Jun 2001	773	871	TALLIN	2 Jun 2001	13900	Birth	ONNEPAIV
917	F	2 Jun 2001	773	871	TALLIN	2 Jun 2001	13901	Birth	ONNE
919	M	2 Jun 2001	775	832	TALLIN	2 Jun 2001	13903	Birth	TUGRIK
920	M	2 Jun 2001	775	832	TALLIN	2 Jun 2001	13904	Birth	GABATSIJOK
921	M	2 Jun 2001	775	832	TALLIN	2 Jun 2001	13905	Birth	SERGO
922	F	2 Jun 2001	775	832	TALLIN	2 Jun 2001	13906	Birth	TIRTS
929	M	2 Jun 2001	776	851	TALLIN HIUMAA	2 Jun 2001 16 Sep 2002	13913 UNK ltf	Birth Release	JESPER
930	M	2 Jun 2001	776	851	TALLIN	2 Jun 2001	13914	Birth	JOONATAN
936	M	4 Jun 2001	773	895	TALLIN	4 Jun 2001	13920	Birth	MIKLUHHO
937	M	4 Jun 2001	773	895	TALLIN	4 Jun 2001	13921	Birth	ZORBAS
938	F	4 Jun 2001	773	895	TALLIN	4 Jun 2001	13922	Birth	ZUZI
939	F	4 Jun 2001	773	895	TALLIN	4 Jun 2001	13923	Birth	ZETTA
947	F	9 Jun 2001	773	853	TALLIN	9 Jun 2001	13931	Birth	MEETA
948	F	9 Jun 2001	773	853	TALLIN	9 Jun 2001	13932	Birth	MUGRI
953	M	20 Jul 2001	773	615	TALLIN	20 Jul 2001	13937	Birth	FRANK
954	M	20 Jul 2001	773	615	TALLIN	20 Jul 2001	13938	Birth	FARIAN
955	F	20 Jul 2001	773	615	TALLIN	20 Jul 2001	13939	Birth	FRIIDA

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 Restricted to:  
 Locations: TALLIN /  
 Dates: As of 01/09/2002

Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	Name
957	M	21 May 2001	902	712	POZNAN TALLIN	21 May 2001 27 Mar 2002	MD0458 14014	Birth Transfer	VACLAV
958	M	21 May 2001	902	712	POZNAN TALLIN	21 May 2001 27 Mar 2002	MD0459 14015	Birth Transfer	JAN
959	F	21 May 2001	902	712	POZNAN TALLIN	21 May 2001 27 Mar 2002	MD0460 14016	Birth Transfer	MARIZA
1021	F	19 May 2002	775	910	TALLIN	19 May 2002	14325	Birth	
1022	M	21 May 2002	776	939	TALLIN	21 May 2002	14326	Birth	
1023	F	21 May 2002	776	939	TALLIN	21 May 2002	14327	Birth	
1024	F	21 May 2002	776	939	TALLIN	21 May 2002	14328	Birth	
1025	F	21 May 2002	776	939	TALLIN	21 May 2002	14329	Birth	
1026	M	22 May 2002	774	959	TALLIN	22 May 2002	14330	Birth	
1027	M	22 May 2002	774	959	TALLIN	22 May 2002	14331	Birth	
1028	M	22 May 2002	774	959	TALLIN	22 May 2002	14332	Birth	
1030	M	26 May 2002	775	911	TALLIN	26 May 2002	14334	Birth	JUSS
1032	M	26 May 2002	775	911	TALLIN	26 May 2002	14336	Birth	
1033	F	26 May 2002	775	911	TALLIN	26 May 2002	14337	Birth	
1035	M	27 May 2002	774	918	TALLIN	27 May 2002	14339	Birth	
1036	F	27 May 2002	774	918	TALLIN	27 May 2002	14340	Birth	
1040	F	27 May 2002	774	918	TALLIN	27 May 2002	14344	Birth	
1041	M	30 May 2002	775	915	TALLIN	30 May 2002	14345	Birth	
1042	M	30 May 2002	775	915	TALLIN	30 May 2002	14346	Birth	
1043	M	30 May 2002	775	915	TALLIN	30 May 2002	14347	Birth	
1044	M	30 May 2002	775	915	TALLIN	30 May 2002	14348	Birth	
1045	F	30 May 2002	775	915	TALLIN	30 May 2002	14349	Birth	

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 Dates: As of 01/09/2002

Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	Name
1051	M	5 Jun 2002	776	948	TALLIN	5 Jun 2002	14355	Birth	
1052	F	5 Jun 2002	776	948	TALLIN	5 Jun 2002	14356	Birth	
1053	F	5 Jun 2002	776	948	TALLIN	5 Jun 2002	14357	Birth	
1054	F	5 Jun 2002	776	948	TALLIN	5 Jun 2002	14358	Birth	
1055	M	6 Jun 2002	774	922	TALLIN	6 Jun 2002	14359	Birth	
1056	F	6 Jun 2002	774	922	TALLIN	6 Jun 2002	14360	Birth	
1057	M	13 Jun 2002	775	884	TALLIN	13 Jun 2002	14361	Birth	
1058	M	13 Jun 2002	775	884	TALLIN	13 Jun 2002	14362	Birth	
1059	F	13 Jun 2002	775	884	TALLIN	13 Jun 2002	14363	Birth	
1060	F	13 Jun 2002	775	884	TALLIN	13 Jun 2002	14364	Birth	
1061	F	15 Jun 2002	774	912	TALLIN	15 Jun 2002	14365	Birth	
1062	F	15 Jun 2002	774	912	TALLIN	15 Jun 2002	14366	Birth	
1063	F	15 Jun 2002	774	912	TALLIN	15 Jun 2002	14367	Birth	
1064	F	15 Jun 2002	774	912	TALLIN	15 Jun 2002	14368	Birth	
1065	F	15 Jun 2002	774	912	TALLIN	15 Jun 2002	14369	Birth	
1066	M	15 Jun 2002	775	885	TALLIN	15 Jun 2002	14370	Birth	
1067	F	15 Jun 2002	775	885	TALLIN	15 Jun 2002	14371	Birth	
1068	F	15 Jun 2002	775	885	TALLIN	15 Jun 2002	14372	Birth	
1069	F	15 Jun 2002	775	885	TALLIN	15 Jun 2002	14373	Birth	
1070	M	18 Jun 2002	773	871	TALLIN HIUMAA	18 Jun 2002 16 Sep 2002	14374	Birth Release	lrf
1071	M	18 Jun 2002	773	871	TALLIN HIUMAA	18 Jun 2002 16 Sep 2002	14375	Birth Release	lrf
1072	M	18 Jun 2002	773	871	TALLIN	18 Jun 2002	14376	Birth	

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Restricted to: EUROPEAN MINK Studbook Page 7  
 Locations: TALLIN / (Mustela lutreola novikovi)  
 Dates: As of 01/09/2002

Stud #	Sex	Birth Date	Sire	Dam	Location	Date	Local ID	Event	Name
1073	F	18 Jun 2002	773	871	TALLIN	18 Jun 2002	14377	Birth	
1074	M	25 Jun 2002	774	777	TALLIN	25 Jun 2002	14378	Birth	
1075	M	25 Jun 2002	774	777	TALLIN	25 Jun 2002	14379	Birth	
1076	M	25 Jun 2002	774	777	TALLIN	25 Jun 2002	14380	Birth	
1077	F	25 Jun 2002	774	777	TALLIN	25 Jun 2002	14381	Birth	

TOTALS: 50.62.0 (112)

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## ANNEX 7 – DEFINITIONS OF DEMOGRAPHIC AND GENETIC PARAMETERS

### DEMOGRAPHIC TERMS

**Population Growth Rate** ( $\lambda$ ) -- The proportional change in population size from one year to the next.  $\lambda$  can be based on life-table calculations (the expected  $\lambda$ ) or from observed changes in population size from year to year. A  $\lambda$  of 1.11 means a 11% per year increase;  $\lambda$  of .97 means a 3% decline in size per year.

**$P_x$ , Age-Specific Survival** -- The probability that an individual of age  $x$  survives one time period; is conditional on an individual being alive at the beginning of the time period. Alternatively, the proportion of individuals which survive from the beginning of one age class to the next.

**$Q_x$ , Mortality** -- Probability that an individual of age  $x$  dies during time period.  $Q_x = 1 - P_x$   
The proportion of individuals that die during an age class. It is calculated from the number of animals that die during an age class divided by the number of animals that were alive at the beginning of the age class (i.e. "at risk").

**$l_x$ , Age-Specific Survivorship** -- The probability that a new individual (e.g., age 0) is alive at the *beginning* of age  $x$ . Alternatively, the proportion of individuals which survive from birth to the beginning of a specific age class.

### GENETIC TERMS

**Current Gene Diversity** (GD) -- The proportional gene diversity (as a proportion of the source population) is the probability that two alleles from the same locus sampled at random from the population will be identical by descent. Gene diversity is calculated from allele frequencies, and is the heterozygosity expected in progeny produced by random mating, and if the population were in Hardy-Weinberg equilibrium.

**Founder** -- An individual obtained from a source population (often the wild) that has no known relationship to any individuals in the derived population (except for its own descendants).

**Founder Genome Equivalents**(FGE) -- The number wild-caught individuals (founders) that would produce the same amount of gene diversity, as does the population under study. The gene diversity of a population is  $1 - 1 / (2 * FGE)$ .

**Founder Genome Surviving** -- The sum of allelic retentions of the individual founders (i.e., the product of the mean allelic retention and the number of founders).

**Inbreeding Coefficient** (F) -- Probability that the two alleles at a genetic locus are identical by descent from an ancestor common to both parents. The mean inbreeding coefficient of a population will be the proportional decrease in observed heterozygosity relative to the expected heterozygosity of the founder population.

**Mean Generation Time** (T) -- The average time elapsing from reproduction in one generation to the time the next generation reproduces. Also, the average age at which a female (or male) produces offspring. It is not the age of first reproduction. Males and females often have different generation times.

**Mean Kinship** (MK) -- The mean kinship coefficient between an animal and all animals (including itself) in the living, captive born population. The mean kinship of a population is equal to the proportional loss of gene diversity of the descendant (captive born) population relative to the founders and is also the mean inbreeding coefficient of progeny produced by random mating. Mean kinship is also the reciprocal of two times the founder genome equivalents:  $MK = 1 / (2 * FGE)$ .  $MK = 1 - GD$ .

**Percent Known** -- Percent of an animal's genome that is traceable to known Founders. Thus, if an animal has an UNK sire, the % Known = 50. If it has an UNK grandparent, % Known = 75.

**KV, Kinship Value** – The weighted mean kinship of an animal, with the weights being the reproductive values of each of the kin. The mean kinship value of a population predicts the loss of gene diversity expected in the subsequent generation if all animals were to mate randomly and all were to produce the numbers of offspring expected for animals of their age.

**Representation** -- Number of copies of a founder's genome that are present in the living descendants. Each offspring contributes 0.5 to Representation, each grand-offspring contributes 0.25, etc.