Part III:

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Restocking and protection of the European hamster in Flanders, preliminary results

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The Common hamster has undergone a serious decline in Flanders, as similarly seen all over Europe. In 2006 only two known key-areas remained, in Bertem-Leefdaal and in Widooie. Both were small and isolated populations. On average we found 10 burrows/year in each key-area. Other potential hamster areas were searched in 2007, with the help of nature organisations Natuurpunt vzw and Likona. This search was successful in Limburg, were hamster presence was found in Heers and Riemst. Hoegaarden in Vlaams-Brabant yielded no more burrows (data Natuurpunt vzw,2007).

Because of its threatened populations the Flemish government decided to take steps to protect the European hamsters in its boundaries. To protect the hamsters in-situ hamster-friendly management is employed on 32 ha in the key areas. This management provides permanent cover and food supply and can off course only be in existence because of the excellent co-operation with the farming community. In addition we have 6 ha of extensions and corridors.

To conserve the genetic variability and to ensure the possibility to restock or reintroduce hamsters in the wild, Flanders participated in the Dutch breeding program by donating 3 Flemish founders. Two males joined the program from Leefdaal in 2003 and 2004, the most recent addition came from Widooie in 2006.

Genetic research showed the Flemish populations being seriously inbred, with an inbreeding coefficient of 82%. To save the species from extinction, despite the recently installed in-situ protection measures, the Flemish government decided to restock the remaining populations, according to the IUCN guidelines.

In spring 2007 sixty hamsters from the Dutch breeding program were released into human made hamster burrows and the safety of the hamster-friendly managed plots. Thirty female were released a fortnight prior to the males to ensure a maximum chance of matings with the wild males present. One third of the released hamsters were fitted with radio-transmitters.

Preliminary results

We found that the female hamsters left their prefab burrows after 10 days on average. Some of the radio-tracked females travelled further distances than was theoretically expected. The longest distance measured was 1300m, where as females normally stay within a 500m range. In Widooie most females finally settled in hamster-friendly managed plots (figure 1). All males left the burrows immediately after release (figure 2 and figure 4), in search of female hamsters. One particular radio-tracked male was followed for several days as he went from one female burrow to another and back.

On average female hamsters that lived past 10 days post release made 2 to 3 burrows. Males that survived this period had 4 burrows, one male dug his 4th burrow after only 11 days. As was expected we found that males had a shorter life expectancy than females did, post release. Of the 4 males found dead none survived 30 days, whereas 3 out of 4 females survived longer than 40 days. The importance of this being that the released and radio-tracked females did have ample time to reproduce. The main cause of mortality was predation (table 1). Top predators were birds of prey, closely followed by fox and marten. Some of the victims were too far decomposed to deduce the cause of death.

TABLE 1. *Causes of death of the hamsters with a transmitter in each area.*

	Birds of prey	Marten	Fox	Road kill	Unknown	Total
Widooie	3	-	1	1	1	6
Leefdaal	2	1	2	-	3	8
Total	5	1	3	1	4	14

To check the reproduction we recaptured females in both areas. Due to the greater disturbance effect than expected we drastically reduced the use of this technique, given to the precarious balance of the Flemish hamster populations. Still we found 6 nursing or pregnant females in Widooie and 2 in Leefdaal.

By the end of the summer, after regular harvest we checked all cereal plots for hamster burrow presence in the designated perimeters of both key-areas. We found that hamsters had dispersed all over the perimeter, even crossing larger roads with frequent and fast traffic. In Leefdaal they dispersed over a larger area (figure 6). Possibly this is caused by the larger abundance in cereal plots, the more dispersed presence of autogenous hamsters or the greater disturbance due to 'twitchers' in this area. The above mentioned could also reflect on the final number of burrows found in both areas. Inventory yielded 24 burrows in Leefdaal and 53 in Widooie (table 2). These figures represent the number of burrows found in regular plots, this for reasons of comparison with results of earlier years.

TABLE 2. *Number of burrows per year, before and after restocking and the implementation of hamster-friendly management (HFM).*

Management	Nothing	Cereal strips	HFM	HFM+restocking
Year	2004	2005	2006	2007
Widooie	6	20	7	53*
Leefdaal	11	6	16	24*
Total	17	26	23	77*

**= HF-plots not checked yet.*

Conclusion

In conclusion it can be said the number of burrows found post restocking was larger than prior, when on average 10 burrows per key-area were found. The survival rate of the restocked hamsters was calculated using the Mayfield method. At 72 days, 37% of the animals with a transmitter were still alive. The dispersion was found to be high and predation proved to be the mean cause of mortality. Further more these preliminary results show that the major goal of the restocking project was met as we found reproduction had taken place.

Further analysis and more field results are needed for a scientifically sound conclusion of the effect of the restocking project on the Flemish hamster population at large. But it seems fair to say that Flanders as well as the rest of Europe can not cease its efforts to try and protect a species in decline.

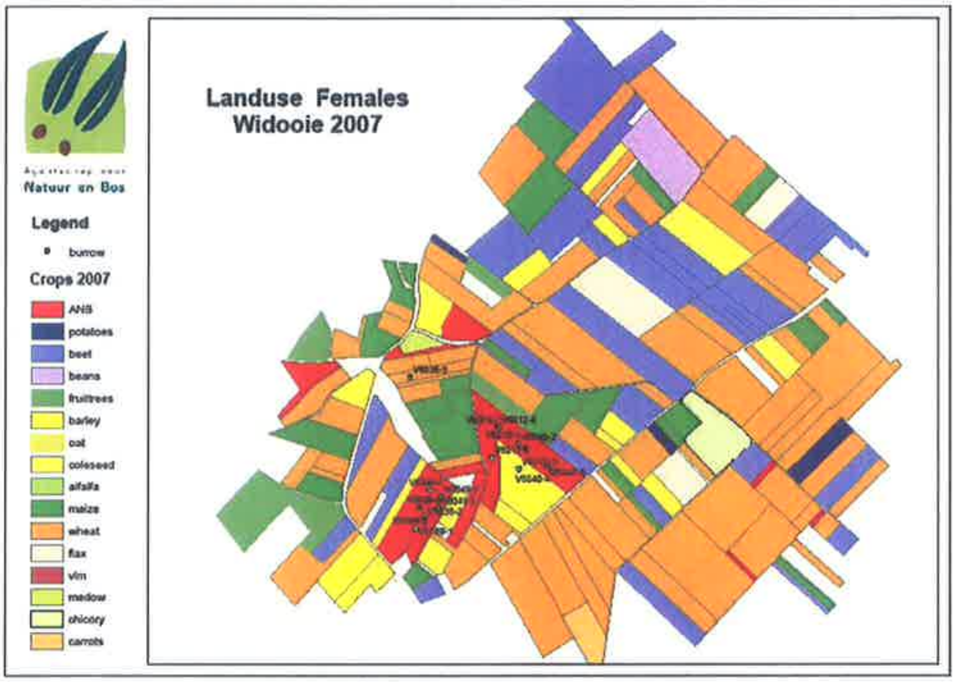

FIGURE 1. *Land use of reintroduced captive-bred females in Widooie in 2007.*

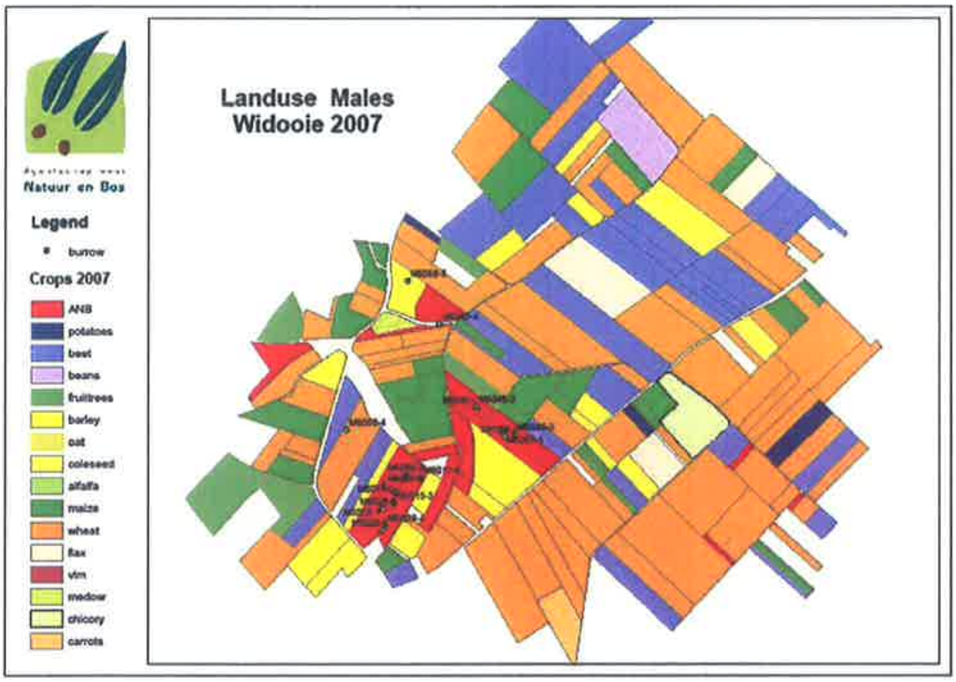

FIGURE 2. *Land use of reintroduced captive-bred males in Widooie in 2007.*

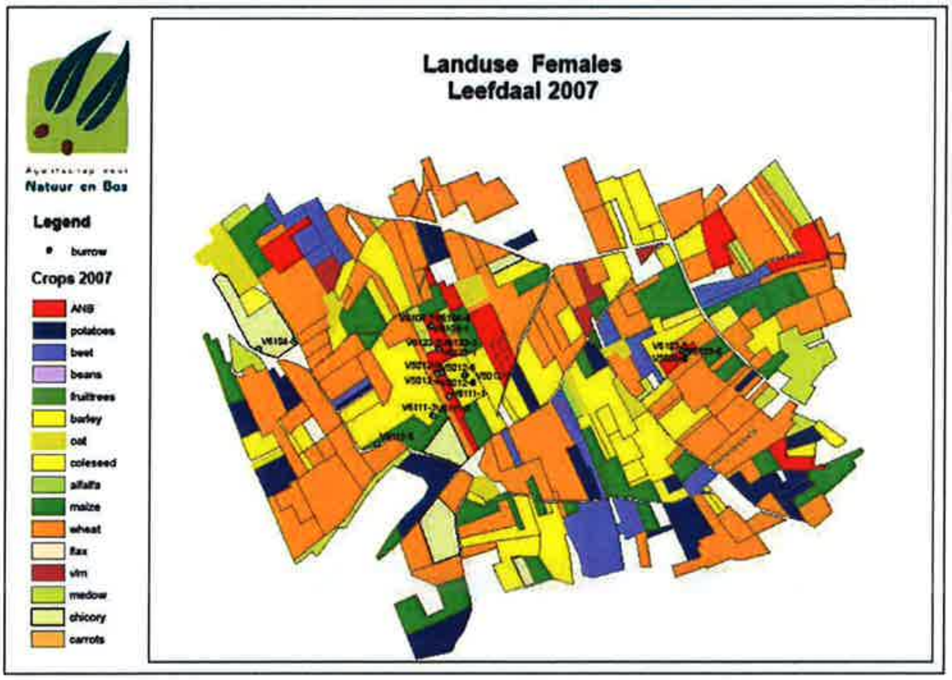

FIGURE 3. *Land use of reintroduced captive-bred females in Leefdaal in 2007.*

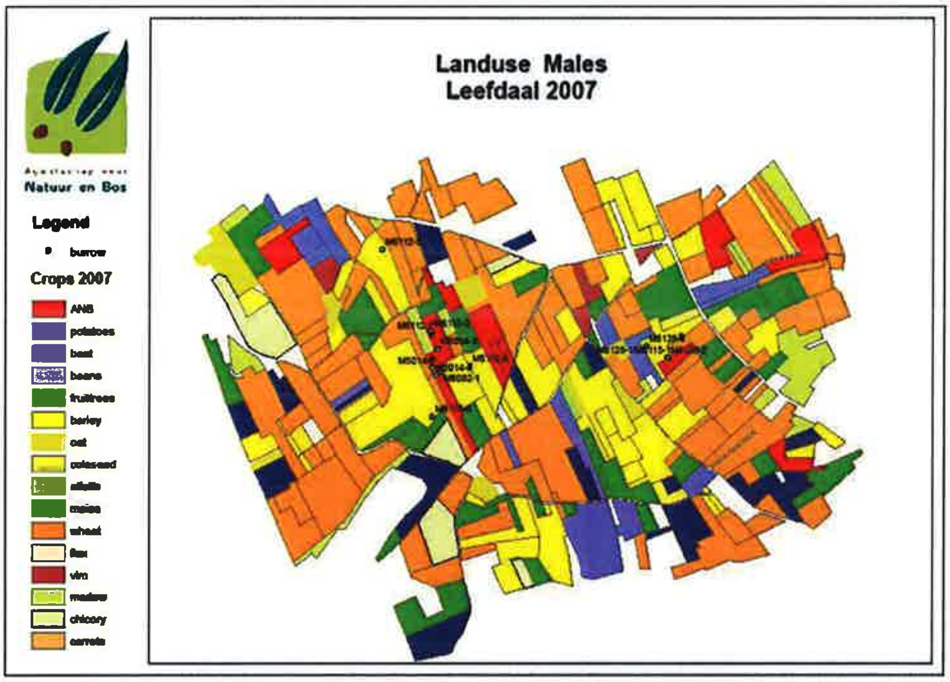

FIGURE 4. *Land use of reintroduced captive-bred males in Leefdaal in 2007.*

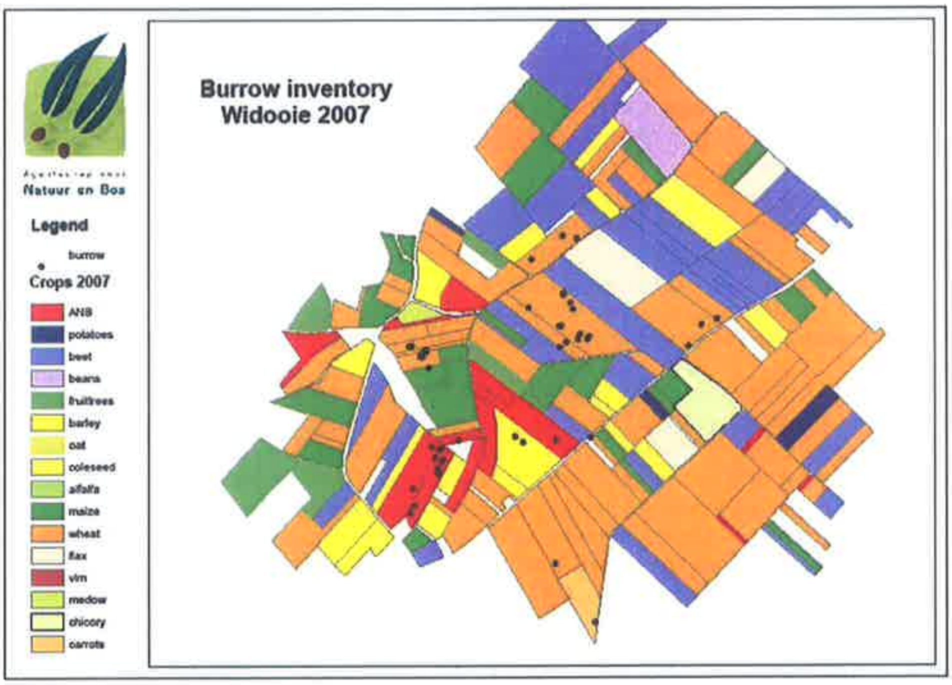

FIGURE 5. *Burrow inventory of Widooie in 2007: 53 burrows were found.*

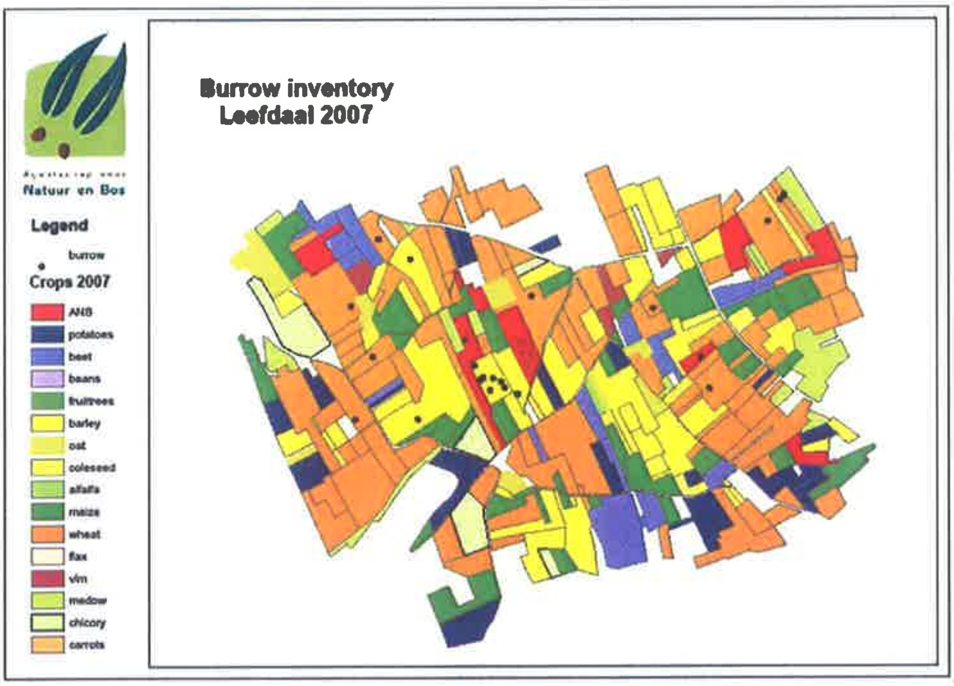

FIGURE 6. *Burrow inventory of Leefdaal in 2007: 24 burrows were found.*

The effects of hamster-friendly management on the hibernation success of the common hamster.

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An intensive research program on hamsters is carried out by the Alterra Research Institute and the Radboud University Nijmegen since 2002. By following the hamsters throughout the year we have obtained a good view of the ecological problems and needs of the hamster. Based on the ecological information that was collected, we developed several protection measures that are easy to incorporate in the regular farming practice and which are beneficial for hamsters. The last 2 years we have studied the overwinter-survival of hamsters on fields with different types of management.

The winter is a dangerous period for hamsters, because the crops have been harvested and most of the cover has disappeared. The risk of predation during the winter is therefore high, which means the population of hamsters declines during the winter. In a healthy and natural situation the losses will be compensated during the summer due to reproduction. The recovery of the population is easier if a lot of hamsters survive the winter. However, in the modern agricultural landscape of Western Europe, the survival rate of hamsters is low and most of the populations have probably great difficulties to recover in spring and summer. The survival in hamster-friendly managed area's is high enough for a stable or even growing population, but the survival on regular fields is to low. To increase the survival of hamsters on regular cereals fields we introduced the 'survival'-stripe, a stripe of unharvested cereals, and checked if this measure was helpful for the survival of hamsters during the winter.
In the area's where the hamsters live, we distinguish different types of protection and protection measures. There is a global protection on a landscape scale to prevent building of houses and roads in a larger area, within these protected area there're special hamster-reserves and fields with hamster-friendly agreements with farmers. A hamster-reserve is managed by a nature-protection organization, while the other fields are hamster-friendly managed by farmers who are compensated for the work and their loss of income. The most important difference between the regular cereals fields on the one hand and the hamster-reserve and hamster-friendly managed fields on the other hand, is the time of the harvest.

Method
Each year an almost complete burrow-survey is conducted by the Province of Limburg and the Research Institute Alterra in all of the area's with a hamster population. As much fields as possible with a suitable crop of cereals or alfalfa, are checked for burrows after the harvest in July of August (cereals fields) or later in the year when the crops (alfalfa & unharvested cereals) are dense enough to detect burrows. All the burrows are mapped and the exact location is recorded with a GPS. In the following spring we have checked as much burrow-locations as possible for any signs of occupancy.
The survival-stripe is a stripe of not harvested, regular managed cereals of 20meter width and at least 100meter long. This stripe can be on one side of the field or in the middle, it can also cover the whole field (and is then called a 'survival-field'). The survival-stripe agreements have a duration of six months: from the time of harvest till the next spring. In the following spring the farmer is allowed to use the stripe, or the field, in a normal agricultural way, without any restrictions whatsoever. The survival stripes are located in the neighborhood of the hamster-reserves and the fields with hamster-friendly agreements, but at last 1,5 kilometer away from such core-area's.

Results
Our results revealed major differences between the spring burrow-activity of hamsters on fields with a different type of management (figure 1). On regular managed fields, without any protection, 5% till 15% of the known and checked burrow-locations showed signs of activity in spring. Whereas 45% till 50% of the burrows in the hamster-reserves or on fields with an agreement were reopened. On survival stripes the overwinter-survival was even better with at least 50% reopened burrows.

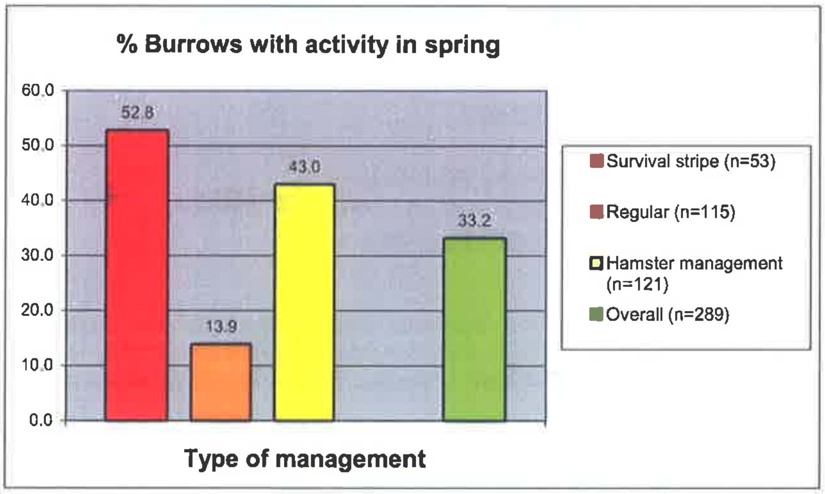

FIGURE.1. *Percentage of burrows with spring activity on fields with different types of management in 2006 and 2007.*

Discussion

For a stable population an overwinter-survival of 20% is needed (La Haye & Müskens, unpublished data), which is only possible on fields with some kind of management. On regular fields the survival is to low for a sustainable population. As a consequence, the hamster population will go extinct in area's without protection measures, at least in the Netherlands. The Alterra-research has already shown that a regular management of cereals and alfalfa is, in principal, beneficial for hamsters, because these crops provide cover and food (Muskens et al., in prep). The use of pesticides, fertilizer or ploughing has no direct harmful effects on the hamster population. But, a regular managed cereal field will be harvested at the end of July or in the first half of August. The harvest is a disastrous moment for the hamsters, because the hamsters on such regular managed fields have to deal with a sudden lack of cover and food. Most hamsters are probably predated after the harvest, some of them will perhaps be able to move to another unharvested field and a very small proportion of the population will survive and stay on their burrow.

The hamster-reserves and the hamster-friendly managed fields are not harvested or the harvest is limited. As a consequence, there's cover and food during the complete mating season, which enables the hamsters to raise 2, sometimes 3, litters in 1 mating season. To soften the transition between the hamster-friendly managed fields and the regular managed fields in the surroundings, a new protection measure has been developed: the survival-stripe.

Conclusion

The research of Alterra has shown that cover and food are essential for the survival of hamsters. On regular managed fields the crops provide cover and food till the end of July, while in the hamster-reserves and on the hamster-friendly managed fields the harvest is limited. A limited harvest means that more hamsters reproduce, survive and that they will find enough food for their winter-storage. Survival stripes can soften the transition between the hamster-friendly managed fields/reserves and the regular managed fields in the surroundings.

The reintroduction project of Cricetus cricetus near the City of Mannheim, Baden-Württemberg, Germany - first results and experiences.

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The Rhine - Neckar Region is known as a very old hamster area because of the favourable environmental parameters (Rietschel & Weinhold 2005). The first discovery of a hamster is dated back to the year 200 (Lüttschwager, 1968). Today the Rhine - Neckar Region is a big industrial area, the seventh biggest urban area in Germany.
The hamsterpopulations are all separated from each other. Over the last years all Common Hamster populations in the Rhine – Neckar Region have suffered a significant decline. In 2001 due to various building projects on hamster habitats the city of Mannheim started a species conservation plan the "Artenhilfsprogramm Feldhamster" in 2002. This plan includes measurements on inhabited hamsterhabitats and in 2004 a breeding program started in the Heidelberg Zoo with the objective of re-introduction. Because of negative breeding results in the years 2004 - 2006 (for details see abstract of Heimann in this journal) a new breeding stock of 70 animals was purchased from the University of Strasbourg in February 2007. 30 (12 ♂, 18 ♀) animals were released in May 21 on a one hectare big barley/lucerne field in a landscape conservation area near Mannheim – Strassenheim.

Methods
The landscape conservation area in Mannheim – Strassenheim is about 450 ha. On one side it is boardered by the Autobahn A 6 but on all other sides there is only farmland. Before the release 30 holes of 50 – 60cm depth were dug as optional burrows. Around the holes release cages were placed for preliminary protection against avian and terrestrial predators. To provide a maximum of food supply and coverage, the barley and lucerne on the field was first cut at the end of the active season in October.
All of the hamsters were tagged with subcutaneous transponders (Trovan ID100) and 15 were additionally radiotagged (Cable – tie collar, TW4, Biotrack, UK). The Biotrack - collars have a ground to ground signal range of about 250 – 400 m. Radiotracking was carried out three times a week. Hamsters were tracked either to a burrow or until they were seen. Additionally burrow counts and capture-mark- recapture were done in monthly intervals.
Live-traps were put in front of the burrows for 3 days and controlled twice a day. Trapped hamsters were health checked, weighed and in case of an injury anesthetized for further treatment. Trapped juvenile Hamsters were tagged with subcutaneous transponders (Trovan ID100) and their sex was determined.
On the 14th of August 16 (7 ♂, 9 ♀) more hamsters were released on a second release site nearby. This was done to restock the initial release stock and because of the limited space in the breeding station (for details see abstract of Heimann in this journal). All 16 hamsters were tagged with subcutaneous transponders and 6 were additionally radiotagged. So in total 46 hamster were released in 2007.

Results
Monthly recaptures:
In June 9 Hamsters, 3 adult males and 6 adult females were trapped. 2 females showed signs of pregnancy, weighing 306 and 425g. One other female had suckled nipples. In July 17 hamsters were caught among them 8 juveniles. In August 11 (6 ♂,5 ♀) hamsters were found in the traps. 8 juveniles (5 ♂, 3 ♀) and 3 of the initial stock. In September one male adult, 2 male and females juveniles were caught. In October only one juvenile male was found in the traps (Fig. 1, Tab. 1).

TABLE 1: *Monthly recaptures of the hamsters on the first release site*

	Male adults	Female adults	Male juveniles	Female juveniles
May	18	22	0	0
June	3	6	0	0
July	2	7	4	4
August	1	2	5	3
September	1	0	2	2
October	0	0	1	0

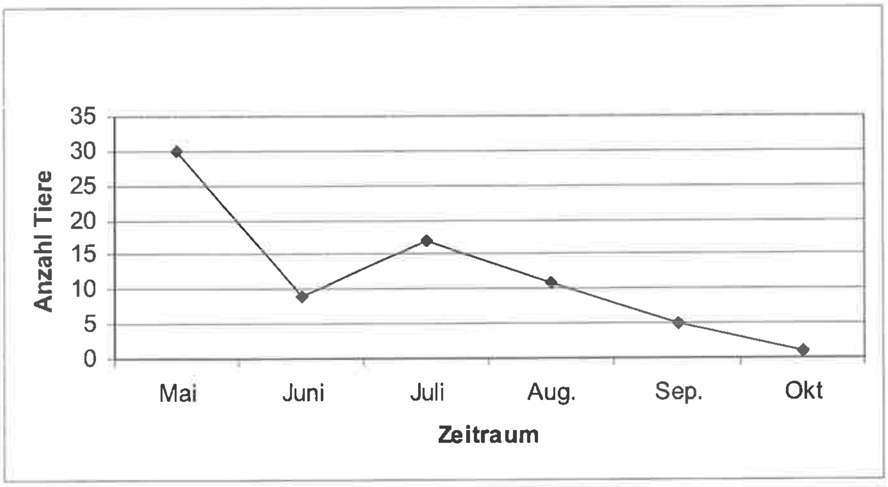

FIGURE. 1: *Number of Hamsters caught on the monthly recapture sessions.*

The hamsters on the second release site were caught in September and October. In September7 hamsters, 4 male adults and 3 female adults were trapped. In October two male adults were caught and 4 more hamsters were seen in their burrows.

Mortality:
Of 21 radiotagged hamsters 9 were predated (8 red fox, 1 dog), one animal died of intraspecific aggression. The signals of the remaining 11 radiotags were lost between June and August. Their fate is still unknown (Fig. 2).

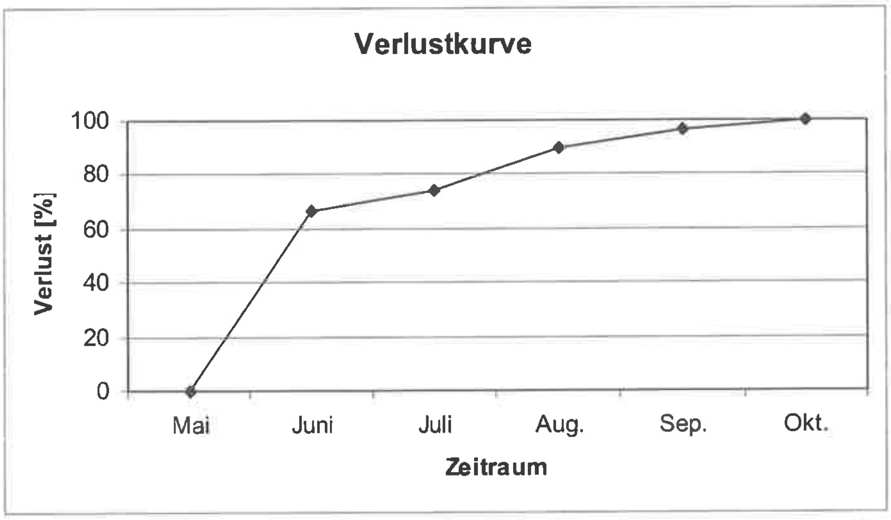

FIGURE 2: *Mortality rate of the Hamsters on the release site.*

Predators present in the area are weasel (Mustela nivalis), polecat (Mustela putorius), buzzard (Buteo buteo), kestrel (Falco tinnunculus), the long-eared Owl (Asio otus)and dogs (Canis lupus familiaris).

Dispersion:
In July 3 burrows were found 150m and up to 300m away from the release site. All the other hamster burrows were found on the release site (Fig. 3) .

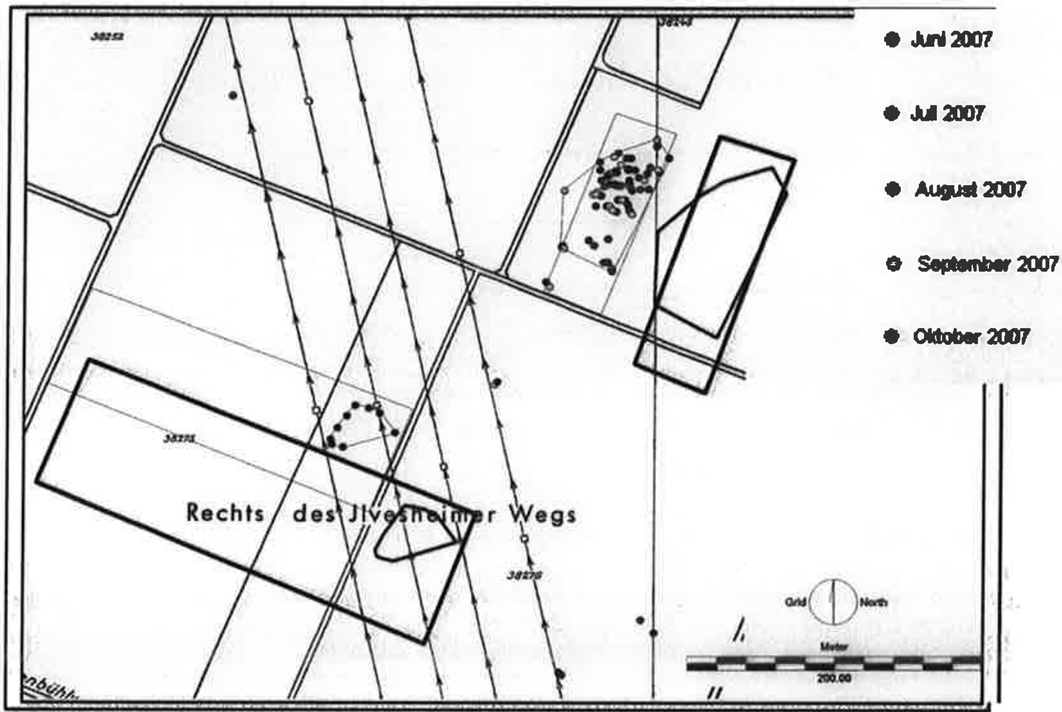

FIGURE 3: *Dispersion of the Hamsters in the landscape conservation area „Straßenheimer Hof" from June to October 2007. The two release sites are framed in black.*

Body mass development:
The body mass is an indicator for the fitness and constitution of an animal (Tab2). It is therefore a criteria to see how the reintroduced hamsters cope with the new environment. One female was caught in every session but in September. In May she weighed 235g. In June she was obviously pregnant, weighing 350g. In July and August her weight rose from 245 to 278g. In July a male youngster was caught with 203g. In October he weighed over 370g.

TABLE 2: *Body mass development of hamsters from May to October(*=pregnant)*

	Animal(Nr)	May	June	July	August	September	October
female	176	234g	256g	296g	237g	-	-
	158	235g	350g*	245g	278g	-	-
	179	300g	425g*	283g	-	-	-
male	138	342g	474g	481g	492g	497g	-
	704	-	-	203g	-	271g	372g

Conclusion
There are several parameters for a successful reintroduction of the Common Hamster.
The hamsters on the two release sites immediately began to dig burrows after their release or they occupied the pre – dug ones. This shows a good adaptation to the natural conditions.
4 pregnant females and 16 juveniles were found in June and July. There had to be at least 4 litters according to the weight and length of the juveniles. It is suggested that ca. 30 hamsters were born. This is another good sign of adaptation. We were pleased to find one juvenile in July on our first release site and in September on the second one. It seems that the hamsters can find each other and the distance between the fields is not too high.
Recent results of reintroduction programs in Holland (Müskens et al, 2008) showed high losses in the first two months after the release. Predation of the red fox is the most reason mortality. The red fox rapidly adapted to the new animals as food although the kennel is more than 800 m away from the release site. And it seems that the hamsters, knowing no predators in the zoo, fell prey to the foxes.

All radiotagged hamsters in the may release stock were lost in the first ten weeks. It is not quite clear if this cable-tie collar is a handicap for them. Statistically there is no significant difference between radiotagged and not - radiotagged hamsters, because in August we only caught 3 not – radiotagged animals of the initial stock and in September only one non – radiotagged hamster was caught. Previous results (Weinhold, 1998) showed no relation between the radiotag and higher predation.

From June to October the hamsters gained weight as expected due to the big offer of different cereals on the surrounding and our release fields.

Only three burrows were found up to 300m away from our release site. In other projects in Holland and in existing populations in Mannheim, burrows were often found up to 1km away (Müskens et al., 2008; Sander, in prep) .

All in all it can be said that the first year of reintroduction has been good but the release of the 30 hamsters can only be a small step. Next spring over 150ha of the fields in the landscape conservation area in Mannheim – Strassenheim will be mapped to see, how many hamsters survived the winter.

The next years other releases are planned with the offspring from the breeding stock in the Zoo. We hope to release up to 100 hamsters in 2007.

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ABSTRACT

The consideration of the field hamster (*C. cricetus*) with intrusions
An empiric report on two large-scale projects in the Rhenish Lössbörde

Die Berücksichtigung des Feldhamsters (*C. cricetus*) bei Eingriffen
Ein Erfahrungsbericht zu zwei Großprojekten in der rheinischen Lössbörde

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Summary
As a particularly and strictly protected national and European species the Common hamster has to be considered in affecting projects. By means of two examplary projects, which were accomplished before respectively after the new regulation of BNatSchG in the year 2002, is presented, how the Common hamster is considered in nature and landscape affecting projects in Germany. Examples are the transnational trade area „Avantis" near Aachen and the brown coal power station „BoA Neurath" near Neuss, both more than regionally well-known due to media interest in the „hamster question". From the processes of these projects it is derived which requirements concerning biological and species protecting legal aspects of the Common hamster are necessary in proceedings of permission.

Zusammenfassung
Als besonders und streng geschützte nationale und europäische Art ist der Feldhamster bei Eingriffsvorhaben zu berücksichtigen. Anhand von zwei Projekten, die vor bzw. nach der Neuregelung des BNatSchG im Jahr 2002 durchgeführt wurden, wird dargestellt, wie der Feldhamster in Deutschland bei Eingriffen in Natur und Landschaft behandelt wird. Als Beispiele wurden das grenzüberschreitende Gewerbegebiet Avantis bei Aachen und das Braunkohlekraftwerk „BoA Neurath" bei Neuss ausgewählt, die durch das mediale Interesse an der „Hamsterfrage" über die Region hinaus bekannt geworden sind. Aus den beiden unterschiedlichen Projektverläufen wird abgeleitet, welche fachlichen und artenschutzrechtlichen Anforderungen an Genehmigungsverfahren bei einer Betroffenheit des Feldhamsters zu stellen sind.

Der Artikel wird voraussichtlich Anfang 2009 in „Natur und Landschaft" (Zeitschrift für Naturschutz und Landschaftspflege) publiziert. Daher wird an dieser Stelle auf eine ausführlichere Darstellung verzichtet.

ABSTRACT

Population of common hamster in Simferopol (Ukraine): fast formation of synathropic adaptations.

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The common hamster is not classified as a synathropic species. It has specific needs with respect to soil type, temperature and moisture. The common hamster has been widely spread over the whole peninsula, occupying steppe and foothills areas and found in mountainous areas up to 500 m. A mild and warm climate, a long vegetative period, and a large abundance of fruits and vegetables are seen as favorable for this species. Since the early 1970s this species strongly increased in abundance in Simferopol and other cities of the Crimea. In 2000 this species had not only occupied suburbs, but also the central part of the city, forming permanent settlements in vacant sites such as parks and front gardens. In some places its density amounted to 136 individuals per 1 ha, which is much higher than outside the urban territories. Animals settled nearby highways, and seemed not be afraid of noise and light. It is of special interest that in August, when reproductive activity diminishes, hamsters lived in aggregations and did not avoid each other, but shared their burrows. High densities were maintained in urban environments even during years of deep depression observed outside the urban areas. Thus, the vacant sites of Simferopol seem to offer more favorable conditions for the common hamster compared to natural habitats. Natural omnivorous features, high fecundity, ecological flexibility and an almost lack of natural enemies allowed this species to get well adapted to urban habitats, which may give rise to epidemiological problems in the future.

ABSTRACT

Seasonal constraints and reproductive performance in Common Hamsters.

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Common Hamsters (*Cricetus cricetus*) are hibernators and therefore strongly limited by time constraints. Previous studies have demonstrated high individual variation in the timing and duration of the active season. Furthermore, the timing of reproduction has been suggested to be crucial for reproductive success in the current season. In 2006, the active season was remarkably shorter compared to former years, due to very harsh winter temperatures and extended snow cover in spring. In this study we therefore compared reproductive timing and output of individual females in the season 2006 with that of individuals monitored in the years 2003-2005 in the same area. Animals were live-trapped in regular intervals, weighed, individually marked and reproductive status was determined at capture. The number of litters per season and litter size were determined in nine females. In addition, female condition before hibernation onset and overwinter survival were used to estimate the consequences of previous reproductive effort.
The onset of a female´s first gestation period in 2006 occurred about three weeks later than in the years 2003-2005. However, no significant difference in the timing of litter emergence could be found between all studied years. The size of a female's first litter per season and overall offspring number were lower in 2006 than in previous seasons. Nevertheless, the number of litters per female was similar in all years. The pronounced time constraints in 2006 were reflected in a higher percentage of females overlapping lactation of the first and gestation of the second litter after a postpartum oestrus, compared to previous years. The time period between weaning of the last litter and the onset of hibernation in 2006 was about three weeks shorter than in former seasons. According to this limited postreproductive period, females entered hibernation with the lowest body mass found in all studied years. This may negatively affect overwinter survival and future reproductive success.

ABSTRACT

Conservation breeding of *Cricetus cricetus* in Germany – history, results and experiences

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According to the common hamster conservation plan of the City of Mannheim (Baden-Württemberg, Germany), a breeding centre was established at the Zoo of the neighbouring City of Heidelberg in 2004. The first breeding stock, consisting of 19 (5 ♂, 14 ♀) animals was provided by the Biological Institute, Dep. of Animal Physiology, at the University of Stuttgart. After a promising start in 2004 with over 40 young hamsters, the following years where less successful with 18 hamsters in 2005 and only 4 hamsters in 2006. Within the breeding stock a high percentage (60%) of animals fell ill with cancer of the thymus gland (thymoma) and died at an average age of 24 months. The normal average lifespan lies between 28 and 31 months (ERNST et al. 1989). According to the decreasing breeding success and a very specific clinical picture, the assumption was that an inbreeding depression had occurred and that the breeding stock was no longer suitable for reintroduction.

In consultation with the City of Mannheim a second breeding stock was purchased. This breeding stock was provided by the University of Strasbourg, CNRS-ULP, Institut des Neurosciences Cellulaires et Integratives (Prof Pévet), and consisted of 70 (30♂, 40♀) animals. 30 Of these hamsters were released at the release site in May and 40 (18♂, 22♀) animals provided the base for the new breeding stock. Because inbreeding depression could not be proved as single cause for the lack of breeding success the keeping conditions at the breeding centre were also changed.

In comparison to the years 2004 to 2006 we observed the mating behaviour more closely. Already on May 30th the first litter was born, another 23 followed, the last on the 7th of August. Out of those 24 litters, with an average size of six young per litter, 144 young hamsters are currently available for reintroduction and breeding in 2008.

ABSTRACT

The distribution and the level of genetic diversity of the common hamster, *Cricetus cricetus,* in Poland.

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The current range and distribution of the common hamster, *Cricetus cricetus* in Poland was established. The range of the species has dwindled substantially in the course of just 30 years and the process is still going on. The Polish populations are isolated from Belarusian, Czech and German ones; there is low probability of some exchange with Ukrainian hamsters. Moreover, the areas of hamster distribution in Poland are isolated from one another. In view of the marked shrinkage and fragmentation of the range, we propose changing the status of this species in Poland from unknown (DD) to endangered (EN).
The genetic diversity of 12 populations in the present range was established. The control region of mtDNA was sequenced for 150 individuals and partial sequence of cytochrome *b* for 40 individuals. Only seven haplotypes of mtDNA control region were found and hamsters with the same haplotype inhabited large areas. Such pattern of variation cannot be the result of present genetic drift, but is rather a consequence of historical, postglacial bottleneck.
The differentiation of cyt*b* sequences showed the presence of two phylogenetic lineages in Poland. One of them, so far specific for Poland, most probably re-colonized Polish uplands from the east. The other one migrated from the south, as it is identical with Pannonia described from Czech and Hungary. The hamsters of Pannonia group are more endangered in Poland as they are represented by small, isolated populations. On the other hand, Polish lineage seems viable, however immediate conservation efforts are necessary.

ABSTRACT

Geography and climate: how did the common hamster colonize Central Europe.

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The common hamster *Cricetus cricetus* is the only widespread continental steppe mammal in central Europe. Its distribution centre in eastern Europe and western Asia comprises mainly open or wooded steppe whereas the species' occurrence in central Europe is strongly associated with agricultural sites. Fossils and DNA-based population structures identify the species as an element of cooler and moderate climatic periods. In contrast to that, times of extreme warming or cooling may have caused significant population retreats. The decline of the common hamster during the last decades is most significant at its distribution boundaries. The causes for that are still matters of debate but anthropogenic factors may not be the only reason for the retreat of the common hamster. We used genetic data to infer the range changes of the species mainly focussing on the western populations. It seems that the western hamster populations comprise a very dynamic boundary and that the western area was colonized from different source populations during the last 10,000 years.

ABSTRACT

Synchronisation of circannual rhythms in European hamsters: The effect of short photoperiod.

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The European hamster (*Cricetus cricetus*) is the only hamster species which has a true circannual clock, enabling the animal to prepare for changes of the seasons by appropriate adaptations of its physiology and behaviour before the environmental changes take place. The preparation for hibernation starts already in mid July and the development of gonads for the reproductive season in spring and early summer is initiated early in the year when the animals are still in their hibernacula. Both changes can be initiated endogenously that means without the animal having information about the time of year. However, the endogenous period of this circannual (= circa 1 year) rhythm is never exactly 365 days and in European hamster mostly <365 days. Thus, it has to be synchronised to the natural years either by phase delaying or by slowing down the cycle. It is well accepted, that the seasonal changes in daylength synchronise the circannual rhythm, however, by which mechanism is only partly understood and should be investigated in this study. A total of 150 male European hamsters captured in the field were subjected randomly to 15 groups. All of which were transferred to a short photoperiod (SP, mimicking winter) for 6 weeks starting in June, to synchronise all animals. Thereafter all groups were transferred to a constant long photoperiod (LP, mimicking summer). Two groups stayed as control their lives long in LP conditions and animals displayed beautiful circannual rhythms in their bodyweights and reproductive states. Each of the other groups was subjected to a 2nd SP period of 4 weeks, but each of them 4 weeks later. The first group was transferred to the 2nd SP 2 weeks after the first SP. Each 2-4 weeks reproductive state and body weight were checked and compared with the ones of the control animals. Interestingly, a preliminary analysis of the data showed that SP can advance the circannual rhythm of reproduction and body weight by 250 days but it can only delay by 40 days. This is in strong contrast to the hypothesis that changes in photoperiod have predominantly to delay the endogenous rhythm of European hamsters. Further analysis is necessary to explain this result.

ABSTRACT

Fox control to protect hamsters, (how) did it work?

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In 2005 and 2006 the population of foxes and their management was studied in the South of Limburg, because of the possible effects of foxes on the reintroduced hamster populations. To prevent the predation of hamsters, foxes were shot from the beginning of February until the end of April/beginning of May in 5 (resp. 6) hamster habitats and in a buffer zone of 1 or 1,5 kilometre around the hamster habitats.
The main goal of this study was to evaluate the effectiveness of fox control. The hunters wrote down how many hours they spent which methods were used. Each dead fox was brought in for a more detailed analysis on age, gender and reproductive state.
Just outside the shooting zones five foxes were caught alive and supplied with a radio-collar. The territories of these foxes were ca. 65 ha in size, fox density was estimated to be about 4 adult foxes per km^2 and ca. 1.5 litters per year (with a mean litter size of 5.1 juveniles). Fox control led to a reduction of about 50% of the fox population and, also, a reduction of 50% in the (expected) litters. This proofs that the management was effective to (temporally) reduce the population of foxes.
The effectiveness of fox control decreased with the width of the buffer zone. More foxes were shot per km^2 with a buffer zone of 1 kilometre wide, then with a buffer zone of 1.5 kilometre width. The radio-collared foxes had a maximum activity radius of 1 kilometre. None of the five foxes with a transmitter tended to shift their home range towards the hamster habitats where foxes were shot and where empty territories were available. A buffer zone of 1 kilometre width is therefore sufficient, as was the period of fox control.

ABSTRACT

Are hamster populations vulnerable for predation by foxes?

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The main mortality-factor of hamsters is predation. Almost half of the predated hamsters were caught by Red-foxes (*Vulpes vulpes*). The last years we tried to decrease the mortality of hamsters by controlling foxes in and around the hamster reintroduction-areas. The survival of wild and captive-bred hamsters showed big differences between years and areas, which made a solid analysis more difficult. In this presentation the influence of fox-control on the hamster-population is shown.

ABSTRACT

Farmland birds in Europe, their trends and distribution.

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The European Bird Census Council collects data on breeding bird trends and distribution from a large number of countries in Europe. In 1997 the European Breeding Bird Atlas was presented. Since 2002 breeding birds trends across Europe have been reported. Trend information was derived from annually operated national breeding bird surveys spanning different periods from 20 European countries, obtained through the Pan-European Common Bird Monitoring (PECBM) scheme. A software package named TRIM was used to calculate national species indices. These were combined into supranational indices for species, weighted by estimates of national population sizes. Weighting allows for the fact that different countries hold different proportions of the European population.
Species are being classified within four main biogeographical regions, Atlantic, Boreal, Continental and Mediterranean. And the species were also classified according to their main habitat type. For both the farmland and woodland birds so-called composite indicators were calculated. The resulting farmland bird index (FBI) shows strong decreases in all regions across Europe. A remarkable difference between western and Eastern Europe can be shown in the years after the political changes in the east. The large-scale extensification of farmland use results in a (temporary?) increase of the FBI. The trend information is based on many local observations of breeding bird occurrence. These data can also be used to compile farmland bird distribution maps using geostatistical tools like kriging. By comparing the numbers at sample locations between years change maps can be calculated. These maps indicate the regions in Europe were changes in farmland bird numbers are most prominent. If some species of farmland bird can act as a proxy for population dynamics in hamster population than these methods also could indicate possible changes in hamster populations across Europe.

ABSTRACT

An internet-accessible knowledge system on spatial evaluation of the habitat; a meadow bird system as guide for hamsters?

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Effective management for nature conservation needs a basis in scientific research and a careful communication of the knowledge to the workers in the field. This is especially the case in agri-environmental schemes, where nature conservation is to be combined with agricultural exploitation.
For meadow birds there is a long lasting discussion on this subject, with questions like: what are the minimum conditions which have to be fulfilled? What are the possibilities within agriculture and how does this relate to nature reserves? What area is needed to reach the goals (if they are formulated)? The today's view is that a so-called mosaic-management is needed, an alternation of several growth stages and type of use in space and time.
In practice there is a gap between scientists and workers in the field how a effective mosaic is defined. To bridge this gap a knowledge system is developed. The system concentrates on defining suitability of the habitat (excluding management) and on the expected effectivity of management, related tot the survival of chicks.
This system is internet-accessible. A prototype is operational. At the moment experiences are gained with applications in practice.
The system is developed for the black tailed godwit (*Limosa limosa*). It is likely to be applicable for other meadow bird species. The general principles we used make it interesting to explore the applicability for Hamster.

POSTER

An earth-laid gas pipeline runs through the Thuringia Basin, one of the densely populated hamster regions in Germany. Which are the effects for the Common Hamster?

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Positive aspects:
Research has been done on the Common Hamster in the district around Gotha, which is part of the Thuringia Basin.
Existing data was provided by the:

- TULG (Thuringia nature authority) in Jena,
- Nature authorithies in Erfurt (capital town of Thuringia)
- Local administrations from Gotha, Arnstadt, Eisenach,
- Specialists, familiar with the environment.

The existing data was gathered and analyzed by the engineer's office LANGE GbR for a review of the actual situation new data has been obtained throughout the years 2005 and 2006. By now it is possible to compare the afore existing and the newly acquired data to express new statements about the evolution of the Common Hamster in this region.

Negative aspects:
Destruction of the Common Hamster's natural environment: during the period of construction, the habitat of the Common Hamster had to be destroyed and an alternative habitat had to be found as a compensation for the time being.

The engineer's office LANGE GbR has completed the research on the Common Hamster. More research has to be done on future projects in different regions of Thuringia, despite there is a shortage of funding and a limited space of time in planning and construction processes of major development schemes. The gas pipeline runs through typical East German agricultural areas, where the Common Hamster still lives without nature management measures.

The questions are: why and how could the Common Hamster survive without nature management measures to date? What are the reasons?

Important considerations:
- Which field crops does the hamster prefer for a balanced diet?
- In which field crops has the hamster been found?
- The types of field crops have been researched,
- Which quality of soil does the Common Hamster prefer?

This question was answered by examining the 2m deep pipe trench (MARTENS & MARTENS, 2007).

There are two methods to banish the Common Hamster from the construction sites of the gas pipeline. The methods are compared.

POSTER

Survival analysis to predict the predation risk in reintroduced populations of the Common hamster (*Cricetus cricetus*) in the Netherlands

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The Common hamster (*Cricetus cricetus*), a rodent species inhabiting farmland in parts of west- and central-Europe, has suffered a dramatic decline over the last 20 years in the western part of its geographical range. Populations in France, Belgium, Germany and the Netherlands, collapsed mainly due to land-use intensification. In 2002, a breeding program was started to reintroduce the Common hamster in the Netherlands. From 2002-2006, a total of 460 hamsters were released at 6 locations with adjusted agricultural management, aimed to reduce predation risk. Part of the released captive-bred hamsters and of recaptured wild-born hamsters received a radio-transmitter. In this way, a total of 379 hamsters were monitored. Predation was the main mortality factor, with 95% killed by foxes, polecats, birds of prey, and other predators. Survival rate analysis revealed that mean yearly survival rate varied from 2-22% and was mainly dependent of: a) origin of hamsters, i.e. wild-born or captive-bred, b) gender, c) month of release d) year and e) site of release. Yearly fluctuations in survival rate were considerable, mainly due to type and timing of agricultural measures. Perspectives for long-term conservation of Common hamster populations on farmland are discussed.

POSTER

Individual density, reproductive activity and stress levels in Common hamsters

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Densities of Common hamster populations are known to be highly variable depending on environmental conditions and anthropogenic factors. Due to the high reproductive potential of Common hamsters, population density can increase within a short time period under favourable conditions. High individual density, however, can cause increased stress levels in many mammalian species. At our study site, population density has been found to vary throughout the season and between different parts of the area. Therefore, we investigated potential relationships between stress load estimated by concentrations of faecal cortisol metabolites (FCM) and population density in different sections and among sex and age groups. Common hamsters were captured using Tomahawk live traps and were fur marked in individually different patterns. Local density was determined by repeated scans of preselected sections in a standardized way. Cortisol concentrations, as indicator of adrenal activity, were analysed from faecal samples using enzyme immunoassays (EIA). We found no significant relationships between FCM levels and individual density. Preliminary results, however, indicate increased cortisol concentrations in adult females during periods with high juvenile density. Furthermore, sex differences in FCM concentrations of juveniles were found shortly after natal emergence with females showing higher levels than males. In general, we assume that reproductive activity, especially in adult males, was the predominant factor causing increased stress levels in individual hamsters. Periods with high frequencies of sexual and aggressive interactions seemed to affect adrenal activity independent of local density.

POSTER

Inventory of burrows of the Common hamster (*Cricetus cricetus*) in the province of Vlaams-Brabant (Flanders, Belgium) in 2007

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Between 1998 and 2002 large-scale inventories of hamster burrows were carried out in Flanders (Belgium) by De Wielewaal/Natuurpunt Studie. These inventories located four distinct relict populations: Bertem and Hoegaarden in the province of Vlaams-Brabant and Heers-Tongeren and Bilzen-Riemst in the province of Limburg (with Bertem and Heers-Tongeren as main hamster populations).

Since 2003, systematic monitoring of burrow densities has been limited to two small zones in the heart of the 1998-2002 core areas: a 200-ha study area in Bertem (by the Nature Study Group Dijleland) and a 400-ha study area in Heers-Tongeren (by LIKONA). Post-harvest inventories in cereal fields yielded annually 6-16 burrows in each of these areas. After 2002, no systematic searches have been conducted elsewhere in the 1998-2002 core areas. Hence, recent information on the survival or population trends of the Common hamsters outside the two study areas is completely lacking. As a result, the current conservation status of the Flemish hamster population is not well known.

Since 2005, a number of farmers have adopted hamster-friendly management schemes in the two study areas, offered by the nature and rural development agencies of the Flemish government. Deployment of protection measures into other areas is hampered by the lack of accurate hamster distribution data. Beside, any relict population can be very important for the survival of the species, as they might carry genetic material that has been lost in the core populations.

In order to improve our understanding of the conservation status of the Flemish hamster population, to evaluate the effectivity of the protection measures taken and to identify additional areas where protection measures could be taken, the actual distribution needs to be mapped in detail, followed by careful monitoring of the remaining populations. In 2007, a first step towards this goal was taken with a large-scale inventory in the province of Vlaams-Brabant.

The study area comprised all 39 1-km^2 UTM-squares where hamster burrows were found in the period 1998-2002. At least 5 % of the area of each square (= at least 195 ha in total) was inspected for hamster activity. Additional searches were conducted in areas that had not been searched properly in 1998-2002 (e.g., Outgaarden and Landen).

Between the end of July and early September 2007, harvested wheat, barley and oats fields were visually inspected for hamster burrows. We searched a total of 629 ha: 304 ha in Bertem (of which 85 ha in the monitored area of 200 ha), 211 ha in Hoegaarden, 47 ha in Outgaarden and 67 ha in Landen. The results were very meagre: in Bertem we found 13 burrows (12 certain and 1 probable) and in Hoegaarden, Outgaarden and Landen we did not find any certain hamster burrows. Out of the 13 burrows in Bertem, 11 were located within or just besides the monitored area. In the poster we discuss the probability of absence of the species outside the 200-ha area based on the amount of area searched.

POSTER

Are circannual rhythms innate in European hamsters?

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When maintained in a constant photoperiod most but not all European hamsters (Cricetus cricetus) show circannual rhythms in reproduction and body weight thus, the question arises whether circannual rhythms are innate in this species. We investigated two seasonal parameters (reproduction and body weight) as well as two circadian parameters (activity pattern and sulfatoxymelatonin excretion) in 12 hamsters. All animals were born and raised by longterm pinealectomized mothers kept under LD15:09 after mating. At weaning, the 12 pups were split into 3 groups: One was maintained in LD15:09 so that the animals had no photoperiodic change in their life. The other two groups experienced a decrease in photoperiod to LD12:12 or LD09:15 at weaning. During the following 69 weeks, all 3 groups showed 4 subsequent characteristic phases in the activity pattern. Phase 1 to 3 correspond to characteristic seasonal patterns in natural light conditions: juvenile pattern (rhythmic, high activity) followed by winter pattern (weak rhythm, low activity) followed by summer pattern (again precise rhythm, high activity). Phase 4, in which the animals remained for the rest of their lives, was not comparable with any natural pattern and showed a clear 24-h rhythm but low amounts of activity. Except for group 1, that showed an additional short reproductive phase at the end of phase 1, all animals became reproductive from the beginning of phase 3 and remained reproductive to their deaths. In all groups, the body weight increased as long as the animals were reproductive. Only the sulfatoxymelatonin values showed no circannual variations. The experiment thus suggests that in European hamsters appropriate seasonal changes in activity, reproductive state and body weight are innate from birth until they enter phase 3. In natural conditions, this phase is accompanied by a phase of sensitivity to photoperiodic information. The authors presume that the animals need a second photoperiodic signal at least in phase 3 to develop an enduring circannual rhythm.

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