The 22nd Annual Meeting of International Hamster Workgroup

What We Have Accomplished and What Is to Be Done Next

Programme and Abstract Book

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Foreword

Dear participants,

it is my great pleasure to welcome you to the 22nd Annual Meeting of International Hamster Workgroup. In previous years, the meeting has been held in many European countries in which the Common hamster still persists. This year for the first time the meeting is being organised in the Czech Republic, the heart of Europe. Located on the Morava River, the city of Olomouc is the ecclesiastical metropolis and historical capital of Moravia. Today, it is an administrative centre of a central Moravia region in which hamsters have always been present due to highly productive soil used for agricultural production, mainly cereals.

Olomouc is an ancient university city and has more than one hundred thousand residents. Olomouc has several large squares. The main one, the Upper Square is adorned with the Holy Trinity Column, designated as a UNESCO World Heritage Site. Olomouc is the natural centre of a historical ethnic region Haná covering the productive lowlands in the Upper Moravian Vale along the river Morava. It is among the warmest areas in the Czech Republic where hamster populations still thrive fairly well. Here hamsters can be found in both farmlands and suburban areas in which we have study plots for our own research.

I am very happy to host this meeting in Olomouc. In AMIHW 22, roughly 40 participants from 7 traditional hamster countries have registered. Additionally, we have one lecturer from Spain. With 17 lectures on various hamster topics we manage to offer you a delightful variety of research perspectives covering all fields of current ecology, genetics and conservation biology.

I hope that this meeting will represent a brainstorming opportunity contributing to the exchange of new and exciting scientific points and to developing new networks and collaborations. I believe that you will also find some time to enjoy the city of Olomouc by walking through downtown and city parks.

Welcome!

Emil Tkadlec

Committees

Scientific committee

Emil Tkadlec
Palacky University Olomouc, Czech Republic

Agata Banaszek
University of Bialystok, Poland

Maurice J. J. La Haye
Alterra Wageningen UR, The Netherlands

Stefanie Monecke
University of Strasbourg, France

Tobias E. Reiner
Senckenberg Research Institute, Germany

Ulrich Weinhold
Institute of Faunistic, Germany

Organising committee

Emil Tkadlec
Jan Losík
Ana Gouveia
Ivana Petrová
Martina Bendová
Blanka Krausová
Marek Bednář

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Friday, November 13

Registration will be open from 11:00 to 13:00 (At the entrance hall of the Faculty of Science). All lectures will take place in the Lecture Hall 3.003, Floor 3, Faculty of Science, 17. listopadu 12, Olomouc

Opening Ceremony

13:00 – 13:30

Welcome: **Zdeněk Dvořák**, Vice-dean of the Faculty of Science

Plenary lecture (Chair: Emil Tkadlec)

13:30 – 14:30

Agata Banaszek (University of Białystok, Poland): The species that shift their ranges in response to the oceanic-continental climatic gradient in Europe: is the Common hamster one of them?

14:30 – 15:00

Coffee break

Session 1: Distribution and Management (Chair: Ulrich Weinhold)

15:00 – 15:20

Vladimír Vohralík (Charles University in Prague, Czech Republic): Current distribution of the Common hamster in Bohemia (Czech Republic)

15:20 – 15:40

Adrien Chaigne (ONCFS, France): Unexpected results of French Common hamster population monitoring in 2015

15:40 – 16:00

Maurice La Haye (Alterra/Dutch Mammal Society, Netherlands): 12.5 years of hamster management in the Netherlands

16:00 – 16:20

Marco Sander (Institut für Faunistik, Germany): Photos and more from the field

19:00 – 22:00

Dinner in Svatováclavský pivovar & restaurace, Mariánská, Olomouc

Saturday, November 14

Plenary lecture (Chair: Emil Tkadlec)

09:00 – 10:00
Stefanie Monecke (University of Strasbourg, France): Global dramatic decrease in the range and the reproductive rate of the European hamster (*Cricetus cricetus*) – a review and an outlook

10:00 – 10:30

Coffee break

Session 2: Demography (Chair: Maurice La Haye)

10:30 – 10:50
Ivana Petrová (Palacky University Olomouc, Czech Republic): Better reproduction in larger-sized females of the Common hamster leads to high population density

10:50 – 11:10
Ana Gouveia (Palacky University Olomouc, Czech Republic): Estimating winter survival probability of subadult Common hamsters

11:10 – 11:30
Emil Tkadlec (Palacky University Olomouc, Czech Republic): Applying matrix population models to life history of the Common hamster: from models to further field studies

11:30 – 13:30

Lunch

Plenary lecture (Chair: Tobias E. Reiners)

13:30 – 14:30
Carina Siutz (University of Vienna, Austria): Reproductive performance, juvenile development, and hibernation patterns in free-ranging Common hamsters

14:30 – 15:30
Coffee break and Poster Session

Celebias, Eichert: The use of odorous bait in trapping of the Common hamster *Cricetus cricetus* (L., 1758)

Marciszak, Ziomek: Rediscovery of the Common hamster *Cricetus cricetus* (L., 1758) in western Poland

Melosik et al.: Phylogenetic evidence of a North lineage of the Common hamster *Cricetus cricetus* in Poland

Reiners et al.: Ten years of genetic sampling of Common hamsters in Olomouc: insights from DNA

Session 3: Behaviour and Management (Chair: Stefanie Monecke)

15:30 – 15:50
Alexey Surov (Severtsov Institute of Ecology and Evolution, Russia): Physiological and behavioural adaptations of Common hamster (*Cricetus cricetus*) to urban environment

15:50 – 16:10
Martina Bendová (Palacky University Olomouc, Czech Republic): Nocturnality in a natural population of the Common hamster

16:10 – 16:30
Tobias E. Reiners (Senckenberg Research Institute, Germany): Is there a conflict between conservationists and researchers? – A response to Monecke 2014

18:00 – 22:00

A guided tour through Olomouc downtown. Dinner in Café Restaurant Caesar, Horní náměstí–radnice, Olomouc

Sunday, November 15

Plenary lecture (Chair: Emil Tkadlec)

09:00 – 10:00

Eduardo Roldan (National Museum of Natural Sciences, Spain): Comparative aspects of reproduction in hamsters

10:00 – 10:30

Coffee break

Session 4: Genetics and Management (Chair: Agata Banaszek)

10:30 – 10:50
Natalia Yu. Feoktistova (Severtsov Institute of Ecology and Evolution, Russia): Genetic structure of urban population of the Common hamster (*Cricetus cricetus*)

10:50 – 11:10
Zofia Korbut (University of Białystok, Poland): Are the mtDNA lineages in the Common hamster (*Cricetus cricetus*) differentiated in nuclear sequences?

11:10 – 11:30
Charlotte Kourkgy (ONCFS, France): Habitat management: a tough nut to crack

11:30 – 11:50

Ulrich Weinhold (Institut für Faunistik, Germany): The CAP-Reform and its possible consequences for hamster conservation

11:50 – 12:00

Closing the AMIHW 22

12:00 – 13:30

Lunch

Plenary presentations

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The species that shift their ranges in response to the oceanic-continental climatic gradient in Europe: is the Common hamster one of them?

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The distribution of species oscillates in response to climate changes and mostimportant range shifts of European species were related to Pleistocene glacial periods. The temperature changes within latitudinal gradient in Europe caused temperate species to contract their ranges to southern refugia during glacials and expand during interglacials. However in Europe, the species distribution is also influenced by another very important climatic gradient. The longitudinal oceanic-continental gradient was also significantly variable during Pleistocene glacial cycles. While temperature influences species distribution within latitudinal gradient, it is the humidity that plays the most important role within the longitudinal one. Some species are adapted to the oceanic climate, more humid and les seasonally variable, while other species require drier climate with pronounced seasonal variation. The examples of continentally adapted species are ground squirrels *Spermophilus* spp., saiga antelope *Saiga tatarica* and pika *Ochotona* spp. Such species contract their ranges during more humid interglacials and expand during glacials, when climate influenced by massive glaciers is dry and very continental-like. The history of these species will be described in more detail and compared with the history of the Common hamster (*Cricetus cricetus*).

Global dramatic decrease in the range and the reproductive rate of the European hamster (*Cricetus cricetus*) – a review and an outlook

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The European hamster is probably the fastest declining Eurasian mammal. Nevertheless, the IUCN red list status is still {least concerned". This categorization is based on three assumption: (1) the decline concerns only a small part of the huge distribution area (roughly between the Rhine and the Yenissei) i.e. Western Europe, where (2) modern agriculture, which occurred early in these countries (3) increased the mortality of this farmland animal. Ambitious cost-intensive mortality reducing measures are, thus, implemented for the protection of the European hamster in Western Europe. However, only with very limited success, slowing down but not stopping the decline. Since none of the three fundamental assumptions was supported by any data we reviewed literature and added data from questionnaires and field work to reappraise them. For neither hypothesis we found support. We created an up-to-date distribution map for the European part of the distribution area.

Compared to 1982 the species has vanished from more than 75% of the European areas even in Central and Eastern Europe. For the Russian part as well as for Belarus, Ukraine and Moldova we gathered information on the relative occurrence of the European hamster. It has decreased in 48 of 85 originally inhabited provinces compared to 1965. In 41 provinces the species is meanwhile rare and in 9 extinct. This rapid decrease all over the huge distribution area is explainable by alarming data on the reproductive rate. It decreased by 77% compared to the years 1914–1935, and this affects populations of the whole distribution area. After considering the normal mortality rate of this prey species, one female raises nowadays on average only 0.5 females for next year's reproduction, which condemns the species to extinction. The most dramatic discovery was, however, that the reproductive rate continues to decrease. Our data from the years 1765 up to the present suggest that the European hamster will go extinct already between 2020 and 2035 due to a too low reproductive rate.

The here shown global fast decline in distribution, density and reproductive rate strongly suggest to increase the status of the European hamster immediately from "least concern" to "critically endangered" on the IUCN red list. The extinction is only stoppable if the factor which since about 1925 increasingly impairs reproduction is identified. If this shall be successful in the short remaining time, fundamental research on the reproduction on European hamsters has to become a central pillar of protection measures. Applying only the classic mortality-reducing protection measures might gain some time, but won't protect the European hamster from extinction. Thus, new strategies need to be developed.

Comparative aspects of reproduction in hamsters

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There is an enormous diversity in reproductive traits among rodents. Males from different species exhibit considerable variation in testes mass relative to body mass, which translates into differences in relative sperm numbers, as well as in the shape, size and function of spermatozoa. Both sperm numbers and sperm design are key determinants of successful reproduction. Hamsters have unusually high relative testes mass, which suggests high levels of postcopulatory sexual selection. In addition they have an unusual sperm morphology, with some species showing very streamlined sperm heads, and extremely long cells. In fact, one species, the Chinese hamster (*Cricetulus griseus*) has the longest spermatozoa recorded for eutherian mammals. Sperm function has been examined in much detail in *Mesocricetus auratus* after this species was the first in which defined conditions for in vitro fertilization were reported in 1963 and thus became the standard laboratory model for studies of gametes and fertilization until it was superseded by the laboratory mouse. Efforts to define in vitro fertilization conditions for *C. griseus* have met with mixed success and, to this date, no reliable method is available. Only anecdotal evidence exists for in vitro fertilization in *Phodopus sungorus*. Studies of hamster sperm function in our laboratory have characterized differences in sperm survival, swimming ability and energy (ATP) production in *M. auratus*, *C. griseus* and *Phodopus species*.

Hamsters have been the focus of studies on the specificity of sperm-oocyte interaction. *Mesocricetus* species are known to hybridize in captivity, whereas more distantly related ones (*Mesocricetus* $\times$ *Cricetulus*) can cross-fertilize under in vitro conditions. Genes coding for proteins involved in reproductive function are under strong selective pressure. Among these genes, protamines are important for chromatin condensation and, thus, for determination of head shape and size. Rodents have two types of protamines (PRM1 and PRM2) and the proportion between them seems crucial for normal sperm formation. Interestingly, some hamster species (*C. griseus* and *Cricetus cricetus*) do not have PRM2 in the mature sperm and how this affects sperm head shaping is not known.

Overall, despite some knowledge of hamster gametes and reproduction, it is regrettable that little or no information exists on sperm design and function (and other male traits), and sequence and regulation of genes important for reproductive function, for most hamster species. Therefore, despite being relatively well known in other aspects, comparative studies of reproduction are scarce and patchy in hamsters and, as a consequence, we still do not have a clear picture of evolution of gamete form and function, and fertilization mechanisms, in this group. We trust that future efforts in research may improve this situation. It is now clear that hamsters are a set of high performers whose study may help to shed light on molecules and functional morphology of reproduction and thus contribute to our understanding of speciation processes and conservation of endangered species.

Reproductive performance, juvenile development, and hibernation patterns in free-ranging Common hamsters

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Hibernating animals show a strict timing of the annual cycle and have a relatively short reproductive period during which females usually produce only one litter before preparing for the forthcoming winter period by accumulating sufficient body fat. In contrast, female Common hamsters can produce up to three litters per season resulting in an extended reproductive period. In addition, Common hamsters rely not exclusively on body fat reserves for hibernation, but also build up food stores. The timing of the active season is crucial to facilitate reproductive output and preparation for hibernation. The earlier female hamsters emerged from hibernation in spring, the earlier they started to reproduce and the more litters and offspring were produced. A high reproductive output, however, could not only impose conditional costs on an individual, but might also limit the time available to prepare for the winter period and by that probably affecting hibernation patterns. The long reproductive period also leads to large seasonal distributions of birth dates and depending on the time of birth, juveniles might experience temporal constraints which could have consequences on development, body condition, and survival.

By applying capture-mark-recapture techniques and behavioural observations throughout the active season we were able to monitor free-ranging populations of Common hamsters in Vienna since several years and collect data on the timing of the active season, reproductive performance, maternal care, juvenile development, body condition, foraging behaviour, and hibernation patterns. We determined the reproductive output by monitoring body mass changes and teat size development, enabling us to determine litter emergence dates in individual females as well as juvenile development. In some years we also investigated hibernation patterns by recording body temperature changes during winter using subcutaneously implanted data loggers. Analyses of reproductive output showed that most females had one or two litters per season and only 17% managed to produce a third litter. In one season we also investigated reproductive effort in males by genetic analyses and found that all males within the study site sired at least one litter, produced on average 8.8 ± 5.1 juveniles/season, and in four litters multiple paternity was detected. The time of birth affected juvenile development and survival in that late-born individuals were smaller and had lower body mass at the end of the season and showed higher overwinter mortality. An extended maternal support, however, could reduce these negative effects. Finally, we found that adult Common hamsters showed exceptional sex differences in hibernation patterns, although they followed the typical patterns of immergence and emergence sequences. Adult females spent less time in torpor and hibernated for shorter periods than adult males. These sex differences were not simply due to conditional deficits in females caused by maternal investment, but might be explained by behavioural differences in foraging strategies. As opposed to males, adult females showed mainly food caching behaviour, likely resulting in larger food stores. This could further lead to more flexible use of torpor in adult females compared to males.

Oral presentations

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Nocturnality in a natural population of the Common hamster

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Precise timing of both seasonal and circadian changes in physiology and behaviour are important for animals. In chronobiological studies several captive hamster species have long been used as biological models, including the Common hamster (*Cricetus cricetus*). Hamsters are known as nocturnal animals which exert their activity largely during the dark phase of LD cycle with the maxima at dusk and dawn. However, little is known about variation in the extent of nocturnality in a natural seasonal environment. One suburban population of the Common hamster has been studied in the southern part of Olomouc, Czech Republic, for more than 10 years. Since 2010, a unique system of automatic registration of the marked individuals has been used to detect animal activity. This system consists of circular antenna placed at a burrow entrance, data logger and battery. We obtained data on the activity of marked individuals using the automatic registration at selected burrows. The daily proportion of nocturnality over breeding season was analysed by fitting generalized additive models, assuming binomial error distribution. Nocturnality appeared to fluctuate much over the breeding season, with a periodic component which seems to be related to a reproductive cycle of adult females. Further studies should focus on disclosing the underlying causes behind the pattern of variation in hamsters' nocturnality in the field.

Unexpected results of French Common hamster population monitoring in 2015

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Monitoring of population evolution of an endangered species is a major tool to define and evaluate conservation efforts. The Common hamster has been protected since 1993 in France and yearly monitoring of its population started in 2001. The current census protocol has been applied since 2010 in Alsace, only region of presence in France. Burrows are counted in all favourable crops (about 2 130 ha of winter cereals and Luzern in 2015) in April within the recent distribution range.

Since 2013, first year of the current French National Action Plan, collective agri environmental measures (collective planning of crop rotation by farmers and implementation of a minimum of 24% of hamster-friendly crops) and intensive measures (unharvested wheat) grew in power leading to an improved habitat for hamsters. Restocking operations are carried out in restored habitat areas. A population growth has been expected as a result of these increasing efforts.

After one year of worthy increase of the number of burrows in 2014 (+37% compared to 2013), the spring census in 2015 showed a sharp decrease (−49% compared to 2014). Population seems to drop in the whole range of the species. However, we wonder if this apparent decrease in the number of burrows reveals, totally or partly, a fall of the Alsatian hamster population. Firstly, like many rodents, the Common hamster is prone to demographic fluctuations. Exceptional weather conditions in summer 2014 (abundant rain after a very dry spring) might have led to a lower reproduction rate. Then, monitoring is conducted at the same date each year, but burrow opening after hibernation might have been locally delayed in 2015. Finally, the monitoring protocol may be sensitive to an increase of intensive measures (unharvested wheat) because hamsters could be retained in such fields in spite of crop rotation.

To assess these hypotheses, we suggest completing or evolving the current monitoring protocol by:

- The implementation of additional census in July near burrows detected the year before.

- The adaptation of field sampling in the future to take into account crops rotation and habitat management.
- The implementation of a method for estimation of burrow density, taking into account detection probability and allowing statistic comparisons. A distance sampling survey (line transect) has been tested in 2015 and shows hopeful results.

In spite of one year of unexpected results in hamster population monitoring, French stakeholders have to maintain efforts to preserve the species in Alsace. However, this shows us that research is still needed to understand the many factors influencing hamster population dynamics.

Genetic structure of urban population of the Common hamster (*Cricetus cricetus*)

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Over the past half-century Common hamster (*Cricetus cricetus*), along with range-wide decline of natural populations, actively settles the cities. Now the species occures in such European cities as Košice, Lublin, Prague, Vienna, in a number of German cities. In Russia Common hamster populates Nalchik, Kislovodsk, Moscow, Omsk, but the largest population of the species inhabits Simferopol (Crimea).

The reveal of genetic structure of Common hamster has to shed light on habituation, distribution, the origin of urban population. During 2013–2015 molecular-genetic analysis of Common hamster in Simferopol (Crimea) was carried out. To perform it we used tissue samples of 32 individuals caught in different parts of Simferopol, 7 – in the vicinity of the city and 3 – near the village Razdolnoe (100 km northwest from Simferopol).

Based on the analysis of the nucleotide sequences of the cytochrome b gene and mtDNA control region we found that all haplotypes described for Crimea form a single group in median network of haplotypes, thus connection with haplotypes from other geographical regions was not trace. Crimean group of haplotypes are more similar to Central Russia and Kazakhstan, compare to geographically closer region – North Caucasus – where another more distant group of haplotypes is represented. The analysis of the allelic composition of 10 microsatellite loci has shown that, despite the fact that some individuals can move around the city at a considerable distance, the specific demes inhabit particular areas. They are characterized by a high degree of genetic isolation and reduced genetic diversity. Similar phenomenon - isolated groups with high affinity, low genetic diversity and high levels of intergroup differences are also known for hamsters *Calomys musculinus* in Rio Coartem (Argentina) (Chiappero et al., 2011). The population of the *Rattus norvegicus* in the city of Salvador (Brazil) (Kajdacsi et al., 2013) also presents by genetically distinct populations, but the level of diversity in them is high, and the degree of relationship between individuals, in contrast, is relatively low. Thus, different rodent species form specific types of genetic structure in urban area according to their ecological features and degree of development of commensalism.

Estimating winter survival probability of subadult Common hamsters

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Survival estimation in vulnerable populations such as the Common hamster (*Cricetus cricetus*, Linnaeus 1758) is an essential tool when studying the underlying mechanisms and ecological processes involved in their demographics. Increasing evidence indicates that in Europe, the Common hamster populations have been in a steep decline, the species being at risk due to a combination of multiple factors such as landscape fragmentation, agricultural intensification, or increased predation mortality. As matrix models indicate, survival probability of young component over their first winter is a critical parameter affecting population growth rates. Survival probability is commonly estimated using the Cormack–Jolly–Seber method with capture-recapture data. Despite being the best method available to study wild populations, where the possibility of following an individual till the end of the study is none to null, the assumptions needed to estimate the survival parameters accurately are demanding and if not present the results may be biased or of low statistical power. In this study we use two methods to estimate hamster survival: one based on the commonly used Cormack–Jolly–Seber in MARK and one using a simplistic yet useful analytical tool based on subadults and adults densities. Both methods provided us with congruent results.

Are the mtDNA lineages in the Common hamster (*Cricetus cricetus*) differentiated in nuclear sequences?

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The genetic structure of the Common hamster (*Cricetus cricetus*) was described on the basis of three partial sequences of the mitochondrial DNA (mtDNA): control region (ctr), cytochrome b (cyt b) and 16SrRNA (16S). As a result, three ancient mtDNA lineages were identified: Pannonia, found in the Pannonian Basin, North lineage, found in West European countries and Germany and E1 lineage, found in Poland and Ukraine. As the mtDNA is inherited maternally and is a single, not recombining locus, it describes the history of females and may often describe its own history, not the history of the species. Therefore we want to verify the Common hamster history by the analysis of nuclear (nDNA) intron sequences and check if the nuclear genealogies support mtDNA splits. It is possible, that mtDNA and nuclear histories will be discordant, as so far described lineages are very divergent in mtDNA, but showing obvious similarities in nuclear microsatellites. The analysis will be performed on the samples from the whole, so far analysed, part of the species range (i.e. Western, Central Europe and parts of Eastern Europe). We have chosen 8 nDNA intron sequences from GenBank, which were identified in *C. cricetus* genome as a result of phylogenetic works in rodents. For phylogeographic analysis of representative mtDNA localities we will use three most variable introns. The preliminary results of the potential differentiation will be presented.

Habitat management: a tough nut to crack

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Restoring populations comes along with insuring proper habitat management, providing both shelter and food. In Alsace, hamsters live on highly productive farm lands, where plot sizes have grown steadily over the past decades, and specialization has driven to monoculture of cereals (mostly corn). On the short run, emergency solutions such as unharvested cereals are implemented to save the species. However, this solution is not sustainable because it only relies on high subsidies to farmers. In order to improve habitat quality in the long run for hamsters, it is therefore of the upmost importance to develop new productive agricultural practices adapted to the local pedo-climatic conditions, compatible with farmer's technical and socio-economical constraints and favourable to the Common hamster. This objective is part of the 4 year experiment (2014–2017) within the LIFE+ ALISTER program.

After the first 2 years, the assessment is unfortunately not overly enthusiastic. The main idea was simple though: interculture was sown in early spring through the cereal cover, which was to constitute a protection plant cover after wheat harvests in July. The following spring, corn was to be planted over this cover thanks to the strip till technique. But life is tough, and unexpected climatic conditions changed the fate of the experiments, and led us to lively discussions, and decisions we did not expect to take at the beginning. Which kind of interculture is compatible with corn growth? Is it possible to weed without killing the interculture sown in a wheat cover? How to ensure a vegetation cover shortly after wheat harvest in dry weather conditions?

The aim of the talk is to show how difficult it is to improve hamster's habitat with productive agricultural practices. In tight collaboration with farmers, the Agriculture Chamber of Alsace Region (CARA), the CNRS and the ONCFS built a new agronomical decision strategy for the next two years, hoping it will encourage people working on this specie to continue searching for agronomic solutions.

Research funding institutions: LIFE 12/BIO/FR/000979, Office National de la Chasse et de la Faune Sauvage.

12.5 years of hamster conservation, but still no solution

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The main goal of the reintroduction of the Common hamster (*Cricetus cricetus*) in the Netherlands, which started in 2002, is to accomplish a sustainable population of this highly endangered rodent. The Common hamster is strictly protected under the Habitats Directive, which has resulted in huge conservations efforts, including captive breeding and releases of captive-bred individuals. These reintroductions having been running since 2002, although the focus has shifted from population establishment in the first place, to increase genetic variation in local populations and restocking to support very small populations. All efforts have resulted in a population of 400–500 hamsters which nowadays live in three core areas (Sibbe-Amby-Heer; Sittard-Puth-Jabeek-Koningsbosch; Wittem-Heerlen). However, this is still no sustainable population and more conservation efforts are needed.

The hamster population in the Netherlands highly depend on hamster-friendly management. In the last 12.5 years 470 hectares of management has been implemented, but it is estimated that at least 750–900 hectares is needed to achieve a sustainable population in the long term (Kuiters et al. 2010). The main obstacle for more hectares with management, is the precondition of no or at least a drastically reduced harvest. As a consequence, it is needed that farmers have to be compensated for their loss of an income and no harvest is opposite to normal farming activities reducing the support by farmers for this type of management. The high costs of hamster friendly management and a reduced support by farmers makes it very difficult to further expand the number of hectares with hamster friendly management.

This year a new project has been started: 'Hamster on its own feet'. Within this project new crops and innovative management will be tested for several aspects: hamster friendliness, economy, costs, applicability, etc. Main goal is identifying new ways of hamster friendly management which cost less, support the hamster, allows farmers to harvest and which can be applied on 20–25% of all arable fields in a core area. If this project does not deliver, we have to fear for the final extinction of the hamster in the Netherlands.

Better reproduction in larger-sized females of the Common hamster leads to high population density

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There is ample evidence that body size decreases with increasing population density in many taxa of large herbivores. Conversely, we have the opposite evidence for cyclic small rodents, such as vole, that body size increases during the phase of high population density. Despite not being a cyclic species, the Common hamster *Cricetus cricetus* exhibits large variation in population numbers and has a high reproductive potential. However, density-dependent processes in natural hamster populations are still poorly understood. In this study we focused on the variation in body length, body mass and body growth rates with population density, using data collected over 9 years in Olomouc, Czech Republic. Reproduction index was calculated for each year to assess the intensity of reproduction.

As it was previously reported, body size of adult hamsters, particularly females, was found to increase with density. However, this was not found for body mass. There was no evidence for an increase or decrease in body length and mass with density in subadults. Body length growth rates also increased with density in adult but not in subadult individuals. Additionally, annual population density increased linearly with reproduction index. These results may suggest that in some years hamsters grow faster, attain higher body length and reproduce better, which results eventually in higher population density.

Is there a conflict between conservationists and researchers? – A response to Monecke 2014

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For about three decades intensive basic and applied research for the European hamster has been carried out, however, only in limited cases, this research has successfully contributed in the conservation of the species. Recent census data, especially of 2015, are thus shocking, during the past 15 years the European hamster has lost about 50–75% of its range in spite of the fact that due to research many threats leading to extinction are identified and known since the last century.

The received opinion in research is that the reasons for decline of the hamsters are still not sufficiently proven. However, so far, neither decades of sophisticated research in agricultural fields nor basic research in laboratories or breeding centers was enough to fight the decline of the species or transform research findings into practical conservation measures. Another hypothesis for the rapid decline of the European hamster is that the true reason for the decline is not known so far. This hypothesis was also not proven to date.

A thorough review of historic and recent literature has reveiled the majority of reason for the decline of European hamster was already identified long ago. While already in the early years of hamster research the importance of cover, survival and reproduction was emphasized, this is still subject of many studies. So far, basic and applied research focused on mortality, hibernation and reproduction and many others aspects of hamster physiology and ecology; however, it seems extremely unlikely that this research will lead to near-term special findings which will reverse the negative trend of the current species status.

In this talk I would like to point out how huge the gap has grown and how sparse information flow is between research and conservation. Either researchers or conservationists are convinced that the other cannot solve the pressing task to save the hamster. To point to a solution, I would like to encourage all members of the international hamsterworkgroup to take over responseabilty and become "hybrids", a synthesis of conservationists, researchers, teachers, volunteers and politicians. Save hamsters in the field, try to understand nature, educate kids and adults, be altruistic and argue with politicians. This might be the last chance to save the European hamster from extinction.

Physiological and behavioural adaptations of Common hamster (*Cricetus cricetus*) to urban environment

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Synurbic populations show ecological and behavioral differences as compared with populations of the same species living in their natural, non-urban habitats. The most typical features of synurbization according to Luniak (2004): high population density, altered circadian activity, adaptations of diet to supplemental food resources, tolerance toward anthropogenic structures, genetic modifications, etc. During the past decades, Common hamster settled a number of cities and its abundance remaining high and stable. In this point of view this species could consider as a commensal with respect to its behavior, ecology and physiology. However experimental data concern its adaptations to settle cities are insufficient. The biggest urban population of Common hamster inhabits Simferopol (Crimea Republic). During 2013–2015 the annual studies of behavior and physiology of Common hamster in nature and in lab (animals were caught and brought to the lab) was carried out. The hamsters maintained under natural photoperiod and temperature regime either did not show true hibernation or demonstrated torpor or short hibernation (no longer as 2 days). Up to February, no any events of hypothermia were registered. Number of leucocytes has low level in December, some rise in January and stay stable in the rest of the year that is quite differ from hibernating animals (sharp declining with the beginning of winter hibernation).

Patterns of sex hormones dynamic in males and females indicates that breeding season in the city starts in February (progesterone, testosterone picks) and was confirmed too by catching 2 months old animals with body mass 150 g at the end of April (the age was defined by incisor slices).

The aggressive interactions between males started as early as middle of March. We recorded a number of males with serious injuries this time. Cortisol level was higher too compare to other seasons. In summer, aggressive contacts become rarer and we often saw males and females visit strange burrows. Up to August, the breeding is practically finished. The level of prey mortality of hamsters in Simferopol is extremely high because of stray dogs and cats.

Thereby we can conclude that urban population of *Cricetus cricetus* by many characters differ from non-urban ones. It could be connect with additional food supply, higher temperature, as a positive factors but high mortality could led to high fertility and extended period of breeding.

Applying matrix population models to life history of the Common hamster: from models to further field studies

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There are many approaches in ecology to predict population growth rates and dynamics. Matrix population models belong to demographic models which use information on population structure, such as age or stage distribution. There are two important results from matrix population modelling and both are of conservation concern: (1) the estimate of a long-term population growth and (2) sensitivity analysis identifying the vital rates with the highest effect on population growth rates. The key step in the analysis of age-structured populations is the construction of a projection matrix. This process entails reviewing empirical data from field populations and literature sources to parameterize survival probabilities and reproductive contributions for all structural elements of the matrix. Whereas this approach was applied commonly in many mammals, there was no attempt so far in the Common hamster.

I will describe the methods of deriving parameters for projection matrix, paying more attention to parameters for which we lack field data. Then I present the results of sensitivity analysis. These simple models based on either pre-reproductive or post-reproductive census show that the finite population growth rate is most sensitive to probability of survival for the youngest class of individuals at one year of age or subadult component before the first hibernation, depending on an approach we use for analysis. The models thus support the common practice of re-introducing the laboratory-born hamsters as adults at about one year of age.

Current distribution of the Common hamster in Bohemia (Czech Republic)

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During the period 2012-–2015, distribution of the Common hamster was monitored in Bohemia, Czech Republic. Between harvest and subsequent field ploughing, i.e. in August and September we visited all regions in which occurrence of the species after 1990 was reported by previous studies. There, in every field of the KFME mapping grid we checked at least four harvested crop fields, i.e., cereals (preferably wheat and barley), sometimes also alfalfa, various vegetables and examined also field balks and road ditches. In every such field we passed distance ca 2,500 m, searching for hamster burrows. In addition, during all the year we recorded hamster road casualties. Also some personal reports by experienced collaborators were used. Altogether, we recorded hamster presence in ca 220 sites covering 66 KFME fields. Area of the hamster occurrence in Bohemia takes a strip ca 250 km long and mostly ca 30—60 km wide. It runs from lowlands along lower reaches of the Ohře river, through Prague Plateau, lowlands along the Labe river till Svitavská pahorkatina Upland. Easternmost confirmed locality was Linhartice near Moravská Třebová. As from the area between Linhartice and Mohelnice in the Morava river valey records of the hamster are missing, it is very probable that Bohemian population of the species is already totally isolated. Altitude of hamster localities varies between 140 and 410 m (exceptionally 495 m). In some regions of Bohemia the hamster is still common and locally abundant especially in regions of loess sediments. During every August, the number of dead hamsters in roads increased considerably, it suggests that a traffic causes nonnegligible portion of hamster mortality.

The CAP-Reform and its possible consequences for hamster conservation

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The new CAP-reform aims to reward farmers for the maintenance of permanent grassland, crop diversification and ecological focus areas, the so called "Greening". Up to 7% of the agricultural area of each farm covering more than 30 ha should be designated as ecological focus areas. Unfortunately measures for hamster friendly management are not supported by the greening rules. Although plants like lucerne and clover among others are listed as catch crop or nitrogen fixating plant, the deadlines for sowing and mulching do not meet the demands for a hamster friendly management. The obligation to fullfil the greening initiates a competition with contracts for nature conservation, which are voluntarily. Fields with hamster friendly management contracts are not approved as ecological focus areas in Baden-Württemberg to avoid double funding. Therefore the greening bears the risk that farmers will not extend their contracts for hamster friendly management. Additionally the crop diversification rules allow up to 75% of one crop on the arable land, which in conclusion rewards monocultural farming.

Posters

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The use of odorous bait in trapping of the Common hamster *Cricetus cricetus* (L., 1758)

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Food is a commonly applied bait in mammal research. Research on the bank vole (*Myodes glareolus*) have shown that the odour of a whole body can be used as a bait for catching other individuals of this species. However, the results did not allow to answer the question whether the body odour is an equally attractive attractant for species with different social system and behaviour than the bank vole. The aim of this study was to check the odour preferences of the Common hamster regarding the odour of other individual and food. The study was conducted in the village of Przybyszów in the commune of Moskorzew during the period from 25 May to 26 July 2014. Oat flakes, sunflower seeds and carrot were used as the food bait, and the whole body odour was collected from previously trapped hamsters on clean, cellulose sponges. Clean wire live-traps with bait were located near hamsters' burrow in three combinations: 1) trap with clean cellulose sponge (control) and trap with odour bait, 2) trap with clean cellulose sponge (control) and trap with food bait, 3) trap with clean cellulose sponge (control), trap with food bait and trap with odour bait.

The study have shown that food is a more attractive bait for the Common hamster than the body odour of other individuals from the population. Hamsters mainly chose traps with food bait in both, the second (83.78%) and the third (68.95%), experiments. The results of the first (58.83%) and the third (6.89%) experiments suggest that odour of other individual does not have a significant influence on hamsters' choice. In the first experiment the difference between choice of odour bait and control was statistically irrelevant.

Rediscovery of the Common hamster *Cricetus cricetus* (L., 1758) in western Poland

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The Common hamster is a species which has adapted to areas changed by humans. The steppe-like conditions of cereal fields have become a suitable alternative to the original habitat. Poland was not an exception to this pattern and in the past the species was widespread in central and southern Poland, between latitudes 50° and 53°N. Detailed studies of the range of distribution of this species conducted between 1953–1970 showed that the hamster was present in 1176 active localities and in 245 abandoned localities. *Cricetus cricetus* was the most abundant in SE Poland, but 118 localities were found also in the region of Lower Silesia (SW Poland), where it was also quite common. The studies performed between 1999–2006 showed that hamsters disappeared from western Poland and survived only in SE Poland.

In 2013 the species was noted on the fields surrounding Jawor (51°2′55″N, 16°11′49″E) in Lower Silesia, in a locality far away from the current range of this species. Later research in 2014 and 2015 showed that the species is present in a few new localities in that region. Recently, the Common hamster has been documented from five localities in the neighbourhood of the town of Jawor: the town of Jawor – Królowej Marysieńki Street (51°2′55″N, 16°11′49″E), Piotrowice village (51°3′39″N, 16°8′38″E), Paszowice village (51°1′16″N, 16°10′18″E), Bolkowice village (50°59′36″N, 16°11′51″E) and on the fields alongside the state road no. DK 3, where it is especially abundant between the villages of Koiszków (51°8′21″N, 16°10′7″E) and Małuszów (51°6′57″N, 16°10′31″E). One additional isolated locality is situated further to the north, in Piersno village (51°16′39″N, 17°9′27″E). The presence of the species was confirmed by field inspections (active burrows, feeding signs), trapping and direct observations of live individuals or registration of dead specimens (mostly due to road accidents).

All these locations from western Poland are isolated from the current range of the Common hamster in SE Poland, and from Czech and German populations. Such isolated localities are highly vulnerable, especially that all are situated on areas with high human density and pressure. The main mortality factors in these sites are as follow: traffic, predation and intensive farming with deep ploughing, high mechanisation and heavy chemicalization combined with relatively early time of harvest and ploughing of the stubble. In Jawor – nearby the Królowej Marysieńki Street or Małuszów village, the increased development of built-up areas and road network can also be a threat to the survival of the hamsters. Unexpectedly, a negative factor of competition for burrows between the brown rat (*Rattus norvegicus*) and the Common hamster have been detected. The pressure of the rats can have a negative influence on the hamster's population and can be a very important mortality factor in these localities.

Phylogenetic evidence of a North lineage of the Common hamster *Cricetus cricetus* in Poland

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Based on the results obtained so far, Polish populations of the Common hamster (*Cricetus cricetus*) belong to two phylogeographic groups. These two groups are referred to as a southern European group "Pannonia", and a group E1 being specific for Poland and Ukraine. We hypothesize here that a third group ("North"), that was previously reported from Germany and western European countries, also exists in Poland.

Eighteen samples from free-living individuals of the Common hamster were investigated. Both hair from hamster-specific hair-traps and ear tissue were used as a DNA source. Individuals originated from four populations located in the southwestern part of Poland. Three partial mitochondrial genes: control region (ctr), 167 bp, 16S rRNA (16S), 468 bp, and cytochrome b (cyt b), 715 bp, have been used to provide clues to identify the "North" lineage. The newly sequenced individuals were analyzed against all available accessions from the GenBank database ($n = 48, n = 37, n = 95$, respectively) using MEGA v. 6.6. To establish relationships between sequences according to their genetic distance a Neighbor-joining method (NJ) was used for each gene separately and in combined analyses. We corrected distances using a Kimura-2 parameter model of sequence evolution. To assess the reliability of reconstructed phylogenies a bootstrap analysis was performed.

To visualize sequence data a Splits Tree program v. 3. 1. was employed. All newly sequenced individuals originated from different localities in Poland showed one conserved nucleotide sequence in the cyt b gene, that was identical to an accession representing the northern group and preserved in the GenBank. In the amino acid sequence of cyt b (238 amino acids) one specific amino acid change due to transition or transversion , as compare to the Pannonia and E1, was revealed. Taking into account all available data the 16S gene is less variable than the cyt b gene, and sequenced ctr region was less variable than the 16S gene, thus the NJ gene trees were largely unresolved. One haplotype was detected for each of these genes based on newly sequenced individuals.

This is the first report about the occurrence of the northern lineage of the Common hamster in Poland. The presence of this group may indicate that (1) migrations across Poland from eastern refugia has occurred in the past or/and (2) counterflow from the western part of Europe to Poland exists. New genes will be considered to detect the effects of demographic, selective, and random processes in the Common hamster populations.

Ten years of genetic sampling of Common hamsters in Olomouc: insights from DNA

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Here we present the first results of an unique genetic sample set from Common hamsters (*Cricetus cricetus*) originating from one of the most intensively studied populations in Western Europe. We genotyped 199 tissue samples ranging from 2005 to 2015 which were collected from a suburban population in the southern part of Olomouc, Czech Republic, using livetrapping at monthly intervals. In combination with observational data on sex, age as well as recapture history we present estimates of relatedness between individuals as well reproductive success of single individuals. Furthermore we aim to compare classic capture–recapture based population size estimates with estimates of effective population size. The genetic inference will also clarify the amount of immigration as well as inbreeding patterns of this unique population. Analysing this dataset in the frame of several other hamster populations in Western Europe, this long-term genetic dataset will get further insights into the detailed dynamics of Common hamster populations.

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