OTHER

ECOLOGICAL NICHE'S HABITAT DIMENSION OF TERRESTRIAL SMALL MAMMALS' IN TRANSYLVANIA (ROMANIA)

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During the 2000-2007 period, a series of live capture researches were carried out in different parts of Transylvania. Sampling stations were chosen in all the major habitat types encountered here. In all, 9 areas, 67 stations, and 172 habitats were researched. Habitat categories were established based on altitude, physionomy of vegetation (forest, shrub, meadow, etc.), dominant species composition, distance from water, human impact, and in case of forests, presence of shrub/herbaceous layer. 21 species of small mammals (7 insectivores and 14 rodents) were captured.

The habitat types were codified and occurrence, frequency, standardized capture measures and abundances were used in order to assess the habitat's dimension of the ecological niches. Niche widths and other measures were assessed by means of statistical multivariate analysis. The ecological niches' overlapping and similarities were estimated using a standardized measure, that considers both resources and preferences, and the small mammals' populations and communities were ordered by means of cluster analysis. Ecological functional groups are discriminated and relations between habitats and communities structure are showed. Significant correlations between niche widths and regional frequencies are debated.

HABITAT PREFERENCE OF SMALL MAMMALS IN KIS-BALATON NATURAL CONSERVATION AREA, HUNGARY

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The region of Kis-Balaton (Balaton Uplands National Park, Hungary) is a mosaic of huge wetland habitats, unique in Europe. It is a living-space for numerous small mammals, among others the root vole (*Microtus oeconomus*), endangered in Hungary, and many protected shrew-species. We study these small mammal-communities since 2005. Our goal is to get ecological knowledge about the populations, and to compare small mammal-communities of different habitat types. We use the CMR-method and the individuals are marked by tattoo. Research work goes on three different types of habitats: 1: sedgy-reedy, always covered with water, 2: dry area, covered with weeds, mostly *Solidago gigantea* 3: moderately wet area, with diverse vegetation. We looked for the correlation among the physicochemical parameters of the habitats (type of soil, humidity, water-level, etc.), the types of vegetation, the food supply and the community-structure of small mammals. On the basis of our data, we made species-list of the area, stated the habitat-preference of the species, and dominance relationships. We estimated population-sizes, turnover-rates and survivals, stated sex-ratios, age-groups, body-parameters (condition) and home range of the species; than we considered how they differ in populations living in a preferred/non-preferred habitat.

On the basis of our research it can be ascertained that the diversity of the areas differ only a little, but their species-composition is quite dissimilar. Occurrence of rare species (*Microtus oeconomus*, *Neomys fodiens*, *Neomys anomalus*) can be attached to area 1, which is the most diverse.

Some species showed unambigous habitat-preference. Preference showed positive relation to the start of population-growth, rate of population growth and survival. There was a negative relation to home range, and there was no relation to body parameters (condition).

THE DIVERSITY OF PRIMATES (PLATYRRHINI, PRIMATES) IN RIO DE JANEIRO STATE, BRAZIL: AN HISTORICAL APPROACH

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The Rio de Janeiro State is located at southeast Brazil, and in the past was covered in his totality with Atlantic Forest. Nowadays only 16% of that original tropical forest remains. This bioma is one of the richest in biodiversity. In the begin of European colonization seven neotropical primates species could be found in this area: Buffy-tufted-ear marmoset (*Callithrix aurita*), Golden lion tamarin (*Leontopithecus rosalia*), Brown capuchin (*Cebus nigritus*), Atlantic titi (*Callicebus personatus*), Black-fronted titi monkey (*Callicebus nigrifrons*), Brown howler monkey (*Alouatta guariba*) and Southern muriqui (*Brachyteles arachnoides*). Six of them are included in the IUCN Red List of Threatened Species, and those factors that contribute to this situation like habitat loss, fragmented population and harvesting will be discussed. Other Brazilian primates species like *Callithrix jacchus*, *Callithrix penicillata* and *Leontopithecus chrysomelas* were introduced in Rio de Janeiro and the potential risks that they offer to autochthonous primates species will be analyzed.

POPULATION DYNAMICS OF A MICRO MAMMALS´ POPULATION IN A ROCKY GROUND HABITAT IN PEÑA TREVINCA, NW OF THE IBERIAN PENINSULA

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Rocky grounds are essential habitat for a threatened species by the global change, the snow vole *Chionomys nivalis*, which finds stable environments in these rocky structures where to develop their life cycle. The objective of this study is to analyze the population dynamics and structure of the micro mammals' community which inhabit in rocky grounds and cohabitate with the snow vole. The study area is a rocky ground placed in Peña Trevinca (Ourense) at an altitude of 1200 mosl. By its biographic typology it is found in the Mediterranean Region, Western Mediterranean Subregion, Mediterranean- Iberioathlantic Superprovince, Carpetan-Iberian-Leonese Province, Orensan- Sanabriensean Sector, Orensan Subsector.

Between 2005 and 2006 it was made seasonal live-trap with a total trap effort of 1230 traps a day in the study area. During the winter period it has not been possible the sampling due to the snow presence which covered the rocky grounds and made the trapping impossible. The samplings were carried out during three consecutive nights by means of live-traps examining at daybreak and nightfall. The caught specimens were identified at species level, sex, reproductive condition, age, being all specimens marked and subsequently released. It was applied a capture rate which is expressed as the (number of captured specimens/number of trap-nights) x 100. It has been captured 38 *Apodemus sylvaticus*, 5 *Chionomys nivalis*, and 1 *Elyomis quercinus*. In the study area, the biggest rate of capture was obtained by the wood mouse, with highest values of 3.1% in September and lowest values of 2,1% in June. The sex proportions didn't show significant differences in this species.

The global abundance rate has been 3.1%, 0.4%, and 0.1% for the *A. sylvaticus*, *C. nivalis*, and *E. quercinus* respectively.

INTERFERENCE COMPETITION UNDERGROUND - BURROWING BEHAVIOUR OF VOLES IN THE PRESENCE OF SHREWS

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Interspecific aggressiveness and behavioural disturbance are mechanisms of interference competition. Mutual predation on adults or each others' juveniles is a further mechanism known from many carnivore species competing by interference, but the importance of overlap of aggression and predation is unknown. Species specific adaptations to the biotic environment are reflected in behavioural programmes. Behaviour can therefore be used to estimate the relative importance of other species for the evolution of the species.

We studied a 2-species system with interference competition composed by voles and shrews. These species do not use the same food resource, but interact aggressively in their common underground tunnel systems. Additionally, shrews can prey on vole nestlings and juveniles.

To test whether voles do have behavioural adaptations (aggression or avoidance) towards the presence of competitors or nest predators, we investigated the burrowing behaviour of common voles (*Microtus arvalis*), i.e. changes in burrow architecture, in glass terrariums in the presence and absence of common shrews (*Sorex araneus*). Variables such as numbers and depths of nest chambers, total tunnel lengths and complexity of the tunnel system were monitored.

It can be shown, that a response and the type of response (e.g. overall activity, aggression, avoidance behaviour) varies with the individual sex and reproductive state of the animal.

EFFECT OF THE HABITAT FRAGMENTATION ON THE COMMUNITY STRUCTURE OF SMALL MAMMALS IN KIS-BALATON NATURAL CONSERVATION AREA, HUNGARY

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During the reconstruction of Kis-Balaton area the former continuous land was fragmented into separate areas. Our aim was to reveal the resulting changes in the community structure of small mammals. The investigated sites covered three orders of magnitude: Small (10-100 m^2), medium (300 - 500 m^2) and large (1400 m^2 - 4 ha) islands were sampled, comprising diverse habitat types. In the small mammals populations marked differences occurred among the sites regarding diversity as well as density, here detecting the fragmentation was hampered by rapid plant degradation, typical all over Kis-Balaton area.

We concluded that the observed differences in the studied community structures could have been assigned to the habitat fragmentation caused by the gradual inundation of the area. Generally, large, mosaic-like wet habitats were inhabited by the richest fauna, since different microhabitats were connected to each other, promoting animal migration. Small and medium sized land fragments harboured poorer and more vulnerable populations.

THE SMALL MAMMALS OF WARSAW AS BASED ON THE ANALYSIS OF TAWNY OWL (*STRIX ALUCO*) PELLETS

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Technical problems and the intensive human penetration of urban green space leave traditional methods of detecting small mammals (like traps and nets) difficult to apply in cities. We used then analyses of owl pellets as an alternative source of data on the abundances and local distributions of small mammals in the capital of Poland. In 2004-2006 we collected pellets from tawny owl territories. This owl is a dietary generalist and a non-migratory, territorial species. To estimate the composition of small-mammal assemblages, we selected 19 territories of tawny owls, from which pellets were collected at least once a month. Eight of the territories were situated in the city centre (in districts with the most inhabitants), and a further eleven on the outskirts of Warsaw. Tawny owl territories were located in municipal parks, cemeteries and woodlands. Also, we selected one site of pellet collection to indicate changes in the small mammal fauna that might have occurred between the 1970s and the present. Altogether we found the remains of 21 species representing the four orders: Rodentia, Insectivora, Chiroptera and Carnivora. The number of mammal species identified was twice as high in the case of the outskirts of Warsaw as in its city-centre zone (19 and 9 species respectively). The rodents were caught most often, with the greatest shares being accounted for by the striped field mouse *Apodemus agrarius* and yellow-necked mouse *Apodemus flavicollis*. In the central zone the biggest share was taken by striped field mouse and synanthropic species while insectivores were represented only by the mole *Talpa europaea*. Species connected with forest and open areas dominated on the outskirts. Significant changes in abundance and range in comparison with the 1970s concerned the striped field mouse, house mouse *Mus musculus*, mole and bats.

BIOGEOGRAPHY OF THE LATE PLEISTOCENE-HOLOCENE FAUNAL TRANSITION IN CENTRAL EUROPE

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The rearrangements of mammalian communities along Pleistocene-Holocene transition were analyzed based on a rich fossil record obtained from continuous sedimentary sequences in Czech Republic and Slovakia (800 community samples, 29,000 MNI) and neighbouring countries of Central Europe. Besides common general trends (substantial rearrangements of community structure) the multiple records demonstrated striking local and regional specificities. Among other they include (a) continuous survival of several woodland elements (*Clethrionomys glareolus*, *Sorex araneus*, *Micotus subterraneus*, *Microtus agrestis*) throughout Weichselian (including LGM) in the Carpathians (recently proved for a period from 60 to 10 ky BP at the section of Dzerava cave), (b) prolonged survival of the glacial elements *Ochotona pusilla* and *Microtus gregalis* in Pannonian basin and (c) *Dicrostonyx gulielmi* in the Carpathian foredeep, contrasting to (d) early disappearance of them in S-Germany and Bohemia and (e) the differences between particular regions also in other cenologic traits. While the glacial communities were nearly homogenous in their structure throughout whole the region, the Holocene development produced a considerable faunal provincialism, most pronounced during the Boreal.

CHANGE IN MICROMAMMAL RICHNESS IN BELARUS (LATE GLACIATION–HOLOCENE-TODAY)

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It was studied the variation in micromammal richness through 9 time sections from the Late Glaciatio time up to the present. The analysis of available materials shows that in a direction from the Late Glaciation to the present in territory of the region there was an increase in number of species in communities of small mammals. On this background it was marked two peaks (with a maximum on the Middle Holocene) and three recessions of species rich.

Minimum quantity of species of fine mammals in biocenosises and the lowest index of a species rich are characteristic for periglacial communities of Late Valdai and Drias cold snaps in the Late Glaciation. The first increase in total of species in biocenosis and the index of species rich is marked for interstadial warming of the Late Glaciation (11 species), that has been caused by occurrence of species of intrazonal biotopes and forest biotopes of northern taiga.

The second peak is characteristic for the Preboreal period and is connected with active migration and enrichment of micromammal communities with representatives of biotopes of middle and southern taiga. The Boreal period is characterized with reduction of the parameters of species rich that is connected with full disappearance of tundra steppes representatives in periglacial biotopes by the end of this period.

The Atlantic period of an average Holocene is characterized by the highest parameters of species rich (25 species) due to active migration of southern taiga and broad-leaved forests species.

Since the Subboreal period, occurrence of new kinds in biocenosises republics it is not marked. The quantity of species and an index of species rich steadily decrease, that is caused not only a natural course of evolution of a climate, landscapes and biocenosises, but constantly amplifying by anthropogenic influence on zoo- and phytocenosises.

DISTRIBUTION PATTERNS OF DANISH RODENTS

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A total of 62 terrestrial mammal species, including 19 rodent species, has been recorded in Denmark, out of a European fauna of 195 mammal species.
The total number of species is determined by geographical position and the development of landscape, vegetation and climate since the latest glaciation, as well as factors such as recent human influence.
Data from The Danish Mammal Atlas Project have been analysed using GIS (Geographical Information System, MapInfo) in order to describe the distribution patterns of various groups of mammal species. A total of 627 10 x 10 km squares are included in the analysis.
Several rodent species have their northern, western or north-western limit of distribution through Denmark, e.g. birch mouse (*Sicista betulina*), common dormouse (*Muscardinus avellanarius)*, common vole (*Microtus arvalis*), striped field mouse (*Apodemus agrarius*), and western house mouse (*Mus domesticus*).
Most indigenous species are recorded in more than 100 squares, and some of these, mainly rodents are probably even under-represented. Only two introduced rodent species occur in such large numbers of squares.
In contrast, most species occurring in less than fifty squares are introduced species, while only three indigenous rodent species belong to this group.
The highest species richness of small mammals – all species considered - is found in Eastern Jutland, and in North and West Zealand. Generally, low species richness is found on smaller and medium sized islands. Considered separately, both small mammals (less than 250 g) and larger species contribute to the common pattern.

PROBLEMS OF CHROMOSOMAL RESEARCHES MAMMAL FROM NATURAL POPULATIONS OF THE FAR EAST OF RUSSIA

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At the territory of the Russian Far East 105 terrestrial and 35 marine species of mammals have inhabited. Areas of many terrestrial species are extended far beyond the borders of the Russian Far East. Chromosomal researches of mammals of wild populations are important for understanding both the micro- and macroevolution of mammals. The analysis of the literary data (since 1967 to 2006) has shown different research activity as for taxonomic groups, as for methods of karyological analysis applied. Remarkable, that by karyological methods of 16 known Insectivorous species there were investigated only 11 species, from 17 Chiroptera species - 6, from 39 Rodentia species - 31, from 23 Carnivora species - 3, and from 10 Artiodactyla species - only one. Nevertheless, almost for all species the chromosomal numbers are described both from the Russian Far East and other regions of their areas (Siberia, Korea, China, Japan, Europe, N. America, etc.). However, data show that only for three species of mammals there are no indication on chromosomal numbers at all. Available are investigations of animals from a zoo (that are usually without the indication of a place of catching) and single animals from nature; both do not allow to infer a conclusion on chromosomal variability of taxa they are belong to. Our review of chromosomal data revealed that nearly 50% of mammals in natural populations from Russian Far East have been investigated. Percent of species which were subjected by investigation with differential staining techniques of chromosomes do not exceed 30% and they are basically made on rodents. Chromosomal polymorphism and problems that connected with weak karyological investigation of mammals from natural populations of the Far East of Russia is discussed.

THE GENITAL TRACT OF *GERBILLUS TARABULI* AND *PSAMMOMYS OBESUS*, ORCHIECTOMIZED IN BREEDING SEASON: COMPARATIVE HISTOPHYSIOLOGICAL EFFECT

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In dry and hostile environment, rodents develop physiological, comportemental and ecological strategies. The variations occurred especially in endocrine functions such as sexual activity and metabolic functions. In previous studies, we have already described annual variations in reproductive activities in some Saharan Gerbillidae, (*Psammomys obesus, Meriones lybicus, Gerbillus gerbillus* and *Gerbillus tarabuli)* and try to elucidate the endogenous determinism of these variations.

The present study was designed to investigate the ponderal, histological and biochemical repercussion of castration carried out during the breeding season, followed by testosterone replacement upon some parameters of genital tract in the sand rat, *Psammomys obesus* and the great gerbil, *Gerbillus tarabuli*.

Gerbillus tarabuli and *Psammomys obesus* freshly live-trapped in the West Algerian Sahara, were bilaterally orchiectomized by abdominal route under ether anaesthesia. Testosterone treatment began 50 days after castration (75 µg of testosterone enanthate per 40 µl sesame's oil /animal) for 7days. Proteins of the seminal vesicles were analysed by Monodimensional electrophoresis in denaturant conditions on polyacrylamide mini-gel (SDS-PAGE) at 12%.

In the genital tract of *Gerbillus tarabuli* and *Psammomys obesus* orchiectomy induced:

- a dramatic decrease weight in organs of the male genital tract: proximal epididymis, distal epididymis, ductus deferens and seminal vesicles.
- an important reduction of luminal diameter; the number and the size of epithelial cells and supranuclear zona are appreciably reduced .
- testosterone replacement restored histological parameters of control group and induced significant rise in cellular epithelial heights and supranuclear zona.
- expression of some androgenodependent proteins induced by testosterone in seminal vesicles are: 66.9, 46, 33.4 , 30, 12.9 and 9.4 kDa
- suppression of some androgenodependent proteins by testosterone are present in seminal vesicles: 82.9, 78.6, 74.5, 63.5, 43.7and 16.7 kDa.

This study showed that orchiectomy caused important histological and biochemical modifications in genital tract, whereas testosterone replacement restored normal status. These findings suggested the relationships between testosterone and genital tract activity in these Saharan rodent species**.**

MAMMAL CHECKLIST OF BUÇACO'S NATIONAL FOREST, CENTRE OF PORTUGAL

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Buçaco's National Forest (wall fenced area with approximately 105 ha) constitutes an exclusive natural heritage in Portugal and in the World, due to its history, architecture and nature values. Biologically, it represents one of the best dendrological collections in Europe. However an unknown fauna is associated to the amazing and well-described flora diversity. The only faunistic study of this forest took place more than 100 years ago, comprising a survey/inventory of the animals present at that time.

In this project, an inventory and the determination of the mammal species (except Chiroptera) distribution present in this singular space of the Centre of Portugal was conducted. To reach these goals, we applied several methodologies, such as direct observations; gathering and identification of presence indicators (excrements, footprints, tracks, food remains, etc.) and dead animals (natural deaths, road killings and predation); nocturnal surveys, by car and by foot; capture of small mammals and carnivores; infra-red camera trapping and the analysis of raptors' pellets.

22 mammal species (Insectivora: 4, Rodentia: 8, Lagomorpha: 1, Carnivora: 8, Artiodactila: 1) were confirmed and their distribution mapped.

It was emphasized the low occurrence of the European rabbit (*Oryctolagus cuniculus algirus*) in the Forest, since it is a common species present in almost all the National territory. Buçaco's closed and dense vegetation must contribute to this fact.

The occurrence of protected (e.g. the Iberian shrew *Sorex granarius*, the Red squirrel *Sciurus vulgaris*, the Lusitanian pine vole *Microtus lusitanicus* and the European otter *Lutra lutra*) and endemic species such as the Iberian mole *Talpa occidentalis*, the Iberian shrew *Sorex granarius*, the Lusitanian pine vole *Microtus lusitanicus* and the Algerian mouse *Mus spretus*, reinforces the importance of this natural area in terms of Portuguese mammal populations' conservation.

The knowledge and science education of Buçaco's National Forest's biodiversity can contribute to the environmental sensitization of the visitors (more than 100 thousand/year) in what concerns to the maintenance of natural balances and the protection of ecosystems.

ASSESSING THE COMMERCIAL IMPACT OF GREY AND COMMON SEALS

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It is often the perception of people who depend on the fishing industry that seals have a substantial negative impact on fish stocks which affects their livelihoods. The conflict resulting from the interaction between seals and the fishing industry underpins the need to quantify the economic impact of seals. We will build a spatially explicit bioenergetic model to quantify the amount of fish consumed by the UK population of the grey seal (*Halichoerus grypus*) and the common seal (*Phoca vitulina*). We will then quantify the economic consequences of consumption by seals and determine the relative impact of the seal by equating the amount of fish consumed by seals to that removed by commercial trawling.

IMPACT ON SMALL MAMMALS COMMUNITY OF THE TRANSFORMATION OF SCRUBLANDS AS A MANAGEMENT PRACTICE IN DOÑANA NATIONAL PARK (SPAIN)

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One of the principal management practices carried out in the Doñana National Park, as part of the Iberian Lynx and Spanish Imperial Eagle Management Programme, is the clearing of large areas of scrub in order to create open areas where Rabbits can feed and increase their numbers. Despite the significant changes in the scrubland structure that this practice is causing, no studies have been carried out to analyse the modifications in the scrub habitat or in the characteristic species that live there. In this study we established three parcels, defined as "natural" areas, not affected by management practices, and other six parcels in areas clearanced at different periods (one and three years old). All these parcels were trapped seasonally (seven days in each session) during two years, from summer 2005 to spring 2007. We used both Sherman and handmade live traps, and all animals caught were identified to species, weighted, sexed and aged. Moreover, their reproductive activity status was established and finally the animals were tagged (by toe-clipping or microchip implanting) and released at the point of capture. In this study we analyse the composition, species-richness, age structure and space-time distribution of insectivore and rodent communities inhabiting the natural scrublands in Doñana, and also the colonising process carried out by small mammals on areas clearanced previously, one or three years ago. In Doñana National Park, the species richness is very low and represented by individuals of only four species along the studied period: Algerian mouse *Mus spretus* Lataste, 1883, Wood mouse *Apodemus sylvaticus* (Linnaeus, 1758), Greater white-toothed shrew *Crocidura russula* (Hermann, 1780) and Garden dormouse *Eliomys quercinus* (Linnaeus, 1766). Comparatively, the abundance of both murids is extraordinarily higher than that of other species, showing remarkable differences related to habitat and season.

THE ROLE OF RODENTS AND INSECTIVORES IN URBAN TICK-BORNE DISEASES FOCI

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The purpose of the present study is to reveal and study tick-borne infections foci in Tomsk and its outskirts. The materials were gathered in the one of the town's parks (University Grove), in the old graveyard, in the region of south outskirts' stadium and in the north and south suburban forestry. Ternary system of foci has been appreciated: pathogens, vectors and reservoir hosts of infections. Genetic diagnostics shows that tick-borne encephalitis virus, West Nile virus, tick-transmitted borreliosis (*Borrelia garinii*) and ricketsiosis (*Rickettsia sibirica* and *Rickettsia raoultii*) are circulated in urban foci. The West Nile virus (WNV) is new flavivirus for the Tomsk region. Two species of tick first determined as a vectors for WNV – *Ixodes persulcatus* P. and *I. pavlovskyi* . Mosquitoes only marked in this role earlier. Ascertained foci are also characterized by increase of tick's species diversity descending in human and domestic animals. While only *I. persulcatus* is founded in the most part of the West Siberian flat taiga there are also *Dermazentor reticulatus* Fabr. and *I. pavlovskyi* in the studied sites. At the same time the last practically substitute for *I. persulcatus* in biocenoses in town habitats inasmuch as its ecological preferences coincide with conditions of disturbed environment to a greater extent. Specific composition of main tick's feeders, small mammals, on the whole is skimpy (15 species), number of species changes from 1 to 8 in each studied site. The role of small mammals in maintenance of quantity of tick's populations is determined by specific structure, quantity and its changes during spring-summer season. Thus, insectivorous (*Sorex araneus* and *S. isodon*) play basic role in feeding of tick's praeimago stages in the studied site with most disturbed overtop-soil where quantity of small mammals was extremely low. More complicated picture is revealed in adjacent area with lower anthropogenic load; here, as *Apodemus agrarius*' quantity increasing, its role repeatedly increase to August in comparison with the role of *Clethrionomys rutilus* which bringed in maximum contribution to feeding of tick's larvae and nymphes at the beginning of summer. As a whole for season, here *A. agrarius* feed twice as much as *C. rutilus* (175.9 *vs* 81.7). In forestry, the main role in this process belongs to *C. rutilus* characterized by maximum means of indexes of abundance and feeding of ticks. At the same time it is significant that importance of *C. rutilus* can not be considered absolute inasmuch as *S. araneus*'s quantity increase to August. Common shrew takes part in feeding of tick's larvae in this period. Preliminary research of availability of pathogen's marker in small mammals had revealed high level of flavivirus markers but less then known for Western Siberia level of borreliasis markers. It was found that *C. rutilus* was infected by the WNV to a greater extent than *C. rufocanus*. Thus circle of mammals which is the main part of tick's life cycle in urbacenoses is not too large nevertheless it assures active circulation of pathogens and thus maintenance of epidemic intensity of urban foci of infections.

EFFECT OF FOREST MANAGEMENT ON SMALL MAMMAL COMMUNITIES IN ÓCSAI NATURE RESERVE (CENTRAL HUNGARY)

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Small mammal population features and species diversity of communities were compared among four forest cover type (Fraxino pannonicae-Ulmetum vegetation type) in Ócsai Nature Reserve in Hungary using capture-mark-recapture methods. Sampling areas included mature, thinned, four-year-old cut and half-year-old cut habitats. During the survey we marked 758 individuals of 10 small mammal species, using the data of 2600 trap nights. The dominant species were *Apodemus flavicollis* and bank vole *Clethrionomys glareolus* in every habitat. In mature and thinned occurred these species excepted a few individuals of other species. In cutted habitats we captured *Apodemus sylvaticus*, *Micromys minutus*, *Mus musculus*, *Microtus subterraneus*, *Microtus arvalis*, *Sorex araneus*, *Sorex minutus* and *Crocidura leucodon* as well. Accordingly the species diversity was higher in cut forest than mature and thinned but there was not significant difference in the overall relative abundance of small mammals among forest cover types. The case of two dominant species could be estimated and compared the population parameters through the appropriate sample sizes. During spring the relative abundance of both dominant species were significantly higher in mature habitat indicating higher survival rate after winter. Small mammals did not occur in the same season in half-year-old cut habitat except a few wandered individuals because the vegetation cover fell off after the treatment. The relative abundance of *C. glareolus* was significantly lower in half-year-old cut than mature caused the appearing of other small mammal species after the treatment in the survey period. The survival rate of this species was significant higher in thinned than other habitats. The proportion of females in the population of *C. glareolus* was significant higher than males, can be suppose constant inhabiting status of this habitat. In the cut fields where the present various microhabitats and the higher under wood cover is higher more small animal species can occur, but this can enhance the inter-specific competition and effect of predators as well. In addition forest treatment - strangely the clear-cut - can play a role in the bigger fluctuations of population parameters, which shows a lower stability.

VERTEBRATE COMMUNITY DYNAMICS IN BIRCH FOREST FRAGMENTED BY SPRUCE PLANTATIONS IN NORTHERN NORWAY

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Introduction of exotic species is one of the major threats to global biodiversity. Forest fragmentation due to planting of non-native spruce (*Picea abies*) in Nordic mountain birch forest, decreases forest patch size and increases the amounts of artificial edges in the landscape. The emerging debates and high uncertainty of consequences for biodiversity, call for a better understanding of ecological effects on several spatial and temporal scales. Here we focus on the effect on the assemblage of mammals. Introduction of spruce can lead to several potential effects on community dynamics: 1) loss or increase of suitable habitat, 2) change in habitat selection patterns, 3) altered abundance and population dynamics resulting from 1 and 2. These effects are likely to be affected by spatial scale-dependent responses in different species. In this context the patch size and the spatial distribution of the spruce stands are important, as well as the different species' mobility and perception of the landscape pattern. For most of the predators, e.g. red fox (*Vulpes vulpes*), pine marten (*Martes martes*), weasel (*Mustela nivalis*) and stoat (*Mustela erminea*), the plantations of spruce (< 1 ha) in our study area in northern Norway are smaller than the home range requirements and crusing radius', hence creating a fine-grained mosaic. For some of the prey-species, for instance small rodents, spruce plantations are generally larger than individual home ranges.

The aim of the study is to investigate how the vertebrate population and community dynamics respond to tree species conversion at local and regional scales, and in particular understand how the dynamics are affected by new edges in the landscape and changes in forest composition and structure. The analysis will be carried out on two spatial scales; a) stand (forest type) and b) landscape. The data basis consists of snow tracking conducted over three winters (2003-2005) in 32 equilateral triangles of 3 km in the county of Nordland and Troms in Norway. The results are discussed with focus on recommendations to how the forest should be managed to preserve the mammalian community typical for the Nordic birch forest. A particular challenge in this respect is that most of the forest stand is presently young, making it more difficult to predict ecological effects when the spruce forest change to older, closed stands.

SEASONAL DISTRIBUTION AND SIGHTING FREQUENCY OF CETACEANS IN THE MEDITERRANEAN SEA

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The distribution and relative abundance of cetaceans in the Mediterranean Sea was investigated during eight small boat surveys. The survey area included six different areas: the Alboran Sea, the Southwestern Basin, South Tyrrhenian Sea, Ionian Sea, Aegean and Levantine Seas. With the exception of the Levantine Sea survey (summer 2005) all the surveys took place in fall or spring in the years 2003-2006. The survey vessel was a 13 m sailing catamaran travelling at a mean speed of 6 knots in straight passage lines. The presence of cetaceans was assessed visually by observers scanning a 90º degree angle to the left and the right of the boat's course (total 180º), when the environmental conditions allowed it (daylight and sea state below 4 Beauforts). Passages continued during night time and passive systematic acoustic research took place under Beaufort scale 6.

The paper will present the key findings of these surveys. A total of 143 sightings were made over a total of 4,473 km of visual effort contacted between October 2003 and October 2006. The dominant species was the striped dolphin *Stenella coeruleoalba* (N=60, 53.6%), followed by common dolphin *Delphinus delphis* (N=19, 17%), *Tursiops truncatus* (N=14, 12.5%), *Physeter macrocephalus* N=9, 8%), *Globicephala melas* (N=5, 4.5%), *Grampus griseus* (N=3, 2.7%), *Orcinus orca* (N=1, 0.9%) and *Ziphius cavirostris* (N=1, 0.9%). There were also 31 sightings of unidentified delphinids. Species occurrence, school sighting rates and sighting rates for individuals, species distribution in relation to topography (mean depth, distance to shore) and relative abundance were calculated and will be presented for the entire survey as well as for the different regions and seasons. Results were according to existent bibliography showing the striped dolphin a pelagic species (Mean Depth z= 1540m SD=847, Mean Distance to Shore DS=55km SD=44) sharing the same habitat with the sperm whale (z=1100m SD=820, DS= 46.6km SD=53). Pilot whale (z= 580m SD=44, DS=17km SD=0.8), common (z= 715m SD=665, DS=29km SD=37) and rissos dolphin (z= 697m SD=551, DS=22km SD=9) were located mainly at the upper slope while the bottlenose dolphin was sighted at coastal waters (z= 159m SD=158, DS=4.8km SD=3). The results will subsequently be examined in relation to primary production and temperature derived from satellite data, and topographic features.

A HABITAT SUITABILITY MODEL FOR THE ASIAN ELEPHANT IN BANGLADESH

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The Asian elephant *Elephas maximus* is the largest terrestrial mega-herbivore, ranked as *endangered* in Asia and *critically endangered* in Bangladesh. A recent survey has shown that Bangladesh supports a total of 177-227 resident wild elephants, 83-100 non-resident ones from India and Myanmar, seasonally, and 94 captive elephants. Mean elephant density appears to be as low as 0.11/km^{2,} over 1640 km^2. The current distribution of Asian elephants is mainly confined to 12-forest divisions. Over the last decade, due to expansion of human settlements inside the forest, the habitat of elephants has been fragmented and degraded. A Habitat Suitability Model for the Asian elephant in Bangladesh has been built using satellite imagery and global landcover data set, as well as a digital terrain model. Because of the absence of sound quantitative data on the ecology of the Asian elephant in Bangladesh, an *expert-based* model has been created, using a Habitat Evaluation Procedure (HEP) on an hydrological map, a landcover data set and a DEM. Before proceeding to the assignment of scores, all layers have been reclassified as to their spatial resolution to obtain an identical resolution for all geographic information (pixel size= 1 km). Scored layers have been weighed according to expert-opinion and field data, to obtain four scored-weighed layers. All scored-weighed layers have been overlayed and the value of each pixel has been summed to that of each corresponding pixel in the other layers; the resulting sum layer has been divided by 4 getting the final overall suitability map. The map has described an area, corresponding to the 13% of the Bangladesh total surface, as unsuitable habitat; low suitability habitat (viable populations of elephants cannot survive) represents the 75% of the country, whereas suitable habitat (elephants can survive at lower densities) reach the 12%. Only 0.03% of the Bangladesh surface is highly suitable for elephants.
Only the hilly forests of Bangladesh and adjacent border countries present residual – but highly fragmented and often isolated – suitable habitat for elephants: this species is in fact a forest animal, unable to live in areas where the forest has been completely or greatly depleted. The model appears to predict habitat suitability with some accuracy: in fact, the remaining groups of this large mammal are concentrated in areas described as “suitable”. This model confirms a strong association between forests and elephants, at a macro-habitat scale. Further detailed research at landscape scale is needed to obtain information on habitat fragmentation and on migration routes.

UNDERWATER VOCALIZATION BY SAIMAA RINGED SEAL (*PHOCA HISPIDA SAIMENSIS*) DURING THE BREEDING SEASON

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Underwater vocalization by the endangered Saimaa ringed seal (*Phoca hispida saimensis*) was studied during the breeding season in Lake Saimaa in Eastern Finland. Both hydrophone and underwater video cameras were used to monitor the behaviour of seals near their lairs, which were situated in the snowdrifts by small islands. A total of 435 calls by pups (n 6) and 57 calls by adult seals (n 3) were recorded in April in 1999 and 2002-2006, and in March 2007. The nursed pups produced a wide range of calls both underwater and in air. The vocalizations by pups were mostly faint whines, which consisted of normal harmonic vocalization and nonlinear dynamics. The most distinct underwater call by adult seals was a loud knocking sound series that consisted of 3-40 knock elements per series with varied speed and repetition rate. Some of those adult calls included also growling type vocalization. This study describes the underwater vocalization repertoire of ringed seal pups and the adult ringed seal knocking sound series for the first time. This study indicates that the landlocked Saimaa ringed seal might be more vocal than has been previously supposed.

GENETIC IDENTIFICATION OF CETACEAN CARCASSES FOUND IN THE MEDITERRANEAN SEA

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The correct identification of stranded cetacean carcasses is a fundamental issue in the conservation biology of marine mammalian fauna. The exact knowledge of fauna composition, demographical parameters, number and species of stranded specimens and the causes of stranding may help in the management of this major group of marine fauna.
The loss of identifying characters caused by advanced state of decomposition may render the identification of belonging species difficult: when the usual identifying characteristics are missing and only a portion of flesh is available, the identification of species may become a problem. In this case, methods based on amplification and direct sequencing of mitochondrial DNA fragments should be a suitable tool for species identification, traceability and authenticity.
The aim of this work was to verify by DNA-based methods the belonging species of 26 carcasses of cetaceans found in the North Adriatic and the South Eastern Mediterranean coasts. The carcass pool allegedly contained seven different cetacean species and two carcasses which were designated "undetermined" due to the advanced state of decomposition of specimens. Total DNA extracted with a saline procedure was then amplified by PCR for the mitochondrial loci 16SrDNA and CytB. Sequences obtained were analysed and aligned by specific genetic software and compared with reference-sequences downloaded by GenBank (http://www.ncbi.nlm.nih.gov/). Phylogenetic trees were made up by Mega Software and the robustness of the topologies obtained was tested by the bootstrapping method.
In most cases (19 out of 26) molecular data were concordant with morphological identification. Moreover, we were able to identify the belonging species (*Tursiops. truncatus* in both cases) of the two samples classified as "Undetermined". In three cases out of 26, the molecular determination disagreed with the morphological identifications. Finally, in two cases molecular analyses gave non definitive results due to the lack of a referring sequence in GenBank database coupled with the bad state of preservation of DNA in one sample and of the discordant results obtained by the two mitochondrial markers in the other.
From a conservative point of view, the data obtained confirm the usefulness of molecular tools to identify or to confirm the belonging species of samples in which morphological characters are lost for different reason (e.g. decomposition), or of samples which are suspected of being mislabelled.

SMALL MAMMALS AS VECTORS FOR SPORES OF MYCORRHIZAL FUNGI

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The aim of our project is to cast more light onto this relationship between small mammals, forest trees and mycorrhizal fungi in middle European mountainous forests.
Therefore small mammals are life trapped over two consecutive years and their faeces collected at four different study sites. Trapping takes place in spring, summer, autumn and at one site also in winter to get information about seasonal variabilities and yearly differences.
Faeces are examined both microscopically (counting of 50 fields of view -fov-) and by DNA analysis (DNA extraction, PCR, sequencing, cloning).
Furthermore inoculation experiments both under laboratory and field conditions are carried out with seedlings of the three most dominating tree species for the investigation sites (*Abies alba*, *Picea abies*, *Fagus sylvaticus*).
So far we have acquired about 300 faecal samples from eight different small mammal species. Species capture numbers and composition varied between the four study sites (two managed forest sites, one wind throw area and one primeval forest site).
First results from the microscopic analyses show, that faeces from *Myodes glareolus* contain the highest numbers of fungal spores of all investigated species (14 per fov on average), but there has only been one single sample (*Sorex alpinus*) showing no spores at all in the microscopic analysis. Samples from *Sorex* sp. or *Apodemus flavicollis* contain considerably lower amounts of spores (3.1 and 3.6 per fov, respectively), although the diversity of spore types is usually higher.
The highest average number of spores per fov was 13 for the samples from the managed forest (Duerrenstein Wilderness Area), whereas samples from the wind throw site (same area) contain the lowest numbers of spores (about 0.7 per fov). Samples from the primeval forest in the same survey area contain an average of 8.5 spores/fov.
We have found more than 40 different spore types in the faecal pellets so far and have determined spores from many fungal *taxa*, including *Elaphomyces*, *Hymenogaster*, *Melanogaster*, *Octavianina*, *Hysterangium*, and *Boletus*/*Xerocomus*.
At this point of the study, we are able to say, that a variety of small mammals feed (in varying degrees) on different species of both epi- and hypogeous fungi in different habitats. With the completion of this study important insights in the “wood wide web“ will be gained and the role of small mammals in middle European mountainous forests will be understood much better.
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TESTING A BEHAVIOUR BIOLOGICAL APPROACH FOR THE RE-INTRODUCTION OF MAMMALS - HOME EFFECT AND EXPLORATIVE BEHAVIOUR IN RELEASING OF BEAVER, ROOT VOLE, EUROPEAN MINK AND EUROPEAN BISON

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Especially in the case of in situ rescue of mammal species re-introductions carried out with a translocation or with individuals from a maintenance breeding, are necessary. Anyway, individuals are brought into an environment unknown to them, that they have to explore in order to be able to use all necessary resources in future. Every species has developed an explorative behaviour for that purpose. This behaviour is a multifunctional searching behaviour, which is not steered by appetence. The animal is rather in a multi stimulus directed expectation attitude. It must not be looking for food or a social partner.
Accordingly, always the same method of release was applied in four projects of re-introduction of the beaver, the root vole, the European mink and the European bison: Only social groups like families, siblings of a litter, couples or small structured herds were released into reintroduction-enclosures during the first days or weeks. We used this method to create the home effect and the social milieu which the animals should find in their natural habitat at the beginning of their dismigration phase. After the release, the animals showed the typical explorative behaviour: according the mammalian species resting places and food patches the artificial lodges or arenas were visited at least once, in most cases even more frequently. That is why we call it "explorative circles" which are a typical pattern of explorative behaviour in mammals to get to know an area unknown to them. This behaviour suggests that the chosen method of re-introduction which was tried and tested is right for setting mammals into a new area.

BRIDGING MACROECOLOGY AND MACROEVOLUTION: INDEPENDENT CONTRASTS OF BODY SIZE AND RANGE SIZE IN MAMMALS

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We examined influence of phylogeny on the body size - geographic range size relationship within Mammalia using independent contrasts and a recent mammalian phylogeny comprised of 643 genera representing all 22 non-volant terrestrial orders. Our results show that there is pronounced heritability of both body size and range size within lineages. Furthermore, when corrected for phylogeny, there is no significant correlation between body size and range size, suggesting little independent causation between these traits. Thus, although evolution strongly influences the distribution of both traits within lineages, extrinsic factors such as interspecific interactions, environmental constraints, and historical events appear to play a stronger role in shaping the relationship between body size and geographic range size across landscapes. Our results illuminate the difference between pattern and process in macroecology and underscore the primacy of species phylogenetic linkages (as opposed to their body sizes) in shaping their modern ecological traits. These results are of particular importance in a world threatened with a potentially massive loss of biodiversity because they imply that the conservation strategy appropriate for a species must reflect the species phylogenetic context and not just rely on the species traits.

MICROHABITAT PREFERENCES OF SOME SMALL MAMMALS IN FORESTS OF RURAL LANDSCAPE OF SOUTHERN MORAVIA (THE CZECH REPUBLIC)

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A preliminary calculation of preferences for microhabitat in three isolated forests in Southern Moravia rural landscape was estimated. One was old seminatural flood plain forest with dominance of oak Ulmeto-Fraxinetum carpinetum (FF), the other was production broad leaved forest Carpineto-Quercetum acerosum with dominant oak and black locust (MF), the third was pheasantry with variable mixture of forest plots of various woody species and age with permanent supplement of food for pheasants and roe deer (PH). CANOCO statistics software was used for data evaluation. Results show the preferences of rodent species and their adaptability to the various environments. *Apodemus flavicollis* (*A.f.*) and *A. sylvaticus* (*A.s.*) gave in the FF priority to forest bearing mature oak stands. On the other hand *Clethrionomys glareolus* (*C.g.*) was more often found in younger stands with rich undergrowth. The open glades were predominantly occupied by *Microtus arvalis*. These preferences were highly significant ($F=3.291$, $P<0.001$). The rich autumn harvest of acorn in 2003 influenced the very high preferences of FF by *A.f.* and *A.s.* in 2004 ($F=5.475$, $P<0.001$). In the mature MF the mobility of eudominant species was high. *A.f.* was more attracted to the stands dominated by the oaks and *A.s.* to the stands with higher tree richness (lime tree, false acacia, ash etc.) ($F=6.385$, $P<0.001$). This difference corresponds with the feeding strategy of these two species. In the pheasantry (PH), where the diversity of forest habitats was the highest and also the supplementary food can attracted the rodents, both *Apodemus* species were common in all types of forest stands (young, mature, mixed broadleaved and also coniferous), with respect to their quality. The presence of *C.g.* preferably in fruiting oak stand with undergrowth was very likely influenced by lower mobility of the species, diet preferences of herbs and lower dependence on seeds as source of food in comparison with the both Apodemus specialized for seeds and their lower mobility in dense ground cover ($F=6.835$, $P<0.001$). In comparison of preferences *A.f.* more tend to oak stands, preferring big seeds of trees for food, then *A.s.* which was more abundant in spruce and pine plantings. It can be explained by differences in feeding strategy as *A.s.* preferring more open habitats and seeds of smaller size as weed seeds. Also the aggressivity and adaptability of *A.f.* can force out *A.s.* to lower carrying capacity habitats.

EVOLUTION OF BEHAVIOURAL MODIFICATIONS IN UNGULATE MOTHERS DURING THE BIRTH SEASON: THE CASE OF SARDINIAN MOUFLON (*OVIS ARIES*)

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Mammalian females change their behaviour during the birth season as a response to new energetic requirements and antipredator behaviour. Neonate survival rate depends on the use of appropriate behaviours by mothers and the young to ensure that the latter are adequately fed and protected. Aimed to generalize behavioural patterns of female ungulates during parturition season, we studied behavioural modifications of Sardinian mouflon mothers and we compared our findings to those recorded on other ungulate species. Space use, habitat selection, and activity patterns in lactating and non-lactating female mouflons in Sardinia were analysed using radio-tracking techniques during pregnancy, birth, and lactation. Lambs were born in April-early May, and only during this period home ranges of mothers were higher than those of non-mothers. At this time lactating females showed a higher mobility as a result of their need to reach isolated and suitable birth sites. Also habitat choices were strongly different during birth and lactation. In April-May mothers showed a higher use of Mediterranean scrubland than non-mothers, while opposite results were recorded as for their use of meadows. Therefore females adopted antipredator tactics during birth and mothers showed a higher use of habitats that provide good concealment for lambs. Mothers avoided meadows when their productivity was higher, since these are open areas without any kind of concealment for lambs that would thus be vulnerable to eagle attacks. These results are similar with those we obtained in others ungulate species (e.g. *Capra ibex*, *Dama dama*, *Capreolus capreolus*). That lactating females used sub-optimal habitats confirms that ungulate mothers are forced to move to poorer but safer habitats, thus compromising their energy intakes, in order to reduce the predation risk for their offspring. As evaluated by the analyses of their activity, differences between females were detected only after the birth of lambs. Non-mothers decreased their activity status when the air temperature increased, both in April-May and June-July, while mothers did not. Non-mothers were strongly affected by high temperature and decreased their activity patterns, while mothers kept more active, regardless of the temperature. These results confirms that also mouflon mothers, as it was before showed in other ungulate species, spent more time foraging in order to compensate the use of sub-optimal habitats during birth and lactation.

A MODELLING APPROACH TO PREDICT THE SPREAD AND EVALUATE THE MANAGEMENT OF THE AMERICAN MINK IN ITALY

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The American mink is an alien invasive semi-aquatic mammal imported to Italy and other European countries from North America to supply the fur farming industry. This species has been recognised to negatively affect a number of native species through predation and competition. In Italy, the distribution of this species is not known in any detail although it is possible to gather information on the distribution of mink fur farms. The first aim of this study was to evaluate potential distribution of the American mink across Italy through the application of a spatially explicit population dynamics model. We used the current and recent distribution of mink fur farms as the initial points of the spread of the American mink. The model consisted of two components: (1) a GIS that stored habitat and animal population information; and (2) an individual-based population dynamics module that simulated individual life histories and dispersal within the GIS-held landscape. Demographic parameters of mink were estimated using data from the UK. The model was validated by comparing the predicted rate of expansion with that observed in real populations. The mean number of animals in Italy after running 14 simulations for 20 years was 4166(±453SD). The probability density map located the majority of animals in the north-east part of the country, while the population in the central regions did not expand much. The mean total increment in the area invaded by the species after 20 years was predicted to be 29%. Density of river networks appeared to affect the rate of spread. The rates of expansion observed in the UK fell within the mean ranges of the values predicted by the model in Italy, indicating that the model well included the observed values. We are planning to use the predictions of the model to guide a field survey of this species in Italy to be carried out during the summer of 2007. The second aim of this study was to compare the efficiency of two different trapping methods, bank-side traps and traps on floating rafts, in reducing the number of mink. The initial population was considered to be that estimated by the model after 20 years. Using floating rafts it was estimated that the population could be eradicated in 12 years at about 2/3 of cost than using bank-side traps, whose eradication was estimated to take also much longer (33 years). This work is an example of how modelling studies can guide data collection in the field and help design a management strategy.

WHY DO MANY EUSOCIAL ORGANISMS ENJOY A BENEFIT OF REPRODUCTION INSTEAD OF A COST?

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Most theories on the evolution of life histories and ageing assume that sexual reproduction is inevitably costly. Eusocial insects (e.g. ants or bees) challenge this view because the reproductive queens usually live much longer than the non-reproductive workers. In mammals, eusociality has been described hitherto only in the African mole-rat genera *Fukomys* and *Heterocephalus* (*Bathyergidae*, *Rodentia*). We have recently shown that at least in *Fukomys*, sexual activity and reproduction increase life-expectancy significantly, too. Here we discuss why the classical trade-off between reproductive investment and longevity is so often reversed in eusocial organisms irrespective of their phylogenetic background, and the implications of this phenomenon for evolutionary ageing and life-history theories.

EFFECTS OF *ODOCOILEUS VIRGINIANUS* DENSITY AND SUPPLEMENTAL FEEDING ON VEGETATION

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We tested the hypothesis that providing supplemental feed ameliorates ungulate impacts on vegetation. We constructed six 80 ha enclosures in each of 2 geographically separate locations in southern Texas, United States. The 6 enclosures were divided into 3 pairs containing different densities of *Odocoileus virginianus*. Two enclosures had 40 individuals, 2 had 25 individuals, and 2 had 10 individuals. *O. virginianus* are added or removed to maintain densities as near the target density as possible. For each pair of enclosures with a given *O. virginianus* density, one was supplementally fed with 2 feeders containing pelleted feed in the center of the enclosure and one was not supplementally fed. Vegetation canopy cover and biomass were estimated annually during summer during 2003-2006. Canopy cover, species richness, and biomass of herbaceous dicots tended to be lower in enclosures with 40 individuals than in enclosures with 10 individuals, although differences among densities were not statistically significant ($P > 0.05$). Canopy cover and biomass of woody plants was similar ($P > 0.05$) among densities. Woody plant and herbaceous dicot canopy cover and biomass, and herbaceous dicot species richness were similar ($P > 0.05$) in supplementally fed and unfed enclosures, averaged across sampling dates. Increasing deer density appears to impact vegetation similarly with and without supplemental feeding.

ECOLOGICAL STRATEGIES OF THE OLD WORLD ALPINE PIKAS: HOW DO THEY COMPARE TO THE NEW WORLD COUSINS?

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The rock-dwelling pikas (*Ochotona*, Lagomorpha) of Asia and North America are suitable model species for the study of social-spatial structures and foraging strategies of small mammals in severe alpine habitats of low productivity and high seasonality. Both, similarities and differences between species on the two continents can be informative. The intercontinental dissimilarities allow to relate animal strategies to differences in the structure/ quality of their habitats, and the resemblances provide additional support for existing hypotheses verified thus far for one species or continent. Here we present two such comparisons, based on our own results and those found in the literature.

Our study on the territorial behaviour and the social-spatial activity of Siberian pikas *Ochotona hyperborea* generally confirmed earlier information that Asian rock-dwelling pikas live in pairs holding territories. It also provided a new evidence on close association and elementary cooperation between territory holders, especially at the time of hay storing. This clearly contrasts with the solitary territoriality and the individual hay collection in American pikas *O. princeps* and offers a new insight into the cause-effect study of different social systems.

On the other hand, in the intercontinental comparison of foraging strategies of pikas collecting plants for winter stores we found major similarities in winter diet of both species. We proved that the Old World pika is equally selective as the New World species, although earlier studies suggested significant differences in their foraging strategies. Obviously, the same harvesting strategy is the most efficient in high mountains, under limited food availability, high energetic cost of plant gathering and increased predation risk.

EFFECTS OF DEER DENSITY AND SUPPLEMENTAL FEED ON WHITE-TAILED DEER *(ODOCOILEUS VIRGINIANUS*) FORAGING BEHAVIOR

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Large mammalian herbivores can act as keystone species, influencing vegetation communities and thereby entire ecosystems. Biologist seek to limit these impacts by managing herbivore density. In addition, provision of supplemental feed is sometimes promoted as a way to reduce herbivore impacts while maintaining herbivore densities sought by various stakeholders. To understand the effect of herbivore density and supplemental food on foraging behavior, we released tame white-tailed deer (*Odocoileus virginianus*) into 80 ha enclosures that differed in deer density (either 10 or 40 deer/enclosure) and in the provision of a pelleted supplemental feed. Our study was conducted in a semiarid, shrub dominated landscape of southern Texas, USA. We used bite counts and diet reconstruction to determine the effect of deer density and supplemental food on composition and quality of forages eaten by deer. There was an interaction of deer density and supplemental feed on deer diet quality and intake. At low deer density, supplemental feed had little impact on deer foraging, however at high deer density, deer with access to supplemental feed had a higher percent crude protein in their diet and a lower rate of energy intake. All deer consumed large amounts of mast (e.g. fruits, berries, pods) during summer. In spring and fall, mast was a greater proportion of deer diets for deer without access to supplemental feed. These results suggest that supplemental feed cause deer to focus their foraging on vegetative plant parts and less on reproductive plant parts. Such changes in foraging patterns could have implications for plant growth and reproduction, although our study has not been running for a sufficient period of time (3 years) for such changes in the plant communities to be detected. The effects of supplemental feed on deer diet quality and intake rate are greater when deer densities are highest, suggesting complex interactions between deer density and supplemental feed.

THE EVOLUTION OF LEKS: THE POINT OF VIEW OF FEMALE FALLOW DEER (*DAMA DAMA*)

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Numerous hypothesis, not all mutually exclusive, were formulated about the selective pressures leading to the formation of leks. Mechanisms may also be variable among different species.
We tested the predictions of the most discussed theories about evolution of ungulate leks, using data relative to 10 radio-collared and 92 ear-tagged females during 4 rutting periods (2000 to 2003) in the Preserve of Castelporziano, Rome.
We didn't consider models based on habitat limitation or predation risk, since we assumed them not relevant in this population.
"Hotspot" model is not supported by our data: lek site was indeed not included in any of the summer home range of radio-collared females, nevertheless all of them, even if living far from lek (up to 8 km), visited the arena every year. Furthermore the frequency of tagged females seen at lek was not related to distance from capture site.
In addition, during the early rut the number of bucks present at lek was 4 to 7 fold that of females, and this suggest that local female density cannot be the solely explanation for the high aggregation rate of males.
If females were sucked into the lek (like a "black hole") as a result of intense male harassment, we expected a tortuous route from the summer home range to the arena, and a straighter and faster return journey after mating: this was not the case for fallow deer females in Castelporziano.
We observed that most of radio-collared females visited lek more than once, even 6-20 days before mating, when, probably, they were not in oestrus. Hence, we concluded that there is a "female preference" for clustered males.
Females could gain benefits from visiting the arena, such as the opportunity to assess male quality observing them while they display and fight, or they might exploit the preference of other females to select a mate.

HABITAT-SPECIES INTERACTIONS FOR MEDITERRANEAN HARE (*LEPUS CAPENSIS MEDITERRANEUS* WAGNER 1841) AND WILD RABBIT (*ORYCTOLAGUS CUNICULUS* LINNEO 1758) IN SARDINIA (ITALY)

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We developed predictive models to determine the potential distribution of two important game species in Sardinia (Italy): Mediterranean hare (*Lepus capensis mediterraneus*) and wild rabbit (*Oryctolagus cuniculus*). To achieve this goal we estimated distribution and density of both species by means of censuses and hunting bag data in Sardinia from 2003 to 2005, then we evaluated the influence of habitat types on Mediterranean hare and wild rabbit distribution and density. Habitat selection was tested by Chi-square and Bonferrroni intervals. U Mann- Whitney test and Discriminant Analysis were performed to verify the influence of habitat on distribution and density of both species. In addition we tested whether local densities correlate with habitat and landscape complexity. Meadows, garigue and arable land had a positive effect on Mediterranean hare, on the contrary woods had a negative effect. Scrubs, arable land and sandy soils were positively associated to wild rabbit presence and density, while garigue, woods and the shape index of habitat types were negatively associated.

Taking into account the effect of environmental variables on the two species, 13 habitat suitability classes were defined for Mediterranean hare and for wild rabbit, separately. They were associated to observed density values obtaining potential density levels for each habitat suitability class. Our model described about 20% of Sardinia as very suitable and about 50% as suitable for Mediterranean hare. While about 50% of the island resulted very suitable and about 20% suitable for wild rabbit. These results could have an important role in the conservation and management of these two species in a mediterranean island environment.

WHAT FACTORS SHAPE EMBRYONIC MORTALITY IN WILD BOAR?

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Reproduction of female mammals generally requires substantial energy expenditure, notably for polytocous species such as the wild boar (*Sus scrofa scrofa*) in which females produce large litter mass at birth relative to their mass. Moreover, females may selectively adjust their reproductive effort in producing offspring of different sex and quality after conception, both by channelling different quantities of nutrients to particular young and by selective mortality. We studied here one form of maternal control, the embryonic mortality defined as the mortality occurring during the beginning of gestation. Embryonic mortality should be favoured because the energy cost of resorption is minimal as compared to that of gestation and lactation.

We investigated the factors shaping embryonic mortality in a population of wild boar in eastern France. We took benefit of data gathered since the 1983-1984 hunting season to get accurate information from female reproductive tracts. Embryonic mortality was calculated for three different age-classes: juvenile, yearling and adult females. We investigated whether embryonic mortality was influenced by mother's dressed mass, litter size and availability of resources during the breeding season.

Mean embryonic mortality was 15.6% irrespective of the age-class considered (SE = 0.008, min = 0, max = 80, n = 422). In juveniles, embryonic mortality decreased with increasing litter size and variation in litter size accounted for more than 50% of the observed variation in embryonic mortality. In yearlings, the effects of litter size and dressed mass account for 47.7% of the observed variation in embryonic mortality: embryonic mortality was highest in large female producing small litters. Moreover, when the yearling female already reproduced as juvenile, the embryonic mortality was higher, indicating a reproductive cost in terms of reproduction. In adult females, nearly 40% of the observed variation in embryonic mortality was accounted for by the interacting effects between litter size and available resources during the breeding season. In absence of mast embryonic mortality peaked in small litters whereas in mast years, the embryonic mortality was lowest in large litters.

Based on our previous findings that small litters are male-biased whereas large litters tend to be female-biased, the present results suggest that female wild boar would be able to resorb selectively female embryo when producing small litters.

RESOURCE SELECTION BY FOUR-HORNED ANTELOPE IN A TROPICAL DRY DECIDUOUS FOREST

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Four-horned antelope is endemic to India and Nepal. As one of the least studied antelopes of the region, it is always found in low abundance and is known to inhabit dry deciduous forests. Data from road and line transects were collected for a period of three years from Panna National Park. Coordinates of each sighting were taken to plot the sightings on the map of Panna National Park. GIS layers such as eight habitat classes, distance from water and settlements, grazing pressure, isotherm and floral species richness were prepared to understand the resource selection of the Four-horned antelope. A uniform grid of points was prepared to assess availability of these resources in the study area. Chi square test and Bonferroni Confidence Intervals were used to analyse the habitat preferences before developing the resource selection function. Results suggested that except avoidance of disturbed habitat type, none of the available habitat types were preferred or avoided significantly. Resource Selection Function was evaluated using Multivariate Logistic Regression on sampling design with data on only presence. Four-horned antelopes' diet predominantly comprises of high quality forage such as fruits, flowers and pods. Since year long availability of such forage is closely related to tree and shrub diversity, species richness of trees and shrubs was used along with the habitat categories to model the Resource Selection Function. When used together, habitat types contribute little to the model in comparison to the floral species richness. Resource Selction Function excluding data on habitat types indicates that the two main parameters that govern the distribution of the Four-horned antelope within the study area are species richness at trees and shrub level, and anthropogenic disturbance. Understanding the resource selection by the Four-horned antelope provides a useful tool for better management of the habitats in ensuring a long term survival of the species.

RESEARCH ON MAMMALS WITHIN THE GENERAL CONTEXT OF RESEARCH ON THE TOPIC OF INVASIVE ALIEN SPECIES: ITS IMPORTANCE AND CONTRIBUTION

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The number of studies on invasive alien species has increased exponentially in the last few years. However, even if invasive species are the second most important global threat to biodiversity after habitat destruction, the attention of the scientific community toward this problem is still comparatively limited. The aim of this work is to characterise the research topics and trends of scientific studies on alien mammals and to identify how these topics relate amongst themselves and also how they relate to the rest of the studies on invasive alien species with the final goal of identifying potential under-represented research areas. The study is based on a bibliometric approach whereby the published scientific literature on invasive alien species was analysed using a dedicated software (BibTechMon©Systems Research). A total of 4050 papers published on the subject between 1975 and 2006 were selected through the bibliographic database Scopus. From these papers a total of 7708 keywords were extracted using a mixed approach involving the dedicated software together with a manual selection and standardisation of the keywords. The frequency and relationship between these keywords were then analysed. Cluster analysis and a visualisation tool known as knowledge map were employed to study the relationship between keywords that were associated within the same papers. Preliminary results show that mammals are relatively well-studied compared to other *taxa* even considering the relatively low number of species that characterises this *taxa*. Most of the studies on mammals are within the context of conservation research related to problems of loss of biodiversity, especially on islands. The study is ongoing.

MITOCHONDRIAL PHYLOGEOGRAPHY OF BANK VOLE *MYODES GLAREOLUS* IN ITALY

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The bank vole *Myodes glareolus* is widespread in the forests of Western Palaearctic region and is abundant in all the Europe. In Italy this species occur along all the Peninsula from the Alps throughout Appenines mountain chain to farther souths. Recent molecular analyses highlighted the role of glacial cycles in shaping population structure and genetic diversity of *M. glareolus* suggesting that Italian populations show highly diversified haplotypes from the rest of the Europe. The bank vole is not considered as a threatened species and its relative abundance make it a good model for ecological and habitat fragmentation studies. Thus the study of genetic diversity of this species can give useful information concerning the role of past climatic oscillations in shaping genetic diversity and the effect of human activity in reducing gene flow between forest wild populations.
We present preliminary results of phylogeographic investigation on *M. glareolus* in Italy with a special emphasis on central and southern populations. Cytochrome b gene sequences were amplified from total genomic DNA extracted from alcohol preserved tissues and museum samples. Population structure and pattern of haplotype distribution was evaluated thought minimum spanning tree and analysis of molecular variance (AMOVA).

DOES THE ALIEN RACCOON DOG DISPLACE THE NATIVE BADGER FROM THE BEST HABITATS?

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We studied home ranges and habitat use of the raccoon dog *Nyctereutes procyonoides* and European badger *Meles meles* in SE (Virolahti) and SW (Ruissalo) Finland to reveal the possibility of competition for the best habitats between these species. Home ranges (Kernel 95%) of raccoon dogs were larger in Virolahti (294 ha ± 139.6) than in Ruissalo (117 ha ± 29.8), and accordingly, population density was higher in Ruissalo. Also badger home ranges were larger in Virolahti (1015 ha ± 559.4) than in Ruissalo (224 ha ± 157.2) and thus also badger density was lower in Virolahti. Home ranges of badgers and raccoon dogs overlapped by the mean of 60% in Ruissalo and by 37% in Virolahti. Overlap was thus greater in the area with smaller home ranges and higher population densities.
Raccoon dogs favoured deciduous forests over coniferous forests. Their home range size correlated negatively with the proportion of deciduous forests and positively with that of pine forests in their home range. Also badgers favoured deciduous forests but old spruce forests were favoured even more, especially in the area (Ruissalo) with higher raccoon dog density and greater overlap between raccoon dog and badger home ranges. These findings suggest that competition for the most favoured habitat, the deciduous forest, may exist between badgers and raccoon dogs. Because raccoon dogs are more abundant, they may displace the badgers from the most favoured habitat.

SPACE USE OF REINTRODUCED RED DEER *CERVUS ELAPHUS* HINDS IN A MEDITERRANEAN MOUNTAINOUS AREA IN SOUTHERN ITALY

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As the red deer *Cervus elaphus* disappeared from Southern Italy for intense human impact, we carried out a reintroduction programme in the Pollino National Park from 2003 to 2005, a mountainous protected area in the Southern Apennine, Italy. Despite its relevance from the conservation and management point of view, the spatial patterns of the reintroduced populations of wild ungulates has been poorly studied. We then aimed to highlight patterns of space use in 11 red deer hinds radio-tagged and released between February and October 2003. Home ranges were estimated (adaptive kernel; Ranges6) on a seasonal basis synchronised with parturition (15 April - 30 June), weaning (July-15 September), rut (15 September-15 December) and winter (15 December-15 April). Biological seasons were defined by direct field observations. Each home range was characterised by its extent, altitude, slope and exposition class, occurrence of roads and watercourse.

In this study, the seasonal home range size was larger than most others reported in literature. In the first year of study (15 April 2003- 15 April 2004) there were no significant differences in seasonal home range size. Conversely, in the second year (15 April 2004 – 15 January 2005) parturition area resulted the largest whereas the weaning home range was the smallest (Kernel 95 %).

Altitude values were highest during the first time of study (parturition and weaning 2003 seasons, Kernel 50%), whereas during the whole following period, were constantly lower.

Slopes showed significant differences for winter area 2004 (highest) and weaning areas both 2003 and 2004 (lowest) (Kernel 50%).

There are no significant differences among expositional classes, unless west was predominant in parturition area 2004. In any estimated area, occurrence of roads was not significant. It's the same for the occurrence of watercourse, excepting weaning area 2003 (Kernel, 95%) in which it was significant

The almost absence of any significant differences for analyzed data in the first year of study, were possibly due to anomalous space use behaviour in unknown territory, with an explorative first year and usually, a more regularity space use in the second year. Actually, the second year of study showed significant differences in some home range characteristics.

Large size of parturition area was probably conditioned by intense space activity in pre-parturition period (April-May 2004), when hinds search a suitable place for the birth. The contraction of weaning area was probably due to caring for young that reduced movement entities of hinds.

The shift of altitude is probably explainable because the low altitude offered many trophic resource. Territory with high slope presents a vertical variation of vegetation cover which offers, with low energy cost, most various trophic resources that provide for the shortage of grassy layer of winter period. Besides, higher slope territory, offers probably most chances of shelter from both wild predators and wandering dogs, occurrence quite widen in sheep-rearing and rural area in southern of Italy. Lowest slopes of weaning areas was probably due to juvenile reduced movement gift, which drives hinds to stay in flat territories.

The high presence of watercourse in 2003 weaning area, is coherent to great need of water of red deer for thermoregulation due to high summer temperature.

It is unclear why west expositional class was predominant in parturition season.