XXXth IUGB CONGRESS
(International Union of Game Biologists)
AND PERDIX XIII
Barcelona, Spain
5th-9th September 2011

Published by:
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Dear colleagues,
Ladies and Gentlemen,

The University of Barcelona, in co-operation with The Department of Agriculture, Farming, Fish, Food and Environment of Catalonia, the “Instituto de Investigación en Recursos Cinegéticos” and the Game and Wildlife Conservation Trust are pleased to host and welcome you to the XXXth IUGB Congress (International Union of Game Biologists) and Perdix XIII at the Hotel Juan Carlos I, in Barcelona (Catalonia, Spain), held from the 5th to 9th September 2011.

The fact that more than 300 game and wildlife scientists have come together from five different continents reflects the high interest and quality of this year’s IUGB Conference series that for the third time in its history has joined forces with the Perdix series. It further emphasises the growing recognition our field of research is receiving globally.

Furthermore, your dynamic response indicates the relevance of this series main topics. A total of 128 oral presentations will be given and 136 posters presented. In addition to the main congress agenda, eight lectures from distinguished keynote speakers will be held, and six wildlife biology related workshops organised by colleagues who have dedicated great enthusiasm and commitment to the cause.

The range and quality of submitted presentations promises a very interesting congress which will provide a deep and broad insight into the current situation of international game and wildlife research. We further hope that after the conference you will return back to your research projects with satisfaction and inspiration, but most of all with a list of fruitful contacts and maybe even new friendships. We see this conference as a great opportunity to strengthen communication among ourselves, ultimately the key to push the boundaries of wildlife research even further in order to achieve maximum conservation impact.

Our deepest gratitude goes out to all those who have lent us their time and support during the preparation of this Conference, in particular, the patrons and sponsors, and all of you who honour us with your presence here today.

We sincerely hope that you will have a marvellous time during this XXXth IUGB Congress and Perdix XIII in Barcelona, an event you will look back on with fond memories.

Francis Buner  
Chair of Perdix XIII

Manel Puigcerver
Chair of the XXXth IUGB Congress
President of the IUGB (2009-2011)
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Lectures of Keynote speakers
In the UK, numbers of grey partridges *Perdix perdix* have dropped alarmingly, by over 90% since the 1950s and by 50% just over the last 15 years, similar to the trend in other European countries. However, the Partridge Count Scheme of the Game & Wildlife Conservation Trust (GWCT) shows a 40% increase in numbers since 2000 on participating sites. Which interpretation is correct? In my presentation, I explore the background and reasons for this conflicting picture. Grey partridge research carried out by the GWCT over the last 50 years has led to scientifically proven recommendations for the ideal partridge environment in the UK, ranging from habitat requirements to predator density. I examine to what extent the research has influenced UK government policy, consider the role played by European Union CAP reform and that of the Rio de Janeiro Convention on Biological Diversity, and explain how all these have contributed to the GWCT's grey partridge recovery programme. The current situation is that the UK has put in place one of the most conservation-minded and flexible agri-environment schemes in Europe. Many of its habitat prescriptions are based on GWCT research, hence for farmers and landowners the cost of much grey partridge habitat creation and restoration can be recovered. On the other hand, the culling of common predators is not covered by agri-environment schemes, so it is primarily on shooting estates with private gamekeepers that the full package of management measures for the grey partridge can be implemented and the most impressive recovery of the grey partridge can be observed. The future fate of the grey partridge rests on the balance between the economics of agricultural production, agri-environment measures and shooting.
During the past decades many migratory species have declined dramatically – mainly as a result of habitat alteration and fragmentation but also as a consequence of direct human interactions. Examples include the saiga antelope, which is critically endangered due to overexploitation and illegal trade in saiga products. Likewise, Western gorillas are facing the risk of extinction not only due to diseases, but also due to poaching for bushmeat consumption. Traditional pastoralism practices can be extremely beneficial to biodiversity, but they can also generate conflicts related to predator control, as it is the case with the Masai in Kenya and Tanzania. A further example is the problem of poisoning – extremely detrimental to the populations of large carnivores and birds of prey, but deeply rooted in rural communities. Human-wildlife conflicts often also have an international dimension, related, for instance, to traditional medicine treatments’ demand for wildlife products. Wildlife managers have to deal very often with conflicts generated by the human populations that share the territory with the species concerned. Addressing these conflicts from a professional perspective is essential to maintaining the wildlife species in a favourable conservation status. This presentation’s basic hypothesis is that there is a close link between a successful wildlife management and a successful conflict management, based on principles such as a non-adversarial framework, an analytical approach, a problem-solving orientation, the direct participation of the conflicting parties, dialogue as a basis for mutual understanding and facilitation by a trained third party. We will use the above mentioned examples and other ones to show how CMS can contribute to conflict resolution and thus increase the chances of survival of migratory species. As an international body administered under the auspices of UNEP, CMS is committed to the conservation and sustainable use of migratory species. Therefore, CMS also plays an important role in developing best practice projects which involve local communities in habitat management and conservation measures, supporting their understanding of the eminent role of wildlife and how to tap its economic advantages, for instance by promoting sustainable hunting or wildlife tourism.
“SUSTAINABLE HUNTING”:
AN EXPLORATION ALONG ECOLOGICAL AND SOCIAL DIMENSIONS

JOHN D. C. LINNELL

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Hunting is one of the oldest activities that Europeans have conducted, but what role does it have in the 21st century? One hand hunting is a very controversial activity, because of the (1) fact that it by definition involves the death of animals and (2) the social context in which it occurs, and (3) the institutional manner in which it is organized. On the other hand, hunting is also performs an important social and cultural function in many rural communities.

Likewise, although many forms of hunting may represent a blueprint for the ecologically sustainable use of natural resources, which is sorely needed when we look at the global biodiversity crisis, there are other forms that may well be responsible for population declines of target species. The project “Hunting for Sustainability” (funded by the EU’s FP7 program) simultaneously examines the social and ecological dimensions of hunting in the modern world through a selection of case studies scattered across Scandinavia, Scotland, Spain, the Balkans and Africa. This diversity of studies has provided unique insights into the diversity of issues that influence the sustainability of hunting, and even to the way in which we define sustainability. This talk will present some reflections resulting from this project’s activities concerning the way in which social dimensions need to be integrated into considerations of ecological dimensions with respect to formulating hunting related policy.
At the beginning of 2010, the 193 countries that had signed up to the Convention on Biological Diversity, acknowledged that they had failed to meet the 2010 target that they had set themselves in 1992 aiming at significantly reducing species extinctions. At the end of the year they set a new target on preventing species extinctions by 2020 and this is both more challenging and more specific than the 2010 target. Achieving this target will require much greater efficiency in the use of resources and research has a very significant role to play. There are about 300 species of Galliformes and 26% of them are considered at risk of extinction, compared with 12% of all 9,800 bird species. The Alagoas curassow *Mitu mitu* is only known in captivity now, five species are considered Critically Endangered and 25 Endangered.

At the same time there is a significant galliform research literature that stretches back decades for some species. This suggests that the link between research and avoiding species extinctions is slim at best. There are practical reasons for this, such as the interests of research biologists and/or their host institution, what will attract funding and what species/subject combination is likely to lead to high impact publications. It is, however, time to consider whether it is possible to increase the efficiency and global impact of gamebird research. Recent global analyses have shown that whilst the status of all species continues to deteriorate, it is possible to avoid extinctions and their IUCN Red List status to be improved. This suggests, therefore, that with careful planning that involves more strategic direction and sharing of lessons learnt, game biologists can play a significant role in achieving the 2020 target for species adopted by the Convention on Biological Diversity.
Management and conservation of a species should be based on reliable population estimates, together with a thorough knowledge of its biology. However, in the Common Quail (*Coturnix coturnix*), which historically seems to have suffered a severe decline, this may be a hard task. The provision of reliable quail population estimates is problematic for several reasons, such as its extremely high mobility, the dense but ephemeral habitat that it exploits, which makes it almost invisible to the observer, its complex mating system, and restocking practices with farm-reared hybrid individuals resulting from crossing domestic strains of non-native Japanese Quail (*Coturnix japonica*) with Common Quail (*Coturnix coturnix*).

In this talk I will present some results of 30 years of study of the Common Quail by our team at the University of Barcelona. We are trying to overcome these problems by proposing a new methodology of census and a model of species distribution based on the temporal changes of the habitat that it exploits. I will provide new data on population trends at both local and trans-national scales, the extent of hybrids in the native populations, and the influence of temperature and successive changes in crops and vegetation on the breeding biology of the species, also at local and global scales. European ringing recoveries (from 1933 to 2003) in Spain also provide useful information, which indicates that the Spanish Castilian Plateau is an important stopover area which should be specially preserved. All in all, this information allows us to provide management and conservation recommendations for the present and the future, at both local and trans-national scales.
MANAGING CONFLICTS BETWEEN CONSERVATION AND GAMEBIRD MANAGEMENT

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Across Europe, gamebird hunting is an important form of land use with a long history and rich traditions. The way gamebird hunting is managed varies considerably between different regions, especially in relation to the types of management and levels of management intensity. Hunting and its associated practices provide important benefits to biodiversity, but it also finds itself in conflict with conservation in some regions. In particular, the illegal control of predators that is associated with gamebird hunting in some countries brings hunters into direct conflict with conservation organisations. In this talk I will explore the evidence for the costs and benefits of hunting for biodiversity, and then focus on the challenges of dealing with conflicts over illegal predator control. Throughout, I will draw on one conflict I have studied for nearly 25 years involving birds of prey and red grouse in the UK uplands, considering the causes of this fascinating and revealing conflict, the variety of alternative solutions that have been proposed, the barriers that have prevented resolution and the approach currently employed to resolve the conflict. I will explore the role of science, legislation and dialogue and consider the ways forward in finding a solution to this problem. I will end by considering the broader lessons for gamebird management.
MOLECULAR GENETIC TOOLS AND TECHNIQUES FOR IMPROVING MANAGEMENT OF WILDLIFE AND GAME SPECIES

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Improvements in molecular genetic methods have opened many new opportunities for gathering data that can help improve the management of wildlife and game species. This talk will give an overview of recent developments in wildlife conservation genetics and molecular ecology and demonstrate how these techniques can be used for improving wildlife monitoring and management. Specifically, I will cover the use of non-invasive genetic sampling and environmental DNA to detect focal species and diseases, estimate population size and determine sex ratio using examples from amphibians, birds, and mammals. The use of these data for analyses of genetic diversity, gene flow, population viability, hybridization and mating system will also be discussed.
Commercial bushmeat hunting is now acknowledged as a major source of zoonotic disease emergence. Most research on the topic focuses on human contact with infected wildlife. In this talk I will argue that the pervasive effects of bushmeat hunting on wildlife distribution and abundance have an equally important, highly predictable impact on disease emergence patterns. I will start by showing that gorilla and chimpanzee densities in five post-Ebola virus outbreak areas vary systematically along gradients in hunting intensity, likely because rates of viral transmission between ape social groups were lower in zone of heavy hunting and low ape density. I will then present similar gradients in the prevalence of SIV, the ancestor of HIV, in chimpanzees and antibiotic resistance in gorillas. Finally, I will present evidence that the rapid “hunting out” of large bodied species such as apes is causing a compensatory rise in the abundance of small bodied species, portending a spatially and temporally predictable transition from primate to rodent and bat-borne disease emergence.
Oral presentations
Conservation and management of migratory game species
Since 1980, the phenology of the woodcock wintering populations is precisely known in France and especially in the coastal region of southwestern France (in Pyrénées-Atlantiques department) by means of the nocturnal index of abundance (NIA) and hunting indices of abundance. Moreover, it allows a geographical localization of the main wintering stocks. Besides, since 2010 a method of control of hunting bags is established in Gipuzkoa, a province of North of Spain that borders with France, by means of a hunting card that provides particular information for every different region of the territory. NW Spain and SW France are important regions for wintering populations especially during cold spells, when it is possible to find an important stock of woodcock in that area.

In the Pyrénées-Atlantiques department the monitoring program is based on field data collected yearly by 100 hunters and 5 bird ringers. In 2009/2010 wintering season the nocturnal index of abundance varied from 3,2 during October-December to 5,3 in January, with maximums of 8-14 in certain areas during cold spells. In the period 1987-2010, 940 woodcocks were ringed and 143 recaptured.

During 2010/2011 hunting season in Gipuzkoa, 8.851 woodcock hunting cards were issued, and 8.386 cards (94,7 %) were returned at the end of the season. Nocturnal transects will be done once a month from October to February and every three days during cold spells. Information recovered with this method will act as a tool for the wise management, especially in taking decisions about hunting season opening and closing dates and the implementation of special regulations during these periods.
VISUAL COUNTS, BIOACOUSTIC AND RADAR: 3 METHODS TO STUDY WATERFOWL PRENUPTIAL MIGRATION IN SOUTHERN FRANCE

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The chronology of waterfowl prenuptial migration in France is a subject treated by many authors on a national scale but only with methods such as visual counts or ringing. This study is innovative because it is based on 3 complementary methods never used together before: visual counts, bioacoustic and RADAR. It comes from 4 years (2006-2009) monitoring on 2 sites, annually, from the second 10-day period of January to the first of April and required significant human resources. On each site, a monitoring of 24 hours per 10-day period has been carried on by RADAR, associated with nocturnal bioacoustics recordings, and visual census on the same areas. The results are about Anatidae and coot in the Mediterranean area (southern France). The monitoring effort is important: visual counts carried out represent 537 counts-sites (n= 366659 birds counted), bioacoustic has detected 9573 calls for 814 hours of nocturnal recording and RADAR recorded 67368 echoes on a set of 2128 hours of monitoring. The data were analyzed graphically and uni and multivariate statistical tests were made. Visual counts show a decline in numbers from late January/early February.

The nocturnal recordings suggest an initial increase of the value of bioacoustic indices on the second 10-day period of February. RADAR, the most relevant method for tracking bird movements, identifies 2 different migration peaks with the Migration Traffic Rate (MTR) values. Regarding to the analysis, we considered the following migration variables: flight altitude above 400 meters and flight direction towards north east-south east. Except for the winter 2007, particularly clement, a first period of very low intensity is noticed on the second 10-day period of February and a second of higher intensity on the first 10-day period of March. Using 3 complementary methods applied on the same sites for 4 years has allowed us to obtain updated and reliable data on the chronology of waterfowl prenuptial migration in southern France.
From the past three decades populations of European turtle dove, *Streptopelia turtur* are showing decrease trends in many member States of EU especially in Western Europe, which led to the attribution of unfavourable conservation status within EU. Game pressure was been recognised as one of the factors that negatively affect the European breeding population of turtles doves. In fact, birds from northern latitudes while migrating to (and from) Africa faces in the Mediterranean countries an ancient and strong hunting tradition.

Nevertheless the scarcity of information to properly assess the hunting pressure at national level limits the full implementation of the European management plan for this species (from 2007), that highlighted the need for rational hunting based on sound scientific knowledge. Portugal account for about 10% of 2-4 millions turtle doves that are shot annually. In this paper we used hunting bags statistics compiled by the Portuguese Forest Authority (AFN) from game estates to derive trends of harvested turtle doves over two decades. Trends were analysed with TRIM (TRends and Indices for Monitoring data) program that accounted for overdispersion, serial correlation and game estate area. The results revealed a significant decline of turtle dove harvested per unit area over the years (1989-2007) at national level (p<0.01). This negative trend was more evident in Algarve and Oeste, coastal regions where there is a traditional strong concentration of hunting results. At regional level these findings were related with estimated trends for the breeding population, changes in the number of hunters and in the type of hunting regime. Such differential hunting pressure in time and space will have implications on the annual recruitment specially were the analysis of hunting specimens reveals high records of juveniles and birds with physiological parameters non compatible with migration (e.g. low levels of fat and muscles reserves, moult in progress).
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We evaluated alternative hypotheses for the origin of the endemic Azorean subspecies of the common quail (Coturnix coturnix conturbans), the level of differentiation between Azorean and mainland quail, and the possibility of gene flow from the Japanese quail (C. japonica) released for hunting. One hypothesis suggests that Portuguese settlers introduced the common quail to the Azores in the early XVIth century. The other suggests that the common quail colonized the Azores naturally and experiences periodic inflow of European individuals. To test these two hypotheses, we sequenced one mitochondrial gene and one Z-chromosome intron for 109 common quail from Iberia (27), Russia (10), South Africa (6), and the Azores (66) and 34 Japanese quail, both domestic (21) and wild, from Mongolia (6) and Russia (7). Both species appear reciprocally monophyletic and 3% divergent in their mtDNA, but the common quail was paraphyletic in respect to the Japanese quail in the Z-specific locus.

South African birds were significantly differentiated from other common quail in their mtDNA, however, there was one haplotype discovered on two Azorean islands that was likely of South African origin. Azorean quail were not differentiated among islands, or from European birds, and were as genetically diverse as European birds. Our data support the natural colonization of the Azores by the common quail and periodic inflow of European birds to the archipelago. Releases of domestic Japanese quail left no genetic traces in the Azorean common quail. This work was funded by the research project POCI/CVT/61754/2004.
During prolonged periods of severe weather waterfowl habitats are affected by snow or ice. Recreational users of the countryside can move water birds off prime feeding areas, potentially resulting in reductions in body condition, at a time when energy reserves are key to overwinter survival and subsequent breeding success. Over the last 30 years the British Association for Shooting and Conservation has been closely involved, along with the government and other conservation NGOs, in developing and implementing a criteria-driven process for defining severe weather and managing waterfowl shooting during it in order to minimise unnecessary disturbance to overwintering water birds. “Severe weather” is defined as 14 days during which more than half of the selected coastal meteorological stations in a given UK country record air temperatures below +1°C and grass temperatures below -2°C. The process allows for up to three days of non-freezing conditions within this period which are neutral with respect to counting of days but more than three days reset the counting to zero. After the first seven days BASC typically calls for “voluntary restraint” in waterfowl shooting wherever local conditions require it.

If the conditions persist a statutory suspension of such shooting is typically imposed by the national government for a period of 14 days, but to be reviewed after seven days. BASC, through its members, contributes to the national monitoring of waterbird and habitat condition during such periods. There have been calls for voluntary restraint in all of the UK countries in the last three winters. Statutory suspensions have been imposed 11 times since the process started in 1978, including the last two winters. The system works well and is widely respected and applauded by conservation agencies. There are increasing efforts to bring more countryside activities, including dog walking, bird watching/ringing and other wetland users, into the system so as to reduce further unnecessary waterfowl disturbance during difficult winter weather.
MORPHOLOGICAL DIFFERENTIATION OF THE AZOREAN QUAIL

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The common quail (Coturnix coturnix) is a widely distributed, primarily migratory Phasianid. The geographic variation within the species is recognised by several named subspecies described on the bases of plumage and wing length differences. The Azorean quail (C. c. conturbans) is a sedentary endemic of the Azorean Archipelago. Since the Azorean quail evolved from a migratory ancestor, we conducted a comparative morphological study of the Azorean and mainland Portuguese quail to elucidate morphological changes related to the evolution of a sedentary lifestyle. We measured wing length, tarsus length and width, and bill length, width and depth for 41 Azorean and 717 mainland birds. For 38 Azorean and 24 mainland birds, we also measured the length of coracoid, humerus, ulna, carpometacarpus, femur, tibiotarsus, and tarsometatarsus. The length of each of the 10 primaries was measured for 51 Azorean and 244 mainland quail. All measurements were taken from full-grown birds (> 8 weeks of age).

Factor analysis of these measurements showed that the Azorean quail are smaller and have shorter, less pointed wings than those of mainland birds. When body size is accounted for, the Azorean specimens also have longer and narrower beaks and longer legs. Our results are consistent with the reduction of size and flight abilities of the sedentary Azorean quail relative to mainland birds. This study was supported by Secretaria Regional da Agricultura e Florestas (Açores).
The Belgian Ringing Centre’s computerized databases of birds ringed and recovered allow research and applications in GIS mapping. A ringing peak of common quail *Coturnix coturnix* occurred in 1936 after which only occasional birds were caught. However, a recent interest targeting this species emerged in the 2000s. New techniques lead to thousands of birds caught annually, despite the species’ declining status. Since 1927, 234 ring recoveries have been recorded, more than 200 of them in recent years. Typically ringed in early May, the birds are mainly recaptured during the autumn migration (August, September October), usually in the same year. No recovery was recorded during wintertime (December-January).

The recapture locations projected using the ArcGIS mapping facilities and decadal time-scale colored symbols show that recoveries before 1970 are located to the east of the ringing locations, in Germany, Russia and Italy, and the moving ways driven towards the eastern or south-eastern areas from Belgium. On the other hand, the 200 recent recoveries are located to the south of Belgium, in Spain and Portugal via southern France. Recent June and July recoveries data from the Netherlands show that quail continue their migration northwards after their first mating stop on route. Recent Belgian recaptures have recorded only one bird from Italy, and one Belgium-ringed bird was recaptured in the UK. Before 1970, common quails were ringed mainly in the eastern and southeastern parts of Belgium (Walloon Region), whereas recent ringing activity is concentrated in the North and West of the country (Flemish Region). It remains unclear whether our data indicates a trend for different migration routes for quail populations from western and eastern parts of Belgium, or whether there is an actual change in their wintering destination compared to the years before. The recent ringing locations are too unequally distributed to support a strong interpretation of the first hypothesis. A targeted capture effort for quails has been requested this spring in Walloon Region, to obtain future recoveries of birds from eastern Belgium. The second hypothesis will be discussed in regards to the literature. The Belgian records of quails to or from Italy are unfortunately not documented in the 2008 “Migration Atlas of Italian birds”.
We differ two kind of movements in European woodcock (*Scolopax rusticola*): autumn migration from breeding areas to over-wintering areas, and spring migration returning to breeding areas. Ringing has been the principal method to know the migratory movements of migration species, but results are reduced to data collected in the moments of the animal capture and recapture. Terrestrial radiotracking has revolutionized the knowledge of wild species and has been used to study migratory birds too, including European woodcock, but only in their breeding or over-wintering areas, because of the short-range of the terrestrial equipments (5-10 kilometers). New advances in technology, specially Satellite Radio Telemetry (RTVS) offers the possibility of a continuous tracking of the marked animals after their capture and release, which allows the study of all the woodcocks movements during their annual migrations. The study is based on 17 radio-tagged wild woodcocks captured in several over-wintering areas of Spain. Woodcocks are captured according to the methodology described by French ringers. Once captured, we take some animal biometric data and released them in a few minutes fitted with an official ring for migratory birds and with backpack 12 gram solar powered PTT (Microwave Telemetry Inc.) according to the method designed by C.C.B. Scientific Comitee with an harness. Once released, Argos system received and located the data, provided by a French company called CLS, which sent the information to C.C.B. Scientific Committee. We have collected complete migration data between over-wintering areas and breeding areas for 5 woodcocks and locally results for the rest.

Most of the animals came to Spain from circumbaltic areas, specially Karelia, with medium routes around 3800 km, and one woodcock flew more than 6200 km to Siberian Region.
GENETIC AND PHENOTYPIC CHARACTERIZATION OF THE AZOREAN SNIPE

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The Nearctic Wilson’s snipe (Gallinago delicata) and its Palearctic sister, the common snipe (G. gallinago), have allopatric ranges but are similar in their ecology and morphology. They winter together in the Azores but only common snipe appear to breed there. In this study we assess genetic and morphological differences between the two snipe species and determine the status of birds breeding in the Azores. We sequenced one mtDNA gene, one Z-specific, and two autosomal introns for 106 snipe collected in the Nearctic, Palearctic and Azores, including 5 hatched on S. Miguel Is. For 172 snipe collected in the Azores, mainland Portugal, and France we measured 3 phenotypic characters related to sexual/territorial display, 14 skeletal and 4 external characters, and the length of each of the 10 primaries. The species were not reciprocally monophyletic but were significantly differentiated in allele frequencies at all loci. All 5 snipe hatched on S. Miguel Is. were differentiated from the Wilson’s but not from the common snipe. These results suggest recent divergence of the common and Wilson’s snipe and support the breeding of only common snipe in the archipelago. The factor analysis of morphological characters showed that the two species do not differ in size or shape, and the characters related to sexual/territorial display performed well in distinguishing the taxa.

Our results suggest that the two species diverged only recently and remain ecologically and morphologically similar. However, their recent allopatric isolation resulted in rapid evolution of prezygotic isolation. This study was supported by Secretaria Regional da Agricultura e Florestas (Azores).
The common quail (*Coturnix coturnix*) is a very popular game bird in Spain. In spite of this, post-breeding migration patterns are generally very poorly understood. The aim of this study is to present new data concerning post-breeding migration characteristics in the Iberian Peninsula and to analyse how they could affect the hunting period, and thus to provide new management recommendations.

The data were collected from two sources: a) the capture of 579 individuals on 55 sampling days during the post-breeding passage of 2009 and 2010, in an area close to the Mediterranean coast (Garraf, Barcelona Province) which is not a suitable breeding area; b) 665 post-breeding ring recoveries of birds ringed in Europe and recovered in Spain (period 1933-2005), provided by the Euring Databank.

Results clearly show that there are two different waves. The first one (from July to August) is composed mainly of non-sexually active young of the year which, according to their fat deposits, cannot be considered physiologically to be migrant individuals. The second wave (from September to October) is mainly composed of non-sexually active young of the year which, according to their fat deposits, are migrant individuals and weigh significantly more than those in the first wave.

These results indicate that the hunting period in Spain (from 15th August to 15th September) overlaps mainly with the first wave of nomadic individuals and almost entirely misses the main passage (migrants in the second wave). Moreover, knowing the phenology of migration is crucial to adjusting the timing of the hunting period to allow better management of sustainable hunting.
HARVEST DATA FOR QUAIL (*Coturnix coturnix*)
DURING THE HUNTING SEASONS 1995/96 TO 2008/09 IN GREECE

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Harvest data for quail were collected through Project ARTEMIS, the game statistics survey in Greece. This project is financed by the Hellenic Hunters’ Confederation. Data were collected through a questionnaire in the form of a diary, distributed to hunters by mail and through the hunting associations at the beginning of the hunting season. The hunting season for quail officially runs from the 20th of August to the 28th of February, but in practice lasts as long as the presence of this species in the country. Hunting is allowed every day with a daily bag limit of 12 birds per hunter. Restocking with Japanese (domestic) quail has ceased since the late 1980’s. Quail is a popular game species in Greece. Every year, the outings for quail represent 13-21% of the total hunting outings reported for all game species.

During these 14 years, 67,526 hunting outings have been recorded for this species. The percentage of hunters that have bagged at least one quail per season reaches 49-65% of those participating in the project. During the first 4 weeks of the hunting season, approximately 28-60% of the annual quail harvest is achieved. Mean annual hunting opportunity (number of birds encountered) per hunter and outing ranges from 3.4 (SE = 0.04) to 4.8 (SE = 0.06), while mean annual harvest (number of birds shot) per hunter and outing ranges from 1.6 (SE = 0.04) to 2.8 (SE = 0.04). The year 1995/96 is considered an exceptional quail year, with values of 7.3 (SE = 0.12) and 3.9 (SE = 0.07) for mean annual hunting opportunity and harvest per hunter and outing, respectively. These indices show stability of populations, despite annual fluctuations. This has implications for the quail populations of SE Europe migrating through Greece, which is a major stopover area on this migration corridor.

Distribution of daily harvest shows that only less than 3% of hunters achieve a bag of 6 or more quail. Mean annual harvest per hunter ranges between 11 (SE = 0.84) and 25.9 (SE = 1.15) birds (23.1 birds, SE = 1.46 for the year 1995/96).
Human dimensions of game wildlife management
DIFFERENCES IN DEMOGRAPHY AND HUNTING SUCCESS BETWEEN RESPONDENTS AND NON-RESPONDENTS IN THE DANISH GAME BAG RECORD

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Danish hunting licence holders are under legal obligation to report their personal game bag after each hunting season. However, since 2000 a substantial proportion (ca. 40 %) of the licence holders has failed to do this. In an attempt to raise the reporting rate, reminders were issued to all licence holders failing to report their game bag in the hunting season 2007/08. This gave a unique opportunity to compare in detail the demography and hunting success of early vs. late respondents. In “normal” years, i.e. years without reminders, there would obviously not be a late respondent group, as these would be classified as non-respondents. The study is based on analysis of data drawn from the Danish Game Bag Record on the demography of 161,300 Danish hunters (98 % of all licence holders in 2007) and personal game bag reports from 98,400 early respondents and 39,500 late respondents. 5.1 % of the licence holders were females. The average female hunter was 6.2 years younger than the average male hunter, 43.4 and 49.6 years, respectively. Overall, early respondents had a higher success rate than late respondents (71 % and 38 %, respectively), and early respondents bagged more game (25 vs. 19 per successful hunter) and more quarry species (3.8 vs. 3.1) than late respondents. There were clear differences in the performance of male and female hunters.

On average, males were more successful than females (63 % vs. 30 %) and males bagged more game than females (25 vs. 10). These relative differences were also found between respondent groups. The results will be used to alter the routine procedures correcting for missing reports in the estimation of regional and national totals of bagged game in the Danish Game Bag Record.
During the past few decades in Finland, the growth of wolf (Canis lupus) population has created modern human-wildlife conflict which has expanded from a local to the EU level. The conflict have emerged between local people and wolf but also between different stakeholders concerning methods of management and especially concerning the role of hunting in wolf management. The aim of this study is to make this conflict more transparent and understandable and provides suggestions regarding the governance of the conflict. The data is based on a semi-structured questionnaire distributed among interest groups and open hearings among local people throughout Finland during 2004. Methodologically, qualitative as well as quantitative tools are used.

The wolf conflict is an example of one of the multifaceted human-wildlife conflicts where complex socioeconomical challenges are connected to each other at a local level. The specific biological abilities, the negative image of wolves and fear among people are of concern in this matter. In the society the conflict appears mostly trough stakeholders’ contradictory goals. However, the predictors of conflict between stakeholders became better understood through spatial and cultural contexts. Especially hunting developed by local elements and conservation having a non-local background, have clashed with the wolf being the major bone of contention. The wolf conflict can be defined as insolvable by nature, where the understanding of this is the key of management and mitigation processes. Because no final solution is in sight, despite constant management efforts, adaptive and learning processes are needed.
This article examined the predictive influence of beliefs and attitudes on normative beliefs about wolves and brown bears. Knowledge was hypothesized to moderate these relationships.

Data were obtained from stratified random face-to-face interviews conducted within an Italian National Park (n = 1611). Two separate path analyses based on multiple regression analysis were carried out. Both models supported the role of attitudes in mediating perceived impact beliefs and support of protection of large carnivores. Knowledge moderated these relationships but only for wolves. These findings support the idea of affect being more important than cognition in predicting normative believes. Residents of the national park held higher level of knowledge about bears than wolves, encouraging the importance of educational programs for conservation.
PRELIMINARY RESULTS OF WILDLIFE SURVEYS IN A MULTIPLE USED PROTECTED AREA, WESTERN TANZANIA

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The recent findings in landscape ecology tends to shed doubts on the ability of strictly protected areas (IUCN categories I and II) to ensure realization of their objectives in terms of biodiversity conservation, particularly for species with large and seasonal home ranges.

This led to a renewed interest of the conservation community for the “low status” protected areas, particularly those that are embedded in a greater complex of PA. In this context we initiated a research in an area with a low protection status in Western Tanzania, where wildlife and the forest are exploited and managed by local communities. To assess if such community conserved areas are likely to play a role in respect of their conservation value, it is necessary to monitor the evolution of their biodiversity.

Moreover, monitoring methods should be adapted to be implemented on a regular basis by the communities themselves. First challenge was to select appropriate methods to be applied, by local people, in an extended area of Miombo woodland. We decided to take mammals – excluding fossorial and flying species – as focal group, using a combination of transect and camera trap census techniques. Aims were to make an inventory of the species present in the study area, to know their spatial distribution, and, for some species, to develop a counting method to assess the trends of their population dynamic. After 3 field campaigns, from 2008 to 2010, we have a first picture of the species present and partly of their distribution. Combined methods yields impressive results with the identification of 50 species of small, medium, and large mammals, with a comparatively modest research effort (e.g. <700 days of camera traps). Most of the spectacular and rare species that are usually found in national parks were present, including red listed species such as the wild dog (*Lycaon pictus*) or the leopard (*Panthera pardus*). Furthermore, the presence of species with uncertain status in Western Tanzania could also be confirmed. The presence of this diverse mammal community, with all sizes of carnivores, indicates the existence of a well structured ecosystem. This initial knowledge and the selected monitoring methods will give an opportunity to evaluate if this type of community based management is sustainable from the point of view of the conservation of the mammal community, despite its alleged low protection status.
Hunting has always held an important position in Finland for both its role in wildlife management and its value as a pastime. Moreover, it has been closely intertwined with the Finnish way of life, cultural tradition and identity, particularly in the northern parts of the country. Most state land – two-thirds – is managed by a state enterprise known as Metsähallitus. Currently, ninety percent of the land in the Sámi homeland is public property in that it is administered by the state. One of the statutory tasks of Metsähallitus is to provide citizens with hunting opportunities on state land and to manage the game resources on those lands sustainably. Yet, at the same time, Metsähallitus is required to safeguard certain special statutory rights, which vary from region to region.

This remit entails numerous challenges for the officials involved; tensions arise, most conspicuously in the northern parts of the country. Conflicts between the government and local population have been identified in the following areas: defining the ecological and social sustainability of hunting, reconciling the free hunting right of local residents with the sale of hunting permits to non-residents, obligations to safeguard Sámi culture, and reconciling the interests of hunting and reindeer herding. These all exhibit features common in natural resource conflicts: disagreements between groups of stakeholders regarding information, differing frames of reference in interpreting regulations and divergent interests, and distrust between parties. Social and ethnic tensions in the North have a long history, with disputes centring on issues such as the meaning of nature for the regional identity, the right to self-determination, land ownership, and the North-South confrontation. To promote interaction, communication and regional co-operation between various interest groups, Metsähallitus has adopted an approach encompassing ongoing participation, communication, hearing procedures, and dialogue among the key stakeholders in the region. This approach has proven effective in planning sustainable hunting and game management; it has clearly succeeded in defusing conflicts that has emerged previously in managing hunting-related issues.
THE MEANINGS OF HUNTING IN GORSKI KOTAR, CROATIA

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Human dimensions research on hunting predominantly focuses on the socio-economics of hunting and less focus is given to the cultural and social context of the activity. This study investigated the cultural and social aspects of hunting in the region of Gorski kotar (Croatia) by exploring meanings and perceptions of hunting to hunters and non-hunters. Specifically, this research examined the reasons and motivations that drive people to hunt, their opinions on hunting, and the role that hunting plays in their life.

Semi-structured in-depth interviews (n = 7) and focus groups (n = 5) were conducted with hunters and non-hunters. Data were analyzed using a grounded theory approach. The findings suggested that both hunters and non-hunters perceived hunting as a traditional activity, and recognized it as an element of future regional development. Different motivations for hunting were identified (e.g. recreation, stress relief, trophy). Both groups evaluated hunting depending on the perceived motivations behind participation and the types of hunting. Non-hunters considered hunting as beneficial to the community (i.e. economic income), whereas hunters benefits were more personal (i.e., companionship). Hunters indicated a greater number of limiting factors for the future growth of hunting than non-hunters. This study provided a better understanding of the importance of hunting and its relationship with game management. The results of this research can be used to promote hunting activities and provide an understanding of the importance this activity has within the local community.
FROM LYNX AND MEN – A CONFLICT THEORY PERSPECTIVE

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Studying species’ behaviour and characteristics is the wildlife manager’s area of expertise. Yet all tools seem to fail when it comes to understanding the manners of Homo sapiens. While it has been widely acknowledged that wildlife management is primarily the management of people, wildlife managers often remain helpless in the face of people’s outraged reactions towards management and protection measures. The same is true for the lynx-conflict in southern Germany, where the question of lynx (Lynx lynx) protection and reintroduction has been an issue of conflict between hunters, farmers, conservationists and wildlife managers for more than 25 years. The aim of our study was to understand the attitudes and behaviour of hunters and farmers in this conflict in order to reveal the causes of their resistance against the lynx. Thus, we drew upon a qualitative social science approach and an analytical framework comprising sociological and psychological theories of conflict and interaction. In different regions of Baden-Wuerttemberg focus group discussions among hunters and farmers were carried out, which were audio recorded and transcribed. Transcripts were analysed on the basis of Grounded Theory and Documentary Method.

Our findings indicate that the resistance against the lynx is a symptom of symbolic interaction and group conflicts between the involved actors, fed by their striving to define their social identity. As these patterns of human interaction are at the root of other examples of wildlife-conflicts as well, our research contributes to wildlife managers’ toolbox for understanding and handling such conflicts.
ESTIMATION OF THE ECONOMIC IMPACT OF A HUNTING BAN FOR THE GREEK RURAL AREAS

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In 2009 hunting was banned for a few days in Greece, after a decision of the Council of State. Hunting, however, plays a significant role for the economy of rural and mountainous areas. Therefore, the objective of the present research was to estimate if hunting bans can influence the economy of such areas in Greece, and how much will be the cost. Since the accommodation and food services sector covers the needs of hunters when they are outdoors, the research focused on hotels and restaurants for the estimation of the economic impact.

Three areas were selected, that is the Prefectures of Messinia, Aitoloakarnania and Eurytania. In these areas, by using random sampling, questionnaires were administered to the owners of such businesses. Firstly, some questions about general characteristics of their ownership were asked; afterwards, they mentioned if a future hunting ban would have an impact on their business. If yes, they were asked to estimate this impact in economic terms and to declare if they consider it significant for their operation. The questionnaires were analyzed by using descriptive and applied statistical methods. The results showed that most of the owners consider the impact as significant and estimate it as the 10% to 30% of their annual earnings. Such a result should be highly considered by environmental decision makers, since rural and mountainous areas in Greece are abandoned and the small businesses that still operate there can't afford many drastic changes in rural tourism.
CROSS-PROPERTY AGREEMENTS ON PRIVATE LANDS PROVIDE SCALE FOR GAME BIRD MANAGEMENT

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Private lands are critical to conservation planning for game birds, worldwide. In the US, Farm Bill programs have been used as the model to convert cropland to native vegetation, but highly unpredictable grain prices compete with subsidy payments. Landowners often convert lands back to row crops. The game management profession is in need of innovative models that support effective management of populations and sustainable agricultural practices. Ecotourism is one model that should be considered. Cattle farmers in Namibia, in southern Africa, have joined together to form conservancies in which landowners retain ownership rights but form agreements with neighbors about consumptive use limits, habitat management, water management, and ecotourism development. Namibian conservancies have 5-58 farms and range from 75,650-500,000 ha. Thus, cross-property agreements such as Namibia's conservancies can provide scale for effective game bird management. Heterogeneity can be established at multiple scales, which could support diverse communities and protect rare species. Zoning within a large conservancy-type area could allow more intensive agriculture or energy development in concentrated zones that provide traditional economic payouts to the group, while allowing other zones to be used for wildlife management and ecotourism activities. Marketing strategies for ecotourism can be conducted more effectively on behalf of a set of landowners with a large land base than for a single, smaller ranch property. The landowners may also find NGO's and management agencies willing to provide more time and expertise to facilitate management plans, given the history of decisions of the landowner group.

Legal means to such ends will vary around the globe; in the US, the simple agreement used to form housing and lake associations can be applied in rural settings. Game managers and conservation biologists should consider cross-property agreements as a potential approach to landscape management of game bird habitat.
Interactions humans-wildlife
INTEGRATED DISTURBANCE ECOLOGY: FROM THE IMPACT OF OUTDOOR WINTER SPORTS ON ALPINE WILDLIFE TO THE CREATION OF WINTER PRESERVES

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The steady spread of tourism and leisure activities exerts huge impacts on biodiversity. Rapidly developing outdoor winter recreation such as free-riding is threatening wildlife of mountainous ecosystems, with traditional networks of nature reserves being insufficient to mitigate disturbance effects. We studied the impact of outdoor winter sports on the Black grouse, a threatened bird whose timberline habitat largely overlaps with snow sports in the Alps – the main winter tourist destination of Europe – with a view to proposing corrective measures.

First, we quantified (wide-range comparative approach plus flushing experiments) the detrimental physiological (stress and energetics) and behavioural responses of Black grouse subjected to anthropogenic disturbance in winter (2002-2009). Second, we modelled the winter habitat of three different «species» (Black grouse, skiers including snowboarders, and snowshoers) from aerial photographs (2006-2010): this enabled us to recognize and predict the main areas of conflict between Black grouse and winter snow sports, especially free-ride activities. The resulting maps allowed setting priorities for delineating optimally located winter preserves in the SW Swiss Alps, where public steering measures will be implemented (forbidden access in winter). The methodology developed can be used for other wildlife submitted to anthropogenic disturbance in other areas where winter recreation represents a potential threat to biodiversity.
As ungulate prey provide the Eurasian lynx (*Lynx lynx*) with food for several nights, it may be worth defending them from scavengers. However, during the day lynxes may be led to move to safe shelters by human activity and may face a trade-off between the needs to patrol the territory and to defend a food source. As males hold bigger territories than females, their behavior should be more affected by this trade-off. We tracked 5 GPS-collared lynxes (3 males and 2 solitary females) in the Šumava National Park (Czech Republic), where the main human activity is tourism, and in its surroundings, mainly influenced by forestry and farming. We recorded the habitat features at 112 prey sites, in 89 cases we got the daily GPS-locations too. We used ANOVA to test if lynxes avoided proximity to roads while hunting and if presence of roads (i.e. human disturbance) and habitat structure (i.e. presence of shelters) influenced the “prey site-daily resting sites” distance. At night, with low human activity, lynxes did not avoid paved roads and tourist trails.

Females used prey sites longer than males and stayed closer during the day. For females, the “prey site-daily resting sites” distance was negatively correlated with the presence of shelters and the distance to tourist trails. None of these factors affected males’ behavior, which may be driven mainly by the need to patrol the territory. Our study represents a basic step to achieve the best compromise between tourism development and species conservation.
In recent years wild boar (*Sus scrofa*) have become a pest species in periurban areas of certain large cities of Europe and elsewhere due to the habituation of this species to people and humanised urban landscapes. However, as yet relatively little is known about the characteristics of habituated wild boar populations and how best to manage them in complex urban-social environments. Collserola is a large (8,500 ha) periurban park situated beside the city of Barcelona and is covered mostly by Mediterranean pine and oak woodland, as well as scrub and grassland formations. There is minimal agricultural activity in the park and the hunting of boar and other game species is permitted in approximately half of its area. The problem of habituated wild boar has been increasing in the park where this process has been monitored since its initial stages over a decade ago. Habituation has been facilitated on the one hand by an expanding wild boar population and on the other hand by the benign attitudes of some urban residents who encourage their presence by direct feeding. This has modified wild boar behaviour and is likely to artificially promote fertility rates given that habituated female boars are significantly heavier than non-habituated individuals. The presence of wild boar in urban areas of the park is a cause of nuisance for many residents, with damage to gardens, rubbish bins, fencing, etc. but they also pose risks for collisions with vehicles, for disease transmission, and occasionally even for attacks on domestic pets or people.

However, public attitude towards them is often ambivalent and more so with regard to controlling them, thus complicating management options. At present most habituated boar that cause problems in Collserola are removed by live capture with tranquiliser darts, and subsequently sacrificed. In this presentation we highlight the main traits of habituated wild boar in Collserola and the strategies applied in managing them and the problems they create, and we compare this population and its environmental and urban landscape context with that of other cities where the presence of wild boar is now also a source of similar conflicts.
INFLUENCE OF NEW IRRIGATION CROPLANDS ON WILD BOAR *Sus scrofa* ROADKILLS IN NW SPAIN

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The wild boar (*Sus scrofa*) inhabits on more than 2/3 of the Iberian Peninsula, being absent only in 167.820 Km². Anyway, the species seems to be increasing in relationship with new irrigated lands, which currently cover more than 21.4% of the Iberian croplands, mainly with maize (*Zea mays*), crop which had an increase of 10% during the past 15 years, covering 349.163 ha (2008 data). Wild boar uses these croplands as feeding and quiet shelter areas up to 8 months –from June up to March according to agriculture habits– mainly if other nearby resources are scarce. The increase and expansion of wild boar populations related to new maize croplands is specially observed in the Northern Spanish Plateau; increasing the number of wild boar collisions with vehicles (WBVC) into these areas. The goal of the communication is model the spatio-temporal distribution of these WBVC using generalized additive models based on a Geographic Information System (GIS) with WBVC traffic reports from 2002 to 2009, over the different plateau habitats. It was observed that WBVC increases more on maize areas, than in those with forest cover and/or major speed and traffic volume; being it the main explanatory variable in the models. Moreover, the cropland closeness to roads increases WBVC risk, because it limits driver visibility.

For evict future collisions, it is recommend avoiding sowing into a band of at least 5-6 m width along roadsides, in order to diminish presence of the species, as well as increase driver reaction time.
Human-wildlife conflicts are widespread and socially important where predators are involved. Predator species may compete with us for the same resources (e.g. game species) and predator control for hunting purposes is thus frequently implemented in many countries. In spite of this, many aspects regarding predator control are still unknown. We aimed to evaluate quantitatively the extent and methods of predator control implemented in central Spain, and assess the reasons that lead game managers to control predators. In addition, we investigated whether practices and perceptions regarding predator control vary according to the type of hunting estate (commercial or non-commercial). Data were gathered through face to face interviews with game managers from 58 small-game hunting estates within central Spain. Predator control was employed in 90% of the estates, and control intensity increased in commercial estates, which invest more money on gamekeepers.

The main methods employed were cage-traps, shooting and destruction of warrens and nests. Some illegal practices (e.g. leg-hold traps) were also admittedly used. Overall, non-selective methods, such as snares, were more frequently employed in commercial estates. Most managers believed that predators had an important effect on prey, and therefore that not doing it would lead to smaller hunting bags. This argument did not vary among different types of hunting estates. Predator control intensity was directly related to the perception of its need by the managers. Our results highlight the important role that both social and economic factors (i.e. perceptions and types of estates, respectively) play driving predator control, and therefore the need of incorporating these factors when making decisions to mitigate the human-predator conflict.
One Swedish conservation success story is the restoration of large terrestrial predators. The hope was people would hold more positive attitudes toward these organisms as numbers grew and people became familiar with these animals. We examined this hypothesis by comparing data from 6 surveys, 1980-2011, conducted in Sweden. In 1980 there were no wolves, nearly no wild boar and only about 500 bears, and over 300,000 moose. About 80% of the respondents reported seeing a moose. 13% indicated that fear of meeting wild animals sometimes made them hesitate to go out in nature. When asked which animals 9% specified moose, 3% bears, and 1% wolves; >1 respondent identified wild boar. In 2001, when there were approximately 100 wolves, the bear population had increased four fold to about 2000, and there were 30,000 boars, we included a more general question measuring fear: “Are there some wild animals that you are afraid to meet when you are out in nature?” and gave a list of 8 animals to consider; 63% responded they were not afraid of any animal. Yet, 43% indicated they were afraid to meet a bear, 28% to meet a wolf, and 25% to meet a wild boar.

Only 14% feared moose, although moose are more common, frequently encountered and kill and injure more humans than all of the carnivores combined. Fear of moose wolves and bear remained stable 2001-2011 even though wolf numbers doubled and bear numbers increased by one third. Fear of wild boars increased to only 35% when wild boars reached 180,000. Our data suggest fear is not directly related to numbers of animals that evoke that emotion.
In Europe, hunting and its associated management has been performed for centuries and has potentially had profound effects on our landscapes and on the biodiversity they hold, although the latter aspect has not received much attention outside the UK. We investigated the relationship between hunting management, raptor and steppe-bird diversity in Central Spain. We surveyed 54 red-legged partridge hunting estates with varying game management intensity in spring and/or summer between 2006 and 2009. Birds were counted from fixed points (58 ± 57 points per estate, range 4-425). Information about game management was gathered through interviews with game managers. We modelled the abundance and number of species of each bird group in each estate according to habitat variables and game management variables (mainly artificial feeding, releases of farm-reared birds, predator control) with forward-backward stepwise GLMMs. Our results show that steppe-bird and raptor abundance and diversity are mainly associated to habitat, not management, variables. Partridge abundance showed a positive relationship with the number of raptor species observed but not with their abundance. We conclude that management implemented for red-legged partridges in Central Spain does not seem to have neither positive nor negative effects on co-existing species (steppe-birds) or their predators (raptors), but having good densities of partridges, and maintaining the habitat that allows those high densities, has a positive effect on biodiversity.
Coyotes (Canis latrans) have recently become established as top carnivores in many metropolitan areas across North America, with important implications for conservation and human-wildlife conflicts. Information on survival and cause-specific mortality is integral to our understanding of the ecology and management of coyotes, but little is known regarding these dynamics within the urban matrix. Specifically, we hypothesized that a relatively low survival would be indicative of an ecological sink within the city, or high survival would be evidence for a refuge or source population. We monitored survival of 181 radiocollared coyotes residing within the Chicago, Illinois, metropolitan area during 2000-2008. Annual survival ranged between 0.58 for subadult females and 0.70 for adult females; however, there were no significant (all P's > 0.1) differences between demographic groups. We recorded 68 mortalities, of which 62% died from collisions with vehicles, 18% were shot, 10% died from mange, and 10% died from other causes.

Patterns of survival in this heavily-urbanized landscape were similar to rural coyote populations protected from exploitation; however, juvenile survival was considerably higher than that for juveniles in rural populations exposed to heavy harvest levels. These results, combined with dispersal patterns, suggest that, at least in the agricultural Midwest where hunting and trapping is prevalent, large metropolitan landscapes may serve as refugia for coyotes. Consequently, attempts to minimize human-coyote conflicts through population reduction of coyotes are unlikely to be successful. Few coyotes were removed as nuisances, reflecting the coexistence that is largely undetected by the general public.
The exploitation of marine resources was of central importance in the subsistence economy on the coasts. Whereas the human intervention in ecological communities was permanently increasing in many regions, ancient Eskimo culture remained unchanged over the last several centuries due to severe climatic conditions and isolation. The purpose of this study is to provide more detailed interpretations of human exploitation patterns of seals in the past. We studied sea mammal remains from cultural layers of an ancient Eskimo settlement on the eastern coast of the Bering Strait. Frequency analysis of species, data from thin sections of canine teeth, epiphyseal fusion data and comparisons of metric measurements were used for assessing the life history of an assemblage of archaeological seal remains. In this study the dynamics of faunal assemblages from archaeological sites which date approximately 800-2370 BP (cal.) is discussed. During the whole period seals clearly dominated in the mammal fauna with the ringed seal (Pusa hispida Schreber, 1775) as the most common species followed by the bearded seal (Erignathus barbatus Erxleben, 1777). The less numerous were remains of such marine mammals as walrus and large seal. Age structure of ringed seal remains showed that the main prey (more 77%) were non-breeding animals – yearlings, juveniles and old adults (the seal is sexually mature when five-six years old).

Our data provides evidence of selectable cropping, oriented to easily accessible part of seal population, and corresponds with the data from ethnographic sources. Traditional palaeeskimo approach of hunting was not negative for local seal population and did not lead to strong decrease in population size, because individuals that contributed less to reproduction rate were eliminated. In conclusion, aboriginal cropping was permanent and stable through time factor in this region.
Hunting by shotgun inevitably causes non-lethal wounding of game that are hit by pellets but not retrieved by the hunter. Danish X-ray investigations in the 1990s detected shotgun pellets among 36% adult (i.e. older than first winter) pink-footed geese, 34% adult eiders and 25% red foxes. For this reason, a national action plan to reduce wounding was implemented in 1997, granting hunters an initial trial period during which to reduce the number of wounded animals on a voluntary basis. By 2005 a significant decrease in the number of wounded animals had been found as a result of the plan. The objective of this study is to follow up on the action plan by investigating the number of animals with shotgun pellets during 2009-2011.

Red fox and eiders were collected by shotgun using rifle or #BB shotgun pellets (4.6 mm) during January-February 2009 and 2011. Pink-footed geese were caught alive using cannon-nets in March 2009 and 2011. All individuals were aged, sexed and X-rayed. #BB pellets were easily distinguished from ordinary shotgun pellets in X-ray images. The percentages of adult pink-footed geese carrying shotgun pellets were 22.2% in 2009 and 22.8% in 2011. These results represent a significant increase from the 18% found in 2005. The percentages of eiders with pellets in 2009 were 3.5% and 16.7% for females and males, respectively, which represent the lowest incidence rates in eiders since 1997. For red fox, the 2009 investigation showed that 10% carried shotgun pellets. This percentage has been stable since 2003 and is a significant decrease from the 25% in the 1990s.

Results from the collection of eiders and foxes 2011 were not ready before the IUGB abstract submission deadline April 4, but will be presented at the conference.

Danish annual bag of pink-footed goose has been stable since the 1990s, but the Danish proportion of birds harvested from the flyway population has fallen from 66% to 50% in the last few years. The increase in geese with shotgun pellets can therefore be explained by increased hunting activity outside Denmark, but an increase in wounding of geese within Denmark can not be excluded. In general, the results are taken to indicate that the positive impact of the Danish action plan has been sustained after 2005.
Wildlife in Kenya are found primarily in National parks and National reserves and hence most of the human wildlife conflicts are concentrated on the periphery of these protected areas. However, more wildlife are also found in private and public lands outside these protected areas where due to the conflicting land uses, human wildlife conflict are high. To resolve these conflicts several methods have been used but the formation of conservancies in these areas have had the effect of reducing conflicts, generating employment and revenue for the local communities, and winning space for the wildlife. This paper will look at the stupa of the various conservancies in Kenya.
DIFFERENCES IN THE REACTION OF GEESE ON HUMAN DISTURBANCES IN URBAN AND RURAL REGIONS

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An increase of the greylag geese (Anser anser) population in Germany is leading to several problems, in particular to pollutions with droppings on sunbathing areas and damages on agricultural areas and plantings. To explore possible management strategies it is vital to understand how geese behave and react on different types of disturbances. By monitoring greylag geese (Anser anser) and Canada geese (Branta canadensis) in four different parks in Munich, Southern Germany, and at the Franconian lake «Altmühlsee» we investigate how the geese react when being directly disturbed by humans. The study was carried out from November 2009 to April 2010 and from January 2011 to March 2011.

We find statistically significant differences between the geese' reactions in the different parks in Munich. Geese show very little reaction in frequently visited parks but respond strongly in more protected areas. The type and strength of reactions is shown to depend also on the species and the habitat’s structure. Greylag geese react stronger than Canada geese. Comparing the geese' reactions in rural and urban regions we find that the average reaction distance is 40 meters in rural regions compared to merely 1.5 meters in urban parks. Furthermore the animals' behaviour differs significantly from that monitored in rural regions where geese tend to fly away rather than to walk away as observed in the city. Additionally, we demonstrate that the reaction of geese depends on the origin of the disturbance like for instance pedestrians, dogs or bike riders. Our results provide important new information that will help to develop successful wildlife management policies aiming at a sustainable solution of the aforementioned problems.
TEMPORAL AND SPATIAL DETERMINANTS OF WOODPIGEON NEST SUCCESS:
A MULTI-SCALE APPROACH

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Habitats undergo increasing modifications due to growing urbanization and agriculture intensification. In such a context, ecology aims at understanding the scaling of the responses of species and communities to these modifications. In turn, these ecological data can be used by environmental managers to set priorities addressing habitat and species management. To assess the importance of any habitat to breeding birds, it is necessary to determine the contribution it makes to overall recruitment of new birds to the population. Daily nest survival and consecutive nest success are important determinants of reproductive rates and population dynamics. As multiple scales affect nest survival, ranging from micro to macro-habitat characteristics, there is also a need to evaluate how processes operate at different spatial scale, particularly for widespread species which have enlarged their breeding range following the colonization of new habitat. Here, we report a 5 years monitoring study of temporal and large-scale spatial variation in woodpigeon nesting success in France, relying upon more than 5000 nests. The French woodpigeon population has dramatically increased and is now a common breeding species. Simultaneously, this formerly woodland species has colonized farmland and is now increasingly present in urban habitat. While regarded as a valuable game species by French hunters, it is increasingly considered as a pest by farmers.

In such a context, management strategies are expected by both farmers and hunters with regards to breeding woodpigeon population, and nest success might be a key component to take into account into such management practices. In order to understand how woodpigeon breeding success is shaped, we first investigate how does nest success vary through time and space, and secondly how important nesting habitat is for such variation in breeding success. We particularly pay attention to comparison of nest success between urban and non urban populations, as we expect the recently urbanisation of woodpigeon to have large impact on reproductive rates and further French breeding population dynamic.
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Moose (Alces alces) is probably the deadliest vertebrate for humans in Finland. Between 2000 and 2009 there were more than 21 000 moose-vehicle collisions (MVC) resulting to 76 human fatalities and 2 142 injuries. In addition to human casualties, economic losses as well as physical damage to moose caused by collisions are considerable. Consequently, preventing measures are needed. Knowledge of the mechanisms behind MVCs is prerequisite for the development of the required management tools.

Our objective was to determine to which extent the MVCs are explained by moose population size and traffic volume. We selected game management associations (GMA, total amount 298) as spatial units because of their important role in planning moose management strategies. We used linear regression where the number of MVCs (collisions/GMA) was used as dependent variable. The winter population size of moose (individuals/GMA) and traffic volume (million vehicle kilometers/GMA) were the explaining variables for which the explanation capability was calculated separately for every year. Our results show that both independent variables have a positive effect on the number of MVCs. Depending on the year, the population size and traffic volume together explained 30-49 % (mean 41) of the total variance of MCVs. When considered separately, the explanation rate of the population size was slightly better than traffic volume. We emphasize the importance of the management of moose population size as a strategy for preventing MVCs, especially as introducing regional limitations on traffic volume in areas with high MVC risk is unlikely.
Several European studies have confirmed that collisions of tetraonids with power lines, overhead cables, and fences may cause significant mortality. Thereby, yearly mortality rates may exceed hunting bags. Collision surveys provide information on specific hazards of power lines or overhead cables and allow for an identification of hazardous terrain characteristics. Hitherto, data on tetraonid mortality due to human obstacles were scarcely available for Austria. In a first study, we conducted a questionnaire of Austrian hunters about their experiences of collision-induced mortality of grouse. We sent questionnaires to all heads of Austrian hunting districts (n = 55), who further distributed the questionnaire to interested hunters. About 25% of participating local hunters (n = 54) have observed collision-victims within their hunting district estimating yearly losses up to 5 birds per district.

As cocks of caipercaillie (Tetrao urogallus) and black grouse (Tetrao tetrix) may only be shot in Austria, if at least 5 calling cocks are documented per district, the estimated losses may locally exceed contingent hunting bags. The remaining 75% of hunters have not found any collision victim, yet. Additionally, we analysed 51 documented cases of deadly grouse collisions. For caipercaillie, equal proportions of male and female collision victims occurred within these documented cases, whereas cocks prevailed within found cascades of black grouse. We deducted a catalogue of species-specific and facility-specific prevention measures both for cables and fences, accounting for recorded collision circumstances of the documented collision victims. We installed an online database to collect further details of observed collision mortality to improve our understanding of wire-striking frequency and to derive management recommendation for the prevention of collision mortality.
HELP! SOME WILD ANIMAL IS SITTING IN MY BACKYARD! - TOWARDS AN URBAN WILDLIFE MANAGEMENT CONCEPT

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Abstract: In Germany, as throughout Europe, urban wildlife is on the rise. Species such as the wild boar (*Sus scrofa*) and the red fox (*Vulpes vulpes*) have discovered urban areas as new habitats. This has caused increased concern and conflict, ranging from noise and smell nuisances and damages in and around homes, to disease transmission and serious accidents.

Current legislation, administration and management structures appear inadequate efficiently to tackle the problem, and there is growing confusion on how to deal with urban wildlife conflicts. Two examples of the many unsolved issues are: 1) In Germany, liability for most wildlife damages rests with the owner of the hunting right. However, as hunting is not permitted within city limits, wildlife damage becomes nobody’s responsibility. 2) Citizens ask for population control, but strictly oppose any lethal removal. Thus, government agencies need to develop urban wildlife management concepts. In an ongoing project funded by the State government of Baden-Württemberg, we are working towards a basis for such a concept. Starting with qualitative expert interviews, where main conflict types and management deficiencies will be identified, we plan quantitative questionnaire surveys with involved persons, as well as media analyses to assess conflicts and management strategies.
VISITOR MANAGEMENT AND IMPACT OF RED DEER Cervus elaphus L. ON THE RAVINE FORESTS IN THE EIFEL NATIONAL PARK

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The ravine forests Tilio (platyphilly) – Acerion Pseudoplatani of the river Urft valley north of Vogelsang belong to the most valuable mature plant communities of the Eifel National Park. The National Park Eifel is a 110 km² woodland reserve in the German low mountain range (altitude 200 - 600 m) and was founded in January 2004.

The impact of red deer on the plant communities of the ravine forests was analyzed by means of vegetational surveys including estimating the feeding intensity on the different plant species. The influence of the tourism on the impact of red deer on the plant communities is analyzed by comparing the browsing intensity in 2004 before the opening of the area for visitors and 2010 after an heavily increase of tourism.

Characteristic species of the storey are Fraxinus excelsior, Acer pseudoplatanus, Acer platanoides, Ulmus scaber and Tilia platyphyllos. Because the slopes, these plant communities grow on, are rather steep and the solifluction up to 2006 red deer used these areas only to a small extent as feeding grounds. With the increasing human impact the browsing intensity on the association characteristic species Lunaria rediviva, which is dominant in the herb layer increase from 16 to 34 % biomass, taken away. Altogether the strong feeding pressure caused by human disturbance will lead to problems for the development of this forest type. Vegetational surveys are a suitable method to analyze the influence of changes in behaviour, caused by man, on the habitat situation. A visitor management concept has to be improved, to keep ravine forests and red deer in a balance.
Interactions between land use demands and habitat requirements of wildlife species are a source of conflicts that often threaten conservation and sustainable management of wildlife species and habitats as well as the sustainability of the land use activities involved. The complexity of human-wildlife conflicts calls for new, integrated and foresighted approaches to conflict management. Aiming at the development and demonstration of an integrated spatial planning framework for the management of conflicts between humans and wildlife in the Wienerwald Biosphere Reserve in Austria, we have applied an interdisciplinary and participatory research design and new GIS assisted method to identify and assess human-wildlife conflict potentials in a spatially explicit way.

We used Significant Indicator Species (SIS) and Significant Indicator Recreation Activities (SIRA), with both fulfilling umbrella functions for other species and activities. Together with local experts the following, hunted or protected animal species were selected as SIS: Red Deer (*Cervus elaphus*), Wild Boar (*Sus scrofa*), Black Stork (*Ciconia nigra*), Capercaillie (*Tetrao urogallus*), and Ground Squirrel (*Spermophilus citellus*). The selected SIRA represent recreation activities that are practised frequently in the region and have a high ecological disturbance potential: mountain-biking, jogging, geo-caching, activities with dogs, ballooning. Knowledge on the distribution of SIS in space and time was gathered by in-depth interviews with local experts and from hunting bag statistics and monitoring data. The spatio-temporal distribution of SIRA was modelled as “recreational use probability” in a GIS environment, based on driving factors in the source and target areas derived from, e.g., empirical socio- and psycho-demographic profiles, population densities, infrastructure network, landscape suitability attributes, and behavioural preferences of each group.

By overlaying GIS layers on SIS (habitat use, population density, connectivity) and SIRA (distribution, use intensities), spatial conflict potentials were determined and then validated with the help of stakeholders. The resulting maps of conflict potentials proved a useful tool for developing integrated conflict management strategies by employing spatial planning approaches.
Methodologies, models and techniques
MOLECULAR APPROACH APPLIED FOR IN VIVO DIAGNOSTIC OF SELECTED LIVER AND STOMACH PARASITES OF CERVIDS

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Free-living ruminants are often infected by various endohelmiths which can cause serious health problems of their definitive hosts such as weight loss, diarrhoea, reduction of trophy, suppression of immune response etc. Very similar clinical signs followed by health problems of grazing ruminants are caused by digenetic liver and stomach flukes *Fasciola hepatica*, *Fascioloides magna*, *Dicrocoelium dendriticum* and *Paramphistomum cervi* (Trematoda). Post-mortem diagnosis of each of the fluke species is easy due to their typical morphological characters; however in vivo diagnostic is problematic because of very similar size, shape and internal structure of their eggs. In such cases, molecular approaches employing PCR-based techniques may be very helpful. Therefore, the aim of the work was to design species-specific molecular markers for exact in vivo differentiation of fluke species. Internal transcribed spacer 2 (ITS2) of global populations of parasites was used to demonstrate intra- and interspecific variability and to assess interspecific differences among studied species. Spacer regions which were absent from intraspecific polymorphisms but were characterized by interspecific sequence heterogeneity were chosen and applied for the design of species-specific primers. Their specificity was successfully tested on genomic DNA isolated from adult individuals of studied species and also on DNA isolated from eggs.

Designed ITS2 molecular markers are of particular importance because they are applicable in in vivo diagnostics of fluke species after coprological examinations. The work was supported by the Slovak Research and Development Agency under contract APPV-51-062205 and LPP-0126-07.
DETECTION OF MOOSE USING FLIR

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I determined the probability of forward-looking infrared radiometer (FLIR) mounted in a fixed-wing airplane to detect and verify moose (Alces alces). This purpose was to determine the potential for using FLIR for a modified Gasaway et al (1986) ratio estimates based on low and high intensity aerial surveys for moose population surveys. The study area was located in northern New Hampshire within mixed deciduous-coniferous forests. The survey was conducted using FLIR mounted on a fixed-winged airplane during daylight hours flying transects at 600 m above ground level at 90 knots. The FLIR look angle was oriented at 45–50° using a slight side-to-side sweep to search the 300 m wide belt transect. Low intensity surveys used transects spaced at 300 m apart while the high intensity transects were spaced 150 m wide allowing overlap of the adjacent transect. A total of 25 samples were obtained using radio-collared moose as the sample unit. The FLIR detected and distinguished moose in all cover types within the study area.

Data were collected over 3 days with 88% of the moose detected in the low intensity search pattern and 96% in the high intensity search pattern. Determining age and sex of moose was examined in Boreal Forests in Northern Ontario Canada. A color camera was used in tandem with the FLIR. The FLIR was used to detect the individuals while the color camera determined the age / sex classes. I examined the potential to classify the moose using FLIR. There was good confirmation of the moose using FLIR based on the IR signature of the head.

Additional data should be collected to develop a catalog of moose signatures for age / sex class confirmation.
The idea that scale considerations are important when trying to understand animal response is now almost universally accepted by wildlife ecologists and game biologists. Since the early 1980s, there has been increasing development of the underlying theory of scaling. All of the conceptual developments are set in a context that assumes some ‘view’ of landscape pattern. Many papers have been written, arguing that biologists should attempt to sample the landscape in a way that closely mimics the species in question. Much progress has been made with sampling protocols and statistical analyses. However, many investigators still cling to an outdated perception of what constitutes ‘habitat’. The binary view of ‘habitat’ vs. ‘non-habitat’ and the patch-matrix-corridor model appear to be the default landscape view. It is not necessarily wrong, rather, it is a caricature of how species perceive their habitat. I argue that this approach is too restrictive and does not accurately reflect the reality to which animals respond.

We can do better. In this presentation, I trace important developments related to how landscapes have been visualized by ecologists and suggest why these are important for game biologists to consider.
MODELLING DISPERSAL CORRIDORS FROM GENETIC POPULATION STRUCTURE

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Functional connectivity between spatially disjointed habitat patches is a key factor for species persistence in fragmented landscapes. Connectivity models for identifying potential dispersal corridors require information about those landscape features affecting dispersal. We present a new approach using spatial and genetic data, obtained from feather samples collected between 1999 and 2004, of a highly fragmented population of capercaillie (Tetrao urogallus) in South-western Germany to investigate landscape-effects on gene flow and to parameterize a spatially explicit corridor model. Mantel regressions were employed to quantify the effect of different landscape features on relatedness among individuals, while controlling for distance effects. We extrapolated the results to an area-wide landscape permeability map and developed a corridor model that incorporates stochasticity in simulating animal movement.

The model was evaluated using both data-partitioning and independent observation data of dispersing birds. Most land cover variables (coniferous forest, forest edges, agricultural land, roads, settlements) and one topographic variable (topographic exposure) were significantly correlated with gene flow. Although inter-individual relatedness inherently varied greatly and the variance explained by geographic distance and landscape structure was low, the model significantly explained relatedness in the validation data and the spatial distribution of dispersing birds. Landscape structure measurably affected within-population gene flow. By converting these effects into spatial information our model enables localizing priority areas for the preservation or restoration of metapopulation connectivity.
Bighorn sheep (*Ovis canadensis*) were reintroduced to historic, unoccupied bighorn sheep habitat on tribal lands in the Rio Grande gorge of northern New Mexico in October 2006. The Taos Pueblo tribe initiated this effort to lead the way in the greater statewide conservation goal of reestablishing the species in the Upper Rio Grande watershed and to restore a missing faunal component to this landscape.

The process leading to the reintroduction of bighorns to this area included habitat evaluation by a team of North American wild sheep biologists, and the assessment of potential for contact with domestic sheep and goats. The reintroduction was accomplished utilizing a soft release protocol to minimize the potential for egress of bighorns from the identified unoccupied range. The initial bighorns released in the Rio Grande Gorge exhibited complete site fidelity to the reintroduction area. These bighorns have experienced an increasing growth rate since 2006, with minimal mortalities. The site fidelity and increasing growth rate documented in this reintroduction suggests soft release techniques for bighorn sheep can be effective in addressing concerns of animal movement or emigration after post-capture release.
EVERY PARTRIDGE COUNTS – SUCCESSFUL TECHNIQUES USED IN THE CAPTIVE BREEDING OF WILD GREY PARTRIDGE IN IRELAND

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Between 1998 and 2001 the last remaining wild grey partridge population in Ireland faced imminent extinction with only 4-6 breeding pairs, and an autumn population of 22-24 birds. By 2010 the population had recovered to 55 breeding pairs and an autumn population of 921 birds. Traditional game management methods including predator control and habitat provision in a project site of 12,000 hectares have played an important role in that recovery.

However, this paper concentrates on another key aspect of wild partridge management in describing how we have successfully used traditional grey partridge management methods of the 19th century to aid the recovery of our national population in 21st century Ireland.

Each year a variable number of grey partridge are trapped from the wild, and placed in a unit where they pair naturally with other wild birds overwintered in pens within the project site. Each pair is then allotted their own breeding pen. Within this pen the natural breeding process begins with nest construction, laying, incubation and hatch. After several weeks the pair and their brood are released into suitable habitats. We use many other traditional but long forgotten techniques to ensure that every partridge counts in this recovery project. The captive breeding programme began in 2002 with two pairs of grey partridge. They were released with a resulting 10 juveniles. In 2010 we had 32 pairs producing 510 chicks of which 436 survived as juveniles. This represents an 85.5% chick survival rate. In 2010 one hen laid and incubated 27 eggs and hatched out 27 chicks, which may be a world record for partridge and indeed for any bird species. The techniques we use are traditional and labour intensive but they work. We recommend that other grey partridge recovery projects should consider captive breeding to compliment other game management methods used.
For important game species like woodpigeon (with about 9.5 million birds annually harvested in Europe) it is important to assess the origin of birds using different flyways. The population genetic structure of woodpigeon in Europe was studied analyzing the distribution of different D-loop haplotypes among bird samples, collected in various breeding and wintering sites of the species (in Russia, Belarus, Lithuania, Sweden, Hungary, France, Spain and Portugal).

Totally 89 different haplotypes were identified after analysis of partial D-loop sequences consisting of 359 bp mtDNA fragments derived from 360 samples. Significant differences were found between woodpigeons of different origin and the hypothesis of panmictic European population of the species was rejected. Based on frequencies of distribution of haplogroups and occurrence of some rare haplotypes only in certain geographical regions it was determined that specific genetic population structure characteristic of sedentary populations of woodpigeons (of birds breeding in the Balearic Islands, etc.) is different from that of migratory populations of the Baltic region origin using the Eastern Atlantic Flyway (birds breeding in NW Russia, Belarus, Lithuania, Sweden and wintering mainly in the Pyrenean Peninsula). A distinct population genetic structure is characteristic also of woodpigeons breeding in Hungary and using the Mediterranean Flyway.
ESTIMATING RED DEER (*Cervus elaphus*) POPULATION SIZE BY GENOTYPING FAECES: A NON-INVASIVE APPROACH

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Some ungulate species are of conservation concern, whereas others are under heavy harvest pressure. Reliable data on population sizes are lacking in most cases. Non-invasive genetic population estimation approaches represent a promising tool for ungulate management.

We developed and tested a non-invasive genetic approach for red deer (*Cervus elaphus*) population estimation based on faeces collected from a free ranging red deer population in south-west Germany. In the study area, increasing harvest rates of >1 per km\(^2\) and year in combination with increasing levels of browsing and bark pealing damages indicate a considerable increase of the red deer population within the last years. During 10 days, 1128 faeces samples were collected in a forested study area of 100 km\(^2\). After DNA extraction, a real-time PCR was carried out for all faeces samples to determine the amount of target DNA. Further genotyping using 8 microsatellite markers was carried out only for samples with a sufficiently high content of red deer DNA. The analysis yielded 398 reliable consensus genotypes which correspond to 247 different red deer individuals. We calculated population size estimates for both sexes separately using the programs MARK and CAPWIRE. For the calculation of population densities, we augmented the transect grid by a seasonal male red deer home range radius to account for the fact that the study area is not geographically closed. The resulting population densities (1.24 (0.98 – 1.95) male and 1.92 (1.35 – 3.84) female red deer per km\(^2\)) can be used to evaluate and adapt red deer management measures (see Hohmann et al., this Symposium).
The use of cost effective and silent light aircrafts and the increased availability of infrared cameras on the civil market make aerial surveys with IR cameras an interesting option. We present our results of non invasive aerial counts using a combination of thermal infrared (for detection) and high resolution RGB images (species-specific identification). The aircraft was equipped with a computer linked camera system consisting of a JENOPTIC® infrared camera (640*480 Pixel) and a Canon 5D Mark 2® high resolution RGB camera. Until March 2011 we have flown 32 missions over the German National Parks Bayerischer Wald, Hainich, Kellerwald-Edersee and the biosphere reserve Pfälzerwald-Vosges du Nord. Within a total area of about 6000 ha for each site, we followed linear transects with a flying altitude of approximately 450 m above ground level. Within each study area we scanned 1.200-2.000 ha for every two hours of flight time. Depending on the area up to 19 larger mammals (mainly ungulates) per 100 ha were detected. Furthermore we accomplished a test to calculate detection rates in relation to the coverage (different type and density of the vegetation).

Detection rates ranged between 56% (old pine forest) and 91% (old defoliated beech forest) to 100% (open land). Meanwhile this method is being used successfully elsewhere. Recently we were able to detect and identify free living wolves.
SPERM MORPHOLOGY OF BROWN BEAR (*Ursus arctos*) AND MOOSE (*Alces alces*), COLLECTED POST-MORTEM IN WESTERN TAIGA, AS DETERMINED BY ELECTRON MICROSCOPY

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In order to establish baseline information of reproductive biology on sexually mature brown bears (*Ursus arctos*) and moose (*Alces alces*), genital tracts were collected from forty-six 1.5 – 7.5 year old moose and six 2.5 – 8.5 year old male brown bear. Organs were collected from animals that were shot during three consecutive hunting seasons (2008-2010) in Kirov district (Western taiga, Russia). Genital tracts were retrieved within 20 hours (max. 47h) of death. The testes, seminal vesicles and epididymides were weighed and measured and spermatozoa examined for motility and morphology as determined by light and electron microscopy. In both species the sperm head was bilaterally flattened and spatulate in shape with the nucleus capped by a symmetrical acrosome with the tail attached mid-basally.

Incidence of sperm variability differed across season and age of the animals. The frequency of sperm abnormalities, and their characteristics as determined by electron microscopy, may be useful in determining male fertility and how this varies with month of sampling and age.
In Germany as in many other parts of Europe forest dwelling ungulates are usually regulated by means of hunting. But reliable data on population sizes are lacking in most cases which would be helpful in calibrating hunting success in terms of population regulation. Within this framework non-invasive genetic population estimation approaches represent a promising tool for ungulate management. We developed and tested a non-invasive genetic approach for wild boar (Sus scrofa) and red deer (Cervus elaphus) population estimation based on faeces collected from free ranging populations in south western Germany. Through genotyping of faecal samples a capture-mark-recapture based modelling of population size has been conducted. In the study area, a state hunting ground of 10.000 ha size, the applied hunting regime intends to reduce wild boar and red deer populations as a measure to diminish forest damages (red deer) and to control diseases (classical swine fever, wild boar). A comparison of the resulting spring population densities based on genotyping faeces showed that harvest was merely able to take approx. 50% of assumed reproductive output for red deer and only approx. 35% of assumed reproductive output for wild boar. Thus the current hunting practice has been denounced as an insignificant regulating tool and reliable population estimates can be used as a calibrating tool to adjust hunting practice.
Successful management practices for declining species depend often on viable long-term surveys acquired e.g. by point counts. Despite high standardization of field protocols, uncertain detection probability remains mostly an important source of variability and bias. This effect is of main importance in low-responsive species or species occurring in habitats with highly variable visibility, as it is the case for the Red-legged partridge (*Alectoris rufa*) in most of the Mediterranean habitats, e.g. shrub vegetation of the Matoral. Such methodological problem can be counterbalanced by different field techniques and statistical tools allowing to estimate detection probability and thus to adjust estimates.

In our study, we used playback calls to increase detectability during field surveys. Points were located along secondary roads, randomly selected within each study site. On one study site, 9 point counts were surveyed three times a season. Each total survey time per point count (8 min) was divided into three intervals of equal duration (2min40s) accompanied by a playback session consisting in an entire strophe of male mating call run four times toward each cardinal wind direction, using a 4-W speaker.

In the past, most count programs could not take in account or test potential sources of variation in detection probabilities (e.g. habitat type, date, hour or observer experience) in abundance estimation and simply assume that count indexes are proportionally related to abundance. Here the repeated counts collected over the last 20 years by the ONCFs were modeled using the binomial-mixture models, which allow simultaneous estimation of abundance and detection probability. These models provide detectability-corrected abundance estimates without individual identification, based simply on temporally and spatially replicated counts. They allow incorporating and testing covariates related to sessions or sites.

We demonstrated that wind, temperature, hour, date and the habitat closure all have an impact on detection probability while observers experience did not induce biased estimates. We also demonstrated that there was no saturation of the counts using playback methods by comparing their results with those obtained through exhaustive methods such as quadrat counts.

The present approach might be particularly helpful for long-term surveys of red-legged partridges on a larger, Mediterranean scale, allowing also to alert population declines. Moreover, hunting plans could be supported by yearly estimates, which seems of particular interest for this highly managed game bird species.
AN AUSPICIOUS START AFTER RELOCATION: THE IMPACT OF ACCLIMATISATION TIME ON STRESS PHYSIOLOGY AND SURVIVAL OF RE-INTRODUCED GREY PARTRIDGES

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The drastic decline of grey partridge numbers in many European countries mainly due to the intensification of agriculture, has led to an increase of re-introduction attempts all over Europe. However, successful re-introduction projects are still the exception. Questions of origin (wild vs. captivity bred birds), rearing and release techniques are subject to controversial discussions and must be considered case by case. Release techniques in particular have been found to crucially influence the outcome of re-introduction projects. While there is some agreement on when to apply hard vs. soft release techniques by means of origin and age of the animal the physiological consequences of the duration of acclimatisation has hardly been looked at.

Transport per se can have negative effects through an increase of stress hormones. Our aim was to reduce physiological stress by applying a soft release strategy to autumn flocks of grey partridges within a re-introduction project in Switzerland. We investigated whether the duration of acclimatisation of the birds in the release pens at the release site impacts different aspects of the stress physiology (bound vs. free corticosterone) in the birds. We found a marked decline of corticosterone baseline and stress response levels for birds that were kept in the release pens for 32h after arrival on site compared to birds just after transportation and to birds that remained in the release pen for only 8h. The stress constitution of the bird at the time of release potentially impacts behaviour and eventual survival after release.
INTRODUCTION OF RED DEER INTO NOVEL TERRITORIES CAN BE MONITORED BY THEIR PARASITES

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In the 19th century, when commercialized hunting became very popular in Europe, wapiti (Cervus elaphus canadensis) and white-tailed deer (Odocoileus virginianus) were imported from North America to European parks and reservations. In 1865, American wapiti deer together with their parasites, giant liver flukes Fascioloides magna (Trematoda), were introduced to the Regional park La Mandria near Turin (Italy), were flukes successfully adapted to local red deer (C. e. elaphus) population. Besides Italy, two stable European foci of F. magna have been established; 1) Czech Republic, and 2) the Danube floodplain forests, involving territories of Austria, Slovakia, Hungary, and Croatia. In our work, we aimed to determine the origin of European foci and to understand the course of colonisation by this alien parasite using sequence analysis of selected mitochondrial DNA regions. Our study revealed that introduction of F. magna to Europe was a result of more than one event; mitochondrial haplotypes found in Italy were distinct from those determined in the remaining European localities. For Czech populations of parasite, a south-eastern USA origin of giant liver fluke was revealed. Identical haplotypes, common for parasites from Czech Republic and from expanding focus of Danube floodplain forests, implies introduction of F. magna to the Danube region from the already established Czech focus. Due to ecological barriers between European foci and mainly due to transcontinental introduction, natural migration of red deer apparently did not play role in parasite transmission. Therefore, an attention should be paid to sustainable veterinary control of human-induced introduction of red deer into novel territories, preventing the risk posed by non-native parasites to game parks. The work was supported by the Slovak Research and Development Agency under contract APVV-51-062205.
TO BE TWO SUBSPECIES OR NOT? THAT SURELY IS THE QUESTION

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In previous studies it has been shown that the genetic structure of the European grey partridge population is mainly divided into two mitochondrial DNA lineages, namely to the eastern and to the western. They have been considered to represent subspecies *Perdix perdix lucida* (eastern and northern Europe and Ireland) and *Perdix perdix perdix* (Central Europe). The native Finnish population represents *P. p. lucida*, whereas the stock used for introductions has mainly represented *P. p. perdix*. In this work we studied if the two lineages are detectable also if microsatellite markers were used and if hybridisation between the two subspecies could be detected. We used feather samples collected across Europe between 1998 and 2010. DNA was extracted from feather quills using QuickExtract DNA Extraction Solution 1.0. Genetic variation was assayed at ten microsatellite loci (ARU1A1, ARU1G4, ARU1E66, ARU1E102, ARU1F114, MNT12, MNT412, MNT477, MNT45, MNT408). Alleles in no less than 300 samples have been assayed so far at five microsatellite loci. During writing of this abstract the laboratory work is at the final stage, and the results remain to be seen.

However, the results will be interesting in either way – either supporting or not supporting the results about the genetic structure obtained using mtDNA of the grey partridge in Europe. If the existence of two subspecies is supported, the results should then also reveal whether these two subspecies have interbred in the wild in Finland during the last decades, in other words, whether there is a quantifiable contamination of the wild population by the game farm stock.
Habitat fragmentation is particularly intense in metropolitan areas due to the pressure of urban sprawl and infrastructure development. Protected nature areas here are vital to providing refuge areas for wildlife, thus maintaining local biodiversity in highly populated regions, as well as providing important recreational, educational and other services for city dwellers. However, these areas often have low ecological connectivity, and so protected areas can be vulnerable against further urban development. In particular, new road, rail, power and water infrastructure is a frequent component of future land planning, and even Natura 2000 sites are not always immune to its implementation. Current conservation rationale emphasises the importance of habitat quantity and the fragmentation effects of linear infrastructure on wildlife habitat may thus be underestimated, more so if corrective measures are perceived as being a sufficiently effective alleviation against conspicuous negative impacts such as roadkill or barrier effects. However, habitat quality has been shown to be as, if not more, important than quantity in determining wildlife persistence or extinction. In heterogeneous Mediterranean landscapes wildlife habitat is in reality often a diverse mosaic of varied quality rather than a simple black and white habitat-non habitat dichotomy. In Collserola Natural Park, a Natura 2000 site located in the Barcelona metropolitan area, we used conventional GIS land use maps and radio tracking locations to calculate the Mahalanobis D^2 statistic in order to produce more realistic species’ perspective habitat quality maps for the common genet (Genetta genetta). Territorial analysis of continuous maps obtained were coherent with the ecological requirements of this species.

Subsequently, a reduced set of landscape metrics were obtained using Fragstats 3.3 in order to analyse current and possible future fragmentation impacts of urban and infrastructure development on genet habitat in the Park. Results obtained indicated possible threshold impacts of infrastructure on highest quality core habitat in certain areas, with loss of up to 50% or more of optimal territories, underlining the importance of edge effects. Our findings suggest the need for added precaution in evaluating habitat fragmentation impacts in Mediterranean periurban natural areas where multiple synergic impacts aggravate low ecological connectivity.
THE USE OF AIRBORNE LASER SCANNING DATA IN ASSESSING HABITAT PREFERENCE OF MOOSE (Alces alces)

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In the analysis of forest resources, the utilization of airborne laser scanning (ALS) has led to detailed knowledge about 3D structure of vegetation. Simultaneously, satellite based gps-techniques have been providing accurate and dense data in space and time about animal movements and thus becoming common practice in wildlife habitat studies. However, the lack of information about habitat’s 3D structure has been recognized as a weakness. Thus, combination of the precise locations of the animal and the 3D structure of its chosen environment would provide thorough understanding about its habitat preferences. We conducted a study to investigate the use of ALS in analyzing habitat selection of moose.

The study area was located in west coast of Finland. Data consisted of 18 gps-gsm-collared moose (monitored from 2009 to 2010) and ALS data were collected in 2010 over the moose habitats. Based on ALS attributes we investigated how forest structure changed around the monitored moose locations and how these differed from the structures of randomly selected locations. The results indicated that the monitored moose preferred forests that had smaller tree heights and more vegetation close to ground level than in the nearby areas. The preferred habitats also had slightly higher stand density than the neighboring areas. The randomly located areas differed also from the moose locations in terms of height distributions. The random areas had generally higher trees than the moose habitats. Most importantly, airborne ALS proved its capabilities. With ALS and gps-gsm-collars, it was possible to locate moose movements precisely and to link moose locations to the characteristics of vegetation. This provided successful results and strong support for future studies.
The wild boar (Sus scrofa L.) population has increased in most parts of Europe during the last three decades. This emphasizes the need for innovative monitoring techniques, especially because there are currently no widely accepted methods for this species. Road-based distance sampling (RBDS) is a method that allows monitoring of species over large spatial scale. Recent studies have shown that using thermal imaging during RBDS could highly improve the estimation of wild boar population densities. Our study aimed at (i) demonstrating the applicability of road-based distance sampling for wild boar counts and (ii) evaluating the effectiveness of RBDS for wild boar and roe deer using thermal imaging equipment and a laser rangefinder in five different areas. First, we analyzed wild boar distribution in relation to roads using damage to agriculture locations. Second, road-based transect surveys with distance sampling were applied during four nights (2 starting after sunset and 2 before sunrise) in each surveyed area. Two thermal imaging cameras were used on each side of a vehicle to detect animal presence. Once animals were detected, the distance between each animal and the vehicle was estimated using a laser rangefinder in combination with a spotlight.

Results show that (i) wild boar damages are distributed randomly around the secondary road network and that (ii) wild boar can be effectively detected using RBDS in association with thermal imaging. However, further improvement of the sampling scheme of the road network should be developed in order to effectively monitor the population in the long term. We furthermore conclude that RBDS could be an efficient method for the monitoring of the wild boar over a large area.
Populations of European wild rabbit have been decreasing in France since the 1950s. Landscape modification because of changes in agricultural practices is one of the reasons. Knowledge of habitat characteristics of the species is fundamental to help them to recover.

Our objective was to model wild rabbit habitat in Mediterranean scrub and riverain thanks to the methods of landscape ecology. The study area measures 46 500 ha and covers the Natura 2000 (ZPS) area of Durance valley (southeast France). It is made up of 6 pilot areas of 100 ha each. The rabbit presence/absence was noted four times from 2008 to 2010 on 569 plots of 1 ha. The number of pellets, latrines, burrows and scratches were taken into account. In addition, 500 active warrens were located by GPS. The spotlight transect counts carried out from 2008 to 2010 indicate that population densities are low (KIA<8.8 rabbits/km). Besides, cartography of vegetation with a metric precision was realized by remote sensing. This allowed us to identify water, bare soil, herbaceous, shrubs and trees. Landscape structure and diversity were evaluated using the variables available in Fragstats (with ArcGrid in ArcMap 9.1) such as the number of patches (nump), the edge density (ed), the shape complexity, the Shannon and Simpson diversity index, the proportion of the different vegetation layers and the mean distance to the nearest open area and the nearest cover. Logistic regression was used to assess the link between rabbit presence/absence and landscape structure.

Our results indicate that nump, ed and shrubs proportion are significant in one variable model. Burrows are very close to the ecotone, at a mean distance of 5.8 m. Based on these results advice for artificial warrens creation will be suggested. Then, thanks to the final model, we will be able to create a diagnostic method prior to management in order to improve habitat quality.
ESTIMATING THE SEX AND AGE STRUCTURE OF WILD FOREST REINDEER SUBPOPULATION – COMPARING METHODS

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The total number and the sex and age structure in a subpopulation of wild forest reindeer (Rangifer tarandus fennicus) in Central Finland have been monitored by aerial surveys every 2 to 5 winters since 1992. The information of the trends in subpopulation has been insufficient between these censuses. There was a need to test whether the sex and age structure can be monitored by making field observations during autumn and early winter when most of the sex and age classes are represented in the flocks. The estimated calf percentage and calf-female ratio can indicate reproduction success and the effects of the predation of large carnivores. The sex structure of adult population can reflect the effects of possible sex biased quarry.

The hunters made 313 field observations from the forest reindeer flocks between 11th Oct. and 16th Dec. in 2007. Total of 26 flocks were photographed and/or filmed by hunters and researchers at the same time. The helicopter census was conducted in Feb. 2008. Estimates of the methods were compared with G2 -test. Estimates of calf percentage were almost equal.

There was a little variation in the estimates between individual observing persons, which was primarily due to spatial variation in the flock composition. The date of observation, the flock size or the identifying skills of the person observing influenced the result only a little. There was variation in the proportion of the adult males and females between methods as a result from the identifying skills of the person and variation in abundance of sexes. Field count is a useful tool to estimate the calf percentage of forest reindeer subpopulation. It can be used as an “early warning” -system to detect sudden changes in the factors regulating the population. The best ways of monitoring structure of the adult population are aerial surveys or photographing large flocks in the late autumn.
NEAR INFRARED REFLECTANCE SPECTROSCOPY – NIRS – FOR THE DETECTION OF TERRITORIAL MARKING IN EUROPEAN RABBIT PELLETS

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NIRS is a growing technology expanding to new areas of analysis and research. Its application on fecal samples –F.NIRS- allows a non-invasive, rapid, cheap and easy way to study factors such as diet, sex or ecology of wild species. However, the chemical compounds related to territorial marking have not been studied with F.NIRS yet. Social interactions, such as territoriality, are relevant to the biology of gregarious species, and its influence on reproduction and survival affects population density. So, a better knowledge of territoriality may be of great use in improving the success of restocking actions. Olfactory communication through anal gland secretions plays an important role in territorial marking of wild rabbits (Oryctolagus cuniculus L.).

These secretions coat fecal pellets, which are deposited in latrines and, unlike isolated pellets, serve to delimit territories. The aim of this work is to study the viability of the NIRS technique for the detection of territorial marking in rabbit pellets, via discrimination between marked –latrine- and not marked –isolated- pellets. For this purpose, both isolated and latrine pellet samples were collected in the same zone, Cordoba, south of Spain, during the reproductive peak, in order to minimize samples’ chemical variability and maximize the territorial signal intensity. NIR spectra of the fecal samples were measured, and qualitative models were developed using Partial Least Square method and discriminant analysis. The resulting discriminant equation classified 85.1% of samples correctly in the full cross-validation, and this equation was used to predict group membership for a different sample set in the external validation, achieving 73.7% correct determinations. Considering these results, we conclude that F.NIRS is a feasible method with which to detect chemical territorial marking signals in rabbit pellets, thus making it suitable to study social interactions on rabbit populations.
DOES EARLY ANTI-PREDATOR TRAINING INCREASE THE SUITABILITY OF CAPTIVE RED-LEGGED PARTRIDGES (*Alectoris rufa*) FOR RELEASING?

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Although training anti-predator behaviour in captive animals for conservation purposes has been a common management tool in some species, not many studies have been carried out on game birds. This work aimed at evaluating the effects of anti-predator training on escape responses, post-release survival and spatial distribution of farm-bred red-legged partridges (*Alectoris rufa*).

Anti-predator training consisted in two conditioned stimulus (raptor model and human presence) and two control tests which were presented during three consecutive phases to two groups of farm-hatched broods: ‘adult-trained’, when chicks were reared in the presence of adult partridges and ‘control-trained’, when chicks were bred without adults, which acted as control group. All behavioural responses and alarm calls were recorded in the farm and radio-tracking techniques were used after release.

Farm-bred partridges subjected to anti-predator training showed appropriate vocal responses and better anti-predator behaviour in comparison to partridges reared under current rearing methods. Autumn and winter-spring releases over two consecutive years of 44 trained and 40 non-trained partridges showed that mean values of survival (73 days) home range (13 hectares) and dispersion (550 m) of trained birds were statistically higher in comparison to non-trained partridges, with 50 % of birds failing to survive more than two weeks after release. Farm-bred game birds, which normally suffer from high predation rates after release, could highly benefit from the use of cost-effective training techniques based on the exemplary behaviour and alarm calls given by experienced adults.
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DOES THE USE OF PLAYBACK AFFECT THE ESTIMATES OF NUMBERS OF RED-LEGGED PARTRIDGE *Alectoris rufa*?

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The red-legged partridge *Alectoris rufa* is widely distributed with natural populations in Portugal, Spain, Andorra, France and Italy. The IUCN Red List classifies this species in the category LEAST CONCERN that refers to species without conservation threats. In Italy the species lives in a situation of potential conservation risk for its long-term preservation as its habitat is increasingly threatened by the disappearance of traditional agriculture-related environments. In such a situation it is important to use sensitive and appropriate monitoring tools to assess population changes over time and to identify potential conservation threats.

The objective of this study was to evaluate the effectiveness of the playback method for estimating the density of calling males. The study area was located in Brignano-Casasco (Alessandria Province – northern Italy), an area of approximately 1.000 ha that is closed for hunting. The census protocol consisted of 4 transects with 8 points each, monitored during three consecutive days. Monitoring started one hour before to one hour after sunrise. We compared the registration of spontaneously calling males at dawn with direct observations. The playback method provided the presence of 9 males. The census at dawn of the spontaneous calls estimated the presence of 25 males while observing the subject from the transect allowed the observation of 17 different pairs. The playback census revealed an underestimation rate of 64%, compared to the method that gave the best results. The coefficient of variation (43.3%) of the playback method was rather high and indicates a low repeatability.

Our study has made a critical evaluation of a method widely used but for which there is little data about its effectiveness. The results raise some doubts about its real capacity to monitor the status of *Alectoris rufa* populations. Indeed a second monitoring session carried out in 2010, whose data are currently analysed and will be ready to be presented at the IUGB Conference, could lead to further interpretations of the census technique effectiveness. The impact of our results on red-legged population management are discussed.
Meta-analysis is a powerful statistical method to summarise research findings across studies. It was originally developed and applied in medical, physical, and behavioural sciences, but there have been several articles on meta-analysis published in the field of conservation biology since the 1990s. However, conducting a meta-analysis is still not common in conservation, and, moreover, the term is not well-defined. Consequently, the specific methodology of a meta-analysis is often confounded with other approaches to summarise research findings across studies, e.g. vote counting. We encourage scientists to apply the advantageous methodology of a meta-analysis in their studies and call for a clear and correct usage of the term meta-analysis, i.e. referring to the specific methodology used in the medical sciences. We use our own analyses on nest predation in tropical forest birds to explain the different methodological steps of a meta-analysis, e.g. prerequisites for a meta-analysis, generation of effect sizes, weighting of studies, usage of models, and summary effects.
Species extinctions and population dynamics
ROCK PARTRIDGE *Alectoris graeca* POPULATION DENSITY AND TREND IN CENTRAL GREECE

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The rock partridge (*Alectoris graeca*) has been recently listed as vulnerable in the Greek Red Data Book, but data concerning its numbers and its population trend are limited in Greece.

We hypothesized that the population density declines are following similar trends as in other parts of its distributional range in Mediterranean. Our objectives were to estimate its population density, and to explore possible patterns in population trends between 2004 and 2010. Furthermore, we investigated if its density is influenced by habitat types, seasons, hunting regulations and environmental parameters. Rock partridges were counted within permanent narrow strips (n = 77, width = 250 m) located in hunting (n = 43) and non-hunting zones (n = 34) during spring and summer by game species guardians in mountainous areas of Central Greece. The programme DISTANCE (Buckland et al. 1993) was used to calculate the population density (ind./ha), the mean flock size and the encounter rate. In each line transect, three random samples were established for monitoring vegetation structure and cover. We employed univariate statistics and GLM ANOVA to test for differences among years, surveying seasons, habitat types, and between the two hunting zones. The overall population density (D = 0.284 ind./ha; 95% CI: 0.166-0.449) remained stable among years (P > 0.05). During the study years, densities were always higher in summer (0.426) than in spring (0.142) due to reproductive outcome, but not significant. Similarly, rock partridge densities were slightly higher in non-hunting zones than in hunting zones, but again not significant.

The population density was positively correlated with altitude, and associated with habitat type. Rock partridges were counted frequently in higher altitudes with less vegetation cover and more rocky areas. Our findings indicate that rock partridge population remain stable within a large area of its native distribution in Greece, and possibly other factors rather than shooting, such as hybridization with the chukar partridge, parasites, predators and habitat degradation, may be involved in local population decline.

The Lajta Project (co-ordinates: 47 51’ N, 17 12’ E) covered 3085 ha. Within this area crop cultivation is dominant. Fields are separated from each other by forest belts, tree rows etc, extending altogether over roughly 120 ha. This habitat structure characterized by cultivation of 12-15 field crops was able to keep partridge population with densities of 1.88 birds/km² (1990).

The Project started in 1991/1992, we set the aim to achieve increments of carrying capacity for partridges (and other small game species) living in the area. Therefore, a full-time gamekeeper was employed and habitat improvements initiated. As a result – after 4 years – the breeding population increased to 10.1 birds/km². Besides increased numbers of nesting pairs, also the number of reared chicks increased, from 5.1-11.2 individuals per km² in 1990 to 27.3-38.4 individuals/km². However, field sizes were not changed significantly; although under the influence of habitat management the lengths of field margins increased by approximately 25 % (from 82 m/ha to 115 m/ha), they still reach only half of the values found in the countries of Central Europe where private ownership of farmed land is dominant.

After the field privatisation realized in 1995 as part of the political change in Hungary – effecting approx. 50% of the project area – the possibilities of habitat improvement decreased, and the technological pressure on large-scale farming increased. As a result of these processes the partridge population decreased again to 1.43 birds/km². The new management strategy applied in the project since 1996 resulted in a slow increase of the breeding population, which stabilized at around 5 birds/km². The August density increased in the same period from 4,5 birds/km² to 13-15 birds/km².

During the investigated two decades chick and winter mortality were extremely high. The most important key factors influencing the grey partridge population dynamics in our study area seem to be clutch and chick losses (k₁) and winter mortality (k₃).
The detailed analysis of long-term registration data for main game mammal animals is carried out. The two main purposes of the study include (i) a quantitative investigation of the population size dynamics of game mammals (the elk, Manchurian deer, wild boar, roe and squirrel) in the Russian Middle Amur area; (ii) analysis of the external factors and the hunt influence on the reproduction and space-time dynamics of these species. The approach based on mathematical modeling is used for the description of tendencies in the population size dynamics and estimation of the external factors influence. A general mathematical model of the harvest species population dynamics has been developed.

It is shown, that the population size maintenance for many game species is determined by their migration activity. A decrease in the ungulates number is often a consequence of snowy winter in the years, prior to reproduction. According to the model parameters estimation, the birth-rate and survival of game animals (wild boars and squirrels, for example) depend on the availability of forage reserve (cedar nuts and acorns of the Mongolian oak). A forestland decrease, caused by felling and fires, results in the wild animals’ reduction, which occurs with a lag of two – three years.

In this way it is shown that a change in the wild animals’ number is determined by hunting intensity, the availability of forage reserve, and by snow depth in the years prior to reproduction. A lean year and abundance of winter precipitations have an unfavorable influence on the population preservation. The animals die of starvation or migrate in search of better fodder conditions. Reserved territories promote not only the game species preservation, but also some growth in their population size, though this means is obviously insufficient.

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WINTER MOVEMENTS OF COMMON POCHARD INFERRED FROM NASAL SADDLES IN WESTERN FRANCE

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Waterfowl can use different wintering sites within the same winter, but little is known about their movements between such sites. Studying winter movements of common pochards (Aythya ferina) is particularly interesting since the species is suspected to be a potential long-distance carrier of highly pathogenic avian influenza viruses. Thanks to a combination of both ring-recoveries and capture-recapture data of individuals fitted with nasal saddles in western France, we studied common pochard movements during winter (October-March).

Previous analyses showed that all strategies of movements may coexist during winter (residence, long-distance, to and fro movements). Based on the results of these analyses, a multi-state model was built to estimate monthly local survival and probability of departure from the ringing site taking into account age and sex of individuals. Our results show that each month about 12% of birds left the ringing site for other wintering sites. We observed very low local survival rates incompatible with variations of mortality. Rather than dying, many birds seemed to actually leave permanently the monitored areas (i.e. the areas where birds can be observed or trapped). Indeed, local survival rates were particularly low at both the beginning and the end of winter. These temporal changes of local survival rates met the two peaks of migration (post and pre-nuptial). Particularly low local survival rates were recorded in October for adults and in November for first-year individuals, suggesting a differential migration departure of the age classes. This study exemplifies how nasal saddles can be used to assess the exchange of birds between wintering sites and measure turnover rates at wide spatial scales.
In Hungary, increases in free-ranging wild boar in the last few decades have been attributed to several factors: higher environmental conditions of the species, variations in the type of dominant crops (especially maize), lack of big predators, inefficient hunting, additional food and perhaps climatic changes, too.

At the same time in our land captive management of wild boar is living its second Renaissance. Nowadays about 10 percent of wild boar populations are living in enclosures in Hungary. We were curious, there is a difference between the reproductive success of wild boar populations living in hunting enclosures and free-ranging populations, or not?

From this aim wild boars were collected during the wild boar hunting season by drive hunts, reflecting the situation of the species’ reproductive biology between the months of November to January, since 2006. We examined 8 closed and 4 free-ranging populations, about 600 wild boar females.

All of bagged females were aged in the field based on colour of the hair, tooth eruption patterns and wear. Three age classes were considered: 1 year old - females fewer than 12 months old; 2 years old - between 12 and 24 months old; adults - females over 24 months old. We collected the following data from the females: date of death, reproductive status (breeding—pregnant or lactating— or not breeding). The reproductive tracts (uterus and ovaries) were removed during field necropsy and preserved by freezing (–20º C). The embryos in the uteri of pregnant females were counted, sexed, and we measured their weight. No significantly lower reproductive success were found in case of wild sows kept in enclosure than in free-ranging populations, but intrauterine mortalities was higher in enclosures. The influence of condition on wild boar reproduction and fertility was tested and found to be at least of minor interest for the reproductive success of the species.
INFLUENCE OF RABIES CONTROL OF FOXES ON POPULATION DYNAMICS OF SMALL GAME IN POLAND

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The rabies control of foxes was started in western part of Poland in 1993, and it was developed in other regions during next years. The oral vaccines with bait against rabies were dropped from aircrafts in all the country since 2002. Monitoring of fox number shows that the population size of these animals, which for many years has been stabilized, since mid 1990s, began to steadily increase. In 1996-2001 the increase of population and hunting bag of foxes were observed in western Poland, while in the central part of the country the process was observed in 1998-2003. The latest increase of fox population was observed in northern and southern part of Poland (2003-2007) which where covered with oral vaccination against rabies as the last one. Finally population size of foxes was increased four times in this short period although the hunting bag was increased fivefold. This species, previously preferring the border between forest and fields and meadows, also began appearing regularly in open agricultural areas and over time also populated the urban areas. The increase in density of foxes in Poland was accompanied by increasing numbers and raising hunting for raccoon dogs and mustelids (badger, marten, polecat). In turn, a sharp decline in density of the hare and partridge populations were recorded in that time. As a result, the harvest of these two species of small game in Poland declined at the turn of the century more than tenfold. As the main reason of decline in the hare and partridge populations was increase of four-legged predator abundance, especially the fox, as well as changes in agrocenosis, which pace has increased after the political and economic transformation in the country after 1989.
Red-legged partridge (*Alectoris rufa*) populations in the Iberian Peninsula are declining in the last decades, but monitoring data are obscured by the effect of generalized releases for game purposes. Therefore, identifying the main demographic parameters affecting partridge population dynamics is required in areas free of releases. One of these regions is Navarre (northern Spain), where the species also shows a clear declining trend during the last 20 years. During a field work carried out in 6 areas of Navarre (5.500-7.000 Ha) between 2006 and 2009 (February-November), involving the radio-tracking of 139 adult partridges and 110 chicks, we estimated demographic parameters such as adult and chick survival, hunting mortality, and several reproductive parameters. In order to identify the parameters most affecting population dynamics, we developed different individual-based population models using Program Netlogo. Models were calibrated using data of population trends and chick/adult ratios from independent temporal series (spanning 1990-2010). Results from a sensitivity analysis of the demographic parameters show that the population was most sensitive to survival of pre-reproductive and nesting adults and survival of chicks between one and five months old, which produce larger changes in lambda with small changes in the parameters. However, if only one parameter should be manipulated to achieve population recovery (lambda >1), either nest success or survival of chicks younger than one month should be improved. In a more realistic scenario, habitat management will improve simultaneously different parameters which would have larger effects on lambda. Parameters highly susceptible of improvement, due to their low estimated values in the field, are adult survival, nest success, and chick survival during the first weeks of life. Realistic scenarios improving simultaneously several demographic parameters would allow partridge population recovery, mainly through habitat recovery, which would improve nest success and adult and chick survival, combined with reduced hunting quotas.
In order to preserve and manage the wild populations of game species it is necessary to develop monitoring programmes within their range. The summer migratory species that use herbaceous habitats are affected by continuous changes and transformations of European agricultural systems. The quail depends on the changes and amendments of the European Community Agricultural Policy (CAP) and also on the conditions in economic development and nature conservation in the countries where it overwinters.

The (RFEC) quail monitoring programme in Spain has been running from 2002 to 2011. The project involves hunters and conservationists. A relaxed social atmosphere has been created to promote the cooperation of traditionally opposing groups (hunters and ecologists). The research work on the quail has been associated to the formation of the hunters. We have designed and implemented a training programme for hunters with different levels of participation. Standardized protocols, measuring instruments and formularies have been elaborated to collect the field data.

Quail summer and reproduction stay: we quantify this period by means of live capture of singing males with the help of lures and nets. We consider January 1st as day number 1. In the Canary Islands and the Southwest of the Peninsula, the first detections and captures occur between days 25-35 and in the North of the Iberian Peninsula between days 75-85. The last detections and captures of singing males are registered in the Islands and in the South between days 185-255, and in the North of the peninsula between days 220-260. Peak abundance is between days 165-205. The period of quails staying in Spain can be estimated to be of about 190 days.

Quail return at the end of the summer: we evaluate this period with the study of the quails captured by the hunters. We use card-envelopes for the collection of biological samples that are studied in the laboratory. 25,769 wing samples of quails from all the Spanish territory have been collected. We have developed a classification system based on 8 age classes with approximation in months. Five age ratios have been established to assess population status. The quail population has annual numerical fluctuations that can be very pronounced, within them and during the years studied, the quail population remained stable.
GREY PARTRIDGE (Perdix perdix) DENSITY ESTIMATIONS AND POPULATION DYNAMICS ON THE COUNTRY LEVEL: CONNECTING LOCAL SURVEYS WITH HIGHER STATISTICS. A CASE STUDY FROM THE WILD ANIMAL INFORMATION SYSTEM OF THE GERMAN STATES (WILD) TIER-INFORMATIONSSYSTEM DER LÄNDER DEUTSCHLANDS = WILD)

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During two recent wildlife surveys in 2006 and 2009 pair densities of the Grey partridge (Perdix perdix) were evaluated using estimations of local professional hunters. The assessment method is standardized and uses the sightings of pairs or calls during the mating season as well as sightings of animals in the course of the year within the hunting district. In 2006 nearly 28.000 and in 2009 more than 26.000 hunting districts participated in the survey. This represents more than 52 % or 9.9 million. ha, respectively 45 % or 8.5 million. ha of suitable habitat in Germany.

Pair densities found in individual hunting districts ranged between < 0.1 and 18 pairs/100 ha and in the community and state levels between 0.1 and 5.0 pairs/100 ha of open country. Median pair densities decrease with increasing altitude, although broods could be found at elevations of 700 m a s l. This data is used to estimate the total number of animals on the basis of elevation and grand natural region. The calculation uses the real numbers from the community level to estimate densities for communities without survey data. This approach is based on the assumption that population density of an area is primarily based on measurable local conditions. Altitudinal zones have a width of 50 m and the highest zone is > 650 m above sea level and every community is assigned to one of the seven grand natural regions of Germany. This estimation technique results in a total number higher than other studies, but the proven method and the high number of professional participants leads to the conclusion, that our outcome is closer to reality. Results of the study suggest more than 120.000 pairs of partridges for 2006, but a nearly 10% drop in pair numbers for 2009. Several reasons for this decline are discussed in the context of changing land use and shrinking habitat, as well as evaluations to back up the methods used.
Veterinary aspects of wildlife and conservation
CHEETAH CONSERVATION IN MASAI MARA (KENYA) IS THREATENED BY \textit{Sarcoptes} MITE INFECTION: EPIDEMIOLOGICAL AND GENETIC STUDY IN WILDLIFE/LIVESTOCK SYSTEM

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\textit{Sarcoptes scabiei} causes sarcoptic mange in companion, livestock and wild animals as well as scabies in humans. It potentially causes huge economic loss due to reduced production and increased mortality in animals. Introduction of a single case of scabies into crowded conditions can result in an epidemic. A two-year cross-sectional study was conducted to determine the epidemiological and genetics aspects of \textit{Sarcoptes} mite infection in the worryingly threatened cheetah from Masai Mara (Kenya), involving wild (lion, wildebeest and Thompson gazelle) and domestic (sheep, cattle, goats and dogs) animals in sympatry with the threatened felid species.
Populations of the native Eurasian wild boar (*Sus scrofa*) are expanding throughout Europe. Concern on the potential risks posed by this wild suid as a source of livestock (especially domestic swine) infections is increasing, too. This is clearly the case of Aujeszky's disease virus (ADV), a herpesvirus shared by wild and domestic suids that causes losses to the swine industry and concerns regarding large carnivore conservation. In Europe ADV control in pigs has led to a significant decrease in prevalence. Meanwhile, ADV is continuously reported in wild boar populations but little is known on its temporal trends. We tested the temporal evolution of ADV seroprevalence in wild boar from Spain. We hypothesized that wild boar exposure to ADV would remain stable in time even after significant reduction of ADV prevalence in pigs.

Sera from 1659 wild boar were collected from 1999 to 2010 in 43 sampling sites within 6 biogeographic areas from mainland Spain and tested for the presence of antibodies against ADV by commercial ELISA (IDEXX HerdCheck Anti-ADV gpI). Wild boar were grouped according to sampling date into three main seasons (2000-2003, 2004-2007 and 2008-2010). ADV prevalences were compared through season both globally and by biogeographic area by means of chi-square tests. Global seroprevalence for the ten-year studied period was 49.6%. Antibody prevalences were high in all areas (56%; n=1435) except for two (9%; n=224). Globally, the seroprevalence remained high and stable. In three areas the increase in seroprevalence with season was statistically significant while only in one area we detected a significant decrease. In the same period, the county prevalence in domestic pigs decreased from 70% to 1.7%. Results presented herein confirmed our hypothesis and show increasing seroprevalence rates for some of the studied areas in spite of the decreasing trend reported in pigs. This is an evidence of the increasing risk wild boar poses after the successful ADV eradication campaign in Spain. These results are also relevant regarding carnivore conservation.
FOX CULLING: AN INAPPROPRIATE WAY TO FIGHT AGAINST *Echinococcus multilocularis* AROUND NANCY (FRANCE)

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**Objective:** The aim of our study is to assess the relevance of fox culling as a sanitary protocol to protect the population of a city against *Echinococcus multilocularis*.

**Method:** The study area is a 20 km radius circle (1256 km²) centred on the city of Nancy, northeastern France. In the northern half, devoted to the fox culling, we asked for an intensive hunting, trapping and night shooting activity. Each fox has to be sent to the laboratory. In the south, no change on the hunting pressure is asked. In parallel, each year of the study, a batch of foxes is sampled homogeneously on each area by night shooting or trapping from October to April. Intestines are then tested using the SSCT technique to assess the presence of *E. multilocularis* adult worms. Both fox populations (culled and control) are monitored by night counting and biometric data surveillance.

**Results:** After two years, 825 foxes have been shot in the study area (including those for analyses). Nonetheless, no significant change in prevalence ($X^2 = 0.001; p=0.9746; df = 1$) has been achieved, going from 39.0% (23/59) to 36.2% (21/58) in the north area. Furthermore, we failed to detect any significant change concerning the biometric data (night counting, sex-ratio,…). We have already done 183 shooting operations totalizing 1,468 hours of night work and 13454 km.

**Conclusion:** Albeit there is still one year to go, the culling protocol tested around Nancy seems to be ineffective both regarding the fox population and the fox prevalence for *E. multilocularis*. Moreover, it is time and money consuming as well as ethically questionable. As a consequence, we would discourage any authority from using this kind of protocol to protect their population.
INFECTION PRESSURE OF HUMAN ALVEOLAR ECHINOCOCCOSIS DUE TO SMALL TOWN FOXES (Vulpes vulpes)

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In recent years red foxes (Vulpes vulpes) have been recorded in villages and small towns more frequently. Detailed information about space use by foxes and the prevalence of foxes infected with the small fox tapeworm (Echinococcus multilocularis) is lacking for this habitat. Radio-tracking of 17 foxes showed that the animals spend 38% of their time within the settlement and 62% in areas outside the town. Foxes focused on the border between urban and rural areas and preferred the settlements and grassland areas outside the villages. About 43.1% of the foxes using villages and small towns had been infected with E. multilocularis. The infection rate is not significantly different from the 39.4% infection rate in foxes in open countryside, determined by the intestinal scraping technique. PCR analyses of faeces could also not proof significant differences between these two habitats. One quarter of the fox faecal samples come from private gardens of residents, which present an immediate source of infection to humans. We assume these similar infection rates are because of foxes get infected outside of the villages, where sufficient intermediate-host species are abundant, especially in the preferred grassland areas. Foxes carry the parasite continuously into villages and small towns. Comparing the number of people living here and considering the E. multilocularis prevalence as well the potential risk of human infection in villages and small towns is higher than in rural areas. Furthermore, the frequent contacts between foxes (respectively the contact to infectious material) and people are enforcing the infection risk as well.
The chukar partridge is very popular as a release bird for recreational hunting in Cyprus. Limited information exists concerning the nutrient requirements of the chukar partridge. Therefore, the aim of the present work was to estimate the optimum protein and energy level of breeder diets of captivated partridges (Alectoris chukar) reared in North Cyprus (Gönyeli). Three different energy (2600, 2800, 2900 ME kcal/kg) and four different level of protein (14.5, 18, 20, 24 % Crude Protein) using 3X4 factorial design total 12 experimental diets (corn and soybean based) were prepared. 288 females and 108 males at 18 weeks of age were randomly distributed in twelve treatments group. Each group replicated three times and each replicate had eight female and three male chukar partridge. Birds were fed with 12 different diets for one week to adapt. After that egg production, egg weight, feed conversion rate, hatchability and fertility were recorded at the end of 2 weeks of the experimental period. Egg production was between 1.90-4.06/per hens weekly (p<0.05); 2900 ME and 20% CP showed significant better egg production compared to all other experimental groups. Average egg weight was between 21.13-23.34g (p >0.05). The minimum-max feed conversion value (feed consumption/egg weight) was 1.43-1.71 and was not significantly affected by different diet treatments after the second week of the experiment (p>0.05).

There were significant different between hatchability (%) and fertility (%) p<0.05. Low fertility and hatchability were recorded if the diet that had 2800 ME and 18% CP; the best results were recorded in the diets that contained 20% CP: 2900 ME; 24 % CP: 2900 ME; 2600 ME: 18 %CP. However, this is first report related to different energy and protein level of partridge breeder diets.
SUCCESSFUL INTEGRATED LONG-TERM BAITING TO COUNTERACT Echinococcus multilocularis

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The project aimed to minimise the risk to humans of infection with alveolar Echinococcosis by deworming foxes. Air distribution of bait in agricultural and recreational areas was combined with distribution of bait by hand in towns and villages in order to cover the entire fox population (baiting area: 213 km²). Within the first year, bait was distributed every month, and in the following years at six-week intervals. As of the beginning of 2010, bait is being distributed 5 times per year. The bait distribution density is 50 pieces / km² (König et al., 2008 + 2011).

In winter 2002/2003, infection rates in the project area were around 52 % (König et al. 2005). Immediately before the measures were implemented, in the year 2005, the pre-baiting prevalence was 51% (45-57% CI 95%, N = 286) (König et al., 2008). During a one-year period following the first 4 months of bait distribution, only one positive fox was found (prevalence 1%; 0-7% CI 95%). Prevalence rates declined to 2% (2007), 3% (2008), 2% (2009) 1% (2010) (König et al., 2011). In the suburban and urban areas, the infection rate was reduced to 0 % and it has been sustained at this level since 2007. No significant change has occurred in the untreated control area. To ensure efficient use of resources it is crucial to know where counter-measures are most beneficial. To assist prevention efforts, a model has been developed based on prevalence rates in foxes, fox population densities, fox defecation rates and human population densities. The model calculates the likelihood of people coming in contact with Echinococcus multilocularis. It shows that in 2005, before the deworming program started, the likelihood of contact in our study area was 175% above the Bavarian average. Today, after 5 years of the worming program, this likelihood is 95 % below the Bavarian average infection risk. This is a great achievement in preventing human infection with the fox tapeworm.
We studied lead (Pb) exposure in waterfowl using non-invasive fecal sampling in an area of the Guadalquivir Marshes (Doñana National/Natural Park, SW Spain) affected by the Aznalcollar mine disaster in 1998. Fresh greylag geese (Anser anser, n = 191) and purple gallinule (Porphyrio porphyrio, n = 91) feces were collected from three sites (Caracoles, Entremuros and Cerro de los Ánsares) during the 2004 to 2008 wintering seasons. Lead and aluminium (Al; as an indicator of soil ingestion) were analyzed in dried/acid digested samples. The concentration of fecal porphyrins and biliverdin (as biomarkers of Pb effect) and Pb isotope profiles (to discriminate between potential sources of Pb exposure) were determined in a selection of samples. Results showed a decrease in Pb exposure over time in greylag geese wintering in Doñana, and that soil ingestion was the main source of exposure.

In contrast, in purple gallinules resident in the Entremuros, Pb exposure increased during the sampling period. In the Entremuros, both species appear to be exposed to high Pb sources, and these probably include Pb shot pellets (from historic hunting activity), iron plaque (on roots of emergent plants such as Typha and Scirpus, rich in Pb) or remnant patches of polluted soil dating from the mine spill.
Through a recent (2003 – 2007) survey of ectoparasites on hoofed mammals in western North America, a literature review, and examination of archived museum specimens, we found that the exotic deer-chewing louse, *Bovicola tibialis* (Piaget), is a long-term, widespread resident there. The earliest known collection in this region was from Salt Spring Island, Canada in 1941. We found these lice on the typical host, i.e., introduced European fallow deer (*Dama dama* L.), and on Asian chital (*Axis axis* [Erxleben]), native Columbian black-tailed deer (*Odocoileus hemionus columbianus* [Richardson]), and Rocky Mountain mule deer (*O. h. hemionus* [Rafinesque]) x black-tailed deer hybrids. Chital and the hybrid deer are new host records. All identified hosts were known to be or probably were exposed to fallow deer. Geographic records include southwestern British Columbia, Canada; Marin and Mendocino Counties, California; Deschutes, Lincoln, and Linn Counties, Oregon; Yakima and Kittitas Counties, Washington; Curry County, New Mexico; and circumstantially, at least Kerr County, Texas.

All but the Canadian and Mendocino County records are new. *Bovicola tibialis* displays a number of noteworthy similarities to another exotic deer-chewing louse already established in the region, i.e., *Damalinia* (Cervicola) sp., which is associated with a severe hair-loss syndrome in black-tailed deer. We discuss longstanding problems with proper identification of *B. tibialis*, population modeling efforts, the probability that it occurs even more widely in the United States, and the prospects for it to cause health problems for North American deer.
EFFECTS OF INGESTION OF PESTICIDE-COATED SEEDS ON RED-LEGGED PARTRIDGE SURVIVAL AND REPRODUCTION

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Agrochemicals are proposed as a potential cause for avian declines in agricultural areas from Western Europe. Ingestion of pesticides incorporated into plants or invertebrates may cause death or reduced reproductive success, thus compromising population viability. Cereal seeds, which are an important food source for some species during autumn and late winter, are usually coated with pesticides before sowing. The aim of this study was to analyse the effects of the ingestion of coated seeds by red-legged partridges (Alectoris rufa) on survival, reproduction process and chick viability. We tested an insecticide (imidacloprid) and two fungicides (difenoconazole and thiram) at two doses each: a dose corresponding to the recommended for seed coating and another dose twice as high as the recommended one.

Each experiment consisted in two groups of six couples of partridges each fed with treated seeds for a 10-day period that concluded 20 days before the beginning of the reproduction. Cages were checked daily for egg-laying monitoring. Eggs were incubated and the following variables were retrieved: clutch size, egg length and width, shell thickness, fecundation and hatching rates, and chick survival and growth (i.e., mass and length) until day 32 after hatching. High concentrations of imidacloprid and thiram caused 58% and 42% mortality, respectively. Sex-dependent lethality was detected for thiram, being males (60% mortality) more affected than females (29% mortality). Fecundation and hatching rates were not altered by pesticide exposure. Egg size and eggshell thickness were significantly reduced by the three pesticides, although only at high doses in the case of thiram. Chick survival was also reduced by the three compounds, with mortality rates >60% at day 32 after hatching in all cases compared to 30% mortality of controls. These observed lagged effects on chick survival suggest a potential for reproduction disruption of coated seed ingestion.
IMPROVED CHARACTERIZATION OF SARDINIAN MARTEN’S (*Martes martes latinorum*, BARRETT-HAMILTON 1904) MORPHOLOGICAL TRAITS BY RADIOLOGICAL INVESTIGATIONS

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Objectives: In recent papers descriptions of morphometric peculiarities about adult martens (*Martes martes latinorum*) living in Sardinia were given. This contribution aims to broaden such characterization about some anatomic and structural aspects of this wild animal, by a radiological investigation on skeletal apparatus.

Methods: A total of 26 martens were sent to our labs throughout 2009-2010. Data were gathered and analyzed. Radiological checks were carried out on the whole skeletal apparatus to assess normal radiographic anatomy. Presence, shape, number and relationships of bones compared also to other carnivors were taken into account. Physis were observed and described in the young animals. According to the identification of martens in agreement with age and gender, biometric measures took into account: 2 heights, 6 lengths, 4 widths and 4 girths.

Results: The spinal column resulted composed of the following vertebrae: 7 cervical, 14 thoracic, 6 lumbar, 3 sacral, 20-21 coccygeal, plus 8 sternebras (head+body length: cm 48 ± 3.4). Clearly distinguishable radiopaque clavicle in the adult as well as the bone of the penis, that results developed (4.5 cm lengthed and 0.3 cm of width at the basis) and radiopaque also in the young martens, ending in an “eye of the needle” shape. The radiologic examination permitted to evidence the presence of the physis also in appendicular skeleton’s bones, therefore to point out the animals’ ages on the basis of the largeness and the radiolucency of the abovementioned physis.

Conclusions: The detailed characterization achieved through radiological analyses allowed to improve the description of anatomical and structural peculiarities of Sardinian marten. We feel that this data are a possible references point for skeletal morphology description in this species and provide some comparative morphological pictures regarding skeletal conformation in other martens population.
We present an overview of disease agents known to affect common eiders (Somateria mollissima) at different stages of the annual cycle and assess the potential impact at the population level. During recent years, the Baltic-Wadden Sea population of common eider, an important quarry species, has declined dramatically. Various other factors (e.g. predation, food shortage and hunting) have been implicated as potentially adversely affecting the population, but little is known about the potential impact of parasites and disease on eider populations. Depending on the virulence of the disease agents, the impact on the host population may range from direct mortality to sub-lethal demographic impacts (e.g. reduced fecundity), which may be readily overlooked in nature. Here we list the disease agents, assess their relative potential to affect eider populations and scrutinize the literature for evidence of population impacts. In particular, we focus on 1) the role of avian cholera, caused by the bacteria Pasteurella multocida, which has had significant impact on survival rates in local colonies, 2) a paralytic syndrome suggested to cause depressed breeding in the Baltic, 3) the complex interplay between acanthocephalan parasite infestations and body condition, and 4) emerging infectious diseases, which may potentially affect eider populations in the future as a result of climate change-induced food web changes and energetic stress.
Wildlife biology, behaviour and game species management
INFLUENCE OF FARMLAND MANAGEMENT ON IBERIAN HARE (Lepus granatensis) SPACE USE IN A STEPPE-LAND HABITAT


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Iberian hare (Lepus granatensis) has shown a negative trend in Navarre (northern Iberian Peninsula) in the last years. As Iberian hare is a species linked to agricultural systems, the management carried out in this habitat has important effects in their populations. The aim of this study was to assess the space use of Iberian hare in the Biosphere Reserve of Bardenas Reales in relation with land management. Spotlight transect (218.5 kilometers) were carried out to locate Iberian hares in four different seasons: November, February, May and September. Simultaneously we characterized the land use in all the area prospected (a buffer of 155 m for each path side, 5880 ha totally) at the four seasons sampled. Land use was defined by 25 categories considering also crop development stages and management degree of fallow and stubble lands. We determined land uses included in a buffer of 10 meters (edge use) and 50 meters (land use) for each hare location using GIS tools. Our results show that Iberian hares selected as feeding areas land patches with a certain degree of vegetation cover. Selected patches varying according to the season, selecting cereal crops only in the first stages and scarcely managed or no managed stubble and fallow lands during the rest of the year. Scrubland (Artemisia herba-alba, Salsola vermiculata, Lygeum spartum, Rosmarinus officinalis, ...) was selected by hares during all the year.

However fallow lands severely managed (actually ploughed lands) were negatively selected along all the year. Otherwise hares selected heterogeneous areas (patchy areas) with a certain degree of edge density. In conclusion, the management of stubbles and fallow lands in agricultural systems is the great importance for Iberian hares because it determines their suitability for this species. Minimum management of these structures should be promoted by the Common Agricultural Policy.
Game management is widely implemented in Spain, potentially affecting 75% of the surface of the country. It often involves controversial practices like predator control or releasing farm-reared animals that may be risky for biodiversity conservation in certain circumstances. Conversely, practices such as habitat management can facilitate the preservation of natural ecosystems and improve the ecological value of human-made ones. However, no comprehensive study of these aspects has ever been developed in Spain. We obtained a set of variables quantifying physical and economic traits, management techniques, and hunting pressure and modalities in a sample of 59 game estates primarily aimed to red-legged partridge hunting, located in south-central Spain, by interviews with game managers. This gamebird is one of the most socio-economically important small game species in Spain and within the study area. We compared non-commercial estates (aimed for leisure, managed mainly by local hunting societies), commercial estates (aimed to obtain economic benefit) and intensive estates (a special category of commercial estates with administrative permission to release farm-raised partridges in unrestricted numbers).

Annual hunting pressure was similar between non-commercial and commercial estates, but annual harvest was higher in commercial estates. Commercial estates (both intensive and not) had a relative simplification of land uses (alternative land uses like livestock or forestry being less frequent) and more intensive management, including higher frequency and number of partridge releases and more intensive predator control, but retained more natural vegetation. Non-commercial hunting estates had less intensive management and, due to less frequent releases, could be a key element for the conservation of wild partridge populations in agricultural areas.
DO WOLVES AND HUNTERS REGULATE UNGULATE POPULATIONS?

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Aims of the study were to investigate 1) combined hunting and predator impact on ungulate population and 2) different preferences of wolves and hunters for ungulate age classes to understand if top-down control is operating. We studied the interactions between predators and ungulates from 2000 to 2010 in a mountainous region of Tuscany (Italy). The ungulate community included wild boar and roe deer: the estimates of their densities varied from 1.6 to 33.9 km² and from 24 to 44 km² respectively and were obtained by drive censuses. One pack of 2-6 wolves and hunters utilized study area (120 km²). We collected and analysed 2108 wolf scats. Consumed species and ungulate's age were determined through the analysis of recognizable bone fragments and macroscopic comparison of hairs. We estimated the number of ungulates used by wolves calculating relative biomass by the Weaver biomass model (1993). Through Nagy's formula (1987) we estimated daily energy demand of wolf pack. To assess different age classes preferences between wolves and hunters we used Chi-square test. On average annually wolves removed 70 wild boar and 52 roe deer (8.9% of wild boar and 1.7% of roe deer populations) and hunters removed 672 (48%) wild boar and 179 (5.9%) roe deer. Juvenile ungulates were preferred by wolves whereas adult ones by hunters.

Our results showed both quantitative and qualitative differences between hunting and wolf predation impact on ungulate population. In the study area removal by wolves and hunters didn’t exceed annual increase of ungulate populations. The combined impact of wolves predation and hunting pressure couldn’t explain fluctuations in ungulates numbers. Wild boar number was related to acorn crop of the previous season. The two combined mortality factors may limited but didn’t regulate ungulate densities.

The interdependence between herbivorous mammals and forest succession is well understood. The effects of herbivores on the forest vegetation are under the spotlight as animals profoundly affect vegetation patterns and processes. Meanwhile, over the last decades, changes in their distribution assumed a very unusual character. We aimed to reveal the changes in animal effects on woody vegetation depending on the forest succession and the key indices of climatic factors that could be use to predict the impact of herbivores to forest.

I have employed the integrated method of belt transects (100 × 4 m) and sample plots (50 × 2 m). The number and distribution of local deer populations, their age structure and sex ratio have been assessed using the pellet group count method during the non-vegetative period. The total route is 693.1 km and the total number of sample plots is 4,255. The duration of the non-vegetative period determines the time and extent of animal impact to the woody vegetation. The elongation in this period impelled the distribution of animals in the early successional forests where living conditions meet animal demands. It is necessary to consider not only successional process but also the certain animal species and its present and potential response to the environmental changes. The role of certain deer species on the main tree species has been determined depending on the forest category. There is the close positive relation between changes in the limiting climate factors and an area affected by deer ($r = 0.57$). Moose most closely relate to the damaged area ($r = 0.55$). Roe deer and hares are attributable to the early successional seres despite of their classical attribution to the species group of the second successional stage while moose most use plantations of later succession seres.
MALE AGE STRUCTURE AND INDIVIDUAL ANNUAL BREEDING SUCCESS
OF RED DEER MALES (Cervus elaphus L.)

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The population of St-Hubert (Belgium) is free-ranging and located in a 14 000 ha forest. According to the annual bag statistics, since 2001, 2 to 16% of the annual culled males are >9 years old.

In this study, we try to assess if, in a population with a high proportion of old males, 1) breeding is restricted to a few dominant males or if most of them succeed in reproducing 2) breeding success is linked to age and 3) younger males breed later than older ones.

Male reproductive success was estimated by paternity analysis of embryos collected on culled females during the hunting season. Potential fathers were genotyped by extracting DNA from the cast antlers for every >3 years old males and from the carcasses of the younger ones. Individual conception dates were estimated from measurements on the embryos. Independence of age on paternity was tested with a chi² test and estimated conception dates were regressed on age of fathers.

After 5 years sampling, the paternity of 156 embryos was determined accurately. From these embryos, 85% had a different father. Age of the fathers varied from 3 to 15 years. Males from 6 to 10 years old had a higher breeding success than older or younger ones. Younger fathers did not breed later than older ones.

These results suggest that breeding in a population with a high proportion of old males is not restricted to a few dominant males. Prime age males had a higher breeding success but 15 years old stags still breed and a higher rate than expected of 4 and 5 years old males do reproduce. The majority of these younger fathers did not breed later than the old ones.

This was confirmed by the field observations for 30 year: according to the evolution of the age and sex structure of the population, the amount of mating groups during the rutting period has increased and the amount of individuals within the mating groups decreased. We suggest that in the population a St-Hubert with a well balanced adult sex ratio, the risk of spending too much energy to defend a harem becomes so high that more males will breed with fewer females.
INTEGRATION OF INTRODUCED MOULFONS WITH THE LOCAL MOULFON POPULATION IN THE SOWIE MOUNTAINS

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Gory Sowie are part of the Sudety Mnts and are located in southwestern Poland. In 1902, 5 mouflons *Ovis aries musimon* were brought from Slovakia into this region. In the next years there was an increase in population number until it reached 778 animals in 1995. Changes in not proper development of horns have been noticed for a long time. The older the males were the more curved horns they had, which eventually started to stab into the animal’s neck. This process eliminated older animals and it was suggested that inbreeding it. In order to increase genetic variability it was decided to introduce more mouflons from Slovakia and Czech Republic. Between 2002-2004 76 mouflons were bought and placed to reproduce in two enclosures located in Bielawa and Jemna. In June 2006 mouflons from both enclosures (n= 177) were released. These were 59 males, 79 females and 40 lambs. All released animals were given ear tags and 10 females and 10 males got radio collars produced by Televilt.

In the following years location of animals was confirmed through telemetry receivers. The results suggest that released mouflons colonized the area of 850 ha in enclosure Bielawa and 690 ha in enclosure Jemna. The animals were located max. 1.0 km - 3.1 km from the enclosures apart from one male that was found 9.1 km away from the farms. The average home range of males was 222 ha whereas for females it was 175 ha. After 4 years 19 out of 20 animals were still alive. The forest area in Gory Sowie that is inhabited by local population of mouflons is 15 800 ha. The degree of integration of released animals with the local mouflons was low as they occupied only 9,7% of range distribution of local population. It is possible that colonization of bigger areas took place through progeny of introduced animals. It will be clear within next 2-3 years if introduction of mouflons gave the expected results.
Most of the decline in grey partridge populations is attributed to farming intensification and related loss in habitat quality (crop diversity, field enlargement, scarcity of cover and food after harvesting, etc.). As a consequence habitat management is recommended to improve partridge demography and carrying capacity, but few studies have tested the effectiveness of the proposed tools. We assessed separately the impact of wildlife cover (mainly maize-sorghum strips), field division (6m bare ground strips inside wheat fields) and food supplementation (grain feeders) using Before-After / Control-Impact, multi-site or one-site 6-year experiments. The management schemes corresponded with what is currently applied or could reasonably be applied in the field by French hunters and/or farmers to potentially allow their future development. The studies were carried out in the ‘Centre’ region of France which was the species’ core area in the 1980s, but it markedly declined during the 1990s and 2000s in the southern margins. We monitored partridges through censuses in spring and winter, and a brood surveys in summer. Statistical analyses involved sophisticated linear mixed-effect (LME) and generalized linear (GLM) models, as well as more basic models such as non parametric comparisons of means, depending on experiments and data. We did not detect any significant positive effects among any of these 3 schemes on partridge pair density and reproductive success. Some improvements were observed, but on managed areas as well as control areas. The wildlife cover experiment showed that strip edges may act as an ecological trap with regard to predation risk (mainly raptors).

Our study highlights the need for field experiments at farm-scale to test the effectiveness of each management measure. Assumptions based on occasional observations of partridge individual habitat use (that are likely to be biased) may be misleading because they fail to capture the properties of the whole system. We conclude that habitat management should combine different measures and should be more intensive than is currently the practice.
The results of the long-term study on the Eurasian lynx are presented. The reintroduced lynx population in the Bohemian Forest (a border region between the Czech Republic, Bavaria and Austria) was surveyed during last 20 years. Large-scale monitoring system was used to study the distribution and development of the population. An intensive and complex research was pursued since 1996. Radiotelemetry and GPS-GSM telemetry was primarily used to study spatial and temporal activity, macro and microhabitat usage, interaction with the main prey species. The diet composition is known from verified kills, stomach contents of dead animals, scat analyses. Other noninvasive methods has also been applied recently (camera trapping, genetics) for the monitoring of occurrence, individual identification, density estimations, individual life history, reproduction, feeding behaviour. DNA samples were extracted from the tissue, scats, hair, saliva.

With a combination of different methods, the principles of a spatial and social organisation is described. The data from a large-scale monitoring were used to build a rough model of habitat suitability over a large area. Telemetry data enabled a detailed habitat analysis and models on a fine scale level. The results are used for practical implication in species protection and management.
A low availability of invertebrates important in the diet of northern bobwhite (Colinus virginianus) chicks has been suggested as a cause for declining populations on farmland in the Southeastern United States. Here, the diets of chicks foraging in agricultural and native habitats in Georgia were compared. In 2001 and 2002, faecal samples were collected and analysed from nocturnal roost sites of broods on farmland (n = 19) and on a wild-bird shooting plantation with large areas of native habitat (n = 22). Differences in invertebrate composition between the study sites were investigated using compositional analysis. While the diet of chicks on both sites contained similar invertebrate groups, the composition of the diets varied significantly.

Nearly twice as many Coleoptera were found in the diet of chicks foraging within native habitats than those on farmland. On farmland, however, higher numbers of Hemiptera were found in the faecal samples. These data suggest that although the invertebrate diet of chicks differs between the two landscapes, the faecal samples from broods on the farmland site did not lack numbers of important prey items. The use of brood-rearing cover created through an agri-environmental stewardship scheme is probably reflected through these results.
EFFECT OF PREDATION ON THE EUROPEAN RABBIT (*Oryctolagus cuniculus*).

IN FENCED RESTOCKING AREAS

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The European rabbit (*Oryctolagus cuniculus L.*) is considered a keystone species in the mediterranean ecosystems because it is a prey species for many Iberian predators, besides having a great economic importance as a game species. However, several events have led to reductions in rabbit populations in Spain in recent decades. As a result, both hunters and governments have undertaken many actions to improve rabbit populations. Among these actions, the use of translocations has significantly increased. The main problem experienced during the translocations is the short term (7 days) mortality attributed to predation. Therefore predator exclusion fences are made in the restocking plots in recent recovery programs. Fences are permeable to aerial predation and not 100% impervious to land carnivores, however very few experiences have been recording restocking success in fenced plots and little it is known about factors affecting it. The aim of this study was to determinate the effect on restocking success, measures as maximum rabbit abundance in each plot of i) the community of predators and ii) the structural factors such us vegetation, soil or slope.

We carried out a series of sampling: surveys of raptors, carnivorous spotlight counts, camera traps, predator excrement collection on transects and predator captures. Ocurrence of natural warrens was alre recorded. Data were analyzed using Partial Least Square Regression (PLSR). The variables were reduced to 3 components explaining 90% of the variance in the data, showing that the number of natural warrens per hectare, the % of protected warrens and the number of restocking plots in 3 km around were the elements that influenced positively on the maximum abundance of rabbits.
Hybridization and introgression can threaten natural populations, especially when they occur as a consequence of human activities. Populations of wild red-legged partridge (*Alectoris rufa*) have recently declined and the release of farm-reared partridges has become a widespread strategy. Although wild red-legged and chukar partridge (*A. chukar*) do not breed in sympatry, captive red-legged partridges have often been hybridized with chukar partridges to increase their productivity, and hence game releases have spread hybrid birds into the wild. In this study, we investigated the occurrence of hybrids and differences in the fitness (survival and breeding) between hybrid and “pure” red-legged partridges to evaluate the consequences of genetic introgression into a wild population located in central Spain. We captured 115 wild red-legged partridges in late winter/early spring (fieldwork was carried out in February-October 2003-2005), among four game estates (central Spain; 38° 80´ N, 3° 80´ W, 610 m a.s.l.) with three different hunting management policies. To detect introgression, we used 8 diagnostic microsatellite loci and a cytochrome b sequence. We found introgression in 28.7 % wild partridges.

We used generalized linear models. The proportion of hybrids was higher among estates where restocking with farm-reared birds was conducted. Incubation probability was similar in hybrids and “pure” partridges. Hybrid females laid larger clutches than “pure” ones, but hatching success did not differ between hybrid and “pure” partridges. Hybrid birds had lower survival rate than “pure” ones, mainly because of higher predation rates. Our results show that, despite lower survival, hybrid partridges breed in natural populations and confirm a serious risk of genetic contamination of wild pure partridge populations, because of widespread releasing of farmed hybrid birds. Controlling introgression from allochthonous genomes is of vital importance for red-legged partridge long-term conservation.
MAGNETIC ALIGNMENT IN SOME GAME SPECIES

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We observed grazing and resting red and roe deer and analyzed deer beds (n = 2,974 at 241 localities) and demonstrate a tendency to alignment in a roughly north–south direction.

Because wind and light conditions could be excluded as a common denominator determining the body axis orientation, alignment with the magnetic field lines is the most parsimonious explanation. We also show that extremely low-frequency magnetic fields (ELFMFs) generated by high-voltage power lines disrupt this alignment. The disturbing effect of the ELFMFs on body alignment diminished with the distance from conductors. These findings constitute evidence for magnetic sensing in large mammals as well as evidence of an overt behavioral reaction to weak ELFMFs in vertebrates. Red foxes hunting (“mousing”) small animals in high vegetation or under snow where the prey cannot be detected visually rely particularly on hearing. The body orientation of a fox while preparing for a jump was recorded in 592 cases in 95 hunting series in 84 foxes at 65 localities in different habitats. When foxes are hunting in high vegetation and under snow cover, successful attacks are tightly clustered to the north, while attacks in other directions are largely unsuccessful. The direction of attacks was independent of time of the day, season of the year, cloud cover, and wind direction. We suggest that this directional preference represents a case of magnetic alignment and enhances the precision of hunting attacks. Our findings open new horizons for the study of magnetoreception.

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EFFECTS OF HUNTING MANAGEMENT ON THE SUMMER ABUNDANCE OF RED-LEGGED PARTRIDGE IN SPAIN

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We studied whether hunting management techniques currently used in Central Spain affect the summer abundance of red-legged partridge (Alectoris rufa) or the young/adult ratio (as a measure of productivity). We studied 44 non-intensive hunting estates between 2006 and 2009, recording management through personal interviews and using field surveys (point count method) to record partridge abundance and habitat data. We modelled abundance with a mixed model (lmer R function), with “year” as a random variable, and artificial supplementation of food and water, predator control, releasing and harvest intensity as explanatory variables, together with habitat variables (to account for habitat variations among estates). We found a positive relationship between summer partridge abundance and artificial ponds.

We detected no relationship between partridge abundance and fox control, but a significant positive relationship with magpie control (although the effect on partridge abundance was very small). We did not find any relationship between abundance and the releasing of farm-bred partridges. When the young/adult ratio was added as a covariate to the previous model, this variable had a big effect on abundance, the previous relationships with ponds and magpie control remained, and a negative relationship appeared between partridge abundance and harvest intensity. Young/adult ratio was significantly related to artificial ponds and habitat diversity. Our results show that habitat management is crucial to raise red-legged partridge availability in summer, whereas releases and fox control appear to be ineffective.
RESTORATION OF A SUSTAINABLE GREY PARTRIDGE *Perdix perdix* SHOOT IN EASTERN ENGLAND

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Eastern England has been a stronghold for grey partridges *Perdix perdix*. A long history of gamekeeping, light soils and diverse cropping provide favourable conditions for them. In common with the rest of Britain, numbers declined from the 1950’s onwards. On one famous shooting estate, partridges on a 45 km² study area comprising five different game areas (beats) have been monitored by Game & Wildlife Conservation Trust (GWCT) since the 1950’s.

Since 2001 a programme of habitat creation, supplementary feeding and intensive predation control has been undertaken to restore numbers of grey partridges. The main habitats provided include tussocky grass margins, insect-rich foraging cover for chicks and winter game cover which provides shelter and food. Approximately 6% of the farmed area is dedicated to conservation measures which benefit grey partridges. Supplementary wheat grain is provided from mid September until the end of May via small feed hoppers placed along hedgerows. Feeder density is in the region of 50 hoppers/km². The focus of predation control is in the spring, to reduce levels of nest predation. The main predators controlled are foxes *Vulpes vulpes*, (crows *Corvus corone* and magpies *Pica pica*), small mustelids (stoats *Mustela erminea* and weasels *Mustela nivalis*) and rats *Rattus norvegicus*.

Monitoring of the grey partridge stock is undertaken in conjunction with the GWCT and consists of counts in March to assess numbers of breeding pairs, and in late August after harvest to assess breeding success. Numbers of grey partridges have increased dramatically during the course of the restoration period from 4.4 pairs/km² in March 2001 to 58 pairs/km² in March 2011. In the highest density beat there were 88 pairs/km² in March 2011. In autumn, densities of grey partridges have increased from 30 birds per km² in 2001 to 167 birds per km² in 2010. These densities are comparable with those in the 1930’s. In the last three winters, between 1000 and 1600 grey partridges have been harvested and spring stocks continue to increase.
During the second half of the 20th century, the breeding population of grey partridge (*Perdix perdix*) in Switzerland declined from over 10’000 to less than 20 individuals. The Swiss partridge recovery project started in 1991 in two regions, canton of Geneva and Schaffhausen, with focus on species conservation by habitat improvements. Establishing a population for hunting is not a purpose. Due to newly created habitats, mainly wildflower strips, the population of several red-listed target farmland bird species have increased. However, these measures came too late for the grey partridge. From 1998 onwards, projects aiming at the reintroduction of the grey partridge were launched in both areas. Each year, around 100 individuals were released using different techniques with variable success. Since 2008, hundreds of grey partridges are released each year in Geneva in order to test whether higher densities improve survival and breeding success. We constructed a rearing site to hold up to 900 partridges for release.

Artificially-reared chicks were fostered to a captive grey partridge pair in aviaries and subsequently released as family groups in autumn. For political reasons, predator control is not possible in Geneva. The density of reproductive foxes is recorded, and by fencing nests, we will try to increase the breeding success. All released partridges are colour-ringed and 50% are fitted with a radio tag to assess survival and breeding success. First results show that, even with a higher number of released birds, it is difficult to improve the demographic parameters. However, enhanced areas are important habitats for released grey partridges and the conservation of red-listed farmland bird species in general.
Patterns of nest defense against predators by attending adults of many ground-nesting bird species are poorly understood, largely due to a historical inability to directly monitor nests.

Most nest defense studies observed responses elicited from model predators or human observers presented to birds and generally have not attempted to present these events in the context of predator-prey relationships. Generally these studies have focused only on decision-making by the incubating parent (e.g. theories of parental investment, future opportunities, and etc.) with little or no consideration given to predator species or behavior (e.g. threat level of particular predator species to the adult). During 1999-2006 we monitored all predation events \((n = 241)\) from 790 video-monitored Northern Bobwhite \((Colinus virginianus)\) nests. We evaluated parental, predator, daily, and seasonal correlates contributing to patterns of nest defense by bobwhites using a model selection approach. Models including predator type \((PRED)\), and clutch age \((DOI)\), and parent \((AGE)\) were the most influential factor in determining nest defense, including \(PRED+AGE\) \((w = 0.356)\), \(PRED+AGE+DOI\) \((w = 0.161)\), and \(PRED+SEX+AGE\) \((w = 0.139)\). However, model weights of individual parameters suggest that predator type is the most important individual parameter. We propose that nest defense decisions in the bobwhite are a hierarchical process, with the threat posed by the particular predator to the attending adult being the primary cue. This has implications for management of ground nesting species relative to predator communities.
RESTORATION OF A WILD GREY PARTRIDGE SHOOT: A MAJOR DEVELOPMENT IN THE SUSSEX STUDY

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The scientific basis of wild grey partridge management has been known for a generation. This includes controlling nest predators, providing nesting cover, having sufficient insect food for chicks and appropriate rates of shooting. More recently measures such as providing food for adult birds and habitats for protection from birds of prey have been considered important. Habitat provision can be expensive, but in the UK costs can be partially recovered through Agri-environmental Schemes offered through the Department for Environment, Food and Rural Affairs.

The landowner still needs to pay for the essential gamekeeper. Since 2003/04, one part of the Game & Wildlife Conservation Trust's Sussex Study area has put these principles of environmental management into practice with the express aim of restoring a wild grey partridge shoot to this part of Southern England. Results have been impressive, with the spring pair density going from 0.3 pairs per 100 ha in 2003 to nearly 20 pairs per 100 ha in 2010 on an area of nearly 10 km². Over the past two years a wild grey partridge shoot has taken place, and the landowner and his team have been the recipients of several environmental awards for best practice in game conservation. Our talk will focus on the management undertaken and the effect on grey partridge numbers. We shall compare this to the situation across the remainder of the Sussex Study area.
The fragility of many populations of brown hares (*Lepeus europeus*) in Western Europe is a concern for managers, hunters and naturalists. The influence of multiple factors on the survival of its populations and a habitat under a strong competition for space renders conservation efforts particularly difficult. Improving the quality of the habitats is often not enough for the populations to recover. Considering this, we took benefit from the presence of a locally high density population to use wild individuals to restock areas were the species had disappeared or was close to it. Aim of the project was to optimize the translocation methods, to assess the evolution of the spatial behaviour after release using radio-tracking, and to compare the results with the frequently used release of captive reared individuals.

Over 160 wild brown hares were translocated between 2006 and 2009, half of which were fitted with radio collars. In addition, ten individuals were radio-tagged and released back in the source population as a reference. In a preliminary analysis, it appears that most individuals settled down after less than two months and their seasonal home range, once settled, was similar to that observed in the source population, at least for females. Released individuals had the core of their home range usually within 900 m of the release site with extremes at 4.5 km. Mean duration of tracking of the radio-tagged individuals was 186 (±128) days in the reference area, 135 (±116), 119 (±177), and 43 (±49) in the respective target areas. In comparison, of the 8 captive reared hares that were released, 7 died less than 36 hours after release, and the last one after 20 days. The translocation of wild individuals appears thus to give far better results than the commonly used release of captive reared individuals.

Moreover, two years after the last translocation tagged individuals can still be observed, but the majority of the hares present are not tagged, which indicates an existing natural reproduction of the released individuals and of their offspring.
Fallow deer (*Dama dama* L., 1758) although it is a species included in the list of alien species for Polish fauna in many hunting areas it is an important component of game and its role continues to grow. Increase the rank of this species is due to its relatively small environmental requirements and poorly marked fear of human. Thanks to this characters it is an interesting alternative game for hunting areas with high human impact. With the natural growth as well as new introduction of the species, the number of fallow deer increased from around 9,000 individuals in 2000, by 13,000 in 2005 to approximately 23,000 individuals in 2010 in Poland. The hunting bag stood at 2.5 thousands individuals in the 2000/2001 season, 3.3 thousands in season 2005/6 and 5.1 thousands in 2009/10. The largest populations of this species occur in the western Poland. There is also a few areas where there has been no presence of the animal, and it is mainly at the eastern part of Poland.

The paper will present different strategies for introduction of this species, research and the different problems arising in areas of rapid growth of fallow deer population.
IMPORTANCE OF ENVIRONMENTAL VARIABLES AND LANDSCAPE STRUCTURE FOR RABBITS (Sylvilagus floridanus) AND HARES (Lepus californicus) IN SEMIARID ENVIRONMENTS IN MEXICO: GAME PERSPECTIVES FOR MANAGEMENT

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Landscape composition is an important element of habitat requirements for a lot species in the semiarid regions. Lagomorphs have an important role in the ecology in a lot species. Lagomorphs are used as prey for carnivorian species in arid and semiarid environments. Rabbits and hares are key species in extreme environments because provide biomass to another species. Our work tries to describe the importance of the landscape elements and composition in the rabbit and hare distribution in the central part of Mexico. We select the typical arid environment; compose by Opuntia sp. and another vegetation association as Jatropha sp, Acacia sp. and wild grass. We realise a Multicriterian Evaluation (GIS) to discriminate the areas without elements which describe the arid environments. Potential surface to realise surveys is 6,800,000 ha, but we select 94 sampling points to determinate presence absence of rabbits and hares associated to Opuntia sp. Transects have 100 m of length and was made in the matrices of landscape composition. We analyze the data with GLM to obtain niche models.

Our results show strong relationships between the landscape horizontal structure (Opuntia sp.) and hare frequency, whereas with the rabbit abundances, there are relationships with climatic variables and landscape composition (grasslands, chaparral and scrublands).
MORTALITY RATES OF WILD BOAR IN EUROPE AS A TOOL FOR WILD BOAR MANAGEMENT

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In many parts of Europe wild boar Sus scrofa population increase and dispersal into new areas is accompanied by economic problems. Due to underestimation of population densities and reproduction rates harvest rates seem to be insufficient, especially proportions of shot females might be inadequate. Thus, we calculated mortality rates of several wild boar populations, to show the efficiency of hunting within 13 years from studies conducted in 16 different study areas distributed over 8 European states. For calculating mortality rates the daily probability of survival of radio telemetrically observed wild boar were analysed according to Mayfield (1961) for three age classes (0, 1, ≥2 years) and both sexes. Of 872 animals observed by VHF- or GPS-telemetry 228 died during the total observation of 121998 days. The mortality rates of wild boar, especially piglets were low (about 0.5). About three third of all observed animals survived at least until the next period of reproduction.

The sex ratio of the shot piglets equals the sex ratio of captured piglets, there seems to be no sex biased hunting in this age class. Shooting was the main cause of death, only very few animals died by natural causes, e.g. diseases. The comparative analysis of all studies reflects a low mortality of wild boar in highly productive populations. Our results certified the findings of several studies that predation, natural mortality and road mortality have only small impact on wild boar populations, whereas especially nutrition or hunting are mainly decisive. In consequence of high reproductive rates (≥250%) 80% of the summer population has to be harvested. In all our studies mortality rates, and thus, harvest rates are less than the total net reproduction. Especially the harvest rate of piglets seems to be insufficient. Thus, the population will increase further. High reproduction has to be counteracted by regulating mainly the reproductive animals.

For regulating a population combined and effective hunting methods have to be conducted to harvest at least the net reproduction. Thus, we recommend higher hunting rates of piglets (80 % of the offspring should be harvested) and of adult females. Intensified hunting of piglets by drive hunts and at an early age as well as intensified single hunt on adult females might help regulating wild boar populations.
FURTHER IMPROVEMENT OF THE METHOD "BORN TO BE FREE" AND OBSERVATION FOR LYNX REINTRODUCTION TO THE PISKA PRIMEVAL FOREST

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At Poland lynx is a species in the Red Data Book. Its population is estimate on about 200 specimens. Lynx existed mainly in the Karpaty Mountains as well as in the north-east part of Poland. The lowland population is more endangered. The aim of experiments is reintroduction the lowland lynx to the Piska Primeval Forest, where it existed not far ago. Since in the Polish zoological gardens were only karpatien lynxes or karpatien-scandinavian ones, according to the rule of IUCN, it was taken the decision to import some lowland lynxes from Minsk ZOO (Belarus). The animals originated from non-relative parents.

The first specimens were released in 2004. The preliminary observations on progress of reintroduction were presented on Congress IUGB in Uppsala in 2007. 2011 is the eighth year of reintroduction. Totally 12 lynxes were released into nature, 11 of them using the new developed method “Born to be free”, and one using the similar to traditional one. A rich documentary material was collected concerning behavior of lynxes at the first year of their lives, while the young cubs kept the contact with their mothers. In 2008 it was found, that some-month-old cub was accompanying by the elder siblings. It should be noted, that such phenomenon was known only in bears and wolves - it is “a guardian”. More detailed observations showed, that some-month-old lynx was walking with the elder sibling some days not coming to mother at that time.

The food for young cubs was given even about 1 km from the enclosure with mother. In the spring the young lynxes come to food rare and rare and stopped using it, in spite the food is still given. In the last two years, it was noted that mesopredators do not use the given food and rather avoid these places. The observations show, that on the area where lynx exist; e.g. near the enclosure or at the place of giving roe or red deer carcass, the mesopredators (like fox, raccoon dog and marten) do not use this food.

However, at places of giving food, not visited by lynxes, these animals were monitored. These results confirm the Finnish data, that presence of lynx can limited the mesopredators populations. It was observed, that young lynx near food grazed with whiskers the carcass, as well as stems of neighbouring trees, probably protect this area against other predators. It was confirmed by photo-traps. Since the introduced lynxes originated from there individuals, some attempts of mating captive females with the wild males was taken. The preliminary observations suggest, that these recent experiments can be used for isolated lynx populations, where lack of ecological corridors inhibit gene exchange by natural dispersion.
NATAL DISPERSAL BEHAVIOUR IN EUROPEAN HARE (*Lepus europaeus*)

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Dispersal is a key parameter in animal population dynamics. We studied natal dispersal in hare in two populations of France differing by the type of landscape (mixed farming or intensive agriculture) and the density (medium or high: 23 vs. 41 hares/km²). The objectives were to describe movement patterns, to assess dispersal and survival rates, and to test the effect of density and of hunting. We studied natal dispersal by radio-tracking juvenile hares (*n* = 84 and 87). Dispersal behaviour was determined by examination of individual movement patterns (stationary, explorer, shifter, one-way), and dispersal and survival rates were modelled using a multi-state analysis. The maximum distance moved was 17 km, and the dispersal rates were 43% and 34% respectively. In both populations, dispersal mainly occurred before the age of 6 months, and it was male-biased: Males dispersed twice more than females. However, females moved over longer distances. We did not detect a clear effect of population density on dispersal departure rate, whereas, about settlement rate, dispersing hares tended to move into densely occupied areas.

When considering the concurrent survival probability, we showed that dispersing juveniles suffer from a considerably higher mortality rate during transience compared to philopatric juveniles, due to both hunting and predation. Beside, hunting seems to increase the probability of dispersal departure. But hunting also promotes temporary departure behaviour. These explorations occurred later in the season than natal dispersal, and more during the hunting period and the mating season. Moreover, contrary to natal dispersal, the exploration behaviour was not male-biased. Natal dispersal appears to be a rather frequent and ubiquitous feature in hare. However, hunting may affect dispersal success and movement behaviour.
The purpose of the present work was to evaluate the effectiveness of selective predator control as a method to improve the survival of red-legged partridges (*Alectoris rufa*). The study was carried out during 2008 and 2009 in two hunting estates of Navarra (northern Spain), where two treatment zones were considered depending on the predator control. Red foxes (*Vulpes vulpes*) were selectively controlled during the first year in one of the zones (“predator control zone”, hereinafter PC Zone), while no control was applied in the other zone (“not predator control zone”, hereinafter NPC Zone). In 2009, treatments were inverted between zones.

We radio-tracked 89 adult partridges in all study areas, which allowed us to locate 45 partridge nests and 31 broods. We captured and radio-equipped 108 partridge chicks of two different ages: 46 chicks few days after hatching and 62 chicks over one-month old. We estimated the effect of predator control on the survival rates of adult partridges, their nests and their chicks using program MARK 4.0. According to Akaike information criterion, predator control was not included in the preferred models of adult and nest survival rates. Although predator control was not included in the preferred models explaining survival rates of youngest chicks, estimated survival rate was slightly higher in the PC than in the NPC zones. Contrarily, predator control improved survival rates for one month old chicks, and it was included as a factor of the most preferred models. Consequently, predator control did not improve survival rates for adult and nesting partridges, but it improved chick survival, especially for chicks over one month old.
BEAVER DISTURBANCE INCREASES DIVERSITY IN WATERBIRD COMMUNITIES

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We studied the keystone effect of ecosystem engineer, beaver Castor canadensis, on a waterbird assembly of seven waders and ducks in boreal ponds. The study took place in southern Finland in 1988–2009. Ducks and waders were censused four times during the breeding season. On the course of the study period, natural experiments were created as beavers caused disturbance by flooding 14 forest ponds. For each flooded pond, there was one non-flooded pond as a control. Upon two first years of beaver flooding, all seven species of the study increased although some of them to a lesser extent. In control ponds changes in diversity were negligible.

The number of waterbird species per pond per year was clearly higher during beaver inundation (mean = 1,48) than before the beaver (0,43), and so was the number of observations per census (0,80 vs 0,14). Similarly, within waders the number of species was higher during flooding than before (1,16 vs 0,38) as was the number of territories per census (0,43 vs 0,13). The same pattern was found in ducks: the number of species was higher during beaver occupancy than before it (1,80 vs 0,50), and more duck observations were made during beaver flooding than before the flood (1,17 vs 0,15). Teal Anas crecca and green sandpiper Tringa ochropus showed numerically the most positive response upon flooding. Mallard A. platyrhynchos and wigeon A. penelope were new species entering the duck guild in the beaver affected wetland patches. From the waterbird perspective, the beaver disturbance seemed intermediate in intensity which led not only to increased number of species but also to a higher abundance. For many of the bird species, the beaver seemed to act as a facilitator by modificating the habitat to a more favourable state.
Wild boar is an autochthonous animal species of the Czech Republic that has significantly increased its population density in recent years. There are concerns that there is an associated negative impact upon agricultural crop production however, objective methods for sustainable management of wild boar, especially for estimation of its population density and intensity of regulation are still lacking. Wild boar differs markedly from the other free-living ungulates in its spatial activity and food selection, which limits applicability of the experiences and methods used for other species. Two methods of wild boar population censusing in a forest environment were tested in this study.

The density of wild boar was evaluated in an area of 2,256 ha, circumscribed by both natural and man-made barriers that restrict wild boar migration. Wild boar abundance was estimated using traditional dung count and photo trapping data analysis. Both field methods were used in the winter-spring season 2009 – 2010. Wild boar abundance as assessed by dung count was 6.1 ind./km² and by phototrapping 6.8 ind./km². The results have revealed that if correctly performed, both of the tested methods are applicable to estimate wild boar abundance. Photo trapping seems to be more accurate; it requires special equipment and is time-consuming, however, it provides additional information on the structure of the population and requires less experience to undertake. Combination of several methods is advisable.
FACTORS INFLUENCING ANTIBODY PREVALENCE AGAINST MYXOMATOSIS

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Myxomatosis is a viral disease that drastically decimated wild rabbit (Oryctolagus cuniculus) populations in Spain during the 50’s. This disease still affects the Spanish rabbit populations, although its incidence at large scale is poorly understood. The main goal of this study was to characterize myxomatosis in relation to the immunological status of rabbit populations distributed throughout Spain. Antibodies against the myxoma virus were determined using an immunoassay (ELISA) to a total of 753 rabbits sampled between 2003 and 2009 in 45 different locations. The effect of several variables, including animal age, rabbit abundance, and genetic differentiation of rabbit population (there are two different subspecies of rabbits in Spain), on the antibody prevalence against myxomatosis was tested using a GLM. Over half (52%) of the samples presented protective antibodies. Moreover, the proportion of juveniles and population abundance were identified to be the most important factors influencing the antibody prevalence against myxomatosis (negative and positive effect, respectively). GLM analysis did not found a genetic effect on the prevalence of antibodies. These results reinforce the observation that myxomatosis is an endemic disease in Spain, and call for the need of a higher number of epidemiological studies that identify the different types of immunoglobulins to confirm whether the loss of maternal antibodies found in this study is real or not.

Finally, these finding suggests that prevalence of antibodies of hunted rabbits and a simple analysis of abundance, may be a useful surveillance protocol to predict the effect of myxomatosis in Spain.
The aim of this study is to develop different parameters (density, extraction rate, trends) for decision-making and management approaches of Environmental Administration from the analysis of the hunted specimen data in Andalusia (87,504 km²), and to characterize and optimize the harnessing from the perspective of sustainability and environmental conservation.

We used more than 400,000 records reported by almost 7,500 owners of hunting grounds (which account for 80.9% of the area) between 2002 and 2010, in which the number of harvested animals by species, year and hunting’s method is specified. Using basic statistical analysis by global area and homogeneous hunting areas, we’ve estimated population parameters relative to the abundance, hunting yield and extraction rate of each species, both annual average and the time trend.

Hunting yield data assess the importance of harness of each species and by comparison with the inventory data we can deduce the different extraction rates. The zoning for homogeneous hunting areas, using superposition with habitat suitability coverage for main species, allows the detection of the best areas and sets optimal levels of harvesting, as well as the location of areas that have lower or higher yield than the potential and the identification of their causes and consequences. The trend of yields in recent years indicates the degree of populations stability of each species, allows to measure its growth or decline, and thus detecting alarming situations to anticipate for the future with appropriate management criteria.

The big game species show a general increase. Red deer stands out as the species of big game with higher hunting yield, despite a slight decline in recent years, but generally is expanding, particularly in the Andévalo (Huelva). There is a general negative trend in yields of small game, despite being high. We can detect soft growth in pigeons and European turtle doves, or local rabbit population increases (mainly in countryside areas) and a generalized decrease of red-legged partridge.
The reproductive parameters of a wild boar population located in a flat area with a mosaic of cropland and wetland habitats were analysed and compared with those observed in wild boar populations living in forested mountain habitats. A total of 296 reproductive tracts (uterus and ovaries) of females captured all around the year at the Aiguamolls de l’Empordà Natural Park were collected and analysed from 2000 to 2010. The embryos and foetuses were counted, sexed and aged and the mating and birth periods were determined. The weight and age of each female was also registered. Fifty-two per cent of the total females analyzed were pregnant. Pregnant females were registered at all times of the year except in July (but the sample size for this month was very small). Nevertheless, in accordance with the pattern observed in most European populations, a marked main mating season was observed from October to January, with a peak during November and December in which 81% of the conception dates fell. A mean litter size of 5.1 ± 0.18 (range from 2 to 8) embryos or foetuses per litter was registered, which is the highest known value recorded in wild Iberian populations with no supplementary feeding. In forest populations from the same region (Montseny and Garrotxa), a lower litter size (4.1 foetuses per litter) was observed. Furthermore, the fecundity was lower and the intrauterine mortality was higher in these populations than in that of l’Empordà. The most likely explanation for the high productivity observed in Aiguamolls de l’Empordà is the high availability of food all around the year, and especially the high consumption of crop plants (particularly maize and sunflower) that make up 37% of the wild boar’s annual diet and around 67% of the elements consumed during the summer. These results suggest that the colonisation of flat cropland areas and the increase in consumption of cultivated plants is contributing to the increase in the wild boar’s litter size and consequently to the rise in its population density.
EFFECT OF SUPPLEMENTARY FEEDING ON SURVIVAL AND BREEDING SUCCESS OF WILD PHEASANTS

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The aim of this study was to test the possibility to enhance natural productivity of wild pheasant *Phasianus colchicus* populations through supplementary spring feeding in areas where this species has declined as a consequence of the arable habitat changes. The study was carried out in a game reserve of 1,000 ha in the province of Pisa (central Tuscany, Italy) from 2008 to 2010. Inside the game reserve, an area of about 200 ha had supplementary feeding from February to June using 30 feeders that were regularly refilled with corn whereas another area of the same size was used as a control. The two areas were located along parallel valleys at about 250 m from each other. In 2009 and 2010 we inverted the areas to reduce the effect of environmental variables. In each area, four successive counts at dawn or dusk gave a reliable estimate of territorial male density and an index of female density. Pheasant broods were counted 4 times between July and August along standardized roadsides bordering fields.

In addition a total of 77 hens were captured and fitted with necklace radio transmitters (40 in the experimental areas and 37 in the control areas) and located with a receiver from March to August in order to evaluate survival and reproduction.

Cock density was higher in fed areas (16.3 km⁻²) compared to unfed areas (11.9 km⁻²) as well as the numbers of hens per cock (1.7 ± 0.79 vs 1.3 ± 0.63 p<0.01). Brood density was higher in fed areas (7.2 km⁻²) compared to unfed areas (3.9 km⁻²) as well as broods sizes (4.8 ± 2.32 vs 2.8 ± 1.72 p< 0.01). Survival of hens released in fed areas was 40% vs 29.7% in unfed areas. Radio tagged hens released in unfed areas were not able to reproduce successfully whereas 17.5% of hen released in fed areas produced broods.

Supplementary spring feeding seems benefit wild pheasant populations. However the high mortality due to mammals predation of radiotagged hens registered especially in 2009 and 2010, suggests that this practice may be not sufficient to counter the pheasant decline in areas with high predation pressures.
The results of the most recent Irish red grouse (Lagopus lagopus hibernicus) survey indicate that the population in the Republic of Ireland is just over 4,200 birds (average 1.1 per 1 km square surveyed). This suggests a 50 percent decline in range in the last 40 years. Recent genetic research also suggests that the Irish race of red grouse (hibernicus) is genetically different from (scoticus) and that a significant percentage of the population in Ireland is genetically bottlenecked and in serious risk of extinction. Using a local game hunting club (Glenfarne Gun Club, North West Ireland) red grouse project as a case study, this paper describes how red grouse populations can be effectively managed in an Irish context. The paper discusses the various management strategies utilised by Glenfarne Gun Club to increase the local red grouse population. These include heather management, predator control, disturbance control, implementation of sustainable hunting, improving public awareness and population monitoring. Various human dimensions of red grouse management in Ireland, which include complex issues relating to land ownership and state regulation, are also discussed. Since 2007, monitoring through the use of tape lure surveys, early morning call counts and dog counts have shown a three-fold increase in the red grouse population on the project site.

The paper concludes by presenting recommendations for a national strategy to restore red grouse in Ireland, with the assistance of Ireland’s largest game hunting organisation, the National Association of Regional Game Councils. These include creating a targeted red grouse species action plan in Ireland, continued monitoring of populations in key areas and facilitating the maintenance and improvement of habitat quality.
The work purpose is to determine the influence degree of the number of wolves (*Canis lupus*) on wild ungulate populations. The research methods are field, statistical, questionnaire. Wolf occupies almost all the territory of the Amur region, except the south of the Zeya-Bureya plains. The number of predators is growing throughout last years. In 2006, the wolf population was about 890 individuals, and reached 2,224 individuals in 2010. The widespread argument against the wolf is - with increasing numbers of predators reduced the number of ungulates. It is true only in cases it constantly cooperates with only one species or adverse factors for ungulates contribute to its successful hunting. The complete or almost complete extermination of wolves has not always been a cause of their victims' growth. Sharp decrease in number of ungulates is promoted by a deep snow cover and ice-crust, which prevents the mobility. In such circumstances wolves extracted animals freely. Within the extensive area wolf lives with several types of ungulates in some areas, and in others –with only one. In the first and second case the ratio of the predator with his prey is different. Comparing the graphs of wild ungulates and wolves over the past five years, we can conclude that with an increase in wolf population in the Amur region, the number of ungulates varies slightly.

With increasing number of wolves, populations of deer (*Cervus elaphus*) and roe deer (*Capreolus pygargus* Pall) had not declined by more than 20% by 2008, but their numbers began to increase again in the following years. Populations of elk (*Alces alces*) had been raising or decreasing by 4% since 2007 every year. Increased number of wolves is a limiting factor in the rising number of ungulates. If we take into account the state of abiotic and anthropogenic factors, the objectivity of the wolf predation will increase.
Spatio-temporal co-occurrence of three ungulate species living in sympatry was investigated in a Mediterranean environment: one native, the Iberian red deer (*Cervus elaphus hispanicus*), and two exotics, the European mouflon (*Ovis orientalis musimon*) and the aoudad (*Ammotragus lervia*). The aim of the study was to infer any potential interspecific competition. All possible pairs of combinations (dyads) were considered. In order to compare the probability of species co-occurrence, multiple tests of significance for all 2 by 2 combinations were performed using a Pearson’s chi-square test. Logistic regression models were used to estimate the effects of the reproductive period, habitat, and several group attributes on co-occurrence patterns for each dyad. The probability of co-occurrence varied between dyads, and it was not always explained by random associations according to species abundance.

Aoudad groups thus co-occur with mouflon groups at a higher rate than expected by random. Habitat type was the most important variable explaining co-occurrence of red deer with the other two species, mainly mouflon. This variable did not influence, however, co-occurrence of aoudad and mouflon. Among the hypotheses proposed to explain aoudad association behaviour with the other two species, competitive displacement by red deer in the past and improvements in foraging efficiency due to its association with mouflon appeared to be the most feasible explanations. As for mouflon and red deer, direct interactions might be expected at artificial food and water sources as well as resource competition under food shortage conditions in habitats preferred by both species.
Numerous studies describing behaviour in the grey partridge focus on the daytime. This is the first study analysing night-time behaviour in winter and comparing it with common knowledge on their day-time behaviour especially in respect to predator avoidance. For night-time detection of grey partridges and observation of their roosting and flight behaviour a handheld infrared thermal camera was used. To analyse the strength of the relationship between two variables the Kendall Tau-b test was used for non-parametric variables and Pearson Product Moment Correlations were used for parametric variables. For calculating multiple logistic regressions in SAS 9.1.3 the procedure ‘logistic’ was used; for all other analyses SPSS 15.0 was used. On average a 5 h survey was conducted per night during which approx. 150–400 ha could be scanned for roosting partridges. A total of 640 partridges in 102 coveys were detected and approached during 85 scanning hours. Flight initiation distance averaged 22.8 m and the flight distance 155.6 m. All detected coveys were clearly avoiding field boundaries as roosting sites to roost in the open field. Comparing day- and night-time behaviour of partridges they not only perceive a ‘predation risk landscape’ but moreover a ‘predation risk schedule’ resulting in a circadian shift in anti-predation strategies. Furthermore, partridges were ascertained to roost in tighter groupings on darker nights. I hypothesize that the efficiency of visual detection decreases with deteriorating light conditions – confirmed by a decreasing flight initiation distance – and partridges huddle closer together fearing such an insecure situation. The preference to roost in smaller subunits within one covey is explained by a more efficient predator detection compared to tight groupings. In contrast to the day-time behaviour, at night the first choice as an escape movement is flying. Altogether partridge behaviour in winter at night was found to be well adapted to predator avoidance and energy economy.
POPULATION GENETIC STRUCTURE OF WILD BOARS IN THE WEST BALKAN REGION


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Objectives: Western Balkans represents one of the most important European genetic reservoirs of game species, such as wild boar. Management of these genetic resources need a detailed description of the variability represented by different populations and integration of these data with their dynamics for a fruitful economic exploitation and sustainability. Genetic diversity and population structure of wild boars in the West Balkan region are not well known. With the aim to estimate the population genetic structure, we analysed a sample of wild boars from Vojvodina (Serbia), Slavonija (Croatia) and Bosnia using four microsatellite markers.

Methods: Total of 134 muscle tissue samples from different hunting areas across Vojvodina, Slavonija and Bosnia were collected. The sample included individuals of both sexes and different age classes. Four microsatellite loci, previously shown as high polymorphic in wild boar populations, were selected. GENEPOP version 3.4 was used to calculate basic genetic parameters and the exact Hardy-Weinberg equilibrium test was carried out.

Results: All loci presented a high degree of polymorphism and a total of 76 alleles (mean 19 alleles per locus) were detected. Average observed heterozygosity (Ho) value was 0.615. Deviation from Hardy-Weinberg equilibrium was found due to significant heterozygote deficiency detected for three of the four analyzed loci and for all populations. FIS value over all loci and all populations was 0.2954, and the effective number of migrants based on private alleles was 1.64.

Conclusion: Based on this analysis, we concluded that genetic diversity within the Western Balkans wild boar populations is comparable to the values found in other European wild boar populations. Sufficient levels of gene flow were found between all populations and the spatial structure derived from statistical analyses of genetic data showed slightly closer nuclear gene pool affinity of Vojvodina and Slavonija populations in relation of Bosnia population, which are shown as independent branch. This could be explained by the fact that there are higher amount of gene flow between Vojvodina and Slavonija populations, which are also geographically closer.
The Red-legged partridge (*Alectoris rufa*) is one of the most representative farmland species in Spain. During the last years, an important negative trend has been observed across their entire distribution. Habitat simplification has been proposed as one of the main factors causing this decline. However, studies evaluating the specific role of each habitat element are scarcely available.

The aim of this work was to study the habitat selection, survival rate, causes of death and nest location and success of 74 radio-tracked wild red-legged partridges in three hunting areas from Navarra (northern Iberian Peninsula). These areas represent a gradient from well preserved to highly simplified areas.

Barley and wheat crops were negatively selected in the Compositional Analysis whereas vineyard, shrubland and almond-trees were positively selected. The Kaplan Meier Survival rate decreased significantly with the reduction of edge density and land-use diversity. Red fox (*Vulpes vulpes*) predation was the main cause of death (26% of marked birds). The nest viability was higher along edge habitats (100%) compared to shrubland (75%) or cereal crops (30%). Agriculture practices and red fox predation were the main causes of nest lost (46 and 27% respectively).

Our results show that restoring land edges and land-use diversity is needed to assure viability of this farmland species in a medium or long-term.
Lynx are individually identifiable by their unique coat patterns, making them ideal candidates for capture-recapture surveys. In winter 2009/2010 we installed two opposing digital cameras on 56 sites based on a systematic grid of 2.7 km in the area of Bavarian Forest National Park (BFNP) and the adjacent Šumava National Park (SNP) forming a study area of 695 km². We took pictures of ten independent lynx, eight juvenile lynx and six unknown lynx. We estimated density with camera trapping data using the MMDM (Mean Maximum Distance Moved) method resulting in a reference area of 1170 km². The estimated density produced a span of 0.85/ ind. per 100 km² (independent included) and 1.37/ ind. per 100 km² (independent & unknown included). The combined camera-trapping session of BFNP and SNP was repeated on more than 700 km² in winter 2010/2011. This will enable us to reduce the uncertainties of the lynx density estimation because of recaptured individuals from the previous session.

Our goal is to optimise data analysis of population models regarding individual and seasonal capture probabilities. The data gathering in a greater spatial extend ensures higher statistical power regarding the accuracy of abundance and density estimates.
BAIT-UPTAKE OF RED FOXES (*Vulpes vulpes*) DEPENDING ON HABITAT-QUALITY AND COMPETITION IN URBAN AREAS

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The red fox (*Vulpes vulpes*) is one of the most successful species that occupied cities and their suburbs during the last decades. Foxes are known to be frequently infected with *Echinococcus multilocularis* even in urban areas, attention needs to be focused on these populations regarding the development of control strategies. To optimise the bait-uptake-rate of praziquantel containing baits a camera-trap-study was done in the years 2007 and 2008 in the city of Herrsching (Germany).

Possible competitors for bait-uptake and the bait-uptake rate of foxes were investigated. Also the frequency of foxes turning up in relation to centre or the outskirts of cities and the habitat-qualities of the gardens were examined. After categorising of the gardens according to the quality for foxes and the distance to the outskirts of the city camera traps were placed for nine nights in a row, after every third night the bait was replaced.

The frequency of foxes filmed by the trap was lower to the centre of the city than in the outskirts of the town. In the gardens with low habitat-quality no foxes were filmed and the time of bait uptake was markedly higher. 44.4% of the baits removed were taken by foxes. If the bait was still lying in front of the camera trap when the fox arrived, it was taken by the fox in 75.8% of the cases. Major bait competitors are hedgehogs, which can be avoided by placing the baits higher, for example on the top of compost heaps. Also hedgehogs are seasonally bait competitors because they do not occur in winter. Rodents mainly carried the baits away, so the baits stayed in the system and cats didn’t take the baits at all. With taking the bait competitors and the quality of the gardens into account, effective baiting strategies against the small fox tapeworm can be optimised.
Wildlife law and policy
A controversial issue in nature and wildlife conservation, for example in protected areas, concerns the question of how to manage hunting practices. The classical and widespread type of protected area in Germany is based on administrative acts that define “dos and don’ts” in relation to human activities for every area. However, these rules are often not accepted by local stakeholders, leading to regulatory inefficiency in achieving the objectives of nature protection. This raises the question of how the administrative efficiency can be improved. The study investigated the shortcomings of the current regulatory practices with regard to hunting regulations in protected areas.

For this purpose the content of 800 administrative acts was reviewed and analysed using content analysis and statistical procedures. Additionally 26 qualitative interviews with relevant actors were conducted and protocols of selected controversial proceedings were examined.

Analysis was based on the “regulatory arrangement approach”, a policy instrument choice theory which helps to evaluate the appropriateness of policy instruments. The results show that, throughout the course of the last 30 years, regulations for hunting increased considerably. At the same time, monitoring of these is minimal, due to the restricted personnel capacities of the agencies in charge. Furthermore, communication among the concerned administrative sections as well as between administration and local stakeholders was perceived to be slow and insufficient. Effectiveness would therefore be improved through the integration of a more cooperative (i.e. less “regulatory”) and informative policy style both in the course of the proceedings as well as in the application of the administrative acts. This requires conceptual learning by all actors involved.
At the end of the 1980s Swiss agriculture was frequently the subject of bad publicity. The agricultural sector was accused of producing too much, generating excessive costs, clearing out the countryside, polluting the environment and affecting biodiversity negatively. This pressure led to a major agricultural reform programme that was launched in 1993 with the introduction of supplementary and ecological direct payments.

Against this background the Swiss Agency for the Environment mandated in 1991 the Swiss Ornithological Institute with a long term programme to support the breeding bird species of open farmland, in particular the grey partridge, as well as the brown hare, and to acquire practical experience with the application of the agri-environmental schemes. In the last 20 years the habitat in two study areas in the Cantons Schaffhausen and Geneva has been successfully improved. The areas became model regions for evaluating the agri-environmental schemes of Swiss agro-policy. Many species benefited from the habitat restoration.

However, despite some locally successful initiatives the policy reforms of the 1990s have not been able to solve the most pressing environmental problems caused by agriculture. The national government is currently taking steps towards new policy reforms. Changes to the direct payment system are on debate and goal-oriented incentive payments on focus. Furthermore, the Swiss food industry realised that biodiversity can be an important added value for Swiss agricultural products in order to increase the economic value on an embattled market. In 2008 the biggest Swiss retailer together with the farmer organisation “IP-Suisse” and in close collaboration with the Swiss Ornithological Institute, launched a programme to benefit biodiversity on farms. Farmers who will sell their products under the Label of the farmer organisation IP-Suisse have to achieve defined criteria for biodiversity measured by a point system. This market incentive is influencing the strategy of the presently debated agricultural policy reform.
A CONTRIBUTION TO THE CURRENT DEBATE ON THE IMPROVEMENT OF HUNTING STATISTICS: THE CASE OF SPAIN

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Hunting is assuming a growing role in the current European forestry and agroforestry landscape. However, consistent statistical sources that provide quantitative information for policy-making, planning and management of game resources are often lacking. Recently, the European Commission has declared the importance of high quality hunting bag statistics and the need to set up a common scheme in Europe for their collection, interpretation and proper use.

This work aims to contribute to this current debate on hunting statistics in Europe by exploring data from the last 35 years of Spanish hunting statistics. It extends the analysis of hunting statistics to the three major pillars underpinning hunting activity: hunters, hunting grounds and game animals. Our results indicate that official hunting statistics can be incomplete, dispersed and not always homogeneous over a long period of time. This is an issue of which one should be aware when using official hunting data for scientific or technical work to avoid misinterpretations and inadequate conclusions. Some examples are provided.
LEAD SHOT BAN COMPLIANCE IN SPANISH WETLANDS: EFFECTS ON PB POISONING PREVALENCE

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The prevalence of lead (Pb) shot ingestion in waterfowl hunted in Spanish wetlands around the Mediterranean coast during the 1990s was as high as 30-39 % in mallard (Anas platyrhynchos), 69 % in common pochard (Aythya ferina) and 74 % in northern pintail (Anas acuta).

Lead shot use was banned in protected wetlands in Spain in 2001, however, this was not fully implemented in the Ebro delta until 2003. Here, we show results for three hunting seasons (2007-2010) where shot wintering waterfowl (n = 454) from this wetland were monitored. The type of embedded shot present in hunted birds was studied by X-ray and dissection. The prevalence of Pb shot ingestion was studied by gizzard examination. Ban compliance was relatively low in 2007-08, i.e., 26.9% of birds had embedded Pb shot, 10.6% had Pb and steel shot, 48.8 % had steel shot, and 13.8 % had no shot. After these results were produced, the ban was reinforced and compliance subsequently increased (to 1.7%, 8.2%, 74.1% and 16.0%, respectively). The prevalence of Pb shot ingestion in mallards in 2007-08 (28.6%) was comparable to the pre-ban prevalence (30.2%), but, it was significantly higher than in subsequent seasons (in 2008-09: 5.1%; in 2009-10: 13.8%). In the last year of the study, a significant proportion of birds still had embedded Pb shot and/or ingested Pb shot in their gizzards.

This may be because the ban was not implemented in unprotected rice fields, where the majority of ducks often feed. By extending the ban to all waterfowl hunting (not only that undertaken in protected wetlands) the risk of Pb poisoning in waterfowl can be greatly reduced.
ARE FARM-REAURED RESTOCKED QUAILS REALLY COMMON QUAILS (*Coturnix coturnix*)?
A GENETIC APPROACH

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The Common quail (*Coturnix coturnix*) is a popular game species in Spain whose populations show strong inter-annual fluctuations, and restocking with farm-reared individuals is common in some areas. The genetic identity of these individuals is not clear, which arouses suspicion about their possible hybrid origin with the domestic Japanese quail (*Coturnix japonica*). Several studies have claimed that hybridisation between the Common quail and the domestic Japanese quail entails a potential threat to the species. Restocking has been declared illegal in some European countries; in Spain, local authorities are required by law to ensure that restocked individuals are native species, but no attempt has been made to identify them genetically.

The aim of this study is to identify the genetic origin of individuals reared in a sample of four commercial farms in Spain for hunting purposes, and to establish a genetic methodology that could be used by the authorities for this purpose.

We analysed the nuclear DNA (using 12 microsatellites) of 52 individuals from the four farms, together with 19 quails from an experimental strain that stemmed twenty years ago from a hybrid breed which has been systematically backcrossed every breeding season with Common quail individuals; the latter were used to test the power of the methodology. The information from the nuclear DNA was complemented with mitochondrial DNA analysis performed in previous studies on two of these breeds. Results show that 73% of the commercial farm-reared individuals are F2 between Common and Japanese quail, only two individuals were similar to Common quail (3.8%), one was similar to Japanese quail (1.9%) and the remaining 21.15% were hybrids whose inheritance cannot be determined exactly; on the other hand, the hybrid origin of the experimental farm individuals was detected by the mitochondrial DNA analysis, while their nuclear DNA was strongly similar to Common quail. We conclude that individuals sold for hunting purposes in these farms were not Common quail, and that genetic monitoring of the quails raised on farms for restocking is indispensable for the conservation of the native Common quail.
CONTRIBUTION OF GREEK HUNTING ASSOCIATIONS TO LAW ENFORCEMENT FOR THE WILDLIFE PROTECTION

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Hunting Associations in Greece have created a Game-warden Body for illegal hunting control and wildlife protection. These Game-wardens have fully interrogative rights for the control of hunters and they file criminal charges, in any case they justify any infringement of the Hunting Law. The objective of this research is to present, evaluate and strengthen the contribution of game-warden in wildlife protection. The presence of the Game-warden body of hunting organisations carries out repressive and preventive control at poaching, as it is proved by the reduction of infringements, even though the number of hunters’ controls has been increased.

It must be mentioned that game-warden cost (salaries, vehicles and other equipment, operational cost) is totally and only covered by the voluntary payment of the Greek hunters, through their hunting associations. An analysis of the hunting infringements was made using applied statistics techniques in order to classify them in the significant degree of influencing wildlife protection. It was examined the correlation between law enforcement and infringement categories, and this was combined with hunter awareness, hunter information, hunting law applicability as well as with the percentage of infringement concerning the game species, the non-hunting species, the hunting techniques and other characteristics of hunting activity.

The presentation of benefits from the game-warden operation will aid to undertake actions and initiatives for improving enforcement about hunting legislative framework and applying proper communications campaigns for the information of the hunters.
Numerous times since the 1970s have central European conservationists failed to re-stock and stabilise threatened populations of grouse by releasing captive-bred or translocated birds. Recently, with increased awareness of low genetic variability in remnant populations, restocking re-gained attention as a grouse restoration measure: release of a few successful breeders might eliminate inbreeding depression and enable population growth. In the Rhön, Germany, a 3300 ha upland area renowned for its open cultural landscape, black grouse *Tetrao tetrix* have long been a symbol of nature conservation. As elsewhere, the population crashed in the 1970s. Major efforts went into measures such as habitat improvement, predator control, and reduction of human disturbance. When in 2008 numbers of displaying cocks were down to <10 and genetic variability was shown to be reduced, state authorities considered translocation as last resort to prevent extinction.

A key question was whether a translocation would be justifiable according to the IUCN Re-introductions Guidelines, which emphasise that the causal factors leading to extinction should have been ameliorated sufficiently to allow establishment of a viable population. I will use the case of the Rhön black grouse to demonstrate application of the IUCN Re-introductions Guidelines in management. I illustrate the challenges of assessing habitat capacity and population viability based on fragmentary data and discuss the practical value of the guidelines in the political decision making process for, or against, restocking: they force managers to ask the right questions and thereby contribute to the clarification of data gaps, to outline key assumptions and limiting factors, and to prioritise conservation actions.
CONTROL OF RELEASES OF FARmed GAME BIRDS IN GREECE BASED ON GENETic TESTS

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We review current knowledge regarding the genetic structure and the control of the releases regarding some Greek game species. According to the decision “Stocking of biotopes with game animals”, by the Greek Ministry of Environment, the release of farmed game animals is permitted only if these are suitable for the biotope; suitability is based on health/veterinarian tests as well as genetic analyses to certify their endemism.

This requires accurate genetic tests based on pre-existing information. Using different sets of mitochondrial and microsatellite markers the genetic variation and structure of four game birds i.e. rock partridge (Alectoris graeca), chukar partridge (Alectoris chukar), grey partridge (Perdix perdix) and pheasant (Phasianus colchicus) have been studied so far. More than 500 samples of both wild and farmed origin around Greece were included in the analysis. Results reveal once more the rich biodiversity of the Greek fauna, based on the existence of region-specific alleles and sequences within Greek wild populations. However, much work and funds are needed for the full determination of the genetic structure of Greek game species. The analyses of farmed animals, performed so far, outline the need to intensify the control of farm-bred releases; this is due to evidence of low introgression of non-native alleles in farmed populations. The new ministerial decision is on the right direction but still many problems have to be tackled.

Analyses of wild populations were financed by the 4th Hunting Federation of Sterea Hellas.
The Australian Government regulates exports of Australian wildlife/wildlife products under the Environmental Protection and Biodiversity Conservation Act (EPBC). A case study of a State Government application for EPBC approval of a plan to commercially harvest and export brushtail possums was studied. Although most public submissions opposed the plan and few supported it, the Australian Government approved the plan. Commercial operators may now legally harvest, process and export brushtail possums for meat and skins. Analysis of the public submissions indicated that supporters cited the sustainable use of otherwise wasted resources and the need to manage overgrazing. Those in opposition questioned the scientific basis of the plan and cited beliefs that possums and wildlife in general have intrinsic worth and should not be viewed as a resource; animal welfare concerns (frequently referring to a YouTube video of possum slaughtering); and comparisons to seal and whale hunting with reference to overseas perceptions of Australia.

Some features of the EPBC process are described in this paper including that, although intended to be an open and co-operative process, it is not in practice co-operative, public or transparent. Philosophically or ethically based objections to the consumptive use of wildlife cannot be considered and there is no mechanism to distinguish between domestic or international constituencies or to deal with multiple, campaign response submissions. It is shown that in order to effectively express their concerns, opponents of wildlife harvesting need to have input at a much earlier stage in the process: despite provisions for public submissions, by the time applications are being determined, the decision to harvest has already been made.
Posters
Conservation and management of migratory game species
Blackbird is mainly a medium distance migrant and one of the most important species for the hunting economy of Mediterranean countries. The aim of this study is to give preliminary results on the demography and energetic parameters.

The study area consists of a 4 Km$^2$ area of maquis shrublands, olive groves and vineyards. In total, 240 blackbirds were collected and examined for their body condition, sexed and their total body, stomach with the content and heart were weighted. Chi Square ($\chi^2$) test of independence and Analysis of covariance (ANCOVA) were used for data analysis. Independent categorical variables were sex (male - female), hours that birds were hunted (morning - afternoon) and date (<31/11, 1/12-1/2, >10/2). The mean air temperature of hunting day was set as a quantitative independent variable. The sex ratio of 105 males and 135 females slightly differs from the ratio of 1:1 ($\chi^2 = 3.81, P = 0.051$). The sex ratio male/female was 60/60 at the morning and 45/75 at the afternoon, i.e. during the afternoon hours more females were hunted. The sex ratio did not differ significantly between the three date periods ($\chi^2 = 1.8, P = 0.409$). Body condition, total body and stomach weight of the birds were not influenced by sex and hours, but were increased significantly when the temperature was decreased and in later date periods. Heart weight was higher in males. In conclusion the demography of blackbird didn’t change significant during the period November – February of the same year, but air temperature and date affect energetic parameters.
The Carpathian basin is one of the main migrating and wintering area of Eurasian wild geese. The Hortobágy National Park is a stopover place for birds, typical habitats are mainly grasslands, wetlands and fishponds. The most of the migrating geese are white-fronted goose (*Anser albifronts*), but the globally endangered lesser white-fronted goose (*Anser erythropus*) and the red-breasted goose (*Branta ruficollis*) also observed each year. The greylag goose (*Anser anser*) is the only breeding goose species in the area and regular in the migration periods as well. Hungary has a temperate continental climate influenced by three main factors, these are the Eastern-European continental, the Western-European oceanic and the Mediterranean influences. The winter temperature is fluctuating between wide range, caused by the diverse effects and the basin character. The study period was the last twenty two years since 1989. We analysed the correlation of the average monthly temperature and snow cover to the number of wintering white-fronted geese. Our results showed significant increase in number of overwintering geese, and we have found several phenological changes in the timing of goose migration caused by climatic factors.
In the Azores archipelago the quail (*Coturnix coturnix coturbans*) is an endemic and sedentary subspecies, and plays an important role as a game species. On São Miguel Island, the quail population has declined over the last few decades. To reverse this trend, the local hunting administration started a quail-restocking programme in 2001 with captive breeding of native quail captured on the island. According to radio-tracking results, one month after release, these birds had a high survival rate (86.7%, \( n = 25 \)), and females were nesting during the second month. The present study evaluates dispersal and the use of space by these quail, after release, and how they differ from those quail hatched in the wild. It also intends to evaluate if insular quail sedentariness and landscape modulate the use of space differently from what is known for primarily migratory quail in mainland Europe. We tracked 40 released quail (from 2008 to 2009) and six wild quail (since February 2011), tagged with PIP transmitters (Biotrack, 2.3g). Dispersal movements were analysed with reference to release/capture site.

Home range was estimated using the Minimum Polygon Convex method. Preliminary results show that dispersal (±SD) was low for both groups of quail (released: \( x = 210.7 \pm 122.4 \text{ m} \), \( n = 20 \); wild: \( x = 115.3 \pm 7.4 \text{ m} \), \( n = 5 \)). In both cases the estimated home ranges (released: \( x = 1 \pm 0.5 \text{ ha} \), \( n = 6 \); wild: \( x = 1.8 \pm 1.5 \text{ ha} \), \( n = 6 \)) seem not to differ from values found in previous studies for mainland quail. Released quail and those hatched in the field appear to use the space in a similar way, supporting our previous results of successful adaptation of released birds. More data will be presented during the conference, as tracking is ongoing.
IS AGE COMPOSITION OF COMMON QUAIL (*Coturnix coturnix*) ATLANTIC POPULATIONS RELATED TO MIGRANT PHENOTYPES?

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The age composition of common quail (*Coturnix coturnix*) populations was analysed throughout the breeding season in two sites above 40° North (Figuerola del Camp and Alp, in 2008, 2009 and 2010, n = 267 adults) and in two sites below 40° N (Sanlúcar la Mayor, Spain, in 2006 and 2007, Fkih-Ben-Salah, Morocco, in 2008, n = 277 adults). Moreover, a sample of 567 individuals (83 of which were adults) was analysed during the autumn passage in a Spanish non-breeding site situated above 40° N (Garraf, in 2009 and 2010). Individuals were captured by using a horizontal net and a digital decoy during the breeding season, and with vertical mist nets and a digital decoy during the autumn passage. The age of captured individuals was determined by their moult pattern.

Results show that the age composition of individuals throughout the breeding season was significantly different in populations above 40° North and in those in Southern Spain and North Africa. Thus, the ratio of the number of individuals aged three years or more (Euring code 6) to the number of second-year individuals (Euring code 5) was, on average, 1:11.7 in the Northern breeding areas (Figuerola del Camp and Alp). In the Southern breeding areas (Sanlúcar la Mayor and Fkih-Ben Salah) this ratio (on average, 1: 4.3) was significantly different from the Northern areas (G test, G = 12.77, 1 d.f., p<0.01). The autumn passage in Garraf gave a ratio (1:10.9) similar to that of the breeding season in the same latitudes (G = 0.03, 1 d.f., p = 0.86) and also different from that of Southern breeding areas (G = 4.98, 1 d.f., p = 0.03). These results indicate that there are a higher number of older individuals in the southern populations than in the northern populations.

As it has been proposed in the literature that individuals above 40° N may belong to a long-migrant phenotype, whereas individuals below this latitude may belong to a short-migrant phenotype, our results strongly suggest that long-migrant and short-migrant populations follow different population dynamics, the survival of older individuals being much higher in short-migrant populations. Alternatively, these older individuals may have modified their migrating capability.
The European population of great cormorant has increased strongly in the past decades both in terms of abundance and distribution. In 2001, cormorants started to breed also in Switzerland and since then two colonies of about 400 breeding pairs have established at the lake Neuchâtel. This development was accompanied by more and more complaints of fishermen about reduced yield and unacceptable damages on the fishing gear. Questionnaires revealed considerable economic damages that, however, have not been verified with systematic field surveys.

Mandated by the Swiss Federal Office for the Environment FOEN, we assessed damages caused by cormorants, tested potential prevention measures and evaluated potential adaptations of the fishing practice to prevent damages. In two summer and winter test periods, we assessed damages as injured fish and number of holes found in ground- gillnets with a dimension of 100 x 2 meters and a mesh size of 24 (summer, perch fishing season) and 45 millimetres (winter, white fishing season), respectively. We tested the prevention effect, the handling, technical applicability and the applicability in the fishing practice of four measures: “invisible buoy (common gillnet with lucent buoyage)”, “cormorant buoy” (common gillnet with 10 floating hides of real cormorants), “scarecrow” (automatically inflatable on buoy installed) and “bird bangers” (fired at gillnets). For the experiments we always applied a measure- and a control net at a time. Along with this quantitative approach, we observed cormorant behaviour to evaluate the effect of each prevention measure. With a maximum of 2% of total catch, the assessed damages (injured fish) were at much lower level than expected from former studies based on questionnaires. Additionally, the number of holes in the gill nets increased with their use, independently of cormorant presence and the number of injured fish. The fact that we detected damages at a very low level made it difficult to quantify a possible prevention effect of the three tested measures.

Nevertheless, we found evidence that scarecrows keep cormorants off the nets. In the actual situation of rare damage events, we consider the tested measures as unreasonably costly and laborious. Therefore, we advise adapting the fishing-practice to the daily hunting behaviour of cormorants by reeling gillnets before sunrise to further minimize damages. Our assessment of damages caused by cormorants does not match with the complaints of the fishermen. This example highlights the influence of human emotions on the perception of human-wildlife conflicts and thus the importance that practical solutions should be based on verified data and biological understanding.
Human dimensions of game wildlife management
Different land-use systems can have a key role in landscape-level wildlife management and conservation. Sustainable land use is the result of human interaction, learning, conflict resolution and collective action. Moreover, an appropriate geographical level needs to be set in order to accommodate different biological, economic and social interests.

In Belgian farmlands, hunting territories are often small entities (240 ha in average) which are not suitable for integrated management. Our project “Not less than 2000 hectares!”, located in Wallonia (southern Belgium), aimed at developing a model of biologically sound management of wildlife, at large scale (with a minimum of 2000 ha). Such a scale involved a multi-actor approach (local authorities, farmers, hunters, foresters, conservationists...) with the goal of enhancing habitat for both game and non-game wildlife species.

Two study sites, representing two different game management councils, were chosen, where an inventory of the existing ecological network was performed. All network elements were exhaustively censed and mapped (trees, hedges, agri-environmental schemes). Based on this inventory, target zones were identified for action and awareness raising. Different tools (public incentives, information and training sessions) were used in order to promote or to maintain a diversity of habitats, creating synergies between agriculture, hunting and other conservation interests. Yearly monitoring of game species has taken place since 2008. The chosen scale gives a holistic view allowing better decisions to protect, restore, and manage game populations.

In conclusion large territories (2000 hectares minimum) represent consistent management units for farmlands game in Belgium. At a biologically sound territorial level, the participatory approach can be a powerful tool guiding local use of land and wild living resources.
In England, the number of red-legged partridges (*Alectoris rufa*) released each year has increased significantly over the past 15 years. In excess of 6.5 million birds are released each summer to support an annual harvest of around 2.5 million birds. Although widely researched throughout their native range, there is a lack of scientific data on the fate and survival of released red-legged partridges in England. From 2008 to 2010 we radio-tracked red-legged partridges on six shooting estates in southern and eastern England to determine their fate and survival after release.

On each site in late August we attached transmitters to a sample of between 41 and 48 juvenile (approximately 16 weeks old) birds. Birds were tagged as they were placed in release pens alongside un-tagged birds. They were held in the pens for up to one week prior to release. After release birds were located twice weekly for the first month and at least once a week until the end of January the following year. The proportion of birds shot during the course of the shooting season ranged between 23% and 53%. Average survival until the end of the hunting season (1st February) was 17% (minimum survival 2%, maximum survival 37%). Predation (mainly by red fox *Vulpes vulpes*) was the main cause of non-shooting mortality on all sites.
LONG TERM EFFECT OF SEEDLINGS’ BROWSING AS EXAMINED IN POLE STAGE

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Loss of increment and decrease of timber quality was investigated in the consequence of seedlings’ browsing. Data were collected in the Bükk mountains, North Hungary. Sample territories were marked out in beech (*Fagus sylvatica*) and sessile oak (*Quercus petraea*) pole stands having been browsed in seedling’s age by red deer, roe deer and mouflon. The damage had been described to affect 80% of the sessile oak and 65% of the beech seedlings. The number of the sample territories in each stand was 10, with a 10 × 10 m size. We chose control territories of the same size in stands which were not browsed because they were protected by fence. We registered the number of the trees only in oak stands because in beech there was significant difference between the number of seedlings of the sample and control territories. Furthermore we measured in both species the diameter at breast height (1.3 m) of the stems, the height of the trees and the malformations of the stems occurred lower than 2 m (Zamora et al., 2001), such as tortuosity and crotch. The data were evaluated by Student’s t-test and Mann-Whitney U test.

The number of stems and the mean height of the trees was significantly lower in the previously browsed oak stand ($p = 0.00$ and $p = 0.00$, respectively). There was no significant difference between the diameter at breast of the browsed and non-browsed oak trees ($p=0.1$). The diameter at breast height of the stems ($p = 0.01$) and the mean height of the trees ($p = 0.01$) was significantly lower in the previously browsed beech stand ($p < 0.01$). The number of crotched stems was significantly higher in previously damaged stands in the case of both tree species (oak $p = 0.00$ and beech $p = 0.03$).

The browse of the seedlings didn’t affect significantly the stem quality of the pole stands. During the commercial treatments the damaged stems can be removed, action eased by the fact that the damaged stems have been distributed evenly. However, browsing negatively affected the growth of the trees, which fact caused economic loss for the owner.
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The populations of herbivore ungulates in the Cantabrian Mountains (Spain) have increased without any attempt to control population density for the last decades. This rising number of herbivores in wooded areas has coincided with the decline of the population of Cantabrian capercaillie (*Tetrao urogallus cantabricus* Castroviejo, 1967). Herbivores have a great capacity for modifying forest structure and composition in a way that affects capercaillie habitat. The aim of this study is to assess the effects of grazing by wild and domestic herbivores on the diversity and richness of plants as well as on natural forest regeneration under different browsing pressures and different forest management practices. The selected approach consists in the study of the effect of herbivores on bilberry (*Vaccinium myrtillus*), a key species for capercaillie conservation. The field experiment is located in 16 beech stands of the south-west of Cantabria region, Spain. At each stand we installed three replicates of three different treatments depending on the type of grazing exclusion fencing (domestic, domestic and wild ungulate exclusion) and a control plot without fencing. We collected field data each year since 2007.

Preliminary results show that species richness decreases when bilberry appears. The grazing exclusions cause a rapid increase of understory vegetation. However, bilberry does not seem to recover from heavy browsing until after at least three years, and depending on soil conditions.
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After 100 years of absence, wolves (*Canis lupus*) now find their way back into Germany. In the year 2000 the first wolf pack established itself and the first four cubs were born in Saxony. Until today a population of six packs and 2 cubless pairs has been monitored in this region. Since 2006 there has also been an increasing number of sightings of individual wolves in Lower Saxony.

This is why wolf management ought to be established in this region. Against this backdrop the hunting association of Lower Saxony initiated a co-operation project with the Department of Nature Conservation. Its aim is to involve hunters actively in wolf monitoring and to promote the acceptance of wolves within the hunting community. As hunters are very familiar with their hunting grounds and have profound knowledge of wildlife, they are highly suitable partners for monitoring projects. But when it comes to wolves the situation is different. The hunters lack the relevant knowledge of the behaviour and biology of wolves. Main concerns are that wolf occurrence will decrease the population of the game, mainly of the deer; or it will cause behavioural change in the game, which could affect the results of hunting. In other words, to get hunters involved in wolf monitoring, it is essential to promote the acceptance of wolves among the hunting community.

Therefore, this project, initiated by the hunting association of Lower Saxony, will pay special heed to the hunters’ concerns. Providing suitable information to hunters will help to reverse the lack of knowledge. An empiric study will focus on the attitude of hunters towards wolves and the reasons for it. By means of a long-term study changes in attitude will be detected. In addition, a deer monitoring system will be established by which the impact of wolf occurrence on deer is to be determined. Objective information about wolves along with useful data about their impact on deer will help to increase their acceptance by hunters. Involving hunters and their expertise in wolf monitoring will establish effective wolf management in Lower Saxony.
Populations of large carnivores in Central Europe are heavily affected by man-made mortality risks such as vehicle collision or poaching. Especially poor acceptance among hunters towards these species can increase the poaching rate up to a level that is threatening the viability of a population. Area-wide efforts to improve attitudes towards large carnivores often fail due to limited management resources. Objective criteria to select local focuses for intensive mediation are rare. In a first step we used a spatially-explicit and individual-based population model for lynx (*Lynx lynx*) to identify regions in South-West Germany where reduction of poaching probability would have the most positive effect on the viability of a hypothetic population. Additionally, based on a literature review, we identified six factors that allow estimating the relative poaching risk at a community level, using data on agriculture and hunting statistics.

The population model showed that reducing poaching probability in communities predominantly used by the simulated lynx, led to a significantly stronger reduction of the population extinction risk than decreasing the poaching probability in randomly selected communities with suitable lynx habitat. Combining these results with the community-related information on poaching risk allows recommendations in which communities targeted efforts for improving the attitude towards the lynx would be most promising regarding both, the viability of lynx population and economic cost-efficiency.
MOTHER-ASSISTED REARING (“BORN TO BE FREE” METHOD) INCREASES SURVIVAL RATES OF RELEASED CAPERCAILLIES (Tetrao urogallus)

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Young Capercaillies that move extensively after release to an unknown environment might have lower survival due to higher energetic expenses and increased predation risk. We tested if space use (cumulative range) and daily mortality rates (Mayfield estimator) of recently released birds were affected by the way the chicks were reared. We compared Capercaillie chicks reared by two different methods. One group consisted of chicks that were incubated and reared by their mothers, according to the “born to be free” method elaborated by A. Krzywinski (“born to be free” group). Chicks of the other group were reared using traditional method in absence of their mothers (control group). We then fitted 12 chicks (6 of each group) with radio-transmitters at the age of 18 weeks, and released them in the Bory Dolnońlńskie (Lower Silesian Forest), Poland.

While the chicks of the control group were released without any assistance (except a feeding station at the release point), the 2 mothers of the “born to be free” group were placed for the first 14 weeks in a cage situated in the zone where the group was released. The released young had visual and aural contact with their mothers. During the first 80 days after release, birds of the control group used larger ranges than the “born to be free” group (mean ± CI: 43.8 ± 14.1 km2 vs. 17.7 ± 8.1 km2, P < 0.001). Birds of the “born to be free” group had a daily mortality rate of 0.1%, whereas chicks from the control group had a rate of 0.6%. We conclude that the “born to be free” method substantially reduced the movements and the range of the released birds, which resulted in higher survival.

We suppose that this is because the exploration behaviour of “born to be free” birds into the new environment is similar to that of chicks hatched in the wild. Hence, the first results of our ongoing project suggest that mother-assisted release might be best practice for restocking or reintroduction programmes.
MAY F1 WILD OFFSPRING PRODUCED IN CAPTIVITY IMPROVE THE EFFECTIVENESS
OF GREY PARTRIDGE RELEASE PROGRAMS?

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There has recently been a “new” interest in grey partridge release programs in France -
despite we estimated that the success rate in the long term was of ca. 25%. Many studies
have documented the reasons why hand-reared birds survive so badly once released in the
field. Behavioural, physiological and anatomical causes have been outlined. To test the
“genetic” component, we made wild grey partridges reproduce in captivity. We tested semi-
intensive breeding conditions (small above-ground boxes) - contrarily to what other teams
are currently attempting.

Indeed, our aim - in case of success - was to be able to produce enough offspring to carry out
release programs on large sites and/or on a number of sites. We monitored the reproductive
performance of field-captured partridges and wild partridges issuing from clutches saved
from farming destruction (chicks born in captivity). The proportion of pairs laying eggs was
the first limiting factor to offspring production, survival the second one (wild-captured
birds that are under high stress). The survival rate of the produced “wild strain” offspring
was compared to the survival rate of “captive strain” offspring (reared in exactly the same
conditions) through a radio-tracking experiment. We did not detect a higher survival rate
of wild strain birds.

The reproductive performance is also currently being compared. These results do not
encourage us to recommend this technique (with our conditions), producing wild strain
young partridges in captivity is time and money consuming, but is not likely to improve the
success rate of release programmes.
European hare (*Lepus europaeus*) populations have not recovered from their shrinking over the past fifty years in Germany. Most hare habitats are agricultural regions which are farmed according to conventional farming standard. Whether hare populations benefit from organic farming has not been studied up to now. We aimed to compare the population density of European hares between an organic farm and adjacent conventionally farmed areas from 2004 to 2010. Both study sites are approx. 500 ha in size, have arable crops and pasture, the same climate and types of soil.

They are located in Schleswig-Holstein, Germany, about 40 km north-east of Hamburg. Hare population densities were estimated by spotlight counts in spring and in autumn, at least twice per season and site. After passing normality test and equal variance test, a t-test was applied for comparing two groups. Mean hare density (n*100 ha⁻¹, ± s) of the period 2004-2010 was greater in the organically farmed area than in the conventionally farmed area, as well in spring (13.37 ± 3.53 vs. 8.24 ± 2.87, t = −2.98, df = 12, P = 0.01) as in autumn (16.10 ± 2.71 vs. 10.60 ± 2.55, t = −3.73, df = 11, P < 0.01). The higher hare densities in the organically farmed area may be interpreted as results of positive effects of organic farming. It seems worth to continue this study in order to see whether and to which extent hares do benefit from organic farming over a longer period of time.
SUSTAINABLE USE OF WILDLIFE RESOURCES: AN INTEGRATED CROSS-SECTOR ASSESSMENT FRAMEWORK

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Wild animal populations, wildlife habitats and their management are subject to multiple impacts caused by various and often conflicting land use demands. In particular in multiple-use landscapes, hunting and other land use activities such as forest management, agriculture, recreation, and land development are connected with wildlife resources in an interwoven system of dynamic interactions and feedback mechanisms.

This is often a source of conflicts, may negatively affect animal population status and habitat suitability, and constrains the sustainability of each form of land use. Sustainable use, in contrast, requires that each land user group considers the ecological, economic and socio-cultural dimensions of their activities and their respective spatial and temporal scales, their ecosystem impacts and their effects on species, habitats and neighbouring land uses. While concepts and assessment tools for sustainable use exist in specific sectors of land use and have recently been developed for sustainable hunting in Austria (Forstner et al. 2001, 2006), truly integrated approaches that fully consider land use impacts on wildlife are still widely lacking.

In response to this unsatisfied need, in the Austrian research project “Integrated Sustainable Wildlife Management in the Wienerwald Biosphere Reserve (ISWI-MAB)“, a cross-sectorally integrated, operational assessment framework of principles, criteria and indicators for the sustainable use of wildlife resources has been developed by the example of a peri-urban, forest-dominated model region. By applying a participatory research approach, including extensive land user surveys (interviews, questionnaires) and interdisciplinary stakeholder dialogue, interactions between hunting, forestry, agriculture and recreational activities with wildlife were analysed, wildlife-related conflicts and synergy potentials identified, and their significance for sustainable development in the Biosphere Reserve evaluated. In the presentation, the research methods applied will be outlined, regional key use-wildlife conflicts will be highlighted, and the integrated assessment framework will be presented.

The restocking of the grey partridge using farm-reared birds is a usual management strategy in many areas across Europe including Spain. Despite many individuals are released in these projects, most of them are unsuccessful to establish a viable population. Generally the mortality among released birds is very high.

The objective of this study was to examine the survival and mortality causes of farm-reared Pyrenean grey partridges released in the south-western Pyrenees. Between August and November 2006, we released 81 farm-reared Pyrenean grey partridges. Animals were released in two areas. Each individual was tagged with VHF radio-transmitters and their locations estimated by triangulation. Before release we recorded biometric variables: tarsus length, maximum tarsus diameter, fat depot and body mass. Animals differed in their diet during captivity and their release method. We compare the survival of the animals between diet, releasing area, releasing method and also between mortality causes using the Kaplan Meier analysis. On the other hand we study the relative impact of different mortality causes from the carcasses recovered. We compare biometric variables between mortality causes with Kruskal-Wallis test.

From the 81 animals released, we found 66 animals dead and 13 more animals still alive 13 weeks after their release. There were statistical differences between the survival of animals fed with insects ($S = 0,36$); standard ($S = 0,05$) or enriched diet ($S=0,00$) as well as between the survival of hard ($S = 0,62$) and soft ($S = 0,00$) released animals.

The most important mortality cause was the mammal predation (red fox account for 53% of dead individuals). Individuals predated by mammals were statistically smaller (lower body mass and maximum tarsus diameter) than those predated by raptors.

Predation was higher during the first 20 days after release. These results were similar to those reported in other studies from different areas (Italy, Scotland). This work can help to design restocking plans with higher probability to achieve a sustainable population. Measures that should be considered include: increase the number of released animals per year, increase the number of releasing years, increase the quality of target animals (with animals with insect-based diet, heavier animals), and reduce probability of predation (through predator control and anti-predator behaviour training for target individuals).
Bilberry (Vaccinium myrtillus L.) is a key species for the subsistence of Capercaillie (Tetrao urogallus L.), as it is the most important source of food for adults and it is used as cover, and, also, as source of invertebrates for the chicks. The Honeybee (Apis mellifera L.) is the main pollinator of over 80% of flowering plants. This insect is suffering a severe decline, with the respective decrease of the pollination and, therefore, of fruit production. Our main goal was to analyze the importance of honeybee pollination on bilberry production. Three natural bilberry fields were chosen above the tree line in northern Palencia province, Spain. One hive was placed in each field. Ten sample sites were selected at 25, 50, and 150 m from and around the hive. Each site consisted of three plot treatments (1 m²): honeybee exclosure, other pollinators exclosure and control plot. Ten bilberry twigs per plot were chosen and the number of flowers per twig was counted in May.

Pollinated flowers were counted later, and fruit production measured at the end of August. Successful fruit production was estimated based on the total number of fruits and flowers per plot per treatment and sampling site in order to assess the influence of honeybees and their importance in helping to produce bilberry fruits. The results indicate that the honeybee exclosure and the distance to the hive have a highly significant effect in the fruit production. Our results show that honeybees are a necessary pollinator agent for bilberry, successfully increasing yields of fruit production per plant, and therefore, improving habitat conditions for the endangered Capercaillie.
Interactions humans-wildlife
In order to reduce the problems caused by wild boar to agricultural-forestry activities, management models should be fitted by taking into account all data available including those relating to the activity of hunting. The hunting in the Province of Genoa is made by hunters organized in teams that collaborate in the collection of such information. 

Objective: Collecting and analyzing data on hunting to check quality and quantity of wild boar populations, their spatial and temporal dynamics and finally organizational skills and withdrawal of fighter teams.

Methods: Data collection has been performed by entering the information into a database, reported by the teams on special forms, about the organization of beatings (day, month, township, village and present hunters) and the characteristics of shot animals (gender, weight and age). Data have then been processed to obtain information, both annual and five-year, about the number and characteristics of shot animals, shooting down distribution and teams organization and efficiency.

Results: Management of these data allowed us to acquire accurate information about organizational nature of hunting and about quality and quantity of wild boar populations and their spatial distribution.

Conclusion: Gathered information, together with those from other monitoring activities (sightings on spring feeding sites, checking damage caused to agricultural production and recording of reports of presence), allowed us to define rational shooting quota, to improve organization of shooting extraordinary interventions, to maximize economic efforts in order to create passive prevention systems for agricultural production.
WHAT HAVE WE LEARNED ABOUT WILD BOAR IN COLLSEROLA NATURAL PARK?

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Collserola Park is a large peri-urban Natura 2000 site occupying some 8,500 ha which is situated beside the city of Barcelona. Less than 20 years ago the wild boar (Sus scrofa) was still a relatively scarce species in Collserola, but its population has risen steadily over the years and it now holds one of the highest density populations in Catalonia. Wild boar ecology has been monitored in different phases using diverse methodologies with the aim of establishing criteria for correct management within the park. Applied research methods have included nocturnal transect surveys on foot and in vehicles, field-sign sampling at fixed stations and along linear transects, radio-tracking, as well as gathering data through the monitoring of hunting battues and of wild boar captured or killed for other reasons (live capture of problem animals, road kill, etc.).

In the initial phases we focused on the basic ecology of boar in the park in relation to natural habitat, and results highlighted an essentially ‘classic’ relation between population tendency and oak mast productivity, as well as the limitation factor of the hot dry Mediterranean summers. Subsequently we studied the increase in the wild boar population and its response to the anthropogenic environment of Collserola’s metropolitan context, comprising urban areas, transport infrastructure and intense public usage. Information gathered was used for example in applying and recommending measures to reduce collisions with vehicles and alleviate the barrier effect of transport infrastructure.

This period also coincided with changes in the management of wild boar hunting within the park which was aimed at improving its efficiency and regulation in this intensely used protected nature area. In recent years, the habituation of wild boar to humans in Collserola has increasingly centred attention on the causes and management of the presence of this species in urban areas, as well as the continued monitoring of overall demographic tendencies in order to achieve better resolution of the conflicts generated by the presence of boars in urban areas. Our findings illustrate the variety and complexity of wild boar ecology in this metropolitan context where the human dimension involved can hinder the conversion of scientific and technical monitoring into applicable management options which are currently focused on reducing wild boar numbers in the park and minimising conflicts.
Numerous studies were conducted in order to evaluate the impact of wind farms in bird's populations due to collisions of birds with wind turbines. Given the importance of developing a viable renewable energy resource, the purpose of this study is to contribute at the evaluation of bird's mortality due to wind turbines collisions in relation to the recorded avian fauna of the area. Data were collected in accordance of the protocols used in many similar studies using the data form, proposed by Morrison 1998. The study conducted in 5 wind farms located as much as in Greek inland (Peloponnesus and Sterea Hellas) as in two Greek islands (Crete and Cephalonia). The survey lasted for 18 months and the preliminary results impose some small, less than the expected, impact of wind farms on bird's populations of the areas where the wind farms are established or even on migrants' bird's populations.
Lake Balaton is the largest lake in Central Europe with a surface covering 600 km². The now fragmented wetland habitats at the southern shore – 20-400 ha fishponds, marshes – were once parts of Lake Balaton, their area coverage is smaller than 3%. Based on the survey results of the South-Balaton Bird Monitoring, Lake Balaton provides few nesting opportunities for the birds but it is a very important feeding and resting habitat during the autumn migration and wintering period. Ten thousands of waterbirds use this area, averagely 20% of them are staying on fishponds and marshes. Due to the human disturbance (tourism) and the lack of semi-natural habitats Lake Balaton is less significant as nesting area in the breeding period, therefore it is only a seasonally-restricted Ramsar site. The survey results clearly show that during the breeding season bird species richness is significantly higher in the wetland habitats compared with Lake Balaton. These species also include several strictly protected species such as the ferruginous duck, the pygmy cormorant, the great white egret and the night heron. The wetlands of the southern shore are important habitats during the migration and wintering period but their functional importance is even more significant as nesting area.

Although the area is surrounded by roads and settlements and it is also affected by intensive fishing and hunting, its nature protection importance is reflected by species richness and density. The area supports more than 1% of the individuals of the greylag goose, white-fronted goose and great white egret population, and the number of individuals of the regularly occurring species is more than 20,000, thus the area itself fulfils the Ramsar criteria 6. and 7., constituting an ecological-functional unit Lake Balaton.
I have studied the impact of forest structure change on game animal diversity, abundance and the possibility to predict the negative change in the game species diversity. The abstract bases on my PhD –thesis from 2002).

Total study area is about 300 000 sq. km. in the Eastern Fennoscandia: Eastern Finland and Russian Karelia. The data is based on the Wildlife Triangle Scheme in Finland (Lindén et al. 1996) and Winter Track Counts in Russian Karelia (Priklonski 1973). Altogether more than 100 grid squares of 50 × 50 km are included in the study. The results are obtained and utilized as abundance indices and from the forest inventory results. I have obtained the proportions (in percentages) of forest areas, bogs, lakes, etc. of the total area of the grid. The relationships between changes in landscape (forest) structure, animal species diversity and population dynamics are quantified. Using the regression analysis it was observed that the game species richness index (Simpson’s diversity index) is positively connected to the amount distribution of ripe coniferous forests. The closest correlation is fixed for the 8 “forest” species. The reaction of 15 game species is described. Every species demonstrates a very specific reaction on the logging and subsequent changes of habitats according to secondary succession of the ecosystem. For example the snow hare and wolverine demonstrate absolutely different reactions.

The consequences of anthropogenic transformation of the plant (forest) cover on large territories for vertebrate species are shown only and most clearly within the territories with natural boundaries, landscape structures. That may be a taiga biome, taiga subzones, forest growth areas and smaller territorial units, also including landscape contours.
BIOCHEMICAL AND IMMUNOLOGICAL EFFECTS OF COATED SEED INGESTION ON RED-LEGGED PARTRIDGE (*Alectoris rufa*)

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Pesticide application is suspected to be a major cause of population decline in farmland birds. Seeds coated with fungicides or insecticides constitute a main part of the diet of species such as the red-legged partridge (*Alectoris rufa*) during sowing seasons. The aim of this study was to test the effects of coated seed ingestion on *A. rufa* physiology and fitness. We tested an insecticide (imidacloprid) and two fungicides (difenoconazole and thiram). Each experiment consisted in two groups of six pairs of partridges exposed at two doses: a dose corresponding to the recommended for seed coating and another dose twice as high as the recommended one. Seed administration was prolonged for a 10-day period, after which all animals were transferred to an untreated diet and monitored for an additional 12 days.

We took measures on mass, ventilation rate, ornamentation, hematocrit, plasma levels of hormones, vitamins and carotenoids, oxidative stress parameters and immunocompetence, which was analysed by testing primary and secondary cellular responses (PHA test), as well as humoral response (SRBC-agglutination test). High levels of the three tested pesticides had an effect on ornamentation by reducing the percentage of eye ring pigmentation. Low concentrations of imidacloprid and high doses of thiram induced significant weight loss and reduced body condition, although animals recover quickly once the exposure was terminated.

These two pesticides also induced oxidative stress; percent of oxidized glutathione was significantly increased by thiram, whereas imidacloprid reduced the retinol concentration in plasma. Imidacloprid and thiram showed also an immunosuppressive effect, impairing the primary cellular immune response. Interestingly, this effect was only reported for males in both cases. Coated seed consumption may compromise health of farmland birds, especially during seasons when little alternative food sources are available in the field.
European rabbit (*Oryctolagus cuniculus*) is considered as a keystone species in the Iberian Mediterranean ecosystems. In the Iberian Peninsula, rabbits are a staple prey for more than 30 vertebrate species (carnivores, birds of prey and reptiles), including some endangered species such as Iberian lynx (*Linx pardinus*) and the Spanish Imperial eagle (*Aquila adalberti*).

Rabbits act as ecosystem engineers by altering the structure of vegetation, grazing plants, dispersing seeds, digging burrows and fertilising soils. Furthermore, rabbits play an important role as a main game species. After the outbreak of viral diseases, provoked by the introduction of Myxoma virus (mixomatosis) and RHD calcivirus (rabbit haemorrhagic diseases), rabbit populations dramatically decreased in the former areas of distribution, producing several consequences in the conservation of ecosystems. Historically, the rabbit has always been responsible of extensive damages, mainly in crops but also in buildings and structures. During the last decades, the negative effects also decreased. However, and due to the rabbit population recovery, old conflicts have raised again in the last years.

During 2010, a study was carried out to evaluate the situation in Catalonia (NE Spain). The diagnostic included the analysis of rabbit population abundance, geographic distribution, virus antibody prevalence, genetic parameters, phenology of the crop damages, crop types and game management. The study concluded that 40-50 years after the viral outbreak, rabbit populations in Catalonia are recovering in range and abundance, and it is expected to approach to parameters similar to the pre-outbreaking. The conflict situation is consequently becoming a serious issue. Bearing in mind that landscape is different, the solutions should be coherent and adapted to the present environment. The economic values of agriculture, the demographic characteristic of the rural settlements in XXI century, the transport networks and the game management are important factors to consider for a sustainable control over rabbit populations.
INTEGRATING THE DEER (Cervus elaphus) IN THE PORTUGUESE FORESTS: IMPACT AND FOREST CERTIFICATION

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In the forest perimeters of the Lousã Mountain, in the centre of Portugal, the emergence of red deer (Cervus elaphus) is causing some local conflicts among the different stakeholders who report damages on forest or agriculture. For the other hand, one of the perimeters (Lousã) was selected to develop PEFCC certification system. A first step in our study was determined whether a real damage or an impact by red deer has in fact occurred. We considered four types of forest cover and we selected randomly nine plots (150 m²) in each one. All trees were recorded and measured the diameter at breast height (dbh). For each tree with rub was recorded information about characteristics of marks. The amount of foliage browsing was estimated visually (%) except in regeneration type, where we counted the total number of leaders consumed. Others variables were considered in each plot to analyzed their influence about damage: The shrub layer was scored according to its height and cover, altitude and distances to the nearest village, river and national road were too recorded. Cluster analysis allows examining some pattern about of damage, separating browsing of fraying damage.

The stand of pine regeneration suffered a significant damage by browsing. The percentage of fraying damage among the various types of forest was not significantly different. Some species of trees were more susceptible to fraying damage (chestnut). In all cases the deer shows a preference to rub the smallest trees. The classification trees, where the % rubbed trees is the response variable, allowed stand out the dbh and the tranquility as factors which contributed more for the probability of damage. Finally, we discussed the opportunity of incorporate new indicators in the certification process and the necessity in finding a balance between different stakeholders and wildlife.
Roe deer became extinct from most of Catalonia (north-east Spain) during the nineteenth century. At the end of the twentieth century, reintroduction plans were carried out at several sites. In the ‘La Garrotxa Volcanic Zone Natural Park’, the reintroduction project was drawn up in 1994 and 49 individuals were released between 1995 and 1999. The project included a monitoring program that is still in place today. In the early years, 42 radio-collared individuals were monitored telemetrically. Now, monitoring is carried out mainly by collecting species observation data from technicians, guards and (specially) hunters in particular. The aim is to analyze population expansion.

All data is analysed by means of GIS and the distribution area and observation density for each sector are obtained using the Kernel method. The roe deer population expanded quickly both in number and distribution area. Ten years after the first releases it was estimated that the population was composed of nearly 1,000 individuals and observations are now distributed over an area of 70,000 ha. This can no longer be considered an isolated population, as it has come into contact with neighbouring populations, which are also expanding. In 2004, hunting of the species in this area began, with 4 captures, and these have grown to a total of 89 individuals hunted in period 2009/2010. However, the population continues to grow and some conflicts have appeared such as some damages to crops and traffic accidents, although these conflicts are very localized. The team of the Natural Park is registering the data about these conflicts and give advice to farmers and road managers to reduce them. In conclusion, the population is now well established and continues to expand and to apply an adequate hunting pressure it is important to control the population growth and prevent conflicts from increasing.
A decline of farmland birds is observed all over Europe further to changing agricultural practices over much of the last century, through the change of habitat quality and availability. The red-legged partridge (*Alectoris rufa*), could be seen as a flagship species for biodiversity in Mediterranean landscape mosaic highly modified by human activity over the centuries. In order to maintain sustainable red-legged partridge populations in the future, knowledge of an appropriated management is a major step. The positive effects of open habitats on partridge presence in spring have been shown already. However, little information exists on finer habitat analyses e.g. on plant species choice, especially in Mediterranean viticultural patches. The objective of this study was to determine use of individual plant species (e.g. seed-bearing, leguminous). A variety of seed-bearing and leguminous plants was used to test which plant plots were mostly frequented by the birds over the whole study period.

We undertook the field work in collaboration with voluntary farmers on seventeen viticulture plots in south-western France from 1994 to 1998, representing the whole panel of observed farmland types, i.e. abandoned vineyard plots, clearings and cultures. They were cultivated with different plant types, e.g. seed bearing plants such as fescue, wild oat, and leguminous plants, such as alfalfa. All of them were subjected to faunal occurrence survey yearly from April to October and vegetation transects, realized yearly in May and June, corresponding to the maximum cultivated plant coverage and invertebrate prey presence. The habitat structure and vegetation composition were measured in a 4 m² transect zone, with 5 transect lines and 100 sample points. The frequentation of surveyed plots by the red-legged partridge was estimated via the compilation of direct presence indices, such as observation and indirect indices, e.g. via feathers or feces, and transformed later to presence/absence data.

For the analyses, we choose Bayesian model approach of Kuo and Malik (1998) to estimate probability of each variable to influence partridge presence. The Bayesian approach shows the probabilities of each variable to influence red-legged partridge presence. The highest value is attained by fescue, with 75% of probability and dactyle (15%). The plot replicate number was not sufficient for all plant species, which was partly related to the fact that the spontaneous seed grow back of some chosen species (darnel, alfalfa, clover) was better than others. Therefore, these preliminary results can lead to discuss on a compromise among plant species preferred by partridges during spring in viticultural plots for their nutritive value, and those plants, robust enough to grow back spontaneously the following years under water-deficit conditions. However, the number of plots per plant tested should be increased for further studies.
THE EFFECT OF LIVESTOCK, ALTITUDE AND SLOPE ON A RED-LEGGED PARTRIDGE POPULATION IN ALENTEJO, PORTUGAL

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Red-legged partridge (Alectoris rufa) is a non-migratory bird found mainly in the Iberian Peninsula whose conservation status is Least Concern. However, in the last decades there has been a growing concern for the loss of habitat quality due to the results of either land abandonment or farming intensification.

This study was conducted in an agrosilvopastoral land use system called montado. The density of pairs in the spring and the covey size in late summer were estimated during three years (2007-2009) and related to water abundance, dirty tracks density, altitude, slope, and stocking rates of beef cattle, sheep, goat and horse. Linear foot transects (6 transects were walked 4 times, 112 km in total) were used to locate red-legged partridge and their abundance was estimated using the Distance® version 6.0 software. Habitat selectivity was analyzed, both in spring and late summer, using Bailey’s confidence intervals. The average population size was lower in late summer (0.28 birds/ha) than in spring (average 0.3), suggesting a very low reproductive success and/or a high post-breeding dispersal rate. Pairs in spring showed selective neutrality, whereas the coveys in late summer avoided areas grazed by goat and selected areas with a developed shrub layer.

The larger coveys selected relatively high altitudes, relatively steep hills and relatively low stocking rate areas. Apparently, due to intensive grazing there is a lack of cover to provide protection against severe weather and escape from predators. Therefore, reducing stocking rates seems an appropriate measure in order to improve cover quality and thus to enhance the carrying capacity of montado for the red-legged partridge.
PREVENTING FOOD CONDITIONING AND HABITUATION OF BROWN BEAR IN SWITZERLAND

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Brown bears *Ursus arctos* have been immigrating occasionally from the Trentino (I) to the south eastern part of Switzerland since 2005. As experienced in other human-altered landscapes, this development comprises a high conflict potential that has to be minimised from the start of the species’ return. Coexistence of bears and humans demands animals that behave inconspicuously and affect human land-use as little as possible. Bears thus are to be protected preventively against food conditioning and habituation. Our aim was to develop a spatially explicit concept to secure potential, human-caused food sources from being used by bears in Switzerland. We adopted a four step procedure:

- In a study area of about 210 km\(^2\) in the south eastern part of Switzerland (Val Müstair), we assessed all human-caused potential sources of food for bears. We mapped a number of over 2300 sources, classified them by types, qualified their attractiveness for bears and suggested different measures for their protection against bears.

- Food conditioning and habituation of bears starts in remote areas, where bears come into contact with human-caused food sources without leaving their natural habitat. Based on this assumption, we computed four zones of different accessibility of the landscape for naturally behaving bears using a habitat suitability model and cost distance analysis (GIS). Half of the assessed potential, human-caused food sources were not accessible, 20% hardly accessible, 17% easily accessible and 12% were located within the potential habitat of brown bear.

- Based on the accessibility described in step 2 and the attractiveness for bears, we developed a system to prioritize the food sources to be protected. For each zone, we recommended immediate and medium-term action depending on the attractiveness. In hardly accessible zones, little attractive food sources may remain unchanged.

- We identified the potential bear regions of Switzerland by considering habitat suitability and the most probable immigration routes. For these regions, we recommend implementing the steps 2 and 3 to minimize the risk for bears to habituate to human-caused food sources. Further, competent and constant information and assistance of people will be an inevitable prerequisite to make entire regions well-prepared for the return of brown bears.
Hunting is an important socio-economic activity in Spain and the rest of Europe favoring high density populations of big game species in many natural areas, and involving several ecological impacts such as effects on habitat structure and on biodiversity. The aim of this work was to assess the influence of big game management on four medium-sized carnivores in a Mediterranean protected natural area from central Iberian Peninsula. Hunting management is adopted in an unequal form along our study area, and was divided in three zones: zone H (intensively managed), zone M (moderately managed) and zone L (scarcely managed).

Sampling was stratified in the three areas, and a total of 36 two-kilometer length survey routes were walked searching for scats of red fox (Vulpes vulpes), badger (Meles meles), stone marten (Martes foina), and wildcat (Felis silvestris). Vegetation and habitat structure variables were also measured at each survey route. Our results show that mesocarnivores as a whole, and red fox, badger and wildcat independently may be negatively affected by indirect big game management through the effect of wild ungulates on the habitat structure, composition and complexity. Moreover, wildcat may also be directly affected through the nuisances derived from hunting activities. We suggest that the maintenance of reasonable densities of wild ungulates, according with the carrying capacity of the environment, is crucial for the protection of scrub-pastureland mosaic areas necessary to assure long-term medium-sized carnivores conservation. On the other hand, big game management plans might be based on moderating the direct nuisances associated with some hunting activities, with the end of minimize the impact on more sensitive species such as wildcat.
REINTRODUCTION OF THE EUROPEAN BISON (Bison bonasus) TO A SUBMONTAINOUS FOREST LANDSCAPE IN WESTERN GERMANY

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The attempt to reintroduce a small population of European bison in the mountain range “Rothaargebirge” aims to contribute to the conservation of this highly endangered species. Furthermore it will contribute to fill again the ecological niche of the grass and roughage feeder in a central European forest landscape. Both ecological and socioeconomic benefits to the region are expected.

A state-of-the-art environmental impact statement is currently underway and additionally a broadly structured and well-integrated program of social assessment, stakeholder participation, and conflict management is established to overcome political and social obstacles. Intense public relations are applied to raise awareness among the regional population as the first step developing tolerance as base for a sustainable co-existence of men and bison. Currently eight European bison roam in a 90 ha research enclosure representing the regional landscape. As all individuals were raised in captivity their behaviour towards humans is evaluated in various scenarios. Telemetry systems, fence types and feeding are tested to adapt and optimize the future management considering conflict avoidance. If during this captivity phase bison are found to be manageable in this region, the permission to release this herd will be given by the state of North Rhine-Westphalia. This will be a milestone in ongoing efforts to conserve this species and its ecological role in human-dominated landscapes. It may well become exemplary for further reintroduction projects. The project is financed by the German Federal Environment Ministry and the Ministry for the Environment of the State of North Rhine-Westphalia and is basically carried out on the property of the initiator Prince Richard zu Sayn-Wittgenstein-Berleburg.
Methodologies, models and techniques
Parapatric species and the implications of climate change: A case study on hares in Europe

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Parapatry is a biogeographic term used to refer to organisms whose ranges do not overlap but are immediately adjacent to each other; they only co-occur – if at all – in a narrow contact zone. Often there are no environmental barriers in the contact zones, so competitive interaction is advocated as the factor that modulates species distribution ranges. Even when the effects of climate change (CC) on species’ distribution have been widely studied, there are few studies aimed in exploring CC effects on the biogeographical relationships between closely related – parapatric – species.

We modelled the environmental favourability for Lepus granatensis, L. europaeus and L. timidus in Europe using variables related to climate, topography, human disturbance and land use, and projected the models to future according IPCC scenarios. Favourabilities for present and future scenarios were combined using fuzzy logic in order to i) quantify the CC effects on species distribution, ii) determine the biogeographical relationships between species in parapatry, and iii) assess the CC effects on these relationships. Results showed different responses to CC. Whereas L. granatensis demonstrated the highest forecasted expansion, minor increments and contractions were obtained for L. europaeus and L. timidus, respectively. L. granatensis showed higher favourability values than L. europaeus in their contact area. This suggests that L. granatensis may have some advantages over L. europaeus if competitive relationships were established, and this situation is expected to exacerbate under CC scenarios. Whereas favourabilities for L. europaeus and L. timidus are similar in the contact area, mean favourability for L. europaeus is predicted to increases under CC scenarios, which may comprimise the co-existence with the L. timidus.
Hybridization between closely related wild and domestic species is of great concern because it can alter the evolutionary integrity of the affected populations. The high allelic variability of MHC loci usually excludes them from being used in hybridization detection studies.

However, if a) neither parental species shares alleles with the other, and b) one of the parental species possesses an exceptionally low number of alleles (to facilitate analysis), then even MHC loci have the potential to detect hybrids. By genotyping the exon 2 of the MHC class II DRB1 locus, we were able to document the first hybridization between domestic goats (Capra hircus) and free-ranging Iberian ibex (Capra pyrenaica hispanica) in the Rute-Priego Mountain (Cordoba, Spain). If the conditions mentioned above are met, this approach offers a time and cost saving alternative to other methods of hybrid detection, which constitutes additional value of MHC genes for animal management and conservation.
ASSESSING MINERAL CONTENT IN TEETH AND BONES OF RED (Cervus elaphus hispanicus) AND FALLOW DEER (Dama dama) USING SCANNING ELECTRON MICROSCOPE ANALYSIS

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Mineral assessment must be included in wild life management studies because nutrition, reproduction, game production, immunity and survival may be curtailed when a given element is outside the adequate range. Monitoring mineral content may provide useful information on possible mineral deficiencies and/or excesses and the life conditions of animals. As part of a study of the body condition of Mediterranean deer we assessed the mineral content of mandibular bones and enamel and dentine of the first molar of 55 red and 26 fallow deer from the Sierra Morena, southern Spain. Teeth and mandibular bones were cut transversally into thick sections and all samples were carbon coated. We used a SEM (Scanning Electron Microscope model JSM-5800, JEOL), the accelerating voltage was carried at 20 kV and the semiquantative analysis was performed after appropriate ZAF (atomic no., absorption, secondary fluorescence) correction. Microanalysis showed the basic element involved in the process of biomineralization. The macrominerals detected were: Calcium, Phosphorus, Sodium, Chlorine, Sulfur and Magnesium. Other elements considered essential as Silicon and Aluminium were also detected in several specimens. The mean content of elements was expressed in percentage. There were statistically significant differences in mineral content in dentine, enamel and bone between species. However, the Ca: P ratios (in bone = 1.10 and 1.05; in dentine = 1.88 and 1.80; in enamel = 1.86 and 1.86; respectively in red and fallow deer) were found to differ between regions but not between species.

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IMPACT OF HABITAT FRAGMENTATION ON THE GENETIC STRUCTURE OF GREY PARTRIDGE POPULATIONS

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The Grey partridge (\textit{Perdix perdix}) reaches in the Pyrenees the southern limits of its range. In these southern mountains, the Pyrenean grey partridge subspecies \textit{Perdix perdix hispaniensis} inhabits mainly the grasslands and shrublands of the subalpine zone. Under the combined pressure of environmental and anthropogenic constraints, these landscapes currently experience a significant evolution characterized by an increase of forested landscapes at the expense of open landscapes.

A consequence of this habitat global change is the increase of the fragmentation of the grey partridge habitats. In this study we investigated the effects of habitat fragmentation on the genetic structure of partridge populations. Using 12 microsatellites, we genotyped 510 grey partridges (376 from the Pyrenees and 134 from north-eastern France). The results revealed a significant genetic structure in the Pyrenean populations and an absence of genetic structure in the north-eastern populations. Compared to the almost continuous habitat occupied by the grey partridge in north-eastern cultivated open fields, the high level of habitat fragmentation in the Pyrenees is likely to explain the genetic structure observed in the Pyrenean grey partridge populations.
ESTIMATING POPULATION SIZE OF WILD UNGULATES BY ANALYZING COLLECT DRIVE HUNTS DATA

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In Poland, hunters using guess – estimate data, calculate number of wild ungulates. Such non–rigorous population census underestimated numbers of red deer (RED), roe deer (ROE) and wild boar (WB). It resulted in low harvest, overabundance of these species, high compensation for WB damage (15,2 mln euro/ year) and cost of prevention against forest damage by deer (25,6 mln euro/ year). There is urgent need to replace guess – estimate data by reliable population census methods. In this paper we are testing collect hunt data (CH) for estimation absolute numbers of big game animals. 65 CH were selected including 313 driven plots (DP) which size varied from 60 – 70 ha. Number of hunters and drivers ranged from 12 to 15 and 6 – 8 persons per CH respectively. Number of dogs amounted to 2 – 3 animals.

Data base included number of RED and ROE seen by hunters per 1 DP (X1 and X2 respectively) and number of WB shot (X3). Our work was performed in 12 Polish forest districts in which absolute population density (Y = N/1000 ha) was estimated by driving, block count and snow tracking census. These data (dependent variables) were correlated with the data obtained from CH (independent variables). The following 3 formulas were derived:

Y1 = ((99,6)*arctan((0.17)*X1), r = 0,83, n = 12, RED; 
Y2 = ((283,0)*arctan((0.218)*X2)), r = 0,75, n = 16, ROE; 
Y3 = ((101,5)*arctan((1,699)*X3)), r = 0,81, n = 12, WB. The above equations were applied to calculate number of RED, ROE and WB from CH data in Niepolomicka Forest (10 500 ha) during December/ January 2010/11. Results showed presence of 480 RED, 1 530 ROE and 245 WB. During the same time population number of these 3 species was determined by driving, block count and snow tracking census. Obtained data indicated that Niepolomicka Forest is inhabited by 530 RED, 1 620 ROE and 272 WB. In Poland 12 000 – 15 000 CH take place and number of DP ranged from 60 000 – 75 000. Concluding, data from CH may constitute a reliable method of big game population census, but it depends on changes in the Polish Hunting Low.
Monitoring of wood pigeon migrations and their spatial and temporal evolution. Results induced by new technologies

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Monitoring wild life and more precisely wood pigeons in their habitats is usually a tedious job for the ground watcher. Several methods exist to respond to monitoring requirements. Standardized methods, which correspond to usual ringing techniques, make it possible to get comparatively reliable results, depending on sought data concerning the population. Indeed, it is easier to highlight migratory processes (flightways....), to determine ringing duration, to study birds fidelity to wintering area.

More “technological” methods, which combine localisation and data acquisition through the installation of Argos beacons which, through satellites, send tags about the equipped birds. They make it possible to better understand feeding strategies, breeding process, migrations and adaptation to surrounding; all this at the individual scale.
SEASONAL HOME-RANGE ESTIMATION IN A RED POPULATION OF NORTHERN APENNINES, ITALY

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From December 2008 to September 2010, we studied the spatial behaviour of 11 red deer hinds through GPS-GSM radiotelemetry, collecting 1 fix/hour, in the Northern Appenines, in a densely forested area (84% of vegetation cover; 18318 ha).

Two different spatial strategies have been described in our population, on the basis of the overlap of seasonal home ranges: one female was migrant (seasonal MCP overlap = 0%), while all the others (N = 11) were residents (seasonal MCP overlap: 36% to 100%). Furthermore, for resident hinds, we described the extension and the shape of their home ranges, using two methods, Kernel and LoCoH (R 2.10, adehabitat package). No difference was found in size using the 2 methods for resident hinds but Kernel seemed to have a better biological adaptability. Unlike the residents hinds, the migrant female showed very different extension and shape of her home range depending on each used method.

We therefore suggest to use this method when elaborating data from resident individuals.
EVALUATION OF DIFFERENT DNA-EXTRACTION METHODS FROM VARIOUS SAMPLE TYPES AND GENETIC ANALYSIS IN EURASIAN LYNX

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Importance of noninvasive genetic sampling is obvious especially in context with elusive species as the Eurasian lynx. The comparison of DNA extraction yield from different sample types is necessary to ensure reliability of PCR outcome. There is also need to test suitability of isolation kits, markers and PCR conditions. We tested several commercially manufactured DNA isolation kits. First-DNA all tissue (Gen-ial), Gene Elute Mammalian Genomic DNA miniprep (Sigma), Invisorb® Forensic Kit I (Invitek) and QIAamp Stool Mini Kit (Quiagen) were chosen as suitable for our purposes. Bohemian Forest lynx population was established by reintroducing approx. 25 animals from the Carpathians in the 70’s and the 80’s of last century and is relatively isolated.

Thus it is highly suitable to use more microsatellite markers than usually. We chose 21 microsatellites developed for domestic cat and 3 for bobcat (Lynx rufus). Loci were multiplexed (co-amplified in the same reaction) according to the allele length distributions. Sex identification was provided by zinc-finger and amelogenin regions of the x and y-chromosomes. PCR products were analyzed and visualized by means of standard procedures. Tissue, hair, saliva and scats samples subjected to our study were collected in years 2006-2011 in the Bohemian Forest. Our results provide a useful guideline for lynx (and carnivores generally) population studies based on genetic analysis.
APPLICATION OF NEW TECHNOLOGIES IN DATA COLLECTION ON GAME SPECIES

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The management of populations of game species requires data collection from hunted animals, the realization of pre and posthunting census and other complementary activities such as tracking their migration movements, ringing, etc. However, the data analysis is performed after the end of the campaign to collect them, preventing the possible implementation of immediate actions in real time. For this reason, two CCB members started a data collection system on-line of the hunting trips and captured woodcocks through Internet, available for other hunters club after entering a username and password to allow access to the personal page of each hunter. Attempts have been made to ensure that the system easy and intuitive to hunters/partners who wish to use. This application enables real-time tracking of all information entered by users, enabling the development of many reports as you want quickly. These reports can be general, with all existing data in the application or sector, divided by temporary spaces (such as fortnights, months or hunting seasons) or territorial (regions and even provinces).

To complement and enhance the application, subsequently it was adapted to may also enter the data sheets of scientific ringing in those Autonomous Communities where there is authorized to conduct such studies, being able to integrate with each other by a display of real-time results, and to enter census data of european woodcock migratory movements. This allows to get real-time data to know the dates of arrival of woodcocks to Spain and dates of departure to their breeding territories, the hunting pressure experienced by species, or the age and sex ratio of hunted animals.
Dispersal barriers may arise and disappear repeatedly over the course of a species’ distribution and can have different effects depending partially on the duration of the barrier and the species’ ecology.

The red-legged partridge (Alectoris rufa) has a large natural distribution range extending from the Mediterranean to humid temperate zones. However, the genetic structure of this species is unknown. We investigated the potential impact of Pleistocene and Holocene range shifts on the phylogeographic patterns and genetic population structure of this species using mitochondrial DNA control-region and nuclear microsatellite loci. Our results imply that during the Pleistocene glaciations this species was affected by climatic changes and ephemeral geographic barriers, which led to their current shallow genealogical and genetic structure apportioned into five genetic groups: South-western, Central-eastern, North-western, Balearic, and French and Italian, which could be recognized as management units (stocks) of the A. rufa species. Future conservation and management plans of this species should take into account its wild genetic structure in regards of releases of captive-bred partridges for restocking, avoiding the mixture of different gene pools and alteration of intraspecific diversity.
Faeces are widely used as an indirect method for wildlife monitoring. However, sometimes there is a high risk of misidentification in the field, especially with increasing numbers of similar sympatric species. The aim of this study was to conduct a blind test of ungulate dung identification and to determine accuracy in the identification of different ungulate species through their dung pellets. For the blind test, a total of 22 experimental subjects (13 males and 9 females) were recruited, all staff from the Spanish Institute of Wildlife Research (IREC) at Ciudad Real, Spain. In the lab, subjects were presented with 35 dung samples from 4 species: red deer (*Cervus elaphus*), Iberian ibex (*Capra pyrenaica*), aoudad (*Ammotragus lervia*) and mouflon (*Ovis orientalis musimon*). Prior to the test, the subjects were given a briefing about the usual morphological criteria used to assign dung to a certain species and were shown samples of known origin. Subjects were given 20 seconds to identify each numbered sample. When time was over, the subject proceeded onto the next sample.

Subjects were not aware of how many samples of each species were included in the test. Mean correct identification of dung samples was 63%. Mouflon was the species with the highest rate of correct identifications, and aoudad was the species with the least correct identifications. There were no significant differences between male and female subjects in overall successful identification of dung samples. Results confirm that there is relatively high uncertainty in the identification of dung pellets of ungulate species living in sympatry. This uncertainty can be reduced with preliminary training and unification of criteria under specific field conditions. We recommend that tests similar to the one presented should be carried out when several observers are involved in dung counts for wildlife monitoring purposes.
Game species in Mexico are more than 60 species (small and big species) according to Leopold (1956). Local Government provides game approach for more than 16 species in different states since 1992. The most important big game specie in Mexico is the white tailed deer (*O. virginianus*) with 8 subspecies. Tamaulipas, Nuevo León and Coahuila area the most important states for sport hunting of this specie. By other hand, rabbit (*S. floridanus*) is the most common small game specie in Mexico. Two kind of game activities are present in Mexico: subsistence and sport. Rabbit is the most important specie in subsistence hunting, with low economic XXXX. By other hand white tailed deer is very important for local people, with some important ingress (3500 USA Dollars for piece). The main scope of this work is developing a niche model to determinate the most important areas to include both hunting strategies and propose this areas for intensive wildlife management. We use data from GBIF and CONABIO to determinate localities with presence of both species, and environmental variables (Worldclim). Both data were processed in Maxent to obtain Niche models. These models were post-processed in Idrisi GIS. Our result show strong relationships of white tailed deer presence (81715865 ha) with landscape structure (mainly scrublands) and raining persistence. By other hand, rabbit presence (33836114 ha) is determinate by land uses composition. Both species presence are important in the central part of Mexico (21562468.98 ha). Local efforts are strongly focused in the north part of Mexico and have to increase the management plans and hunting areas in the central part of Mexico.
RESULTS OF COMPLEMENTARY HAIR TRAPPING FOR WARRENN SURVEY

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The hair trapping itself was introduced and implemented in our warren survey taken place in the Erdspuszta in Hajdúság as a complementary and specifying method in order to be able to specify the proper species that inhabits the given dens. In addition it provided basis for the inspection of other den living animals. In two years 53 hair traps were set up to 38 dens in the survey area. By checking and inspecting the traps in two weeks of periodicity 171 hair sample were gathered from which 137 was specified. The results showed that 4 percent of the samples were badger 11 percent were fox and 65 percent were hare hair.

The results showed that rabbit and fox samples were gathered from two separate dens separated in time and badger and hare hair together were trapped in the same time in the same den. Only fox hairs were trapped in 5 cases and only hare at 3 sites. The phenomena that the hare hair were found in that quantity without any other hair samples can not be derived from being just a prey, the root of this result require further investigation. The hair trapping method did not raise the number of the properly specified dens but proved the actual unhabitated states. This method provides interesting data which can not be gained by a fast and short field research thereby it can be a significant element of field studies.
This study is focused on the shape change of red deer antler (*Cervus elaphus hispanicus*). The sample was obtained during the 2007-08 and 2010-2011 hunting seasons from different closed big game states of eastern Sierra Morena (Jaén, Spain). A 3D geometric morphometrics analysis was carried out using a MicroScribe digitizer, taking 115 landmarks in each one of the 100 specimens studied. We explored antler shape variation to understand the morphological transformations linked to the shape change and we tested the influence of several factors as age, geographical procedence or year. The analysis allowed clustering the specimens in terms of their morphologies. As previously assumed, the existence of a basic pattern of development was confirmed and we observed that the biggest shape variability was associated to the crown. Although red deer antler is commonly a symmetrical structure, differences in development between the right and left branches appeared. Morphological differences seem to be due to age, conditions of environmental stress (mainly affecting the availability and quality of food) or population density. Therefore, we conclude that 3D geometric morphometric analysis of red deer antler could be a useful technique for quantifying morphological variation of the structure and, hence, an indirect indicator to know the quality of individuals or their environmental situation. Finally, another benefit is that this technique is non-invasive, and thus it does not cause any damage to the antler very appreciated as a hunting trophy.
ESTIMATING OF RED AND ROE DEER NUMBERS BY SNOW TRACK DENSITY INDEX IN SOUTHERN POLAND

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Population size of red and roe deer in Niepolomicka Forest is determined by Forest Service using guess estimate. Such non rigorous census may bear significant error leading to over or under harvesting deer population. Therefore main objective of this work was estimate red and roe deer numbers in Niepolomicka Forest by snow track density index that was next transformed into absolute population density. Our study area was situated 35 km East of Cracow and covers 10,8 thousands ha of forest. The main woodland (8,8 thousands ha) is mixed coniferous forest of Pino-Quercetum type and 3 other small woodlands are deciduous forest of Tilio-Carpinetum type. In December 2010 number of snow tracks was counted along 51,6 km of line transects during 5 consecutive days. Altogether, 1210 and 1594 snow tracks of red deer and roe deer were registered respectively. The average snow track density index amounted to 4,69 tracks per km/day (red deer) and 6.18 track per km/day for roe deer. Population density and numbers were computed using non linear regression formulas Y = a*arctan(bx) (Y = population density per 1000 ha, x = tracks per km/day; a and b are constans). Calculation showed that our study area is inhabited by 512 red deer and 1608 roe deer. Forest Service data are considerably lower i.e., 329 red deer and 622 roe deer. We suggest to apply our method to deer management in Niepolomicka Forest.
Cytogenetics is concerned with the study of chromosome characteristics applied to phylogenetic and systematic studies that are enhanced by using modern molecular methods. All the approaches are recently adopted in research of important helminth parasites of cervid game. The aims of the work were (i) description and comparison of karyotypes of the giant liver fluke *Fascioloides magna* and the common liver fluke *Fasciola hepatica*; (ii) applying the fluorescent in situ hybridization (FISH) with 18S rDNA probe, and (iii) interpretation of results in terms of fascioloid phylogeny.

Chromosome preparations were made from testes of live flukes using the spreading method. The slides were stained with Giemsa or processed by FISH, and evaluated using light and fluorescent microscope Olympus BX. A comparison of *F. magna* and *F. hepatica* karyotypes revealed significant differences in chromosome number (2n = 22 in *F. magna* and 20 in *F. hepatica*) and in their morphology. Particularly, the longest pair of *F. hepatica* was clearly metacentric and twice as long as the subtelocentric chromosome of compared fluke. Hypothetically, it might evolve due to centric fusions and translocations from two single-armed pairs of *F. magna*. Using rDNA-FISH, a single locus for ribosomal genes was visualized in both flukes. However, rDNA clusters have distant species-specific location on short arms of 5th pair in *F. hepatica* and in pericentromeric region of the long arms of 10th pair in *F. magna*. Altogether, *F. hepatica* might be regarded phylogenetically younger and the generic affiliation of the taxa seems to be correct. The work was supported by Slovak APVV Agency (LPP-0126-07) and by VEGA (2/0148/09).
HABITAT SUITABILITY MODELING OF RED-LEGGED PARTRIDGE
(*Alectoris rufa*) IN ANDALUSIA

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The main goal of this study is to develop a habitat suitability map of red-legged partridge (*Alectoris rufa* L.), based on spatial distribution of environmental variables in Andalusia (Spain).

The general methodology used is the availability of habitat modeling (HSM, Habitat Suitability Modeling) using generalized linear models (GLM). Information of abundance of partridge has been compiled from the database of Andalusian hunting species monitoring program. Kilometric Abundance Index (KAI) of 121 hunting grounds has been used, after the removal of data from the hunting grounds with releases and re-stockings. The 26 factors initially identified are variables representing habitat characteristics (mainly climatic, topographic, land-use and fragmentation variables) that potentially have an influence on the distribution and abundance of red-legged partridges within the study region. They have been obtained from existing thematic maps in the Andalusian Environmental Information Network (REDIAM). We used a multivariate analysis to simplify the number of variables before inclusion in the GLM. The working tool was the raster spatial analysis with Geographic Information Systems (GIS).

We obtained a model, composed of 5 factors (elevation, relationship between forest area and non-forest, mean patch size, perimeters of patches per unit area and mean of distance to inhabited buildings), that explained only 30% of the abundance distribution. The remaining 70% was explained allegedly by other variables, such as human factors dependent on hunting management and agricultural habits. That probably shows a large dependence between the red-legged partridge populations and human activity, and calls into question whether the current level of intervention in hunting management of partridge, and agricultural habits like use of pesticides, are correct. The obtained habitat suitability map shows practical use allowing to quantify habitat quality of wild red-legged partridge populations, to identify areas “naturally” good for the species and its application as a useful tool in wildlife management, for example by comparison with the abundance or hunting yield maps.
ESTIMATING THE ABUNDANCE OF WILD BOARS (Sus scrofa) IN A FOREST SETTING BY USING TRACKING DOGS

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Studying the wild boar (Sus scrofa) population is difficult to tackle without resorting to costly, complex methods that cancel out their application to a large extent. An estimate was made in the summer of 2009 of the abundance of wild boar in the primarily beech and oak forest settings south of the city of Vitoria-Gasteiz (Spain). A non-invasive technique based on a traditional hunting system from northern Spain was applied: sampling using leashed tracking dogs (hounds) trained to identify fresh boar tracks. Six forest plots were designated in the study area (9229.5 ha, 58.2% forest) and their perimeters covered by 1-2 dogs guided by their owners.

The dogs’ behaviour (barking, etc.) indicated the presence of traces, allowing the boars’ directionality and whether they were entering or leaving the plot to be determined. A total of 32.3 km were covered (average transect: 5.4 ± 0.6 km) with a total of 490.5 hectares surveyed (average plot: 81.6 ± 19.5 ha). Ten traces of solitary specimens or herds were intercepted, corresponding to a minimum of 16 different specimens who had used the surveyed area the night before, with a minimum of 5 inside the plots (D plot: 1.06 ind/100 ha). It can be affirmed that the boars detected, at the least, are inside the area of study, whether or not they were inside the perimetrically covered plot (D min: 0.30 ind/100 ha). In addition, potentially at some point the night before, all of them may had been inside the plots at the same time (D max: 3.39 ind/100 ha). The average of the three possible calculation methods was proposed as a density indicator value: 1.58 ind/100 ha. We conclude that this method can be applied to estimating the wild boar population and has an adequate cost-results balance, which facilitates its use for species management, regardless of the existence of hunting practices and substrate conditions in the zone.
In southern European countries release of captive-bred red-legged (Alectoris rufa) partridges is used to reinforce hunting areas where wild populations have decreased. Several studies have recorded cases of artificial genetic pollution of A. rufa by Alectoris chukar, due to a better growth and adaptation performance of the latter to captivity as a result of artificial selection. Hybrids detection is crucial to avoid uncontrolled restocking which may lead to a widespread introgression of foreign species in locally adapted partridge species. The aim was to develop a cost-effective medium-throughput genotyping method to allow easy introgression detection of A. chukar into wild A. rufa populations. For this purpose, four Spanish and one French laboratories analyzed 266 blinded partridge samples (68 red-legged partridges from wild Spanish and French areas, 80 individuals from two Spanish cinegetic farms, 40 red-legged samples from two Spanish museums, 38 wild chukar partridges from Libya and Cyprus, and 40 artificially generated hybrids A. rufa × A. chukar) by different molecular methods and their results were compared. Among the SNP (Single Nucleotide Polymorphism) markers validated, a subset of twenty-three target sequences (22 genomic and 1 mitochondrial) were selected based on their species exclusivity and optimized in one multiplex reaction hybridized by Primer Extension. The 22 nuclear markers subset shows a detection power of 1, 0.998 and 0.947 for a three consecutive backcrosses with A. rufa B1, B2 and B3, respectively. The simple, flexible and low-cost SNP typing assay developed here allows the fast genotyping of few SNPs at a reasonable price with no need for an expensive infrastructure. This fact, along with the unification of criterion and method for hybrids detection among the main Spanish and French partridge laboratories, provides an effective tool to control the introgression of reproductive-bred individuals in hunting areas and on farms before restocking.
A NEW SET OF 16S RRNA UNIVERSAL PRIMERS FOR GAME SPECIES IDENTIFICATION

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Nowadays, great value is placed on accurate and secure animal identification for taxonomic, phylogenetic, forensic and conservation purposes. Advances in technology together with lowering costs of DNA sequencing resulted in identification of species by short sequences of DNA. In this study, bioinformatic methods were used to specifically design universal primers within 16S rRNA gene according to the following criteria: the priming sites needed to be sufficiently conserved to permit a reliable amplification (pooled samples) and the genetic marker needed (a) to be sufficiently variable to discriminate among most species and sufficiently conserved within than between species, (b) to be short enough to allow also accurate amplification from processed samples (food) and non invasive approaches (fur, feathers, faeces etc) (c) to convey sufficient information to assign samples to species and (d) to be amplified under variable lab conditions and protocols. Furthermore, short sequences allow the accurate massive inter and intra-species identification of point mutations by the SSCP technique. The size of the amplified segment ranged from 222 to 252 bp. Amplification and identification success was 100% with all kinds of tissue tested in both raw and processed samples in a wind range of mammal (68), avian (32), reptile (12) and amphibian (7) species, including almost all European mammal and avian game species. In addition, no intraspecific polymorphism was detected, at least for the 10 samples analyzed within each species. Therefore, this short segment of the 16S rRNA mitochondrial gene could be the ideal candidate for a rapid, accurate, low-cost and easy-to-apply and interpret method to identify mammal and avian game species by PCR amplification that can be easily incorporated in integrated conservation and forensic programmes.
We develop and validate a method of fecal near infrared reflectance spectroscopy (F-NIRS) for analysis of acid detergent fiber (ADF) as a measure of diet quality consumed by two sympatric species of deer in a Mediterranean region. We used 121 red deer (*Cervus elaphus hispanicus*) and 114 fallow deer (*Dama dama*) culled during the 2008-9 hunting season in Sierra Morena, Jaén. Rumen contents and feces were collected immediately afterwards under controlled conditions. The study was conducted in four stages: 1) First, in the laboratory we determined the ADF of a total of 235 rumen samples through chemical analysis (Van Soest and Wine, 1967); 2) Second, absorption spectra were obtained from feces samples previously lyophilized. Measurements and recording of the spectra were performed with a Bruker Tensor 27 Fourier Transform computer with a DTGS detector and attenuated total reflectance accessory (ATR-FTIR); 3) In the third stage a calibration equation capable of predicting the ADF was obtained by the regression of the analytical results of ADF to the spectra of reflectance NIRS of feces. Data were previously transformed by the first and second derivative. Different regions of the spectrum were tested and different calibration equations were obtained using a partial least squares (PLS) analysis; 4) As a final step the accuracy of each predictive equation was assessed, from the correlation coefficient (r) and the square root standard error of calibration (RMSEC), the square root of the standard error of cross validation (RMSECV) and the root mean square error of prediction (RMSEP). The reliability of this method was assessed using an external validation with 56 independent samples. The optimal equation for predicting ADF showed the following results: $r = 0.995$, RMSEC = 0.61, RMSECV = 6.27, RMSEP = 4.49. The results and mathematical models show that fecal NIRS technique is satisfactory for determining ADF in red as well as fallow deer. This technique is shown as an exceptional tool for monitoring wildlife in an indirect way, fast and non-invasive.

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Species extinctions and population dynamics
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In Poland during spring and summer 2010 temperature was much below the annual average (16.2°C vs. 15.8°C) and precipitation showed much higher values (56.8 mm vs. 90.0 mm). Therefore the main objective of this paper was to analyze population dynamics of grey partridge and European hare from spring to autumn 2010 using unfixed line transect method. The study areas were 2 farmland habitats situated 35 km East of Cracow. Study site A (3096 ha) was lowland in Vistula Valley and study site B 3200 ha was located in a hilly upland. Using topographic maps line transects of 7.2 km and 7.8 km were established sites A and B respectively. In March and October 2010 during 3 consecutive days, a team of 5 persons and 2 dogs recorded perpendicular distances of all encountered animals along the transects.

The number of hares (n = 69) and partridges (n = 58) declined with increasing perpendicular distance (r = –0.94 and –0.81). Using the number of animals seen in 30-m intervals, linear regression formulas were calculated: y1 = 6.05 – 0.035 × 1, y2 = 8.39 – 0.05 × 2, where y is the number of hares (1) and partridges (2) seen and x is a perpendicular distance from the line transects. Using above formulas the area of census and the number of animals that were missed were calculated. The estimated monitored areas covered by the transects varied from 208.1 to 315.2 ha. The density of hares in spring amounted to 3.17 and 7.16 animals/ 100 ha at the sites A & B respectively. By autumn the density of hares had decreased to 0.6 and 1.9 individual/100 ha respectively. The density of partridges in spring was equal to 4.0 birds/100 ha at site A and 3.2 birds/100 ha at site B. The density of partridges in autumn decreased to 2.4 animal/100 ha in site A. A slight increase of partridge density to 3.5 birds/100 ha was observed at site B. A sharp decline in hare density was probably caused by a flood that took place in parts of the study area, mainly at site A.
Wild boar, Sus scrofa, is distributed worldwide and wild ancestor of domestic pig. To determine the pattern of genetic diversity and genetic structure of wild boar in northern Eurasia, the genetic variation within and between wild boars from Russian West to South Korea was characterized. A total of 153 individuals was subjected to 16-microsatellite loci analysis. Expected heterozygosity ranged from 0.484 in south western region of South Korea and 0.755 in mixed populations of Russian Ural. Except these two regions, most of wild boars showed a similar level of genetic diversity. Level of genetic differentiation (Fst) was ranged 0.024 between two provinces of South Korea and 0.376 between Estonia and South Korea. Wild boars from Jeju island of South Korea had relatively high FST value with respect to all other populations, ranging from 0.189 to 0.329, and showed a discrete structure.

Structure analysis and relationship tree indicated that wild boars from Estonia and Ural were grouped together separated from other wild boars, indicating the genetic traits of mixed population are closer to European, than to Asian ancestors. AMOVA analysis indicated 14% of total variation is accounted for by regional difference, implying significant regional genetic differentiation. Taken together, results revealed the pattern of genetic diversity and differentiation among wild boars from Northern Eurasia appeared to be correlated with geographical distances and wild boars in Jeju, Korea, were independently structured indicating no gene flow with other populations. Further studies using more geographic samples of wild boar and native pigs from Eurasia will shed light on our understanding of: (i) genetic structure and phylogeography of wild boars from Eurasia; (ii) historical origin of and domestication process of Asian native pigs.
The Balkan chamois (*Rupicapra rupicapra balcanica*) population in Greece is protected and classified as rare. Its shooting has been prohibited since 1969. The objective of our study was to ascertain the distribution, population size and habitat parameters of chamois in southern Pindos mountain range during the period 2008-2010. Field data collection was based on visual observation from panoramic view spots via binoculars (12 × 50) and telescopes (20 × 60). Moreover interviews from local people were used to identify potential locations where chamois resided and provide information on the distribution in the past. Habitat analysis and corridors between groups were calculated using Geographic Information System routines. Results indicated that the population size of the chamois varied from 143 to 159 individuals. The population distributed in 10 mountains and three of them are within wildlife refuges. Chamois habitat includes steep slopes, sub alpine meadows and forests with fir, beech and oaks.

Long term monitoring on population status will be necessary to gain knowledge for effective management.
A MODEL FOR DIFFERENTIATED MANAGEMENT OF GREY PARTRIDGE
Perdix perdix IN DENMARK

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The purpose of this work is to provide input into a national management plan for the grey partridge in Denmark, aimed at maintaining or increasing the present level of the population. The Danish population has declined markedly since the 1950s mainly because of reduced heterogeneity of arable land associated with changes in agricultural practices that negatively affect especially breeding site availability and chick survival, as shown in other parts of the breeding range. Increased voluntary local efforts on game habitat management have not led to increases of the partridge population, probably because such actions in many cases have not been directly focused on the specific requirements of partridges and occur at random on a small scale. Partridge numbers have been found to increase markedly and rapidly in areas where agricultural practices, habitat restoration and management are focused on providing the landscape patches required for successful reproduction, and likewise to respond positively to reduced hunting pressure and predator abundance. Based on existing knowledge, a management model, which incorporates a feed-back response between bird population levels and implemented management actions, was developed. The model requires a population monitoring scheme to evaluate effects of targeted management actions, and it is suggested to monitor population changes by systematic counts with dogs combined with supplementary counts carried out by local land users. Four levels of breeding densities (poor: 1-4 pairs/km², low: 5-9 pairs, fair: 10-19 pairs and good: >20 pairs) and associated autumn populations, are suggested as differentiated management goals to which hunting pressure may be adjusted: no hunting of poor populations, and max. 10%, 20% and 25% of the autumn population being harvested at increasing density levels.

In order to provide a tool that is easy to use, hunting is recommended only on flocks of at least 7 birds. The 7-bird rule is already a widely used rule of thumb among Danish hunters, which theoretically could benefit partridge populations.
IN-SITU CONSERVATION OF THE QUAILS OF CENTRAL MEXICO: A SANITARY APPROACH

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Central Mexico is characterized for to hold a great biodiversity, although, this has not been completely studied. Relatively to upland game birds we found four species of quails: Montezuma (Cyrtonyx montezumae montezumae), bobwhite or common (Colinus virginianus), barred (Phylortyx fasciatus) and scaled (Callipepla squamatta) and representing an unimproved cynegetic resource. In the highlands of central Mexico, particularly the State of Mexico, the habitat of these birds has been drastically reduced as a result of human activities as agriculture, forestry and urbanization.

The basic information respect to their distribution, abundance, feeding, interaction and behavior there is poorly developed and diseases or health status is unknown. The objective of this research is to realize sampling of populations, to evaluate quail’s habitats and to identify potential suitable areas of good quality habitat for to advance their conservation, increase their populations and their utilization under active sanitary monitoring.
Nest predation study was carried out in the Dinnyési Fertő area in April and June 2010 using different (duck, geese and plasticine) eggs in artificial nests. The target species were the greylag goose (Anser anser), mute swan (Cygnus olor), mallard (Anas platyrhynchos), pochard (Aythya ferina) and coot (Fulica atra). During the spring study period both mallard and domestic goose eggs were used, while during the summer study period domestic chicken eggs and plasticine eggs were placed in the nests. Egg predation was significantly higher (t-test, p < 0.05) in the spring period compared with the summer period results.

Predation on duck eggs was more significant compared with the goose eggs, most probably due to the thick egg-shell of the goose eggs. Predation of clutches was particularly high on the site where both artificial duck and goose nests were placed mixedly, although this phenomenon was not statistically proven due to the small sample size. The less intensive predation during the summer period can probably be explained by the high water level caused by the long and heavy precipitation events in June. The predator identification results (plasticine eggs) showed the dominance of avian predators. The most important avian predator species were the magpie (Pica pica) and the hooded crow (Corvus corone cornix). Regarding the mammal predators, it has been proved that the only mammal nest predator species in the area is the eurasian badger (Meles meles) of which importance has been remained mostly hidden in many cases.
Myslibórz Forest District covers 11.6 thousands ha of woodland and include 86 small size forests. During 5 years (2002-2006) number of roe deer snow tracks was counted along 16 line transects (total length – 66.4 km). Every year number of daily snow tracks during 5 consecutive days was registered. The relationship between daily snow track density index (track per km) and absolute population density (N/1000 ha of forest) was established by using snow tracking data and driving census in 9 sampling plots (total area 1011.6 ha). This formula \( Y = (316) \times \arctan ((0.3771) \times X) \), where \( Y \) is population density (N/1000 ha) and \( X \) is daily snow track density index (T/km), was applied to calculate roe deer population density from snow tracks collected in 16 line transects. Estimated average population density ranged between years from 334.5 to 344.3/ 1000 ha of forest i.e. from 3707 to 4025 individuals.

The accuracy of mean calculated for 5 days tracking period of 95% confidence level varied between years 3.85 to 8.65%.
Status of hoofed mammals populations (*Alces alces* L., *Rangifer tarandus fennicus* Lonnb., *Sus scrofa* L., *Capreolus europeus* L.), their distribution and management in Karelia were discussed. The data of winter counting, surveys of hunters and data collected from field trip in different parts of Karelia used in study. Moose is one of main game species in Karelia. The highest number of moose registered in the south of republic is 4,0, and lowest in north – 1,7 tracks per 10 km of route. The total number in 2010 was about 17 thousand animals. Management of moose population in Karelia is no optimal. For the last decade about 3 % from total number was harvested only. Forest reindeer spread in north and central districts of Karelia. The species number in 2010 was low and estimated in 2300 ind. Today hunting on forest reindeer in Karelia is forbidden but the poaching is the serious problem and many cases of illegal harvest of reindeer registered annually. Spread of wild boar have a mosaic structure and tight connected with agricultural territories. The highest number in the south of republic – 0,4 tracks per 10 km of route. In central part of Karelia wild boar is very rare. Sometimes the appearance of this animal recorded in northern districts. The roe deer doesn’t live in Karelia. But last time the animals encounter in different parts of Karelia more often.

It can be related with increasing number of these animals in neighboring territories. The study done with support grants of RFFI 10-04-00913, Presidium of RAS «Biodiversity» 01200955236, FASI 02.740.11.0700, SBS RAS 01200955239.
The number of grey partridges (*Perdix perdix*) in Poland considerably decreased in the 1990s. The population decline was connected with the drop of reproductive success, including both the brood production rate and chick survival rate, as well as the decrease in annual survival rate of adult birds, mainly females during the breeding period. Increased abundance of nest and incubating female predators (particularly foxes) was mentioned as the main reason, and agricultural intensification was probably a secondary factor. In the years 2001-2011 partridge populations in Poland were monitored in selected agricultural areas located in various regions of the country to obtain current information about changes in their density and other demographic parameters. In the monitoring areas, spring partridge density (call counts in March/April), reproductive success (counts of adult and young birds in August) and annual survival rate of adult birds were estimated. At the beginning of the 21st century, the average spring density of partridges in Poland was about three times lower that in the early 1990s. In the years 2001-2011, from <1 to 10 pairs per km² were found in individual areas. Moderate fluctuations (due to changing weather during chick-rearing periods and winter seasons), but no significant long-term trends in mean partridge density and other population parameters were observed during this period. High predator pressure and some negative changes in agricultural practices were probably responsible for low partridge numbers in many regions of Poland at the beginning of the 21st century.
In the recent 10 years the population of wild geese has increased in Southern Germany. Currently grassland in parks and artificially built waters extend possibilities to brood and browse for geese in the urban area. In Munich there are problems with geese due to droppings in parks and recreation areas as well as feeding damages.

For urban wildlife management, data about population size and development of geese are essential.

Data were collected by counting the geese on monthly basis in the year 2008 and since 2009 on weekly basis.

The synchronized counts have been realized by several assistants at 23 waters in Munich, Southern Germany. Additionally, mapping of breeding birds have been conducted. Therefore the species of geese and the numbers of eggs per nest have been monitored. Based on the coloured marking of the nests and the continuous control abortion of breeding and new nests were detected.

The most frequent species found in Munich was the greylag goose (Anser anser) with 83%. The Canada goose (Branta canadensis) is the second most important species with 8%. Breeding- and rearing areas in Munich were found in 20 public parks and cemeteries. Among these, only two public parks were concentrated for moulting and breeding. In these parks the number of breeding pairs of greylag goose has increased from about 35 to 70 pairs between 2007 and 2009. About 15% of these pairs did not succeed in getting their goslings fledged.

In 2009 113 pairs of geese have been breeding in the whole urban area of Munich. Among them 79 breeding pairs were greylag geese and 26 pairs have been successful in breeding. However in 2008 there have been 31 breeding pairs.

With 1650 wild geese, there is a considerable urban population in Germany. Population values and attitude of citizens are necessary to develop a management concept. However the question about problems with geese cannot be answered by population data but rather by the human attitudes towards geese.
STUDY OF LOCAL WILD RABBIT (Oryctolagus cuniculus) PULLULEMENT
BY COMPARISON OF TWO DIFFERENT DENSITY POPULATIONS

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Wild rabbit populations experienced a decline in France from the middle of the twentieth century. Nevertheless we are confronted to unexplained local pullulement phenomena. Understanding swarming mechanisms is essential to predict, control or develop populations.

We have tested existence of characteristic variables of pullulement by studying two populations geographically very close but different by their rabbit density: very high density (KAI = 51.7) versus medium density (KAI = 18.8). This study was located in eastern Pyrénées, southern France. We captured 955 individuals and studied the following factors: sex, age, weight, clinical signs of myxomatosis, parasitological level, physical conditions, reproduction activity, blood tests (glucose, fructosamine, AST, ALT, bile acids, urea, total protein, creatinine, T4, gamma gt, sodium, potassium and progesterone), genetic (analyze by nine microsatellite markers), serology (research specifics antibodies to RHD and Myxomatosis) and vegetation quality (fibers, proteins, fats, starch and digestible energy). We highlight an upper weight for adult males of strong density population. Glycemia is higher in the population of medium density. Blood progesterone level is higher for the adult females of medium density population. We observe a significant proportion of Iberian genetic alleles in both populations. Proportion of adults RHD antibodies carriers is higher in the medium density population.

Concerning vegetation quality we note an important concentration of proteins in the habitats sampled in the zone of high density. Confrontation of those preliminary results with others irruption populations exempt of Iberian genetic influence has allowed to derive some characteristic leads of swarming wild rabbit, keystone species for mediterranean biodiversity.
GROUP DYNAMICS OF WILD GOAT (*Capra aegagrus*) IN RUTTING SEASON IN THE VERCENIK MOUNTAIN WILDLIFE RESERVE AREA, TURKEY

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The group dynamics and population size are very crucial for survival of wildlife population. We studied the diurnal group dynamics of the Wild Goat within a 61,000 ha open pasture and forested area during the rutting season.

Direct observations and photo trap techniques were used to determine the group dynamics. Individuals were defined as a different group with distance between at least 50 m and feeding/walking direction was distinct. The observations showed that rutting season last from December 15 to January 20 and birth in late May in response to local and average climate conditions. Observation results were evaluated with Deterministic Analysis. The group size was mainly consisted of 4.68 individuals. The groups were shaped with average 1.13 young males (2-3 years old), 1.28 old males (over 4 years old), 1.87 females and 2.07 yearlings. The group dynamics showed that each female nearly having the one yearling. After the rutting season, females, young males and yearlings can be observed together and old males leave the females and yearlings. The total count was estimated at 100 individuals by the wildlife reserve area ranger.

Unfortunately, we did not observed very old males (like 10-12 years), we believe that this may be affected from poaching, continuing very common in the region. Future observations will be focused on the survival rate of males, females and yearlings and also population viability.
Monitoring animal population trends is essential to develop appropriate wildlife management strategies. In Portugal, red deer populations have been increasing in size and distribution over the last three decades. One of the largest free-ranging populations is located near the Portuguese-Spanish border, in the Northeast of the country. Red deer reappearance in that region dates from early 1980s, when several animals dispersed naturally from Sierra de la Culebra Regional Hunting Reserve (Zamora, Spain) into the Portuguese territory.

This recolonization process has led to an increasing concern in relation to conservation, management and game exploitation of this species. An evaluation of the real population status is a key aspect for correct management planning and decision-making. By using two direct count methods, line transects and vantage points, we estimated red deer densities and other population indices (i.e. sex-ratio and recruitment rates) in the northern unit of Lombada National Hunting Area (Bragança, Portugal). Indirect methods were used to update information about distribution area.

Our results showed a slow increase in the population density and a considerable geographic expansion in relation to the last two decades. Using distance sampling in line transects we estimated an average population density of 3.26 ind/100 ha (95% CI = 2.27-4.70). Furthermore, we calculated a mean population sex-ratio of 0.81 (95% CI = 0.71 – 0.92), which is close to an 1:1 proportion, and the annual variation in the number of calves per female indicated a low productive population. When comparing our results with those of Sierra de la Culebra technical plans, we found similar population indices, reinforcing the transboundary character of red deer population. We highlight the importance of regular and long-term monitoring programs and we recommend a cooperation between Portugal and Spain in red deer management. Managing transboundary populations is an interesting new challenge in wildlife management.
Since 1997 wolf (*Canis lupus*) became protected species in Poland. However up to now the governmental agencies that are responsible for nature protection did not established a professional monitoring of wolf population dynamics. Polish statistical Yearbook showed recently that wolf population declined from 1000 to 600 animals, but it is based upon quess-estimate data from State Forest Service.

Therefore the main task of this paper was to collect data on relative density index in February 2010, and to compare obtained results wish similar data, which were obtained in February 1999.

The study area was 50,5 thousands ha of forest *Fagetum carpaticum* type in part of the Polish Eastern Carpathians called Bieszczady Mountains. It is a very important wolf core habitat in southeastern Poland. Using the same as in 1999 line transects (n = 5, length = 204,2 km), snow track of wolves were counted during 5 consecutive days in February 2010. I collected 114-wolf track i.e. 22,8 track per day or 0,111 per km/day. In February 1999 mean density of wolves tracks amounted to 20,0 per day or 0,099 tracks per km/day. Comparing to 1999, the relative population density increased by 14,0%, but this change was not statistically significant. No population increase during the period when the wolf was protected species suggests that population number of wolves when they were game species was similar to the current one. Wolves are territorial species and most likely surplus of wolves during the period when they were game species and now when they are protected species is reduced through emigration of young animals, which are colonizing western parts of Poland.

Key words: wolf, Polish Eastern Carpathians, relative density, snow tracks
A central component of natural selection on breeding strategies is the survival of offspring until independence. Red deer populations are adapted to the climate conditions in their distribution ranges. In northern areas of Europe, rainfall and low winter temperatures have been shown to constitute the main causes of calf mortality. In Mediterranean areas, however, red deer populations may experience stronger selection due to the conditions under the summer rather than under the winter, as in this region summer has been reported as the most limiting season for herbivores. In this study we investigate calf survival in six years with different weather conditions.

We performed survey counts after the summer during 6 years and in different seasons in one of these years that was the driest one. Our results show a decrease of the proportion of calves in drought years. Calf's mortality from spring to autumn in the driest year was 0.45. These results support that summer is the limiting season also for calf survival in these populations in the Mediterranean region, and that prospects from Global Climate Change should be taken into account as a potential cause that can exacerbate these consequences.
Veterinary aspects of wildlife and conservation
Lungworms of *Dictyocaulus* spp. (*Strongylida: Dictyocaulidae*) are frequent nematodes of deer (*Cervidae*) in many parts of the world. These worms are considered to be the most important parasites causing pathological changes in bronchi and bronchioles in farmed deer stocks.

A few *Dictyocaulus* species exists in cervids in Europe but it is hard to distinguish them accurately on the basis of their morphological features. Previous studies used some molecular markers to identify lungworm species. Often the results are not comparable to each other due to use of different molecular markers. *D. viviparus* considered to live in cattle, while *D. eckerti* in cervids (red deer, fallow deer, moose, reindeer) and musk ox. Study in Sweden demonstrated that roe deer and moose are infected with a different species, *D. capreolus*. We characterize molecularly the lungworms living in red, fallow and roe deer in Hungary and evaluate the previously used molecular markers in point of species delineation. DNA sequences of 5 molecular markers (18S, 28S, ITS2, Major Sperm Protein (MSP) and mitochondrial cytochrome c oxidase subunit I (COI)) were used to examine the genetic variability among lungworms. The sequence variability of ribosomal 18S and MSP gene are lower than 28S, ITS2 and COI. Because of the intraindividual variability of 28S and ITS2 we suggest to use the standard barcoding gene, the COI as species delineation of lungworms. DNA sequencing of several lungworms collected in Hungary revealed an undescribed *Dictyocaulus* species living in wild red deer.

The presence of cryptic lungworm species highlights the need for more widespread sampling of lungworms living in several ruminant species in different geographic regions to describe the relationship with their hosts.
The objective of this paper is to present preliminary results on the development of a protocol to assess animal welfare in wild ungulates in captivity. The protocol is based on the methodology developed in the project Welfare Quality for farm animals, which is an extension of the Five Freedoms and includes mainly animal-based indicators. The indicators included in the Welfare Quality protocol for domestic cattle were applied to red deer (*Cervus elaphus*), fallow deer (*Dama dama*) and dorcas gazelle (*Gazella dorcas*) kept at Barcelona Zoo. The indicators refer to four elements of welfare: nutrition, housing, health and behaviour. A literature review was done to assess the validity of each indicator for each of the target species.

Once adapted to each species, the protocol was run on the Barcelona Zoo facilities to verify its feasibility and identify possible methodological problems. Most of the measures included in the Welfare Quality protocol were found to be useful in the three species studied.

However, some animal-based indicators are difficult to apply to wild species as there is lack of detailed information on their general biology and behaviour. A further problem –which to some extent also applies to farm species–, is that obtaining an overall assessment of animal welfare may be very difficult, as different indicators measure different aspects of welfare. Despite these shortcomings, it is concluded that the methodology developed over the past few years for farm animals may be applicable to wild animals in captivity and that whenever possible emphasis should be put on animal-based indicators rather than on resource-based ones. Nevertheless, some resource-based indicators are likely to be used when animal-based indicators are not available and to identify improvement strategies.
IDENTIFICATION OF THE PREGNANCY-ASSOCIATED GLYCOPROTEIN GENE POLYMORPHISM (EXON1-2 AND INTRON A) IN THE DOMESTIC AND WILD PIG GENOME*

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Pregnancy-associated glycoprotein family (PAGs) belongs to placental aspartic proteinases that are expressed in chorionic cells (pre-placental trophoblast and trophectoderm after placentation) of some eutherian species. Complementary DNA (cDNA) of the PAGs have been identified, so far, in the Artiodactyla (cattle, pig, sheep, goat, white-tailed deer and water buffalo), Perissodactyla (horse, zebra), Rodentia (mouse) and Carnivora (cat) order. Eight cloned cDNAs of porcine PAGs (pPAG) have been classified as catalytically active members of pPAG2-like subfamily (pPAG2, 4, 6, 8 and 10) or potentially inactive pPAG1-like subfamily (pPAG1, 3 and 5). However, the PAGs have not been examined in the wild pig genome.

The aim of this study was (1) to identify amplicon-polymorphism profile of PAG genes in the domestic and wild pig (wpPAG); (2) to identify 5′-terminal region of nucleotide sequence differences between pPAG and wpPAG genes. Genomic DNA (gDNA) was isolated from leukocytes of domestic pigs or hair roots/skin of wild pigs, purified, then applied as a template for PCR with sensATG/2AS starters to amplify 5′-gene fragment (exons 1-2), due to pPAG2 gene structure. Dominant PAG amplicons were cut out from agarose gel, purified by G-Capsule, then sequenced (3130 Genetic Analyzer, Applied Biosystems). Length-polymorphism of pPAG (1000, 1100, 1200, 1350 and 1500 bp) and wpPAG (1200, 1350, 1500 bp) amplicons was identified. The nucleotide sequences of PAG amplicons within exonic donor and acceptor regions were surprisingly very comparable in the domestic and wild pig.

The highest sequence polymorphism of the pPAG and wpPAG amplicons has been found in the middle region of intron A (approx. 350-500 bp), among entire internal nucleotide sequence (1150 bp) encompassing exon 1, intron A and exon 2. Such PAG analyses of genomic amplicon sequences can be useful data for a novel marker preparation that enable to test genetic biodiversity of many wild animal species.

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Infectious diseases of wild animals are distinguished according to both agents causing them and animal species susceptible to infections. They are also essentially different in relation to the course of disease and losses to farms caused by such diseases. Virus diseases of wild animals can occur as single cases or affect large populations of animals in the vast territories growing into epizooty. Moreover, the major economic damage is caused not only to hunting reserves but also to animal farms in case of farmed animal infection.

The paper presents the testing results of 75 sera samples from wild mooses of different age groups collected in the territory of the Russian Federation (Table). The samples are collected from animals of different age and sex groups, under yearlings (sampling period: 2007-2010) and adult animals (sampling period: 2006-2010). Results obtained in the process of serological testing show that the greatest percentage of seropositive samples is related to PIV-3 that is 96%. Percentage of seropositive samples for bovine coronavirus infection (BCV) is 8.3%, but the sera samples collected from under yearlings from 2007 to 2009 were negative. Percentage of seropositive samples for bovine respiratory syncytial virus (BRSV) collected from adult animals from 2006 to 2008 is 5.5%. The obtained results indicate the extensive circulation of PIV-3 in wild moose populations.
FACTORS AFFECTING SEROPREVALENCE OF *Toxoplasma gondii* IN THE ENDANGERED IBERIAN LYNX (*Lynx pardinus*)

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In the present study, seroprevalence and associated risk factors for *Toxoplasma gondii* infection in the Iberian lynx (*Lynx pardinus*), the most endangered felid species in the world, were determined. Serum samples from 129 Iberian lynx collected from 2005 to 2009 in the two areas where survive in Spain. In addition, 85 wild rabbits (*Oryctolagus cuniculus*), sharing the habitat with the Iberian lynx. Samples were tested for antibodies to *T. gondii* by the modified agglutination test (MAT) using a cut-off value of 1:25. Antibodies to *T. gondii* were found in 81 (62.8%) Iberian lynx. Seroprevalence to *T. gondii* in lynx significantly increased with age (P <0.001). *T. gondii* seroprevalences were similar in free-ranging (66.7% of 93) and wild-caught captive lynx (69% of 84) but significantly lower in captive-born lynx (22.5% of 40). There were no significant differences in seroprevalence between sexes, geographic region and year of sample collection (2005 to 2009). The fact that four captive born lynx seroconverted was indication of contact with *T. gondii* also in the captive breeding centers. Oocysts of *T. gondii* were not detected microscopically in faecal samples from 58 captive lynx. Wild rabbits are the most important food source for the lynx. Antibodies to *T. gondii* were found in 14 (11.9%) of 85 rabbits tested.

The present results indicate that *T. gondii* infection is widespread in the Iberian lynx populations.
The endemic Cyprus mouflon has been present in Cyprus since the Neolithic times and is of Asiatic origin brought to the island by man. It inhabits a mountainous area of 700 km² with its stronghold being Pafos forest in the SW of the island. It is the largest terrestrial mammal and a protected species under Cypriot legislation and listed in Annex II/IV of 92/43 EE Habitats Directive. Population dynamics are studied through systematic monitoring that includes annual fall population counts on 20 transects covering the species' range. Fall population estimates for 2010 were 2574 ± 599 animals whereas the average population structure was 35% rams, 36 % ewes, 17% lambs and 12% yearlings (ratio of rams: ewes: lambs: yearlings 95:100:47:33). Two-hundred and eight dead or sick animals (208) were taken to the Veterinary Department for post mortem examination from 2001 to 2010. Ram mortality was 47%, ewe mortality 27%, lamb mortality 13% and yearling mortality 5%. Disease was the first cause of mortality (39%) whereas poaching, predation and vehicular collisions came second (each constituting approximately 14%). Accidents came third (11%). Fifty-one animals (25%) examined had parasitic pneumonia at various stages. In 5 mouflon we have observed fertile cysts of *Echinococcus granulosus*, whereas in 5 different cases *Cysticercus tenuicollis* was detected. Coenurosis *Coenurus cerebralis* was detected in 3 cases and on 1 case Systemic Cryptococcosis *Cryptococcus neoformans*. Mouflon went through an infectious keratoconjunctivitis epidemic during 2001-3 with 71% of all disease-related mortality during that 3-year period to be attributed to this disease factor. Annual counts showed a decrease of 20% in population numbers in 2003, following the end of the outbreak.

The population recovered to pre-outbreak numbers in 2007. Mouflon is threatened mostly by livestock encroachment to its habitat (potential disease transmission and forage competition), poaching, and feral dog predation, increased road network that fragments its habitat and increases collision risks.
DETECTION OF THE BAGAZA VIRUS IN THE RED-LEGGED PARTRIDGE IN CADIZ (SW-SPAIN)

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In August 2010, several hunting reserves in the hunting area of “Campiña” in the countryside of Cadiz (SW Spain) notified the administration of an abnormal mortality of red-legged partridges (Alectoris rufa) and of the common pheasant (Phasianus colchicus), which showed signs of nervousness; according to the information giving by the hunting areas owners’, the 37% of the partridge population and the 11% of the pheasant population could have been affected.

The Regional Environmental Ministry of the Regional Andalusian Government activated emergency health measures, within the Epidemiologic Watch Programme for Andalusian wildlife (PVE), in collaboration with the Regional Agriculture and Fishing Ministry and the Regional Health Ministry. Epidemiologic tests were carried out and the animals which were dead, dying or which showed the symptoms were analyzed. Post-mortem studies were carried out on 15 red-legged partridges and 4 pheasants at the Center for the Analysis and Diagnosis of Wildlife (CAD – Regional Environmental Ministry), carrying out autopsies, histopathological, microbiological and parasitological studies on their internal organs. In spite of not observing any macroscopic lesions during the autopsy, the histopathological study revealed myocarditis and encephalitis practically in all of the birds studied. These lesions, in the absence of protozoa in the lesions or other pathogens, may be attributed to a viral infection. Samples were sent to the Central Veterinary Laboratory in Algete, Madrid, where the presence of the Bagaza virus (BagV) was confirmed in 9 individuals (7 partridges and 2 pheasants), detected for the first time in Europe, and whose distribution up to now included sub-Saharan Africa and India. The diffusion of the Bagaza virus among continents can be associated to the migration of infected birds, though without ruling out illegal bird releasing or repopulating of birds for hunting or the introduction of exotic bird species for commercial purposes; the mosquito species Culex spp. and Aedes spp. have been reported as vectors in the transmission of Bagaza virus. At this time the possible pathogenicity of the illness in humans is unknown. Some of the birds showed, in addition to the nervous symptoms, diarrhoea associated with intestinal lesions due to a parasitic infection, mainly coccidian (Eimeria kofoidi and Eimeira legionensis), bacterial (Escherichia coli, Enterococci), and/or intestinal dysbiosis. In all cases the possibility of the digestive infections having been caused by a virus was ruled out. The following suggestions have been proposed to prevent the disease from spreading: 1) to maintain all water points clean, 2) to control the virus vectors by using repellents and disinfectants, 3) to avoid bird repopulations in the affected areas.
Based on what was established in the Regulation for Hunting Organization, the Regional Environmental Ministry of the Regional Andalusian Government set up in 2009 the Epidemiological Watch Program for the Wildlife in Andalusia (PVE), whose objective is to carry out the monitoring of the state of health of wild species, detect the appearance of diseases, determine disease prevalence, and establish together with the Regional Ministries of Agriculture, Fishing and Health, the pertinent intervention measures, either for disease prevention, fighting or control.

The Program has 15 specific protocols for species or groups of species, including the following game species: red deer, fallow deer, roe deer, wild boar, rabbit, red-legged partridge, Spanish ibex, mouflon and Barbary sheep. The official laboratories for the analysis and diagnosis of the diseases which are the objective of the study are: the Cordoba Laboratory for Animal Production and Health (Regional Agricultural and Fishing Ministry), the Campanillas, Malaga Laboratory for Animal Production and Health (Regional Agricultural and Fishing Ministry), the Central laboratory for Animal Health of the Environmental, Rural Life and Marine Ministry in Algete (Madrid), and the Center for the Analysis and Diagnosis of Wildlife (CAD, Andalusian Regional Government – Egmasa, Environmental Management Company).

Since it was set up in September 2009, different samples have been taken from 2193 animals (381 red deer, 76 fallow deer, 88 roe deer, 515 wild boar, 453 rabbits, 323 red-legged partridges, 313 Spanish ibex and 44 mouflons), currently 70% of the planned analysis have been carried out.
ROLE OF WILD ANIMALS IN RABIES SPREAD IN RUSSIA

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Wild life pathogens may cause a mortality in a part of wild animal population and disease and mortality in domestic and farmed animals and in humans. For this and other reasons diseases of wild animals pose a serious social and economic threat for humans. A large number of rabies cases have been detected in wild animals in Russia and the number of rabies cases is ever increasing not only in wild animals but also in other animals.

Thus, the number of rabies cases increased from 537 cases in 2000 up to 2,317 cases in 2010 in wild animals, from 465 cases in 2000 up to 1,359 cases in 2010 in domestic animals and from 404 cases in 2000 up to 761 cases in 2010 in farmed animals. During this period of time from 4 to 19 humans died from rabies annually. Every year 400,000 - 470,000 humans received post-exposure treatment. International cooperation aimed at the prevention of the agent introduction from neighboring rabies-affected countries is a crucial for rabies control.

Oral vaccination of wild animals in Russian and Finnish and Russian and Lithuanian border regions has been successfully carried out for several years with the financial support of the European Union. The national programme has been developed for successful rabies control in Russia that is aimed at decreasing number of this dangerous disease cases through application of attenuated and inactivated vaccines and development of new methods and improvement of current methods for rabies diagnostics. A new draft of the RF Ministry of Natural Resources Order “Approval of list of veterinary preventive and anti-epidemic measures for the protection of game from diseases” was recently published (February 18, 2011). Discussion, approval and execution of this Order will contribute to the prevention of introduction of wild animal infectious disease agents to the country and their spread. Role of animal individual species in rabies spread in Russia is discussed in detail in the paper.
The aim of this study was to assess the seasonal changes in reproductive variables of native red-legged partridge (*Alectoris rufa*) males in Spain. We used 19 individuals obtained from the Red-legged Partridge Reference Station in Andalusia (Andújar-Jaén, Spain, 38°N), all of which were one year old at the beginning of the experiment.

The birds were transferred to the El Encín Research Station (Madrid, Spain, 40°N), and housed in groups of 3 in cages (90 cm long × 82 cm wide × 60 cm high) under natural environmental conditions. Semen was collected twice every month using a massage technique.

The collection period lasted 12 months. Semen was immediately diluted 1:1 (v/v) using a Lake medium. The diluted semen was cooled to 5°C, transported to the laboratory, and sperm variables examined within 45 min of collection. The highest reproductive activity (ejaculatory response to massage technique and presence of spermatozoa in collected samples) was recorded in March and April (78-86% of birds ejaculating with presence on spermatozoa), decreasing from June (53%) to August (18%) and reaching a minimum in September to December (0-8%). The recrudescence of ejaculatory response and spermatogenic activity occurred in January (25%) and February (50%). Sperm concentration during the period with highest reproductive activity was 324.9 ± 47.8 × 10⁶ sperm/ml. Computer-aided sperm analysis showed 34.1 ± 5.7% immotile spermatozoa, 53.9 ± 4.7% spermatozoa showing non-progressive motility, and 12.0% ± 1.6 spermatozoa showing progressive motility. The percentage of spermatozoa with membrane integrity was 74.1 ± 3.7. In conclusion red partridge show a clear seasonal pattern in spermatogenic activity (Supported by INIA grant RZ2009-00001-C02).
THE ADDITION OF EGG YOLK IN SEMEN EXTENDER DOES NOT AFFECT STORAGE OF RED PARTRIDGE SPERMATOZOA

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Short-term storage of partridge spermatozoa would allow short distance transport for reproductive technologies for conservation programmes.

Early reports indicated that the addition of chicken egg yolk to semen diluents decreased sperm respiration rates and fertilising potential in fowl spermatozoa. The reasons for these decreases remain unclear but the replacement of chicken egg yolk by turkey egg yolk resulted in the disappearance of the deleterious effect. It can be hypothesised that avian intra-species interactions between the egg yolk and sperm occur among species. The aim of the present study was to assess the use of chicken egg yolk as a novel additive for the preservation of partridge spermatozoa.

Semen was collected from 12 native red-legged partridges (Alectoris rufa) from the Red Partridge Reference Station in Andalusia (Andújar-Jaén, Spain). Semen of six birds was immediately diluted 1:1 (v/v) using a Lake medium. The semen of the remaining six birds was diluted in the same conditions but using a Lake medium containing 15% chicken egg yolk. The diluted semen was immediately cooled to 5°C and transported to the laboratory. Different sperm variables were analysed 6 hours after semen collection such as immotile spermatozoa, spermatozoa showing non-progressive motility, spermatozoa showing progressive motility, spermatozoa with intact acrosome; sperm abnormalities. No significant differences were found in sperm variable values between samples diluted with or without egg yolk. In conclusion, the addition of egg yolk to semen diluent did not decrease sperm variables and did not offer any advantages in semen preservation (Supported by INIA grant RZ2009-00001-C02).
Parasites of the genus Sarcocystis can infect mammals, birds and reptiles. Some Sarcocystis species are pathogenic organisms dangerous to humans and domestic animals. Up to now very few Sarcocystis species have been reported in different bird species of the family Columbidae. Under a light microscope several cysts of Sarcocystis were found in woodpigeons hunted in Lithuania in 2008-2009. The infected birds showed no clinical signs of the disease. Morphologically investigated Sarcocystis sp. had type-1 tissue cyst wall and were not distinguishable from S. calchasi, S. columbae and S. wobeseri, parasitizing in birds, but they were identified as Sarcocystis columbae by means of DNA data of 18S rRNA and 28S rRNA gene sequences.

Predatory birds (particularly the goshawk Accipiter gentilis) are expected to be definitive hosts of S. columbae. It is possible that more pathogenic Sarcocystis species such as S. falcatula and S. calchasi can also parasitize in woodpigeons. The woodpigeon is one of the most important game bird species in Europe, with about 9.5 million individuals being annually hunted, and therefore Sarcocystis parasites can potentially get into the human environment.
Increased interactions at the domestic livestock-wildlife interface, especially in open air livestock breeding situation is favoured by territorial expansion and population growth of wild ungulates. The aggregation of resources that are commonly used by both domestic and wild individuals results in spatial and/or temporal overlap among them. We describe and quantify the presence of wild ungulates in food and water sources used by extensive livestock in South Central Spain (province of Ciudad Real) by using infrared camera trapping in 9 open air livestock herds. In summer season we documented visits to farms by red deer (67%), red fox (16.3%), wild boar (15.3%) and roe deer (1.4%). 90.4% were detected in water sources (troughs or water holes), 2.7% in outdoor feeders (troughs or on the ground) and 6.9% in control points. In autumn survey 81.1% of visits were due to red deer, 13.5% wild boar, 3.8% red fox and 2.2% roe deer. No visitations were detected in farm buildings. Although domestic and wild ungulates shared the same drinking and food areas, we hardly ever document both in the same picture (just one case series in a control point involving pigs and red deer).

They partitioned use temporally, especially wild boar, more frequent in nocturnal hours. We detected an important proportion of days with red deer and wild boar presence (1 every 4 days and 5 days, respectively, in summer). Increased concentration of animals visiting the same locations seeking drinking water could lead to indirect transmission of the disease within and between both wildlife and livestock. Excluding large wildlife species and reducing the attractiveness of the farm to them and providing alternative water sources to limiting access to wildlife could reduce disease transmission.
Wildlife biology, behaviour and game species management
To examine moose *Alces alces* and red deer *Cervus elaphus* population status and hunting impact on them, data about hunted animals’ number and sex-age structure in time period 1999-2010 were analyzed. To assess morphometric parameters of hunted animals, we used data about 4 year period (2005 – 2008) from hunting permits from 10 forest districts in Latvia with different moose and red deer density. To assess reproduction success for both species, reproductive material (uterus and ovaries) from hunted cows from these forest districts were collected and agedness of embryos detected.

Statistical analyses were performed using SPSS15 and MS Excel programs. To asses any differences in morphometric parameters of the hunted animals through the years and different age groups, we used nonparametric Mann – Whitney U test and Kruskal Wallis H test. Chi square Yate’s correction was used to asses if there are statistically significant differences between sexes of the hunted calves (Fowler et al. 2006). There have been observed high hunting pressure on moose and red deer bulls through the 12 year period. Statistically significant difference between sex structure of the hunted calves of both species were established, where males > females (P = 0.01). No statistically significant changes in morpometric parameters for both species between age groups and years were observed. An analysis of reproductive material shows extended rutting time from the middle of august till the end of October and in breeding process 50% of cows of both species are taking part in the second year of life. The primary data of this research shows strong hunting impact on moose and red deer populations in Latvia.
USE OF DENS BY IBERIAN HARES (Lepus granatensis) IN A STEPPE-LAND HABITAT

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Resting areas are determinant for Iberian hares (Lepus granatensis) survival, considering their selection an antipredatory strategy in this species. The aim of this study was characterising resting areas and dens selected by Iberian hares in the Biosphere Reserve of Bardenas Reales to assess the habitat requirements of this species.

We radiotracked 12 Iberian hares in February of 2010, obtaining 427 diurnal localizations during the study period. Using GIS tools we described diurnal home ranges of radio tracked animals. Simultaneously we characterised 38 dens at microhabitat level: 26 dens were obtained from radio tracked animals and 12 were obtained inspecting study area. Characterisation was carried out at two levels, describing land use and vegetation composition at a buffer of 1 and 10 meters around den point. Our results show that Iberian hares selected for resting area scrubland patches and almond crops, both in pre-harvest and post-harvest periods. Gullies were also selected positively by hares. According to microhabitat level, majority of dens was located at scrubs (overall Lygeum spartum, Salsola vermiculata, Rosmarinus oficinalis) and herbaceous with less than 50 centimeters of height. A 13% of dens were located at arable land (a 5% at stubble and 8% at barley crop). Although they selected high edge density areas, there was not a positive selection of patch edge to place their dens. The aspect of a great percentage of dens was south-east, the opposite of predominant wind in the study area. In conclusion, Iberian hares place their dens to avoid predation and need certain availability of patches with vegetation cover for diurnal resting area. Therefore the conservation of this kind of patches in the agricultural landscapes results essential for this species. Otherwise application of a correct management to arable lands should not be focused only to edge, at least for Iberian hare conservation.
Dental anomalies including polydony, oligodonty, extra roots or teeth rotation were studied in a set of 29 wild boar (Sus scrofa) mandibles (11 males, 11 females, and 7 individuals of unknown sex) from southern Spain. The only anomaly found was the congenital absence of the lower first premolar (P1). Oligodonty was present in 6 of the 29 individuals, either bilateral (5) or unilateral (1) cases. There was no relationship between the incidence of this anomaly and the jaw length, sex or age. We found that first premolars may be persistent deciduous teeth, contrary to the theory that “they erupt as permanent teeth only”. This 20.69 % prevalence was similar to that reported in wild boar, but much lower than reported for domesticated species. The P1 is often absent in modern domestic breeds of pigs and usually present in wild boar. Domesticated species are reported to have more anomalies than their wild counterparts because of inbreeding, artificial selection, low genetic heterozygosity, and other genetic determinants. The lower first premolars, as well as the upper and lower third incisors, are associated with diastemata in the dental arcade of pigs. Given the placement of P1, oligodonty may reflect a trend toward reduction of the dental arcade from the primitive eutherian number. This agenesis, as a congenital absence resulting in a reduced number of teeth in a given position, may also possibly have some evolutionary relevance.

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Objective: studying of the aspects of interrelations between people and bears. The article is based on the routes that were carried out in May-July 1996-2010 (over 3 thousand km) in 170 habitats. Nominal subspecies Ursus arctos arctos dwells in the Tomsk area. The region concentrates about 6% from the all-Russian numbers of bears and over 50% from the West-Siberian stock. The stock has increased in 1.5 times from 2002 to 2009. The Verhniy Tym, the Verhniy Ket’ and Nizhniy Chulym are most densely populated. The licence hunting for a bear is opened from August, 1st till February, 28th; the licence’s cost is 100 dollars. Cases of attacks of beasts on livestock and humans are noted: from 2005 to 2009 80 individuals of cattle were lost in the region; the total economic damage has reached about 40 thousand dollars; ten attacks on people are also registered.

The greatest number of bears is typical for conifer forests and carved woods. It’s met less in pine woods and on bogs. Occasionally the beast visits meadow flood-lands of rivers and outskirts of settlements. The bear is fed with a last year’s Oxycoccus palustris on bogs in May; it also eats Allium victoralis, young leaves of Populus tremula and young growth of Heracleum dissectum.

The essential role in bear’s feeding is played with berries from second half of July. Cedar nuts make the big part in excrements of bears in August. The bear also attacks reindeers and elks. Selkups and Khants, occupying the Tomsk region, had a cult of a bear in different hypostases: as a totem animal, as a person’s double, as the owner of the Bottom world (the world of shades), as a spirit of the taiga. Many toponyms of the region include the name of a bear. Steady increase of brown bear populations is observed, it leads to the sharpening of relations with people.
DOES DISTURBANCE RESPONSE MATCH THE STARVATION-PREDATION RISK TRADE-OFF IN THE ROCK PARTRIDGE (Alectoris graeca saxatilis)?

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The starvation-predation risk trade-off predicts that animals should lose some weight when facing a higher predation risk, but without impairing their fasting and survival performances. This factor has led to particular concern for the conservation of the alpine rock partridge, which is known to store low fat reserves, and lives in high altitude areas subjected to harsh weather conditions.

Disturbance due to leisure activities and potentially high predation risks may also exacerbate the energetic imbalance. To investigate how body mass in this lean species changes in response to increased disturbance events and/or food restriction, we created four groups, each containing 7 males and 7 females, and housed in outdoor tunnel aviaries. Control (Ctrl) and “Ctrl-30%” groups were left undisturbed with food supplied ad libitum in the first case, and restricted by 30% in the second. Birds in the “Dist-adlib” and “Dist-30%” groups were subjected to disturbance events for 30 min/day over 7 consecutive days, with food available ad libitum and restricted by 30%, respectively. Disturbance events were carried out during the winter with a radio-controlled car covered with a red fox fur to mimic predation threats. Daily food intake and body mass changes were determined between the beginning and the end of the trial. We used a repeated measure ANOVA and ANCOVA to compare absolute values and relative body mass losses respectively. The body mass of Ctrl birds did not change (p>0.55). Males lost (p<0.001) on average 40g (7% of initial weight) to 47g (8%) in the three other groups. Females lost 24g (5%) and 27g (6%) in the “Dist-adlib” and “Dist-30%” groups respectively, and lost twice as much (48g ca.10%; p<0.05) in the Dist-30% group. Daily food intake did not change (p>0.11) in the Ctrl and Dist-adlib group, but it was actually reduced by 30% in both restricted groups. These results show that both males and females responded to the disturbance/increased predation risk by reducing body mass without compensating by eating more. A limited weight loss may improve escape capabilities and reduce associated energetic costs under higher predation risk. Even when food is scarce, males and females (to a lesser extent) remained able to buffer the effect of disturbance or predation risks. This response fits the starvation-predation risk trade-off, but the mechanisms underlying body mass and body fuel adjustments are complex and likely to be sex-dependent.
The project Alzando el vuelo for the conservation of the Spanish Imperial Eagle started in 2006. During three years a land stewardship network was created through voluntary agreements between individual landowners from Campo de Montiel and Sierra Morena Oriental and SEO/BirdLife. Several management measures were performed within the land to improve the habitat of the species and their effectiveness was evaluated using rabbit abundance as an indirect indicator. In parallel the effectiveness of other management measures usually performed by landowners were also evaluated.

The results indicated that the more effective management measures at short-term were those implying less costs in terms of economical and maintaining effort. To sow the land fallow with legumes or leaving them without ploughing and create small crops of cereals in forested areas produced immediate increase of rabbit abundance. Moreover this type of actions reduced the impact of rabbit on crops to be harvested. Everlasting structures like beetle-banks and artificial burrows were also very effective to increase rabbit population. The installation of artificial feeding and water supply systems, the release of red-legged partridge and fox control, not only imply a high economical cost but it maintaining suppose a high effort in terms of work. Moreover these management measures showed the less effectiveness at short term on rabbit abundance, at least in the study area. To improve feeding supply it is advisable to offer optimal food for rabbits around artificial water supply systems, to control genetic origin of released partridges and to redirect fox control. Finally, the installation of fence around crops to avoid rabbit impact, the construction of ponds indicated that it is necessary further research about the effectiveness of these measures, which could show higher effectiveness at a longer time period than the time duration of this study.
The European rabbit (*Oryctolagus cuniculus*) is a keystone species in native Iberian ecosystems. The species suffers an important decline in Spain as consequence of habitat changes, diseases and probably by hunting pressure. Nevertheless, some authors and hunters suggest that this decline can be a consequence of predation by generalist predators, mainly the red fox (*Vulpes vulpes*).

We tested the potential effect of red fox on rabbit populations by using a combination of functional responses, bioenergetic modelling and basic demographic simulation. We also discussed how this effect can be translated to hunter economic loss. Functional responses were derived from diet data and rabbit censuses (using a combination of line transect method and latrine counting) over 17 locations distributed in mediterranean systems of central Spain.

Bioenergetic modelling was based on published literature. Finally, demographic simulation was undertaken using a basic theta-logistic stochastic model. We simulated predation impact using several simulation scenarios differing on red fox densities. The functional response was fitted to a type II model. Suggesting specialist behaviour in relation to rabbits. From the combination of bioenergetic and demographic modelling we observed only significant predation effects on rabbit population when rabbit densities were below 0.1 rabbit/ha. These results are also corroborated from the economic impact data. As a practical conclusion, red foxes only impacted in the case of low density of rabbits, but even at this situation the impact is mainly relevant when we combined a high rabbit consumption and high fox density. From our results and considering rabbit as the main target of hunter interest, predator control when rabbit densities are above 0.1 rabbit/ha could be unjustified.
Changes in the Calving Behaviour of Farmed Fallow Deer (Dama dama L.)

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The aim of this study was to determine the calving behavior of farmed European fallow deer. The observations were carried out from June to August 2010 in a fallow deer farm at the Research Station of the Institute of Parasitology, Polish Academy of Sciences, Branch in Kosewo Górne (NE Poland, 53o48’N, 21o24’E). Two herds were analyzed: one herd comprised animals of different ages, representing both the male and female sex, whereas the other herd consisted of females with their young. Behavioral patterns described as “establishing kindergartens” and changes in the suckling behaviour, not noted in free-range deer, were observed in both adult and young farmed animals.

Does and fawns that lied hidden in the grass responded to stress factors (the presence of man in the paddock, moving closer to the herd) with escape, and the fawns formed tight groups of more than ten individuals. This type of behavior was observed in particular within the first month after birth (July). In the herd of animals with a different age and sex structure, does allowed several (3 - 4) fawns, including their own, to suckle. They also allowed other adult females and a male aged two years to feed on their milk.

The results of this study suggest that farmed fallow deer may exhibit untypical calving behavior while raising the young, not reported from wild populations.
GENETIC STRUCTURE IN BROWN HARES (Lepus europaeus) FROM SERBIA AS INFERRED FROM MICROSATELLITES

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Objective: Earlier phylogeographic mtDNA data suggested that post glacial recolonization of central Europe by brown hares has started exclusively from one or more glacial refugia in the central or south-central Balkans. However, apart from regionally limited allozyme data from the northern Balkans, which suggested relatively close genetic relationships to central European populations, no further information on genetic variability of hares from the central and northern Balkans is available. Presently, we examined genetic variability in Serbian hares, particularly to check for an increased genetic differentiation in north-south direction, which might reflect the major direction of range expansion from the supposed glacial refugia in the central Balkans.

Method: We genotyped 115 brown hares collected in five regions for allelic variation at eleven microsatellite loci and calculated population genetic statistics using standard software packages.

Results: Overall genetic diversity was high: we found a total of 129 alleles, with an average of 11.7 alleles per locus, and mean region-specific expected heterozygosity was 0.73. But we did not find significant variation of allelic richness across regional samples and genetic differentiation among regional samples was low, with no indication for a raised north-south differentiation. A Bayesian STRUCTURE analysis suggested that our data most likely represented six genetic subunits, which were, however, not congruent with the initially recognized sample regions.

Conclusion: For Serbian hares we did not find any indication of a particularly increased genetic differentiation in north-south direction, which would otherwise have reflected the supposed major expansion direction from late glacial refuges in the central Balkans. All indices of genetic diversity and differentiation for the currently studied hares suggest a high level of gene flow with no specific geographic signature.
We tested the habitat selection displayed by red-legged partridge family coveys in a Mediterranean farmland dominated by olive groves with mixed patches of scrublands and herbaceous crops. Our main hypothesis was the use of the crop borders instead the central area. The study area was located in the Antequera area, (Malaga province, southern Spain) and the study period was May to August over three years (1996-1998). We compared the habitat used by a total of 264 different coveys with the habitat available (n = 140 random sampling control points) through logistic regression. We have found an explicative model that classifies 83.3% of the coveys and 75.7% of the control points correctly. This model (AIC = 329.97) positively relates the habitat selected by the coveys with nearby herbaceous crops and borders of natural vegetation (ecotones of scrubland or “lindes”) and with higher habitat heterogeneity (measured through the Baxter-Wolfe interspersion index) and higher insect biomass than in the control points. There was also a negative relation with the distance to old olive groves. We also explored possible relations between the habitat used by the coveys and the age of the chicks through PCA and multinomial regression models. We have found that coveys with old chicks use old olive groves with nearby “lindes” and avoid young groves and scrubland borders that are more commonly used by younger coveys. The habitat used by old coveys also offers less habitat heterogeneity than that used by younger coveys.

The habitat selection pattern found agrees with our hypothesis. Partridge chicks look for cover and food where available, in this case in the olive grove borders. During spring and summer the grove shows a high frequency of bare soil due to the agricultural work, forcing the coveys to displace to the “lindes” with a potential predation risk that could affect their survival likelihood, especially during the early weeks of their life.
TELEMETRIC TRACKING OF THE SIKA DEER AND THE RED DEER IN THE DOUPOV MOUNTAINS – PRELIMINARY RESULTS

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Spontaneous spreading of the Sika deer in the Czech Republic takes place since the beginning of the past century; currently the species occurs in high abundances in western and northwestern parts of Bohemia. Spreading of the Sika deer into localities, where the native Red deer is present and their hybridization represents a serious problem.

One of the most important regions of occurrence of both species is the Doupov Mts. (hunting district Hradiště, military area.), where our research is situated. Since 2009 both species are telemetrically monitored with use of GPS collars (Vectronic Aerospace GmbH). Until now, eight Sika deer and one Red deer were marked. The aim of the research is to determine intra- and interspecific relations, and to establish population management strategies. The main research focus is put on finding the way how to stop spreading of the Sika deer and prevent hybridization with the Red deer.

Based on preliminary data, the male Sika deer home-ranges were calculated (Kernel model, 95%, 719 - 1,448 ha, MCP model 1,487 - 3,910 ha). Preliminary analysis of habitat preferences from October to April revealed preference for grass stand (33-50%) and coniferous forests (13-29%). The study was supported by the Grant Agency of the Czech university of life sciences (projects. nr. 20104301, 20114306.).
We studied the patterns of variation in stress levels shown by roe deer (*Capreolus capreolus*) populations over a year, according to the species phenological cycle, living in three types of Mediterranean environments present in central Spain: mountain holm-oak forests, holm-oak forests with croplands, and xeric holm-oak forests. Higher levels of stress during the reproductive period and in the dryer environments were expected. Stress levels were measured by quantifying the cortisol (a stress hormone) found in fecal samples, for which immunoassays (ELISA) were performed. An elemental analysis of nitrogen content (indicating food quality) in each sample was also made.

A Generalized Linear Model (GLM) was performed with the cortisol amount as a response variable and using season, type of environment and nitrogen content as predictors. A total of 332 samples were analyzed, and a significant model obtained (Multiple R = 0.76, p < 0.001). Stress levels changed each season, showing the highest cortisol values during spring (cubs rearing) and summer (rut period). Moreover stress levels tended to be lower in mountain forests (the more humid ones).

By contrast, populations in xeric forests tended to maintain high amounts of cortisol from winter to summer. Therefore, overall it is needed to avoid stressing activities for the roe deer during its reproductive period. In addition, and given that chronic stress can produce harmful effects on individuals (and thus on populations), the management of populations inhabiting the more xeric environments should be especially careful during almost all the year to guarantee their conservation.
ECOLOGY OF THE CAUCASIAN GROUSE DURING BROOD-REARING PERIOD

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The Caucasian grouse Tetrao mlokosiewiczi is endemic to the Caucasus Mountains and is classified as Near Threatened by the IUCN. We surveyed Caucasian grouse at the northwestern edge of its distribution: on the Lagonakskiy Ridge in June-July 1998 and July 2004, and on Magisho Ridge in July 1999 and June 2006. Habitat use by broods was affected by weather. On sunny days most broods were encountered in meadows, followed by ravines, and pine forest.

In rainy weather most broods moved to the ridge tops and a few to pine forest. Subadult males followed broods and used the same habitats. Adult males strongly preferred ravines and only occasionally were encountered in meadows. Their habitat use was not affected by weather and differed from habitat use by broods and subadult males. Well-camouflaged females, chicks, and subadult males used relatively open, food-rich habitats, whereas black adult males preferred ravines, where nutrition was poor, but where tall grass protected them from aerial predators.

We found one nest with five hatched eggs in pine forest close to timberline. On Lagonakskiy ridge, broods lost one chick per 10 days on average. The goshawk Accipiter gentilis appears to be a main predator of the Caucasian grouse. The estimated density of Caucasian grouse on Lagonakskiy Ridge (2.3 adults/km²) was similar to densities reported in other parts of the species range (2.3 ± 1.2; N = 7). We found no significant difference of Caucasian grouse density between nature reserves and unprotected areas.
COMPARING MOVEMENTS OF THREE SMALL MAMMALS SPECIES IN FRAGMENTED AND CONTINUOUS FOREST IN THE BLACK FOREST, GERMANY

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Forest fragmentation may significantly affect distribution and movements of animals across the landscape.

The specific aim of this study was to analyze how forest fragmentation influences movement-patterns of three small mammals species in the Black Forest, a forested mountain range in southwestern Germany. The landscape forms a mosaic of forest, settlements and farmland. The study was designed as a comparison between small forest patches surrounded by farmland and larger controls in continuous forest parts. The field work was carried out in three study areas consisting of three control sites within continuous forest and three study plots representing fragmented forest. Movements of three forest-dwelling species were analysed based on capture-recapture dat: yellow necked mouse (*Apodemus flavicollis*), bank vole (*Clethrionimys glareolus*) and wood mouse (*Apodemus sylvaticus*). Based on habitat fragmentation theory, we assessed three predictions: 1) animals move longer distances in fragments than in continuous forest, 2) animals move less in forest fragments than in continuous forest, 3) males move further than females. We partially found these hypothesis supported. However, considerable variations among species and between the different studied areas were found. Possible causes and implications will be discussed.
The wild rabbit (Oryctolagus cuniculus algirus) was introduced on Azores during the 15th century, where it is an important game species. Currently it occurs on 8 of the 9 islands, with variable abundances, under different hunting regimes. The goal of this study was to accurately assess rabbit abundance on S. Jorge Is. (central group), because it is socially perceived as a pest (for damages caused to pastures), and draw guidelines for rabbit management in order to minimize human-wildlife conflicts. Since March 2009, rabbit abundance has been estimated by spotlight counting along five linear transects, distributed throughout the island and crossing different habitats with good visibility. Rabbits were counted monthly, during 1-2 nights, by two observers, along both sides (up to a 100-m width band) of each transect, and classified as juveniles or adults (or undetermined) according to size. The number of rabbits/km (±SE) ranged from 31 ± 11 (February 2011) to 92 ± 42 (July 2009). Average abundance over the last two years is estimated at 63 ± 4.2 rabbits/km, which is considered quite high in relation to other Azorean islands [e.g. 7 ± 0.5 on S. Miguel (eastern group); 16 ± 1.1 on Flores (western group)].

We argue that promoting hunting tourism could be a management option to maintain rabbit numbers under sustainable control and provide income for local populations. This study is ongoing as part of a wider project aimed at improving game management of five game species, including the wild rabbit, in the Azores archipelago.
Host density and contact rates are important parameters for understanding the dynamics of transmissible diseases, including rabies. Management of raccoon strain rabies is particularly challenging in metropolitan areas, largely because urbanization may alter host population structure and social behavior. To proactively model rabies dynamics, we determined variation in population density and structure across the Chicago metropolitan landscape, Illinois, USA, and measured contact rates in free-ranging raccoons.

We conducted livetrapping in sites with various levels of development, including exclusively within the matrix, to determine relationships between demographics and landscape structure. During 2005-06, we captured 529 adult raccoons, 87 adult opossums and 70 domestic cats during 3,343 trapnights. The most heavily urbanized sites had low densities and a relatively young age structure, and a more diverse mesocarnivore community. We radiocollared 42 (20 M, 22 F) adult raccoons with proximity detectors and recorded >230,000 contacts during 18 months in an urban park. A more specific analysis of 32 raccoons monitored for a complete annual period yielded over 77,500 contacts lasting >1 second. The mean number of contacts recorded per day ranged from 0 to 96 for individual dyads, and the duration of each contact ranged from 1 second to 576 minutes/day. The overall pattern that emerged was that contacts were extensive within the local population throughout the year and across dyad types, and the greatest social distance (or geodesic distance as determined by social networking analysis) between all pairs of individuals averaged only 1.1 steps.

This high contact rate indicates that highly transmissible diseases would spread quickly in this population.
European wild rabbit is a keystone species in Mediterranean ecosystem, since they are an important prey for more than 30 Iberian predators and is one of the principal game species in Spain. Therefore, after rabbit decline in late 20th century, hunters and authorities carry out many strategies to enhance rabbit populations. A strategy widely used in recent rabbit recovery programs is the rabbit restocking in fenced plots for exclude terrestrial predators, because predation is the main problem of rabbit translocations in the short-term. However, even in fenced plots, the predation by birds of prey can be important, especially in low-cover areas. In this study we tested the effect of aerial predation in short-term in rabbit restocking enclosures.

For this purpose 5 fences were built, three of which with no top net and therefore a accessible for raptors (open plots) and two enclosures with no access for either raptors or carnivores (close plots). We compared the rabbit abundance measured by the pellet count once a week after restocking. Data were analyzed using linear mixed models. The results showed that close plots had higher rabbit abundance being the differences between the two types of enclosures higher during first three weeks, probably because rabbits were more vulnerable to predation in the first days after release. Furthermore in both types of fences, an abrupt decrease in rabbit abundance was recorded during the first three week after release, being more stables since the fourth week, when the different in rabbit abundance between two types of plots were kept constant. We concluded that predation by raptors plays an important role in the firsts week after release, when rabbits are not adapted to the new environment, and its impact decrease when the animals are well acclimated.
The fragmentation of landscapes is considered the most imminent threat to the biodiversity of Germany.

Forest patches surrounded by agricultural fields has long been a typical landscape pattern for the Black Forest. The aim of this study was to determine if this landscape pattern provides good habitat for small mammal species. To study this, we looked at demographic aspects of small mammal populations: sex, condition and animal abundance in forest patches and compared them to controls in contiguous forest. Predictions were a) animal abundances will be lower in forest patches, b) the sex ration will be male biased in patches and c) condition (measured through animal weight) will be worse in patches than controls.

Three study areas in the southern Black Forest were used, each with three control sites in contiguous forest and three in forest patches. Trapping took place between June and September, 2007-2009, with two trapping sessions per summer. A mark and recapture design was used with 49 live traps in a grid with 15 meters between trapping stations. Two species were captured in large enough numbers to enter statistical analysis: the yellow-necked mouse (Apodemus flavicollis) and the bank vole (Myodes glareolus). Abundances were calculated using the robust design in the program MARK. Sex ratios were tested against a ratio of 1.0 using chi-squared test.

Condition was analyzed using a nested ANOVA. Contrary to our predictions, patches proved to not be lower quality habitat. In the year of high animal abundance (2007), there was found to be no statistically significant difference between animal abundance, sex ratio or condition the patches and controls. Whereas in years of low abundance (2008 and 2009), patches proved to be better quality habitat.
The Black Forest, located in south western Germany, is home to the second largest capercaillie (Tetrao urogallus) population in Central Europe. Despite restoration efforts capercaillie numbers are still declining with the species being red listed as threatened by extinction. The significant increase in abundance of generalist predators is, besides changes in habitat, disturbance and climate change, one fundamental cause for the decline of grouse in Central Europe. The red fox (Vulpes vulpes) is thought to be one of the most important predators of capercaillie in the Black Forest. In Germany, there is no information available on fox densities at the large scale. Hence, we conducted faeces counts on line transects at 6 survey sites in the Black Forest using standardized sampling protocols. We searched a total of 266 line transects between October and December in 2009 and 2010 and found between zero and 7 faeces per transect. For each transect we extracted landscape variables on two different scales: on the transect scale to adjust for possible small scale differences in faeces density or faeces finding rate and on the fox home range scale, which we used to identify relative differences in faeces density as a proxy of fox density.

To identify the variables on the home range scale that explain the differences in the number of faeces, we used a Poisson regression model, in which we included the variables of both scales. We performed out of sample validation by fitting a model with the 2009 data and validated it using the 2010 data and vice versa. We found that landscape heterogeneity and soil quality had a positive influence on fox density. Further, we extrapolated the results to the entire Black Forest to enable management decisions. Knowledge on the density of foxes in the Black Forest is essential for explaining the current capercaillie distribution and for creating guidelines for the handling of predators to enhance capercaillie conservation.
The aim of this study was to compare the parameters of gastrointestinal function in wild and farmed mink populations. The experimental materials comprised 16 adult male American mink aged one year. Wild animals (group W, n= 8) were harvested in north-eastern Poland. Farmed animals (group F, n= 8) with the standard coat color came from a production farm. The animals differed in body size and weight (group W – 1.0 kg, group F – 3.02 kg). The mink were placed in individual metabolism cages equipped for quantitative collection of feces and urine. The experiment was conducted in April. A five-day experimental period proper was preceded by a ten-day adjustment period. Once daily, the mink were fed 200 g of a diet whose nutritional value met the nutrient requirements of animals. Leftovers and feces were collected daily, and were weighed accurate to 10 g. Urine was preserved with 20% sulfuric acid. The nutrient content of feed and feces, and the nitrogen content of urine were determined by the Weenden method. Nutrient digestibility and nitrogen retention were calculated using the standard balance method. Wild and farmed mink populations differed with regard to the parameters of gastrointestinal function. Farmed animals were characterized by higher digestibility of crude fat, crude fiber (P<0.01) and energy (P<0.05) and higher nitrogen retention levels (P<0.01).
Objective: The Carpathian basin is a great habitat for big games. Hungary is well known of its high level game-management. The demand for more profitable and sustainable game-management has been increasing in the last few years, as more and more game preserves were established. According to the law in the game-preserves, the game bearing capacity is not the most important parameter, because in these areas the feeding is continuous. In practice, this means that in the game-preserves we find a much higher density of games than in Nature.

Methods: The scene of this work was a game-preserve belonging to the Nyírerd Corporation (Nyíregyháza). The game preserve is divided into three different units based on the density of the wild boars (0,9 wild boar/ha, 1,3 wild boar/ha, 0,7 wild boar/ha). To this endeavor, we have conducted a botanical survey (plant coverage, life-form spectrum) in the three previous units and in the control areas (outside of the game-preserve) as well.

Results: After the botanical survey, it can be stated that the plant coverage in the control area is corresponding with the coverage in planted black locust stands; meaning in other words that a lower number of herbaceous species give high plant coverage. In the area with 0,9 and 0,7 wild boar/ha frequency this coverage percent is lower. In case of the area with 1,2 wild boar/ha frequency the presence of herbaceous species is not detectable.

Conclusion: After the first botanical survey, we can conclude that on areas with higher game frequency the number of herbaceous species is lower. This is a considerable fact which the game manager has to keep in mind while planning the feeding, in order to achieve a sustainable, long term game management.
HABITAT SELECTION BY RED DEER (CERVUS ELAPHUS) IN AN INNER ALPINE AUSTRIAN REGION

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With this study we aim to identify habitat use of red deer populations, with special regard to wind throw areas and winter feeding sites. In our study area, an inner alpine region of Styria (Austria), heavy storm events produced wind throw areas of more than 650 ha in the year 2002. These areas are supposed to be highly attractive as feeding and retreat sites for red deer. From the viewpoint of forestry and alpine hazard management this might be a challenging situation, as selective browsing can segregate target tree species, and decelerated regeneration succession (due to browsing and bark stripping) will increase the risk for torrential floods, sediment transport, debris flows, snow avalanches, land slides, as well as rock fall. Therefore, we observed the spatial-temporal distribution and habitat selection of 11 stags and 9 hinds. They were collared with GPS-transmitters in February 2009 and were observed until spring 2011. We gained a GPS-position of each individual every three hours.

Habitat composition was determined by a comprehensive inventory sampling plot procedure plus forest inventory information, and analysed using ArcView 9.3 and generalised linear mixed models in R. Our preliminary results indicate that during winter individuals were strongly influenced by intensive supplementary feeding, whereas they showed a more diverse habitat selection during summer and rut. This is in line with the fact that red deer have become year-round inhabitants of alpine regions. In former times, seasonal migration to lowland areas (such as floodplains and riverine lowlands) in red deer was common. Nowadays this is constrained by anthropogenic infrastructure, habitat fragmentation, human interests and artificial feeding. Further we could show that stags and hinds used wind throw areas differently, with stags strongly avoiding the wind throw areas all year round.

Hence, adequate hunting management has to consider sex specific distribution of red deer in the area.
The Eurasian wild boar, *Sus scrofa*, has a broader historical range, which includes Europe and North Africa, and is the more abundant species. At present *S. scrofa* is subdivided into circa 16 subspecies. For the differentiation between the wild varieties and those with domestic ancestors, anatomical and morphological criteria are considered unclear (Rosell et al., 2001). However, geometric morphometric data may show some morphological differences between these groups of *S. scrofa*, wild and domestic. With this technique we can make future comparisons between the wild *S. scrofa* of Europe and North Africa, and *S. scrofa* introduced into South America. The first records of the introduction of European-boar (*S. scrofa*) into South America date from 1904 and 1906, during which some individuals were brought from Europe to the province of La Pampa, Argentina, and in Brazil dating from 1960, in the state of Paraná. For a preliminary study a sample of 29 mandibles of European wild boar (11 males, 11 females and 7 unknown) stored at the University of Jaén was analyzed using 2D geometric morphometric procedures. Geometric morphometrics were performed using TPS series and we used 12 and 10 landmarks for the lateral and dorsal views of the mandibles, respectively. Morphological differences were detected in the ontogenetic series mainly affected the horizontal ramus, and the molar and incisor alveolar components as well as coronoid, condylar and angular processes.

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The European roe deer (*Capreolus capreolus*) is the most common big game species in Poland. In March 2010, the estimated roe deer population size was 756,500 individuals, and the number of animals hunter-harvested in 2009/2010 exceeded 162,000. The objective of this study was to determine the average carcass weight of the European roe deer in Poland, in view of the hunting season, the month of harvest and environmental conditions in roe deer habitats. The experimental materials comprised 48,979 carcasses of roe deer, including 19,854 carcasses of females (does), 24,374 carcasses of males (bucks) and 4,751 carcasses of the young (fawns), hunter-harvested during nine hunting seasons, from 2000/2001 to 2008/2009. The average carcass weight of does, bucks (after the removal of head with antlers) and fawns harvested in Poland was 17.05 kg, 17.27 kg and 11.71 kg, respectively. The average carcass weight of roe deer varied depending on region. The heaviest animals were harvested in north-eastern Poland, and the lightest in south-western Poland. A high percentage share of fields in the investigated area had a positive effect on the body/carcass weight of roe deer. Animals with the lowest body/carcass weight were harvested in regions characterized by the highest proportion of afforested land. The average carcass weight of roe deer was also affected by the month of harvest.

The heaviest females, males and young were harvested in December, May and January, respectively. Mean annual air temperatures had no significant effect on the carcass weight of roe deer, but the carcasses of harvested animals tended to be heavier in seasons characterized by higher annual temperatures. The average carcass weight of roe deer was not considerably affected by total annual precipitation.
HABITAT USE OF PHEASANT (*Phasianus colchicus*) BROODS IN SOUTHERN FINLAND

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The habitat use of pheasant broods has not been studied much in Finland. We released both hand-reared (N = 33) and wild (N = 31) ring necked pheasant hens at the end of May, in southern Finland (60˚ N, 24˚ E). Both groups were translocated to the study area and kept in similar pens and fed similarly before release. We followed the hens with broods by radio-tracking for four weeks after hatching.

First we analyzed the overall habitat use of surviving broods. We included only those broods for which we had at least 23 observations, altogether 318 observations. Compared with the overall availability of the six most important habitat types, pheasant hens with chicks seem to prefer certain environments, while avoiding others. Most broods were detected in the most common habitat type, cereal field, but compared to availability of different habitats, the highest number of brood observations was made in field banks (14.1%), which comprised only 2.5% of the study area.

Then we more closely analyzed the use of cereal fields. We included altogether 190 observations of 10 hens. 64.7% of the pheasant broods in cereal fields were found closer than 20 m to the field edge, and 70.1% to the nearest edge zone. During the study period the amount of field margin area (under 20m from field edge) averaged 23.5 ha, representing 36% of the available cereal field area. Hens were found in this area 123 times, compared with the expected 68, indicating a high preference of margin area. Our results indicate that pheasant broods prefer banks, margins and strips to pure field lands. Special game fields should be placed near field margin areas to benefit pheasants. Improving habitats for broods can result in a better game yield later in autumn, resulting in a lesser need of introduced birds.
Analysis of roe deer spatial behaviour is one of the main aims of the large Czech-German project concerning the lynx and roe deer ecology in the region of Šumava Mountains.

Particular aim of this study was to compare spatial behaviour and habitat requirements of roe deer in NP Šumava and NP Bavarian Forest. Total of 40 animals of both sexes were included in the study using GPS plus collars (Vectronic Aerospace). Spatial behaviour dynamics was analysed by changes of seasonal home ranges expressed by MCP and Kernel HR calculated with the help of Hawth’s Tools extension for ArcGIS. Analysis of habitat requirements was carried out by precise land cover classification based on aerial orthophotomaps in original scale 1:3000. In the first step of the study we focused on the home range size and habitat use characteristics during different seasons and between both sexes. Attention was paid also to the behaviour of males and females during the rut. Landscape structure, habitat composition, anthropogenic impact differ in both study sites, therefore the comparison of roe deer spatial behaviour and habitat preferences revealed evident variation. This individual differences in habitat selection indicate the high roe deer ability to survive in many habitat types. Acquired knowledge could be helpful for both local and European level of management practices of roe deer population.
In Poland, collect drive hunts are widely used for harvesting roe deer in autumn and winter, but its results are not used by game managers for estimating population size. Census of roe deer is chiefly based upon guess estimation that bear unknown errors. Therefore the main objective our work was to transform data from drive hunts into absolute population density of roe deer. The data were collected in Forest District Rudziniec, located in Southern Poland near town of Gliwice. It covers 21 thousands ha of mixed deciduous forest divided by several woodlands surrounded by farmland. During 4 months (October 2010- January 2011) we collected data from 177 collect drive hunts.

Total number of roe deer seen by hunters amounted to 1167 animals i.e., 6,56 per one drive hunt. Using formula $Y = 68,8+19,5X$ ($Y =$ population density N/1000ha of forest, $X =$ number of roe deer seen per one drive hunt), population density was estimated as 196,7 individuals per 1000ha of forest (4129 roe deer in the study area). In February 2011, using 180 persons, driving census technique to verify population size was applied. Data from 12 sampling plots covering 1566ha of forest showed population density equal to 228,0 animals/1000ha of forest (4788 roe deer in the study area).

We conclude that collect drive hunt data can be a reliable tool for management of roe deer in our study area.
The appearance of the Hooded Crow has been observed in many European countries since 1960. Many studies tell about the crow’s settlement and continuous population increase; for example: in Hungary (Tapfer 1974, 1978, 1985, Juhász 1983, Fintha 1994, Ujhelyi 2005, Kövér & Juhász 2008), in Finland (Hugg 1994, Vuorisalo et al. 2003), in Norway (Munkejord et al. 1985, Parker 1985), in Poland (Mazgajski et al. 2008), in Russia (Konstantinov et al. 1982, Korbut, 1996). There are several factors driving this species’ urbanization. Primarily there are the possibilities provided in urban settings for nesting and diverse sources of food. As a nesting species, we note the appearance of the Hooded Crow in Debrecen in 1959, at present is a permanent, common breeding species, observable in all parts of the city.

In year of 2007 we started the colour ringing of the Hooded Crow in Debrecen. We caught the birds at nest thanks for a crane basket. During four years we ringed 54 nestling before flying away. We used in all case of nestling scheme ring on the left tarsus. Besides this we put 1-, later 2 colour plastic rings on the left and the right tarsus for future individual identification. The records that I got back until now shows young birds do not leave the city. Consequently they increase the crow population year by year. The young birds stay near their birth place.
SEASONAL HOME RANGES OF RED DEER (Cervus elaphus) AND ITS IMPACT ON THE SCALE OF CULLING MANAGEMENT

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In Wallonia (South of Belgium) the culling plan is drawn up by the administration and computed each year based on the spring census. The hunting associations have the responsibility to share the culling plan out among their members. This step of the process is complicated by a lack of knowledge concerning the tendency of red deer to stay on their home range across seasons. This study aims to describe the range of red deer and more specifically to focus on the differences between the census and hunting seasons.

During the last 10 years, 24 females and 15 males were tagged with GPS collars in St-Hubert and Hertogenwald forests. The former site consists only of forest while the latter gives access to agriculture. We calculated seasonal (March-April and October-November) home ranges (kernel adhoc, P=50 and 95%) on a random subsample of 100 GPS-fixes / season allowing 33 and 18 comparisons for females and males respectively. We then measured the distances between the seasonal centers of the main P=50%-kernels and compared the areas of the P = 95%-kernels. We also compared ranges according to sex and looked at study areas (for females). Kruskal Wallis tests were employed for each comparison.

The median distance between the main seasonal centers is 456 m for females and 1613 m for males with a difference between sex ($H = 11,76 ; P < 0,001$) but with no difference between study area. The median home range is 302 ha for females and 522 ha for males in spring and 287 ha and 699 ha in autumn. The area roamed by males was significantly larger than for females in spring ($H = 6,47 ; P = 0,011$) and autumn ($H = 10,07 ; P = 0,002$). No statistical difference was demonstrated between seasons for either sex, or for the different study sites. The small distances between activity centers together with the very similar and small home range sizes of females between seasons suggest that areas used in spring and autumn overlap almost completely. This was the case independent of study site although a higher variability was detected in the study site that borders agricultural land. Males are less constant in their range behaviour and live on larger areas.

We recommend that culling management scale should be adapted according to sex. The size of a management unit should not exceed 2 to 3000 ha for females and should remain at a minimum of 5000 ha for males, as currently stated by law. In this way sharing out the culling plan would be simplified and better fit the local population abundance of females.
Red deer is a new species in Estonian fauna and its role in the local biotopes has not been thoroughly researched. The aims of the present study were to gather data about the diet composition of Estonian red deer and to assess the impact of red deer to silviculture.

Rumen samples of 141 culled red deer were collected during the three months of autumn (September, October and November). Rumen samples were washed and in the course of the analysis the volume and frequency of each food group (grasses and forbs, shrubs, deciduous trees, conifers, fruits and grains, others) in a sample was assessed, so it was possible to establish the quantitative composition for red deer diet.

The most important food group during the study period was grasses (average volume of 81%), which was followed by twigs and leaves of deciduous trees (9% of volume in the average). The volume of deciduous trees was highest in September and main species used were: buckthorn (*Frangula alnus*), silver birch (*Betula pendula*) and different species of willows (*Salix* sp). The average volume of dwarf shrubs was 4.2% and the usage of dwarf shrubs showed a constant increase during the months under study. Group fruits and grains had an average volume of 3% and the proportion was highest in September. Conifers were little used by red deer (average volume of 0.9%) but the frequency of conifers in the samples was relatively high (8...11% of samples) and the main species in this group was juniper (*Juniperus communis*). Group others (mainly lichen, mushrooms and ferns) had an average volume of 4% in September and October and declined to 1% in November.

The diet of Estonian red deer is similar to the diets of Scottish red deer (high proportion of grasses) and different from the red deer populations in continental Europe (low usage of woody plants). Based on the data gathered with this study it is possible to state that during the study period the impact of red deer on silviculture is trivial. The situation may change in late winter when the limited availability of grasses increases the usage of woody plants.
Baiting with maize is the most common hunting technique for wild boar in Germany. About 50% of the annual hunting bag is shot at baiting sites. Purpose of our study was to investigate the importance of this supplemental food in the diet and energy supply of wild boar. The 5,600 ha study area near Stuttgart belongs to the regions with the highest harvest rates (10 wild boars/100 ha forest/year) in South Germany. We analysed the food components in 401 stomachs of wild boar from 2002-2006. Weender analysis was used to measure the crude nutrients of each stomach content. Calculated from the nutrients with formulas for domestic pigs the content of metabolisable energy (ME in MJ/kg DS) of the stomach contents was evaluated. Mast was the largest single component of the diet (33% of total volume), reaching up to 85% of the food volume in years with high mast availability. Wild boar favoured the mast of oak and beech over maize from baiting sites. Only in one non-mast-year maize reached a greater amount (28%), whereas it varied from 1% to 8% of the diet in years with mast availability. ME of the stomach contents (≥ 11MJ) varied significantly.

In years with large amounts of mast (>50%) in the diet ME was 10% - 30% higher than in the non-mast-year with the largest maize consumption. However, the energy intake by the feeding was considerable. Up to 42% of the metabolisable energy in the stomachs per year originated from maize and other feeding items. The results are not transferable to coniferous forest, as the preference for mast prevented a higher consumption of maize. We suggest, that more research into the energy intake of feeding should be undertaken in suboptimal habitats without natural mast trees.
SURVIVAL AND DISPERSAL PATTERNS OF RELEASED RED-LEGGED PARTRIDGE (Alectoris rufa) IN A MEDITERRANEAN COASTAL AREA

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Reinforcement of red-legged partridge populations are usually carried out as a traditional management tool across the hunting areas of Portugal, Spain, France and Italy. Primary objectives of releasing partridges are to obtain a mid-time viable population but also an easy hunting chance (days after release). Partridges used for restocking purposes are usually of farm-reared origin (700 farms in Spain) and 2-3 millions of birds are released yearly in Spain. However, not enough studies have been carried out to analyse the real effectiveness of this tool. During September of two consecutive years (2005 and 2006) an experimental release of 340 red-legged partridges was carried out in a coastal area in NE Spain with the main objective to measure the probability of survival and dispersal patterns from the point of release. Fiftysix partridges were tagged with VHF radio-transmitters and their locations estimated by triangulation. The estimated mean survival rate after 90 days was 20.7% (Kaplan-Meier, StdError = 5.7%) with no significant differences between sexes. The average time of survival, defined as the time when half the population was still alive, was 8 days. Predation was the cause of death in 75% of tagged partridges recovered (n = 44). Finally, the average dispersal distance was 242 m (StdError = 34.3), ranging from 49 to 2,151 m. These results were similar to that reported in previous release experiments in other habitats: low survival, low dispersal and high mortality. Although the ‘bad’ results obtained, the accurate knowledge of this parameters can help to model the restocking plans in order to be consequent with the aim: to obtain a viable population. A higher number of red-legged partridges released, an even distribution of release points, reduction of predation probability, all could be variables to be modified.
Estonians have been living together with large carnivores for a long period. Although the populations have been fluctuated in a wide range during the last century, they have never been completely exterminated from our territory. Last nadir of both species populations occurred in 2002-2003 after intensified harvest pressure following the populations last peak in mid 90-s. Up to 2002 both species were harvested without any bag limits and hunting for wolf was opened all year round. In 2002 the national large carnivore management plan was compiled and new management goals, closed seasons, population monitoring and annual quota systems were established and implemented to prevent the further deterioration of populations. Implemented strict measures caused recovery of both carnivore populations and currently they occupy nearly all suitable habitats in Estonian mainland. Wolf number in nowadays is near the border of social carrying capacity and lynx number is due to quick decrease of roe deer in last few years near the border of natural carrying capacity. Monitoring of wolf and lynx is based on complex analyse of data collected by four different methods: mapping of visual and track observations throughout the country; collecting data (time, place, age, sex, reproductive status) from all harvested individuals; snow track census on permanent transects all over Estonia; and monitoring wolf depredation on livestock.

Following the changes in population demography, distribution of depredation events and objectives set in management plan the annual harvest quotas are calculated and distributed between regions. Current management system implemented since 2003 has proven to be effective for conserving wolf and lynx populations in Estonia. However, there are several preconditions to keep or achieve the system effective: clearly established management goals; robust monitoring results; straight linkage between monitoring results and quotas; strictly regulated hunting; relatively high public (hunters) acceptance on large carnivores as well as on monitoring results and management goals.
We tested factors affecting home range size of red deer such as habitat quality (Said – Servanty 2005), the season and the sex of the deer (Mysterud et al. 2001) and disturbance. We also investigated the patterns of home range shift in different habitats and the use of unforested areas.

Red deer (*Cervus elaphus*) were fitted with GPS collars in three different habitats: a) a flat area with many crop fields between the forest patches, b) a hilly area with fertile forests and crop fields and c) a much disturbed by human activities mountainous area with a big forest block uninterrupted by crop fields. The collars were programmed to produce an hourly recording of position. Comparisons were made between 1) the expansion of home range, 2) the intensity of open habitat use. Home ranges were calculated by MCP and Kernel methods. The seasonal change of size of the home ranges showed similar dynamics in the three regions. The summer home range was always smaller than the autumn-winter ranges.

Stags had significantly larger home ranges than hinds. Examined with the MCP method the difference was even larger than the results obtained from the Kernel method, which latter focuses on density distribution. This shows that the autumn-winter movements mostly represent rambling and only in a lesser, but still significant extent derive from the real extension of home ranges.

In the flat and hilly area, the winter range often overlapped the summer range. In the mountainous area, there was a definite home range shift. In the disturbed area differences were found between the day and night-time home areas, while in the less disturbed two areas the phenomenon was not observed. Large differences existed at regional and individual levels regarding the use of the open habitats. The red deer in the flat and hilly area used the open habitats in a more intensive way than those in the mountainous area.
THE STATUS AND CONDITION OF ALIEN GAME ANIMAL SPECIES POPULATION IN LITHUANIA

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During the last century it was very popular to introduce alien game animals in Lithuania. The main aim was to increase the abundance of game fauna and to improve the productivity of hunting areas.

Mostly, the introduction was performed spontaneously and without scientific background. The introduction of the alien species disturbs or can disturb steady nature balance. The aim of work is to define the status and condition of alien game animal species population in Lithuania. In the last century was attempted to acclimatize 12 species of mammals and 4 species of birds, listed as game animals. These animals can be divided into 4 groups: 1) the acclimatization was successful (animals adopted to Lithuanian climate conditions, can naturally breed) – the fallow deer (Dama dama L.), the raccoon dog (Nyctereutes procyonoides G.), the Canadian mink (Mustela vison S.), the muskrat (Ondatra zibethica L.), the greygoose (Anser anser L.); 2) the acclimatization was partly successful (animals adopted to Lithuanian climate conditions, but due to other factors, cannot live in a wild) – the European moufflon (Ovis ammon musimon S.), the sika deer (Cervus nippon L.), the pheasant (Phasianus colchicus L.), the coypu (Myocastor coypus M.); 3) the acclimatization was not successful (introduced animals disappeared) – the desman (Myogale moschata L.), the Siberian squirrel (Sciurus vulgaris exalbidus Pall.), the Siberian roe deer (Capreolus pygargus Pall.), the silver fox (Vulpes vulpes fulva D.); 4) the acclimatization process was unclear, it was stopped – the European rabbit (Oryctolagus cuniculus L.), the wild turkey (Meleagris gallopavo G.), the Canadian goose (Branta Canadensis G.). Invasive species, which can be hunted all year long are the Canadian mink (Mustela vison S.) and the raccoon dog (Nyctereutes procyonoides G.). Ineligible species is the sika deer (Cervus nippon L.). The introduction of alien species now is not allowed.
ESTIMATION OF GENETIC ORIGINALITY OF THE SABLE IN CENTRAL SIBERIA

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Sable - one of the most valuable fur species of Russia. Its natural populations are under intensive legal hunting - nearly 400-450 thousand skins a year (Safonov, 2005). After sharp population decline in XX century, there were the essential changes in the structure of populations on all species area connected both with artificial translocations, and to natural restoration of its number. However, the intraspecific genetic structure of the sable remains practically not investigated.

This study was carried out in order to estimate the genetic originality of the sable populations in the central part of the species area. We obtained data on allele frequencies of 11 microsatellite loci for 119 sables hunted at the 2009/2010 season in 4 areas of Central Siberia - Tungussko-Chunsky (28 samples) and Kuraginsky (32 samples) regions of Krasnoyarsky Krai, Katangsky (32 samples) and Bratsky (27 samples) regions of Irkutsk oblast. For this 4 sample sets for 11 microsatellite loci an average value of expected heterozygosity (He) varied from 0.659 to 0.707, the number of alleles for a locus - from 8.0 to 9.1. Differences between sample sets were not statistically significant (Fst=0.0000-0.0038, p=0.565-0.994). Analysis based on allele frequencies by clusterisation method (Pritchard et al., 2000), realized in program Structure v. 2.2, has shown absence of obvious population structure within the total of Central Siberia sables. Thus, sable populations inhabiting investigated Central Siberia areas, as a whole are genetically enough homogeneous. These investigations of sable genetics revealing consistent pattern of interaction between different sable populations, will promote perfection of exploitation of this economically important species of Russian fauna.
Fruits are important wildlife food because of high caloric value and digestible energy. However, few habitat analysis include inventory of fruit production.

Therefore, the main objective of this work was to estimate soft mast production in mixed coniferous forest of Pino-Quercetum in Niepolomicka Forest. This woodland covers 8,8 thousands ha of land and it is situated 35 km East of city Cracow. It is inhabited by 180 bird species and it is classified as Natura 2000 site (PLB120002). The fruit production of shrubs and dwarf-shrubs was harvested during summer/autumn 2010 using belt as transects (length = 37.3 km; width = 10 m) and 240 quadrate 1 m² sampling plots. In the forest-meadow ecotone, the fruit production amounted to 0.81g dry wt/m² out of which 41.3% belong to alder buckthorn (Frangula alnus). Percentage share of hawthorn fruit (Crataegus oxyocantha) and European spindle (Euonymus europaeus) was 17.4 and 15.5% respectively. In forest habitat production of soft mast amounted to 0.63 g dry wt/m². The main component was blueberry (Vaccinium myrtillus) 73.0%, Crataegus oxyocantha (20.6%) and Frangula alnus (6.3%). It is suggested to increase soft mast production by planting various shrub species along 155 km of forest roads in Niepolomice Forest.
While roe deer distribution is continuous and expanding in the north half of Spain, towards the south, roe deer are present in isolated populations, with the south-western limit of the species’ worldwide distribution extending into the provinces of Cadiz and Malaga. The low density of roe deer populations in Andalusia, in contrast to Northern Spain and Central Europe may be explained by the peculiar productive conditions of the habitat in the Mediterranean region. But also habitat transformations and the high numbers of wild and domestic ungulates influenced the extinction of roe deer in some Andalusian areas. With the aim of increasing the roe deer distribution in Andalusia, the Regional Government started in 2009 the “Roe Deer Management and Reintroduction Plan in Andalusia”, which includes the reinforcement of the Andalusian roe deer populations that present low density levels, and the reintroduction of the species in suitable areas where it disappeared in recent time. In the case of reintroductions, roe deer are being released in enclosures (8-15Ha) until they are acclimated, then restricted doors will be open in the enclosure to allow their free movements; before this moment, some individuals will be marked by radio-collars to follow their dispersion.

The Plan will also promote corridors for natural dispersion of roe deer populations and actions to improve the habitat quality for the species, such as conditioning natural sources and creating artificial water points (very important for roe deer during summer), to create small open sunny areas (0,25Ha) in the forest by clearing the vegetation (which produce good feeding areas for roe deer), to create small planting areas (0,25Ha) with botanically suitable species for roe deer, and to create some artificial feeding points when necessary (mainly for recapturing individuals).
SUSTAINABILITY OF DIFFERENT MANAGEMENT REGIMES OF THE DINARIC BROWN BEAR POPULATION IN SLOVENIA AND CROATIA

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Slovenia and Croatia share the same brown bear population. The species is formally strictly protected with culling regulated through “derogations” in Slovenia while in Croatia it is still managed as a game species. The aim of our study was to gain insight into the long-term sustainability of different management regimes. We used bear mortality data for Slovenia from 1998 to 2008 (n = 922) and for Croatia from 2005 to 2009 (n = 422). A two-sample test for equality of proportions indicated that, in the total reported mortality, the share of animals killed in quota hunting in Slovenia (59.4%) was significantly lower ($\chi^2$-sq. = 7.1, df = 1, p<0.01) than in Croatia (67.2%). The proportion of management removals in Slovenia (17.8%) was significantly higher than in Croatia (6.0%; $\chi^2$-sq. = 32.1, df = 1, p<0.0001). The proportion of males hunted within the given quota was significantly ($\chi^2$-sq.=17.7, df=1, p<0.0001) larger in Croatia (78.3%, n = 281) than in Slovenia (63.7%, n = 548). The average age of bears killed in quota in Croatia was 5.47±0.27 (1 s.e., n = 167) and in Slovenia 2.82±0.12 years (1 s.e., n = 418). Survival analysis run in “R2.12.0” showed that until the end of the 4th year of life survival rate was 0.21 in Slovenia and 0.52 in Croatia. Results confirmed that different management regimes could have different effects on the bear population. We see this approach as a step towards safer decision-making on the bear harvest in Slovenia and Croatia.
EFFECT OF SEX, AGE AND SOCIAL STATUS ON MORTALITY RISK OF THE GREY PARTRIDGE

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Mortality in birds is known to vary with the stage of life cycle, sex, age and social status of an individual. In the grey partridge (*Perdix perdix*), only females incubate large clutches and thus invest more than males into reproduction whereas males are more active in pairing prior to the breeding period. Older individuals can benefit from previous experience during pairing and nesting, but they are also burdened with costs of previous reproduction and survival. The birds are exposed to hard winter conditions, a period with reduced food supply and cover.

On the other hand, aggregating in coveys and increased vigilance during this period can reduce predation risk. Adult sex ratio in grey partridge populations is moderately skewed towards a male surplus, which is a supposed result of generally higher mortality of hens. We analysed recent survival data of 169 radio-tracked grey partridges from three different areas in the Czech Republic (A: 2002-2003, B: 2003-2004, C: 2009-2010), using models of Cox's proportional hazard. We found that the mortality risk varied within the year, being the strongest during the covey period (autumn to winter) without any significant effect of sex and age. Survival increased during the pairing period (late winter to early spring) with similar mortality in both sexes, but significant effect of age.

Older (more experienced) individuals survived better, probably due to less time spent pairing compared to yearlings. Mortality increased again during the nesting period when females died significantly more than males. Males had lower mortality throughout the year (25% lower than females) which may cause the male surplus (10-18%) in our studied populations. The results are essential to allow reliable modeling of population dynamics of grey partridge populations in modern agricultural landscapes.
Population ecology of the wild reindeer in North Yakutia and Chukotka Peninsula was studied. Aerial and land counts were carried out.

Yakutia tundra is inhabited by the Lena-Anabar, Yana-Indigirka and Indigirka-Kolyma reindeer populations. Their dynamics in number has been traced since 1950-60s. In 1987 the Indigirka population reached its peak in number (130 000), by 2000-2002 it reduced to 34 000-42 000 animals. Almost similar changes occurred in the Indigirka-Kolyma population: 1993 – 40 000, 2002 – 29 000 reindeer. The adult male-female ratio was 1:2-3 during the increase in number, calves share made 28%, and during the population decline it was - 1:1-1.3, calf share reached 14%. The Lena-Anabar population has the following pattern: 83 000 animals in 1991 and 95 000 in 2009. Male-female sex ratio was 1:1.5 and calves proportion 22% (2009). In recent years the time and length of seasonal migrations in this population changed, broken sequence of movements to the summer and winter ranges is traced.16 000-18 000 reindeer inhabited Chukotka from 1970 to 1990. There are the Anyui, Omolon, Central-Chukotka and Mine populations in this peninsula. Since 1990 to 2000 these herds increased in number to 80 000-90 000 individuals.

The main reason of the populations’ rapid growth is their recruitment from Yakutia reindeer cohorts because their migration routes moved eastward. Migratory reindeer populations are soundly detached formations, well accessible to be controlled and managed by man.
Fallow deer is an important species of Hungarian game management; as such its behaviour, including its daily activity patterns and annual variations of these are especially important.

We tested the differences in the annual variations of activity patterns between sexes; in the mating season bucks may show increased activity, whereas lack of food in the winter may influence daily activity of both sexes. We examined annual variations of daily activity of two does and two bucks based on GPS telemetry data (Tomkiewicz, 1996; White et Garrott, 1990). Each individual had a total of 24 positions/day (8760 annual). Data were analysed by linear interpolation (Juhász, 1993) and by Mann-Whitney U-Test, and were processed with the aid of ArcView and DigiTerra computer softwares. In terms of a year, daily average distance traveled by does was 3756m (min. 1350m, max. 10898m), while bucks traveled 3740m (min. 659m, max. 14159m). In spring and summer, peak activity of does coincided with sunset and sunrise (see also Mattiello, 1997), which resulted in dual peak daily activity graphs where traveled distances coincided with the average yearly covered distance (3757m/day; min. 1441m, max. 9735m). Bucks had fewer activity peaks during these seasons, this was their passive period (2531m/day; min. 659m, max. 9106m). Daily distance traveled by the two sexes differed significantly (p=0.0005) during this time of the year. In fall during mating season does showed increased activity but their daily traveled distances coincided with the average yearly covered distance; whereas, bucks traveled larger distances (see also Apollonio et al. in 2003, 2004) and utilized more mating areas (5819m/day; min. 1979m, max. 14159m). In winter the activity patterns of the two sexes (minimum activity, peak undetermined activity at dawn, significant activity at sunset) were similar; however, their daily travelled distances varied significantly (p<0.0004).

While overall daily activity of does coincided with the average yearly covered distance, bucks traveled larger distances (4405m/day; min. 744m, max. 13913m), most likely in search of food to cover increased requirements.
Objective: J. Prūsaitė (1961) studied the morphology of wolves in Lithuania. 29 wolves were craniometrically explored at the 18 measurement points. These skulls were compared to the skulls of the wolves in Belarus and Middle Russia at the 4 measurement points. There was made no more any osteological analysis of wolves in Lithuania. The aim of this work is to perform osteometrical analysis of skulls in wolves and to compare the results.

Methods: There were examined skulls of hunted wolves in Lithuania during hunting season of 2005/2006-2008/2009 years. 88 skulls were examined (86,3% of all hunted wolves during this period). Skulls were measured under A. von den Driesch (1976) method. There were made 51 measurements in each skull. The indexes of skulls calculated according to V. Onar formulas (1997, 1999). There was performed a review of standard teeth formula deviations. Analysis were made by “Microsoft Excel 2000”. Arithmetic averages and standard deviation were evaluated.

Results: 3 skulls of hybrids were detected during measurement. They were eliminated as well as 6 skulls of wolves younger than two years old. It was determined that condylobasal length of wolves’ skulls ranges from 211,5 to 251,8 mm (males 237,9 ± 7,8; females 225,2 ± 7,0). Meanwhile J. Prūsaitė (1961) indicates range from 226,2 to 254,5 mm, (males 242,4; females 230,6). Latvian scientists determine range from 200,0 to 259,0 mm (males 237,0 ± 10,0; females 225,0 ± 8,0) (Andersone, Ozolinš, 2000). The biggest length between jowls’ bend ranges from 120,8 to 154,5 mm (males 140,2 ± 7,8; females 129,8 ± 6,4). J. Prūsaitė (1961) indicates the average of jowls’ length up to 142,5 mm for males, and 139,2 mm for females. Ž. Andersone and J. Ozolinš determined (2000) that this measurement point ranges from 118,0 to 161,0 mm (males 143,0±8,0; females 132,0 ± 6,0) for Latvian wolves.

Comparing the skulls of hunted wolves during the hunting season of 2005/2006 – 2008/2009 and 1958-1959 can be concluded that the skulls of hunted wolves of late years are smaller. The wolves hunted in Belarus in the middle of the last century (Garvinas, Donourovas, 1954) were bigger than wolves hunted in Lithuania of late years.

Anomalous teeth formula was found in fifteen skulls (17,4% of all skulls) – 10 males and 5 female. Eight cases were detected, when one or both third molars of mandible were missed. There were two cases, when additional last molar was detected, and five cases, when additional tooth near first primolar was detected.

Conclusion: The results of the research show that craniometrical measurements of hunted wolves in Lithuania, Latvia, Belarus and Poland are very similar. Comparing the skulls of hunted wolves during the hunting season of the beginning of this century and the middle of the last century can be concluded that the skulls of hunted wolves of late years are smaller. All noticed deviations from standard teeth formula were inborn.
GENETIC VARIABILITY AND STRUCTURE OF GOLDEN JACKALS (*Canis aureus*)
FROM BULGARIA, SERBIA, AND HUNGARY

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Recent microsatellite and mtDNA data of golden jackals from Serbia indicate very low genetic diversity. Only one mtDNA haplotype has been found, and this suggests a genetic founder effect in Serbia, that has been colonized by jackals from Bulgaria.

To test this hypothesis, we analysed 132 Bulgarian and 26 Hungarian jackals, using the same eight microsatellite markers as in the earlier study and using Serbian marker individuals for direct comparison.

All new individuals were also sequenced for the same mitochondrial control segment as the Serbian jackals. All 279 jackals from Bulgaria, Serbia, and Hungary, had the same mtDNA haplotype, except for a single new one, which differed by only one substitution and occurred in only one Bulgarian jackal.

Allelic richness calculated from microsatellite data did not differ significantly across the whole study range, and the recently established pioneer population in Hungary did not exhibit lower genetic diversity than all other populations. Genetic differentiation was rather shallow across the entire range studied. Concordantly, a Bayesian structure analysis suggested a quite high level of overall gene pool admixture. Hence, both the Serbian jackals and the very recent Hungarian founder population and even the older Bulgarian source population appear similarly genetically depleted. This might reflect a very small effective population size that has given rise to most if not all jackals currently roaming the Balkans and expanding their range to central Europe. The currently found high Bayesian population admixture suggests a raised level of migration, possibly over long distances, which should counteract further loss of genetic diversity.
THE EFFECT OF AN EXTREMELY WET YEAR ON A SMALL GAME MANAGEMENT
IN NORTHEAST HUNGARY

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Objective: The wet weather of 2010 heightened the already bad situation of Hungarian small game managements, causing inland inundation on hundreds of thousands of hectares. This year the annual precipitation was more than 970 mm in case of many areas of the region, (the average precipitation is 640 mm). The accurate evaluation of the caused damage could have been performed with the help of the autumn population estimation; however as this estimation was done only in few game management units, we thought it was necessary to survey the reproductive success.

Methods: During our work we made spring assessments in 10 game management units, evaluating the spring and summer reproductive success. Observations were extended to the autumn bag, specifically to the rate of young specimen in the bag.

Results: The autumn-winter inland inundation: reduced the survival rate of pheasants and hares decreased the population number (due also to the hunting of this two species) damaged the feeding ground of small game hunting societies. In the region we observed differences regarding the effect of wet weather on the reproductive success of small game population.

Conclusion: In case of pheasant it has been proved that, because of the high precipitation and inland inundation most of the first and second nests perished. In many areas the rate of young pheasant cocks was hardly 30% in the autumn game bag. On the contrary the very same index in the case of hare was better in the northern part of the region. Unlike the south part of the region, where the reproduction success was worse. The autumn bag and the rate of young hares hardly reached the 40%. As the precipitation in these two areas was similar, the differences were caused by some other factors, most likely by soil type.
Captive management of wild boars for hunting purposes plays an important role in Hungarian wild game management (OVA, 2010). A significant portion of the operational costs of such hunting preserves consists of feeding related expenses. As such it is important to gather information about food utilization of captive wild boars in order to understand the extent as to which the population relies on artificial food sources in addition to natural sources. In order to answer this question we compared the feeding habits of captive versus free living wild boars. In our analysis we examined the stomach contents of 24 wild boars kept in an 205 ha hunting preserve and 16 free living individuals; samples were collected between January 5-7, 2011. Samples were washed with sieve range, then dried and classified into food groups according to type (Baubet et al, 2004).

Data were statistically analyzed with Mann-Whitney U-Tests. The following food types were present in captive wild boar diets: oak acorn 2.8% (0-67.1); corn 54% (0-93.4); green vegetable matter 41.2% (3.8-99.4); roots 0.8% (0-4.1); food of animal origin 1.1% (0-14.4). In free living wild boars diets consisted of: acorn 44.8% (0-77.4); corn 5.6% (0-51.5); green vegetable matter 29.8% (0-97.8); roots 0.3% (0-2.8), food of animal origin 19.5% (0-62.5). Statistical analysis showed significant differences in diet composition between the two populations for acorn (p = 0.000), corn (p = 0.000) and food of animal origin (p = 0.002), whereas green vegetable matter (p = 0.219) and roots (p = 0.139) showed no statistical differences between the two groups. In captive wild boars the most prevalent food source from naturally occurring food items was green vegetable matter, which did not differ from the free living population. In comparison, consumption of acorn and food of animal origin were insignificant in the captive population which otherwise were most significant sources of food in the wild population.

These findings suggest that higher population density in captive populations results in lower food availability per individual, which is compensated by artificial food sources as it is reflected in the high corn consumption ratio of captive wild boars.
In Russia – large carnivores traditional and very popular game animals. Formed controversial and mainly negative attitude toward to this species explained by their predation on domestic animals and wild ungulates.

We use archive data and literature to show the dynamic of its number and bugging for a more than century. Accurate data of monitoring since 1960-s provides us information of all changes in their population (distribution, number, movements and etc.). Beside we use hunting statistic to describe changes in hunting methods.

During the last century, populations of both species have fluctuated widely. Either hunting developed from the total prohibition (for bear) to the extermination by poison (for wolf). Our data show that bear and wolf spread throughout all territory of Karelia. The number of both growing from north to south according with ecological and landscape condition. Bear population is very stable and annually hunting not exceed 8-10% of all population. But in the some local territories it reaches to 20-25%. Wolf population is tie connected with moose (Alces alces L.). Dynamic of wolfs number follow for the moose with time lag (1-2 years) for the whole period of observation. Nowadays Karelia inhibited more over 3000 brown bears and around 350 wolves.
Hunting is a common citizens’ hobby in Finland. When sustainably arranged, hunting is also an important part of game management. One way to ensure sustainability is to make sure that the law and other regulations are followed by hunters.

Law enforcement authorities for hunting issues in Finland are the police, the Frontier Guard, and the Game and Fisheries Wardens of Metsähallitus. These authorities have many cooperative actions. The Game and Fisheries Wardens of Metsähallitus is the only full-time organization in range-guarding and their authorization is valid in state-owned areas. Wardens’ guarding reports are collected annually. The report consists of statistics, the main problems, proposals, and the whole picture of the situation in actions met. According to the reports, wardens have a contact with 8 to 10 thousand hunters, fishermen, and other enthusiasts in the wilderness. Most often the task of a warden is to guide people and ensure that they have permits that are needed and act lawfully. One important mission is to prevent problems beforehand. During recent years, about 7% of the customers have had something to remark. Half of the remarks are due to deficiencies in permits and the other half due to illegality. Most serious problems are the poaching of moose (Alces alces) and large carnivores. Moose is a valuable game species and some organized illegal moose poaching has been revealed. The presence of large carnivores causes tension in reindeer herding areas.

A common assumption is that most of the crimes (90%) are never discovered by the authorities. One suggestion to solve problems better has been to increase resources for guarding and co-operation between authorities. This means ensuring both financial and know-how resources. It is also very important to have an open and honest discussion within the whole society, a discussion concerning problematic and valuable species, and a better understanding of different attitudes.
MANAGEMENT OF THE SIKA DEER POPULATION ON HOKKAIDO ISLAND, JAPAN

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During the last three decades the irruption of sika deer (Cervus nippon) on Hokkaido Island, northern Japan, has caused extensive agricultural damage and severely affected forest vegetation. In 1998 the Hokkaido government initiated aggressive population control based on the “Conservation and management plan in eastern Hokkaido.” Since institution of this plan both the sika deer population size indices and the amount of damage had decreased during 1998-2001. However, the deer population size has re-increased because of reduction of female deer harvest. In order to evaluate the population trend and to estimate the population size, relative density indices using spotlight counts and SPUE (sighting per unit effort) were useful.

We discuss the perspectives on the deer management and the population monitoring.
We tested the relations between partridge chick survival and the habitat structure of a Mediterranean farmland area dominated by olive groves with mixed patches of scrublands and herbaceous crops. Our main hypothesis proposes a relationship between habitat suitability and chick survival. The study area was located in the Antequera area, (Malaga province, south of Spain) and the study period was May to August over three years (1996-1998). The sample size was 264 different coveys. The mean covey size was 8.46 ± 0.24 chicks. We explored the variation sources on covey size (number of chicks, i.e. chick survival) by using General Linear Models (GLMs) with a Poisson error function and a log link function. We also used a logistic regression model to discriminate between optimal-sized coveys (more chicks than average) and suboptimal-sized coveys (fewer chicks than average). Olive grove age has a significant effect on chick survival (Wald = 6.587; P = 0.037). Small coveys are related to the use of older groves while larger coveys use younger groves. There are also significant effects on survival with the distance to ecotones (Wald = 15.465; P < 0.001), the distance to herbaceous crops (Wald = 15.503; P < 0.001) and the existence of irrigation (Wald = 5.521; P = 0.019).

Chick survival also increases with the use of nearby “lindes” and water availability. Optimal-sized coveys are positively related to the use of areas far away from old olive groves and the existence of an irrigation system (normally trickle irrigation). This logistical model classifies 70.2% of suboptimal size coveys and 58.7% of optimal size coveys (AIC = 340.92) correctly. The results highlight the low level of suitability of olive groves for partridge chick survival. Chicks are forced to go out of the grove to look for resources. The scarcity of cover and animal food for the chicks and the existence of a diverse predator community in old groves could reduce covey sizes.

The creation of a network of non-treated and irrigated micro patches of herbaceous vegetation inside the groves, interconnected through green corridors inside the grove, may improve cover, food and water availability and would also facilitate refuge against predators.
Avian assemblages are determined, to a degree, by vegetation and forest structure. The consecutive phases of forest succession might provide habitats of different structure and often different plant species composition. These progressional changes can cause significant changes in the associated bird communities. The relationship between breeding bird communities and different phases of secondary succession of primary deciduous forests (sessile oak) and secondary coniferous forests (spruce plantation) in the Sopron Mountains was studied. Bird surveys have been carried out in 5 different successional stages using the double-visit fixed-radius point count method.

To determine the relationship between habitat structure and breeding bird communities principal component analysis followed by multiple linear regression analysis were carried out. A total of 41 bird species were encountered. There are typical bird communities to order to different stages of forest succession, containing unique bird species or species appearing predominantly in that successional stage. The study has shown structural changes in breeding bird communities during the succession. Bird species richness, density and diversity showed the same trends. Their numerical values were the lowest in the clear-cut areas with young (1-2 year old) plantations, and the highest in the mature stands. After a starting increase (shrub stage) there is a slight decline (10-12 year old stands) because of the canopy closure of the young trees. Further decrease can be observed in the low pole stands, as these habitats are no longer appropriate for species nesting in shrubs and not yet suitable for the hole-nesting ones. Species richness, density and diversity were lower in the early pole and older spruce stands than in the corresponding oak stands.

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Raccoon dog (*Nyctereutes procyonoides*) and American mink (*Mustela vison*) are invasive, non-native opportunistic predators in Poland. Hunting statistics showed that during last 4 years, an average annual harvest rate of raccoon dogs and American mink amounted to 11 and 3 thousands animals respectively in the whole country. Negative impact of both predators upon native mammals and birds should be reduced by heavy hunting pressure, mainly in habitats preferred by these predators. Therefore the main objective of this work is to indicate such habitats. Our study areas were hunting districts (n = 418) located in the Regional Directorate of State Forest in Olsztyn. All hunting districts cover 2,22 mln ha of land out of which 0,66 mln ha (29,7%) are woodlands managed by 33 Forest Districts. Number of both predators harvested during 2005 – 2010 was obtained from hunting districts. Data on forest structure were taken from Forest Service.

During 6 hunting season the annual harvest rate of raccoon dogs and American mink did not change very much and on average was equal to 848 and 620 individuals respectively. In 2009/10 hunting season, the hunting bag of raccoon dogs and American mink amounted to 1,35 animals/1000 ha of forest (range 0.19 – 4,52) and to 0,99 individuals/1000 ha of forest (range 0,07 – 5,84) respectively. Harvest rate of raccoon dogs was positively correlated with proportion of deciduous and mixed deciduous forest (r = 0,48; p = 0,02). The same trend (r = 0,47; p = 0,05) was observed with American mink in alder and riparian forests. We would like recommend including the results of our work into local game management planning.
Objective: studying of changes in the brown bears behavior under anthropogenic pressure. Before 1995, trouble factors had been absent the North East area. Before the middle of the 70th of the 20th century there had not been registered any changes in the animals’ behavior and in their number. In 1970-1985 behavior stereotypes of bears changed and it was promoted by hunting from helicopters.

First, daily activity of bears changed, they prefer to feed in meadows, berry-fields, and rivers at night, and at day-time they rest in remote shrub hollows. It worsened their conditions to take food. Bears refused to visit shallows, where they traditionally had taken hunch back salmons (*Oncorhynchus gorbuscha*) and Siberian salmons (*O. keta*) at day time.

At present time the dens disappeared from the shrub tundra. In 1982-1985 bears began to be forced out of the tundra zone because of anthropogenic pressure. Reindeer-breeders have killed bears, they was announced as “the enemy 2“ following the wolf. Great demand for the fells, priced today up to $2000 USA each, and for other parts of brown bears provoked active poaching of reindeer-breeders. Sometimes they takes 3 or 4 bears per day, even females with cubs may be also shot. In 1990-1992 the situation was aggrivated by illegal and poorly controlled currency hunting for bears. Many populations of brown bears are threatened, especially tundra and littoral ones. According to our mean data (Zheleznov, 1991, 2006) and to their extrapolation on other mountain parts, in the Far North East, the number of brown bears, at that time, was not less than 3-4 individuals. At present time there are about 2-3 of those animals in Far North East of Asia and in Chukotka there are 350-400 individuals.
Workshops
Exotic invasive species are considered by the IUCN Species Survival Commission to be the second largest threat to native species, following habitat destruction. The introduction of exotic species in regions beyond their natural distribution range may alter host ecosystems, thus affecting the viability of native fauna and flora. Concerning ungulates, game activity is among the main driving forces behind the expansion of various species throughout the world. However, not all exotics may have the same impact, as it depends on their ecological niche, the existence of potential competitors and/or predators, and, if herbivores, their effects on plant communities. The other side of the coin is that exotic big hunting originates a series of socio-economical benefits to the human community, although some parties tend to disapprove this activity, such as environmental organizations and farmers. In sum, this is an issue that may be addressed from very different views, which are not necessarily exclusive if a proper management is undertaken. We feel thus that there is room for the discussion and exchange of experiences. Questions such as ‘what’s the ecological difference between exotic wild ungulates and livestock?’ can be raised. As a starting point, we will introduce the case of two exotics in Spain: the European mouflon (Ovis orientalis musimon) and the aoudad or Barbary sheep (Ammotragus lervia), both successfully introduced but showing a differing population dynamic, behaviour and ecology. They have also originated different reactions from stakeholders: from eradication to protection of some of their populations.

How it works:

The idea is to promote a meeting of colleagues for discussion and exchange of views. Apart from the moderators, 3-4 researchers that are interested in the subject are expected to participate, summarizing their experience. Getting together participants from different countries will enrich the round table, as more examples and circumstances can then be exposed and discussed. We have been offered sufficient space and time from the organizers, but a preliminar call of interest is a requisite to assure the success of the table.

The workshops will start with a short account by the participants, around 5 minutes each, using slides if wished, where they will show examples of successful introductions of exotic ungulates due to hunting interest, and the consequences, positive and negative, that these actions have given rise, ecological and socio-economically.

Addressing common scenarios and hopefully reaching some accord on how game biologists can tackle this issue would be our goal.

Moderation:
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GALLIPYR: PYRENEAN NETWORK FOR THE MOUNTAIN GAME FOWL

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The GALLIPYR project is designed to harmonize the methods of monitoring and management of 3 species of mountain game fowl between 3 States that make up the Pyrenean Massif (Spain-France-Andorra): the Capercaillie (*Tetrao urogallus*), the Rock ptarmigan (*Lagopus mutus*) and Grey partridge (*Perdix perdix*). Actions are also conducted to encourage the return of Hazel Grouse (*Bonasa bonasia*), extinct species of the Pyrenees following pressure from human activity. On the French side of the Pyrenees, methods of monitoring of these populations exist across the OGM, the GALLIPYR project will expand and develop expertise between French-Spanish-Andorran specialists for the mountain game fowl, in the whole of the Pyrenean chain for a better cross-border balance.

**Actions implemented:**
The project provides for the creation of a network of Pyrenean mountain game fowl, assistance to the creation of a database of Pyrenees and in implementing actions for habitats and species of mountain game fowl and in particular:

- Cross-cutting actions to species: realization of inventories of cables and lethal fences and visualization of a part of it; the channeling of human displacement in some areas of high strategic value for their preservation to avoid disturbance of species; realization of monitoring of populations of this species and potential realization of models of fitness of habitats associated with abundance models.
- Specific actions concerning the Capercaillie (*Tetrao urogallus*): implementation of forest management to promote habitats on strong issue areas; realization of a management guide for the Capercaillie and study to test the influence of terrestrial predators and the wild boar on Capercaillie populations.
- Specific actions concerning the Rock Ptarmigan (*Lagopus mutus*): a program of translocation of individuals with long-term follow-up of participation in the reproduction of released birds, and of the evolution of the reproductive success, an update of the data on the causes of mortality of Rock Ptarmigan will be also performed.
- Specific actions concerning the Grey partridge (*Perdix perdix*): a practical guide of the supra-forest pasture management modes will be performed, actions to improve Habitat and recovery of populations in Navarre and the Basque country
- Specific actions concerning Hazel Grouse (*Bonasa bonasia*): drafting of a plan to reintroduce it, and if the conditions are met, tests of reintroduction of hazel grouse can be realized in Val of Aran.

**Expected results and perspectives:**
The actions of visualization of the cables and fences should have a positive impact on the rate of mortality of mountain game fowl, but also have beneficial effects on other important species of the birds (owls, raptors,…). For the Rock ptarmigan: improve the efficiency of the reproduction and try to reduce a loss of diversity genetic found in the Rock ptarmigan in the East of the Pyrenees. The methodology of translocation could be transposed to other species. The actions of improvement of habitats (Capercaillie and Grey partridge) expected allow increasing the capacity of habitats and to impact on the demography.
WHAT MAY HUNTERS AND GAME BIOLOGISTS EXPECT FROM EACH OTHER?

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Across the world hunters invest a lot of time and money in habitat management and regulation of hunting for those migratory birds that they have an interest in. Those efforts also benefit many other species of plants and animals.

However, given that these huntable species are a resource shared between many different countries, how can hunters be confident that good management practice being applied in one country or region is not undone by poor or no management practice in others? How even to measure what is good management practice versus poor management practice? What if there is little or no knowledge about what is happening in a number of countries? Should research be prioritised based on the conservation status of migratory bird species? These are just some of the questions that hunters and game biologists want to discuss rationally. Such opportunities for open dialogue are rare however, either because there is poor communication between research institutes and hunting organisations and/or because the protectionist movement has polarised the research community, the hunters’ community and other conservationists.

As such, joined up thinking on huntable species of migratory birds can be a challenging task. The workshop will start with two short presentations, one from a hunter’s perspective, the other from that of a game biologist. Participants will then be encouraged to give their own views, make suggestions, present ideas and formulate suggestions and proposals with the view to increase effectiveness of contacts and cooperation between hunters and game biologists. A summary of the workshop findings will be presented to FACE and to its Members, and thus influence decision making within the context of the sustainable management and hunting of migratory bird species in Europe.
Over the last few decades, wild boar has reached high densities and its distribution has increased. This phenomenon has been recorded in sensitive wetlands and other protected areas in the Nature 2000 network. It has led to conflicts in two main areas: damage to biodiversity, such as predation of the eggs and nestlings of endangered bird species and severe damage to orchids as a result of bulb consumption; and social conflicts due to damage to crops and pasture and traffic collisions with wild boar.

In these protected areas hunting is forbidden. Therefore, population control inside the nature reserves must be carried out by government agencies using various techniques, such as battues, traps and other methods.

The action plan and monitoring carried out at the Aiguamolls de l’Empordà Natural Park and at the Maremma Natural Park, two protected areas located in the Mediterranean basin, enable us to review these techniques and the results. This provides the basis for discussion of the best management practices for controlling these wild boar populations and for reducing damage to natural resources and social interests.

The workshop focuses on three topics:

1) Damage: which species are most vulnerable to the effects of wild boar and how can they be protected? How can other conflicts be reduced?

2) Population control methods. How effective are the capture techniques that are currently in use and which factors must be taken into account to define the control strategy?

3) Habitat management. Can this factor contribute to reducing conflict?
Biodiversity loss in Europe is critically associated to agricultural ecosystems. Recent statistics reported by SEO/Birdlife show that bird populations in Spanish agricultural land are declining during last years.

Recent work with red-legged partridge (*Alectoris rufa*) in Central Spain and Navarra has shown that changes in agricultural landscapes and management techniques are the major drivers of long- and short-term wild population declines too, even in areas with such contrasting environmental features. Wild rabbit (*Oryctolagus cuniculus*), hares (*Lepus* spp.), turtle dove (*Streptopelia turtur*), or common quail (*Coturnix coturnix*) population changes have also been associated to large-scale habitat changes, even in agricultural lands. Thus, agricultural changes are affecting not only overall biodiversity conservation, but also to game production, an important socio-economic activity in European rural environments.

The Common Agricultural Policy (CAP) has recently recognized these facts, and has tried to promote a better role of agriculture in biodiversity conservation through the cross-compliance measures and agri-environmental schemes. However, some implementation failures of these measures and programs have been recently reported too. CAP is going to be re-formulated again in 2013, so we are at a crucial time to develop sound, rational and feasible guidelines to improve relations between agriculture, game production, and biodiversity conservation in farming areas. This workshop will review available information about the topic, indentifying research subjects that need more attention, and proposing specific measures to improve CAP implementation.
European wild rabbits have caused severe economic and ecological losses in many areas of the world where they have been introduced by humans - in many cases for hunting purposes.

Consequently, conservationists and farmers use a range of management practices to eradicate or reduce rabbits and avoid damage to natural vegetation or crops. Scientists have carefully analyzed the effects of such management and are constantly investigating new ways to control the species.

By contrast, where rabbits are native (such as the Mediterranean Basin and southern Iberian Peninsula) most managers, conservationists, and scientists have focused their efforts on enhancing rabbit populations following severe reductions due to myxomatosis in the 1950s and RHD in the 1980s; little information has been gathered on rabbit control, apart from hunting, despite rabbits causing damage to high-value crops. After briefly outlining the different strategies used in Australia, England and Spain to manage rabbits, our main goal in this workshop is to generate a spectrum of management options, and open a forum of discussion on the best potential options for rabbit management in Spain to meet the needs of conservation, hunting and crop protection.