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WELCOME LETTER

The Instituto de Investigación en Recursos Cinegéticos (CSIC-UCLM-JCCM) in cooperation with the HUNTING for sustainability project (EU 7th framework) are pleased to host and welcome you to the **International conference on hunting for sustainability: ecology, economics and society** in Ciudad Real (Spain) from the 27th to the 29th March 2012.

Hunting is a traditional activity practiced around the world either for recreation or for subsistence. In its many different forms, hunting plays important social, cultural and economic roles within society and has both positive and negative impacts on biodiversity. Development of sustainable practices require an integrated approach from social, economic and natural sciences, building on both academic and experience based knowledge.

In this conference, we will explore the potential for sustainable use of biodiversity by focusing on an assessment of the interaction between social, cultural, economic and ecological values and impacts of hunting. Finally, we will discuss how these multidisciplinary results should be taken into account when designing policy, including the future EU policy on hunting and biodiversity conservation.

This conference will join 150 scientists from more than 30 different countries and 5 continents, and we hope it will provide the necessary opportunity to discuss recent and exciting development in game research. A total of 43 oral presentations will be given and 38 posters presented, which reflects the high quality and interest of this conference. We see this conference as a great opportunity to fuel future communications and to strength the ties between the wide scientific community dedicated to the study of game.

We are very grateful to those who have given us their time and support during the preparation of this conference, and to all of you who honour us with your presence. This conference has been funded by the European Commission under the 7th Framework Programme for Research and Technological Development through the project HUNT (212160, FP7-ENV-2007-1). Neither the European Commission nor any person acting on behalf of the Commission is responsible for the use made of the information presented in this conference. The views expressed in this conference are the sole responsibility of the authors and do not necessarily reflect the views of the European Commission.

We hope you will have a wonderful time during this conference.

Beatriz Arroyo
Chair of the HUNT conference



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Instituto de Investigación en Recursos Cinegéticos (IREC) CSIC-UCLM-JCCM

SCIENTIFIC COMMITTEE

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Imperial College (UK)
- Steve Redpath
University of Aberdeen (UK)
- Justin Irvine
James Hutton Institute (UK)
- John Linnell
NINA (Norway)
- Anke Fischer
James Hutton Institute (UK)
- Miguel Delibes-Mateos
Instituto de Investigación en Recursos Cinegéticos, CSIC-UCLM-JCCM. (SP)
- Alba Estrada
Instituto de Investigación en Recursos Cinegéticos, CSIC-UCLM-JCCM. (SP)

SCIENTIFIC PROGRAM

Tuesday 27 March

- 09.00-09.30 Conference inauguration
- 09.30-10.15 **Plenary 1. Steve Redpath.** Integrating approaches to hunting.
- 10.15-11.00 **Plenary 2. Julie Hanta Razafimanahaka.** The challenges of investigating and tackling bushmeat hunting in Madagascar.
- 11.00-11.30 **Coffee**

Room 1 - Session 1. On the meanings of hunting

- 11.30-11.50 **Fischer, A.** et al. (De-)Legitimising hunting – morality discourses on hunting in Europe and Eastern Africa.
- 11.50-12.10 **Kerezi, V.** et al. Game or vermin? Representations of and relationships with wildlife species among hunters and non-hunters in four European countries.
- 12.10-12.30 **Krange, O.** et al. Hunters as stewards of the land.
- 12.30-12.50 **Figari, H.** Real hunters don't shoot for fun!
- 12.50-13.10 **Øian, H.** The meanings of elk hunt and its social and political contexts. Case studies from some Norwegian rural communities.
- 13.10-13.30 **Saayman, M, & Van der Merwe, P.** Why do South Africans hunt?

Room 2 - Session 2. Sustainability in hunting

- 11.30-11.50 **Scallan, D.** The sustainability of recreational hunting in Ireland: a rural development case study.
- 11.50-12.10 **Legagneux, P.** et al. How individual heterogeneity and climatic conditions modulate the effect of hunting management practices and policies.
- 12.10-12.30 **Reljic, S.** et al. Hunting for bear sustainability in Croatia: an overview.
- 12.30-12.50 **Skrbinšek, T.** et al. Monitoring effective population size in a hunted population of brown bear (*Ursus arctos*).
- 12.50-13.10 **Bobek, B.** et al. Hunting in Poland – an example of non-sustained game management.
- 13.10-13.30 **Schmidt, K.** Predators: the touchstone of ecological hunting sustainability.

13.30-15.30 **Lunch**

15.30-16.15 **Plenary 3. Jon Swenson.** Potential evolutionary consequences of hunting brown bears.

16.15-17.30 **Poster session**

Room 1 - Session 3. Hunting in its socio-economic contexts (1)

17.30-17.50 **McNamara, J.** et al. Bushmeat, commodities and climate. An econometric analysis of the supply and demand of bushmeat in an urban market in south west Ghana.

17.50-18.10 **Tadie Limenh, D. & Fischer, A.** Hunting, social structure and social representations of human-nature interactions in lower Omo, Ethiopia: people and wildlife at a crossroads.

18.10-18.30 **Funston P.** et al. Balancing financial and conservation imperatives: trade-offs to maintain viable large carnivore populations and profitable trophy hunting

18.30-18.50 **Moro, M.** et al. What can be done to reduce illegal hunting? An investigation using choice experiments in the Serengeti, Tanzania.

Room 2 - Session 4. Hunting in a changing environment (1)

17.30-17.50 **Robert, H.** et al. Human hunting of roe deer: the interplay of a changing environment and the uncertainty of management decisions.

17.50-18.10 **Dinnie, L.** et al. Property rights and public policy changes: understanding discursive claims to knowledge among Scottish land managers.

18.10-18.30 **Lowassa, A.** et al. The influence of informal institutions and social change on bushmeat hunting in Western Serengeti, Tanzania.

20.00-22.00 **Welcoming reception (wine and munchies) in Museo López Villaseñor**

Wednesday 28 March

09.00-09.45 **Plenary 4. Angus Middleton.** Sustainable hunting.

Room 1 - Session 5. Collaborations and interactions between stakeholders (1)

- 09.50-10.10 **Cinque, S.** Collaborative management in wolf hunting: Rethinking the role of public managers in bridging environmental conflicts.
- 10.10-10.30 **López A. et al.** Relationships between farming and hunting: effects of pesticide-coated seeds on red-legged partridges.
- 10.30-10.50 **Chanteloup, L.** Between conflicts and problem solving: the hunting management in the Bauges game reserve.
- 10.50-11.10 **Bryce, R. et al.** Improving collaboration to reconcile multiple land management objectives in the Scottish uplands.

Room 2 - Session 6. Hunting tourism and conservation

- 09.50-10.10 **Tibebe Weldesemaet, Y. et al.** Sharing of revenues from wildlife tourism and hunting in Ethiopia – does it foster conservation?
- 10.10-10.30 **Suni, J. & Komppula, R.** Hunting on familiar and unfamiliar grounds – Finnish hunters' motivations in local and non-local hunting tourism.
- 10.30-10.50 **Rouco, C. et al.** Rabbit hunting competition as a tool for pest management in Southern New Zealand.
- 10.50-11.10 **Palazy, L. et al.** Which species are the most attractive for trophy hunters?

11.10-11.40 **Coffee**

Room 1 - Session 7. Collaborations and interactions between stakeholders (2)

- 11.40-12.00 **Andersen, O. et al.** Ecological, social and economic benefits from commercialization of red deer hunting in Norway.
- 12.00-12.20 **Sjölander Lindqvist, A.** Targeted removals of problematic wolves in Sweden through lethal control: An analysis of the motivations for controlled hunting.
- 12.20-12.40 **McKee, A. et al.** 'Thinking in new boxes': International reflections on the problems and prospects of the scenario analysis method in wildlife and natural resource governance.
- 12.40-13.00 **Sandström, C. et al.** Changing the rules of 'the game': outcomes and reflections on stakeholder-developed scenarios for the future of ecosystem management in Scotland and Sweden.
- 13.00-13.20 **Flø, B. E.** Meat, feelings and friendship - the rural hunt and the community.

Room 2 - Session 8. Ecological effects of hunting and hunting management

- 11.40-12.00 **Estrada, A.**, et al. Does hunting management affect non-game bird species? A study from Spain and Portugal.
- 12.00-12.20 **Mateo, R.** et al. Lead poisoning of waterfowl in Spain: conservation efforts, trend of prevalences and implications on game meat safety.
- 12.20-12.40 **Newey, S.** et al. Bird diversity and game management in the Scottish Highlands, UK.
- 12.40-13.00 **Nilsen, E.B. & Linnell, J.D.C.** Norwegian lynx harvest: challenges and possible solutions.
- 13.00-13.20 **Nugent, G. & Forsyth, D. M.** Invasive deer, hunting, and sustainability of indigenous ecosystems in New Zealand: is deer browsing a threatening process or a replacement for lost ecosystem function?
- 13.20-15.30 **Lunch**
- 15.30-16.15 **Plenary 5. Beatriz Arroyo.** Sustainability of wild red-legged partridge hunting in Spain.
- 16.15-17.00 **Plenary 6. Djuro Huber and Klemen Jerina.** Sustainability of different management regimes of the Dinaric brown bear population in Slovenia and Croatia: social, legislative and ecological aspects.
- 17.00-17.20 **Coffee**

Room 1 - Session 9. Hunting in its socio-economic contexts (2)

- 17.20-17.40 **Nuno A.** et al. Application of novel approaches to quantify illegal bushmeat hunting in the Serengeti.
- 17.40-18.00 **van der Merwe P.** et al. A regional approach to the economic impact of hunting in South Africa.
- 18.00-18.20 **Rentsch, D.** et al. Bushmeat hunting and consumption in Serengeti, Tanzania: An almost ideal demand system approach to protein alternatives.

Room 2 - Session 10. Hunting in a changing environment (2)

- 17.20-17.40 **Maffey, G.** Digital solutions in traditional landscapes.
- 17.40-18.00 **Heberlein, T. & Ericsson, G.** Social change and sustainable sport hunting: maintaining hunter populations.
- 18.00-18.20 **Bunnefeld, N.** The role of human decision-making for the sustainability of trophy hunting.

18.30 *Trip to Almagro*

Thursday 29 March

Plenary 7. Policies, hunting and sustainability: needs, barriers, solutions
(Simultaneous translation into Spanish will be provided for this session)

09.00-11.00 Talks from **Joseph van der Stegen** (DG Environment, EU), **Maria Ledesma** (ELO, European Landowner Organization), **Johan Svalby** (FACE, Federation of Associations for Hunting and Conservation of the EU), **John Linnell** (NINA, Norwegian Institute of Wildlife Research), **Tamàs Marghescu** (CIC, International Council for Game and Wildlife Conservation), **Santiago Ballesteros** (RFEC, Spanish Royal Hunting Federation), **Luis Fernando Villanueva** (APROCA, Spanish Rural Owner Association for Game Management and Wildlife Conservation)

11.00-12.00 *Coffee/Brunch*

12.00-14.00 **Round-Table discussion:** Policy and ecological tools for sustainable hunting

14.00 **Conference closure**



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CIUDAD REAL, SPAIN - 27-29 MARCH 2012 www.huntconferencespain2012.com



Plenary 1

Integrating approaches to hunting

Steve Redpath

Aberdeen Centre for Environmental Sustainability (ACES), Institute of Biological & Environmental Sciences, Aberdeen University, Tillydrone Avenue, Aberdeen AB24 2TZ, UK.

Hunting has always been a part of how people interact with nature. Over time that interaction has changed from one focused on survival to one where hunting practices are deeply embedded in social structures with important social, economic and ecological functions and impacts. Nowadays, hunting can also be a very controversial practice. Our ability to understand the multi-dimensional aspects of hunting demands that we somehow try to integrate information from different disciplinary approaches. Similarly, our ability to build effective policy and tackle the conflicts between people over hunting practices, also demands that we link academic approaches with practitioner and policy perspectives. In this talk I will explore what we mean by integration, what alternative models are available and what the barriers are to making it work. I will illustrate these points by considering some case studies that have attempted to take an integrated approach to hunting. I will end by looking to the future of hunting and the role of integrative approaches.

Plenary 2

The challenges of investigating and tackling bushmeat hunting in Madagascar

Julie Hanta Razafimanahaka

Madagasikara Voakajy, Lot II F 14 P Bis A Andraisoro, 101 Antananarivo, Madagascar

Bushmeat hunting is part of the livelihoods of many rural people in Madagascar providing much needed protein and income. But important questions remain unanswered: how much bushmeat is extracted from the wild and what species are targeted? How dependent is the population on bushmeat as a source of meat? Whilst traditional taboos have played an important role in restricting hunting of certain species at certain places or times of year (and preventing hunting of others all together) and wildlife legislation defines legal hunting seasons and protected species, there are few quantitative data on the actual hunting and consumption of bushmeat in Madagascar. Because of the law and fady people may be reluctant to reveal bushmeat consumption in interviews. We therefore developed an innovative suite of methods to investigate hunting in Madagascar: the randomized response technique, covert monitoring by local villagers, monitoring of rubbish tips, and forest transects to find direct evidence of traps. Our studies reveals bushmeat, including threatened species, is widely consumed. Traditional taboos are rapidly degrading and laws are poorly known, poorly understood and not enforced. Elders doubt they can revive the taboos, the government have insufficient resources and will to enforce the law. However our research also helps suggest solutions. Taste preference studies show people would much rather eat pig and chicken than lemur. We are seeking partners to improve domestic animal husbandry in rainforest areas-improving the availability of domestic protein. We are tackling poor understanding of laws through an education campaign involving work in schools, radio programmes and posters. However all this is very much just the beginning. The steps should be (i) increasing awareness on the law, (ii) providing alternatives and (iii) enforcing the law. Our biggest task is to get other partners in Madagascar, including the government, to recognize the importance of the bushmeat issue for the future of Madagascar's biodiversity.

Plenary 3

Potential evolutionary consequences of hunting brown bears

Jon Swenson, Andreas Zedrosser, Richard Bischof

Scandinavian Brown Bear Research Project, Department of Ecology and Natural Resource Management, Norwegian University of Life Sciences, Postbox 5003, NO-1432 ÅS, Norway

Interest in the potential evolutionary consequences of harvesting animal populations is increasing. To date, the most conclusive results have been obtained from studies of marine fisheries. However, human-induced selection for life-history traits associated with trophies has also been documented in large mammals and modeling suggests that it also can be caused by nonselective hunting.

We are investigating the potential for human-induced evolution of life-history traits in the Scandinavian brown bear (*Ursus arctos*), which presently is hunted relatively nonselectively in Sweden. We have used four lines of evidence: 1) comparison of relative reproductive effort in populations persecuted for many centuries (Europe) and Our results were consistent in showing the potential for human-induced evolution in brown bears. 1) Female brown bears in populations with a long persecution history allocate significantly more to reproduction (litter size) in relation to body mass than those in populations with a short persecution history. 2) Males show a similar body growth pattern in Sweden, with a long persecution history, and Alberta, Canada, with a short persecution history, but females are smaller in Sweden and are primiparous at a smaller size relative to asymptotic size. 3) Female yearling body size is positively related to lifetime reproductive success, but adult mortality, which is almost totally caused by humans, is a more important factor. 4) Smaller females have smaller young and are associated with them longer. Both of these groups enjoy higher survival when together, due to Swedish regulations protecting family groups. These regulations could potentially select for less productive females. Together, our results suggest that sport hunting has the potential to be an artificial selective force affecting life-history strategies in brown bears. Managers and researchers have an obligation to understand the consequences of harvesting bears and other large mammals, including potential human-induced evolution.

Plenary 4

Sustainable Hunting?

Angus Middleton

*Chief Executive, Federation of Associations for Hunting and Conservation of the EU.
Rue F. Pelletier 82, B-1030 Brussels, Belgium.*

Hunting is strongly linked to our collective history and remains an important recreational activity in Europe, with over 7 million hunters pursuing their passion in one form or another. The public discourse surrounding hunting tends to focus on a mixture of ecological and moral aspects. Whilst the latter aspect is of importance it is a more philosophical debate and for the purpose of interrogating the term sustainable hunting it should suffice to accept that hunting is a legitimate pursuit in all European countries. The discourse on ecological aspects is driven by an increased social and political focus on environmental issues and with that the question of sustainability. The question of environmental sustainability is often evaluated without due consideration to the wider aspects of hunting and the realistic alternatives of not hunting.

It could be argued that, in general, sustainability is an aspiration and the only useful evaluation we can make is whether something is unsustainable. This said such an evaluation still needs to be done in relation to a timeframe suited to the elements under evaluation. Hunting having continued through the millennia exhibits strong characteristics of being sustainable over the long term, but this is not to say that certain practices have not been unsustainable in the shorter term and indeed lead to the decline or extinction of particular species. In this regard it is useful to evaluate hunting as a whole but also to identify particular aspects that may be drivers of excessive biodiversity loss and to measure them against an appropriate timeframe.

The HUNT Project is, to date, the biggest and most integrated European research project undertaken on hunting. In bringing together environmental, economic and social aspects it takes on a more holistic approach to evaluating the sustainability of hunting and the issues associated with contemporary hunting. This presentation aims to draw on these elements to question the role and (un)sustainability of hunting in society today.

Plenary 5

Sustainability of wild red-legged partridge hunting in Spain

Beatriz Arroyo, Miguel Delibes-Mateos, Alba Estrada, Silvia Díaz-Fernández, Javier Viñuela.

IREC (CSIC-UCLM-JCCM), Ronda de Toledo s/n, 13071 Ciudad Real, Spain

Red-legged partridge (*Alectoris rufa*) is the most important gamebird in Spain, both socially and economically. It can be considered a farmland bird, since the main habitat of the species is a combination of agricultural land, mainly dry crops, and natural vegetation, grasslands or scrub, reaching maximum densities in areas of typical Mediterranean climate with fragmented agricultural landscape. Its populations declined on the second half of the XXth century, mainly due to changes in farmland habitat and agricultural management, and an increase in hunting pressure over declining populations. In contrast, the economic interest in this species has increased over the same period. Currently, management to improve their populations is commonly applied throughout the territory. This management includes mainly provision of supplementary food and water, predator control and, increasingly, releases of farm-bred partridges. The development of the farm-rearing partridge industry has led to a change in the hunting activities (e.g. increasing the availability of driven shooting activities), to an increase in the economic revenue of certain estates (as driven shooting generates more income) and to the creation of jobs in rural environments. However, it is also associated to the feeling of a loss of “genuinity” among both hunters and managers alike. Additionally, releases have negative impacts on wild populations and thus are not helping to recover the wild stock. We present existing knowledge about the social, economic and ecological impacts of releases of farm-reared partridges, and discuss their implications. We suggest that, in order to assure the sustainability of hunting of wild partridges as a commercial activity, policies ensuring that released birds are properly identified (e.g. through rings) is implemented, and schemes helping the economic sustainability of estates based exclusively on wild stocks should be developed.

Plenary 6

Sustainability of different management regimes of the dinaric brown bear population in Slovenia and Croatia

Klemen Jerina², Djuro Huber¹, Slaven Reljic¹, Erlend B. Nilsen³, John D.C. Linnell³

1 Biology Department, Faculty of Veterinary Medicine, University of Zagreb, Heinzelova 55, Zagreb, Croatia

2 Department of Forestry and Renewable Forest Resources, Biotechnical Faculty, University of Ljubljana, Večna pot 83, Ljubljana, Slovenia

3 The Norwegian Institute for Nature Research (NINA), Tungasletta 2, Trondheim, Norway

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 (χ -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%; χ -sq.=32.1,df=1, p<0.0001). The proportion of males hunted within the given quota was significantly (χ -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 $5,47 \pm 0,27$ (1 s.e., n=167) and in Slovenia $2,82 \pm 0,12$ years (1 s.e., n=418). Survival analysis run in “R2.12.0” showed that until the end of the 4th year of life survivorship 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.

Special problem for bear management in Croatia is the change of bear status imposed by European Commission. Through the Habitats Directive, bears in all current EU member states are “strictly protected”, including the ones sharing the largest European populations like Carpathian (Romania, Slovakia), Scandinavian (Sweden), and part of Dinaric-Pindos (Slovenia). Croatia asked for an exemption from the Annex IV of the Habitats Directive. The strong arguments to support this approach were: 1) the Croatian bear population grew with continuous hunting from less than 100 to 1000 in the past 60 years, 2) bears are well accepted by local inhabitants, 3) bear hunting provides economic profit to hunters, 4) damages caused by bears are not significant, 5) management of problem bears is straightforward (with less than two bears removed annually, in an average). The national yearly hunting quota since 2009 was set at 100 plus up to 40 bears expected to be lost due to other reasons (traffic, problem bear removals, etc.), but was never reached



(maximum 85%). The refusal of Croatian request to keep the bear as game poses a serious threat to future bear management in Croatia and the well-being of the population, as all the advantages of the current management system may be abruptly reversed in a negative direction. Probably, fewer bears will be tolerated, public attitude will worsen, damage compensation requests will go up, and more bears will be removed annually than they are now. The Habitats Directive allows exemptions but, among large carnivores, so far only a few countries managed to move wolf or lynx to the Annex V from the Annex IV. None for brown bears!



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ORAL COMMUNICATION ABSTRACTS



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SESSION 1. ON THE MEANINGS OF HUNTING



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Abstract O.01

(De-) Legitimising hunting – morality discourses on hunting in Europe and Eastern Africa

Anke Fischer¹, Vesna Kerezi², Beatriz Arroyo³, Miguel Delibes-Mateos³, Degu Tadie¹, Asanterabi Lowassa⁴, Helene Figari⁵, Ketil Skogen⁵.

1 Frankfurt Zoological Society, PO Box 14935, Arusha, Tanzania

2 Department of Biology, Veterinary Faculty, University of Zagreb, Heinselova 55, 10000 Zagreb, Croatia

3 IREC(CSIC-UCLM-JCCM), Ronda de Toledo s/n, 13071 Ciudad Real, Spain

4 Tanzania Wildlife Research Institute (TAWIRI), PO Box 661, Arusha, Tanzania

5. Norwegian Institute for Nature Research, Gaustadalleen 21, 0349 Oslo, Norway

Keywords: culture, discourse, morality, Europe, Africa

Talking about hunting often seems to mean talking about morality: Much of the public debate over hunting revolves around perceptions of moral acceptability of different types of and approaches to hunting. But what exactly is seen as moral, what is seen as a legitimate (or illegitimate) way of hunting?

Drawing on qualitative interviews and focus group discussions with hunters, non-hunters and anti-hunters in study areas in four European and two eastern African countries, we examined patterns in our participants' argumentations, and identified the attributes that are drawn on to (de)legitimise hunting, including characteristics of the hunted animal, hunting techniques and approaches, and motivations. The latter factor in particular, i.e., ideas of legitimate and illegitimate motivations, seemed to underpin a large part of our participants' conversations. For example, hunting for food ("for the pot") was an extremely relevant argument that was used recurrently across study sites to legitimise hunting, especially where hunters were seen to have no other choice. Almost consensually, non-hunters and many hunters across most study areas regarded it as unacceptable not to eat the game killed in a hunt. Similarly, hunting was often legitimised by a reference to cultural identity of the hunter's community that needed to be preserved.

Our analysis identifies these common building blocks of argumentations for and against certain types of hunting, and interprets them against the backdrop of wider societal discourses on subsistence livelihoods, cultural heritage and identity, and the need to make conservation count. We argue that such legitimisations of hunting are embedded in and expressions of such societal discourses, and should be interpreted in this context. Our analysis also suggests that there might be more overlap between argumentations of hunters and non-hunters (and partly even anti-hunters) than commonly thought, which, where required, could be used as a starting point for conflict management.

Abstract O.02

Game or vermin? Representations of and relationships with wildlife species among hunters and non-hunters in four European countries

Vesna Kerezi¹, Beatriz Arroyo², Miguel Delibes-Mateos², Anke Fischer³, Aleksandra Majic-Skrbinsek⁴

1 Department of Biology, Veterinary Faculty, University of Zagreb, Heinzelova 55, 10000 Zagreb, Croatia

2 Instituto de Investigación en Recursos Cinegéticos (IREC) (CSIC-UCLM-JCCM), Ronda de Toledo s/n, 13071 Ciudad Real, Spain

3 The James Hutton Institute, Craigiebuckler, Aberdeen AB15 8QH, Scotland, UK

4 Dpt. of Biology, Biotechnical Faculty, University of Ljubljana, Večna pot 111, 1000 Ljubljana, Slovenia)

Keywords: social meanings of wildlife species

Perceptions and attitudes people hold towards animals, including wildlife species, have been studied for many years, highlighting the historical and cultural dependence of the social meanings of animal species. Social scientific studies on wildlife have tended to focus meanings of single species or wildlife as a whole. Limited attention has been given to variations in perceptions of multiple species and to the differences in meanings between game and non-game species. Our study explored representations of species by examining people's relationships with and views on different game and non-game species. We used a qualitative approach, drawing on semi-structured in-depth interviews and focus group discussions conducted with hunters and non-hunters in all three countries. The data was then jointly explored and analyzed using a grounded theory approach. We found that across hunters and non-hunters, representations of any one species could vary considerably, ranging, for example, from ideas of the fox as a despicable, ruthless predator or time-consuming nuisance to images of a respected opponent. While many participants (especially hunters) at the surface seemed to draw on clear-cut categories such as game versus vermin in their argumentation, a closer look revealed far more complex ideas of species. Our study participants' views on the appropriateness of certain ways of dealing with an animal were closely related to their ideas about this species. For example, hunters tended to consider animal welfare issues especially for those species they considered as game, whereas the opposite was the case for species regarded as vermin – a category that was much less strongly represented among non-hunters. Representations of animal species thus had strong ethical components, and could hence provide insights into a person's value system, and more generally, into their relationship with nature. Especially for hunters, views on animal species were also closely connected to perceptions of their role in land management, for example, as stewards that safeguard



the balance in the countryside, or as conservationists. By providing a better understanding of the different social representations of animals, our findings have implications, for example, for the management of conflicts between different stakeholder groups over animal welfare and the appropriate treatment of animals. Our analysis also suggests that such conflicts might not only be caused by diverging views on the animal species themselves, but rather, by more fundamental divergences between ideas of nature.

Abstract O.03

Hunters as “stewards of the land”

Olve Krange¹, Anke Fischer², Vesna Kerezi³

1 The Norwegian Institute for Nature Research (NINA), Gaustadalleen 21, 0349 Oslo, Norway

2 Frankfurt Zoological Society, PO Box 14935, Arusha, Tanzania

3 Department of Biology, Veterinary Faculty, University of Zagreb, Heinzelova 55, 10000 Zagreb, Croatia

For many hunters, the idea of caring for, and actively assisting the wildlife and the land, is crucial to their understanding of what hunting is about. The basic thought is that since humans have already interfered with nature; nature also needs to be managed – not only for people’s sake, but for nature’s own sake. There is an idea that nature, once tampered with, simply cannot be left alone. Otherwise chaos will result. This chaos will also make animals suffer, because populations will not be managed, and animals will die from starvation, diseases and predation, much worse than the humane bullet from a hunter. There is also a notion of an ideal balance in nature. While this balance may once have been “natural”, hunters have for hundreds of years been a crucial part of the system that is needed to sustain it (because the big predators are gone and so much else is changed by humans). This engagement with wild animals is thought of as part of a deeper unity with nature, which means being part of nature in physical sense. This, according to hunters, distinguishes them from many conservationists, who are said to only observe nature. If we humans are to be part of nature, we must also engage with it, e.g. as predators, but also as caretakers, stewards. The idea of hunters as stewards of the land contributes to a moral justification of hunting, and, importantly, underpins a symbolic appropriation – a sense of moral ownership – of areas that do not belong to the hunters in a legal sense. This raises interesting questions about the basis for responsible wildlife conservation, as it seems to be unrelated to legal land ownership.

Abstract O.04

Real hunters don't shoot for fun!

Helene Figari¹, Anke Fischer², Ketil Skogen¹

1 Norwegian Institute for Nature Research, Gaustadalleen 21, 0349 Oslo, Norway

2 The James Hutton Institute, Craigiebuckler, Aberdeen AB15 8QH, Scotland, UK

Keywords: Hunting culture, Identity, Authenticity, Symbolic efficacy, Representations

Technically, hunting can be understood as the shooting or killing of wild animals. There are, however, numerous examples of forms of hunting in which the act of killing itself does not seem to be the primary motive for the hunt. Based on field work and qualitative interviews, we have analyzed representations of authentic hunting among Norwegian moose hunters. It appears that in these hunting communities the theme of authenticity often revolves around the relationship between the hunter and its game. Most of the informants considered, for instance, that a “real” hunting experience requires a balance in the relationship between the hunter and the animal – the game must have a fair chance to escape. Many of the moose hunters also tied the idea of authenticity to an apparently self-contradictory reluctance to shoot during the hunt.

If hunting is not primarily represented as the killing or shooting of wild animals, what then characterize the moose hunters’ ideas of “true” hunting and “real” hunters? Most of our informants emphasized the social aspect of the hunt, the knowledge it brings, the joy of spending time in natural environments, the duty of controlling game populations. These are well known motives that have all been discussed in previous research. Yet, we believe there is another, maybe less articulated but not least important, achievement at play in the hunt. Some of the informants called it “understanding the animals”, others “to get inside the head of the game”. One said: “A real hunter is like an Indian – soundless and one with the animals”. Hence, hunting seems to represent a way of engaging with authentic nature, with the wild, embodied in the game. In this perspective, at the level of representation, “real” hunters gain some of their authenticity from their privileged contact with true wildness, and their reluctance to shoot – however ineffective such a practice might appear in terms of killing game – stands out as symbolically effective.

Abstract O.05

The meanings of elk hunt and its social and political contexts. Case studies from some Norwegian rural communities

Hogne Øian¹

1 Norwegian Institute of Nature Research, Lillehammer, Norway

Keywords: elk hunt meanings contexts commercialization

It has been rightly argued that meaning of modern hunting cannot be analyzed without regard to the complexities and sensualities of the way in which hunters engage in embodied encounters with nonhuman animals. In most cases, the meaning of the hunt will in addition involve different cultural, social and political contexts, stretching far beyond the hunt itself. In Norway, elk hunting has become a central seasonal event in many rural communities. Even though the organized elk hunts originate just a few decades back in time, it is habitually perceived as a traditional activity, expressing the equality and communality that is seen as central assets of rural communities. The reason why elk hunt is associated with these kinds of values is perhaps not so much related to the fairly broad participation in the elk hunt, as to the democratization of the admittance to hunt that was achieved during the first decades after World War II. According to Norwegian law, fish and game are the property of the landowners. Permission to angle or hunt tended to be conditional on exclusionary and unpredictable policies of individual landowners. The efforts of the national angler and hunters association, supported by among others central actors within the governing social democratic party, ensured that renting of angling and hunting rights became subject to regulations and formalized agreements, providing a more equal and predictable distribution of affordable permits. Partly as a result of this, hunting is by some viewed not only as the articulation of the perceived essence of the communality of rural life, but also like a manifestation of the social equality on the societal level that has been achieved by the social democratic movement. Recently there have been some efforts of integrating the elk hunt into tourism products. Some locals worry that a process of commercialization will undermine what is held to be a fairly equal distribution of inexpensive hunting opportunities within the local communities. Related to these kinds of worries, and based on qualitative, semi-structured interviews of hunters and non-hunters in a rural community in Norway, this paper will present an exploration of how some of the controversies over the efforts of commercialization expose and challenges several aspects of the meaning of the hunt.

Abstract O.06

Why do South Africans Hunt?

Peet van der Merwe^{1, 2}, [Melville Saayman](#)¹

1 North-West University: Potchefstroom Campus, Tourism Research in Economic, Environs and Society (TREES), South Africa

2 Private Bag X 6001, Potchefstroom 2520, South Africa

Keywords: travel motives, hunting South Africa, hunting, biltong hunting, trophy hunting, nature-based tourism, game farms, factor analysis, tourism.

Wildlife tourism is one of the corner stones of the South African tourism industry and can be defined as tourism that is based on encounters with non-domesticated animals, such as springbok, elephants and lions. Wildlife Tourism activities can be classified into two main groups, namely non-consumptive (viewing and photographing of wild animals) and consumptive (such as hunting and fishing). From an economic point of view hunting generated in excess of 6 Billion Rand in South Africa. However very little is known about the reasons why people hunt. The aim of this paper is to determine the reasons (travel motives) of biltong hunters in South Africa.

A web-based survey was conducted on SA Hunters' website, where respondents had the opportunity to complete the questionnaires and send it back electronically. A total of 344 (n) completed questionnaires were received back. A factor analysis was conducted and revealed seven factors, namely educational purposes (Factor 1); culture and heritage (Factor 2); family togetherness (Factor 3); nature experience (Factor 4); adventure (Factor 5); wildlife meat products (Factor 6); and spiritual (Factor 7). These travel motives can assist game farm owners in product development as well as with the marketing of game farms, as owners now know the motives why biltong hunters hunt.



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SESSION 2. SUSTAINABILITY IN HUNTING



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Abstract O.07

The sustainability of recreational hunting in Ireland: a rural development case study

David Scallan¹

1 Department of Geography, National University of Ireland Galway, University Road, Galway, Ireland

Keywords: hunting, rural development, Ireland

Recreational hunting represents an interesting situation as it is rarely mentioned alongside issues of land-use, diversification or recreation within policy discussions about rural development in Ireland. In this context, this paper explores the sustainability of recreational hunting within Irish rural development policy. First, it examines how hunting is part of the rural economy and the ecological management of rural space. Second, it examines how hunting is constructed within Irish rural development policy and positioned by rural policy decision-makers. Finally, it examines how hunting is constructed by farmers. Drawing on data generated from a national questionnaire-based survey of hunters, the paper indicates that recreational hunting has a considerable economic presence in rural Ireland. Mean hunter expenditure estimates ranged from €1,856 for participants involved in game shooting to €6,931 for participants involved in mounted hunting with hounds. A national survey of hunting organisers illustrated that a variety of habitats including hedgerows, woodlands and wetlands were created and managed to improve conditions for hunting, with knock-on benefits in terms of biodiversity conservation. Semi-structured interviews with rural policy decision-makers unpacked a variety of issues which drew on specific constructions of rurality, nature and animals which hindered closer interactions between hunting and Irish rural development policy. Focus group discussions with farmers found that hunters play an important wildlife management role in the Irish countryside but, in some cases, are problematic in relation to land access and tourist hunting. The paper concludes that while hunting activities contribute to the rural economy and to the management of ecology, their highly political and controversial nature prohibits inclusion in 'official' Irish rural development policy. The paper argues that constructions of nature and rurality must become an integral part of sustainable rural development particularly when recreational activities are considered as a mechanism to ameliorate the effects of rural restructuring.

Abstract O.08

How individual heterogeneity and climatic conditions modulate the effect of hunting management practices and policies

Pierre Legagneux¹, Matthieu Guillemain², Cyril Eraud², Joel Bety³, Gilles Gauthier²

¹ Université Laval, 2325, rue de l'Université, Québec G1V 0A6, , Canada

² Office National de la Chasse et de la Faune Sauvage, Direct Etud & Rech, F-13200 Arles, France
France

³ Université du Québec à Rimouski, 300, allée des Ursulines, C. P. 3300, succ. A
Rimouski (Québec), Canada

Keywords: Waterfowl, hunting policies, non-consumptive effects, individual heterogeneity

Human predation through hunting has obvious direct (mortality) effects but can also be a source of disturbance or cause redistribution of individuals. These non lethal effects can have deleterious impacts on multiple traits in target species. By using three case studies in waterfowl, we examine the effects of management policies and hunting practices on key life history traits. Using Robust Design capture-mark-recapture methodology, we first assessed the effects of hunting pressure on the survival and movements (temporary emigration and immigration) of hand-reared mallards *Anas platyrhynchos* released to the wild in Central France. Annual survival rate was relatively low ($18\% \pm 11$) and affected by human hunting. Very high rates of movements between or within lakes were also recorded. Birds in poorer body condition had higher survival rates. Risk-avoidance behaviours likely explain this result whereby individuals in lower condition are less likely to encounter hunters when they leave their release sites. The impact of hunting on these individuals may therefore lead to unintended directional selection of phenotypes. Secondly, we investigated the joint effects of hunting practices (opening dates, length of the hunting season, and number of hunters), local and large-scale climatic conditions, and phenotypic attributes on common pochard's *Aythya ferina* survival in SE France. Using a 14 years (1982-1995) ring-recovery dataset, the survival of common pochards was significantly related to hunting practices and/or pressure. Juvenile survival declined with an increase in the length of the hunting season but the timing of hunting did not affect their survival. Adult survival was positively related to the winter North Atlantic Oscillation, suggesting that wet and mild winters enhanced adult survival. These results illustrate that management decisions should be flexible enough to integrate the weather conditions experienced by birds during the previous wintering period. Finally, we investigated the potential carry-over effects (COEs) induced by environmental disturbance during stopovers on reproduction. During three consecutive years, 2037 females greater snow geese *Anser caerulescens* captured during spring staging were maintained in captivity (with or without access to food) for 0 to 4 days. Duration of captivity (but not food treatment) negatively affected subsequent reproductive success, probably through a stress



response. Reproductive success was reduced by 45 and 71% in two years, but not in a third year with unusually favourable breeding conditions. This unprecedented manipulation indicates that COEs can have a strong effect on individual reproductive success in long-distance migrants but that this effect can be partly compensated for by good environmental conditions on the breeding ground.

Abstract O.09

Hunting for bear sustainability in Croatia. An overview

Slaven Reljic, Vesna Kerezi, Djuro Huber

Department of Biology, Veterinary Faculty, University of Zagreb, Heinzelova 55, 10000 Zagreb, Croatia

Sustainable management is often said to be the key toward a successful conservation. What sustainable management actually is and how to reach it, however, is rather challenging to define. While the knowledge on species ecology is important for reaching effective conservation, it is also necessary to take into account economic and social factors of wildlife management. If left aside, these can have a negative effect on the whole management process and undermine its chances of reaching the level of sustainability. Important part of brown bear management in Croatia, since 1960s, is trophy hunting based on the annual quota regulation. It has been carefully regulated and continually monitored since 2005 through the implementation of the Brown Bear Management Plan for the Republic of Croatia. We explored the impact of such management on three interrelated levels: ecological, economic and social one. The goal was to investigate if the current management system is sustainable for a longtime period. Quantitative methods included statistical analysis in Microsoft Excel and R 2.13.1 software. Biological data and data obtained from questionnaires on economics of bear hunting were analyzed. Qualitative data were collected using in-depth interviews and focus groups discussions. Grounded theory approach was used for analysis. Part of that data was also built into bioeconomical model. Analyses of the Croatian bear mortality data from 2005 to 2009 (n=422) showed that the share of animals killed in quota hunting in the total reported mortality was 67%. This was followed by traffic accident deaths of 19%, and management removals of 6%. The proportion of males hunted within the given quota was significantly high 78,3%. The average age of bears killed in quota was $5,47 \pm 0,27$ (1 s.e., n=167). Survival analysis run in "R" showed that until the end of the 4th year of life survivorship was 0,52. Data on the economics of bear hunting indicated that between 10% and 25% of annual expenditure in hunting units was for the bear management. In general, hunting units did not make a profit from hunting activities, but they did make a profit from bear hunting. The analysis of qualitative data showed that both hunters and non-hunters have a positive attitude toward brown bears and support current management practice. Economic benefits from bear trophy hunting had an important role in hunters' support. Participants perceived bear as a symbol of their region and viewed its presence as a result of a good-quality habitat and proper management. Overall, our results from ecological data combined with the positive economic effect of bear hunting and the good social acceptance of local people and stakeholders all support the current bear management system in Croatia.

Abstract O.10

Monitoring effective population size in a hunted population of brown bear (*Ursus arctos*)

Tomaž Skrbinšek, Maja Jelencic, Lisette Waits, Ivan Kos, Klemen Jerina, Djuro Huber, Slaven Reljic, Peter Trontelj

Biotechnical Faculty, Biology Department, University of Ljubljana, Slovenia

Effective population size (N_e) is arguably one of the most elegant concepts in biology, conveniently summarizing both evolutionary potential of a population and its sensitivity to genetic stochasticity in a single parameter. While this parameter used to be very difficult to estimate in a natural population, new methodological developments over the recent years made it possible not only to estimate, but also to monitor effective population size as it changes through time. We collected tissue samples of brown bear mortality in Slovenia and Croatia ($N= 1119$), genotyped them on 20 polymorphic microsatellite loci and determined age of each animal using tooth cementum rings. We applied four new methods for estimating effective population size that require a single sample of genotypes taken from the population to estimate this parameter at different points in time from 2000 until 2010. We recorded a steady increase in N_e , followed by a decrease over the recent years that possibly reflects the recent management decisions. We demonstrated that this approach can be used as a very efficient, yet at the same time very cost effective method for monitoring a hunted population in the wild.

Abstract O.11

Hunting in Poland an example of non-sustained game management

Boguslaw Bobek, Jakub Furtek, Katarzyna Kopec, Jacek Maslanka, Maciej Ziobrowski

Pedagogical University of Cracow, Poland

Keywords: deer, wild boar, small game, damages, farmers, foresters, hunters, game management, human attitude

In Poland game animals are property of the nation however only citizens who belong to the Polish Hunting Association (PZL) and pay the annual membership are allowed to hunt. Hunters hunt on a private land however its owner do not receive any leasing fee. In the last two decades the number of game animal species shrunk from 58 to 33. Recently, there has been uncontrolled increase in red deer and wild boar population. Local density of red deer is already higher than 100 animals per 1000 ha, and a density of roe deer is 2-3 times higher. Therefore most of the forest, young plantation, including pines, is fenced with public funds about 25 million euro per year. Deer pressure resulted in significant changes in plant species of a forest vegetation floor and understory as well as damage in farmlands. High density of wild boar (60-70 animals per 1000 ha) makes these animals enter urban areas and it also causes a big damage in farmlands. Desperate farmers press local governments to announce state of disaster which would help with reducing the number of red deer and wild boar. Due to overharvest of moose population hunting on these animals has been stopped. Hunters failed to prevent a sharp increase in a red fox population. There was a sharp decrease in harvest of partridge, from 700 thousands to 20 thousands and from 650 thousands to 35 thousand individuals respectively. Restocking of thousands of partridges and hares do not have any results, as the animals that are raising in captivity are not adjusted to the natural environment. The main cause of Polish game management model crisis is non-rigorous harvest planning based upon demographic variables (population density, age structure, sex ratio, recruitment rate and others) that are created by hunters as guess estimate data. Unfortunately this procedure is accepted by Polish Ministry of Environment. The Polish Hunting Association is responsible for the current situation, as according to hunting law it is obliged to make decisions regarding game management. Unfortunately, this association doesn't have enough knowledge and experience with professional and adaptive game management. It means that Polish Hunting Law Act should be amended as soon as possible. To sum up, game management should be supervised by professional managers who work mainly in the State Forest, owners of land where hunters hunt should obtained payments and compulsory Polish Hunting Association membership should be removed.

Abstract O.12

Predators: the touchstone of ecological hunting sustainability

Karoline Schmidt

Free lance scientist, Perchtoldsdorf, Austria

Ten years ago the Environment Agency Austria established a set of principles, criteria and indicators (revised and extended in 2006) based on ecological, economical and socio-cultural aspects to evaluate sustainability in hunting in Austria.

Therein a guiding principle of ecologically sustainable hunting is the conservation and improvement of ecosystem biodiversity and consequently the support or at least tolerance for returning native species, such as bears and wolves.

A guiding principle of economically sustainable hunting in the Austrian hunting system, where hunting rights are coupled to land-ownership, is the profitability of hunting, a very subjective assessment, as criteria differ between a lessor and/or land owner and a tenant or hunting customer and are often inconsistent with ecologically as well as socio-culturally acceptable sustainable hunting. The bedrock for economically sustainable red deer hunting management is intensive supplementary feeding. Ad libitum feeding wild game for more than half a year, nationwide, not only virtually eliminates density- as well as density-independent winter mortality, but also binds red deer to the respective hunting ground and makes their roaming behaviour highly predictable which allows for a highly predictable hunting success - an enormous asset in an economy where time is a scarce commodity. Although it is stated that the aim of sustainable hunting should be to “manage and preserve wildlife habitats in such a way as to make feeding wild animals for the sake of preserving species and/or preventing damage done by game unnecessary”, feeding, the indispensable basis for red management, was deliberately not included in the sustainability criteria.

Most discussions about ungulate management in areas with large carnivores only consider the numerical impact of predation on ungulates and the necessary changes in harvest rates. However, in a management system relying on supplemental feeding, the impact of natural predators on ungulate behaviour is even more important. Natural predators disrupt predictability and thus the basis of economically sustainable hunting. Unless hunting management abandons supplemental feeding, hunting will not be ecologically sustainable with regards to ecosystem biodiversity.



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SESSION 3. HUNTING IN ITS SOCIO-ECONOMIC CONTEXTS (1)



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Abstract O.13

Bushmeat, commodities and climate. An econometric analysis of the supply and demand of bushmeat in an urban market in south west Ghana

James McNamara

Department of Life Sciences, Imperial College London, Silwood Park, Buckhurst Road, Ascot SL5 7PY, UK

Keywords: Economics

The forests of the Ashanti Region in central-southwest Ghana provide numerous goods and services upon which many rural households depend, both for income and for sustenance. One of the key ecosystem services from which humans have historically derived benefit is bushmeat. The exploitation of bushmeat sits within the context of other livelihood options, in particular farming, and provides valuable income in times of hardship when other revenue streams and food stuffs are not readily available.

As a result, the decisions taken by hunters as to whether to hunt, what to hunt and how to hunt are influenced by a variety of factors including climate, fuel prices, availability and cost of alternative goods and the price of bushmeat in local markets.

Using data collected over 27 years from a central bushmeat market in Kumasi, Ghana, an econometric analysis was conducted to determine to what degree fluctuations in climate and key commodity prices influence the supply of bushmeat into the market.

Although bushmeat supply was shown to be relatively constant over this period, there were significant changes in species composition, as well as inter-year fluctuations in the total number of individuals entering the market over the 27 year period. Seasonal variation due to agriculture and climate was shown to play a major role in explaining changes in overall biomass entering the market.

The results indicate that changes in rainfall patterns and agricultural strategies may have consequences for how hunters allocate their time and the distribution of hunting effort throughout the year. Such changes may have implications for the ability of certain species to persevere under increased levels of exploitation.

Abstract O.14

Hunting, social structure and social representations of human-nature interactions in lower Omo, Ethiopia: people and wildlife at a crossroads

Degu Tadie, Anke Fischer

Frankfurt Zoological Society, PO Box 100003, Addis Ababa, Ethiopia

Keywords: illegal, Ethiopia, human-wildlife relationships, social structure

Hunting has often been portrayed as the ultimate form of human-wildlife interaction, emphasising the close connection between hunter and game that is enacted through hunting. Drawing on our analysis of the cultural meaning of hunting in lower Omo, southern Ethiopia, we present here insights into a very different case. Drawing on qualitative methods – in particular, focus group discussions and interviews – we could identify three different types of hunting in lower Omo, all relying on semi-automatic rifles. These can be broadly classified into small game hunting (for food) and big game hunting (either to obtain income from the sale of animal parts such as giraffe tails, or to prove bravery). While hunting for food and for the sale of animal parts were mentioned only cursorily, hunting to show bravery clearly received most attention by our participants.

In particular, they described the different roles of participants in hunting: The hunter, his hunting friend (“miso”), and his honorary elder sister (“misha”). A hunter’s relationship to both miso and misha were created through an event of hunting large game (e.g. a buffalo), but would last for years to come. While the miso stood by the hunter to help and protect him, the misha received the successful hunter upon his return home with a special necklace, drinks and food. Subsequently, the hunter would be able to draw on her and her family’s support in times of hardship. Hunting thus allowed people to establish non-kin, but enduring bonds with other community members, and thus helped to create and maintain social structure.

Interestingly, such human-human relationships was the defining element of our conversations about hunting in lower Omo. Relationships with wildlife (or the non-human environment), as often emphasised in Western contexts, were hardly discussed, even when explicitly probed. Wildlife was seen as a means to an end (e.g., for food, or as a hunting target to display bravery) rather than as a richly structured object in itself. Potentially connected with this, our participants appeared rather helpless and despaired at the current loss of wildlife they observed, and could not see any means to halt the ongoing environmental degradation they were suffering from. Ironically, it might thus be that this



focus on human-human relationships and the – potentially related – lacking means to conserve wildlife will ultimately lead to the demise of hunting activities, and thus of precisely this source of social structure so highly valued in lower Omo.

Abstract O.15

Balancing financial and conservation imperatives: trade-offs to maintain viable large predator populations and profitable trophy hunting

Paul Funston¹, Rosemary Groom², Peter Lindsey³

1 Tshwane University of Technology, Pretoria, South Africa

2 African Wildlife Conservation Fund, Doral, Florida, USA

3 Mammal Research Institute, University of Pretoria, Pretoria, South Africa

Keywords: Financial implications of lion hunting

Large African predators are financially valuable for ecotourism and trophy hunting operations on private, communal and multiple-use state land utilised for wildlife production. However, above certain densities, they impose economic costs through impacts on populations of ungulates that are also valuable. Larger predators may also adversely affect conservation efforts involving endangered smaller predator species (e.g. cheetahs *Acinonyx jubatus* and African wild dogs *Lycaon pictus*). We investigated the financial and conservation trade-offs associated with managing large predators on a large collaboratively managed private wildlife production area in Zimbabwe. Our model showed that lions (*Panthera leo*) result in substantial financial costs through predation on wild ungulates that may not be offset by profits from hunting them. This effect was exacerbated in our study area by high levels of bush meat poaching for the same high-value herbivore species. The trophy-hunting benefits of leopards (*Panthera pardus*), however, significantly outweigh the cost of their predation, due to their preference for lower value prey species. In the absence of additional income derived from photo-tourism the number of lions may need to be managed to minimise their impact, or on financial grounds not introduced at all. Lions drive important ecological processes, but there is a need to balance ecological and financial imperatives on private and co-managed communal land to ensure that wildlife-based land uses continue to compare favourably in monetary terms with less conservation-friendly land uses, such as livestock production.

Abstract O.16

What can be done to reduce illegal hunting? An investigation using choice experiments in the Serengeti, Tanzania

Mirko Moro¹, Loi Naiman², Asanterabi Lowassa³, Dervla Brennan¹, Mikolaj Czajkowski⁴, Anke Fischer², Nick Hanley¹

1 Economics Division, University Of Stirling, Scotland

2 Frankfurt Zoological Society, Arusha, Tanzania

3 Tanzania Wildlife Research Institute (TAWIRI), Arusha, Tanzania

4 Department Of Economic Sciences, University Of Warsaw, Warsaw, Poland

Illegal bushmeat hunting is a serious threat to the conservation status of many species in Africa. However, gaps in our understanding of the determinants of bushmeat hunting and consumption remain. In this paper, we use two choice experiments to quantify these determinants. A livelihoods strategy design is used to investigate factors which might reduce participation in illegal bushmeat hunting, whilst a consumption choice experiment investigated the cross-price elasticity of demand for protein substitutes. In the former, we quantify the determinants of behaviour by hunters, and the trade-off rates between different lifestyle attributes in terms of changes which reduce hunting activity. In the latter we investigate what changes in bushmeat, chicken and fish prices would reduce consumers' market demand for bushmeat.



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SESSION 4. HUNTING IN A CHANGING ENVIRONMENT (1)



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Abstract O.17

Human hunting of roe deer: the interplay of a changing environment and the uncertainty of management decisions

Hagen Robert¹, Fahse Lorenz², Kramer-Schadt Stephanie³, Heurich Marco⁴

1 University of Freiburg, Department of Wildlife Ecology and Management. Tennenbacher Str. 4, 79106 Freiburg, Germany

2 Professorship for Forest Ecology, Swiss Federal Institute of Technology, Universitätstrasse 16, 8092 Zürich, Switzerland

3 Leibniz Institute for Zoo and Wildlife Research, Alfred-Kowalke-Str. 17, 10315 Berlin, Germany

4 Bavarian Forest National Park, Department for Research and Documentation, Freyunger Str. 2, 94481 Grafenau, Germany

Keywords: Uncertainty

Population dynamic of wildlife is influenced by several factors acting on different time scales like year to year variations caused by hunting pressure up to long term variations caused by climate or landscape alteration. Roe deer as one of the most common deer species of central Europe seems to adapt very successfully to variable environmental conditions.

To gain a better understanding of the interplay of the accuracy of density estimations, the frequency of population counts and a variable environment, a population model for roe deer was developed. The impact of human hunting, lynx predation, road kills and density-dependent effects on population dynamics of roe deer is investigated over 20 years. The model output was analysed by sensitivity analysis. It allows the evaluation of different hunting strategies: The conformance to a specified management aim (benefit), the survey frequency and the hunting pressure (effort) are taken as indicators describing the performance of the strategy.

Complete knowledge of the number of living deer leads to a benefit which is 1.5 to 2 times higher than the benefit related to management including an uncertainty up to 30% while the respective effort is comparable.

The results of this study recommend managers to minimize the error of density estimations rather than increasing the frequency of population counts or improving the knowledge of environmental variations and their effects on population dynamics of roe deer.

Abstract O.18

Property rights and public policy changes: understanding discursive claims to knowledge among Scottish land managers

Liz Dinnie, Anke Fischer, Sally Huband

James Hutton Institute (formerly Macaulay), Craigiebuckler, Aberdeen. AB15 8QH, Scotland, UK

Keywords: Land management, private ownership, knowledge, discourse.

In Scotland there is a close association between land management (including game management by shooting/stalking) and property rights through the traditional sporting estate, which governs much of the sporting culture and economy. However, recent policy changes at both national and European levels reflect an increasing diversity of both public and private land management objectives. This has resulted in the creation of new formal institutions governing land and game management, and the inclusion of actors from both the public sector and NGOs who have previously not had much say in how land and game are managed. These new institutions governing wildlife management have developed in parallel to the traditional formal and informal institutions, including property rights, that are guiding the social and economic functions of shooting and stalking.

In this paper we look at how game managers respond to these changes. First we explore game managers' perceptions of current change as compromising private rights and expanding public objectives in land management. Second we investigate the way game managers respond to these changes by establishing a discourse which claims that only they have the true knowledge and understanding of and relationship to the land. The recently emerging formal rules for game management are seen to be generated by international and non-local actors who in the eyes of local game managers are ignorant of the 'proper' way of managing game and the land more generally.

Thus locally well embedded informal and formal institutions – such as traditional property rights - are challenged by more recent institutions that are nationally and/or internationally developed. As a response, discourses develop that reassert traditional control over game management by claiming exclusive knowledge and expertise. This has consequences for new institutional arrangements that aim at conservation: As both the knowledge-related discourse of the game managers and the still existing property rights work against them, they are likely to be ineffective.

Abstract O.19

The influence of informal institutions and social change on bushmeat hunting in western Serengeti, Tanzania

Asanterabi Lowassa¹, Loi Naiman², Maurus Msuha¹, Anke Fischer²

1 Tanzania Wildlife Research Institute, PO Box 661, Arusha, Tanzania

2 Frankfurt Zoological Society, PO Box 14935, Arusha, Tanzania

Keywords: bushmeat, Tanzania, illegal, social norms, social change, informal institutions

The effective enforcement of wildlife-related legislation is often seen as key to curb bushmeat hunting. Laws are formal institutions (i.e., codified rules), and often, their implementation at the local level proves to be difficult. By contrast, little attention is usually given to informal institutions related to wildlife, e.g., traditional norms and rules that guide and constrain human behavior, and the relevance of these for wildlife conservation. In this talk, we present findings from a study that elucidated the influence of social norms and social changes on bushmeat hunting in western Serengeti.

We collected qualitative data from focus group discussions (n=76 participants) and two stakeholder workshops. Our results suggest that in the past, strong tribe- and clan-specific social norms existed in relation to bushmeat hunting. These usually prohibited the killing and/or consumption of a certain animal species for a specific clan, and often invoked punishment (e.g., disease) on those who breached the taboo. Such social norms might have helped to maintain bushmeat hunting in sustainable dimensions. However, we identified four contemporary processes of social change in the data that had caused an erosion of these norms, namely (i) mixing of tribes through intermarriages, immigration and villagisation, (ii) replacement of traditional religious beliefs with . christianity, (iii) increased participation in the market economy, and (iv) the erosion of traditional leadership.

Our findings illustrate that informal institutions can play an important role in wildlife conservation, but are very vulnerable to social change. Our insights from a study area where such norms are nowadays eroded suggests that (i) attention should be directed to those areas where social norms currently still prohibit bushmeat hunting, but might soon be under pressure from social change (e.g., Maasailand) and (ii) that interventions should not only focus on formal institutions, but also explore the potential of informal social norms for conservation.



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SESSION 5. COLLABORATIONS AND INTERACTIONS BETWEEN STAKEHOLDERS (1)



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Abstract O.20

Collaborative management in wolf hunting: Rethinking the role of public managers in bridging environmental conflicts

Serena Cinque

School of Global Studies, University of Gothenburg, Sweden

Keywords: co-management; public managers; wolves; Sweden

Although wolf recolonization can be considered a success in terms of population increase and geographical dispersal, the return of grey wolves (*Canis lupus*) to rural Mid Sweden has caused frustration and discontent among local stakeholders. In particular, farmers and hunters living in or adjacent to wolf territories perceive the political decision to support wolf recovery as intruding on local lives and restricting opportunities for small-scale farming and hunting and that decision makers have left the consequences of wolf recovery policies unaddressed. To overcome the failure of previous politics and increase local consensus, the Swedish parliament passed in October 2009 a resolution concerning the introduction of licensed hunting on wolves as a measure expected to promote local acceptance and facilitate dialogue between different parties. In doing so, the parliament delegates to the regional authorities the responsibility to organize, coordinate and accomplish the licensed hunting in the concerned administrative counties.

Through a combination of participant observations and semi-structured interviews with hunters and public managers in three administrative counties, this paper analyses and discusses the role of public managers in pursuing collaborative efforts in the management of contentious issues. According to Swedish regulation in natural resource management, wildlife managers at regional authorities are not only to be involved in the implementation of policy goals, but also expected to support the recreation of governing structures to allow for the bridging of antagonisms and conflicts. Questioning the principal-agent theory which suggests that elected politicians create governance structures in a linear, hierarchical, top-down fashion to steer and constrain the action of public managers, this paper emphasizes that managers, through their everyday actions, create their own rules and routines in order to facilitate a collaborative management of licensed hunting. It will be argued that in order to understand how collaborative processes work, greater attention has to be directed to the way public managers organize their activities and how they cope with their mandate. By focusing on public managers and their moderating role in collaborative processes, the paper connects to the broader discussion of what instruments or resources the public managers actually employ in their everyday work to serve public interests.

Abstract O.21

Relationships between farming and hunting: effects of pesticide-coated seeds on red-legged partridges

Ana López Antia, Manuel E. Ortiz-Santaliestra, Rafael Mateo Soria

Instituto de Investigación en Recursos Cinegéticos (IREC) CSIC-UCLM-JCCM, Ronda de Toledo s/n, 13071 Ciudad Real, Spain

Keywords: pesticides; environmental exposure; reproduction; physiology

The use of agrochemicals is suspected to be a major cause of population declines of farmland birds from Western Europe. Apart from indirect effects like reduction of available food and optimal habitat, ingestion of pesticide-coated seeds constitute a potential way of direct intoxication. Although the most toxic chemicals are being legally restricted, some of the pesticides currently used for seed coating can cause adverse effects when consumed by birds. The use of coated seeds is a widespread practice, and cereal seeds constitute a major portion of partridge diet during autumn and winter, when alternative food sources are scarce. On the other hand, colour, taste or texture of the coat can make seeds unpalatable for birds, reducing the risk of ingestion. The aim of the present study is to assess the effects of coated seed ingestion by red-legged partridge (*Alectoris rufa*) on individual level and population viability. The first phase of the project consisted in the experimental exposure to five currently used chemicals, two insecticides (imidacloprid and natural pyrethrins) and three fungicides (difenoconazole, maneb and thiram). The second phase consists in the assessment of the environmental exposure of partridges to coated seeds. We report deleterious effects of some of these chemicals on survival, mass and body condition, immune response and metabolism. Several reproductive parameters such as fecundation rate and chick immunocompetence and survival were affected by parental exposure to some of the tested pesticides. Difenoconazole and natural pyrethrins were the less toxic compounds within each kind of pesticide, so it would be recommendable to use them as alternatives to the most toxic compounds when possible. Experimental assessment of food choice revealed that, while some pesticides such as thiram had a repellent effect, the more toxic imidacloprid was not actively rejected by partridges, thus being potentially eaten by animals in the field. Balancing the risks and advantages of seed coating is a necessary issue in which interests of farmers, hunters and conservationists meet. The information provided in this study will contribute to an appropriate management of this question. Financed by FEDENCA (Real Federación Española de Caza) and the Oficina Nacional de la Caza, with the participation of Fundación Biodiversidad.

Abstract O.22

Between conflicts and problem solving: the hunting management in the Bauges game reserve

Laine Chanteloup

Laboratoire Edytem- Université de Savoie, Avenue du Lac d'Annecy, 73370 Le Bourget-du-Lac France

Keywords: game reserve; hunting management; Alps

At the end of WWII, game populations in the French Alps were catastrophic. One of the measures adopted by the government was to create a national hunting reserve in the Bauges (la Réserve Nationale de Chasse et de Faune Sauvage des Bauges), to re-establish the chamois population. The creation of this game reserve led to many conflicts with local hunters because all hunting activity inside the reserve was forbidden. These conflicts carried on until the end of the 1970's and a crash into the chamois population due to a keratoconjunctivitis epidemic. After this event, perceptions from the different land users changed. On one hand, game reserve managers decided to regulate game populations in order to avoid other crash. Since then, two kind of hunting activities are allowed inside the reserve: some "local hunt" for the local hunters and some "touristic hunt" in the form of training course for foreign hunters. On the other hand, local hunters started to see the game reserve as a good way to have more game on their own hunting area touching the reserve. To be part of the game management inside the reserve, they formed a "Groupement d'Intérêt Cynégétique" which is a wide hunting association in order to improve their own game management between their different hunting territories. For almost 30 years, there has been pacification between the different land users: innovative approaches for game management and hunting management have been adopted.

Nevertheless, for 2 years problems have been happening again: For instance reserve managers due to structural changes should respond to new objectives which destabilise reserve situation, some of the local hunters have decided to leave the "Groupement d'Intérêt Cynégétique", the chamois population after a continuous increase and stabilization seems to decrease again...

This study aims to understand the territorial dynamics linked to the Bauges game reserve. Our approach focus on the understanding of conflicts linked to the game reserve. This work is based on the reserve archives, and qualitative interviews with the different land users to understand the multi stakeholder's strategies, their thinking frame, the conflicts and problems solving.

By the study of the Bauges national game reserve, this presentation will allow:



- To understand some kind of game management in the Alps.
- To speak about the different stakeholders involved in hunting activity (not only the hunters, but also the role of the forest service – “Office National des Forêts”; Wildlife and game service- “Office National de la Chasse et de la Faune Sauvage”; scientists).
- To see that the hunting activity is at the junction of tradition and innovation.

Abstract O.23

Improving collaboration to reconcile multiple land management objectives in the Scottish uplands

Rosalind Bryce¹, Althea Davies², Annie McKee², Wendy Kenyon², Steve Redpath¹

1 Institute of Biological and Environmental Sciences, University of Aberdeen, 23 St Machar Drive, Aberdeen, AB24 3UU, UK

2 The James Hutton Institute, Craigiebuckler, Aberdeen, AB15 8QH, UK

Keywords: upland management, stakeholder participation, multi-criteria analysis

Large areas of the Scottish uplands are managed as sporting estates for grouse shooting and deer stalking. Management for hunting takes place alongside other activities such as livestock grazing, forestry, recreation and biodiversity conservation. The type and extent of management practices associated with such activities on upland estates have cultural, economic, social and ecological impacts. An increasing emphasis on the public benefits provided by the uplands has led to a policy focus in Scotland that requires land managers to achieve multiple land use objectives across landscapes and therefore to understand and reconcile these impacts through trade-offs and compromises between stakeholder needs. There is currently no integrated guidance for land managers on how to manage land for multiple benefits. We present the results from two workshops conducted to understand how different land managers view the consequences of various land management options in order to produce a set of best practice guidelines for local collaborative management building on existing national strategies. Workshop participants were Scottish upland managers with a range of objectives including conservation and sporting. A set of six management strategies were designed to reflect current upland management in Scotland. We used a participatory multi-criteria method to evaluate how these strategies achieve a range of policy priorities compared to the management priorities of the participants. Management strategies based on sporting objectives gave the highest overall scores for delivering policy priorities for rural communities while nature reserves scored highest for policy priorities for biodiversity, recreation and low carbon. Trade-offs and compatibilities among the sets of priorities were identified in relation to different strategies. The method used in the workshop captured the complexity and values underlying how decisions are made when managing for multiple objectives. We discuss the implications for future management strategies and how these relate to national policy.





SESSION 6. HUNTING TOURISM AND CONSERVATION



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Abstract O.24

Sharing of revenues from wildlife tourism and hunting in Ethiopia does it foster conservation?

Yitbarek Tibebe Weldesemaet¹, Girma Timer², Degu Tadie¹, Anke Fischer¹

1 Frankfurt Zoological Society, PO Box 100003, Addis Ababa, Ethiopia

2 Regional Government Southern Nations, Ethiopia

Keywords: revenue sharing, institutions

Local people often bear the cost of protected area designations as they forego income from alternative land uses. This also includes areas for controlled hunting. In many places, revenue sharing schemes have thus been developed, based on the assumption that people will support wildlife conservation if they receive tangible benefits from it. However, how have these schemes fared?

We analyse here the legislation and implementation practice of a revenue sharing scheme in the Southern Nations, Nationalities and Peoples' Region in Ethiopia, an area that is rich in cultural and biological diversity, but currently undergoing substantial social and environmental changes that are threatening livelihoods as well as ecosystems. We conducted interviews (n=26) with government representatives of various levels, park managers and community members, as well as two workshops (n=51, n=22, respectively) to gather qualitative insights into actors' understanding of the scheme, their experiences and views on its implementation, perceived consequences of the scheme, and the need for change.

The shortcomings of the current legislation and implementation practice identified by the participants could be clustered to four main factors: (a) Information on the detail of the scheme was lacking among many actors, (b) roles and responsibilities of the actors were imbalanced – district governments were very influential whereas local communities tended to be passive, (c) accountability was compromised, as no provisions had been made to monitor and evaluate the revenue sharing and (d) disbursement of the shares was usually not associated to hunting or tourism, and overall revenue was too limited to have an impact. While some of these factors fostered misunderstandings and misuse of the monies, others meant that even where revenue was disbursed, it was not connected to wildlife conservation, and thus did not have the intended effect.

We discuss the scheme as a form of co-management, evaluate its shortcomings against a number of criteria that have been found to foster good practice in the co-management of natural resources, and suggest approaches to address its shortcomings.

Abstract O.25

Hunting on familiar and unfamiliar grounds – Finnish hunters' motivations in local and non-local hunting tourism

Jarno Suni, Raija Komppula

University of Eastern Finland, Joensuu Campus, Department of Business, P.O.BOX 111, FI-80101 Joensuu, Finland

Keywords: Hunting tourism, wildlife tourism, hunting, wildlife, motivations

As most people in western cultures are isolating and losing connection to nature, the demand for wildlife tourism is increasing. People want to see, observe and even hunt non-human animals in their natural habitat, and for many this can only be done by getting away from cities and travel to remote, rural areas. Wildlife tourism consists of wide ranges of activities and little is known about the actual wildlife tourism experiences. Since there is lack of knowledge of wildlife tourism experience related attributes, determining and investigating the various elements of wildlife tourism experience could be helpful for wildlife tourism management to create sustainable and yet satisfying wildlife experiences for tourists. This paper concentrates on hunting tourism, which is defined as a consumptive form of wildlife tourism. The aim is to examine the similarities and differences in hunters' motivations when they hunt on their usual, local hunting grounds and when they have traveled to a non-local location as a hunting tourist. The study is exploratory and data was collected during September-November 2011 with a web survey. Finnish hunters evaluated the importance of 32 selected motivational variables on a 5-point Likert scale. The same variables were used for inquiries on cases of local and non-local hunting. Statistically significant difference between these two forms of hunting is examined by utilizing independent t-test. Understanding motivational factors related to hunting tourism could help the future development of hunting tourism service products.

Abstract O.26

Rabbit hunting competition as a tool for pest management in southern New Zealand

Carlos Rouco¹, Grant Norbury¹, Dave Ramsey²

1 Landcare Research, PO Box 282, Alexandra 9340, New Zealand

2 Alexandra Lions Club, PO Box 139. Alexandra 9340, New Zealand

Keywords: Easter Hunny Hunt, Rabbit haemorrhagic disease, rabbit trends

Introduction & Objectives: Rabbits are a major pest in the semi-arid regions of New Zealand. Rabbits compete with domestic livestock and damage indigenous biodiversity by over-grazing vegetation and supporting a suite of invasive predators that depredate indigenous fauna. In the 1980s, the government removed rabbit control subsidies for landowners, leading to intense interest in biological control agents. Applications to introduce two lethal rabbit diseases, myxomatosis and rabbit haemorrhagic disease (RHD), were denied by the government. In August 1997, RHD was illegally introduced in the Central Otago region of the southern South Island, and was spread rapidly across the country. RHD initially reduced rabbit densities in most areas by about 50%, and in some areas by more than 90%. However, RHD has since become less effective and rabbit populations are increasing again. Using the results from an annual rabbit hunting competition, we present evidence of rabbit population trends in Central Otago, 14 years after the first RHD outbreak.

Material & methods: Every year in April in Central Otago, teams of 11-12 shooters compete in the "Alexandra Easter Bunny Shoot" competition. The aim is to shoot and retrieve as many rabbits as possible in 24 h. The primary purpose of the competition is to provide recreational enjoyment, but it also promotes tourism and some believe it helps to control rabbit populations. At the end of 24 h, carcasses are placed at a central location for counting. We derived an index of rabbit abundance by calculating the number of rabbits shot per shooter in the year before RHD was released, and thereafter. Indices were derived from 80 pastoral properties, of which 12 were common to every event for 10 years, and 24 were common to every event for 7 years. We assessed trends in hunting rates using all of the data, and the ostensibly more robust subset of data from the common sites.

Results & Conclusions: More than 177,000 rabbits have been hunted since 1997, by 402 teams, which equates to an average hunting rate of 37 rabbits shot per person per 24 h session. The best fitting model was derived from the data from the common sites (10 years). However, regardless of which data were used they all showed a significant reduction in hunting rates immediately after RHD. This declined further after 3 years, but



thereafter there was a steady increase in hunting rates, punctuated by occasionally minor declines. This suggests that although RHD continues to kill rabbits, its efficacy as a biological control agent is waning. This community competition provides a valuable, cost-free source of scientific information that is helping us understand the epidemiology of a major wildlife disease.

Abstract O.27

Which species are the most attractive for trophy hunters?

Lucille Palazy¹, Christophe Bonenfant¹, Jean-Michel Gaillard¹, Frank Courchamp²

1 UMR CNRS 5558 Lab 'Biometry and Evolutionary Biology', University Lyon 1, France

2 UMR CNRS 8079 Lab 'Ecology, Systematics and Evolution', University Paris XI, France

Keywords: trophy hunting, rare species, terrestrial mammals

Trophy hunting is of major relevance to conservation biology, both as a significant source of financial outcome and as a potential threat for rare species. There are however several major gaps in our knowledge of this considerable economic market. Notably, we do not know which trophies are actually owned by hunters and which species are the most attractive. Yet, this information is required for the preservation of threatened species and for the sustainable management of this activity that represents a precious source of funding for conservation planning.

The classically used trophy price is a good but indirect indicator of species attractiveness and can thus be biased. Considering those difficulties, we created an online questionnaire that was spread on the web sites of the largest trophy-hunting clubs and trophy-hunting providers worldwide. First, we assessed the criteria of trophy hunters for choosing one species or another. Second, we directly asked them what their favorite trophy hunting species are. In this way, we obtained an unbiased index of attractiveness of the trophy species. Those findings will contribute substantially to the improvement and economic optimization of trophy hunting management with regards to species conservation.



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SESSION 7. COLLABORATIONS AND INTERACTIONS BETWEEN STAKEHOLDERS (2)



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Abstract O.28

Ecological, social and economic benefits from commercialization of red deer hunting in Norway

Oddgeir Andersen¹, Atle Mysterud², Erling L. Meisingset³, Vebjørn Veiberg⁴

1 Norwegian institute for nature research (NINA), Human dimension department, Fakkelgården, N-2624 Lillehammer, Norway

2 Centre for Ecological and Evolutionary Synthesis (CEES) Department of Biology, University of Oslo, P.O. Box 1066, Blindern, N-0316 Oslo, Norway

3 Bioforsk Økologisk, Gunnars veg 6, N-6630 Tingvoll, Norway

4 Norwegian institute for nature research (NINA), Terrestrial Ecology Department, Sluppen, N-7485 Trondheim, Norway

Keywords: hunting, value chains, rural communities, questionnaire

In Norway, red deer (*Cervus elaphus*) populations have been increasing for decades and the populations are expanding north-, south- and eastwards of the traditional core areas in the western parts of the country. Following a growing population of red deer, hunting quotas in some areas has reached levels so high that hunters in some cases not are able to bag enough animals to regulate numbers. Red deer hunting has traditionally been carried out by the landowner with family and friends, and few landowners open up for increased numbers of non-local hunters in the hunting fields. We believe this is highly a cultural phenomenon, rather than a management-caused (institutional) problem. Commercialization of hunting opportunities can improve hunters' access, increase the variation in hunting amenities and contribute to develop new value chains linked to natural resources in rural communities. Population densities of herbivores close to the carrying capacity can cause several negative side-effects to the landscape as well as to agriculture and forestry, but also positive side-effects by increased income from hunting to local communities in rural areas. Here, we link results from surveys of landowners and hunters to possible ecological effects of red deer populations. We show that conscious economic development can improve all hunters' access to the game resource by offering a wider spectre of hunting amenities without depleting the resource in a non-sustainable context or exclude groups of hunters by increased hunting prices.

Abstract O.29

Targeted removals of problematic wolves in Sweden through lethal control: An analysis of the motivations for controlled hunting

Annelie Sjölander Lindqvist

School of Global Studies, University of Gothenburg, Sweden

Keywords: wolves, controlled hunting, damage prevention

For generations the Swedish rural landscape has been exploited on the premise of a localized domain. The return of the grey wolf (*Canis lupus lupus*), after temporarily being absent, to rural lands and forest fringe areas have resulted in increased encounters between humans and protected wildlife when wolves prey on farmers' and hunters' living private property. When a wolf attacks a hunter's dog or farmer's fenced in cattle, Swedish regulation obliges the state to offer financial compensation and in cases of particularly damaging wolf individuals, the state can decide on lethal control as a damage prevention measure.

This paper presents the results of a qualitatively based investigation of applications (N=80) for controlled hunting as a damage preventive measure. The submitters' reasons and motivations for the petitions for controlled hunting have been mapped as well as if the applicant is an individual property owner or if the application has been submitted on behalf of a stakeholder organization. The authorities' motivations for sanction or refusal have also been investigated.

It will be suggested that when a wolf attacks a farmers' or a hunters' private property, the boundary between human society and nature is "trespassed, incited by a clash of perspectives regarding wolves' presence in the fauna. The empirical base for this paper will help to illustrate how divergent perceptions on how to understand the natural landscape—as a means for the provision of a context for people's relationships with nature and among one another, or as primarily an arena for ecological enhancement—becomes situated in decisions on targeted removals of wolf individuals assessed as problematic for private property owners and enlaced within a cultural and social context. Thus, public efforts within the realm of natural resource management may invoke the raising of voices locally; saying that they want to protect and preserve interests and values they experience to be threatened by current policy implementations. Underscored by a landscape and place-oriented anthropological perspective, in the sense that perceptions of the environment frame both local struggles to maintain social and cultural values and



practices, and authority decisions to support the implementation of political directives and agreements on biodiversity protection, the paper demonstrates how state policy is carried into effect and how underlying processes of meaning production shape how actors make sense of their different actions.

Abstract O.30

'Thinking in new boxes': International reflections on the problems and prospects of the scenario analysis method in wildlife and natural resource governance.

Annie McKee¹, Camilla Sandström², Liz Dinnie¹, Anke Fischer³, Yitbarek Tibebe³, Maurus Msuha⁴, Asanterabi Lowassa⁴, Vesna Kerezi⁵, Aleksandra Majić Skrbinzek⁶

1 The James Hutton Institute, Craigiebuckler, Aberdeen AB15 8QH, Scotland, UK

2 Department of Political Science, Umeå University SE901 87 Umeå, Sweden

3 Frankfurt Zoological Society, PO Box 100003, Addis Ababa, Ethiopia

4 Tanzania Wildlife Research Institute (TAWIRI), PO Box 661, Arusha, Tanzania

5 Department of Biology, Veterinary Faculty, University of Zagreb, Heinzelova 55, 10000 Zagreb, Croatia

6 Dpt. of Biology, Biotechnical Faculty, University of Ljubljana, Večna pot 111, 1000 Ljubljana, Slovenia

Keywords: Institutions, governance, scenario workshop method

Stakeholder engagement and participatory processes are an increasingly established research requirement, enabling the building of trust in and acceptance of research outcomes. Contributing to "HUNTING for Sustainability", project partners in Ethiopia, Tanzania, Scotland, Sweden, Croatia and Slovenia used the methodology of scenario analysis workshops to involve stakeholder groups in co-constructing possible future scenarios of wildlife management conflicts. Generating scenarios allows future possibilities to be investigated in a systematic manner, therefore justifying present action through the consideration of possible, desirable and undesirable futures. Furthermore, the scenario workshop method deals with the uncertainty and complexity of human-environment problems with a range of 'players', providing a platform to anticipate the reaction of and impact on different stakeholders, were certain governance options pursued. A comparative analysis of the workshop purpose, governance focus, scale, methodological adaptation and stakeholder co-construction, through a reflective process undertaken by each partner HUNT team, illustrates the extent to which the scenario workshop method can be policy relevant and at the same time faithful to this established 'future studies' approach. Trade-offs between stakeholder value and methodological strictness proved to be the cause of major differences in the implementation of the method across study areas. Ensuring policy relevance also required scenario workshops to be undertaken during a 'window of opportunity' of institutional change, for example the implementation of new legislation influencing game species as in Sweden and Scotland, or the upcoming revision of existing legislation in Ethiopia. Finally this paper reflects on the lessons learnt from the shared utilisation and adaptation of the scenario workshop method in relation to concepts such as social learning, transdisciplinarity, stakeholder engagement and the contribution of scenario analysis as a meaningful and robust participatory process.

Abstract O.31

Changing the rules of 'the game': outcomes and reflections on stakeholder-developed scenarios for the future of ecosystem management in Scotland and Sweden

Camilla Sandström¹, Annie McKee², Anke Fischer², Liz Dinnie²

1 Department of Political Science, Umeå University SE901 87 Umeå, Sweden

2 Social Economic and Geographical Sciences Group, The James Hutton Institute, Craigiebuckler, Aberdeen, AB15 8QH, UK

Keywords: governance, ecosystem approach, scenario analysis, institutional reform

Recent and ongoing institutional reform of the management of deer in Scotland and moose in Sweden, requires on the one hand a transition from single-species management to more ecosystem-based, holistic, environmental management, and on the other hand a transition from top-down governmental to more decentralized governance. These processes, which include both re-scaling and re-leveling, may influence the power of involved stakeholders as well as how issues and stakes are framed, which in turn may confound institutional reform. This paper presents the outcomes of and reflections on the usefulness of scenario analysis as a tool to facilitate the transition to ecosystem and localized governance in complex and conflictive contexts. The scenarios, which were developed during a series of workshops and involving a range of stakeholder organisations, provide an insight into potential governance options for deer, moose and wider species management in Scotland and Sweden, and the opportunity to explore the implications of various multi-scale and multi-level governance arrangements. The strategies developed by stakeholder participants in order to reach desirable and avoid undesirable future pathways show however, that stakeholders may push and pull issues between scales and levels depending on where they have more power and influence. Our findings thus emphasise the need to consider ecological scales and management levels, and the potential tensions between these, when implementing institutional reforms in the context of the complex, 'multi-player' management of a mobile resource.

Abstract O.32

Meat, feelings and friendship - the rural hunt and the community

Bjørn Egil Flø

Centre for Rural Research, Centre for Rural Research - Ntnu Dragvoll 7491. Trondheim, Norway

Keywords: moose hunt, community, identity

The moose hunt is said to be the community hunt (bygdejakta) and an important activity for rural men and their construction of rural masculine identity. In this paper I ask; if the moose hunt truly is the community hunt, how then is it linked to the rural community? How do the rural hunters link themselves and the moose hunt to the community and the local non-hunters?

By participating in the moose hunt and joining a local moose hunting team I discovered that in an increasingly post-modern world, at least in the academic approach, the materiality of the moose meat is an important object in the construction of the local in the local moose hunt.

Even if the local systems of how the meat is distributed between landowners and non-landowners, hunters and non-hunters differ a lot between the different hunting grounds (jaktfelt) it involves more than just the hunters. The distribution of meat ties the moosetown together, it connects the people and the community to the hunt, the hunter to the household, the man to the women and children and it even brings the out-migrated back for a short visit. The meat not only secures the continuity of the moose hunt as a common cultural event in the community, it also makes the hunt relevant for the community and, not least, it makes the community relevant for the hunt.



SESSION 8. ECOLOGICAL EFFECTS OF HUNTING AND HUNTING MANAGEMENT



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Abstract O.33

Does hunting management affect non-game bird species? A study from Spain and Portugal

Alba Estrada¹, Jesús Caro¹, Pedro Beja², Luis Borralho⁴, Fabián Casas³, Miguel Delibes-Mateos¹, Silvia Díaz-Fernández¹, Luis Gordinho^{2,4}, Luis Reino², Javier Viñuela¹, Beatriz Arroyo¹

1 Instituto de Investigación en Recursos Cinegéticos – IREC (CSIC-UCLM-JCCM). Ronda de Toledo s/n. 13071. Ciudad Real. Spain.

2 CIBIO (Centro de Investigação em Biodiversidade e Recursos Genéticos). Campus Agrário de Vairão, Universidade do Porto, 4485-601 Vairão, Portugal.

3 Estación Experimental de Zonas Áridas (EEZA). CSIC. Ctra. de Sacramento S/N. 04120. La Cañada de San Urbano, Almería, Spain.

4 ERENA. Rua Robalo Gouveia, 1-1A, 1900-392 Lisboa, Portugal.

In Europe, hunting and its associated management has been performed for centuries and has potentially had profound effects on landscapes and on the biodiversity they hold. We investigated the effect of hunting management on non-target bird species. For doing so, we explored the relationship between hunting management and different groups of birds of conservation concern. We conducted the study with two different approximations.

In a first step, we assessed whether there were a higher abundance or species richness in hunting estates with game management than in those without management. This survey was conducted in 24 game estates in South Portugal in spring and summer 2001-2002. Twelve of the hunting estates performed game management activities for small-game species while the other 12 corresponded to areas open to hunters but where no game management was undertaken. Groups of species considered in the study were passerines, steppe-birds, ground-nesting birds and endangered birds. We modelled the abundance and number of species of each bird group in each estate according to the game management regime (with/without game management) and to habitat variables with GLMMs and selected the models with lowest AICc. Our results show that all groups of species considered (except passerines) were more abundant or more diverse in hunting estates where game management was performed.

In a second step, we aimed to know if our previous result was also relevant in another study area, as well as to disentangle which management activities could specifically affect bird diversity. We surveyed 54 small-game hunting estates in Central Spain with varying management intensity in spring and/or summer 2006-2010. Groups of species considered were raptors and steppe-birds. Information about game management was gathered through interviews with game managers. We modelled the abundance and species richness of each bird group in each estate according to habitat and game management variables (type of hunting regime, artificial feeding, predator control, number of keepers



and partridge abundance) with GLMMs and selected the models with lowest AICc. Our results showed that management implemented for red-legged partridges (*Alectoris rufa*) did not seem to have neither positive nor negative effects on the abundance of their predators (raptors), but having good densities of partridges had a positive effect on the number of raptor species. However, some activities leading to improve red-legged partridges (in particular, supplementary feeding and predator control) had a positive effect on steppe-birds, which share habitat requirements with them.

Therefore, we conclude that game management activities have positive effects on different groups of bird species in the Iberian Peninsula. All models are affected by habitat variables, so it is very important to maintain the habitat that allows those high densities and that has a positive effect on biodiversity.

Abstract O.34

Lead poisoning of waterfowl in Spain: conservation efforts, trend of prevalences and implications on game meat safety

Rafael Mateo, Ana López-Antia, Núria Vallverdú-Coll

Instituto de Investigación en Recursos Cinegéticos, IREC (CSIC-UCLM-JCCM), Ronda de Toledo s/n, 13071 Ciudad Real, Spain

Keywords: Plomo, intoxicación

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 four hunting seasons (2007-2011) where shot wintering waterfowl ($n = 503$) 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 with less than 5% of birds with only Pb shot. However, 22.9% of harvested birds contained embedded Pb and steel shot in 2010-11. 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 2010-11: 13.5%). 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. Game meat Pb levels were above maximum residue levels according to EU regulation for livestock meat in birds that had ingested Pb shot and birds killed with Pb ammunition. A significant reduction in game meat Pb levels was observed with the implementation of the use of steel shot.

Abstract O.35

Bird diversity and game management in the Scottish Highlands, UK

Scott Newey¹, Karen Mustin¹, Ros Bryce², Debbie Fielding¹, Justin Irvine¹

1 The James Hutton Institute, Craigiebuckler, Aberdeen AB15 8QH, Scotland, UK

2 Aberdeen Centre for Environmental Sustainability, University of Aberdeen, Zoology Building, Tillydrone Avenue, Aberdeen, AB24 2TZ, United Kingdom

Keywords: game management, game bird, avian diversity

Breeding birds were surveyed on 78 1km² areas on 27 estates in the Scottish Highlands. For each estate data on main management objective (game bird shooting, deer stalking, sheep production, or conservation), habitat management (prescribed burning, legal predator control, and habitat diversity) were collected. We assessed how bird species diversity; species richness and Shannon-Weiner Index, and community structure responded to different aspects of estate management. Overall bird species richness or diversity was not strongly influenced by upland management. However, bird community structure was significantly affected by predator control and prescribed burning.

Abstract O.36

Norwegian lynx harvest: challenges and possible solutions

Erlend B Nilsen, John D.C. Linnell

Norwegian Institute for Nature Research, 7485 Trondheim, Norway.

Large carnivores management is often surrounded by controversies, because they are frequently involved in depredation on domestic animals, might compete with hunters for large game, and because large carnivore harvest is often itself very controversial. Against this background there is often an expectation that carnivore management should be very precise, which is rendered difficult by the fact that their population status is often hard to quantify and because – compared to e.g. ungulates - few studies of the impact of harvest exist. In this talk we will focus on the harvest management of the Norwegian Eurasian lynx population. We will first focus on the historical development in both the population estimates and harvest bag. In particular, we will focus on to which extent hunters are able to achieve the management goals set by the managers, and how harvest rates vary between years and age- and sex classes. An emerging pattern from these analyses of historical data since the onset of the quota harvest in 1994 will be that while the current monitoring might produce sound population estimates, a one year time lag between the population surveys and harvest season invokes time lags in the management system that are likely to produce unstable dynamics in the lynx population. Finally, we will present some new modeling tools that will be parameterized based a combination on data readily available for the managers in combination with more detailed data based on individually marked lynx. We will highlight how these tools can be utilized to help lynx managers reaching their management goals.

Abstract O.37

Invasive deer, hunting, and sustainability of indigenous ecosystems in New Zealand: is deer browsing a threatening process or a replacement for lost ecosystem function?

Graham Nugent¹, David M. Forsyth²

1 Landcare Research, P.O. Box 40, Lincoln 8152, Canterbury, New Zealand

2 Department of Sustainability and Environment, 123 Brown Street, Heidelberg, Victoria 3084, Australia

Keywords: deer, New Zealand, moa, browsing, ecosystem sustainability

There is a long-standing conflict of interest in New Zealand between the aspirations of deer hunting groups and conservationists. This is because the seven taxa of deer present are all been introduced by Europeans since 1850 (to provide food and sport) into a land with no extant large browsers. The deer, mostly red deer (*Cervus elaphus scoticus*), historically increased to high densities in places and caused major changes in the structure and composition of the indigenous ecosystems. These changes came be regarded by 20th century conservationists as threatening processes putting at risk the sustainability of those ecosystems, a view point which resulted in wild deer being classified as pests, currently their only status in law. This in turn has resulted in a hunting management regime under which the sustainability of indigenous ecosystems is considered likely to be maximised when deer browsing (and therefore deer density) is minimised.

However, until about 5-6 centuries ago, a large and apparently abundant suite of browsers had been present in the form of 14 species of moa, large-bodied flightless birds. There is increasingly strong evidence that the largest of these species were highly competent browsers whose browsing is likely to have played an important role in shaping the form and growth patterns of many New Zealand plant species. However, moa were extirpated within a few centuries of the first arrival of humans in about 1200 AD. The issue that emerges therefore is the extent which modern-day deer browsing could be viewed as a replacement for the lost ecosystem role previously played by moa. As avian and mammalian herbivores inevitably differ to at least some degree in the way they feed, their feeding preferences, and their competence as herbivores, it is highly unlikely that deer could ever be an exact replacement. Nonetheless, it is conceivable that, on balance, deer may sometimes add to (rather than always detract from) the potential sustainability of indigenous ecosystems in a truly natural state. This paper explores the evidence and arguments for and against that proposition, and the implications those arguments could have for the management of deer hunting in New Zealand.



SESSION 9. HUNTING IN ITS SOCIO-ECONOMIC CONTEXTS (2)



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Abstract O.38

Application of novel approaches to quantify illegal bushmeat hunting in the Serengeti

Ana Nuno, Nils Bunnefeld, E.J. Milner-Gulland

Department of Life Sciences, Imperial College London, Silwood Park, Buckhurst Road, Ascot SL5 7PY, UK

Keywords: bushmeat; compliance; social surveys

Non-compliance with rules may undermine conservation success. Illegal harvest behaviour is a frequent source of implementation error (related to the translation of policy into practice) and has several environmental, economic and social implications. To devise effective strategies to reduce levels of illegal hunting, natural resource managers must thus be able to assess and monitor the extent of non-compliance, and information is often required on who engages in illegal hunting.

Due to the sensitive nature of this activity, conventional survey techniques intended to provide data on illegal hunting may be inappropriate. The respondents may be unwilling to truthfully reply to incriminating questions and hunting estimates obtained are often inaccurate. To obtain more reliable estimates of rule-breaking behaviour, several disciplines have developed methods for answering sensitive questions that reduce survey response bias by ensuring respondent anonymity.

Using illegal bushmeat hunting in the Western Serengeti as a case-study, we quantified non-compliant harvest behaviour using indirect questioning techniques and investigated the application of the unmatched-count technique (UCT) to identify sociodemographic characteristics of non-compliant households. The effectiveness and potential wider application of these techniques to obtain information on sensitive issues in conservation and natural resource management are discussed.

Abstract O.39

A regional approach to the economic impact of hunting in South Africa

Peet van der Merwe, Melville Saayman, R Rossouw

North-West University, Potchefstroom Campus, Tourism Research in Economic, Environs and Society (TREES), South Africa

Keywords: Hunting, biltong hunting, trophy hunting, tourism, economic impact, South Africa, social accounting matrix

The main aim of this research was to estimate the economic impact of hunting (both biltong and trophy) on three of South Africa's most important hunting provinces namely Limpopo, Northern Cape and Free State Provinces economy. This study used the input-output (Social accounting matrix) and multiplier analyses to evaluate the economic impact of hunting in the regional economy of the three province. Data on biltong hunting was derived from a national survey conducted in 2009 and data on trophy hunting was derived from the Professional Hunting Association of South Africa (PHASA). Based on the methodology mentioned above, results indicated that the direct economic impact of hunting in the three provinces add up to R2.85 billion. The province that generates the most is the Limpopo province with R1.5 billion (direct economic impact). This direct impact resulted in a total economic impact in the order of R4.7 billion, and consequently, in a multiplier effect of 1.78. (Limpopo province), 2.08 (Free State province) and 1.11 (Northern Cape province). With regard to employment, it was found that some 17 461 jobs are directly depended on hunting in the three provinces and thereby supporting the notion that this is a viable and important sector of the tourism industry. From the results it can be concluded that hunting plays an important socio-economic role in the just mentioned three provinces.

Abstract O.40

Bushmeat hunting and consumption in Serengeti, Tanzania: An almost ideal demand system approach to protein alternatives

Dennis Rentsch¹, Amy Damon²

1 Frankfurt Zoological Society, Arusha, Tanzania

2 University of Minnesota, USA

The consumption of meat from wild animals (or bushmeat) occurs throughout Africa and highlights the conflict between two distinct development goals: food security and biodiversity conservation. Growing human populations throughout the Greater Serengeti Ecosystem rely heavily on bushmeat as a source of protein, placing increasing pressure on migratory wildlife populations. We use a unique data set on protein consumption from 132 households over 14 months to examine the factors influencing consumption of various protein sources including bushmeat. The annual wildlife migration of the Serengeti ecosystem provides a natural experiment, one in which local wildlife abundance changes with season, to track consumption and price changes. We find that non-bushmeat protein sources, particularly beef, fish, and to a lesser degree, dried minnows, have positive cross-price elasticity with bushmeat. This indicates that households will switch their consumption patterns away from bushmeat to other protein sources given a large enough price differential. However, we find that household demographics and domestic livestock ownership (chicken and livestock) do not greatly influence bushmeat consumption. These results suggest that improved enforcement that makes bushmeat more expensive coupled with alternative income schemes rather than small-scale livestock projects might best mitigate illegal hunting.



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SESSION 10. HUNTING IN A CHANGING ENVIRONMENT (2)



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Abstract O.41

Digital solutions in traditional landscapes

Gina Maffey¹, Rene van der Wal², Mark Reed³, Justin Irvine⁴

1 dot.rural, University of Aberdeen, Rm 917, MacRobert Building, King's College, Aberdeen, AB24 5NX

2 Aberdeen Centre for Environmental Sustainability, University of Aberdeen, School of Biological Sciences, Auris, 23 St. Machar Dr, Aberdeen, AB24 3UU

3 Centre for Planning and Environmental Management, School of Geosciences, University of Aberdeen, St Mary's, Aberdeen AB24 3UF

4 The James Hutton Institute, Craigiebuckler, Aberdeen, AB15 8QH

Keywords: Deer management

Can hunting communities in Scotland harness digital communication to improve sustainable management practice?

Although viewed predominantly as a recreational pursuit, hunting for the control of deer populations has become a valuable component in the management of our landscape. Subsequently deer counts and habitat assessments are increasingly used on estates and by Deer Management Groups to monitor the state of deer populations and environmental impact.

Alongside this there are a growing number of junior gamekeepers being trained using digital tools in ecological methods, through distance learning, college courses or Scottish Natural Heritage best practice guidance. Harnessing this increasing awareness of ecological methods, and combining it with digital tools could be step towards improving communication around management practice.

This research focuses on the Scottish highlands, specifically on individuals associated with estates concerned with deer management. It explores people's attitudes and awareness of digital technology and ecological methods in respect to deer management. At present it is apparent that there is a generational divide between those who are commonly in contact with digital technology and those that are not. However, the number of individuals that are in contact with digital technology is rising.

There is an overarching danger that in not embracing or exploiting these technologies deer management in the UK will fall behind other sectors, making its practice increasingly unsustainable in the modern climate. This presentation aims to explore the potential use of digital tools for communicating information derived from ecological data, and how this can impact on sustaining hunting practice.

Abstract O.42

Social Change and Sustainable Sport Hunting: Maintaining Hunter Populations

Thomas Heberlein, Göran Ericsson

Dept of Wildlife, Fish and Environmental studies, Swedish University of Agricultural Sciences, Umea, Sweden

Keywords: Hunters, Participation, Declines

Understanding the factors that influence hunter population growth and decline is fundamental to discussions of sustainable hunting. There has been a dramatic increase in the number of sport hunters in North America over the last century as scientific state management of game species was put into place. As game populations were restored and grew in so did hunter populations. That period of increased abundance of both game and hunters appears to be ending. Today in some cases game populations have reached the point where they have become social problems and to do environmental damage. At the same time in North America many states (e. g. California) and Canadian Provinces (e. g. Saskatchewan) are showing declines. A number of European countries (e.g. Italy and France) are also showing steep hunter declines. Hunter populations are aging and recruitment in the younger age classes are declining. There are exceptions to these general trends. In North America hunter numbers are increasing in South Dakota, and Quebec and in Europe there are stable populations in Germany and increasing hunter numbers in Hungary, Austria and Russia, This paper discusses the factors that are associated with such declines and increases and makes suggestions for how it is possible to sustain hunter populations and what research needs to be done to provide a better understanding of this key input variable for sustainable hunting.

Abstract O.43

The role of human decision-making for the sustainability of trophy hunting

Nils Bunnefeld

Department of Life Sciences, Imperial College London, Silwood Park, Buckhurst Road, Ascot SL5 7PY, UK.

Keywords: trophy hunting

Trophy hunting has been widely advocated as conservation tool and is now operating throughout the world, albeit with varying success. Wildlife populations exploited for trophy hunting are decreasing in many parts of the world. The reason for the failures of trophy hunting might be rooted in the following assumptions that are often made in conservation and management programmes for trophy hunting; perfect implementation through top down control by an all powerful and knowledgeable manager and full compliance with the management plan by hunting companies and local people. However, management plans often disregard both the cultural, social and economic needs of local people and the economic interests of hunting companies. We explore these issues using the example of the Mountain nyala in Ethiopia, and suggest a new framework for management that incorporates human behaviour into management decision-making and that takes into account uncertainty in the process of monitoring and implementation of the management plan. This approach can reveal new insights into the management of trophy hunting under multiple objectives of conservation, economic and social viability and under various forms of uncertainty.





POSTER COMMUNICATION ABSTRACTS



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Abstract P.01

Lead shot in Italian wetlands: an attempt to assess the entity of the problem in Padule di Fucecchio marsh

Stefania Ancora¹, Fabrizia Fagnani², Stefania Fortino¹, Claudio Leonzio¹, Alessio Bartolini³, Nicola Bianchi¹

1 Università di Siena, Dipartimento di Scienze Ambientali, Siena, Italy

2 Provincia di Pistoia Dipartimento di Pianificazione Territoriale, Italy

3 Centro di Documentazione e Promozione del Padule di Fucecchio, Castelamartini – Larciano, Italy

Keywords: wetland, sediment, lead shot density, lead concentration

Ingestion of lead shot has been recognized as an important cause of death of waterbirds for over a century. Lead shot fired from fixed hunting posts falls and accumulates in a limited area, unlike shot fired by hunters on foot. Shot that misses its target persists in the environment, accumulates in sediments and may reach very high densities (millions per hectare). Chemical dissolution (oxidation) of lead shot in aquatic environments, on the other hand, can make lead more available, distributing it throughout the aquatic ecosystem. Although often incorrectly regarded as inert, once dispersed in the environment, lead shot undergoes slow transformation, totally disintegrating in 30 to 300 years.

The highest values of lead shot densities have been recorded in Mediterranean wetlands, although no data exists for many European countries. The entity of the phenomenon has rarely been investigated in Italy: some reports are limited to cases of poisoned waterbirds and little systematic information is available specifically for wetlands. We therefore investigated lead shot density and lead concentrations in sediment of the Padule di Fucecchio (Tuscany, Italy), one of the largest inland marshes in Italy (2000 hectares). Since our assessment of lead contamination was concomitant with the ban on lead shot in Special Protection Areas promulgated by the Minister for the Environment on 17/10/2007, we built a useful database for long-term monitoring of the effectiveness of the ban. A detailed map of lead contamination was plotted using sediment data; this will be useful for local administrations involved in management of this site.

The results showed high lead shot density (0-311 shot/m²). Although lead concentrations and shot density were slightly less in protected areas than in hunting areas, contamination was widespread throughout the marsh, with a mean lead concentration of 115.6 mg/kg d.w..



The determination of lead shot available to birds may not accurately assess the magnitude of the problem, but it clearly indicates the risk of ingestion to which birds frequenting the area are exposed.

The data on shot densities and lead concentrations in Italian wetland sediments has hitherto been insufficient to establish the true entity of the problem. Information on lead shot density and lead concentrations is useful to evaluate where and how to conduct remediation. The study carried out on Fucecchio marsh should therefore be extended to national level. Information on lead shot density and lead concentrations is needed for all Italian wetlands, particularly those hosting large numbers of waterbirds and subject to high hunting pressure.

Abstract P.02

The ecological role of the golden jackal (*Canis aureus* L.) in the hunting grounds of eastern Croatia

Ivica Boskovic¹, Tihomir Florijancic¹, Marcela Speranda¹, Sinisa Ozimec¹, Nikica Sprem²

¹ Faculty of Agriculture, Josip Juraj Strossmayer University of Osijek, Trg Svetog Trojstva 3, HR-31 000 Osijek, Croatia

² Faculty of Agriculture, University of Zagreb, Svetošimunska 25, HR-10000 Zagreb, Croatia

Keywords: golden jackal, diet, ecosystem, Croatia

From the early 1980s onwards, an ongoing expansion of the Balkan populations of golden jackal is recorded northwards and westwards of the distribution range, towards central Europe. Dispersal routes pass through the flooded valleys of rivers: Danube, Sava, Drava and Tisza, where thickets and marshy areas provide plenty of food and good habitats. The number of jackals significantly increased in the eastern parts of Croatia in the last twenty years. This period corresponds to period of the Croatian Homeland War, when during the war incidences lot of different kind of weapon, including military, had been available in the area. Illegal hunting resulted in more wounded game and many wild animals were killed, so their carrions become source of food to the hairy predators. The abandoned land area, contaminated with mines, covering 4233 ha in Osijek-Baranja County, 1772 ha in Vukovar-Srijem County, and 422 ha in Brodsko-Posavska County, was unavailable for the management, but it provided good habitats for jackal populations. The role of jackal in the ecosystem and impact on population of worthy wild animals was assessed by surveying food habits and diet spectrum during the three-year period. Undigested stomach content of 196 hunted jackals has been analyzed. In 17 samples, the stomachs was empty, while remains of plant material (mulberry, wild pears and apples, grapes, plums, cherries, hawthorns, corn, wheat, and sunflower), were determined in 76 samples. The remains of large animals (skins, intestines and had without muscle tissue) were determined in 122 samples. The source of this food was animal garbage disposed in unofficial dumps. In 16 stomachs only remains of large animals (muscle, skin and hair) were determined. Muscle tissue of carcasses in stage of decomposition from wounded or dead wild animals was found in 7 samples. In 9 samples it was not possible determine whether it was naturally dead game or game caught by hunting. Rodents caught in agricultural habitats were frequent diet; their remains were found in 34 samples. Remains of tissues from livestock, consumed at garbage dumps, were found in 62 stomachs. Insects and their larvae were determined in 13 samples, and remains of small game (probably consumed after being wounded) were found in 2 samples. Based on data obtained it can be concluded that golden jackal is primarily an opportunistic forager in the ecosystems of eastern Croatia. It is supposed that high garbage availability is responsible for the jackal population increase



in the area. Animal garbage, carrion and rodents were predominant (82% by weight) in diet spectrum, while the plant foods comprised 18% by weight. Therefore, jackal has a positive role of sanitarian in the hunting grounds and their ecosystems in eastern Croatia

Abstract P.03

A quantitative assessment of the release of farm-reared red-legged partridges (*Alectoris rufa*) for hunting in central Spain

Jesús Caro¹, Joaquín Vicente¹, Miguel Delibes-Mateos¹, Christian Gortázar¹, Beatriz Arroyo¹, Javier Viñuela¹, Luis Basurto²

1 Instituto de Investigación en Recursos Cinegéticos, IREC (CSIC-UCLM-JCCLM), Ronda de Toledo s/n, 13071 Ciudad Real, Spain

2 Sección Técnica de Caza y Pesca. Consejería de Agricultura JCCLM. C/ Alarcos, 21. E-13071 Ciudad Real, Spain

The red-legged partridge (*Alectoris rufa*) is the main small-game species in Spain, where several million partridges are harvested every year. Spanish partridge populations have markedly declined over recent decades (e.g. >50% between 1973 and 1992), mainly as a consequence of changes in agricultural practices and overhunting. This population decline has led to an increase in the use of some management activities such as the release of farm-reared game or predator control. Recent studies indicate that releases of farm-reared partridges threaten the integrity of the wild partridge population gene pool and pose a risk to wild populations by introducing parasites, which can threaten other species of conservation concern such as the little bustard (*Tetrax tetrax*). However, the information regarding the release of farm-reared partridges is still very scarce.

We aimed to quantitatively assess the release of farm-reared partridges in the province of Ciudad Real (central Spain), one of the main hunting areas in Spain. In particular, we were interested in evaluating: i) the number of hunting estates that perform releases in this province; ii) the number of partridges released both in total and in each translocation; iii) the date when this management activity takes place. We analyzed the official permits that the regional government granted to the hunting estates to release farm-reared partridges between 2009 and 2011 (n=2011).

Our results showed that the destination of captive-reared partridges was mainly traditional small-game areas located in the south-east of the province of Ciudad Real. Only 9 % of the small hunting estates within the province officially released partridges in the study period. The average number of partridge released per permit was 18.140 (SD=24.225; range: 12-80.000). Overall, 3.809.477 farm-reared partridges were officially released since 2009 to 2011, which means that more than 1.25 million partridges are released annually only in this Spanish province. Interestingly, 90 % of the partridges were released in only 23 hunting estates, and 84% partridges were released from June to September, and only 16% during the regular hunting season (October to January).



According to our results, numbers of farm-reared partridges released in central Spain are higher than those obtained in previous estimates; this stresses the importance of this management activity in certain hunting areas of this region. Urgent research is needed to evaluate whether the incidence of releases is similar in other areas, and their global effects on wildlife populations. This would help to better regulate the use of this management activity.

Abstract P.04

Relationships between predator control and community composition of mammalian carnivores in central Spain: preliminary results

Jesús Caro, Francisco Díaz-Ruiz, Miguel Delibes-Mateos, Beatriz Arroyo, Pablo Ferreras

Instituto de Investigación en Recursos Cinegéticos (IREC) (CSIC-UCLM-JCCM), Ronda de Toledo, s/n, 13071 Ciudad Real, Spain

The conservation of predator populations may have additional problems when their prey are of economic value, such as game species. Among Spanish hunters, Iberian mammalian carnivores have traditionally been considered as a limiting factor for game populations, being systematically killed to protect these populations. In spite of this, many aspects regarding mammalian carnivores control are still unknown. We aimed to evaluate the effect of hunting management, especially predator control, on the composition of the communities of mammalian carnivores, their abundance and inter-specific relationships in central Spain.

Between 2010 and 2011, we surveyed three pairs of small game hunting estates (1475-4992 ha), each pair with similar land use composition but with differences in the use of predator control. Predator culling was a component of small game management in one estate of each pair, whereas no predator control was undertaken in the other estate. Information about predator control was gathered through interviews with game managers. Because mammalian carnivore species are usually scarce, elusive and nocturnal, traditional census methods, such as direct counts, are not useful to survey most of the species. Therefore, it is necessary to use alternative methods to accurately assess the composition of mammalian carnivore communities. We used a combination of three different methods: sign surveys based on faeces detection, camera-trapping and spotlight counts. Valerian-extract solution and Iberian lynx (*Lynx pardinus*) urine were employed for attracting carnivores to camera-traps.

We recorded a total of eight carnivore mammal species during the study by at least one of the three methods employed. Red fox (*Vulpes vulpes*) was recorded in all hunting areas and common weasel (*Mustela nivalis*) in three of them. The other species were relatively rare in our study areas. European wildcat (*Felis silvestris*), Egyptian mongoose (*Herpestes ichneumon*) and Eurasian otter (*Lutra lutra*) were identified in only one hunting estate, and stone marten (*Martes foina*), Eurasian badger (*Meles meles*) and genet (*Genetta genetta*) in two areas. According to the camera-trapping methods, foxes were more abundant in areas with no predator control than in predator control areas in two of the three pairs of hunting estates. On the other hand, the number of species detected differed among the



three methods considered. In this sense, the highest richness values were found for camera-trapping. The results confirmed the value of using these three complementary methodologies, especially camera-trapping, for studying elusive mammalian carnivores and obtaining useful information on the presence and abundance of these species. So far, the number of studied areas is still low to draw firm conclusions and we will increase the sampling size in the following years to determine the effects of hunting management, especially predator control measures, on Iberian carnivore communities.

Abstract P.05

Cholinesterase activity of *Alectoris rufa* Determining a parameter in the assessment of health status of populations

Irina Castro³, Luís Vieira², Lúcia Guilhermino², José Almeida¹

1 CECAV/UTAD - Animal and Veterinary Research Centre, University of Trás-os-Montes e Alto Douro, Apartado1013, 5001-801 Vila Real, Portugal

2 CIIMAR - Interdisciplinary Centre for Marine and Environmental Research, University of Porto, Laboratory of Ecotoxicology and Ecology, Rua dos Bragas, Porto, Portugal

3 CES - Centre for Social Studies, Associate Laboratory, University of Coimbra. Apartado 3087. 3000-995 Coimbra, Portugal

Keywords: *Alectoris rufa*, brain cholinesterase, morfometrics paramaters, physical condition

The red-legged partridge (*Alectoris rufa*) is a game-bird native to Portugal, that plays a key role in the ecosystems it inhabits, being prey of various species and exerting an important control of various plant species and invertebrates.

Because it prefers habitat consisting of a tight mosaic of arable crops interspersed with spontaneous vegetation, *A. rufa* may be chronically exposed to pesticides, some of which may exert neurotoxic effects, decrease the health status of individuals and affect reproduction even at low exposure concentrations, contributing to the decline of wild populations.

Given the conservation of this species, and it's high economic and ecological value, is crucial to investigate the effect that pollutants can have on the health status of wild populations, particularly pesticides because they are biologically active, very toxic, and can decrease the reproductive success in several ways, including by disruption of neurological functions necessary for survival and individual performance, as is the case of cholinergic neurotransmission.

The aim of this study was to standardize the basic conditions for the use of acetylcholinesterase enzyme activity in the brain of *A. rufa* as a biomarker of potential toxic effects of organophosphate and carbamate pesticides in wild populations of this species, using animals from hunting.

Eighty-nine individuals from three different farms located in NE part of Portugal, were used for morfometric parameters, coelomic cavity analysis and brain ChE activity determination. Significant differences ($p \leq 0,05$) between males and females, and among partridges from different farms were found. No significant differences ($p > 0,05$) between males and females nor among animals from different farms were found in brain ChE activity. The mean of total



brain ChE activity obtained was $28.9 \text{ nmol}\cdot\text{min}^{-1}\cdot\text{mg}^{-1} \text{ protein} \pm 6.5$ (average \pm sample standard deviation) which can be used as a reference value in future studies with populations of this species.

The activity of acetylcholinesterase, and other biomarkers indicative of exposure and effect of environmental contaminants have been crucial in the protection of birds of high conservation value in many countries, particularly Europe and North America and may be a fundamental tool for effective management of wildlife, including birds and mammals, due to early detection of adverse effects on health and reproductive capacity of populations, which enables timely mitigation actions.

Abstract P.06

Influence of climate and hydrological conditions on development of antlers in red deer (*Cervus elaphus*, L.) from the Croatian Danube region

Drazen Degmecic¹, Tihomir Florijancic², Sinisa Ozimec², Ivica Boskovic²

¹ HRVATSKE SUME d.o.o. Uprava suma Osijek, Sandora Petefija 35, 31327 Bilje, Croatia

² Faculty of Agriculture, J.J. Strossmayer University of Osijek, Trg sv. Trojstva 3, 31000 Osijek, Croatia

Keywords: *Cervus elaphus*, antlers, clima, hydrology, Danube, Croatia

Antlers are bony structures carried by most members of the deer family (Cervidae). The annual cycle of antler growth consists of rapid growth and casting, which is closely associated with the reproductive cycle, hormonal processes, and environmental conditions. Climatic and hydrological conditions on red deer's habitat can influence directly through air temperature, precipitation, insolation duration, and water level. Indirectly, they are influencing through vegetation as a food source for animals. The aim of the study is to determine connection between climate and hydrological factors and development rate of red deer antlers. Study area is located in Baranja region (NE Croatia), along the courses of the Drava River and the Danube River, which periodically floods the area. Diversity of terrestrial and aquatic habitats created good conditions for dwelling of red deer. The study was carried out during six hunting years, from 2004 to 2010. Data for the analyses were collected by measuring 382 middle aged and mature stags (above 5 years). Worthiness of antlers was assessed according to following parameters: antler weight, total length of branches, number of tines and length of third tine. Values of the parameters recorded in 2007/2008 hunting year were significantly higher than in years: 2004/2005, 2005/2006 and 2006/2007, while in comparison to 2008/2009 and 2009/2010 years, the values were higher (although not significantly higher). Since the management practice was identical in the research period, the attention is drowning to climate and hydrological conditions present at habitat. Hydrological reports indicated that regular spring flooding of the Danube River failed in year 2007, but it occurred in all other years of the research period. Mean monthly temperature during the coldest months was not below 0oC, as it is standard; from November 2006 to February 2007 the average temperature ranged 2.9oC to 8.4oC. The winter 2006/2007 has the highest temperature recorded in 10-year period, and least number of frost days, when only 35 days with temperature below 0.0oC was recorded in these four months. Monthly amount of precipitation in period January-March 2007 was slightly above average (142 mm), while in April and May it reached triple lower amount (45 mm) in relation to all other years of the research period. In the period: November 2006-February 2007, when the coldest climate is being expected, only two days with snow cover



were recorded. The insolation duration recorded in the period: January-May 2007 was very high, with more sunshine hours than in all other years, especially in April when the processes of growth and development of antlers are most intense. It can be concluded that exceptionally favourable climate and hydrological conditions present at habitat of red deer, in the period important for development and growth of antlers, provided the highest values of measured antlers and their worthiness in 2007/2008 hunting year.

Abstract P.07

Economic consequences of red-legged partridge restocking in private hunting estates

Silvia Díaz-Fernández¹, Miguel Díaz-Fernández², Beatriz Arroyo¹, Javier Viñuela¹

1 Instituto de Investigación en Recursos Cinegéticos, IREC (CSIC-UCLM-JCCM), Ronda de Toledo s/n, 13071 – Ciudad Real, Spain.

2 Dexia Banque Internationale à Luxembourg. 69, Route D'Esch L-2953 – Luxembourg.

Keywords: Restocking, red-legged partridge, hunting management, economic evaluation

The red-legged partridge (RLP) is a widely hunted game bird, with its highest densities in the Central and South part of Spain. Currently, one management practice used in many Spanish private hunting estates where RLPs are hunted is the annual release of farm-reared partridges. This happens in commercial or non-commercial estates, although more intensively in the former, where it reaches extreme levels (with thousands of partridges released per km²) in so-called intensive estates. In spite of the ecological problems that the release of millions of farm-reared animals into the wild implies for the survival of wild stocks, medium term problems for both the species and its hunting due to restocking are not evident within a hunting season for an individual estate, nor mandatory to be internalized as costs. Because decisions in private estates are usually made considering the short term, we studied short term (i.e. a hunting season) economic consequences of releases in commercial private hunting estates.

We interviewed a sample of 59 managers of different small red-legged partridge hunting estates, inquiring for qualitative and quantitative data on management for a specific hunting season in each estate and for prices, costs and incomes. After defining the generic mathematical calculations for each item, we took stock of 9 estates with different numbers of partridges released (3 intensive, 3 non-intensive with releases, 3 without releases). For analysis, we calculated for each estate total revenues, total expenses, profitability, expenses per partridge hunted, and revenues per partridge hunted.

We found 17 expense and 5 revenue main items currently attributable to red-legged partridge management in hunting estates. These referred to releases, supplementation of water and food, predator control, staff, land price and taxes. For our sample of studied estates, in spite of the smaller commercial margins found for the 3 intensive estates, they also obtained higher profits and higher turnover. For them, the high annual expenses in operational, staff and capital costs were rewarded with the elasticity of the offer to hunting market demands, once the break even was achieved. However, given the higher ratio of expenses per partridge hunted, intensive estates would be less profitable than non-



intensive ones if harvest was within the level of that found in non-intensive estates. In other words, annual harvest needs to be higher for intensive estates to be more profitable. Indeed, estimated revenues for two of these estates were negative in scenarios of low prices paid per partridge hunted. Two of the estates with no releases (that sold hunting as individual hunting days) also obtained positive revenues in scenarios of average to high prices paid per partridge hunted. Other studied estates never obtained positive revenues. We discuss the implications of these results for the partridge hunting market and the future of estates based on wild stock.

Abstract P.08

How important are red-legged partridge releases in the spread of potential pathogens?

Sandra Díaz-Sánchez, Ana Valeria Gutiérrez Guzmán, Joaquín Vicente, Ursula Höfle

Instituto de Investigación en Recursos Cinegéticos (IREC, CSIC-UCLM-JCCM), Ciudad Real, Spain.

The red legged partridge is one of the most popular game bird species in Europe. More than three million farm red-legged partridges (*Alectoris rufa*) are said to be reared and restocked into the wild. Nonetheless real figures are probably higher. Releases and restocking operations usually result in a short-term increase of population densities that allow for subsequent high shooting pressure, but it is far from clear whether they actually enhance the wild stock. Also, sanitary problems may arise whether farm reared partridges introduce pathogens into the wild. This is so because farm condition may exposure, for example, to enteric bacteria, and birds may suffer increased stress during release operation and subsequent pathogen activation.

A total of 285 cloacal swabs from hunted red-legged partridges were collected during the seasons from 2007 to 2011 from 8 hunting estates within the province of Ciudad Real (Castilla - La Mancha, Spain), among which the intensity of restocking operation differed, both in the proper estate and in the surrounding area. Restocking activity was characterized by using official statistics provided by the authorities. The cloacal swabs, were processed according to standard laboratory procedures for detection and isolation of *Escherichia coli*. Association of prevalence of *E. coli* in sampled estates to releases, in the estate or surrounding hunting estates were investigated using a generalised lineal model (GLM).

Significant differences on the prevalence of *E. coli* were found between restocked (46%, 66 out of 143) and natural populations of red-legged partridges (11%, 16 out of 142) ($\chi^2=40.627$; d. f=1; $p<0.001$). GLM analysis showed an overall positive association of the release of farm-reared partridges and the *E. coli* prevalence observed in restocked and wild partridges, so that restocking-based intensive management strategies may convey a risk of increased of *E. coli* prevalence, probably by introduction of carriers into the wild.

This research evidences that consequences of introducing farm-reared birds into hunting areas may result in negative effects not only for partridges in the related areas, but it could also affect hunting districts where releases are not carried out but that are in close contact to intensively managed hunting estates. The spread and the introduction of enteropathogens such as *E. coli* to the environment could suppose a potential source of



contamination for wild partridges, especially at feeding points in the hunting estates, where cross-contamination between birds may be enhanced and increased because of the stress and adaptation to the new habitat.

In order to assess and maintain the health status of wild and restocked partridge populations, it would be necessary to implement a controlled management of hunting estates where restocking is carried out combined with adequate sanitary procedures of partridges during farm-rearing in aviaries.

Abstract P.09

Analysys of brown bear (*Ursus arctos* L.) trophies from Gorski kotar region (Croatia)

Miroslava Jauk¹, Dario Majnarić¹, Siniša Ozimec², Ivica Bošković², Tihomir Florijančić²

1 Hrvatske šume d.o.o., UŠ Delnice, Supilova 32, 51300 Delnice, Croatia.

2 Faculty of Agriculture, J.J. Strossmayer University of Osijek, Trg sv. Trojstva 3, 31000 Osijek, Croatia

Keywords: brown bear; Gorski kotar, Western Croatia, hunting, trophies

Analyses of trophy items - skull and fur of the brown bear, originated from the hunting ground "Bjelolasica" in the Gorski kotar region (Western Croatia) is presented. The brown bear has been managed in this Dinaric type of hunting ground since 1960-ies. Annual cull rate in the period 1997-2011 was 5.29 head in average; while the average exclusions was 6.79 heads. The sex ratio of the total of 153 culled bears was 73% male, 20% female, and in 7% of animals sex were unrecognized. Average worthiness of brown bear trophy fur in the analyzed period was 314.71 CIC pts; with highest value of 525.8 CIC pts, and lowest of 141.85 CIC pts. Tendency in increasing maximum, minimum and average trophy worthiness was noticeable from 1981 to 2011. Higher increase in width than in length of the bear fur was determined, related to body weight increase as the result of good habitat quality and multiannual feeding. The most of trophy was acquired in March and June during the spring hunting season, and in October and November during the autumn season. All categories of trophy worthiness are distributed under the normal distribution range. The most of trophies belongs in category 300-349.99 CIC pts, and least is in category above 500 CIC pts. According to age structure, the most of the culled was middle-aged bears (54%), followed by mature (24%), young (14%) and bear cubs (8%). Among total of acquired trophy furs, 56% was in gold metal class, 13% in silver, 10% in bronze medal, while 21% of trophies was without medal. High percentage (16%) of trophies with worthiness above 400 CIC pts indicates exceptional trophy value of brown bear fur from Gorski kotar region. Two bears reached worthiness above 500 CIC pts, that is supreme at European level. It can be concluded that high trophy structure of brown bear in the hunting ground „Bjelolasica“ reflects very good quality of habitats. Taking into account tendency in increased cull of the bears in the analyzed period, the maximum managing capacity has not been reached, yet.

Abstract P.10

Combining socio-economic and ecological modelling to assess impacts of wildlife management strategies

Johannes Heinonen¹, Justin Travis¹, Steve Redpath², Michelle Pinard³

1 School of Biological Sciences, University of Aberdeen, Zoology Building, Tillydrone Avenue, Aberdeen, AB24 2TZ, United Kingdom

2 Aberdeen Centre for Environmental Sustainability, University of Aberdeen, Zoology Building, Tillydrone Avenue, Aberdeen, AB24 2TZ, United Kingdom

3 Department of Plant and Soil Science, University of Aberdeen, 23 St. Machar Drive, Aberdeen, AB24 3UU, United Kingdom

Keywords: management, model

Management of natural resources involves understanding of both the dynamics of the natural systems being subjected to management and the decision-making behaviour of stakeholders who are involved in the management process. Hence a thorough understanding of the issue calls for a transdisciplinary approach, where ecological, economic and sociological aspects are taken into consideration. Simulation modelling techniques can provide a powerful method for exploring the likely outcomes of different management approaches and options when based on reliable data from empirical studies. Here we present a framework which couples an individual-based ecological model with an agent-based socio-economic model. In this framework, a single or multiple species of interest can be represented in terms of the individuals that make up the population on a spatially-explicit landscape, allowing the incorporation of individual variability. The socio-economic model also simulates individual variability through the assignment of different attitudes and decision-making options for different agents; these can be made to represent farmers, estate managers, policy-makers, the general public and/or other stakeholders by varying the parameters which control the range of decisions they can make. This structure enables variation in attitudes and circumstances of individual stakeholders, together with interactions between stakeholders, to be simulated. We discuss strengths and limitations of such an approach, and the information requirements for building a robust model of a real management situation.

Abstract P.11

The hunting activity in Mexico and Spain: mirror image or contrast?

Salvador Ibarra Zimbrón

Facultad de Medicina Veterinaria y Zootecnia, Universidad Autonoma del Estado de México, México

Keywords: Hunting, wildlife management, bio diversity, sustainability, Spain, Mexico

Hunting in Mexico and Spain has been developed in different circumstances in biodiversity, development and legislation. At the same time, administrative, conservational and social objectives are very similar.

The differences starts referring to the territorial extension, population, number of licenses, requirements to cover to access the hunting activity as well as the level of intensification, research and regulations in weapon possession and use.

In coincidence can observe the hunting as a tool of wildlife management trough specific management plans around game and non game animals in accordance with sustaintable use.

Mexico is the fourth mega diverse country if the world and Spain are the first country in European Union according to bio diversity, but lights and shadows are patent in aspects like: loss of natural hunt, economic potential and irregular development of activity.

Abstract P.12

The German wildlife information system (wild) - 10 years of small game monitoring: monitoring incidences, distributions, abundances, and hunting bag statistics of game species

Oliver Keuling¹, Egbert Strauß¹, Grit Greiser², Ina Martin², Martina Bartel-Steinbach³,
Ludger Wenzelides³, Roland Klein³, Armin Winter⁴

1 Institute for Wildlife Research at the University for Veterinary Medicine, Foundation, Bischofsholer Damm 15, D-30173 Hannover, Germany

2 LFE - Eberswalde Forestry Competence Centre, Research Institute of the Public Enterprise Forst Brandenburg, Alfred-Möller-Straße 1, D-16225 Eberswalde, Germany

3 Department of Biogeography, University of Trier, Wissenschaftspark Trier-Petrisberg, D-54286 Trier, Germany

4 German Hunting Association (Deutscher Jagdschutz-Verband e.V.), Johannes-Henry-Str. 26, D-53113 Bonn, Germany

Keywords: small game monitoring

Several international conventions on the conservation of biodiversity and on sustainable use of natural resources claim for wildlife monitoring projects. Distributions and red lists of game mammals were based on insufficient data from hunting bag statistics. Hunting bag statistics seem to be unsatisfactory to conduct sustainable hunting, especially for small game animals.

This all highlights the necessity for a monitoring project for game animals. In the 1990th differing monitoring systems for game animals existed in Germany. To standardise the German wide game animal monitoring the "German wildlife information system (Wildtier-Informationssystem der Länder Deutschlands - WILD)" was founded in the year 2000 for census and estimations of the biodiversity of game animals. By the use of standardised methods population densities and progressions are estimated. The results, published annually as reports (<http://www.jagdnetz.de/wild>), are supposed to help developing management recommendations for nature conservation and hunting politics.

Scientific neutrality is the fundament of the monitoring system with a distinct organisational structure with supervisors and voluntary field assistants (local hunters). Three methodical pylons deliver reliable data: a) annual census with different methods and collection of environmental data in so called reference areas, b) nationwide surveys with assessments by local hunters on abundances and distributions of alternating chosen game species, analysed and illustrated on the level of municipal districts. c) Analysis and cartographic illustration of annual hunting bag statistics of every huntable game species within every administrative district. All estimates are regularly controlled by specific studies. As the



hunters collect data voluntarily, this monitoring system is indeed restricted to countries with area based hunting systems, where hunters hold private hunting grounds.

Hunting bags indicate population and distribution changes of several game species. Direct monitoring and inquiries may help deducing distribution and dispersal, population trends as well as hunting impact. We gathered reliable results from small and big game species. Some examples: European brown hare estimated by repeated spotlight counts during spring and autumn have almost stable spring densities but varying growth rates and winter mortalities due to different weather conditions during the years 2002-2010. The red fox and European badger populations, indicated by litter densities were stable on a high level since the start of the monitoring. Pine marten, listed in the red lists, is distributed within all administrative districts belonging to the survey and the hunting bags. For the wild cat some new incidences could be described as a finding of the survey. The forest species wild boar is occurring in high densities and recently spreading into agricultural regions. Several invasive species are dispersing in Germany from some main regions.

Abstract P.13

Hunters attitudes, motivations and behaviors related to participation in hunting in Southeastern Europe (SEE)

Ulrich Schraml¹, Vukan Lavadinović¹, Nenad Petrović², Mersudin Avdibegović³, Miroslav Benko⁴, Pela Pezdevšek-Malovrh⁵

1 Faculty of Forestry, University of Freiburg, Germany

2 Faculty of Forestry, University of Belgrade, Serbia

3 Faculty of Forestry, University of Sarajevo, Bosnia and Hercegovina

4 Forest research Institute, Croatia

5 Faculty of Forestry, University of Ljubljana, Slovenia

Keywords: Hunters, Socio-economic research, SEE region, Theory of planned behavior

Hunting sector in ex-Yugoslavian countries Bosnia and Hercegovina, Croatia and Serbia, is nowadays facing several treats. Pressure of non-hunters to ban hunting, decrease of hunters' number and traditional conflicts with forestry and agriculture are some of them. Except these treats, political processes affect the sector. Since all these countries clearly express as a national policy goal to get membership in European Union (EU), their societies have to go through transition processes. These processes shape all sectors including hunting one. In such circumstances new legislations, strategies and policies come into force without hearing voice of hunters. Although most of these conflicts are based on different human interests, research in Southeastern Europe (SEE) does not meet needs of the sector yet. It is traditionally focused on wildlife biology and decreasing forest damages caused by large ungulates.

This is the first research in SEE region that deals with human dimension in hunting sector. It will investigate socio-economic characteristics of the hunters in the region, as well their attitudes, motivations and behavior toward hunting and changes in the hunting sector. Except hunters' driving motives toward hunting, this research will result also with description of hunters and hunting sector in SEE region. In order to collect hunters' attitudes toward hunting, a survey based on the Theory of planned behavior is carried out at this stage. Expected results will be used for policy recommendations.

Abstract P.14

Poaching in Serbia: factor analysis

Aleksandar Radosavljevic¹, Vukan Lavadinovic², Nenad Rankovic²

1 Directorate of Forestry, Ministry of Agriculture, Trade, Forestry and Water management of Republic of Serbia, Serbia

2 Faculty of Forestry, UNI Belgrade, Serbia

Keywords: Serbia, poaching, game management

Republic of Serbia is country which has suitable habitats for most of European game. Game management and hunting in Serbia has long tradition which was in history mostly influenced by Austrian-Hungarian Empire, and reached its peak during Socialistic Federative Republic of Yugoslavia. However during the 1990-es due to economical and political crises in the country, game management and hunting sector were neglected. It resulted with decrease of a game abundance and trophy quality. Nowadays most of large carnivores are threatened, while number of large ungulates, such as red deer (*Cervus elaphus*) and chamois (*Rupicapra rupicapra*), heavily decreased. One of reasons for this situation is poaching.

Most of hunting grounds in Serbia are managed by three stakeholders - State Enterprises "Srbijašume" and "Vojvodinašume" and Hunting Association of Serbia. Hunting Association of Serbia is the most important stakeholder since it manages, trough hunting fellowships, the most of hunting grounds in Republic of Serbia. Therefore in this paper we analyzed level of poaching in hunting grounds managed by hunting fellowships within two different regions and factors which affect scope of poaching.

Abstract P.15

Infanticide as a potential cause of intrinsic vulnerability to hunting in Primates

Amélie Lootvoet, Carmen Bessa Gomes, Justine Philippon

Laboratory ESE, Université Paris-Sud, Orsay, France

Keywords: hunting, conservation, primates, infanticide

Nowadays, hunting is one of the major threats affecting survival of many animal species. In the case of Primates, hunting has been identified as one of the major extrinsic causes of vulnerability and many studies have already highlighted the negative impact hunting could have on numerous Primate species abundances. Interestingly, they have also indicated differences in species response to hunting, i.e. the changes in species abundances induced by hunting varied among species, independently of the hunting pressure. This suggests differences in Primate species intrinsic vulnerability to hunting. Our work aimed to study the potential role of infanticide by males as a source of intrinsic vulnerability in Primates. Sexually Selected Infanticide by males (hereafter SSI) is known to increase vulnerability to hunting in lions and bears. Since it is also a widespread behaviour in Primates, but with different rates according to species, infanticide could be partly responsible for the differences in species responses to hunting. To study the potential impact of infanticide as an intrinsic factor of vulnerability to hunting, we performed a comparative analysis among a set of 40 Primate species. We used Generalized Estimating Equations, and plan to find that the vulnerability to hunting increase with the species mean infanticide risk. This would be because hunting should be associated with faster replacement rates of infanticidal alpha males.

Abstract P.16

Collared dove (*Streptopelia decaocto*) as pollution bioindicator

Ioan Măcinic¹, Alexandra Trif², Florin Muselin²

1 SC SMF Veterinary Services SRL, Parța, Timiș, Romania

2 Faculty of Veterinary Medicine Timișoara, Calea Aradului, No. 119, 300645, Timiș, Romania

Keywords: collared dove, lead, heavy metals

Collared dove is one of the most common species of dove in our country and the single one, from Columbidae, that is sedentary. It's nest is in the trees, on the buildings and in special cases on the ground. It lives in villages, cities, in forests; often they can be seen eating in the same place with domestic animals.

The aim of the study was to determine the heavy metals (lead) level in different areas with a live bioindicator, the collared dove (*Streptopelia decaocto*). We made that choice because of their behavior (they fly at low altitude over the cities) they are considered to be a biological bioindicator for the level of pollution with heavy metals. The determination was made in two different areas: one near a city with a continuously developing industry (A territory) and one placed at 18 km far from A territory (B territory). After the birds were shooting during the legal hunting season, the samples (lungs, liver, kidneys, testicles, ovaries, muscles and bones) were collected.

Lead was determined by Atomic Absorption Spectrometer AA6500 Shimadzu after digestion by CHEM-MarsX – 5 microwaves digester.

The data were statistically evaluated by ANOVA method and Student test. Lead levels in turtle doves from A territory was significantly ($p < 0.05$) higher in lungs and ovaries.

Comparative with the law that indicates heavy metals maximum admitted levels in meat (CE directive 1881/2006 - 0.1 ppm) and other tissues and organs (ANSVSA Order 97/2005 – 0.2 ppm) the mean lead levels were under the limits, but we found in some lung samples from A territory values that exceed 0.2 ppm (ex. 0.242 ppm).

The hierarchy regarding lead level in tissues and organs was: lungs, bones, liver, kidneys, muscles, testicles and ovaries in A territory and lungs, bones, muscles, kidneys, liver, testicles and ovaries in B territory.

After the lead values that were determined in collared dove tissues and organs we can say that A territory is more polluted and it has a higher risk factor for heavy metals pollution.



The collared dove can be used not only as a bioindicator for heavy metal pollution, but also as a monitoring one.

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Abstract P.17

Hunting management on ecosystem biodiversity

Ioan Măcinic¹, Alexandra Trif², Florin Muselin²

1 SC SMF Veterinary Services SRL, Parța, Timiș, Romania

2 Faculty of Veterinary Medicine Timișoara, Calea Aradului, No. 119, 300645, Timiș, Romania

Keywords: hunting, biodiversity, management

Hunting is known to be one of the oldest practices that a man learned to do. Through this he assured him and his family the subsistence. With the years hunting became more a sport.

In our days there are several aspects related to the hunt. It became more a way to make money so that now in a lot of places on Earth hunting is important from the economical point of view.

Countries with high cinegetical potential have been choosing to hunt with hunters from all over the world that are coming through hunting agencies. So they use to maximum the potential of different wild species to make more money.

In the past there were no hunting periods, no rules. People were hunting for surviving, now there are hunting periods, hunting criteria.

Hunting doesn't mean a way to destroy the nature, a way "to kill wild animals", it is a way to keep safe the ecosystem. We don't hunt all what we see. There are some parameters that we will measure before we calculate the number of animals from each species that are giving free for the upcoming hunting season.

One of the most important things is not to break the ecosystem balance. All the species are important for the ecosystem: from plants to wild animals, from earth-worm and snails to the birds.

More you have a good hunting management plan, more you can improve the relationship between hunting and biodiversity with maximum of earn.

Beginning from management we can discuss about positive or negative impact of hunting on ecosystem biodiversity. A right management will keep all species from the ecosystem and can rise up the quality of each species apart. So we can improve the feature potential



of the ecosystem and rise the benefit not only from economical point of view, but also from biological point of view.

If the management is wrong we will have maybe o benefit for the moment but a deficit later and a disturbance of the ecosystem. If we look closer to mistakes made in the past in different parts of the world we can destroy an entire species with the wrong management.

In our days a method often used to increase the profit is to make a hunting park. There are more reasons for this decision; one of them is that in this case you have a better control on the population of wild game, and it is easier to take out what you want from the population, another is that you aren't under the incidence of hunting low regarding hunting animal's period.

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Abstract P.18

The role of hunting on the structure and function of the scavenger community: ecological and sanitary implications

Patricia Mateo-Tomás¹, Pedro P. Olea², José A. Barasona¹, Javier Viñuela¹, Rafael Mateo¹, Christian Gortázar¹, Joaquín Vicente¹

1 Instituto de Investigación en Recursos Cinegéticos (IREC), CSIC-UCLM-JCCM, Ronda de Toledo s/n, 13071, Ciudad Real, Spain.

2 IE University, Campus Santa Cruz la Real, 40003, Segovia, Spain.

Here we describe an ongoing project on the use of big hunting remains by the scavenger community aimed at informing the management of this human-provided food source to guarantee the conservation of natural ecosystems while minimising sanitary risks for both humans and animals.

The hunting of big game generates yearly tonnes of organic remains which can be an important source of food for many scavenging species (from wolves and bears to vultures), playing therefore a key role in ecosystems where hunting is developed. However, recent episodes, such as the Bovine Spongiform Encephalopathy crisis in Europe or the massive poisoning of vultures with the veterinary drug Diclofenac in Asia, highlight the need of adequately assess the impact of human-provided food sources on the scavenger community. Besides guaranteeing ecosystem conservation, the management of hunting remains should also consider animal and human health (e.g. risk of transmission of diseases such as tuberculosis or lead toxicity).

This project aims to assess the role that the disposal of hunting remains in the field has on the scavenger community at three levels: ecological, ethological and sanitary. To assess it, we use camera traps to monitor the use by vertebrate scavengers (obligate and facultative) of hunting remains generated in three hunting areas of Spain (i.e. Cantabrian Mountains, Montes de Toledo and Sierra Morena). These areas are representative of both the main natural ecosystems (Atlantic and Mediterranean) and the main hunting methods (stalking and hunting drive) existing in the Iberian Peninsula. The hunting remains monitored correspond mainly to the two big game species more frequently hunted in Spain (wild boar *Sus scrofa* and red deer *Cervus elaphus*) but also to other big game species such as Cantabrian chamois *Rupicapra pyrenaica parva*, European roe deer *Capreolus capreolus* and Iberian wild goat *Capra pyrenaica*. Additionally we take biological samples (blood, tissue, feathers) from both big game species and the main scavengers to know their sanitary status (e.g. disease prevalence, presence of lead).



This monitoring will allow to know the scavenger community feeding on the hunting remains in relation with the hunting method, the habitat characteristics and the season. These data will be used to evaluate potential sanitary and conservation risks and opportunities.

Abstract P.19

Understanding bushmeat hunting in western Serengeti: a multivariate analysis

Loiruck Naiman¹, Anke Fischer¹, Asanterabi Lowassa², Dennis Rentsch¹

1 Frankfurt Zoological Society, PO Box 14935, Arusha, Tanzania

2 Tanzania Wildlife Research Institute (TAWIRI), PO Box 661, Arusha, Tanzania

Keywords: bushmeat, Tanzania, illegal, Serengeti

Bushmeat hunting, i.e., the (usually) illegal hunting of wildlife for consumption, is frequently seen as a major threat to wildlife conservation. In western Serengeti, concerns of conservationists have recently been increasing as over the last decades, objectives of bushmeat hunting seem to have developed from subsistence to commercial reasons. However, despite a multitude of studies that suggest that hunting in western Serengeti is generally carried out for meat and/or cash, factors that motivate individuals to hunt bushmeat are poorly understood. This is not least due to the illegality of the behaviour which has rendered research notoriously difficult. In addition, previous studies on individual behaviour have either focused only on sub-groups of hunters (e.g. arrested hunters) or employed only correlation analysis.

Here, we present data from a random sample of western Serengeti residents (n=200) who, over 10 months, reported monthly on their household's protein consumption. As part of their protein meal recall, we also enquired about the source of the meat. Reports of home-sourced bushmeat were interpreted as an indication of participation of a household member in bushmeat hunting.

Overall, we found that 18% of all interviewed households had had home-sourced bushmeat at least once during the runtime of the survey. In a binomial logistic regression that used reports of home-sourced bushmeat (yes/no) as a dependent variable, we found that ethnicity, self-reported relative wealth, bushmeat consumption and the presence of cash income from farming significantly explained the likelihood of having home-sourced bushmeat. Other variables, such as the presence of your men in the household, livestock ownership or perceptions of risk and law enforcement, however, did not have a significant effect.

These findings will now be analysed in more detail, for example, to also identify the role of distance to the nearest areas suitable for hunting. We discuss the suitability of the variable "home-sourced bushmeat" as an indicator for hunting, and develop recommendations for conservation and development policies.

Abstract P.20

Sustainable hunting as a part of game management plans in Finland: a legislative, ecological and socio-economical approach

Madeleine Nyman¹, Jukka Bisi¹, Jarkko Nurmi², Reijo Orava², Janne Pitkänen³, Christian Krogell³

1 Metsähallitus, PO BOX 94, 00131 Vanda, Finland

2 Finnish Wildlife Agency, Fantsintie 13-14, 00890 Helsinki, Finland

3 Ministry of Agriculture and Forestry, PO BOX 30, 00023 Government, Finland

Keywords: sustainable, hunting, management plan

In Finland, the administration of game species and nature conservation is shared between the Ministry of Agriculture and Forestry and the Ministry of the Environment. Ministry of Agriculture and Forestry is responsible for the management of all game populations through the Hunting act. The Hunting act is subordinated the Nature Conservation act, as hunting is viewed as a part of nature conservation. Hunting is thought of as one tool for managing game species in a larger perspective. For the most challenging game species, i.e. threatened species or species that cause economical damages to livelihoods, habitat specific or species specific national management plans have been prepared / established / produced. In international forums, views concerning the total protection of game populations and, on the other hand, on the principles of sustainable use of game populations, have been the subject of debate. This debate has also included Finnish game management, especially concerning migrating species and species that are considered threatened and thereby strictly protected. The management plans are drawn up applying the Convention on the Conservation of European Wildlife and Natural Habitats, recommendations No 59 (1997) and No 74 (1999) of the Permanent Council, the principle of sustainable use advocated by the World Conservation Union (IUCN), and the obligations under the EU's Habitats Directive. This way, Finland's international obligations regarding the management of game populations have been considered. As a part of the management plan process, hearings of the opinions of local people, regional actors and national stakeholders are conducted.

The management plans consist of a comprehensive information package on the species or habitat in question, a summary of the socio-economic data based on the public hearings, and of the outlines of the management policy. The central objective of the management and conservation of game populations in Finland is to reach and maintain a favourable conservation status of the species, which make up the framework for the population management. As the well-being and viability of game populations is ensured in the long term, socio-economic factors can be accounted for to a higher extent in the management



process. The management measures are implemented through an ecosystem approach, which aims at finding a balance between the use of natural resources and the limits of the ecosystem, and of improving coexistence between man and game species and to ease conflicting views among the various stakeholders.

Abstract P.21

Management and control of the Eastern cottontail in a protected area of central-Italy

Melissa Oriolo¹, Gisella Paci¹, Marco Ferretti², Antonio Giuzio¹, Gabriele Stagi¹, Marco Bagliacca¹

1 University of Pisa, Pisa, Italy

2 Province of Pistoia, Tuscany, Italy

Keywords: Cottontail, *Sylvilagus floridanus*, European hare, *Lepus europaeus*, Management, Central Italy.

The Eastern cottontail (*Sylvilagus floridanus*), a lagomorph native of the American continent, was introduced to Italy in the mid-1960s. In the following years a rapid territorial expansion and a remarkable demographic increase was observed in many hunting areas.

Also in the protected, no hunting, areas, named ZRC, fitted for the reproduction of wild hares, the eastern cottontail is now present. In these areas the cottontail range largely overlaps with that of the native European hare (*Lepus europaeus*) so that management of these areas where they occur together (sympatric areas) must comprehend both species since they have similar habitat requirements.

In a ZRC of central Italy where the first cottontail appeared in 2001, Night-time spotlights censuses were used to evaluate the diffusion of the foreign species in comparison with the native hares. The trend of the cottontail was constantly increasing while the trend of the hare was constantly decreasing so that in 2010 the density of this cottontail reached 34 subject/100ha (st.d. 4.11) and the density of the hare 8 subject/100ha (st.d. 2.06).

For this reason, in 2011, we programmed a capture plan of both species, with the aim of radiotracking the animals during their feeding activity and the reduction of cottontail by 3 different techniques of hunting.

40 *sylvilagus* were killed during the programmed hunting while first results of radiotracking did not show any shifts in habitat at macrohabitat level.

Abstract P.22

Importance of distribution of habitat types in the hunting management in Croatia

Sinisa Ozimec¹, Tihomir Florijancic¹, Ivica Boskovic¹, Drazen Degmecic²

1 Faculty of Agriculture, Josip Juraj Strossmayer University of Osijek, Trg Sv. Trojstva 3, HR-31 000 Osijek, Croatia

2 Hrvatske sume Ltd. Zagreb, Forest Administration Osijek, S. Petefija 35, HR-31327 Bilje, Croatia

Keywords: habitat, hunting ground, Croatia

In Croatia there are 1.060 hunting grounds, situated on the surface of 5,012.905 ha, of which 34% are forest land, and 66% agricultural land. They are established for breeding, protection and hunting the game, with an aim to preserve natural balance of the wildlife flora, fauna and their habitats. Each animal species has its own particular habitat preferences with regard to vegetation type, terrain, living space and climate. The greater diversity of habitats in the hunting ground consequently provides sufficient food and shelter for the game. National Classification of Croatian habitats defines 11 main classes of habitats, eight of which contain most of the natural and semi-natural types of habitats and ecosystems, while three contain various anthropogenic habitats. Comparison of the hunting grounds concerning land surface, habitat types composition and distribution, and game population is made for two selected hunting grounds: XX/109 „Mala Subotica“ (surface of 5,346 ha) and IV/125 „Bosiljevo“ (surface of 5,684 ha). The first is Pannonian, lowland type hunting ground, and the second is located at hilly terrains in transitional area between Pannonian and Dinaric type. In „Mala Subotica“ hunting ground, anthropogenic impact in landscape and habitat diversity is strong, since 89% of habitats belong into class of cultivated land, active and urbanized villages and industrial areas. In „Bosiljevo“ hunting ground the percentage of aforementioned habitat types is only 12%. Forest habitats, mainly deciduous mixed forests of pedunculate oak and common hornbeam are largely distributed in „Bosiljevo“ hunting ground, making 81% of all habitats recorded. In „Mala Subotica“ hunting ground, forests are fragmented and make only 8.4%. Patchy distribution of open, large agricultural surfaces with grasslands, thickets and aquatic habitats in „Mala Subotica“ hunting ground enables breeding and of roe deer, pheasant, and hare as the main hunting game. More forested „Bosiljevo“ hunting ground, with lack of open habitats, has good conditions for breeding of red deer and wild boar.

Abstract P.23

Hunter involvement in wildlife research: achievements and failures from Latvia

Janis Ozolins¹, Janis Baumanis², Gundega Aizupiete¹

1 State Forest Research Institute 'Silava', Salaspils, Latvia

2 Latvia's University of Agriculture, Jelgava, Latvia

Keywords: hunters, wildlife research

About 23,000 out of 2 million local inhabitants and one thousand foreigners participate annually in hunting various wild species including 17 mammal and 27 bird species. Hunting is restricted by Hunting Law, Hunting Regulations (latest versions affirmed in 2003, amended in 2009) and several subordinated legal acts. Hunting rights in Latvia belong to the landowners. Wildlife is nobody's property unless a wild animal is legally captured or killed by somebody who has rights to hunt. Landowner can become a hunter and harvest game populations in his or her estate. Estates, however, are fairly small and include on average 9 ha of woodland per one landowner. In order to preserve widely ranging animals from persecution by countless landowners, legislators have appointed minimum size of hunting grounds for most valuable species: moose *Alces alces*, red deer *Cervus elaphus*, roe deer *Capreolus capreolus* and wild boar *Sus scrofa*. Moose hunting requires at least 2,500 ha of woodland, while the roe deer can be managed in 200 ha of suitable habitat. The landowners need to be merged in a way that one hunting ground covers enough private estates or a combination of private land and state forest. The State Forest Service had been the main authority responsible for both spatial administration of game management and hunting quotas as well as assessment of game population status. The hunters have to agree with numbers of landowners who are not hunting about assigning hunting right to a hunter club or individual game keeper. Just after registering their written agreements to the State Forest Service, the hunters are allowed to start game population harvest and receive shooting permits according the planned quotas. In theory, such a system of game management ensures efficient control and sustainable use of animal populations from point of view of the hunters. On the other hand, it does not solve all problems in the cases with overabundant or declining species and situations are still challenging decision makers and researchers to find new ways how to harmonize interests of all – the land owners, hunters and conservationists. Involvement of hunters into gathering the data needed for appropriate assessment of population status is tested out so far few times. Success depends considerably on the target species and particularities of required data. Our experiences with 7 species are analyzed: beavers *Castor fiber*, otters *Lutra lutra*, 3 above mentioned deer species as well as two large carnivores – grey wolves *Canis lupus* and Eurasian lynx *Lynx lynx*. Curiously, mistakes were done not just in census



of populations and guesses on animal age but also in sex determination of the taken individuals. Beavers and lynx had been missexed most often. It is concluded that hunter involvement is helpful to increase sample size but certain biases should be considered using results provided by the volunteers.

Abstract P.24

Demand for hunting licenses in Greece

Konstantinos Papaspyropoulos¹, Christos Sokos², Kyriakos Skordas³, Symela Kelesidou⁴, Periklis Birtsas⁵

1 Department of Forestry and Natural Environment Management, TEI of Lamia, 36100 Karpenissi, Greece

2 Research Department, Hunting Federation of Macedonia and Thrace, Greece

3 Support Department, Hunting Federation of Macedonia and Thrace, Greece

4 Gamewarden Department, Hunting Federation of Macedonia and Thrace, Greece

5 Department of Forestry and Natural Environment Management, TEI of Larissa, 43100 Karditsa, Greece

Hunting licenses price in Greece depends only on spatial restrictions and the institution that issues them. It is independent from the game species, harvest and time period. Hunting licenses price is determined by the Greek Government. The spatial restrictions are relevant to where the hunter wants to hunt according to his/her residency. There are three different hunting license types: local, regional and general. The institutions that issue a hunting license in Greece are two: hunting clubs and Forest Service. Most of the 230 thousand hunters in Greece are members of hunting clubs and issue there their license. However, there is a small tendency in recent years from hunters to issue their license in Forest service. Hunters pay a higher price when they issue a license in their hunting club compared to Forest service. This is compensated by the fact that hunting clubs use hunters' money on game management actions (Habitat improvement, Gamewarden, Research, Education etc.). Previous literature has showed that Forest service has the potential to invest their money on more and better actions than it does nowadays. Additionally, the Greek Ministry of Environment tends to increase every year the hunting license price mainly due to tax collection reasons, without taking into consideration the economic recession in Greece. This fact has discouraged many hunters from issuing a hunting license the recent years. In Greece there has been no research conducted about the hunting demand and its respective elasticity. Therefore, in the present research a first attempt is made to introduce and address this topic in Greece. In order to achieve this data available in the Hunting Federation of Macedonia and Thrace were collected. Hunting Federation of Macedonia and Thrace is a Legal Entity of Private Law that represents sixty three Hunting clubs of Northern Greece, with almost more than fifty eight thousand hunters as members. All the data from 2003 to 2010 about the type of hunting license and its price were collected from all the hunting clubs. The prices of hunting licenses in Forest Service were collected. Firstly, some general descriptive statistics were extracted. Then three types of elasticity for hunting licenses were measured. Firstly, the price elasticity of demand for hunting licenses, so as to test if the price increase has an impact to the hunting licenses number throughout the years. Secondly, the income elasticity of demand



for hunting licenses, so as to test if the income decrease in Greece has an impact to the hunting licenses number throughout the years. Thirdly, the cross price elasticity of demand for hunting licenses was measured, so as to test if the price of hunting licenses in the hunting clubs has pushed hunters to purchase the hunting license from the Forest Service. It is believed that through such a research, implications about the factors that affect the demand for hunting licenses in Greece can be extracted.

Abstract P.25

Harvesting of *Geochelone denticulata* (Linnaeus, 1766) in three indigenous communities located in the Purús River basin, Ucayali, Peru

Alonso Pérez Ojeda Del Arco¹, Sidney Novoa Sheppard², Jorge Herrera Sarmiento³, Bufeo, Gasta Bala, Laureano Indigenous Communities⁴

1 Facultad de Ciencias Forestales, Universidad Nacional Agraria La Molina (UNALM) Apdo. 456, Lima, Peru

2 ESCAS - Escola Superior de Conservação Ambiental e Sustentabilidade, IPÊ - Instituto de Pesquisas Ecológicas, Nazaré Paulista, SP 12960-000 Brazil

3 World Wildlife Fund – Peru Program Office

4 Ucayali, Perú

Keywords: Amazonia, Indigenous communities, harvesting, vulnerable species

Indigenous people from Purús basin have in subsistence hunting one of its main activities to obtain food and products for cultural use. As in other parts of Amazonia, there is great pressure on larger prey such as medium and large mammals (ungulates, primates and rodents), as well as some birds (Cracidae). However, little attention has been repaired in the use of the land tortoise *Geochelone denticulata*, categorized vulnerable by IUCN, located in Appendix II of CITES, and whose presence elsewhere in the Peruvian Amazon is beginning to be scarce.

The aim of this study was to analyze the harvest of tortoises during the period May 2008 to April 2010, in three indigenous communities in the Purús River basin: Bufeo (Juni Kuin ethnicity), Gasta Bala (Sharanahua ethnicity) and Laureano (Amahuaca ethnicity), in the framework of the 'Amazon Headwaters Initiative' developed by the Programme Office of WWF Peru.

Results show that *Geochelone denticulata* was the most demanded species in Laureano (112 individuals), third in Gasta Bala (234) and fifth in Bufeo (51). Also, in the three communities, was among the 5 species with the highest contribution of biomass with a total of 2954 kg (5.3%). In Laureano, the total catch was for own consumption, while in Bufeo and Gasta Bala communities were assigned a percentage for sale (13%) and (6%), respectively. A greater number of individuals were harvested in the rainy season (November to April) with higher incidence in the capture of males (60% of total). Analysis of CPUE (kg / hour) between dry and wet seasons shows no difference (UBufeo =221.5, p = 0.1080; UGasta Bala = 2984.5, p = 0.3480; ULaureano = 1239, p = 0.0989), suggesting a similar effort in both seasons for hunters of the three communities. However, statistical



difference was found when comparing CPUE between the three communities (Hdry 2, 103 = 29.29, $p < 0.0001$; Hwet 2, 272 = 67.76, $p < 0.0001$) highlighting a bigger effort in Laureano with respect the others (Dunn's post hoc test, $p < 0.05$), the same which is adjacent to a natural protected area (Reserva Comunal Purus), where there are restrictions on hunting and conservation status of wildlife is better.

Considering the high demand of *Geochelone denticulata* is necessary to diagnose the abundance and population status of the species in the area to determine the sustainability of its use. It is also recommended to approach the study from an ethnozoology perspective so that way traditional ecological knowledge of the tortoise can be recorded in order to include them in future actions to manage local wildlife.

Abstract P.26

The not so common Common Quail: northern breeding populations dependent on southern ones on a breeding cycle?

José Domingo Rodríguez-Tejreiro¹, Irene Jiménez-Blasco¹, Francesc Sardà-Palomera², Inés Sánchez-Donoso¹, Manel Puigcerver³

1 Departament de Biologia Animal, Facultat de Biologia, Universitat de Barcelona. Avinguda Diagonal 643, E-08028 Barcelona, Spain.

2 Area de Biodiversitat, Centre Tecnològic Forestal de Catalunya, Ctra. Sant Llorenç de Morunys, km. 2 E-25280, Solsona, Spain.

3 Depart. de Didàctica de les Ciències Experimentals i la Matemàtica, Fac. de Formació del Professorat, U. B. Passeig Vall d'Hebron 171, 08035 Barna, Spain

Keywords: Coturnix, itinerant breeding, outside yearlings, reproduction cycle

Itinerant breeding has been cited in the common quail (*Coturnix coturnix*); moreover, it has been described that yearlings hatching in Southern areas could breed in Northern areas. However, little is known about the effect of this phenomenon on the breeding populations within its distribution range. We examined the effects of the reproduction of these yearlings on itinerant breeding populations as they move away from the sub-Saharan strip where they winter.

Between 2007 and 2009, the age composition of common quail (*Coturnix coturnix*) male populations belonging to the Atlantic population was analysed throughout the breeding season in four Spanish sites (Aznalcóllar, 37.52°N, Figuerola del Camp, 41.36°N, Cabañeros, 42.2°N and Alp, 42.38°N), three French sites (La Cavalerie, 44°N, Sault, 44.46°N and Montbel, 44.58°N) and two Portuguese sites (Maranhao, 39°N and Mirandela, 41.5°N).

Males were captured by using a horizontal net and a digital decoy during the breeding season, and their age was determined from their moult pattern. Capture and ringing revealed that some fully-grown yearlings (Euring code 3) were captured too early in the breeding season to have hatched at the site where they were captured. Since the laying period lasts, an average of 10-11 days, incubation takes 18 days and the period of chick growth to nearly adult size is at least 47 days (Puigcerver, 1990), yearlings captured before 75 days from the date of first arrivals were considered outsiders (hereafter, outside yearlings). Yearlings captured after these 75 days were indistinguishable from those hatched there; thereafter, calculations are based on minimum values.

Genetic analyses showed that yearlings contribute to reproduction in the same breeding season in which they hatch. 1158 individuals were captured during this study, of which 175



were outside yearlings. The proportion of outside yearlings had a median of 11.6%, with a minimum of 4.3% in Aznalcóllar (Sevilla) and a maximum of 29.8% in Montbel (France). Moreover, the number of outside yearlings increased exponentially with latitude ($R^2 = 94\%$, $F(2,6)=50.56$, $p<0.001$).

These results suggest that contingents of the breeding populations in Northern areas depend strongly on the breeding success of other populations, probably situated in Southern areas. So, breeding in the north depends partly on recent southern breeding. These results have important management implications for the design of actions plans.

Abstract P.27

The value of hunting bears as trophies. A revealed preference application in Croatia

Slaven Reljic¹, Pere Riera², Isabel Patino², Djuro Huber¹

1 Department of Biology, Veterinary Faculty, University of Zagreb, Heinzelova 55, 10000 Zagreb, Croatia

2 Institute of Environmental Science and Technology, University of Barcelona, 08193 Bellaterra (Cerdanyola del Vallès), Barcelona, Spain

Bear hunters pay for the bears as trophies, depending on their size and quality, and for other attributes surrounding the experience, such as the services provided by the hunting unit managers, the natural characteristics of the hunting ground and alike. A survey conducted in Croatia collected information on the costs incurred by bear hunters and the characteristics of the bears and hunting units. The costs are regressed against the characteristics, thus obtaining their implicit values. This paper presents this valuation exercise.

Preliminary Hedonic results are based on a small sample, 30 observations only. The average price charge of a 300-point bear trophy hunted in Croatia in the last three years is circa 3000 euro. The average additional price charge for each CIC point is circa 20 euro. Full results will quantify the contribution of the relevant variables to the average price. Furthermore, the full dataset will be used to value non-market determinants, like environmental and recreational conditions.

Abstract P.28

The integration of hunting into the international tourism market

Juan Ignacio Rengifo Gallego

Universidad de Extremadura, Facultad de Filosofía y Letras, Departamento de Arte y Ciencias del Territorio, Campus Universitario s/n 10071 Cáceres, Spain

Keywords: Hunting, hunting tourism, international tourism

Introduction: Tourism implies a domestic or international trip for a specific reason. In the case of hunting tourism, such trips are as a result of several factors such as the abundance, the diversity and the irregular distribution of the species for hunting. For this reason, there are now companies throughout the world offering hunting packages and services and using magazines, the internet and trade fairs to advertise their services.

Objectives: To analyze the degree of internationalization of hunting tourism.

Material and method: In order to analyze this degree of internationalization, we have taken as a source of information the typology of the exhibiting companies present in 2009 at the two most important hunting trade fairs held annually in Madrid (Spain): FICAAR (International Hunting and Arms Fair) and Venatoria. The information was gathered from the official catalogues and the internet. This study has involved distinguishing between those exhibiting companies that offered hunting packages and services and those that did not offer them. Once the companies commercializing hunting services were identified, the following variables were studied:

- Country of origin of the company.
- Areas where the hunting packages were offered. For the purpose of this article, we have divided them as follows: North America (Mexico, United States and Canada), Central and South America, Europe, Asia, Oceania and Africa.

Results: In the preliminary analysis, 132 hunting companies were studied, out of which, 83 had the necessary information. These companies were from 22 different countries: Europe (9), Africa (6), North America (2), Central and South America (1), Oceania (2) and Asia (2). Of these 83 companies, 35 offered hunting services only in a single country, whereas the rest of them offered these services in more than one country. We even confirmed that 10 companies operated with different destinations throughout all continents. Finally, we would like to point out that the African countries, especially those in the southern part of the continent, were the destinations that appeared most frequently (51 companies operating in African countries).



Conclusions: Hunting has entered the international tourism market where a large number of highly specialized companies operate at a worldwide level. Although some companies operate with only one country, the majority operate with different destinations with a wide distribution from a geographic perspective, because they are only intermediaries between hunters and providers.

Abstract P.29

Trends of several birds captures in 11 game preserves of Extremadura (Spain), between 2000 and 2006

Gregorio Rocha

Dpto. Ingeniería del Medio Agronómico y Forestal. Universidad de Extremadura. Avda. Virgen del Puerto, 2. 10600 Plasencia (Cáceres), Spain

Keywords: Trends, captures, hunt, European Turtle Dove, Wood Pigeon, Collared Dove, *Streptopelia turtur*, *Streptopelia decaocto*, *Columba palumbus*

We analyze the catches (between 2000 and 2006) of several species of summer hunting: European Turtle Dove (*Streptopelia turtur*), Wood Pigeon (*Columba palumbus*) and Collared Dove (*Streptopelia decaocto*), although, the latter does not is included in the list of game species. Data are collected in 11 game preserves of dehesa's habitat, in the Cáceres province (Spain).

We detected no significant changes in slope ($p>0.05$), between years, for European Turtle Dove's catches. Therefore, according to the model, the trend of the population would be stable. However, between 2001 and 2006 the analysis indicates that may have happened a decrease of 6.7% per annum with a significance of 90%.

Meanwhile, Wood Pigeon's captures appear without significant changes in trends over time, during the seven years assessed.

Unlike the previous species, the Collared Dove's catches are increased by 35.22% annually between 2000 and 2006. First, we observe a slight decrease between 2000 and 2002. Then appears a remarkable increase between 2002 and 2006, and this is less pronounced since 2005. These results appear provide further evidence of expansion and densification of this species in west of Iberian Peninsula. In Europe, its main habitat are parks and gardens in towns, villages and surrounding farms, but in the dehesas of Extremadura (hunting zones) has also found a very suitable habitat. The controversy arises when the Iberian Peninsula is hunting a species whose capture is illegal, while in many European countries, this hunting is allowed.

Abstract P.30

Hunting and raptor conservation in eastern Spain: a review of shot birds in the last decade (2000-2010)

Marta Romero Gil¹, Ruben Limiñana Morcillo², Cristina Gallardo Gomez¹, Jorge Crespo Martinez³

¹ Estación Biológica Terra Natura. CIBIO, Universidad de Alicante. E-03080, Alicante. Spain

² Instituto de Investigación en Recursos Cinegéticos (IREC). CSIC-UCLM-JCCM. Ronda de Toledo, s/n. E-13071, Ciudad Real, Spain.

³ Conselleria de Infraestructuras, Territorio y Medio Ambiente. Centro de Recuperación de Fauna "La Granja" de El Saler. Avda. Los Pinares, 106. E-46012, Spain

Keywords: endangered , "media veda", protected, rehabilitation centre & Valencia

Hunting still represents a conservation problem for several animal species in Spain, where it is currently one of the main threats for endangered species or populations. Here, we analyze the effect of hunting on protected wild bird species in the province of Valencia (Eastern Spain), identifying the most affected bird groups to assess its impact on endangered species. To do that, we reviewed admissions data of shot non-game birds to "La Granja" Wildlife Rehabilitation Centre (Valencia) in the last decade (from 2000 to 2010). A total of 479 protected birds coming from Valencia province were admitted during that period. Most of these protected birds were admitted during the two different hunting periods in Spain, with 8% of them entering to the rehabilitation centre during the "media veda" (the hunting season between August and September) and 86% during the "veda" (the hunting period between October and February). Raptors were the most affected group, with diurnal and nocturnal raptors representing the 62% and 12% of total birds admitted, respectively. The species most commonly found shot was the Common Kestrel (*Falco tinnunculus*), followed by the Eurasian Sparrowhawk (*Accipiter nisus*) and the Common Buzzard (*Buteo buteo*), with 105, 75 and 41 individuals admitted, respectively. Also, 11 individuals of the Marsh Harrier (*Circus aeruginosus*), which is listed as "Endangered" in the Comunidad Valenciana, and five individuals of the Bonelli's Eagle (*Aquila fasciata*), listed as "Vulnerable" in Spain, were also admitted to the centre; hence, hunting may represent a severe threat to the local populations of these species. On the other hand, amongst nocturnal raptors, the Eagle Owl (*Bubo bubo*) and the Little Owl (*Athene noctua*) were the most affected species, with 25 and 12 admittances respectively. Apart from raptors, aquatic birds, such as herons (e.g. *Ardea cinerea*), egrets (e.g. *Bulbucus ibis*) and rallids (e.g. *Porphyrio porphyrio*), were also quite affected by shooting in the study area. Finally, a slightly decreasing trend in the number of shot birds admitted to the rehabilitation centre during the study period was observed, when compared with the total bird incomes. This trend may be due to an increased perception of environmental problems and conservation concern by people or to the fact that a smaller number of



hunting licenses are issued each year. However, some other conservation problems may be counterbalancing this trend (such as, for example, those associated with infrastructures like power lines), as the total number of birds admitted to this rehabilitation centre has remained stable during the study period.

Abstract P.31

Ecosystem services provided by vertebrate scavengers linked to hunting activities in Spain

José Antonio Sánchez Zapata¹, Francisco Botella¹, Esther Sebastián-González¹, Marcos Moleón¹, Sergio Eguía²

1 Departamento Biología Aplicada, Crte Beniel km 3,2, 03312, Orihuela, Alicante, Spain

2 Centre for African Ecology, University of Witwatersrand, Wits 2050, Johannesburg, South Africa

Keywords: functioning, guilds, conservation, biodiversity

Vertebrate scavengers play an essential role in accelerating the return of nutrients to food webs and eliminate potentially infectious bodies. However, its role in the functioning of ecosystems has only been studied with some intensity in a few areas of international importance for conservation where the study of wild ungulates and their predators and scavengers is particularly relevant for management. In all these cases, the availability of carrion associated with both natural mortality (predation, starvation and disease) as derived from human uses (hunting, culling and accidents) can be very high. Here we provide a description of ecosystem services provided by vertebrate scavengers linked to different hunting activities in Spain. Obligate and facultative scavengers are responsible of the consumption of most the biomass of ungulate carcasses left in the field by hunters. The structure of the scavenger communities and the spatio-temporal predictability of hunting resources are the main factors affecting ecosystem functioning and their services.

Abstract P.32

Interactive effects of obligate scavenger presence and scavenger community richness on lagomorph carcass consumption patterns

Esther Sebastián-González¹, José Antonio Sánchez-Zapata¹, José Antonio Donázar², Nuria Selva³, Ainara Cortés-Avizanda², Fernando Hiraldo², Marcos Moleón⁴

1 Universidad Miguel Hernández. Ctra Beniel km 3,2, 03312, Orihuela, Alicante, Spain.

2 Estación Biológica Doñana, CSIC. C/Americo Vespucio, s/n, La Cartuja, 41092, Sevilla, Spain

3 Institute for Nature Conservation. Polish Academy of Sciences, Mickiewicz 33, 31-120, Krakow, Poland

4 Centre for African Ecology. Universty of Witwatersrand, Wits 2050, Johannesburg, South Africa

Keywords: Carrion, hare, *Lepus* spp, *Oryctolagus cuniculus*, rabbit, vulture

The consumption patterns in vertebrate scavenger communities can be influenced by multiple interacting factors. Identifying these factors may be of major importance to understand ecosystem functioning. In this article we experimentally studied the scavenger community feeding on rabbits and hares in 4 different areas (two in Spain, one in Australia and one in Argentina). We analysed the effect of the number of scavenger species (particularly obligate) in the community on the carcass detection and consumption times, and on the structure (i.e. nestedness) of the community. The use of the carcasses by facultative avian scavengers was high in most of the areas, while the presence of facultative mammal scavengers was highly variable. The order of arrival to the carcass also varied depending on the area. In general, the first species entering the carcasses was a bird. The richer scavenger communities presented lower detection and consumption times, especially the ones with obligate scavengers. Moreover, the structure of the assemblage seemed more organized in the areas with obligate scavengers, even if the pattern was not significant.

Abstract P.33

Hunting wild boar: how to reduce impacts... and increase effectiveness!

Andrea Monaco¹, [Laura Scillitani](#)², Claudio Pellati³, Silvano Toso⁴

1 Regional Park Agency (ARP) – Regione Lazio, Italy

2 via Paradisi 6, 42125 Reggio Emilia, Italy

3 via Alessandro Manzoni 4, Milano, Italy

4 Institute for Environmental Protection and Research (ISPRA), Italy

Keywords: hunting, wild boar, management

Wild boar (*Sus scrofa*) is increasing in number and range in all Europe. This important game species can impact biodiversity, is a major pest for agriculture and can act as a vector of livestock diseases. In Italy it is typically hunted by the drive hunt, which is carried out by a hunting team and involves a pack of tracking dogs of different breeds. This method can negatively affect the demography of the hunted population as it does not always allow hunters to choose what to shoot. Drive hunts generally encompass large areas and often the employed dog packs are not trained to selectively chase boars, severely impacting coexisting species, particularly other ungulates and large carnivores as the Brown bear (*Ursus arctos*) and the Wolf (*Canis lupus*), priority species in Europe (Habitats directive). In addition, drive hunt might displace wild boars from their usual range, altering local density, and hence increasing the risk of disease transmission and crop damages. Finally, it is the hunting technique that cause the highest rate of human accidents. The aim of this study is to critically analyze the problematics related to the drive hunt and to promote the adoption of an alternative method that might allow to reduce the negative impacts, maximizing the harvesting at the same time, as reducing the overall densities is a priority for wild boar management. The proposed method, the “girata”, imply the use of a single well trained dog kept on a leash for the entire length of the hunt, involve a lower number of hunters and encompass a smaller area than the drive hunt. We compared the selectivity of harvesting in relation to age and sex classes, the effectiveness and the overall costs of the two methods.

The study was conducted in an hilly region of approximately 1,940 Km² in the Northern Apennine. Data were collected in 2002-2005, during 3 different hunting seasons. We compiled a database referring the characteristics of 4,459 different hunting actions (type of hunting method, number of dogs and hunters employed, time duration, area encompassed), and an hunting bags database containing age, sex and biometry of about 10,000 hunted wild boars. As expected girata allowed a higher selectivity for age class of the hunted animals, while we found no differences in sex selectivity. Drive hunt was less effective than “girata”: the number of boars harvested per Km², as well as the hunting bag



per hunters and dog was significantly lower in the drive hunt. A multiple regression analysis revealed a weak influence of the number of dog/Km² and hunters/Km² in determining drive hunt effectiveness ($R^2=0.305$). Finally, the cost/benefit analysis revealed that although drive hunt imply higher cost for the hunter, the benefits (in terms of kg of meat and possible incomes) are lower than in the case of the girata. Finally, the use of a single well trained dog and of a smaller hunting team reduce the risk of disturbing coexisting species with high relevance for conservation.

Abstract P.34

Sexual segregation in different-sized ungulates: red deer and mouflon under semi-natural management conditions

Marisa Sicilia¹, María Miranda², Lucía Gálvez-Bravo¹, Jorge Cassinello¹

¹ Instituto de Investigación en Recursos Cinegéticos (IREC), CSIC-UCLM-JCCM, Ronda de Toledo s/n, 13071 Ciudad Real, Spain

² Center for African Ecology, School of Animal, Plant and Environmental Sciences, University of the Witwatersrand, Johannesburg, South Africa

Keywords: European mouflon; game species; habitat segregation; Iberian red deer; Mediterranean ecosystem; segregation hypotheses; sexual segregation; SSAS; ungulates

Sexual segregation is common in polygynous dimorphic ungulates, being positive related to the level of sexual dimorphism. Causes of segregation are highly debated and the proposed hypotheses to explain it are usually grouped into two categories: habitat-related and social-related hypotheses. We tested sexual segregation patterns under several habitat-related hypotheses in two different-sized ungulates: the Iberian red deer (*Cervus elaphus hispanicus*) and the European mouflon (*Ovis orientalis musimon*), living in sympatry in a Mediterranean hunting estate. We hypothesize clearer segregation patterns for red deer than mouflon based on two facts: 1) greater sexual dimorphism in red deer; 2) higher likelihood of scramble competition in red deer due to its higher density in the study area. We considered three main animal classes in the analyses: males, lactating females and non-lactating females. For all 2 by 2 combinations of them, we tested significant segregation/aggregation patterns by the 'sexual segregation and aggregation statistic' (SSAS), and then we assessed to what extent those patterns were explained by habitat variables. Red deer appeared sexually segregated throughout all the year, while mouflon showed significant segregation only during certain periods. The results obtained for habitat segregation in red deer were not consistent with the 'scramble or indirect competition hypothesis' predictions, whereas the 'reproductive strategy-predation risk hypothesis' appeared to be the one explaining red deer segregation during the birth and lactation periods. However, in general the segregation observed was slightly explained by habitat variables for both species. The presence of supplementary food and the lack of landscape variability, along with social factors, might account for these results. The higher segregation rate in red deer, compared to that of mouflon, might be a consequence of the greater sexual dimorphism of the former, while other factors, such as interspecific competition, could play an important role for the segregation patterns observed in mouflon. We suggest carrying out more detailed behavioural studies on this issue.

Abstract P.35

The wild boar interaction on Croatian agriculture

Nikica Šprem, Hrvoje Novosel, Tomislav Treer

Faculty of Agriculture, Department of fisheries, beekeeping, game management and special zoology University of Zagreb, Zagreb, Croatia

Keywords: Croatia, crop damage, human-wildlife conflict, wild boar

Agricultural damage by wild boar has been reported from all over the country, and is a major concern for both agricultural and wildlife agencies at the national level. In this study 4,695 cases of wild boar (*Sus scrofa*) damage over a 4-year period (2005-2008) were analysed. Damages on crops were recorded throughout 11 months of year, but highest was during the time of crops maturation and throughout May, June and July. The average annual damage payment amount was 559,977.49 €, and annual number of payments have a negative correlation (-0.469) to the total payment amount. The average annual number of damages over four years was approximate, but the highest number of damages was recorded in 2007 (1,217 cases). A large portion, 86% of total number of payments, were payments with a value of less than 678 €, which indicated a relative small economic value of single wild boar damage. With a large share in the total payment value and in total number of damages greater than 60%, maize (*Zea mays*) is the most important agriculture crop from the standpoint of damages from wild boar. Beside maize, other economically important crops, with a total payoff amount bigger than 10% are cereals (barley- *Hordeum vulgare*, oats- *Avena sativa*, rye- *Secale cereale*) and grape vine (*Vitis* sp.). The correlation between yearly number of payments and yearly production was not calculated for any crop. The impact of wild boar damage on agriculture crops, in total, leads to conclusion that this is a major problem of this species. The results showed a specific subset of game damage in Croatia and, as such, it can be extrapolated to provide insight into the damage found in actual conditions.

Abstract P.36

Coping with spatial structure in the cooperative management of hunting revenues

Julia Touza¹, Martin Drechsler², James C.R. Smart³, Mette Termansen³

1 Department of Applied Economics, School of Economics, University of Vigo, Lagoas Marcosende s/n, 36310 Vigo, Spain.

2 Helmholtz Center for Environmental Research – UFZ, Department of Ecological Modeling, Permoserstrasse 15, 04318 Leipzig, Germany.

3 Department of Policy Analysis, National Environmental Research Institute, University of Aarhus, Frederiksborgvej 399, 4000 Roskilde, Denmark.

This paper investigates the emergence of local-scale cooperative behaviours in a landscape where spatial externalities between landholders affect net benefits from hunting. Landowners primarily interested in shooting revenues prefer higher deer densities in their holdings, but existing deer density and consequently hunting revenues depend also on their neighbouring agents' hunting decisions. This analysis is implemented using the example of deer management in the UK. Under law in England, Wales and Scotland, landownership confers the right to shoot resident deer; and considerable revenues can be generated by leasing shooting rights for mature males of deer species such as *Cervus elaphus* and *Capreolus capreolus* with antler trophy heads. Coordinated hunting actions among landowners are essential to maximise delivery of these sporting objectives, this is because spatial externalities arise from hunting decisions through density-dependent movement of deer among neighbouring lands. If a landowner hunts deer heavily, deer density on his landholding will reduce and fewer deer from that holding will tend to move to neighbours landholdings, imposing a externality on the stalking revenues obtained from neighbouring agents. Social dilemmas typically arise under these circumstances because cooperation among agents is prone to exploitation by “selfish” individuals through which society ends up in a situation dominated by defectors, at a loss to all, as famously characterised by “the tragedy of the commons”. There is much current interest in studying how individuals facing such social dilemmas overcome the strong temptation to defect and instead cooperate to deliver benefits. Evolutionary game theory has sought mechanisms to explain the emergence of cooperation among selfish individuals in these complex socio-ecological contexts, and spatial implementations of standard games have shown that the development and persistence of cooperation is affected by spatial structure. However, existing game theoretic models do not incorporate the dynamics of the managed natural resource or cross-linkages between natural resource dynamics and management actions and payoffs. In this research, an agent-based model is used to investigate how spatially defined interactions among landholders' hunting decisions influence the emergence of cooperative behaviours in the management of red deer in Scotland. Simulation results show cooperation emerges through the formation of compact clusters of cooperative



landowners in the landscape surrounded by defecting individuals. These defecting landowners are those agents that free-ride on the cooperative individuals by culling higher proportions of the deer population. Cooperative individuals prevail by hunting at low intensities to maintain the deer density at high levels, which maximizes their neighbours' hunting benefits and also minimizes their own culling costs, thus maximising their payoffs.

Abstract P.37

Harvest rates of red deer (*Cervus elaphus*) populations from Iberian Peninsula

Carolina Vázquez, Joaquin Vicente, Pelayo Acevedo, Christian Gortázar

Instituto de Investigación en Recursos Cinegéticos, IREC (CSIC-UCLM-JCCM), Ronda de Toledo s/n, 13071 Ciudad Real, Spain

Keywords: Iberian Peninsula, game management, *Cervus elaphus*, harvest rate, game pressure, deer density, carrying capacity, density dependence.

In the absence of limiting factors or intensive management red deer tends to overabundance we pose the hypotheses that in the case of red deer, the extraction rate by hunting is variable, and not always according to population management criteria, therefore causing significant imbalances between effective extraction and the desired extraction in relation to environmental, sanitary, socioeconomic and hunting quality criteria. The goal is to characterize the hunting exploitation as output per surface and in relation to the red deer's population size in key areas of the Iberian Peninsula, using a temporal series of five populations employing the density-dependency to compare in a theoretical situation of Maximum Sustainable Yield, MSY. It can be observed that there is no relation between the rate of extraction by surface and the rate population extraction. It is manifest that the Iberian Peninsula contains two main environments (Atlantic and Mediterranean), with varying degrees of exploitation (the first more social, the latter more industrial), and highly variable density and extraction parameters, all of which could denote an absence of long-term management beyond the defined population goals, a situation that is plainly visible in the center-south region of the peninsula. We conclude that densities and extraction rates through hunting can vary considerably even in the local scale. In populations located in the center-south region of the peninsula (a Mediterranean region with a high production rate) an elevated carrying capacity could favor a larger extraction by surface in comparison to northern populations. The spatial-temporal variations in the studied parameters suggest a general tendency to reactive management systems that do not adjust to densities or planned goals according to the carrying capacity of the environments. Finally, we consider it necessary to improve knowledge of population status, development and implementation of quality indicators of populations and management, and monitoring over time. We conclude that extraction rates thru hunting can vary considerably even in the local scale.

Abstract P.38

Sociological analysis of the Spanish hunters

Carolina Vázquez^{1,2}, Beatriz Arroyo², Miguel Delibes-Mateos²

1 Facultad de Medicina Veterinaria y Zootecnia, Universidad Autónoma del Estado de México, México

2 Instituto de Investigación en Recursos Cinegéticos, IREC (CSIC-UCLM-JCCM), Ronda de Toledo s/n, Ciudad Real, 13071, Spain

Keywords: Qualitative study, content analysis, hunting, hunter, social perception.

Spain is considered as a paradise for hunting, and hunting involves more than 1 million people of very different backgrounds throughout the whole of the national territory. This occupation integrates different actors, activities, points of view, and game species. We aimed to assess the social significance of this activity from the point of view of the main actors -the hunters. Methods: interpretive phenomenological analysis of hunter responses to a structured questionnaire. We analyzed contents of a monthly section in a hunter's magazine that consisted of a fixed questionnaire to hunters and game practitioners, which included questions such as "your best hunting experience," "how do you see the future of hunting," "name a hunter you are proud of" or "who/what merits a shot of salt in the derriere". Responses were coded and analyzed according to three major topics: evaluations of hunting as an activity, strengths and weaknesses of the hunting world; position of hunters within society; and perceived changes and future of hunting. A total of 108 questionnaires (from 2003 to 2011) have been collected. We present preliminary results from an initial exploratory analysis of a total of 35 questionnaires.



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LIST OF PARTICIPANTS

·Ademasu, Meseret	ademasumeseret@gmail.com
·Ancora, Stefania	stefania.ancora@unisi.it
·Andersen, Oddgeir	oan@nina.no
·Anstett, Laetitia	lanstett@chasseurdefrance.com
·Anza Gómez, Ibone	ibone.anza@uclm.es
·Arroyo, Beatriz	beatriz.arroyo@uclm.es
·Ballesteros, Santiago	secretariogeneral@fecaza.com
·Bandeira, Victor	victor.bandeira@ua.pt
·Barros, Tânia	taniabarros@ua.pt
·Baumanis, Jānis	jbaumanis@inbox.lv
·Bessa-Gomes, Carmen	carmen.bessa-gomes@u-psud.fr
·Bieniek, Martyna	martyna.bieniek@uwm.edu.pl
·Bobek, Boguslaw	b.bobek@o2.pl
·Bombik, Pawel	pawel.bombik@lowiec.pl
·Boskovic, Ivica	bivica@pfos.hr
·Bryce, Rosalind	r.bryce@abdn.ac.uk
·Bunnefeld, Nils	n.bunnefeld06@imperial.ac.uk
·Cañadilla, Jesús	jesus.canadilla@uclm.es
·Caro Hidalgo, Jesús	jesus.caro@uclm.es
·Carvalho, João	jlocarvalho@gmail.com
·Cassinello, Jorge	jcass@irec.csic.es
·Castro, Francisca	francisca.castro@uclm.es
·Castro, Bela Irina	bela.irina.castro@gmail.com
·Cinque, Serena	serena.cinque@gu.se
·Chanteloup, Laine	elaine.chanteloup@univ-savoie.fr
·Cleopa Naiman, Loiruck	loinaiman@fzs.org
·Comalrena De Sobregrau I Esteve, Marc	marc@sobregrau.net
·Corell Alcantarilla, Pedro	pedro@losclaros.net
·Damon, Amy	adamon@macalester.edu
·Degmečić, Dražen	dradegy@gmail.com
·Delibes-Mateos, Miguel	miguel.delibes@uclm.es
·Díaz Fernández, Silvia	silviadiazfernandez@gmail.com
·Díaz Ruiz, Francisco	pacodi1480@hotmail.com
·Díaz Sánchez, Sandra	sandra.diaz@uclm.es
·Dinmal, George	allafricastudentsunion@yahoo.com
·Dinnie, Liz	liz.dinnie@hutton.ac.uk
·Edwards, Charles	charles.edwards@imperial.ac.uk
·Estrada, Alba	albaestradaa@gmail.com
·Ferreira, Catarina	catarinam.andrade@uclm.es



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·Ferrerias de Andrés, Pablo	pablo.ferrerias@uclm.es
·Figari, Helene	helene.figari@nina.no
·Fischer, Anke.....	ankefischer@fzs.org
·Flø, Bjørn Egil.....	bjorn.flo@rural.no
·Florijancic, Tihomir	flory@pfos.hr
·Fonseca, Carlos	cfonseca@ua.pt
·Fortino, Stefania	stefifor@hotmail.it
·Funston, Paul.....	funstonpj@tut.ac.za
·Fusari, Alessandro	alessandrofusari@yahoo.it
·Gamborg, Christian	chg@life.ku.dk
·Hailu Buta, Fetene.....	fetenehailu@gmail.com
·Heberlein, Thomas A.....	taheberl@wisc.edu
·Heinonen, Johannes	r01jph11@abdn.ac.uk
·Hofmann, Johanna Maria	j.hofmann@jagdschutzverband.de
·Huber, Djuro	huber@vef.hr
·Ibarra Zimbrón, Salvador.....	sibarraz@gmail.com
·Igota, Hiromasa	igotah@gmail.com
·Ilvesviita, Pirjo	pirjo.ilvesviita@metsa.fi
·Irvine, Justin.....	justin.irvine@hutton.ac.uk
·Jerina, Klemen.....	klemen.jerina@bf.uni-lj.si
·Jiménez Blasco, Irene	ijimenb@gmail.com
·Kerezi, Vesna	vesna.kerezi@gmail.com
·Keuling, Oliver	oliver.keuling@tiho-hannover.de
·Krange, Olve	olve.krange@nina.no
·Lavadinovic, Vukan	vukanlavadinovic@yahoo.com
·Ledesma, María.....	maria.peli@hotmail.com
·Legagneux, Pierre	legagneux@gmail.com
·Limiñana, Rubén	ruben.lm@gmail.com
·Linnell, John.....	john.linnell@nina.no
·Lootvoet, Amélie.....	amelie.lootvoet@u-psud.fr
·López Antia, Ana	ana.lopezantia@uclm.es
·López Lucero, Juan Francisco	juan.francisco.lopez.lucero@uabc.edu.mx
·Lowassa, Asanterabi	asante.kweka@gmail.com
·Măcinic, Ioan.....	ioan_macinic@yahoo.com
·Maffey, Georgina	gmaffey@abdn.ac.uk
·Marghescu, Tamas.....	t.marghescu@cic-wildlife.org
·Martínez Arangüena, Pilar.....	pilar@gescaza.es
·Mateo Soria, Rafael	rafael.mateo@uclm.es
·Mateo Tomás, Patricia	rktespejos@gmail.com
·Mckee, Andrene	annie.mckee@hutton.ac.uk
·Mcnamara, James	j.mcnamara09@imperial.ac.uk
·Middleton, Angus.....	angus.middleton@face.eu
·Milner-Gulland, E.J.....	e.j.milner-gulland@imperial.ac.uk



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·Mohammed, Umar Baba	allafricastudentsunion@yahoo.com
·Moro, Mirko	mirko.moro@stir.ac.uk
·Mougeot, Francois	francois.mougeot@uclm.es
·Næss, Camilla	camilla.naess@nina.no
·Newey, Scott.....	scott.newey@hutton.ac.uk
·Norbury, Grant.....	norburyg@landcareresearch.co.nz
·Nuno, Ana	ana.nuno08@imperial.ac.uk
·Nyman, Madeleine.....	madeleine.nyman@metsa.fi
·Oian, Hogne	hogne.oian@nina.no
·O'reilly-Nugent, Graham.....	nugentg@landcareresearch.co.nz
·Oriolo Mesa, Melissa	oromela@yahoo.it
·Ortiz Santaliestra, Manuel	manuele.ortiz@uclm.es
·Ozimec, Sinisa.....	sinisa.ozimec@pfos.hr
·Ozolins, Janis	janis.ozolins@silava.lv
·Palazy, Lucille.....	lucille.palazy@u-psud.fr
·Papaspyropoulos, Konstantinos.....	kodafype@hunters.gr
·Pérez Ojeda Del Arco, Alonso	alonso30@hotmail.com
·Puigcerver Oliván, Manel	mpuigcerver@ub.edu
·Razafimanahaka, Julie Hanta	hantajulie@gmail.com
·Redpath, Steve.....	s.redpath@abdn.ac.uk
·Reljić, Slaven.....	slaven.reljic@gmail.com
·Rengifo Gallego, Juan Ignacio	irengifo@unex.es
·Rentsch, Dennis	dennisrentsch@fzs.org
·Robert, Hagen	robert.hagen@forst.bwl.de
·Rocha Camarero, Gregorio	gregorio@unex.es
·Rodríguez Teijeiro, José Domingo.....	jrodriguez@ub.edu
·Romero Gil, Marta	marta.rgil@gmail.com
·Rouco, Carlos	roucoc@landcareresearch.co.nz
·Saayman, Melville	melville.saayman@nwu.ac.za
·Sánchez Zapata, José Antonio	toni@umh.es
·Sandström, Camilla	camilla.sandstrom@pol.umu.se
·Scallan, David	davidscallan1@gmail.com
·Schmidt, Karoline	karoline.schmidt@inode.at
·Scillitani, Laura	laura.scillitani@gmail.com
·Sesay, Mohamed.....	alhajibangs@gmail.com
·Sicilia, Marisa.....	marisa.sicilia@uclm.es
·Sjölander Lindqvist, Annelie	annelie.sjolander-lindqvist@globalstudies.gu.se
·Skogen, Ketil.....	ketil.skogen@nina.no
·Skrbinšek, Tomaž.....	tomaz.skrbinsek@gmail.com
·Šprem, Nikica	nsprem@agr.hr
·Suni, Jarno.....	jarno.suni@uef.fi
·Suraj, Hamdan.....	allafricastudentsunion@yahoo.com
·Svalby, Johan	johan.svalby@face.eu



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·Swenson, Jon jon.swenson@umb.no
 ·Tadie Limenh, Degu degutadie@fzs.org
 ·Tahiru, Mustawil allafricastudentsunion@yahoo.com
 ·Tibebe Weldesemaet, Yitbarek yitbarektibebe@fzs.org
 ·Timer, Girma girmatimer@yahoo.com
 ·Torres, Rita Tinoco rita.torres@ua.pt
 ·Touza Montero, Julia María julia.touza@uvigo.es
 ·Valente Santos, João Pedro joaovalente@ua.pt
 ·Van Der Merwe, Peet peet.vandermerwe@nwu.ac.za
 ·Van Der Stegen, Joseph joseph.van-der-stegen@ec.europa.eu
 ·Vázquez Guadarrama, María Carolina mvz.carolina.vazquez@gmail.com
 ·Villafuerte, Rafael rafael.villafuerte@uclm.es
 ·Villanueva González, Luis Fernando direccion@aprocacm.org
 ·Viñuela, Javier javier.vinuela@uclm.es



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