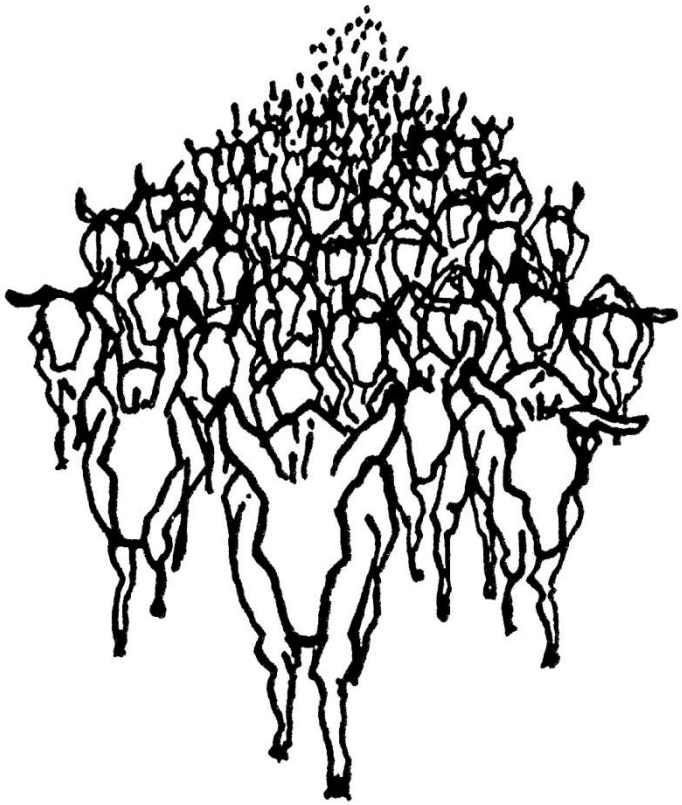
Animal Populations - World Resources and Animal Welfare



UFAW International Animal Welfare Science Symposium

14th – 15th July 2015

Zagreb, Croatia

UFAW

Established 1926

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Science in the Service of Animal Welfare

Welcome to the UFAW Symposium

We would like to welcome you to Zagreb, the capital city of Croatia, for the latest in UFAW's programme of themed international meetings, which bring together leading scientists, veterinarians, policy makers and all those with an interest in animals and their welfare, and which UFAW initiated in 1957.

The theme of the symposium is 'Animal Populations- World Resources and Animal Welfare'. Humans and their kept animals (farm and companion) comprise the larger part of the world's vertebrate biomass. The world's resources are limited, and as humans use more of these, fewer resources are available for wild and other animals. Whether we like it or not, we humans now control or greatly influence the population sizes of many, and perhaps all, other vertebrate species, and decisions that we make to keep more of some species e.g., domestic, and farm animals have implications on the numbers and welfare of animals of other species that the world can support.

How do we apportion resources between kept and wild animals? How do we balance the welfare interests of one species against that of another? Modern veterinary science enables us to keep a high proportion of animals alive to old age (when we wish it), but these occupy niches that would otherwise have been filled by young replacements: but is fewer long-lived animals better than more short-lived ones? Little effort seems to have been made to address how such balances should be struck. It appears that it is time to try to decide how many of which animals we want and how to achieve that most humanely.

This meeting features talks and posters from scientists from around the world that will discuss issues surrounding the rationales and methodologies of humane control of animal populations (kept and free-living) in pursuit of preserving biodiversity and minimising welfare risks to animals, as well as other related concerns.

We would like to thank all those who are contributing to the meeting, as speakers, poster presenters and chairs, the delegates from the 28 countries who are attending and Dr James Kirkwood, who proposed the topic of this meeting. We look forward to what we trust will be a thought provoking and engaging meeting.

Stephen Wickens, Robert Hubrecht and Mario Ostović

UFAW and The Faculty of Veterinary Medicine, University of Zagreb

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Established 1926

General Information

Organisers:

The Universities Federation for Animal Welfare (UFAW), the international animal welfare science society, is an independent registered charity that works with the animal welfare science community worldwide to develop and promote improvements in the welfare of farm, companion, laboratory, captive wild animals and those with which we interact in the wild, through scientific and educational activity. To this end, UFAW:

- Promotes and supports developments in the science and technology that underpin advances in animal welfare.
- Promotes education in animal care and welfare.
- Provides information, organises symposia, conferences and meetings, publishes books, videos, technical reports and the international quarterly scientific journal *Animal Welfare*.
- Provides expert advice to governments and other organisations and helps to draft and amend laws and guidelines.
- Enlists the energies of animal keepers, scientists, veterinarians, lawyers and others who care about animals.

UFAW is an independent organisation, and throughout its history its work has primarily been funded by donations, subscriptions and legacies.

UFAW's philosophy: The importance of science to animal welfare

Ensuring good welfare is about more than ensuring good health. Animal welfare is about the quality of animals' lives: their feelings. It is now widely agreed, although it is not yet possible to prove absolutely, that many species are sentient - they have the capacity to feel pain and distress, they can suffer and, conversely, be aware of pleasant feelings - and that this matters morally. But how do we assess, from the animal's point of view, what matters to them and how much?

"Science informs, motivates and facilitates advances in animal welfare by providing a strong evidence base for changing attitudes and practices, and by creating practical and effective solutions to welfare problems."

UFAW promotes and supports a scientific approach aimed at finding ways to gain insight into what matters to animals, assessing their welfare and improving the quality of their lives through practical developments in all aspects of their care.

Change for the better depends on knowledge, understanding and practical solutions. UFAW believes that good science can inform, motivate and facilitate that change - whether through developments in legislation, professional 'best practice' or the actions of other organisations and individuals.

In promoting and supporting this scientific approach to improving welfare, UFAW's work is wide-ranging and undertaken with many other organisations and individuals - enlisting and informing the energies of animal keepers, scientists, veterinarians, lawyers and others who care about animals.

Assisting in the organisation of the Symposium is Dr Mario Ostović of the **Faculty of Veterinary Medicine**, University of Zagreb, Croatia. The Faculty of Veterinary Medicine was established in 1919 and is part of the oldest and biggest university in South-Eastern Europe, the University of Zagreb which was founded in 1669.

Information about the Symposium:

The Symposium is being held in the Hotel Dubrovnik on Ban Jelačić Square in the centre of Zagreb. Talks will take place in the 'Ban Jelačić' conference room on the first floor of building.

The Symposium programme is a very busy one and delegates are requested to take their seats in plenty of time before the start of each session. These will start promptly at the time indicated and each speaker has been allocated five minutes for questions from delegates. The first session, on the 14th July, will begin at 9.10am.

Delegates with any questions or queries should address these to the staff at the Symposium registration desk, in the conference foyer, in the first instance. Cloakroom facilities and storage for luggage is available on request.

Catering:
Tea, coffee and other refreshments will be served in the conference foyer and in the 'Ban Zrinski' room, where the posters are displayed. Lunch will be served in the 'Centrum' room on the ground floor of the hotel, at the times indicated in the timetable (p7-8).

Safety:
In the event of a fire or other emergency, please leave via the nearest emergency exit. Delegates should then go to the muster point, which you will be directed to when exiting the building. A check that everyone attending the Symposium is present will then be made.

Access to the wireless network:
Search available networks and select 'WiFiHD Kongres'. When asked for a password type in 'HDUzg1929' .

Drinks reception: 'Kaptolska klet'
A drinks reception is being held from 7.30pm on the evening of the 14th July in central Zagreb at the restaurant 'Kaptolska klet'. The restaurant is a short walk up the hill from the symposium, on the cathedral square. Drinks and canapés will be available at the event. Afterwards delegates are free to explore Zagreb.

Delegates will be responsible for getting to the venue themselves, but there will be people around to act as guides.

Information on Presentations

Speakers:
We request that all speakers ensure that they have loaded a copy of their presentation, which should be carried on a memory stick and formatted for use on Microsoft PowerPoint for PC, well in advance of the session in which they are to talk. As a guide, we would expect anyone talking in a session scheduled before lunch to have loaded their talk and checked it either the day before or as early as possible on the day of their talk.

Speakers should come to the front of the 'Ban Jelačić' conference room where they can load copies of their talk and check that they are complete. Speakers should also inform staff at the Symposium registration desk once they have loaded their talk.

Access to the 'Ban Jelačić' conference room is from 8.00am on the 14th July.

Posters:
Posters will be displayed in the 'Ban Zrinski' room, accessed from the foyer of the conference, on the first floor of the hotel. We request that all posters should be in place before the start of the first session at 9.10am on the 14th July. They should be taken down no later than the end of the afternoon refreshment break on the 15th. For those who arrive on Monday 13th, there is access to the 'Ban Zrinski' room to set up posters from 5.00pm.

Poster sessions:
There will be two poster sessions, when authors will be available to answer questions about their posters. These will take place during the lunch-break, and will start at 13.20. Delegates contributing posters are asked to ensure that they are standing nearby their poster during their allocated sessions (indicated by a superscript 1 or 2 after the poster title in the list of posters – p39-41).

Badges:
Delegates with a special role to play in the Symposium have been allocated a coloured badge, as follows:

Blue	**Organisers and helpers**
Yellow	**Speaker**
Pink	**Poster presenter**

Symposium language:
All presentations and publications will be in English. There is no provision for simultaneous translation.

SCIENTIFIC PROGRAMME:

Speaker Abstracts and Timetable

Symposium Timetable

Day One (14th July 2015):

8.00 – 9.10 Registration. Refreshments available from 8.30

8.00 – 9.10 Poster set up

9.10 – 9.20 Introduction		
9.10 9.20	Hubrecht R (UFAW, UK)	Welcome and Introduction

9.20 – 10.35 Session 1: Chair: Broom, D (University of Cambridge)		
9.20- 9.45	Fraser D (University of British Columbia, Canada)	Cars, cats, climate change and other neglected problems of animal welfare
9.45- 10.10	Baker SE (University of Oxford, UK)	Minimising welfare impacts in wildlife management
10.10- 10.35	Hiby, EF, A Hammond-Seaman A and M Vučinić (RSPCA, UK and University of Belgrade, Serbia)	Establishing specific indicators for monitoring and evaluating dog population management interventions in the Balkan countries

10.35- 11.15 Break: Refreshments

11.15 – 12.50 Session 2: Chair: Ostovic, M (University of Zagreb)		
11.15- 11.40	Ohl F (University of Utrecht, The Netherlands)	Animal welfare considerations: Should context matter?
11.40- 12.05	Olsson IAS, M Magalhães-Sant'Ana and NH Franco (IBMC and Escola Universitária Vasco da Gama, Portugal; University College Dublin, Ireland)	Quantity of life: Living long, well or not at all?
12.05- 12.30	Tomlinson AJ, A Rayner, D Cowan, KE Littin, A Bright and R Layton (Food Animal Initiative and APHA, UK; Ministry for Primary Industries, New Zealand)	Considering animal welfare in a whole-farm approach to wildlife management for sustainable food production
12.30- 12.45	Sharma A (CSK H.P Agricultural University, India)	Street dog population control in the North Western Himalayas of India: Current scenario and future strategies
12.45- 12.50	Hubrecht R (UFAW, UK)	Announcements

12.50 – 14.00 Lunch, including Poster Session 1 (from 13.20)

14.00 – 15.10 Session 3 Chair: Molento, C (Universidade Federal do Paraná)		
14.00- 14.25	Macdonald DW (University of Oxford, UK)	Animal welfare: From rough trade to compassionate conservation
14.25- 14.50	Jung J, J Yngvesson, MP da Costa and M Stéen (SLU and Swedish Centre for Animal Welfare, Sweden; São Paulo State University, Brazil)	Indirect effects of wild carnivores on livestock – examples from Sweden, Brazil and Kenya
14.50- 15.10	Turner DC (IEMT, Switzerland)	Outdoor domestic cats and wildlife

15.10 – 15.40 Break: Refreshments

15.40 – 17.10 Session 4 Chair: Baker, S (University of Oxford)		
15.40- 16.05	Leus K and KM Schad (European Association of Zoos and Aquaria, The Netherlands; Copenhagen Zoo, Denmark)	Controlling population growth while ensuring welfare and future reproductive potential in cooperative breeding programmes in zoos and aquaria
16.05- 16.25	Bonacic C, A Muñoz, E Beltrami and J Laker (Pontificia Universidad Catolica de Chile, Chile)	Feral animals and multiple species management: Animal welfare implications
16.25- 16.45	Mikuš T, S Barnard, M Ostović and Ž Pavičić (Croatian Veterinary Institute and University of Zagreb, Croatia; Istituto Zooprofilattico Sperimentale dell'Abruzzo e del Molise, Italy)	Management of Croatian shelters and dog mortality
16.45- 17.10	Meijboom FLB, N Herdoíza Castro and F Ohl (Utrecht University, The Netherlands)	Wildlife welfare management: A conceptual, legal and ethical challenge

End 17.10

Day Two (15th July 2015):

9.20 – 10.40 Session 5 Chair: Turner, P (University of Guelph)		
9.20-9.25	Introducing second day	
9.25-9.50	Broom DM (University of Cambridge, UK)	New directions for sustainable animal production systems and the role of animal welfare
9.50-10.05	Stevenson PJ (Compassion in World Farming, UK)	Industrial livestock production: The twin myths of efficiency and necessity
10.05-10.20	Josephs JAE and EA McBride (University of Southampton)	Mini livestock: The role of edible insects in welfare friendly farming
10.20-10.40	Gibson TJ, S van Winden, RJ Quy, CT Eason, MS Lambert and NG Gregory (Royal Veterinary College and AHVLA, UK; Lincoln University, New Zealand)	The development of humane rodenticides for rats and Grey squirrels

10.40 – 11.10 Break: Refreshments

11.10 – 12.50 Session 6 Chair: Millman, S (Iowa State University)		
11.10-11.35	Sandøe P, TJ Kasperbauer and B Holst (University of Copenhagen and Copenhagen Zoo, Denmark)	Does culling improve the welfare of zoo animals?
11.35-11.50	Carberry HJ (Aberystwyth University, UK)	Badgers, cattle, and bovine tuberculosis: An animal health problem?
11.50-12.15	Flockhart DTT and JB Coe (University of Guelph, Canada)	Responsible and cost-effective solutions to address the urban cat overpopulation crisis
12.15-12.40	Tribe A (University of Queensland, Australia)	Humane management of kangaroo populations in south-east Queensland
12.40-12.50	Hubrecht R (UFAW, UK)	Announcements

12.50 – 14.00 Lunch, including Poster Session 2 (from 13.20)

14.00 – 15.20 Session 7 Chair: Ohl, F (Utrecht University)		
14.00-14.25	Talling JC and D Cowan (Animal and Plant Health Agency, UK)	A model to facilitate decision making in wildlife management, incorporating welfare costs, effectiveness and population dynamics
14.25-14.45	Nyendwa S and A Matongo (Mwamfumba Animal Welfare and Department of Veterinary, Chibombo, Zambia)	Farmed livestock population management- how many is enough?
14.45-15.05	Ramp D (University of Technology Sydney, Australia)	Learning to share space with wild animals
15.05-15.20	Jenkinson S (Access and Countryside Management, UK)	Doing more with less: Land-use planning and community-based interventions to promote the human health benefits of companion dogs and minimise adverse impacts on the environment, wildlife and farm livestock.

15.20 – 15.50 Break: Refreshments

15.50 – 17.10 Session 8 Chair: Hubrecht, R (UFAW)		
15.50-16.15	Vučinić M, A Hammond-Seaman and K Radisavljević (University of Belgrade, Serbia and RSPCA, UK)	Major deficiencies in stray dog population control strategies in Serbian municipalities
16.15-16.40	Gilchrist JS (Edinburgh Napier University, UK)	Stress physiology of game animal capture and cull: Welfare and productivity for the wildlife industry
16.40-17.00	Part CE, P Edwards, S Hajat, WG Hutchinson and LM Collins (Queen's University Belfast, London School of Hygiene and Tropical Medicine and University of Lincoln, UK)	The future of farm animal welfare in a changing climate

End 17.10

CARS, CATS, CLIMATE CHANGE AND OTHER NEGLECTED PROBLEMS OF ANIMAL WELFARE

D Fraser

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The effects of people on animals can be considered under four broad categories: (1) the keeping of animals for food, companionship and other purposes, (2) deliberate harm to animals in slaughter, hunting and biomedical research, (3) direct but unintended effects on animals caused by crop production, forest cutting, transportation and other activities, and (4) the indirect effects of human activities that disturb natural systems, for example by spreading pathogens, introducing non-native species, using toxic chemicals, and climate change. The first two categories have been the focus of animal welfare science and animal ethics philosophy, whereas the third and fourth categories have been more the focus of conservation and environmental ethics. In reality, categories 3 and 4 activities cause such classic animal welfare problems as suffering, injury and death on a vast scale, and the harms can be expected to worsen as human population and prosperity increase. Moreover, whereas the harms caused by intentional actions can often be controlled and mitigated, harms caused unintentionally or indirectly are generally less amenable to control. A challenge for the 21st century is to being unintended and indirect harms to animals into the realm of animal welfare and animal ethics. Attention to these types of harm should also help to unify animal welfare and conservation.

MINIMISING WELFARE IMPACTS IN WILDLIFE MANAGEMENT

SE Baker

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Human-wildlife conflict occurs worldwide. Managing this conflict has implications for wild animal welfare. Until recently, the welfare impact of wildlife management has received little attention, and the welfare of 'pest' animals has been undervalued. There is increasing agreement that where human activity affects animal welfare these effects should be minimised. Little is known, however, about the relative welfare impacts of different wildlife management interventions and judgements on this vary widely. Welfare impacts therefore need to be assessed objectively. Here, we used an existing welfare assessment model to estimate the relative humaneness of a range of lethal and non-lethal management interventions, as applied to rabbits *(Oryctolagus cuniculus)*, moles *(Talpa europaea)* and crows *(Corvus corone corone)* in the UK. The interventions assessed included shooting, fumigation, snaring, cervical dislocation, stunning, spring trapping, stalking/flushing with dogs, hunting with dogs, live-trapping, translocation, fencing, scaring with gas guns and with scarecrows, and molehill management. Where appropriate, combinations of interventions were assessed, as used in the field, e.g. live-trapping followed by cervical dislocation, stalking/flushing with dogs followed by shooting etc. We were able to produce useful humaneness rankings for the management interventions used with each species. Some rankings appeared counter-intuitive, e.g. the installation of rabbit fencing had a greater estimated impact than shooting a rabbit in the head (although fencing is likely to have a much lower impact than shooting over time), thus highlighting the need for objective, evidence based welfare assessments. As well as ranking the humaneness of interventions, the model highlighted future research needs and showed how Standard Operating Procedures might be improved to reduce welfare impacts. While the model is an advance in assessing wildlife management welfare impacts, it has some limitations and we discuss likely challenges in resolving these.

ESTABLISHING SPECIFIC INDICATORS FOR MONITORING AND EVALUATING DOG POPULATION MANAGEMENT INTERVENTIONS IN THE BALKAN COUNTRIES

A Hammond-Seaman [1] and M Vučinić [2]

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Stray dog problem is still widespread across the European content, in particular in the Balkan region stretching further east into Turkey and west Asia. Whilst many countries have implemented a variety of interventions, the absence of baseline data and lack of specific programme indicators is making monitoring and evaluation of population control programmes challenging.

Many interventions begin with a very basic understanding of the system they are hoping to impact upon, relying on assumptions about the root causes of problems experienced by dogs, and the communities amongst which they live. ICAM DPM guidance strongly supports that initial data collection and assessment should precede any programme or intervention.

Both authors contributed to the development of the most recent ICAM[1] guidance, which aims to recommend valid, reliable, practical, and feasible ways of assessing the impact of domestic dog population interventions. Monitoring and evaluation requires an understanding of what impacts the intervention is striving to achieve. The focus is on applying scientific solutions to real world problems and encouraging an increase in scientific research on DPM.

By using monitoring and evaluation, these interventions can test their assumptions about how their activities affect dogs and people using objective data.

The presentation will presents indicators as developed by ICAM guidance document[2] for reflecting change in 8 common impacts targeted by dog population management interventions, for each impact more than one indicator is presented;

1. Improve dog welfare (animal based indicators)
2. Improve care provided to dogs (resource based indicators)
3. Reduce dog density/stabilise turnover
4. Reduce risks to public health
5. Improve public perception
6. Improve rehoming centre performance
7. Reduce negative impacts of dogs on wildlife
8. Reduce negative impacts of dogs on livestock.

Reducing population density is one of the most desirable outcomes targeted by the dog population management interventions. This paper will analyse the most common errors and shortfalls of the existing dog population management programmes and subsequent impact on desired outcome of reducing the population size.

[1] Current members include the International Fund for Animal Welfare (IFAW), World Animal Protection, Humane Society International (HSI), Royal Society for the Prevention of Cruelty to Animals (RSPCA) International, World Small Animal Veterinary Association (WSAVA) and Global Alliance for Rabies Control (GARC).

[2] ICAM Are we making a difference, A guide to monitoring and evaluating dog population management interventions, 2014

ANIMAL WELFARE CONSIDERATIONS: SHOULD CONTEXT MATTER?

F Ohl

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Today, there is broad agreement that humans have the responsibility to consider animal welfare. It is, however, far from trivial to translate this agreement into practical animal welfare management: views on animals are culture-, time-, place- and context-dependent, and even one and the same person might, depending on the context, look at animals in any number of different ways. Also, current legislative provisions for the management of animal welfare are in general closely tied to context, such that there may be a clear legal distinction between responsibilities defined towards farm animals, lab animals, companion animals, closely managed wildlife, and truly wild animals experiencing little management input.

It has been argued that indeed responsibility to consider welfare is higher in animals more closely managed by man, because these animals have less freedom and have fewer opportunities to respond 'naturally'. Accordingly, a greater human responsibility has been suggested for wildlife species where humans are demonstrably responsible through their actions, either for the compromise to welfare status in the first place and/or for the restricted opportunities available to those wildlife animals to perform appropriate adaptive behaviour, perhaps because of human impacts in restricting habitat diversity. It is, however, increasingly apparent that such division between e.g. captive and non-captive animals is not black and white: there is a growing intermediate category which includes both captive animals that are highly extensively kept (e.g. cattle and horses turned out to graze on flood plains) as well as non-captive animals that are nonetheless substantially curtailed in their behavioural freedom (e.g. large herbivores in the Dutch Oostvaardersplassen Nature Reserve).

As the human population increases, non-captive animals will be more and more affected by human influences, including animal kept by man. Furthermore, due to increased urbanization and the growing number of extensive livestock husbandry systems, the category of animals in the 'in-between zone' (neither wholly domesticated nor truly wild) is expected to expand. Finally, there is a lack of clarity about how to classify formerly domesticated animals that have 'gone wild' (either intentionally or by accident), as well as the ever larger group of 'wild animals' (foxes, herons, stone martens) that are settling in urban environments. Therefore, we need to reconsider the categories in which we classify our responsibilities towards animals and their welfare.

I suggest that sustainable animal welfare management demands a context-independent concept of animal welfare based on the animal's biological functioning. Further, management decisions need to be analysed across contexts of animal use (e.g. how does de-intensification of farm animals affect wildlife populations?), such that cross-contextual risks can be taken on into (ethical) considerations and decision making processes.

QUANTITY OF LIFE: LIVING LONG, WELL OR NOT AT ALL?

IAS Olsson [1], M Magalhães-Sant'Ana [2,3] and NH Franco [1]

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Animal welfare science is mostly focused the quality of life of animals that actually exist. This leaves out a range of ethically relevant issues regarding the quantity of life – in terms of number of animals living and the longevity of each animal. In many cases quantity and quality are related, and often there is a tension between the two. We will develop a discussion around three practical cases presenting quality-quantity dilemmas.

In dairy cows, higher milk production has been accompanied by an increase in production-related diseases; both longevity and quality of life are decreasing. The interplay of factors is complex, as health issues underlying culling may not necessarily be painful and decisions to cull may be driven by the availability of replacement heifers rather than by cow health. Male dairy calves have little value for meat production and are typically killed during the first week of life, experiencing very little life at all, or are reared for veal production under conditions of low quality of life. Dairy cow longevity and male dairy calves raise interconnected questions. Improved cow longevity would potentially make it economically viable for farmers to combine insemination with sexed dairy semen to generate replacement heifers, with meat breed insemination for the remaining reproduction, thus ensuring that only those calves that would become replacement heifers were of a full dairy type, whereas those that would go into meat production would be crossbred.

In research using animals, there is sometimes a dilemma between reducing animal numbers and reducing the impact on individual animals, highlighted by the potential to re-use animals in different procedures. Such a dilemma was presented to students in laboratory animal science training courses (n=235) as a (hypothetical) choice between (i) 20 painful procedures on the same animal across 20 days, or (ii) conducting one single procedure per animal on 20 animals. Answers were evenly distributed when the species was mice (49% for 20 mice; 51% for 20 trials), whereas a clear preference for fewer animals emerged for dogs and primates.

These cases provide real-life examples of complex conflicts between quality and duration of life on the one hand, and quality and number of animals on the other hand. People vary considerably in how they view the value of quality and quantity. The way one values the life of a given animal versus the quality of life for each animal appears also to depend on animal species.

This work was funded by FEDER funds through the Operational Competitiveness Programme – COMPETE and by National Funds through FCT – Fundação para a Ciência e a Tecnologia under the project FCOMP-01-0124-FEDER-029527 (PTDC/MHC-ETI/4890/2012) and the PhD grants SFRH/BD/38337/2007 and SFRH/BD/46879/2008.

CONSIDERING ANIMAL WELFARE IN A WHOLE-FARM APPROACH TO WILDLIFE MANAGEMENT FOR SUSTAINABLE FOOD PRODUCTION

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Certain wildlife species can compromise successful farm management and food-production. Problems include spoilage and contamination of feed and bedding, disease transmission to livestock, and predation. The application of 'integrated pest management, (IPM)' systems to minimise such problems is a well-documented approach focussing on *prevention*, *monitoring* and *control*. However, when operators rely on lethal *control* (typically perceived as cheap and simple), with minimal attention given to *prevention* and *monitoring*, there can be substantial negative ethical, environmental and economic consequences.

Anticoagulant rodenticides (ARs) form the cornerstone of rodent control programmes worldwide. This is despite their classification as markedly inhumane; the negative animal welfare, environmental and food safety implications of lethal and non-lethal exposure to non-target species; and increasing efficacy constraints arising from heritable physiological resistance. We conducted a telephone based questionnaire survey (n=500) to determine whether proactive implementation of on-farm preventive and monitoring activities was associated with a lower frequency of AR bait deployment. Interestingly, preliminary data analysis suggests that 'good practice' activities were not significantly associated with reduced frequency of bait deployment, leading us to query what factors may be more successful in driving reductions in AR use on farm.

A second element in our programme of work is to explore the nature of the relationship between wildlife and farming practices on a wider scale. There is a broad spectrum of stakeholder perspectives with respect to farmland wildlife, with funding available to enhance biodiversity and conserve 'desirable' species, sometimes paradoxically concomitant with deployment of lethal control methods for species that may be considered less welcome on farm. We will explore the value of more holistic approaches incorporating *all* wild flora and fauna, aiming to reduce the numbers of species, or number of individuals within a species that are considered less welcome, and to reduce the degree of conflict that may be associated with their presence.

STREET DOG POPULATION CONTROL IN THE NORTH WESTERN HIMALAYAS OF INDIA: CURRENT SCENARIO AND FUTURE STRATEGIES

A Sharma

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Street dog population has increased at an alarming rate in the North Western Himalayan region due to increased urbanization, tourism, hotel industry, establishment of monasteries and nunneries and lack of proper garbage disposal. There have been exponential rise in dog bites cases in humans and subsequent human rabies cases. This is a flashpoint in the human –animal conflict and an animal welfare concern. The current dog population control measures are occasional animal birth control (ABC) camps by surgical means organized by the State Animal Husbandry Department and few Non- Governmental Organizations (NGOs). There is a lack of long term vision, strategy and a sustained scientific approach to address this problem. A dedicated and trained veterinary teams of veterinarians , paraveterinarians and dog catchers of the State Animal Husbandry Department for ABC should be established at least one in each district. Permanent as well as mobile operation theatres, dog rescue cum rehoming centres need to be created for a scientific and humane effort to address the problem. Co-ordinated efforts through cooperation and collaboration with Veterinary Colleges for providing trained technical manpower and scientific support, NGOs and local self governing bodies for creating awareness and participation of the masses through education right from the grass root levels are needed to tackle this public health issue. The establishment of such a structure can prove to be a benchmark for future animal health, public health and animal welfare interventions.

ANIMAL WELFARE: FROM ROUGH TRADE TO COMPASSIONATE CONSERVATION

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Animal welfare science is an important component of conservation biology. A particular case where welfare intersects with conservation is wildlife trade and use. In this wider context, this talk will summarise aspects of wildlife trade and use on which WildCRU research has explored the link between welfare and conservation. I will first set out overviews of the nature and flows of trade and use involving wild mammals, and then turn to a case study of the use of wild animals in tourism, and the relevance of this to societal attitudes to conservation. A further case study includes the increasing trade in lion bones in traditional medicine. These will be set in the wider context of how animal welfare can best be incorporated into conservation solutions.

INDIRECT EFFECTS OF WILD CARNIVORES ON LIVESTOCK – EXAMPLES FROM SWEDEN, BRAZIL AND KENYA

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With the growing numbers of larger carnivores in Europe, a lot of attention has been drawn to their impact on livestock. The focus has been mainly on the direct effects like killed or injured livestock. However, there is some evidence that indirect effects by the pure presence of predators have even larger effects, both on production and welfare of livestock. Here we give examples and results from our previous or on-going studies on three continents. There are important parallels between the situations on these three continents and analysis of the effectors will facilitate livestock production and conservation of predators.

In Sweden, wolves kill every year about 0.1% of the sheep population and the wolf population is growing fast. Our studies focus on the long-term response of sheep that have survived wolf attacks. Farmers tell about reduced growth and reproduction and changed behaviour of the sheep, as well as difficulties to handle them. We shed light on these factors and effects with help of physiological and behavioural recordings.

In East Africa, livestock on pasture is threatened by lions, hyenas and other predators. To reduce the risk of attacks, livestock in traditional systems is at night kept in enclosures known as bomas or kraals. On daytime, livestock is guarded on pastures that can be hours away from the enclosure and daily walk may take hours. This leaves a very limited time for grazing, with exhausted livestock that has to graze during the hottest hours in the middle of the day. We show how these long walks reduce production and affect the animals' behaviour, and suggest solutions.

In Brazil, cattle can be affected by both big cats and vultures. Vultures are during and after calving often sitting a few meters form the cow. They wait for the afterbirth and rarely attack the calf. However, many cows react strongly on the vultures, which might delay both the birth and the first suckling of the calf. It is essential that calves suckle as soon as possible to get the colostrum milk in time. Our data show that the presence of the vultures delays and reduces colostrum intake, with potential effects on calf health. Big cats like jaguar and puma often kill young calves on pasture. To understand and reduce such attacks is very complex, also in relation to forest fragments that are important both for biodiversity and for the thermoregulation of the cows.

OUTDOOR DOMESTIC CATS AND WILDLIFE

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Although some people might disagree, it has never been shown that cats allowed, or living, outdoors are the main cause for the disappearance of endemic wildlife on the species level on mainland continents - as opposed to oceanic islands. Why are the results of published studies purporting to do this (reported widely in the media) questionable and what do we need to correctly examine the role that outdoor cats actually play? The answers to many questions need to be integrated before any conclusions condemning or exonerating free-roaming cats can be drawn: Do studies based on prey 'carried home' reflect the actual predatory activities of cats? What proportion of prey is consumed, or abandoned 'in the field'? What do gut-analyses of road-killed cats and those shot in wooded areas reveal about their predatory behaviour? Is what we see in urban and suburban areas, or even villages in the countryside, representative for cats across a larger distribution area? Do extrapolations of data on total numbers of prey killed to a much larger area (e.g. an entire state or country) have any meaning at all when these are not presented in light of the entire population of that/those prey species and their yearly production rates? Is the predation rate by cats sufficient to move a (bird-) prey population into "sink" status? Preliminary data, which will be mentioned, are available on all of these questions but at best piecemeal and certainly not integrated enough to allow a general recommendation. More field research is needed, but from well-designed studies whose results are cautiously, and without emotion, interpreted. An additional, potential problem caused by free-roaming domestic cats could be interbreeding with the protected European wildcat, *Felis silvestris silvestris*. One recent study on the edge of the wildcat's distribution range indeed found such evidence, but concluded that interbreeding was not (yet) a problem for the protected species at that location, although continued monitoring was recommended.

If domestic cats are 'found guilty' of either potential problem (or others), then only measures that also consider the cats' welfare and the benefits that they bring to millions of people should be recommended. Suggestions on how to accomplish this will be made.

CONTROLLING POPULATION GROWTH WHILE ENSURING WELFARE AND FUTURE REPRODUCTIVE POTENTIAL IN COOPERATIVE BREEDING PROGRAMMES IN ZOOS AND AQUARIA

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Zoo and aquarium members of the European Association of Zoos and Aquaria (EAZA) work together to cooperatively manage species to ensure a reliable source of healthy animals in the future, with the goals of maintaining demographic stability, preserving genetic diversity, and sustaining behaviourally competent individual animals. Every successful breeding programme will reach a stage where its demographic targets are met and/or space capacity is filled, and further growth needs to be controlled. Even before that stage, certain individuals may need to be kept from breeding for shorter or longer periods, to optimise the retention of gene diversity. In addition, phenomena such as uneven sex ratios at birth, or harem like breeding structures may result in more breeders being required from one sex than the other. This presentation will clarify the spectrum of options available to, and used by zoos and aquaria, with an evaluation of potential pros and cons in terms of behavioural, medical and reproductive consequences and future reproductive potential. Categories of strategies that will be addressed are separation of the sexes, contraception, castration or sterilisation and management euthanasia. Depending on species specific characteristics and experiences, the level of scientific data available, contraceptive products available in particular countries, differences in legislation and cultural aspects, different EAZA institutions in different nations and regions often end up using different approaches, so that on a breeding programme basis, often no single method, but a selection of different methods are being utilised. The presentation will also highlight the sizeable need for detailed and systematic recording of species specific experiences, evidence based learning and scientific research to address the vast number of outstanding questions in this field.

FERAL ANIMALS AND MULTIPLE SPECIES MANAGEMENT: ANIMAL WELFARE IMPLICATIONS

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Feral animals have become an emerging problem in many regions of the world. Livestock and pet animals are becoming invasive in natural areas, affecting other species and their habitats. We discuss some ethical and practical consequences of feral animals, such as damage to property, economic costs, and disease transmission, as well as social attitudes for several species in Chile. Donkeys compete with guanacos and vicuñas in the Atacama desert and impact on livestock farming, livelihoods and native biodiversity. Abandoned llamas are hybridising with endangered guanacos in the Atacama desert resulting in genetic erosion. Dogs and cats are predating and competing with wild carnivores in the Atacama, Mediterranean zone and temperate rainforest of Southern Chile. We monitored and mapped the distribution of these species using camera trapping and detected overlap between carnivores, wild ungulates and livestock inside and outside protected areas. The ethical and conservation consequences of alternative methods for control are discussed and policies and management actions are proposed.

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MANAGEMENT OF CROATIAN SHELTERS AND DOG MORTALITY

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Association between shelter management by various organisations and dog mortality, apart from legal euthanasia, was observed in the study. In Croatia, there are 19 registered shelters for stray animals including dogs, which are managed either by non-governmental (NGO) or veterinary organisations (VET), with the exception of one municipal-managed shelter. Analysed data were collected in 2014 from databases of 8 shelters (42.1%) as part of the Shelter Quality Protocol development – protocol for assessment of shelter dog welfare. All the selected shelters (including the municipal-managed shelter) are facilities with no-kill management policy, as the protocol requires assessment of dogs that have been kept in the shelter for at least 3 months and by the Croatian legislation euthanasia is legal after 60 days. The mortality assessment included adult animals (>6 months) euthanized due to health or behavioural problems and dead without euthanasia.

Of the study shelters, 62.5% (n=5) were managed by NGO and 37.5% (n=3) by VET. NGO shelters had no employees and based their activities on voluntary work and agreements with local veterinary clinics, while VET shelters had at least one full-time veterinarian and one veterinary technician. The average continuously present adult dog population in NGO shelters tended to be higher in NGO than in VET shelters (174.4 *vs*. 46.3 dogs; P=0.052). On annual average, 4.2 dogs were euthanized in NGO shelters, all due to health problems, as compared with 21.4 dogs in VETshelters, with the same share of animals euthanized for health (P>0.05) and behavioural problems(P=0.051).Regarding dead animals without euthanasia, there was no statistical difference (P>0.05) between NGO and VET managed shelters (12.8*vs*. 34.3 dogs/year).

Study results suggest that the shelters managed by NGO tend to provide better animal welfare in spite of the higher number of dogs as compared with VET shelters, but with a lower rate of euthanasia due to behavioural problems. However, is it really so?

WILDLIFE WELFARE MANAGEMENT: A CONCEPTUAL, LEGAL AND ETHICAL CHALLENGE

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Wild animals suffer a significant impact within their living conditions; this can be the result of direct human management programs, but also of more indirect human activities within their environment. This human influence on the living conditions of wild animals implies that we can speak of moral responsibility towards non-kept animals. This can be translated into duties with regard to animal welfare, animal integrity or wildlife management. Despite the human influence of wildlife and the related moral responsibility, the socio-political and ethical problems that arise with regard to the welfare of free living wild animals is still basically an unexplored area. The majority of research still focuses on the welfare of kept animals. As a result, it is unclear how to translate the debates on moral obligation with regard to animal welfare into questions of policy and legislation in the field of wildlife. Given the many occasions in which humans and non-kept animals interact this is an urgent topic to look into.

We aim to present the results of a pilot study, based on case studies from three European countries (the Netherlands, Spain and the United Kingdom). It provides a first presentation and analysis of the administrative frameworks that are used to deal with welfare questions related to non-kept animals in the three countries and it discusses some of the differences and similarities. The aim is to identify and try to define the responsibilities that each of the three countries has established to prevent and manage wildlife welfare problems, and to analyse how this could be applied in cases of welfare management. The results suggest that there are genuine differences and inconsistencies in application, both between and within the countries' policies regarding the welfare of non-kept animals. Furthermore, the results show the lack of a clear welfare definition in the policy and legal documents that can cover welfare issues related to wild living animals. In this sense, the applicability of the available instruments seems to be subject to interpretation, which translates into disagreements between stakeholders. Finally, we show the need (a) to development further ethical analysis of moral responsibilities towards wild animals; (b) to work on an analysis of animal welfare conceptions in the context of non-kept animals; and (c) provide an in-depth political discussion on the potential responsibilities that humans hold towards non-kept animals, which should include the moral views of society and the latest scientific definitions about wild animal welfare.

NEW DIRECTIONS FOR SUSTAINABLE ANIMAL PRODUCTION SYSTEMS AND THE ROLE OF ANIMAL WELFARE

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Truly sustainable animal and plant production systems are urgently needed. A system or procedure is sustainable if it is acceptable now and if its effects will be acceptable in future, in particular in relation to resource availability, consequences of functioning and morality of action. An animal usage system may be unsustainable because of depletion of resource, accumulation of a damaging product or any effect that the general public find unacceptable, e.g.: inefficient usage of world food resources; adverse effects on human health; poor welfare of animals; harmful environmental effects such as low biodiversity or insufficient conservation; unacceptable genetic modification; not being "fair trade" in that producers in poor countries are not properly rewarded; or damage to rural communities. Any of these inadequacies could result in the quality of the product being judged as poor.

Animal welfare and other aspects of sustainability are better than the average in animal production when cattle, sheep, goats or pigs exploit woodland. The trees may have edible leaves or fruits and often produce marketable wood. They usually provide a good environment for animals. The breakthrough in silvopastoral systems is three layer plant production, which includes pasture, shrubs with edible leaves and trees that may also have edible leaves. The production of leaves and other material that can be eaten by the animals is much greater than can be achieved in pasture-only systems. In tropical and sub-tropical silvopastoral systems there can be higher production of cattle and other animals, greater biodiversity, better animal welfare and more worker satisfaction than in pasture-only systems. Animal welfare can be better because of: nutritional improvement resulting from shrub and tree intake; thermal comfort resulting from more shade; less fear because of concealment; better health because of more predators of ticks and flies; less risk of cancers and other diseases caused by too much direct sunlight; better body condition because of nutrient availability, shade and less disease; better social behaviour; and better human-animal interactions.

Reference:
Broom DM, Galindo FA and Murgueitio E. 2013. Sustainable, efficient livestock production with high biodiversity and good welfare for animals. *Proc. Roy. Soc. B. 280, 20132025.* doi.org/10.1098/rspb.2013.2025

INDUSTRIAL LIVESTOCK PRODUCTION: THE TWIN MYTHS OF EFFICIENCY AND NECESSITY

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It is widely assumed that food production must increase by 70% to feed the growing world population and accordingly that further industrialisation of livestock production is essential. This would result in poorer welfare as even with good stockmanship industrial systems generally have a low potential for delivering satisfactory welfare outcomes.

In fact a large increase in food production is not necessary. We already produce more than enough to feed the population of 9.6 billion expected by mid-century. However, over half this food is wasted: 25% perishes post-harvest due to poor storage or is thrown away at retail or consumer levels and 9% of global crop calories are used for biofuels or other industrial purposes. 36% of the world's crop calories are fed to animals but three-quarters of this is wasted due to the low efficiency with which animals convert cereals to meat and milk. The challenge lies not so much in producing more but in wasting less.

If waste in all the above forms were just halved the anticipated population of 9.6 billion could be fed without increasing production. Further industrialisation of animal farming would not be necessary. Nor is it desirable as it is an inefficient use of the world's resources. Industrial livestock production is dependent on feeding grain to animals. For every 100 calories fed to animals in the form of human-edible crops, we receive on average just 17-30 calories in the form of meat and milk. This is a wasteful use not just of these crops but of the land, water and energy used to grow them. Per unit of nutrition delivered industrial livestock production pollutes more water, uses more surface- and ground-water and requires more arable land than pasture-based farming and integrated crop-livestock systems.

Further expansion of industrial livestock production will have one of two consequences, probably both. Its increasing demand for cereals will drive further intensification of crop production and the concomitant use of monocultures, fertilisers and pesticides. These will erode biodiversity and impair soil quality particularly as regards loss of soil organic carbon. Alternatively, the additional demand for feed grain will fuel expansion of cropland into forests and grasslands leading to pressure on wildlife through habitat loss. The only approach that avoids these two harmful alternatives is to substantially reduce grain-based animal production. This will entail decreased consumption of animal source food in the developed world which would also deliver health benefits.

MINI LIVESTOCK: THE ROLE OF EDIBLE INSECTS IN WELFARE FRIENDLY FARMING

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The human population is predicted to reach 9 billion by 2050. This will negatively impact animal welfare, as intensive livestock farming increases in order to satisfy demand for meat protein. One UN proposed solution is to encourage entomophagy. Insects are already eaten in 80% of the world's nations and are high in protein and essential nutrients.

The welfare needs of edible insects can be met easily in respect of temperature, humidity, light and shelter. Their nutritional requirements are not complex and they can be fed on unwanted vegetation or animal waste products. Further, space and social needs are easily combined as most species naturally live in 'social' groups (e.g. mealworms and cockroaches) and have small home ranges.

Whilst it is clear that they respond to aversive stimuli, how they perceive pain is unclear. This notwithstanding, insect farming avoids invasive / fear-provoking techniques common to the management, transport and slaughter of farmed fish, birds and mammals. Preventative health measures do not require antibiotics nor aversive procedures such as beak clipping, dehorning, castration, artificial insemination, farrowing crates or forced weaning of offspring. Insects can be humanely slaughtered using hypothermia (with the associated anaesthesia effects) by being refrigerated, prior to being killed by freezing.

The benefits of insect farming are also environmental. Crickets reportedly require 1000 times less water than beef to produce a kilo of meat. Commercial insect farming emits significantly less methane and ammonia compared to cattle farming. Furthermore, insects' superior feed conversion ratio and minimal space requirement means they have less impact on land use, and using them as a primary food source will slow the rate of deforestation currently occurring for pastoral land or feed crops. Finally, insect farming enables the de-globalisation of food production and increases food traceability.

Commercial farming of insects will require legislation to ensure welfare and hygiene standards and research into issues of bio-safety (e.g. zoonoses / escape of non-native species). Additionally, collaborations between animal scientists, human psychologists and anthrozoologists are crucial to accelerate the globalisation of the insect farming industry and drive a change in attitudes and behaviours towards welfare-friendly meat choices. The latter aspect will be the focus of this paper.

THE DEVELOPMENT OF HUMANE RODENTICIDES FOR RATS AND GREY SQUIRRELS

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Pest species such as mice, rats and grey squirrels cause significant damage to agriculture, forestry and native species in the United Kingdom (UK). Anticoagulant rodenticides are currently the predominant control method for managing the impact of these species. There is widespread concern about humaneness, persistence, bioaccumulation, risks to non-target species, and resistance in target populations to anticoagulant toxins. The aim of the project was to develop a new class of compounds that are relatively more humane than the anticoagulants. These compounds induce the formation of methaemoglobin (MetHb) in the red blood cell, which reduces the capacity of blood to carry oxygen to tissues and causes hypoxia, depressed consciousness, respiratory depression and leads to death over a shorter time period than anticoagulant agents.

Sixty potential MetHb inducing candidate compounds were identified, synthesized and tested *in-vitro*. Of these the most potent compounds where tested *in-vivo* in rats and grey squirrels. In grey squirrels it was found that with all compounds tested there were minimal signs of toxicity when using between 120 and 240 mg/kg, with all animals surviving or being dispatched whilst showing limited signs of toxicity. It was concluded that squirrels were insufficiently sensitive to the compounds tested.

In-vivo testing in rats of all the compounds found that only para-aminopropiophenone (PAVP) showed promise, with an acute oral toxicity of (LD_{50}) 42.2 mg/kg in female rats. The time to death from methaemoglobinaemia in rats was significantly shorter than for anticoagulants (female 67 $\pm$ 16; male 354 $\pm$ 71), with no obvious signs of distress and pain. In a further experiment, rats were examined for any neurological deficits following sub-lethal poisoning with PAVP. After the initial signs of toxicosis signs of recovery began 3-6 h post-dosing, with all animals showing no outward signs of poisoning within 48 h. Over the 14 day monitoring period there was no significant overall difference in performance between PAVP treated and control rats in any of the neurological tests. Death and the sub-lethal effects of methaemoglobinaemia appears to be relatively more humane than that reported for anticoagulant poisoning.

DOES CULLING IMPROVE THE WELFARE OF ZOO ANIMALS?

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It has been widely reported that there is a significant difference in how most European and North American zoos treat "surplus" animals. European zoos typically create surplus by allowing animals to reproduce freely, which then requires culling for population control, while most North American zoos attempt to prevent surplus through contraception, neutering, and separation. We report the results of interviews conducted with zoo directors, as well as other personnel responsible for zoo population management, about the role of culling in managing zoo populations. The interview responses serve as a starting point for discussing the particular question of whether there are *welfare* reasons for preferring the European to the North American model of handling surplus animals.

The most commonly cited reason for preferring the European model is that routine culling maximizes the genetic diversity of captive populations. However, this argument assumes that individual animals must be sacrificed for the sake of the population as a whole, which *prima facie* makes the North American model much better for looking after the interests of the affected animals. We draw from the results of our interviews in order to provide reasons to think that this conclusion is not as straightforward as it may seem.

First, current methods of birth control frequently have negative impacts on animal welfare. Contraception, for example, can have significant psychological effects, negatively impacting both the individual and the population as a whole. Second, even if birth control didn't cause welfare problems, we argue that natural reproduction, birth, and rearing of offspring can foster good animal welfare. Third, culling animals for population genetic reasons can potentially improve the welfare of the animals that will be brought into existence in the future. In light of these three arguments, we argue that a policy which includes culling of surplus animals may actually be conducive to the welfare of zoo animals.

BADGERS, CATTLE, AND BOVINE TUBERCULOSIS: AN ANIMAL HEALTH PROBLEM?

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Bovine tuberculosis (bTB) has been framed primarily as an animal disease problem, with public health implications, and economic costs to the taxpayer and farmers. While policy making is said to be science-led and evidence-based, such delineation of 'the problem' has consequences for: the identification of stakeholders; what knowledges and whose expertise are deemed relevant; the policy options considered; participation mechanisms; and the prospects for just outcomes for human and non-human animals.

Tuberculosis in cattle has history and persistence in parts of the UK, notably with 'hotspots' in Gloucestershire and the South West of England, parts of Wales, and in Ireland. Over the past decade or so general public awareness of bTB has been heightened by the UK Government's 10-year Randomised Badger Culling Trial (RBCT) and the Independent Scientific Group's RBCT Final Report to the UK Parliament in 2007 and, more recently, by the contrasting - and changing - policies of the governments in the UK and Wales.

Focusing on badgers, cattle, and bovine tuberculosis in West Wales, the research explored the relationships between policy making and participation, together with perceptions of justice encompassing farmed and wildlife animals as well as humans. The primary research methodology was in-depth interviews spanning a broad spectrum of interests, including farmers and farming unions, wildlife and conservation organisations, campaign groups, land managers, veterinarians, civil servants, expert advisors, and politicians. In addition, Q-methodology informed a small-scale data gathering exercise at a community 'open day' event, preparatory to trialling it as a tool for facilitating discussion in deliberative groups.

The research argues that:

- bovine tuberculosis is a complex, multi-dimensional environmental issue, involving diverse 'communities of interest' and values;
- recognition of such complexity would enable a broader range of knowledges and expertise to contribute to policy formulation and implementation; and
- participation and public engagement methods and processes grounded in a deliberative philosophical framework - particularly where there are contesting interpretations of knowledge and evidence - may foster outcomes that are more widely accepted and perceived as just to humans and non-humans.

RESPONSIBLE AND COST-EFFECTIVE SOLUTIONS TO ADDRESS THE URBAN CAT OVERPOPULATION CRISIS

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Worldwide concerns over cat overpopulation involve issues of cat welfare, impacts on wildlife populations and public health via disease transfer. To address homelessness, over-taxed animal shelters and unnecessary euthanasia we must consider the collective population of owned cats, unowned free-roaming cats and cats in the shelter system simultaneously because *i*) each category contributes differently to the overpopulation crisis (e.g. differences in neuter rates) , and *ii*) cats move among categories through human interventions (e.g. adoption, relinquishment, abandonment). But how do we make cost-effective decisions to allocate scarce resources to best address the urban cat overpopulation crisis? In this presentation, we use a multistate matrix population model to determine the factors driving population dynamics of cats in any urban area in North America. We then highlight how integrating the population model with decision-theory can identify the optimal solution to address cat overpopulation by providing the time, location and sequence of interventions (e.g. trap-neuter-return, euthanasia, increasing adoption, doing nothing) that will maximize the probability of reaching our objective (e.g. reducing unowned cat populations or euthanasia rates in shelters to zero, or both) at the minimal cost.

Applications of our model could serve many purposes. For example, by iterating the model with successively smaller annual operating budgets, we can determine the tradeoff between the likelihood of reaching objectives over realistic time frames such as years or decades. Additionally, our model could provide any urban area a cost-effective strategy of the actions, timing and location of implementation to address the local cat population challenges whereas simulations across all urban areas in North America would provide the combined resources necessary to address the cat overpopulation crisis at both national and international levels.

HUMANE MANAGEMENT OF KANGAROO POPULATIONS IN SOUTH EAST QUEENSLAND

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While the conservation status of macropods as a whole presents a bleak picture, in contrast, the eastern grey kangaroo is one of the few species to have benefited from habitat changes occurring since European settlement. This is especially true in urban and peri urban areas where a constant availability of food and water combined with low levels of predation have combined to facilitate a high reproductive rate amongst kangaroos, such that these populations now require effective management strategies to ensure the sustainability of both habitat and species into the future.

This situation is becoming common in south east Queensland as residential and industrial development lock remaining kangaroo populations into diminishing and isolated areas of remnant bushland and parkland. The inevitable result has been a considerable increase in human-wildlife conflicts where the welfare of the kangaroos is constantly under threat from dog attacks, vehicle trauma and starvation during droughts. Furthermore, as the human population continues to increase, the need for further development of urban and peri urban areas is becoming imperative and effective, humane wildlife population management is now recognised as being an integral part of the modern urban development.

Eastern grey kangaroos thus represent a dilemma in Australian society today with advice about their management ranging from full protection to unrestricted culling wherever they occur in large numbers. However, traditional lethal methods of population control such as shooting or poisoning are not suitable from both practical and socio-political reasons, and other humane strategies need to be found. A number of non-lethal management techniques have been proposed for use in populations of eastern grey kangaroos particularly fertility control and translocation. While producing a reduction in the target population, such population management strategies may also have a number of disadvantages. In particular these can include the potential behavioural effects and welfare issues for the animals concerned and the substantial costs involved.

This paper discusses the challenges and involved in managing eastern grey kangaroo populations in south east Queensland and the different management strategies that might be implemented. In particular it outlines current research which has investigated the effectiveness and welfare implications of fertility control and translocation, and the potential for these techniques to contribute to the humane management of this species.

A MODEL TO FACILITATE DECISION MAKING IN WILDLIFE MANAGEMENT, INCORPORATING WELFARE COSTS, EFFECTIVENESS AND POPULATION DYNAMICS

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Many wildlife species come into conflict with human interests. These may include conservation, economic or health interests. Society increasingly demands that mitigation of such conflicts should minimise welfare impacts. Comparing the welfare costs accruing from different mitigation actions is complex, and it cannot be assumed that non-lethal methods impose the lowest welfare costs. In many cases the time frame in which action needs to be undertaken and the resources available to undertake the action are constrained. Consequently, tools are required to aid rapid decision-making when faced with multiple options for mitigation. Such decision making models should ideally incorporate the welfare costs of the different actions, with the total welfare cost reflecting the total number of animals affected combined with the welfare cost per individual. The total number of animals affected is usually at least partly dependent on the population biology of the target species, especially in terms of the scale and frequency of actions required for effective mitigation. EFSA have recently published guidance on the use of risk assessment to facilitate effective quantitatively based comparisons of animal welfare between different animal husbandry systems. A similar approach is here applied to wildlife management. Integrating this risk assessment of different mitigation actions with knowledge of effectiveness and population dynamics will provide an innovative decision making tool. Such an approach will be illustrated using the Norway rat as a case study.

FARM LIVESTOCK POPULATION MANAGEMENT- HOW MANY IS ENOUGH?

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Livestock is considered as a source of income, draft power, manure fertilizing field, a medium of trade for barter system and above all an important source of livelihood.

Farm livestock population management has rapidly increased and intensified and this is a response to increased demand of livestock products, especially meat and milk. Not only that but also the livestock population has rapidly increased here in developing countries because the livestock sector contributes more than 35% to agricultural Gross Domestic Product (GDP) and is one of the fastest growing agricultural sub-sectors. The livestock sector has been experiencing what has been coined the "Livestock Revolution." Population growth , urbanization and most importantly, increasing income have resulted in a rapid increase in demand for livestock products, which is likely to contribute well into the future and the farm livestock population will double in ten years. Livestock is a major contributor to food and nutritional security and serves as an important source of livelihood for nearly one billion poor people in developing countries.

The increase in farm livestock populations has meant consequent impacts on the environment due to management changes such as increased use of commercial feeds and poor waste management practices. Although traditional livestock systems have provided a livelihood main stay, particularly for farmers here in Africa and other developing countries, they now face challenges from a degraded natural resource base, negative impacts of climate change such as prolonged drought and this is happening here in Zambia now.

Farm livestock population intensification is bringing about structural changes in livestock systems particularly within the poultry and swine subsectors which provide large returns per unit input and offer farmer economies of scale.

However, there are also current environmental, diseases and welfare concerns when animal rearing occurs in small spaces with little waste absorptive capacity.

The multifunction role and contributions of farm livestock population and management are varied and numerous, but are currently inadequate to meet project needs.

Vigorous development strategies are needed to enhance nutritional and food security and to improve livelihood of developing countries.

LEARNING TO SHARE SPACE WITH WILD ANIMALS

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Many populations of wild animals are considered to be a nuisance to humans because they are perceived to impede on human values (e.g. lives, livelihood). Likewise, species that have become invasive after being introduced into new landscapes are of concern because they can impact on biodiversity values, causing declines in the ranges of native species and even extinction. Whether native or non-native, the management response is often to eradicate or reduce populations of these species and to attempt to return ecological communities to a restored ancestral state. The problem is that justification for intervention is frequently blurred; a conflation of anthropocentric values and environmental morality. Not only does this manifest in widespread killing and poor welfare for many wild animals, badged under the auspices of managing for the greater good, it promotes disengagement and fear of wild animals in local communities. Compassionate conservation, which promotes the inclusion of individual welfare in conservation practice, is reframing how conservation targets are established and actively encourages coexistence with wild animals in ways that incorporates their welfare and well-being. In this talk I highlight how the science and misconceptions about kangaroos, an often unwanted wild animal in Australia, are misused such that entrenched human needs dominate decision making and promote unnecessary exploitation and persecution of this iconic group of animals. I then provide evidence from compassionate conservation research where we have actively promoted local community engagement with conservation and animal welfare science and local kangaroos. Since beginning this research project, a marked increase in positive sentiment towards kangaroos and a decrease in persecution has resulted. By linking attitudinal and education programs for people to sound and independent scientific research we are providing an inclusive way for all stakeholders to participate in re-envisaging how to coexist with kangaroos. This simple approach has resulted in better welfare outcomes for these wild animals and greater empathy for them as constituents in the wider community.

DOING MORE WITH LESS: LAND-USE PLANNING AND COMMUNITY-BASED INTERVENTIONS TO PROMOTE THE HUMAN HEALTH BENEFITS OF COMPANION DOGS AND MINIMISE ADVERSE IMPACTS ON THE ENVIRONMENT, WILDLIFE AND FARM LIVESTOCK.

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With pet dogs accompanying people on half of all visits to the United Kingdom's countryside and urban greenspace, these companion animals provide an enduring daily link between people, wildlife, farm animals and the environment. Research highlights how dogs can be the catalyst for outdoor activity that enhances human health and well-being; this reflects the multi-disciplinary One Health principle of interdependency between the welfare of human and other animals and the environments in which they exist. Equally relevant to the One Health concept are the adverse social, economic and environmental impacts that dog walking can cause, which governments and land managers have traditionally addressed by ever-more restrictions on where dog walkers can go and what they can do. The challenge is thus how to balance the virtues of dog walking and companionship while also minimising negative impacts on competing land-use interests and the welfare and sustainability of other populations of kept and wild animals. Recent applied research and practical projects in England and Scotland, combined with the reality of fewer resources for enforcement-based management, have shown how putting the benefits of companion dogs – and the aspirations of those owning them – at the centre of management interventions, can produce more holistic and sustainable outcomes that better embrace One Health. For example, European Union wildlife protection laws and the recognition that there will be a pet dog in a quarter of new homes, have forced house-builders in south-east England to provide dog-friendly greenspace that is more attractive for dog walking than nearby farmland and wildlife areas. Commercial dog walkers (CDW) are increasingly being restricted, but in Scotland business development workshops have shown that CDW can be highly motivated to become community advocates for responsible dog ownership, and – for example – increase awareness of the little-understood need to remove dog faeces from grazing land, due to growing evidence of *Neospora caninum* causing abortion in cattle. Making it easy for dog walkers to "do the right thing" by providing reliable and relevant information about how and where to get desired experiences – as opposed to simply telling them what not to do – has also eliminated dog attacks on grazing livestock and engaged dog owners in environmental guardianship. Related case studies from three continents and the application of Ajzen's Theory of Planned Behaviour, illustrate universally-relevant principles of how to promote the benefits and minimise the impacts of keeping and exercising dogs at a community level.

[1]*Institutional and contractual affiliations with a range of government bodies and NGOs including: Cairngorms National Park Authority; Forestry Commission; Hampshire County Council; the Kennel Club; Natural England; Office of Public Works, Ireland; Scottish Natural Heritage; Waltham / Mars UK.*

MAJOR DEFICIENCIES IN STRAY DOG POPULATION CONTROL STRATEGIES IN SERBIAN MUNICIPALITIES

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Stray dog populations present a common problem in most of the Balkan countries, including Serbia. Due to the lack of responsible dog ownership institution, regulatory framework and public awareness of animal welfare, these problems have existed for several decades. However, they became more evident with the process of political integration of Serbia into EU and with an attempt to harmonize national legislation on animal welfare with the EU legal framework. Over the last decade many Serbian municipalities have been trying to solve problems related to stray dogs but without much success. This paper outlines some of the main reasons for shortfall in stray dog population control in Serbia based on oral and anecdotal evidence, analysis of the written stray dog control strategies, data collected from stray dog control programmes, evidence gathered from registered dog shelters and analysis of questionnaires completed by representatives of stray dog control services, in municipal and private dog shelters in 15 Serbian municipalities.

Following deficiencies were observed:

1. Absence of preliminary assessment, both of the population size and composition, carrying capacity, as well as failing to identify the source of animals which has led to poorly planned and targeted interventions. In addition there was no cost benefit analysis taking into account the available resources and/or demographic survey of public attitudes and human behavior towards owned and stray dogs.
2. Absence of well-defined objectives and methods regarding the population size control, bite prevention and public health, disease prevention and control. In other words, aims of the adopted strategies with regards to the aforementioned remain unclear.
3. Absence of shelter policies with regard to health and welfare, adoption and rehoming of dogs, as well as length of time that dogs are kept in shelters and no guidelines what measures need be taken to prevent overcrowding of shelters.
4. Absence of clear competencies and lack of adequate education and training for dog control staff, and shelter operators.
6. Absence of cooperation with other stakeholders including NGOs.
7. Absence of specific penalties and failure to enforce the existing with regard to dog abandonment and irresponsible ownership.

It is evident that deficiencies existing in stray dog control strategies in Serbia are numerous. They are linked to the lack of understanding of the problem, and instead resorting to simplistic, popular solutions without clearly appreciating all the relevant factors influencing the population size and dynamics which need to be taken into consideration when planning a targeted and sustainable intervention.

STRESS PHYSIOLOGY OF GAME ANIMAL CAPTURE AND CULL: WELFARE AND PRODUCTIVITY FOR THE WILDLIFE INDUSTRY

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Wildlife ranching, or the management of wild animals for profit from kill, is one way in which to increase the cover and density of wild mammals on land that would otherwise likely be given to domestic livestock. Wildlife ranching is a growing industry in South Africa. Most game reserves are fenced. Where wild animals are fenced in areas with a lack of predators, there is a need to reduce a population that would otherwise expand until starvation or disease provided a check on population growth. Control of population is therefore a necessary result, as well as a goal (via harvesting), of game ranching.

There are essentially two modes of free-living population control in the absence of natural predators; i) capture and translocation, and/or ii) cull (kill). Translocation can provide income to the owner of the stock. Cull can provide income via biltong (meat) or trophy.

The expanding wildlife ranching industry in South Africa is driven ultimately by a demand for trophy and biltong animals, which fuels the wildlife translocation business. Each year in South Africa, approximately one million game animals are shot for biltong, 63,000 killed for trophy, with 130,000 animals translocated. There are therefore major welfare and productivity implications of capture and translocation.

Over 50 wildlife capture and translocation teams operate in South Africa and elsewhere; principally moving ungulate mammals. However, this trade persists with limited scientific evaluation of the physiological stresses on the animals or how to minimise them. Physiological stress is known to compromise animal health, welfare, and consequently value. The benefits of this research therefore go beyond animal welfare, and importantly this provides additional motivation to wildlife managers and the industry to promote good practice that benefits animal welfare by reducing animal stress.

This research evaluated physiological stress of South African game animals sampled post-capture or post-kill. Physiological parameters analysed include blood chemistry, salivary cortisol, and rectal temperature. Over one thousand animals were sampled across a variety of species with variable capture and cull circumstances. Data and results will be presented.

The aim of this research is to evaluate the factors that influence physiological stress within captured and culled South African ungulates, and to subsequently make recommendations to the game industry to reduce the negative effects of stress on the animals.

THE FUTURE OF FARM ANIMAL WELFARE IN A CHANGING CLIMATE

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Poor health and welfare in the animals raised for human consumption is not only important from an ethical standpoint but may also lead to condemnations at slaughter, which detract from farmer profit and add to food waste, both directly and indirectly, through meat and crop (i.e. feed) losses, respectively. Chicken is now the most popular source of meat in the UK and consumption is expected to rise considerably over coming decades. More than 860 million broiler chickens were slaughtered for their meat in the UK during 2010 alone, averaging around 14 chickens per person and up 100 million birds from the number slaughtered in 2000.

Routine ante- and post-mortem inspections at slaughter offer a unique opportunity to assess the health and welfare status of farm animals at population level. We make use of such data recorded at slaughterhouses throughout Great Britain and shared by the Food Standards Agency (FSA) in conjunction with the Department for Environment, Food and Rural Affairs (DEFRA). A temporal analysis of data collected from 6.8 billion broiler chickens, spanning 11 years (2003-2013 inclusive), illustrated long-term and seasonal trends in the prevalence of ascites, cellulitis and emaciation, amongst other conditions. Geographic Information System (GIS) mapping software facilitated investigation into the spatial distribution of conditions (e.g. ascites, dermatitis, joint lesions and respiratory disease), whereby prevalence rates are presented at county-level.

Multilevel modelling of data collected from over 376,000 batches of broilers (totalling ~2.4 billion individuals) between January 2011 and December 2013 was then used to determine which birds may be most susceptible to the common health and welfare conditions identified at slaughter, considering the production system in which they were raised (intensive indoor, extensive indoor, free-range, organic), on-farm stocking density (<33kg/m^2, 33-39kg/m^2, 39-42kg/m^2), broiler breed, age at slaughter, and season at the beginning and end of life. Given that seasonal patterns have been observed in the prevalence of several conditions, with strong associations between prevalence rates and local climate data accessed from the Met Office, we are currently making use of modelling approaches used within human health epidemiology and climate change research to examine the effects of weather on broiler chicken health and welfare. These findings will then pave the way for forecasting future prevalence rates under alterative climate change scenarios.

SCIENTIFIC PROGRAMME:

Poster Abstracts

List of posters:

[1] = Session 1 on 14th July.
[2] = Session 2 on 15th July. Both begin at 13.20

- **Aguirre F, M Mery, O Acevedo, CL Barrios, C Ugaz and B Zapata** (University Mayor, Chile)
  'Evaluation of attitude of farmers surrounding Cordillera Nahuelbuta related to livestock welfare and responsible pet ownership' [2]
- **Baker L and A Boesel** (Wesleyan University, USA; University of Technology Sydney, Australia)
  'Welcoming unwanted wildlife into our communities' [2]
- **Bata I, Z Horvat, D Konjevic and I Petak** (Centre For Wild Animal Care and University of Zagreb, Croatia)
  'Human-roe deer interactions in urban and suburban area of Zagreb and the Zagreb county' [2]
- **Beltrami E, R Alvarado, F Novoa and C Bonacic** (Pontificia Universidad Catolica de Chile, Chile)
  'Welfare of dogs and wild foxes in desert and Mediterranean ecosystems of Chile' [1]
- **Beltrami E, C Osorio and C Bonacic** (Pontificia Universidad Catolica de Chile, Chile)
  'Foxes and small wild felids co-occur spatially with domestic dogs in a highly disturbed landscape in the Mediterranean ecosystem of central Chile' [1]
- **Calduch S, M Pifarré, C Durà, J Ventura, S Palazón and C Pedernera** (Aiguamolls de l'Empordà Wildlife Center and Department of Natural Environment, Spain)
  'Measures for controlling American mink (*Neovison vison*) populations in the Aiguamolls de l'Empordà Natural Park' [1]
- **Comazzi C, M Gamba, S Filacorda and S Mattiello** (Università degli Studi di Milano, Torino e Udine, Italy)
  'Management and implications of a new predator species in north-eastern Italy: the Golden jackal (*Canis aureus*)' [2]
- **Corgatelli G, S Mattiello, S Colombini, M Ferloni, M Test and GM Crovetto** (Università degli Studi di Milano, Amministrazione Provinciale di Sondrio e Como, Italy)
  'Impact of Red deer (*Cervus elaphus*) on forage crops in a protected area' [1]
- **Draper C, D Ramp and L Baker** (Born Free Foundation, UK; University of Technology Sydney, Australia; Wesleyan University, USA)
  'Why compassionate conservation can improve the welfare of wild animals' [1]
- **Gyllenhammar A and K Alvåsen** (Swedish Agricultural University, Sweden)
  'Animal welfare education in primary schools of Lilongwe, Malawi' [2]
- **Heizmann V, E Gilhofer, I Windschnurer and J Troxler** (University of Veterinary Medicine Vienna, Austria)
  'Evaluation of population size, environment, health and behaviour of stray and feral cats in Vienna' [2]
- **Herbst R and W Phillips** (Welttierschutzgesellschaft e. V, Germany)
  'Vets United - A veterinary training programme to improve veterinary care where it is most needed' [2]
- **Hiby EF and A Hammond-Seaman** (International Companion Animal Management Coalition, USA; RSPCA, UK)
  'Assessing the impact of dog management interventions' [1]

- **Hosie CA, TE Smith, AM Holmes, C Emmans and KM Norris** (University of Chester, UK)
  'Addressing welfare issues in amphibian translocation and reintroduction with behaviour and physiology' [1]
- **Kay A, JB Coe and I Young** (University of Guelph and Public Health Agency of Canada, Canada)
  'A scoping review of published research on the population dynamics and control practices of companion animals' [2]
- **Kristiansen TL, L Könyves and V Jurkovich** (Szent István University, Hungary)
  'Assessing animal welfare in tie-stall and loose-housing dairy cattle farms in Norway' [1]
- **Magnani D, N Ferri and S Messori** (Istituto Zooprofilattico Sperimentale dell'Abruzzo e del Molise "G. Caporale", Italy)
  'Perception and information of Italian veterinary students on animal welfare' [2]
- **Maltseva-Williams M, CJ Nicol and TG Knowles** (University of Bristol, UK)
  'Replacing soya with Faba beans in laying hen diets: Effects on feather pecking behaviour, welfare and performance' [1]
- **McBride EA, JAE Josephs, R Bright and R Bush-Evans** (University of Southampton, UK)
  'Perceptions of animals and choices of meat to eat: A cohort study' [2]
- **Millsopp S, C Westgarth, R Barclay and M Ward** (Universities of Chester and Liverpool, UK)
  'Companion animal behaviour counselling: Are we solving animal welfare problems or human welfare problems?' [1]
- **Mutonono - Watkiss B, E Fogelberg and E Parravani** (World Animal Protection, UK)
  'Humane and holistic dog population management' [1]
- **Osmar-Vitalich S** (Swedish University of Agricultural Sciences, Sweden)
  'Rabies, dogs and education. A cross-sectional study on the knowledge, attitude and practice in school children in Tamil Nadu' [2]
- **Petek M, E Cavusoglu, E Topal and IM Abdourhamane** (University of Uludag, Turkey)
  'Effects of plastic or wood slatted floor housing system on broiler welfare' [2]
- **Radeski M and V Ilieski** (University "Ss. Cyril and Methodius" Skopje, Macedonia)
  'Age related welfare changes in dairy cows' [2]
- **Radisavljević K, M Vučinić and A Hammond-Seaman** (University of Belgrade, Serbia; RSPCA, UK)
  'Shelter overcrowding influence on dogs health in Serbia' [2]
- **Reaney SJ and LM Collins** (University of Lincoln, UK)
  'The potential mediating effect of personality on the expression and experience of pain in non-human animals' [1]
- **Robinson LM, K Coleman, DH Gottlieb, MJ Adams, I Handel, MC Leach, NK Waran and A Weiss** (Universities of Edinburgh and Newcastle, UK; Oregon National Primate Research Center, USA)
  'Testing a shortened personality questionnaire with captive Rhesus macaques (*Macaca mulatta*) at the Oregon National Primate Research Center' [2]
- **Russo C, A Amici, M Farruggia and M Lo Valvo** (Universities of Pisa, Tuscia and Palermo, Italy)
  'Rearing methods of wild rabbits (*Oryctolagus cuniculus*) for reintroduction in Sicily' [1]

- **Russo C, C Facchini, LE Della Casa, M Ferraguti and S Mattiello** (Universities of Pisa and Milan, Italy)
  'Wolf (*Canis lupus*) predation on ovine Zerasca breed in Massa- Carrara province' [1]
- **Schad KM and K Leus** (European Association of Zoos and Aquaria, The Netherlands; Copenhagen Zoo, Denmark)
  'Population management in zoos and aquaria' [1]
- **Scrase A, F Monte, JC Pritchard, KK Reyher and DCJ Main** (University of Bristol, UK)
  'Strategies adopted by key influencers to promote the uptake of advice on animal health and welfare' [1]
- **Seligsohn D** (Swedish University of Agricultural Sciences, Sweden)
  'Dog bite incidence and associated risk factors. A cross-sectional study on school children in Tamil Nadu' [2]
- **Souza APO and CFM Molento** (Federal University of Paraná, Brazil)
  'Broiler chicken welfare certification at farm level in Brazil' [2]
- **Stamm FO and CFM Molento** (Federal University of Paraná, Brazil)
  'Methods used and reasons given for tail-docking sheep in the state of Paraná, Brazil' [2]
- **van Dijk L, SM Butcher, SM Mullan, DCJ Main and J Jamieson** (University of Bristol, RSPCA and Soil Association, UK)
  'Initiatives to promote farmers' engagement in on-farm welfare assessment' [1]
- **Zuliani A, M Corrazin, A Romanzin, S Salvador and S Bovolenta** (University of Udine and Centro di Ricerca e Innovazione Tecnologica in Agricoltura, Italy)
  'Welfare assessment in multifunctional dairy farms. Are we using the right tools?' [2]

EVALUATION OF ATTITUDE OF FARMERS SURROUNDING CORDILLERA NAHUELBUTA RELATED TO LIVESTOCK WELFARE AND RESPONSIBLE PET OWNERSHIP

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Animal welfare and wildlife conservation are strongly linked when farms are neighbouring national parks. Livestock in poor health and nutritional conditions may compete for pastures with wild ungulates and also transmit infectious diseases. Similarly, irresponsible pet ownership affects wildlife, transmitting diseases to wildlife. Additionally, dogs increase the conflict between carnivores and livestock, since bite and kill domestic animals. In Cordillera Nahuelbuta inhabits Darwin's fox (*Lycalopex fulvipes*), endemic of Chile and critically endangered. The presence of dogs in the park is one of the greatest threat because is common to have unleashed dogs in Nahuelbuta and also are used them to drive cattle grazing freely inside the forest. The present study aims to identify the attitude of farmers surrounding Nahuelbuta National Park related to livestock welfare and responsible pet ownership as a threat to Darwin's fox.

Interviews to residents surrounding Nahuelbuta National Park in the Bio Bio region were conducted. We asked people about knowledge of the concept of animal welfare and responsible pet ownership. Questions such as number and type of animals, knowledge about health care, livestock management practices, if animals are herded with dogs or not, to name some questions were included in the survey.

Eighty five farmers were interviewed (April-May of 2014). From them, 55% say that they have heard about animal welfare, however when they were asked about its meaning 35% of farmers say that "they do not know". A 73% indicates that is "related to the care and protection of their animals" and declared that is good to care about animals because "they are useful". Regarding pets, they have 2.9 ± 1.88 dogs and 1.8 ± 1.53 cats; 82% of people keep their pets outside all the time without control; 22% trains dogs to attack wildlife. A 40% knows the correct frequency of vaccination and only 10% the frequency of deworming; 95% of farmers say they do not castrate their pets because they are male. Regarding livestock, 29% do use any control of grazing methods and 43% moves their animals for summering and wintering. Logistic regression shows no relation between knowledge of animal welfare and measures taken for the welfare of animals and no correlation was found between number of animals and care to them. This information may guide politics measures to improve conservation, sustainable use of livestock and measures to enforce responsible pet ownership in rural communities and consequently reduce conflict between wildlife and farmers.

WELCOMING UNWANTED WILDLIFE INTO OUR COMMUNITIES

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Urban wildlife live and even thrive in our most populous spaces, yet they exist on the fringes of our society – at the whim of our often, simultaneous feelings of affection, empathy, disgust and fear. Unwanted and perceived as 'invading our personal space', wildlife become the victims of both deliberate and unintentional harm when they, for example, enter our homes, physically threaten us or damage our property.

But what would it look like if we welcome unwanted wildlife into our communities? Perhaps we could change our perspective on wildlife and our interactions with them if we proactively (re)designed communities – our buildings, our roads, our personal and communal behaviours – to include the needs and wants of the wildlife that already share our urban environments.

We will present four case studies of cities that have found non-violent methods for resolving wildlife-human conflicts and discuss how these approaches could be used as a foundation for a new architecture inclusive of wildlife. Typically, these methods have been implemented in reaction to direct conflict; however, we propose integrating these strategies in reconsideration of our communal infrastructure. Ultimately, we believe that reconsidered attitudes and communal architecture will help resolve contradictory feelings towards wildlife, resulting in a more compassionate and non-violent community.

HUMAN-ROE DEER INTERACTIONS IN URBAN AND SUBURBAN AREA OF ZAGREB AND THE ZAGREB COUNTY

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Here we present data about complexity of human-roe deer (*Capreolus capreolus*) interactions, its distribution and consequences in urban and suburban area of the City of Zagreb and the Zagreb Country. Current trends show that roe deer are increasingly present and frequently encountered in urban and suburban areas, which brings specific issues and management problems. In Croatia, existing legislation was developed to manage roe deer populations in hunting grounds and protected areas of nature, while there is no clear answer about wildlife management and welfare in urban and suburban areas. This is of special importance in expanding human communities.

During seven years, AWAP received a total of 60 roe deer. Approximately half of them came from the City of Zagreb, and half were brought form the Zagreb County. Most of the patients arrived in AWAP in late spring. Usually brought were fawns only a few months old, while adult animals rarely come as patients, probably due to the capture and transport related difficulties. More frequently, patients were females. The prevailing causes of injuries were collisions with vehicles (25%) or dog attack (12%), and less frequently cause of injuries could be related to environmental conditions (storms), strangling in a fence, in a tank, etc. Juveniles that were not injured stayed in a shelter until they were nurtured (18%), while wounded animals were released when they were cured (12%), or they died (65%). Some animals had to be euthanized due to incurable injuries (5%). Many animals came with multiple injuries (28%); frequently injured body part were legs (21%) and head (12%). The most common injuries were leg fractures and bite wounds, moreover many animals had flyblown, massive bleeding and were in a state of shock.

This data suggests that expansion of suburban areas caused penetration of wild roe deer into established urban areas and increased the quantity and range of affect they have, such as involvement of roe deer in traffic accidents, intrusion in gardens and horticultural damage, as well encounters with pet dogs. Consequently, there is a higher risk of cruelty, and this should cause significant welfare concern. However, there is a possibility of positive interaction between people and roe deer, since people often enjoy seeing deer around their homes. Therefore, we indicate a need to create management systems for urban and suburban roe deer, involving more frequent deer-people interactions, focused on understanding of biology, welfare and safety of all participants.

WELFARE OF DOGS AND WILD FOXES IN DESERT AND MEDITERRANEAN ECOSYSTEMS OF CHILE

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Chile has a serious problem of dog abandonment in cities and rural areas. Lack of quality food, shelter and veterinary care has led to an increase of significant populations of stray dogs or even feral dog packs in rural areas. We aimed to assess the animal welfare status and sanitary condition of free-roaming dogs that coexist with wild foxes in two ecosystems of Chile. Veterinary campaigns and capture efforts were conducted in The Atacama Desert and central Chile during 2012-2013. Domestic dogs (*n*=86) were examined and sampled, they were mainly owned dogs, but 12 of them were captured dogs in the wild. At clinical examination, most of the dogs presented high ectoparasite loads (62% fleas and 49% ticks) and 14% of them showed poor body condition (below 2.5) and multiple injuries. Foxes (*n*=20) presented good body condition and low ectoparasite loads. However, the foxes in the Mediterranean ecosystem showed dermatophytosis, lacerations and limb amputations by snare traps. A sero-neutralization test yielded a higher proportion of seropositive dogs to canine distemper virus in Atacama (*n*=13/27) than the Mediterranean (*n*=4/10). *Rhipicephalus sanguineus* was the predominant tick species found in dogs and *Amblyomma tigrinum* in foxes. However, 3 *A. tigrinum* were obtained from dogs in The Mediterranean area. Ticks were absent in foxes of the Atacama Desert. A PCR analysis of tick samples (*n*= 25) showed a 44% of them positive to *Candidatus Rickettsia andeanae* and 28% to *Ehrlichia canis*. Noticeably, 41% of all ticks from dogs (*n*=17) were positive to Rickettsia. Among the key findings we emphasize that dogs evaluated showed poor welfare and lack of care from their owners. Diseases detected in dogs could jeopardize the fox populations health in both areas. This is the first study that finds the fox common tick in domestic dogs in the central Chile suggesting contact between them. A priority is the control of stray dogs to prevent the formation of feral packs. Future research should focus on the assessment of risk pathogen transmission between species in sites where both species co-occur and particularly, to understand the role of Rickettsia agents for both species and humans.

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FOXES AND SMALL WILD FELIDS CO-OCCUR SPATIALLY WITH DOMESTIC DOGS IN A HIGHLY DISTURBED LANDSCAPE IN THE MEDITERRANEAN ECOSYSTEM OF CENTRAL CHILE

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The study of the spatiotemporal heterogeneity of carnivores is useful to understand dynamics and behavioural strategies of coexistence between carnivores in a human dominated landscape. We conducted a camera-trapping study to explore the spatiotemporal patterns of a mesocarnivores assemblage in central Chile during 2012-2013. A total of 80 camera traps (5,763 camera/days) were deployed following a grid-sampling scheme in a Mediterranean Biosphere Reserve. Here we report the statistically significant pairs of a probabilistic analysis to assess spatial co-occurrence between species. Culpeo fox (*Lycalopex culpaeus*) and domestic dog (*Canis familiaris*) were the most frequent species and showed a random association with a spatial co-occurrence in 50% of the sampling sites. Dogs were detected within forest fragments and a total of 124 events of dogs and foxes in the same sites within 24 hours were observed. The Pampas cat (*Leopardus colocolo*) and guigna (*Leopardus guigna*) pair resulted with significant positive association in the study area and particularly in forest fragments adjacent to agricultural fields and vineyards. However, the small felids also co-occurred spatially with dogs, with a significant positive association in the forest fragments adjacent to vineyards. Although foxes and small cats used the suitable habitat that are still available surrounding the agricultural matrix, there is a high probability that dogs may be shaping the habitat use, spreading pathogens, even harassing native carnivores suggesting that wild animals could have been affected by their domestic counterparts.

MEASURES FOR CONTROLLING AMERICAN MINK (*NEOVISON VISON*) POPULATIONS IN THE AIGUAMOLLS DE L'EMPORDÀ NATURAL PARK

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On a global scale, invasive alien species have been recognized as the second most important cause of biodiversity loss, immediately behind habitat destruction. American mink (*Neovison vison*) were brought to Europe in the 1920's. Some animals escaped from fur farms or were intentionally released and established breeding populations in the wild over most European countries. The American mink is a semi-aquatic, generalist predator considered a threat to bird populations.

The Aiguamolls de l'Empordà Natural Park is located in the north-east of Iberian Peninsula with a surface area of 4,783 ha. The conservation interest of these wetlands is based on the fact that they are home to native and migratory bird populations besides other aquatic animals and plants. From 2003 to 2012, 67 mink were randomly captured in the park. In 2013 based on previous captures and sightings, footprints, and general mink tracks, a battery of 5 cage-traps were used at 11 sites. Different bait (fish, eggs, meat) were used and the traps were checked daily. Trapped mink were sexed, aged, weighed and measured before being humanely killed. Eighty eight minks were captured of which 58% were males and 42% females. Of the females, 54% were adults and 46% sub adults, with a 68% of sexually inactive animals. Of the males, 82% were adults and 18% sub adults, 40% of males presented visible testicles. One interesting result was the concentration of the catches of sub adult females in August–September. Adult males were captured in February-April and August-September. This can be understood in terms of the annual reproductive cycle. Most of the animals were trapped in four sites which can be identified as capture hotspots.

Since total eradication of the mink population is unlikely, and given the geographical characteristics of the park that favour immigration from outside populations, mink trapping may have to be carried out repeatedly. Based on the results, a strategy that considers the monthly distribution of the traps should be implemented in order to use resources in a most effective way. Two peak times for trapping strategy are indicated: one for the pre-nesting bird season (February-April), and the other for the dispersion season (August-October).

Further research should consider the impact of the American mink on the native biodiversity in a wider framework that prioritises interventions based on the impact of all other invasive alien species and also considers all other threats to biodiversity. This framework must also carefully consider welfare issues linked to culling American mink.

MANAGEMENT AND IMPLICATIONS OF A NEW PREDATOR SPECIES IN NORTH-EASTERN ITALY: THE GOLDEN JACKAL (*CANIS AUREUS*)

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The golden jackal is a relatively new species in Italy, where it appeared about 30 years ago in the North-East. This study reports the first outcomes of acoustic monitoring of the species and the first warning of possible human-animal conflicts in Friuli-Venezia Giulia. We carried out 145 jackal-howling sessions in 5 macro-areas from summer 2011 to spring 2013, with an average of 5 emissions/session (679 emissions). We recorded 42 vocalizations, which were then analyzed in order to estimate the number of callers by screening the fundamental frequency of the single emissions within a howl. Jackal presence was confirmed only in 2 out of the 5 monitored macro-areas (Carnia and Carso), but it was stable only in Carso, with a 20% response rate. The response rate decreased with the number of emissions in a session (E1=9.6%, E2=7.1%, E3=8.0%, E4=3.2%, E5=2.5%, E6 and following=0.0%) and the responses were concentrated in February-April and July-August. Acoustic analysis of vocalizations allowed determining the number of emitters: one animal in 18 cases, two animals in 13 cases, three animals in 11 cases. These numbers are lower than those initially estimated during field recording sessions, when up to 5 individuals were supposed to vocalize simultaneously in one session. However, the presence of groups of up to 7 individuals has been recorded by scout cameras in Carso. In this area, three predation events, leading to the loss of 11 sheep, were reported by one farmer during the study period and are now becoming more frequent. In spite of this, the presence of a predator is well tolerated by this farmer, who valued this species as a touristic attraction for its importance as a source of biodiversity and landscape preservation. This situation suggests that, at the moment, the coexistence of the predator with farming activities may be possible, but a continuous monitoring of the species is required in order to prevent future problems. Jackal howling appeared to be an adequate technique for jackal monitoring. In order to optimize the efforts, our results suggest that sampling should be concentrated in few months, when response rate is higher, and limited to 3-4 emissions/session. Acoustic analysis of the recorded vocalizations is highly recommended in order to obtain more reliable information on the number of individuals. To this aim, keeping records of indirect signs of presence and the use of scout cameras may help to get a complete information on this expanding species.

IMPACT OF RED DEER (*CERVUS ELAPHUS*) ON FORAGE CROPS IN A PROTECTED AREA

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During the last decades in Italy red deer (*Cervus elaphus*) density has locally reached very high values with consequent serious problems due to the interaction with human activities, especially in protected areas. This study aims at quantifying the impact of red deer on herbaceous crops for fodder and silage production in a protected area in Northern Italy (Riserva Pian di Spagna), that has been recently colonized by this species. To this aim, 24 exclusion enclosures (not grazed, NG) on grasses from permanent meadows and 14 exclusion enclosures on maize destined for whole plant silage production, were established. For each of these sample plots, we established an adjacent control plot of identical surface area (2x2 m), freely available to red deer (grazed, G). Maize was harvested in September, whereas three cuts were harvested on meadows (May, July and August). Dry matter yield was determined by weighing the forage crop production of each plot. Grass samples were collected for each cut, both in NG and in G plots, for chemical analysis. Red deer number was monthly estimated by night counts along fixed paths, using spotlights. The analysis of deer distribution allowed the distinction between two areas: High Density (HD, Northern area, with lower human disturbance, abundance of sheltered areas and an estimated deer density of 14-30 heads/km^2) and Low Density (LD, Central and Southern areas, with an estimated deer density of 1.4-1.6 heads/km^2). In HD, red deer impact on maize crop was significant on plant height (NG= 250.7±24.10 *vs* G=136.9±24.10 cm; $p<0.05$) and biomass production (NG=20.0±3.84 *vs* G=6.8±3.84 kg/4m^2; $p<0.05$), whereas no significant effect was observed in LD. Production losses in HD were on average of 67%, due to intense browsing of the plants during the early vegetative stage of development.

Due to the high production variability in meadow plots, deer impact on forage yield was calculated as the ratio between the productions of each G plot and the corresponding NG plot. In the second cut, this percentage was significantly lower in HD than in LD (86% *vs* 99%, respectively; $p<0.05$). The chemical composition of the meadow forages was not different between G and NG. The results obtained indicate that the presence of red deer has an impact on the economic activity of farmers, particularly in term of maize losses, and that appropriate management choices, such as fencing of the crops at risk and/or establishing suitable culling plans, are highly advisable.

WHY COMPASSIONATE CONSERVATION CAN IMPROVE THE WELFARE OF WILD ANIMALS

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Compassionate conservation has rapidly emerged as a paradigm shift in the theory and practice of conservation. We provide an introductory overview and clarify the scope of this emerging field, which lies at the intersection of conservation and animal welfare.

Anthropogenic impacts on animals and their habitats can affect both conservation and animal welfare; and the interplay between these two fields is complex. Compassionate conservation promotes the recognition of synergies and conflicts between these disciplines that have, until recently, been viewed as distinct. Furthermore, it promotes recognition that interventions and practices undertaken in the name of conservation can impact on the welfare of animals.

The welfare of animals in the wild is dependent on their environment, which includes interaction with conspecifics. Impacts on one individual in a population may consequently impact on the welfare of others; for example, killing a female with dependent offspring may result in the death of the offspring by starvation or predation.

Animal welfare science, and in particular its focus on individuals, may inform and refine conservation practice and improve conservation outcomes.

ANIMAL WELFARE EDUCATION IN PRIMARY SCHOOLS OF LILONGWE, MALAWI

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Animal welfare issues are not considered as high priority in Malawi due to other problems affecting the human population. In Lilongwe, the capital city, education programs are used to increase the awareness of animal welfare issues among primary school children.

A study was undertaken to evaluate the knowledge, attitude and practice of animal welfare in primary school children. Two different teaching methods for animal welfare 1) humane lessons (HL) and 2) Animal Kindness Clubs (AKC) were evaluated. The gender perspective was explored and also domestic and animal violence. The study was performed in collaboration with Lilongwe Society for the Protection and Care of Animals (LSPCA). A questionnaire of multiple choice character was handed out to 157 children aged between 9 and 15 from six different schools. Three schools received HLs and the other three AKCs. The children filled in the questionnaire, participated in the intervention (either three HLs or three AKCs), and filled in the questionnaire again. In total, 146 children filled in both the pre- and post-intervention questionnaire, another 92 children did only fill in the post-intervention questionnaire.

All children, regardless of the gender, slightly increased their knowledge about animal welfare when attending the education programs. The HLs, however, was more efficient than the AKCs. Many children had a good knowledge in some animal welfare areas before the intervention. A high proportion (93 %) of the children had experienced violence against animals. About half of the children had experienced domestic violence or both domestic violence and violence against animals. There seem to be a link between domestic and animal violence but further studies are recommended to penetrate the subject.

The conclusion was that the level of animal welfare knowledge is good regardless of gender in primary school children in Lilongwe. The education programs only improve the animal welfare knowledge to some extent. Further studies are recommended to identify ways to improve the animal welfare education programs and to reduce the knowing-doing gap.

EVALUATION OF POPULATION SIZE, ENVIRONMENT, HEALTH AND BEHAVIOUR OF STRAY AND FERAL CATS IN VIENNA

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The study aim is to evaluate population size, environment, health and behaviour of roaming cats in Vienna with respect to the current TNR program.

In spring 2014, 13 managed colonies with 148 cats in different urban habitats were assessed by caretaker inquiry, direct observation at feeding sites and analyses of photos taken of all cats present during observation time in order to allow assessment of some parameters after the observation time. Colonies were assessed by two observers (EG, VH) simultaneously for approximately one hour (before, during and after feeding). Animal numbers, breed, colour, age, sex, neutering status, TNR marking and parameters from five categories were recorded. (1) Feeding & Care, e.g., number of caregivers, feeding frequencies (2) Environmental features, e.g., number, cleanness of feeding/drinking facilities per site, number and size per cat of resting places (3) Health status, e.g., impaired general behaviour & postures, body condition score (BCS), injuries, eye/nose discharges, URTD symptoms, salivation (4) Selected behaviours: play, aggression (5) Human-animal relationship, e.g., smallest distance individual cats kept to caregivers. Descriptive statistics were calculated and inter-observer reliability of health parameters was assessed based on paired recordings by EG & VH using the Kappa coefficient. Spearman correlations were calculated between environment, management & health parameters to test for potential relationships.

All colonies were well fed 1-3 times daily by 1-3 caregivers. One to 30 (11.4±9.4) cats were found per feeding site, where 6.0±6.4 cats shared a feeding facility. Eight colonies had sleeping huts or boxes near the feeding site. In total 81 cats were seen by EG (23.5% juveniles, 76.5% adults, 59.3% females [87.5% neutered], 38.3% males [77.4% neutered]). Most cats appeared to be in good health. 92.6% showed normal general behaviour & postures, 90.1% had a normal BCS. Eye and/or nose discharge was seen in seven cats, partly combined with other URTD symptoms. Two cats showed increased salivation. 10 cats had their left ear tip removed, five cats their tail marked by hair clipping indicating that they were trapped, neutered, and returned to their colony. When called by the caregiver, 44.4% of the 81 cats approached; 28.4% approached very close (< 0.5m). Agreement between observers was high for all health parameters (Kappa coefficients 0.65 to 1.0, $p<0.001$). The percentage of thin animals/feeding site was higher in case of a higher number of cats/feeding facilities ($r_s=0.625$, $p=0.022$) or in case of a higher percentage of soiled feeding facilities ($r_s=0.723$, $p=0.005$).

VETS UNITED – A VETERINARY TRAINING PROGRAMME TO IMPROVE VETERINARY CARE WHERE IT IS MOST NEEDED

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Welttierschutzgesellschaft e.V. (WTG) is a mainly international operating animal welfare organisation based in Berlin. Our projects focus on domestic, wild, and livestock animals as well as educational work in newly industrialised and developing countries. Our new program "Vets United" is specifically aimed at veterinary education.

Vets United is a veterinary training programme to improve animal welfare sustainably through veterinary training. Experienced WTG veterinarians train locals who work or train to work in the veterinary field. The courses are adapted depending on the main animal health and welfare issues in the region, local circumstances and demand in the communities.

To make a well-founded decision in which countries the expansion of the Vets United programme would be most useful and needed we conducted a survey for veterinary educational institutions and NGOs in developing and newly industrialised countries. The questionnaire was sent to about 1000 institutions. 102 questionnaires in 44 countries were completed and send back to WTG. The evaluation of the survey showed that all feedbacks stated deficits in the veterinary training. About 30 % of all mentioned, that there is a major lack of practical training for veterinarians, followed by zoo and wild animal medicine, animal welfare and surgical skills.

Out of all answers 58% indicated that Animal welfare is not part of the veterinary curriculum. 44% considered the animal welfare awareness of vets in their country as poor, none as excellent. As main animal welfare problems stray dogs and overpopulation followed by transport and slaughter methods, lack of animal welfare awareness and legislation. The results of the survey were used by the Vets United team to develop criteria for the eligibility of projects. Main criteria for the decision were the essential needs of a veterinary training programme to improve animal welfare and the availability of experienced partners with the willingness and facilities to make the programme sustainable on a long term.

The first Vets United project was launched in Malawi in cooperation with the Mikolongwe College and the Lilongwe Society for the Protection and Care of Animals (LSPCA). Besides lectures given by a WTG vet the students had the opportunity to improve their practical skills during the course always considering the welfare of the animals. This included examining, vaccinating and castrating the stray dogs on the College campus. In future, the cooperation with Malawi will be enhanced and the programme expanded to other countries.

ASSESSING THE IMPACT OF DOG MANAGEMENT INTERVENTIONS

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Domestic dogs are a ubiquitous species, existing in almost every environment inhabited by people. Interventions to manage dog populations are consequently also common, in order to reduce risks associated with uncontrolled populations. Despite the widespread use of these interventions, few are well evaluated for their effectiveness and there are no internationally agreed indicators or methodologies available for such evaluations. In recognition of the potential learning that could be achieved through systematic evaluations of impact, the International Companion Animal Management (ICAM) Coalition invested in the development of guidelines providing recommended and suggested indicators and methods of measurement.

These guidelines present over 30 indicators, each with the potential to reflect changes in one or more of 8 impacts. Examples of these impacts include: improving dog welfare; reducing risks to public health; and improving public perception of dogs. Further, methods of measuring these indicators are also provided. The guidance is designed to be bespoke, with readers selecting those impacts that relate to their own intervention and then selecting only those indicators and methods of measurement that are most suited to their dog population and data gathering abilities.

This poster describes the process used to develop these guidelines, how best to explore its contents and examples of interventions that have invested in impact evaluation and provided inspiration for the guidelines.

ADDRESSING WELFARE ISSUES IN AMPHIBIAN TRANSLOCATION AND REINTRODUCTION WITH BEHAVIOUR AND PHYSIOLOGY

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Conservation scientists report great concern over poor survival rates of released animals in vertebrate translocation/reintroduction projects. These raise serious issues for the conservation of the species concerned but also for the welfare of the individual animals involved. Welfare scientists have recognised that focussing on reducing sources of stress inherent in translocation/reintroduction work may significantly improve post-release survival rates. We review evidence from our work that sheds light on this important area for amphibians, particularly in the context of a reported 50% global decline in amphibian species.

Environmental conditions leading to the need for intervention (translocation/reintroduction) can be a major stressor. Elevated corticosterone (amphibian 'stress' hormone) has been shown in two species in stressed/disturbed areas, but few studies exist. Taking a behavioural approach we measured egg-laying in European newts *Triturus cristatus* (Great Crested newt- protected in the UK/declining) and *Lissotriton vulgaris* (Smooth newt, declining), where each of around 300 eggs is individually wrapped in a carefully selected leaf. Both species laid significantly fewer eggs (~half) on an alien, pond-dominating, plant species (stressor) compared to a native plant ($N=15$ $p<0.05$ for *T.cristatus*, $p<0.01$ for *L.vulgaris*). In translocation projects, polythene strips are commonly provided for egglaying in new ponds. In tests both species laid near-normal egg numbers on polythene but these took much longer to hatch ($N=15$ $p<0.06$ for *T.cristatus*, $p<0.03$ for *L.vulgaris*). Constraining normal egglaying behaviour may be stressful for individual females and this, coupled with constraints on egg development, may have serious impacts on long-term population sizes. We have recently established a non-invasive assay for corticosterone in these species and are investigating how these stressors (for adult and egg stages) are reflected physiologically.

Another major stressor is transportation, examined in most vertebrate groups, but little in amphibians. During the necessary transportation of *Xenopus laevis* ($N=8$ males, 8 females) to our lab (5h drive) we found significant variation in corticosterone over time ($F=7.65$, $p=0.003$): rising after transport, elevated over the first week and returning to baseline by 5 weeks. This experiment also revealed sex differences, with males showing higher corticosterone ($F=5.21$, $P=0.04$). Sex differences in vertebrate stress responses have been recently highlighted as very important but largely unstudied in reintroduction work. These findings also lead us to concur with recent suggestions that release of translocated/reintroduced animals immediately after transportation may be detrimental for longer-term survival, particularly given the reported effects of stress on cognitive function and coping with a new environment.

A SCOPING REVIEW OF PUBLISHED RESEARCH ON THE POPULATION DYNAMICS AND CONTROL PRACTICES OF COMPANION ANIMALS

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Companion animal overpopulation is a growing concern affecting countries all over the world. In Canada, according to the Canadian Federation of Humane Societies, 60% of both cats and dogs that entered a shelter in 2012 were stray. Overpopulation is a very diverse issue and, it can affect society in multiple ways including public health, environmental destruction and shelter management. Due to this diversity there are many different control practices which have been implemented to try to manage companion animal overpopulation to varying successes. The purpose of this scoping review was to use structured and transparent methods to identify all globally published research investigating companion animal population dynamics and current companion animal population control practices. To date, a comprehensive search strategy has been implemented in 5 online databases (PubMed, CAB Direct, Agricola, PsycINFO, and Scopus) which has resulted in the identification of 9363 citations. The identified citations have been de-duplicated and screened for relevance. A total of 6,848 unique citations have been identified, of these 1,212 have been deemed relevant at the current stage of screening. Full articles are in the process of being procured and confirmed relevant. Pertinent information from these articles on companion animal population dynamics and control is being extracted and summarized. Final results will be presented, including a summary of the quantity, distribution, and characteristics of research in this area. The results from this study will inform the direction of future research on companion animal population dynamics and control by mapping out and evaluating the current research gaps, needs and opportunities in this area.

ASSESSING ANIMAL WELFARE IN TIE-STALL AND LOOSE-HOUSING DAIRY CATTLE FARMS IN NORWAY

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The Norwegian law regarding the housing of cattle states that new barns shall be loose-housed, and that tie-stall systems must be converted into loose-housing systems until 2024. The aim of this study was to compare the welfare implications of the two systems.

Welfare assessment was done on randomly selected dairy cattle farms (6 tie-stall, 6 loose-housing) in Rana County, Nordland, Norway, according to the Welfare Quality® Protocol, which includes 4 major welfare principles, 10 criteria and 27 measures. 15-16 cows were involved per farm (30-100% of the herd). Data collection was done in the morning, after milking.

There were significant differences in the expression of social behaviour and ease of movement between tied and loose-housed animals. Both systems scored high in good human-animal relationship measures. Access to pasture, if present, significantly improved the overall welfare score of a farm. In the criteria of 'expression of other behaviour', tie-stall farms were rated non-classified due to keeping cows tethered for more than 270 days a year. Loose-housed farms were also rated not classified in this category in case of less than 70 days of access to pasture per year.

The farms were classified in two of the four possible welfare categories based on the scores obtained for the four principles; one tie-stall farm was rated 'excellent', all the other farms were rated 'enhanced'. The farm that was classified as excellent had the highest days/year with access to a pasture.

In conclusion, dairy cattle welfare is not necessarily poor in tie-stall housing systems. Tied cows may have an improved welfare quality if they benefit from adequate feeding and watering, access to pasture, comfortable and clean stalls, and a good relationship with the farm staff.

Reference:
Welfare Quality®: Assessment Protocol for Cattle. Welfare Quality® Consortium. Lelystad, Netherlands, 2009.

PERCEPTION AND INFORMATION OF ITALIAN VETERINARY STUDENTS ON ANIMAL WELFARE

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Animal welfare (AW) is a growing concern worldwide. The welfare interest toward the different species is, nonetheless, culture, tradition and religion dependant, and increases with phylogenetical proximity the human species. Since all animals were recognised as sentient beings, attempts should be made to balance the efforts toward all species. Aim of this research was to assess the perception, interest and information of veterinary students toward AW, to investigate their preparedness to take the lead on the issue as professionals.

A questionnaire was distributed to students (n=320) at their second last year before graduation in 7 Italian veterinary universities, geographically distributed across country. The first questions asked were about animal welfare definition and the need to improve AW regulations (AWR), while the following ones were 1-5 likert scales about the self-assessed level of AW information (INFO), the interest toward AW (IAW), the perception of the current welfare level of captive animals (AWLEVEL), and the opinion about what purposes should be allowed for keeping animals (AU; e.g. food production, scientific purposes, cultural events). Spearman's rank correlation coefficient was used to search correlation between responses (significance at $p<0.05$). Friedman test was used to compare the means of student IAW for different species ($p<0.001$), then the Wilcoxon signed rank test was used for species pair comparison ($p<0.05$).

When asked to define animal welfare, students used concepts related to respect of ethology (23%), psychophysics equilibrium (22%), health (17%), and satisfaction of natural needs (16%). Students averagely self-assessed their level of INFO as being 3.27 and AWLEVEL as being 2.86. Overall, 84% of students declared that stronger AWR would be needed. The mean tolerance toward AU was 3.18. The INFO was positively correlated with AWLEVEL, IAW and tolerance toward AU. Also, IAW was positively correlated with AWR and negatively correlated with tolerance toward AU.

A significantly different AWLEVEL score was provided for different species, being higher for pets (4.17) and lower for broiler and hens (2 and 1). Significant IAW differences emerged across species in pair comparisons, with differences between cattle (4.42), pets (4.38) and poultry (3.77).

In conclusion, future veterinarians seem conscious that the level of AW for some species is lower than for other, but themselves point their interest in AW with different weight for different species. However, the correlations between the different aspects investigated show a subjectivity in answering.

REPLACING SOYA WITH FABA BEANS IN LAYING HEN DIETS: EFFECTS ON FEATHER PECKING BEHAVIOUR, WELFARE AND PERFORMANCE

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There is a growing concern that the widespread use of imported soya as the main protein source in EU poultry feed is environmentally and economically unsustainable, creating pressure to find alternative protein sources. Any alternative diet should also protect hen welfare. Faba beans (*Vicia faba minor*) have high protein content and can be grown in temperate climates, making this legume a suitable candidate for replacing soya, however, Faba beans contain antinutritional factors (ANF) that exert negative effects in monogastric animals, e.g. decreased apparent metabolisable energy and protein digestibility.

In this study, two cultivars of Faba beans varying in ANF level were included at 20%, replacing all soya in the diets of Lohmann Brown hens from the age of 19 to 29 weeks on a commercial furnished cage farm in the UK. 24 cages of 38 birds were allocated two Faba bean diets and a control soya-based diet and data on a range of welfare and production indicators were collected.

No significant difference was found between treatments in gentle or severe feather-pecking behaviour and all the hens had good plumage condition at 29 weeks.

There was no significant effect of the diets on hens' weight or egg-laying rate. The mean egg weight was consistently about 1.6% lower for the high-ANF group compared with the other two groups ($p = 0.058$). Eggs from both of the faba bean groups had thinner shells ($p < 0.05$), however only eggs from the low-ANF group showed worse results in egg shell strength tests ($p = 0.05$) compared to the Control group.

Post-mortems on 48 birds revealed that Control hens had heavier livers ($p = 0.01$) compared with the other two groups, whereas hens from the low-ANF group had heavier pancreases ($p = 0.02$) and lower gizzard pH ($p = 0.04$) compared with the Control hens. The hens from both faba bean groups had higher villus-to-crypt ratio of the ileum. Bone strength was not affected by any of the treatments.

Conclusion: Faba bean diets had no negative effect on feather-pecking behaviour, body weight, bone strength or egg production in Lohmann Brown hens. Control eggs had thicker and slightly stronger shells. The hens fed faba bean diets had better digestive health as indicated by ileal histology and lower gizzard pH. The relevance to hens' welfare of the effects on liver and pancreas weights by different diets is not clear and requires further investigation.

PERCEPTIONS OF ANIMALS AND CHOICES OF MEAT TO EAT: A COHORT STUDY

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The UK diet traditionally and currently contains a high proportion of meat and a culturally diverse menu. In 2013, it emerged that it emerged that meat based products were incorrectly labelled and contained horse. The subsequent outcry of the 'horse-meat scandal' was perhaps surprising. Whilst some suggest this was an issue of mis-information, it is a fact that horse is not generally accepted as an appropriate food in the UK, though it is frequently eaten a mere 33 kilometres away in Europe.

UK farming and consumers consider themselves to be conscious of both environmental and welfare issues associated with sourcing meat protein, and 'friendly' products demand a market premium. Yet, insects are not perceived as food, even though their production impacts significantly less on the environment and their welfare needs are met more easily and fully.

A preliminary investigation into these attitudes was conducted with UK undergraduate, final-year students. A repeated measure design meant baseline data was collected prior to the provision of lectures on animal senses and cognition, farming and welfare, and nutritional comparisons of traditional meats and insects. Follow-up was 6 weeks later at the end of this intervention. Data included perceptions of the emotional life and role of different species. Participants were asked if they did or would eat various animals from different taxa, including species traditionally kept as livestock or pets, as well as horses and insects. If they indicated they would not consider eating a species, their reasoning was investigated.

Reasons given for avoiding certain meats can be grouped according to 'care for the animal' (e.g. 'they have feelings'); 'care for one's psychological self' (e.g. 'being for poor people') and finally, 'care for own physical health' (e.g. 'it is unhealthy'). This poster addresses two key points of interest. First, will be the analysis of people's opinions regarding the eating of horse or insects versus traditional livestock or pet species. Second, will be if, and how, such opinions have changed in the short-term after an educational intervention.

The discussion will contextualise the findings in terms of further research areas and application to long term attitude and behaviour change in choices of meat to eat.

COMPANION ANIMAL BEHAVIOUR COUNSELLING: ARE WE SOLVING ANIMAL WELFARE PROBLEMS OR HUMAN WELFARE PROBLEMS?

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The Association of Pet Behaviour Counsellors is an international network of qualified, experienced pet behaviour counsellors, who work on referral from veterinary surgeons to treat behaviour problems in dogs, cats and other companion animal species. Following a seven year hiatus, the APBC has published data on cases seen by UK-based members and one overseas member in 2012. 23% of the eligible membership submitted their data. Data were collected on the species, breed, neuter status, and behaviour problems the animal was referred for.

Of the 2073 cases submitted by APBC members, just 180 were cats, the remainder being dogs. Given that equal numbers of pet cats and dogs are kept in the UK, this is a surprising result. Crossbreed dogs and domestic shorthair cats were the most commonly seen breeds, though high-drive breeds of dogs like Border Collies and Labrador Retrievers featured heavily in the sample. The vast majority of cats were neutered (97% of male cats, and 95% of female cats), but just 68% of male dogs and 72% of female dogs were neutered. The majority of dogs were seen primarily for aggression problems (65%), with just 6% of dogs being referred for owner-absent problems. This is interesting, as other work suggests the majority of dogs show undesirable behaviours when left home alone. Cats were primarily referred for inappropriate toileting behaviour. Other behaviours that cats were referred for are in fact part of a cat's normal behavioural repertoire, but are undesirable to cat owners, like roaming and predation. Regarding aggression, cats were most often seen for aggression directed towards other cats (22%), with only 9% of aggression problems reported being directed at humans. By contrast, 36% of dogs were referred for aggression directed towards humans.

Our data suggests that companion animals are most often referred for problems the owners find unpleasant or worrying to deal with, not necessarily the problems that pose the greatest welfare threat to the animal. The data also suggests that owners may be unaware of their pets' behavioural problems, or are unwilling or unable to invest in solving these problems. Strategies to improve the behavioural welfare of pets in the home will be discussed.

HUMANE AND HOLISTIC DOG POPULATION MANAGEMENT

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World Animal Protection – Progress and Plans for the Future
Large free-roaming dog populations are considered a threat to the public in many countries and are sometimes dealt with by inhumane culling. World Animal Protection works by bringing governments, communities and NGOs together to support and implement sustainable and humane dog population management as an alternative to needless culling.

World Animal Protection has worked to protect dogs for decades in all four corners of the world, including campaigns targeting rabies. We continue to build upon this history by promoting a holistic cycle of dog population management methodology in order for dogs and humans to coexist harmoniously.

Africa: Kenya
The Government of Kenya has made significant efforts to change the way they deal with rabies and their dog population. World Animal Protection has provided assistance to the Zoonotic Disease Unit in the development of their strategy to eliminate rabies by 2030. Five pilot areas for mass dog vaccination have been identified, one of which will be led by World Animal Protection.

Asia Pacific: China
World Animal Protection is collaborating with the China Animal Disease Control Centre (CADC) and has facilitated the development of humane and sustainable ways towards the elimination of rabies in the country through the implementation of mass dog vaccination and education programmes.

Europe: Romania
World Animal Protection is promoting collaboration between the government and local NGOs for the implementation of sustainable, long-term solutions to the dog population problem in Romania. We are assisting the government in the development of a national dog population management action plan and have sponsored a mobile neutering and education clinic run by the local NGO Save the Dogs.

Latin America: Mexico
World Animal Protection worked for almost six years in the state of Puebla, Mexico supporting them in the implementation of rabies vaccination and spay-and-neuter programmes. Puebla is now canine rabies free and the state vets are fully trained to carry out spay and neuter campaigns.

RABIES, DOGS AND EDUCATION. A CROSS-SECTIONAL STUDY ON THE KNOWLEDGE, ATTITUDE AND PRACTICE IN SCHOOL CHILDREN IN TAMIL NADU

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Although known and feared for thousands of years, rabies remains a real and present threat to thousands of people, especially in low- and middle income countries. In India, rabies is an endemic disease, causing human deaths every year. The primary mode of transmission is through the bite of an infected dog. Fighting the disease in the dog population through vaccinations remains the most efficient way to eradicate the disease. The knowledge of rabies in India is unsatisfactory, as a lot of people lack awareness about the severity of the disease and the importance of washing the bitten area and seeking medical attention for post exposure prophylaxis when bitten by a dog. Education programs have been seen to have an effect on the knowledge, attitude and practice towards dogs and dog bites, and also in reducing the number of dog bites in children. The purpose of this study was to evaluate the knowledge, attitude and practice regarding rabies and dogs in school children, and to make a rough assessment of how it is affected by vaccination campaigns and education programs. The study was carried out in the areas of Madurai and Ooty/Coonoor in Tamil Nadu, India, in connection with a large rabies vaccination campaign conducted by the Worldwide Veterinary Service. Questionnaires were distributed in 13 different schools in the two areas, some before (pre-intervention) and some after (post-intervention) an educational speech on dog behaviour and rabies, and the distribution of written information material. The results showed that the children that had partaken in the brief educational lecture had a better knowledge of the modes of transmission of rabies, how to treat a dog bite and how to respond to dogs in the street. The children in the post-intervention group were more aware of the seriousness of the rabies disease and that it is a problem in India. Neither post-intervention nor pre-intervention groups believed themselves or their families to be in danger of contracting rabies. The conclusions drawn from this study is that neither long term eradication efforts or larger vaccination campaigns are sufficient to influence knowledge, attitude and practice in children, and that education programs directed at children are of great importance in preventing dog bites and rabies infection.

EFFECTS OF PLASTIC OR WOOD SLATTED FLOOR HOUSING SYSTEM ON BROILER WELFARE

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Broiler chicken can be housed on deep-litter, slatted, wire floor or cages. However, cage, slatt and wire floor rearing of broiler was not as popular as deep-litter floor rearing, due to problems like breast blisters, lameness and higher initial investment. Recently, cage or slatt housing are becoming popülar because of the welfare problems, health and high litter cost in deep-litter housing systems. This study was made to investigate the effects of different slatted floor housing system on main welfare parameters in broiler. A total of 112 day old male broiler chicks (Ross PM_3) with a stocking density of 14 live birds/m^2 were divided into two slatted housing groups as plastic or wood. Standard production practices and standard broiler ration were used during the experiment in both experimental groups. Animal welfare assessments was made based on physical and production-related measures. All birds in the experiment were assessed on the same day for all parameters by the same assessor. Prior to catching operation; walking ability, feather cover, breast dirtiness, foot-pad dermatitis and hock burn lesions were measured by individual sample scoring in each group. Moreover, the lesions on wing, shoulder, breast and pygostyle of each bird were scored after the slaughter. There was a significant differences for the feather cover score between the groups ($P<.001$) Occurrence of foot pad dermatitis were higher ($P<.001$) in broiler reared on wood slats than in broiler reared on plastic slats. Whereas the hock burn lesion score was greater in birds reared in plastic slat compare to birds reared in wood slatt. Breast dirtiness score in birds raised in wood slatt flooring system was found to be greater than in birds raised in plastic slatt groups. As conclusion, it can be said that welfare of broiler reared in both slat flooring system was mild or moderate level. Further research is needed to investigate the long term effect of slatt systems on broiler welfare such as leg health and indoor air quality and to determine the best slat material.

AGE RELATED WELFARE CHANGES IN DAIRY COWS

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The present farm management practices for dairy cows are overlooking the age of the milking cows in their setup. This raises the question: Can older animals cope with the environment without disturbance of their welfare state, or should be culled? The objective of this preliminary study was to determine the welfare differences in dairy cows considering the age of the animal. Two dairy farms were involved, one free stall farm (Farm A with high welfare scores) and one tie stall farm (Farm B with low welfare scores) with 195 and 50 dairy cows, respectively. The Welfare Quality® Assessment protocol for dairy cattle measure's: body condition scoring, cleanliness, integument alterations, nasal, ocular and vulvar discharge, hampered respiration, diarrhoea, lameness, milk somatic cell count and avoidance distance test, were analysed in both farms. The animals were categorized into three age groups, thus dairy cows in Farm A with average age of 4.53±0.14 years were divided into 2-3 (29% of assessed animals), 3-4 (20%) and >4 (48%) years old, while in Farm B with average age of 8.32±0.49 years, the groups were 3-6 (29%), 6-10 (42%) and >10 (29%) years old cows. The differences in welfare measures and their correlations between the groups within the farms were tested using Chi-Square test for independence and Spearman rank R test; additionally the findings were compared between the farms. The older animals had more integument alterations in comparison to younger animals, total sum of 53 (>4 group) and 180 (6-10 group) hairless patches, lesions and swellings in Farm A and B, respectively. Lameness prevalence was significant considering the age of the animals in Farm B ($p<0.05$), dominating in the 6-10 age group ($R=0.33$). In both farms the avoidance distance test showed that the highest number of animals which allowed to be touched are among the youngest ($p<0.05$), although strong correlation was not evident (Farm A, $R= -0.12$; Farm B, $R=0.02$). The other measures did not present any significant differences considering the age of the animals in both farms. These results are suggesting that maybe there is a possibility the age of the animal it's not a determining factor for its welfare, or that the welfare state of the older and younger animals will be equal, corresponding to the overall welfare of the farm. Still, this is a preliminary study and therefore the question do older animals suffer more in the farm still remains.

SHELTER OVERCROWDING INFLUENCE ON DOGS HEALTH IN SERBIA

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In developing countries such as Serbia, concern for the welfare of dogs housed in temporary shelters has increased in the last decade. According to current Serbian animal welfare law, the euthanasia of dogs is forbidden, unless they have an incurable illness and injury or are proved to be dangerous. This inevitably leads to overcrowded facilities where animal welfare is a major issue. Overpopulation leads to a spread of disease, animal discomfort, physical and emotional suffering and is dangerous for both the animals and their caretakers.

In Serbia, regardless of the organizational structure, animal shelters are notoriously under-resourced in terms of their facility, staffing, and medical capacity. Many of the individuals working at shelters are volunteers with little background or training in population management, socialization and behaviour of dogs, including monitoring and control of infectious diseases. There are 26 registered animal shelters in the Serbia of varying sizes and types that admit lost and unwanted dogs. Five of them are located in Belgrade, capital of Serbia. Most of them are overcrowded since veterinarians avoid euthanasia of animals.

The aim of this study was to determine influence of overcrowding of shelter dogs using Welfare Assessment Protocol for Shelter Dogs. The subjects of this study were sixty neutered mixed-breed dogs obtained from registered municipal shelter in Belgrade. The dogs were relinquished by their owners or brought in as strays. For welfare indicators we used Welfare Assessment Protocol for Shelter Dogs grouped into 12 welfare criteria, which are based on principles of good feeding, good housing, good health and appropriate behaviour. Results show weak positively correlation between overcrowding and too thin dogs ($r=0.31$, $p<0.01$). Also, overcrowding significantly positively influence on panting ($r=0.31$, $p<0.01$), wounds ($r=0.35$, $p<0.001$) and cleanliness ($r=0.38$, $p<0.003$).

This findings suggests that overcrowding can affect welfare and health in sheltered dogs in particular with regards to competition for food, threats or conflict between sheltered dogs. Appropriate education and training of all shelter staff and volunteers especially in management of housing is critical to ensure animal well-being.

THE POTENTIAL MEDIATING EFFECT OF PERSONALITY ON THE EXPRESSION AND EXPERIENCE OF PAIN IN NON-HUMAN ANIMALS

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Individual differences in pain perception, expression and coping is of great interest in both human and non-human animal research, especially when considering the effect a disease may have on the health and welfare of an individual. However, despite this, very little research has focused on how factors such as temperament and personality can have an effect on the expression and experience of pain in non-human animals. Considering the difficulty health professionals have in assessing pain and suffering in non-human animals, it would be of great benefit to have an understanding of whether behaviours such as lameness, which are often perceived to be a protective coping mechanism in response to pain and disease, reflect the severity of a disease or subjective stoicism. A systematic review was conducted to investigate the relationship between pain and personality further. Following PRISMA guidelines, literature searches were conducted using systematic combinations of keywords such as personality and pain, illness and personality, and disease and personality in both human and non-human animals, in Web of Science, PubMed and Cab Abstract online databases. Articles were reviewed for both their relevance and methodology. The review highlighted a clear disparity between human and non-human animal research into pain and personality, with in excess of one hundred and twenty articles being found that focussed on pain and personality in humans, but only one article found that focused on assessing both personality and pain in non–human animals. The quality of each article was assessed based upon a frame work for quantitative research. The main issues with the reviewed literature were related to the reporting of test validity and reliability, sample size and personality definition. Personality, affect and cognition were all found to have an impact on how individuals express and experience pain. The findings suggest that in future pain and welfare assessments in non-human animals' personality and affect should be taken in to account.

TESTING A SHORTENED PERSONALITY QUESTIONNAIRE WITH CAPTIVE RHESUS MACAQUES (*MACACA MULATTA*) AT THE OREGON NATIONAL PRIMATE RESEARCH CENTER

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Personality ratings by research and care staff familiar with individual animals are a reliable and valid way to assess animal personality. However, many questionnaires are too long and thus too time-consuming for care staff, precluding their use in large samples. We sought to assess the inter-rater reliability (ICC[3,k]) and validity of a 12-item version of the Hominoid Personality Questionnaire. Items were selected based on their reliability in previous studies and their likely connection to welfare. We collected ratings on 41 rhesus macaques (mean age = 4.59, 2.5 raters/animal) group-housed in three enclosures at the Oregon National Primate Research Center. Using published definitions of rhesus personality, we calculated scores for the dominance, confidence, openness, and anxiety dimensions. The inter-rater reliabilities of these dimensions were .78, .70, .41, and.38, respectively. We examined the correlations between these dimensions and a behavioral measure of hierarchical rank (i.e., Normalized David's Scores) collected using 15-minute continuous focal observations (19.15 observations/animal). Higher rank was significantly ($ps \leq .001$, $dfs = 39$) correlated with dominance ($r = .68$), confidence ($r = .71$), openness ($r = .55$) and anxiety ($r = -.60$). These results suggest that four personality dimensions derived from a brief questionnaire are reliable and demonstrate convergent validity. This questionnaire will be useful for studies of large samples or facilities with large populations where staff may be unable to complete longer questionnaires or collect detailed behavioral data due to time constraints.

REARING METHODS OF WILD RABBITS (*ORYCTOLAGUS CUNICULUS*) FOR REINTRODUCTION IN SICILY (ITALY)

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In the past, wild rabbits remained only in Spain and in the south of France. Currently, in Italy, this lagomorph is not uniformly distributed: its greatest presence is recorded in Sicily and Sardinia, where the habitat is very similar to the ancestral one. The specie is very important as game and food for many threatened animals of the Mediterranean area: so, there is an important decline in numerousness. The aim of this paper is to test what is the best age of reintroduction in nature using a "soft release" method, in acclimatization pens nearby the breeding farm, limiting mortality due to stress, transport and social factors. The trial was conducted in the mountain area of Palermo district, characterised by a Mediterranean climate, with hot dry summers and mild winter. First, counts of animals were made using the method of nocturnal light census and pellet counts, in order to establish where to capture and where to reintroduce the animals. Capture methods used are traps or ferrets. The captured animals were subdivided according to sex, measured, and their health status is accurately checked. If wild rabbits exhibit the typical biometrical data, they are used as breeders in specialised farms (Regional Law n.33/97): they were ear-marked, vaccinated and treated for parasites. Thus, it starts a breeding period similar to the common rabbit. So, the new-born were transferred in an acclimatization area built on dry ground with a slight slope, where no herbicides have been used to avoid poisoning and rich in natural shrub vegetation and trees. A fence of a narrow mesh, 40cm underground, 2m high and supported by cement poles, prevents the intrusion of predators and the escape of rabbits. Inside the area there is a canopy that protects hay and a feeder with medicated pellets to aid the immune system because stress related to environmental change is high. If the rabbits have retained good wildness, they will soon begin to dig their own burrows. It was noted that 180 days-old animals were more disoriented and less inclined to leave the cage in comparison with 60 days animals that showed greater adaptability and ability to survive after release. Generally, most death occurred during the first week after releasing, without any differences among sex; higher mortality is revealed for older animal that settle more slowly, being not able to eat and to build lairs for defending from predators. From the second week, mortality is similar for all the classes of age.

WOLF (*CANIS LUPUS)* PREDATION ON OVINE ZERASCA BREED IN MASSA-CARRARA PROVINCE

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During the last decades, wolf has become one of the main threats for extensive sheep and goat farms, causing frequent and serious problems in term of production and economy. After several investigations in various Tuscany provinces, we directed our attention at the municipality of Zeri (Massa-Carrara), as local farmers complain frequent attacks and loss of particularly valuable animals belonging to the indigenous sheep Zerasca. This breed is under the protection of Slowfood and it is crucial in supporting the incomes of families living in disadvantaged and marginal areas. To gather information on the characteristics of predation events, possible risk factors and preventive measures in sheep farms, and to understand farmers' attitude towards the problem, sixteen farmers were interviewed. Our results show that all farms move from lower altitudes (650-1000 metres a.s.l.) in winter to upper summer ranges (750-1400 metres a.s.l.). Flock size ranges from 29 up to 355 animals. Most farms adopted some preventive measures: all have night shelters but only 56% have anti-wolf night fences in winter locations, and only one in summer range. Only 32% of farms have guardian dogs, but their number is often too low to guarantee an effective protection. Due to these insufficient preventive measures, predation has been showing a growing trend, with peaks in 2007 and 2010, especially when sheep are in summer ranges. The majority of the predation events occur during daytime, as at night the animals are usually confined in special shelters, and during the *rendez-vous* period (June-October). Although famers tend to blame the wolves for these attacks, the confirmation of responsibility was demonstrated in very few cases, especially because predation events are seldom officially reported and, therefore, inspections by State veterinarians rarely occur. Official complaints are often avoided, in order to save the costs of carcass disposal, and therefore there is a lack of official data on the phenomenon. Our survey highlighted that all the farms have at least 1 predation events, with a total of 32 predation events from 2005 and 2012, leading to the loss of 215 heads (190 found dead and 25 disappeared). The average number of animals lost for each attack is 5.94. Even when the attacks are officially reported, compensations are not always received and are considered inadequate to balance the losses. Local farmers therefore perceive the wolf as a threat to their activity, and this greatly exacerbates the domestic animal/wildlife conflict.

POPULATION MANAGEMENT IN ZOOS AND AQUARIA

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Zoo and aquarium members of the European Association of Zoos and Aquaria (EAZA) work together to cooperatively manage species to ensure a reliable source of healthy animals in the future, with the goals of maintaining demographic stability, preserving genetic diversity, and sustaining behaviourally competent individual animals. Taxon specialists in Taxon Advisory Groups (TAGs) have the difficult task of deciding which species should be cooperatively managed in EAZA institutions and why, as well as balancing space availability and species needs. The role of a selected species (e.g., reintroduction, insurance, education, ambassador for those in the wild, etc.) helps determine its genetic and demographic targets. The intensity of management required to achieve these determines if the species will be managed as a European Endangered Species Programme (EEP), European Studbook (ESB), or Monitor programme. These programmes include species across taxa, from Partula snails to mountain chicken frogs to Mauritius pink pigeons to polar bears.

Each prioritized species has a Coordinator and/or Studbook Keeper responsible for managing the population and maintaining a studbook database recorded in specialized software. Each year, recommendations are made on which individual animals should breed or not breed and transfer to a new institution or stay where they are, based on the species-specific needs, institutional requests, and the science of small population biology. Small population management has unique considerations, including potentially less stable population sizes, vulnerability to inbreeding and loss of genetic diversity, and susceptibility to environmental catastrophes, like extreme weather or political instability. These are mitigated through careful discussions, scientific considerations, and management decisions within EAZA zoos and aquaria.

The successful outcome of population management actions naturally depend on a thorough understanding of the natural history and husbandry requirements of each species, leading to good individual welfare. This in turn provides the population biologist with the challenge to adapt general genetic ideals for population management to the specific socio-biology and husbandry of the species.

STRATEGIES ADOPTED BY KEY INFLUENCERS TO PROMOTE THE UPTAKE OF ADVICE ON ANIMAL HEALTH AND WELFARE

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The uptake of animal welfare advice and change for the benefit of farmed and pet animals is slow, despite a wealth of scientific knowledge in the field of animal welfare science. Developing techniques to encourage farmers and pet owners to instigate behavioural change therefore remains a critical goal for animal welfare improvement. Our research identified the techniques key influencers, such as veterinary surgeons, currently employed to communicate ideas and engage with animal owners on matters of animal health and welfare.

Six facilitated focus group workshops with farm assurance scheme assessors, staff of pet re-homing centres and final year veterinary undergraduates were organised to identify different strategies for motivating animal owners to promote uptake of technical advice likely to improve animal welfare. We concluded that these influencers were able to identify a wide range of potentially successful strategies. Influencers also often recognised a number of difficulties and barriers to motivating animal owners. Furthermore, despite the very different context of each role, the strategies were similar in each workshop, and could be broadly categorised as relating to (i) features of the personal relationship, (ii) personal characteristics of the influencer during interaction with the farmer/client, (iii) characteristics of the inspection/consultation process, (iv) technical analysis of the animal welfare situation and (v) the power relationship between the roles of influencer and farmer/client (not personal).

Many of the strategies proposed also mapped onto the concepts underlying Motivational Interviewing (MI), an evidence-based, client-centred counselling style widely used to elicit behaviour change in human medical contexts. This outcome stimulated further research to assess influencer communication in this light, with a focus on interactions between advisors (veterinary surgeons and farm assurance assessors) and dairy farmers. An analysis of existing advisor-farmer discourse was made with regards to typical communication strategies and the tenets of MI. The potential for MI to be harnessed as a communication method to improve the uptake of advice on animal health and welfare was discussed.

DOG BITE INCIDENCE AND ASSOCIATED RISK FACTORS. A CROSS-SECTIONAL STUDY ON SCHOOL CHILDREN IN TAMIL NADU

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Dog bites pose a threat to public health globally and can lead to infection, disfigurement, incapacity, post-traumatic stress syndrome and even death. In geographical areas where rabies is endemic, bites from infected dogs account for over 90% of the human rabies cases. Children have been proven to be at a greater risk of being bitten by dogs and subsequently contracting rabies than adults. In this cross-sectional study, a school survey was undertaken in association with a rabies awareness campaign in India, to investigate the dog bite incidence and various risk factors associated with dog bites as well as assessing the knowledge of safe interaction with dogs among children in the age group 10-18 years. A total of 1295 questionnaires were collected. 43.2 % (n=556) out of the respondents were boys and 56.8 % (n=731) were girls with a mean age of 14 years. Of the children asked, 73.5 % (n=945) did not own a dog, whereas 26.6 % (n=338) reported they did own a dog. Out of the respondents, 23.3% (n=279) reported having been bitten by a dog. More children were bitten by family dogs than stray dogs, and the most common location for dog bites was in a domestic environment. The gender distribution among the children who reported to have been dog bitten was 39.7% (n=110) girls and 60.3% (n=167) boys. The gender difference was found to be statistically significant ($p<0.05$). There was a significant correlation between owning a dog and being bitten by a dog as well as displaying unsafe behaviour when engaging with dogs. Boys were more likely to display unsafe behaviour than girls. Children who had taken part of an informational lecture on rabies and dog bite prevention gave more correct answers when asked about safe interaction with dogs, but showed no difference in the risk perception compared to children who had not taken part of a lecture. It is suggested that educational efforts targeting children are implemented to raise the level of awareness of rabies, proper wound management, dog population control and safe dog behaviour to reduce the dog bite incidence as well as contributing to the eradication of rabies from India.

BROILER CHICKEN WELFARE CERTIFICATION AT FARM LEVEL IN BRAZIL

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Broiler chicken world population is about 21 billion animals. In Brazil, 5.6 billion broiler chickens were slaughtered in 2013, and domestic market consumes 69% of internal production. The intensification of farm animal welfare debate has led to an increasing number of welfare certification schemes worldwide. However, there is some concern about the extent of these schemes in delivering welfare. In this study, we aimed to identify certification schemes for broiler chicken welfare at farm level as well the number of certified farms in Brazil, and to investigate the extent of nutritional, comfort, sanitary and behavioral welfare indicators within the schemes. Requirements of each scheme were analyzed according to its content and, if pertinent, they were classified in one or more welfare indicators. Two relevant schemes were identified, GLOBALG.A.P.® and Certified Humane®, both in Southern Brazil. GLOBALG.A.P.® is a demand from European importers. A total of 860 broiler chicken farms were certified by GLOBALG.A.P.® and 26 by Certified Humane®, corresponding to 1.9% broiler chicken farms of Southern Brazil. Comfort and sanitary indicators were in greater number in both schemes. On GLOBALG.A.P.® 12.9% of requirements were classified as nutritional, 45.8% as comfort, 44.9% as sanitary and 16.3% as behavioral indicators. Using Certified Humane®, the percentages for the same indicators were 16.6%, 55.2%, 33.3% and 14.6%, respectively. The percentages on each scheme surpassed 100.0% because some requirements were classified in more than one welfare indicator. GLOBALG.A.P.® and Certified Humane® protocols included important items of broiler chicken welfare to benefit animals on certified farms, but with significant possibilities for improvement. Requirements classified as behavioral indicators were commonly related to the resolution of low levels of animal welfare. In both schemes, there is low incentive to use breeds with reduced welfare problems. Animal-based indicators are poorly used and patterns are not established for most of them. It is desirable that certification schemes be critically analyzed on a regular basis regarding their content to meet new demands and to include updates from scientific research to further improve animal welfare. According to this study, the percentage of broiler chicken population on certified farms in Brazil is very low; this may be a consequence of low consumer information about animal production. To increase the number of farms on welfare certification schemes in this country it seems relevant to increase transparency on animal production process and to improve consumer education on the welfare of farmed animals.

METHODS USED AND REASONS GIVEN FOR TAIL-DOCKING SHEEP IN THE STATE OF PARANA, BRAZIL

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Tail-docking is a common procedure carried out in sheep. There are different methods for tail-docking, but there is evidence that all of them cause pain in sheep when anesthesia and analgesia are waived. The objective of the present work was to identify which methods are used for docking and the reasons why farmers dock their sheep tails in the State of Parana, Brazil. The study was carried out through telephone interviews from October 2014 to March 2015 with 188 farmers associated to local sheep cooperatives. From the farmers contacted, 52 no longer breed sheep and two farmers, who had started the questionnaire, quit the interview before answering all the questions. Of the remaining 134 farmers, 116 (86.6%) were man. The majority of sheep was Texel, Santa Inês, Dorper and Ile de France. One hundred and six (79.1%) farmers docked tails; only six (5.7%) of them used anesthesia during the procedure. The most popular method of tail-docking was the rubber ring (81.1%), followed by rubber ring with surgical removing of the tail some hours after (5.7%), surgical removing with scalpel (4.7%), electrical pliers (3.8%), hot iron (2.8%) and rubber ring with cauterization some hours after (1.9%). The reasons given for tail docking in sheep were hygiene in general (31.2%), facilitated mating (22.5%), breed standard (16.1%), esthetics (11.9%), hygiene during the birth (8.3%), avoidance of dirt in ram's penis during the copulation (1.8%), differentiation between rams and ewes (1.4%), avoidance of myiasis and worms (1.4%), facilitated sucking by the lamb (0.9%), tradition (0.9%), higher fertility in ewes (0.9%), higher acceptance by buyers (0.9%), differentiation between purebred and crossbred animals (0.5%), facilitated health management (0.5%), facilitated parturition (0.5%) and because others farmers do it (0.5%). Sixty-nine (65.1%) farmers gave more than one reason for tail docking. The main reason given to tail-docking is hygiene in general which can be controlled with better flock management. The third and fourth most common reasons were breed standard and esthetics, evidencing the influence of culture in human attitudes towards animals. It is important to improve scientific knowledge regarding the other reasons given, to either discredit them in case they are not true or to produce painless alternatives, in case the procedure brings real benefits.

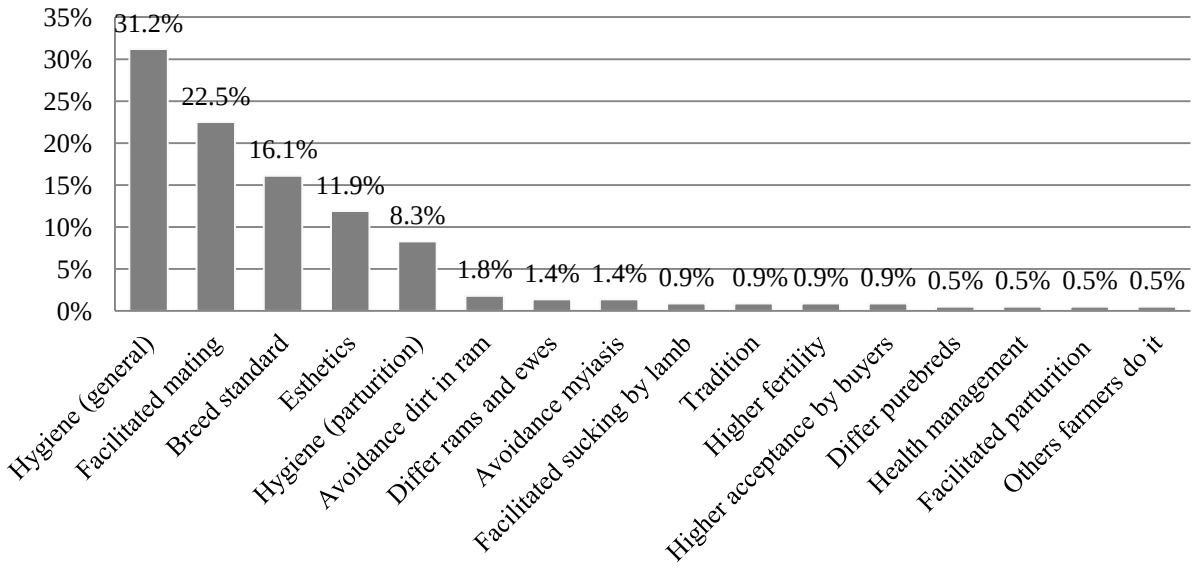

Figure 1. Reasons given, through telephone interviews from October 2014 to March 2015, for tail-docking sheep in the State of Parana, Brazil.

INITIATIVES TO PROMOTE FARMERS' ENGAGEMENT IN ON-FARM WELFARE ASSESSMENT

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The AssureWel project aims to improve animal welfare through the inclusion of welfare outcome assessments within farm assurance schemes. Two practical approaches have been developed and trialled to encourage farmers to use outcome assessments on farm to help inform decision making regarding animal welfare improvements. These are: "joint scoring", whereby the farmer scores the welfare of several animals in conjunction with the farm assurance assessor, and "self-assessment", whereby the farmer alone does a formal welfare observation of their animals and records results. This paper explores farmers' perspectives concerning the practical value of both, and the use of welfare outcome data to inform on farm decision making.

A survey was conducted with a total of 81 members of either the Freedom Food or Soil Association farm assurance schemes about joint scoring (37 dairy farmers) or self-assessment (44 hen farmers). In addition, two focus groups with 17 hen farmers and two with 13 dairy farmers were held.

Of the dairy farmers that responded to the joint scoring survey 84% indicated they had carried out joint scoring. 64% rated positive benefits of jointly scoring animals and 67% indicated that joint scoring lead to useful discussions with the assessor. Farmers indicated that joint scoring provides them a better understanding of welfare assessment scores allocated and 67% indicated joint scoring enables them to undertake self-assessment using the AssureWel protocol.

The hen farmers who responded to the self-assessment survey generally welcomed the increased animal focus. They indicated that self-assessment aids in early detection of a problem and is particularly useful for larger farms that depend on hired stockmen. However, farmers perceived limited benefit of the self-assessment protocol as part of farm assurance, and considered self-assessment as good stockmanship and duplication of what they are already doing on a day to day basis. Many were opposed to the increase in paperwork and time required without any apparent financial benefit. They also indicated that solving a problem when identified was more important than formally recording the scoring.

Focus groups discussions indicated that farmers desired greater use of the data collected in welfare outcome assessments.

Joint scoring as part of the farm assurance audit process was received more positively than self-assessment which is required to be carried out in addition to the audit. The results of this study will inform future policy towards farm assurance.

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WELFARE ASSESSMENT IN MULTIFUNCTIONAL DAIRY FARMS. ARE WE USING THE RIGHT TOOLS?

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Sustainable livestock production is defined by several attributes and animal welfare is a key component that need to be adequately communicated to consumers for them to perform informed choices when purchasing animal products.

The Animal Need Index (ANI 35L) is a welfare assessment method employed in Austria since 1980s which tried to rank farms according to their merits (e.g. alpine pasture) in promoting animal welfare. More recently an European funded project, Welfare Quality®, developed a scientifically-based tool to measure farmed animal welfare and convert such measurements into a communicable welfare score.

The aim of this study is to measure welfare with the above-mentioned methods in dairy farms located in Eastern Italian Alps and to discuss applicability and limitation of such tools in multifunctional farming systems.

Welfare Quality® assessment protocol and Animal Needs Index score (ANI 35L) were used to score dairy cow welfare in 46 farms in the Eastern Italian Alps. Farms were selected on the basis of different housing system (loose or tied), different breeds (mainly Rendena or Italian Simmental) different herd size (min 4 - max 202) different management practices (access to pasture or not) and different participation to certification schemes (organic, territorial production). Farm visits took place during spring time before the traditional summer transhumance to alpine pastures. 837 dairy cows and heifers were assessed. No extreme welfare conditions were observed during the survey. All farms, after computation of principle-scores, resulted in 2 welfare categories (acceptable and enhanced) according to the Welfare Quality® assessment protocol. Similarly, according to the ANI 35L score, medium- high values were recorded (mean=23,1). Slightly higher scores with ANI 35L method might be due to higher weight that are given to farms that use alpine pastures.

The findings of the survey show that, independently of the welfare tool applied, welfare scores are flatten to medium values even when different management practices, housing systems, breeds and herd sizes are taken into consideration. The capability of Welfare Quality® and ANI 35L to capture beneficial effects of multifunctional farming practices on dairy cows welfare is questionable. Protocol changes and adaptations are required in order to measure with proper tools dairy cow welfare in multifunctional farms. Adapted welfare scores, adequately integrated into labels or certification schemes, will give to the consumer the ability to choose products with the best extrinsic quality while promoting multifunctional production systems.