

animal welfare science update

The aim of the animal welfare science update is to keep you informed of developments in animal welfare science relating to the work of the RSPCA. The update provides summaries of the most relevant scientific papers and reports received by the RSPCA Australia office in the past quarter.

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If you have recently had an article or book published that would be of interest to other readers of the Science Update, please send us the reference so we can include it in the next issue. We like to encourage and promote animal welfare research whenever possible but don't always get to see every relevant paper.

review

The sciences of animal welfare

The sciences of animal welfare is the fifth book in the UFAW Animal Welfare Series and, as the title suggests, advocates a multi-disciplinary approach. The premise is that an outward-looking perspective and familiarity with the traditional animal science disciplines will give fresh insights to improving animal welfare. The book acknowledges past successes in general animal science and emphasises the importance of challenging prevailing thinking to ensure that the focus remains on the fundamental purpose of animal welfare science - understanding the animal's own experience of its internal state and of the impact of its environment.

The book's *Introduction* reminds us that there is no single definition of animal welfare: that it is a state within an animal that requires consciousness and sentience, that both physical and mental components affect welfare status and that good animal welfare is more than just the absence of pain. If animal welfare is regarded in terms of an animal's needs, then science is the means to revealing those needs, but both science and current good practice are the means of advancing animal welfare in a practical sense.

The second section, *Paths from the past*, looks at major improvements in animal welfare but also some of the negative consequences for animals within three science disciplines: agriculture, veterinary science and genetics. For example, in the agriculture chapter, the authors point out that improvements in crop and animal production have addressed starvation, malnutrition, injury and disease with obvious animal welfare advantages. Further advances may restore the balance between the need to keep the animal contained and the freedom to satisfy its behavioural needs.

The *Assessment of animal welfare* section examines the continuum of animal welfare ranging from good welfare to severe suffering. The authors outline a grading system for assessing the level of welfare compromise (mental and physical) and ways of mitigating suffering within a given system. Standard behaviour tests in non-verbal humans and other animals are discussed. The authors conclude that a well-balanced behavioural test takes into account animalcentric, anthropocentric, intuitive, and empirical perspectives.

Human inputs and animal welfare looks first at human-animal interactions in different contexts, then moves on to environmental enrichment from a historical perspective. The last chapter in this section looks at animal welfare as a social concern and advocates for better communication of research results and between scientists and animal-using groups to help facilitate the uptake of animal welfare improvements. The authors talk about our social contract with animals, the importance of human advocates and human interpreters "to clarify and convey what animals' needs are and what animals want."

The final section *Thinking outside the box*, looks at the effect of sleep and neurological maturity on animal suffering (the authors provide some fresh insights into pain perception in neurologically immature young) and the effect of sleep deprivation on animal welfare. The final chapter briefly highlights the wider context of animal welfare science, reminding readers that "animal welfare is a matter of significant social concern" making an "ethos of inclusiveness" all the more important when addressing those animal welfare problems that more often than not have been caused, and therefore need to be resolved, by us.

Mellor, D.J., Patterson-Kane, E. & Stafford, K.J. (2009) *The sciences of animal welfare*, UFAW Animal Welfare Series, The Universities Federation for Animal Welfare, Wheathampstead, Herts, UK.

companion animals

Feather-damaging behaviour in parrots

In this review article, the authors summarise current knowledge on feather-damaging behaviour (FDB) in parrots, and compare it to two other conditions, namely feather pecking (FP) in chickens and trichotillomania (TTM) or 'hair pulling' in humans. FDB is a compulsive disorder that is particularly common in birds such as grey parrots and cockatoos. Parrots with FDB chew, bite and/or pluck their feathers with their beak, which damages the feathers and/or skin, and may prevent the normal regrowth of new feathers. FDB has a range of causes, including improper housing conditions (parrots are often kept singly in barren cages), inadequate socialisation when young, environmental stressors, parasites and diseases, and underlying neurological and genetic factors. The authors therefore suggest that it might be more accurate to regard FDB as a group of related conditions, than as a single disorder.

The authors note some remarkable similarities between FDB and TTM, which is a disorder in which a person knowingly or unconsciously pulls the hair from the scalp or other parts of the body. For instance, there seems to be a gender bias in both conditions, with more females being affected. There is a considerable overlap in the causes of both conditions, and they can also be treated with similar drugs. Similarly, FP in chickens also shows a gender bias, and seems to occur at about the same age as does FDB in parrots. Similar social and environmental factors have been implicated in the onset of FDB and FP, and all three conditions, may, to some extent, be considered a stress-coping mechanism for the afflicted individuals. The authors conclude that despite the obvious differences in the actual manifestation of the three conditions, there may be underlying mechanisms that are common to all, and worthy of investigation.

Van Zeeland, Y. *et al.* (2009) Feather damaging behaviour in parrots: A review with consideration of comparative aspects, *Applied Animal Behaviour Science*, 121: 75-95.

Welfare assessment in pet rabbits

Pet rabbits are commonly kept in conditions that are vastly different from those enjoyed by their wild relatives: the latter live in social groups, which spend much time underground, with individuals emerging to forage over large areas in the company of other group members. Rabbits are a popular pet animal in Europe, with an estimated 980,000 animals in 462,000 households in The Netherlands alone. By means of a survey, the authors of this study investigated the welfare status of rabbits kept as pets in over 900 Dutch households, followed up by behavioural observations of animals kept in 66 households.

The researchers found that close to half of all respondents kept their rabbit(s) in solitary housing, and that the average lifespan of a rabbit was 4.2 years. The maximum potential lifespan of a rabbit is 13 years, and the survey showed that solitary housing seems to reduce rabbit lifespan. The majority of rabbits were kept in relatively small cages, and close to half of all respondents failed to inoculate their pets against myxomatosis or rabbit haemorrhagic disease. Solitary-housed rabbits behaved differently from group-housed animals, the former being more likely to display stereotypic behaviours ('digging' on a solid surface, gnawing on parts of the housing system), and socialise less when introduced to other rabbits. A quarter of all rabbits also struggled when picked up, which indicated fear and inappropriate socialisation. The survey results indicate that pet rabbits are often kept in conditions that compromise their welfare.

Schepers, F. *et al.* (2009) Welfare assessment in pet rabbits, *Animal Welfare*, 18: 477-485.

The welfare of pedigree dogs

Pedigree dogs that are bred specifically for dog shows often display a range of breed-specific anatomical, physiological and behavioural disorders that have the potential to be severely detrimental to the animals' welfare. In a recent RSPCA UK-commissioned report, the author of this editorial presented data on a range of issues that were identified as causes for concern regarding the breeding and management of pedigree dogs.

Most alarmingly, many purebred dogs live significantly shorter lives than cross bred dogs, and also incur higher veterinary bills. The author attributes this to the well-known biological phenomenon of hybrid vigour, where hybrid animals are generally healthier than inbred ones. Modern dog-breeding practices, which seek to produce animals that conform to the strict breed standards set by kennel clubs, have resulted in animals that suffer from either anatomical abnormalities, or an increased prevalence of potentially lethal genetic disorders. For instance, English bulldogs frequently suffer from difficulties in movement, breathing problems, and an inability to mate or give birth without assistance or surgery.

Similarly, up to 17% of Cavalier King Charles spaniels may suffer from heart problems. Cocker spaniels of certain colours may display greater levels of “dominant aggressive” behaviour, while certain breeds have lost the ability to perform social signals such as the “play bow”, due to the size and shape of their bodies. Some organisations such as the UK and the American Kennel Clubs have tried to introduce screening programs for common conditions like hip dysplasia, but far more needs to be done. The author, in collaboration with experts in various scientific fields, has identified a few priority areas that need to be tackled first. These include: 1) systematic collection of death and disease information across all breeds, 2) revision of rules to discourage mating between closely-related dogs, 3) monitoring the effectiveness of changes in breeding systems, 4) opening stud books to allow greater introduction of new genetic material into established breeds, 5) promoting the image of a healthy and happy dog as a desirable one, 6) introducing compulsory screening tests for prioritized disorders, and 7) placing restrictions on the number of Caesarean section surgeries permitted per animal.

Rooney, N. (2009) The welfare of pedigree dogs: cause for concern, *Journal of Veterinary Behavior*, 4: 180-186.

farm animals

Effects of socialisation on piglet behaviour

When piglets are weaned in commercial production, they are typically mixed with individuals from different litters. The piglets attempt to establish a new social hierarchy, which can result in injury and stress from aggressive interactions, such as biting. The authors of this study investigated the effects of various pre-weaning housing conditions on the behaviour of piglets. While suckling, the animals were housed in either a group-housing system, in a single-pen loose-housing system, or in conventional farrowing crates. Half of the single-pens and farrowing crates were equipped with doors, so that piglets could enter neighbouring pens. After weaning, piglets from the different treatments were mixed into an open stable.

The researchers found that the piglets from the pens equipped with doors frequently went into neighbouring pens. Following weaning, it was found that the piglets that had had contact with individuals from other litters (through the use of the pen doors) showed less fighting and biting behaviour than non-contact piglets. The non-contact piglets also had more numerous and severe skin lesions, and gained less weight. The authors conclude that allowing piglets to socialise as early as 10 days after birth can reduce the stress associated with weaning, and lead to higher productivity.

Kutzer, T. *et al.* (2009) Effects of early contact between non-littermate piglets and of the complexity of farrowing conditions on social behaviour and weight gain, *Applied Animal Behaviour Science*, 121: 16-24.

Animal stress and food safety

Farm animals are regularly exposed to a variety of conditions that cause them to become stressed - these may include chronic conditions such as overcrowding, inadequate housing, water and nutrition, or temporary ones, such as transportation, handling and weaning. It is now well known that there is a connection between an animal's neural and hormonal systems on the one hand, which regulate stress, and its immune system, which fights disease. However, stress is a complicated phenomenon, and it is difficult to accurately predict the effect that stress will have on an animal's health - low to moderate levels of stress may actually be beneficial to an animal, whereas high levels of stress will probably be harmful.

Studies have shown that during stress, there is decreased gastric acid production, delayed gastric emptying, and accelerated intestinal motility and colonic transit. This can lead to a greater probability that foodborne pathogens (such as *E. coli*, *Salmonella*, and *Campylobacter*) will survive gastric passage and colonise the gastrointestinal tract, possibly leading to food contamination. Some stress-related neurotransmitters may actually facilitate the growth of bacteria, and procedures such as transportation of live animals may cause them to shed more *Salmonella* in their faeces. The practice of feed deprivation, carried out either prior to the transport of food animals, or to induce moulting in layer hens, may also decrease the animals' resistance to infection, and lead to food contamination. The authors of this review article point out that far more research is required in this field, to allow us to understand when farm animals are most susceptible to infection.

Rostagno, M. (2009) Can stress in farm animals increase food safety risk? *Foodborne pathogens and disease*, 6: 767-776.

Housing systems for commercial rabbits

This study investigated the effects of rearing rabbits in two different housing systems - indoor and outdoor - for nearly fifty days during the winter at Pisa University, Italy. At 57 days of age, rabbits were placed into either colony cages kept indoors, or in modified colony cages kept in an outdoor pen, that provided shelter from sun and rain. During the experiment, the rabbits were subjected to behavioural tests for stress levels, whereas after the experiment, the rabbits were slaughtered, and a range of carcass characteristics were measured.

The researchers found that the outdoor rabbits coped better with stressful situations, and also showed better growth performance, and increased physical activity. As a result, their slaughter weight was higher, and their hind legs were more developed. The meat from outdoor rabbits appeared less pale, and had a higher lipid content, that was linked to reduced cooking loss. Moreover, the hind leg meat contained reduced saturated fat, and more of the beneficial monounsaturated fat. The authors conclude that the outdoor rearing system trialled here may be a favourable alternative, due to its many advantages.

D'Agata, M. *et al.* (2009) Effect of an outdoor rearing system on the welfare, growth performance, carcass and meat quality of a slow-growing rabbit population, *Meat Science*, **83**: 691-696.

Assessment of Animal Welfare at Farm and Group Level (WAFL 2008)

The November 2009 issue of the journal *Animal Welfare* contained key papers presented at the fourth WAFL conference held in 2008 in Ghent, Belgium. In recognition of the fact that the field of animal welfare is a young one, and in response to the increasing demand from the public, governments and policy makers alike for clear-cut, unambiguous, and indisputable conclusions about specific and relevant welfare issues, the first conference was held in Copenhagen in 1999, to allow scientists to discuss and develop methodologies for welfare assessments.

A noteworthy initiative presented at this conference was the EU-funded Welfare Quality project (www.welfarequality.net), which has produced protocols for welfare assessment of the major types of farm animals in commercial conditions. The ambition is that these protocols will now be used as European/International standards. Although this in itself is a huge achievement, much work remains to be done - the performance of the protocols need to be validated under different circumstances, and many of the measures of animal welfare discussed here will need to be continually updated.

The next conference, with a continued focus on measuring welfare on-farm and in groups of animals (as opposed to individual animals), will be held in Guelph, Canada, in 2011.

Tuytens, F. *et al.* (2009) Assessing animal welfare at farm and group level: Introduction and Overview, *Animal Welfare*, **18**(4): 323-324.

Pain associated with different slaughter techniques

There has been much debate in the animal welfare literature concerning the level of pain and distress that animals may undergo during slaughter, such as cutting the neck, and allowing the animal to bleed out. It is usually assumed by practitioners of animal slaughter that the sudden loss in blood pressure in the brain, following the severing of the large blood vessels of the neck, quickly reduces the pain and distress associated with the cut. To further minimise pain and distress, animals are often stunned either prior to, or following, neck incision, to render them senseless during the procedure.

Recent developments in electroencephalogram (EEG) technology have allowed researchers to objectively measure the level of pain associated with such procedures, by comparing readings taken from animals' brains to those from humans experiencing pain. During these procedures, the animals are lightly sedated, allowing researchers to isolate changes in brain activity caused by a potentially painful procedure. This series of studies systematically investigated changes in the EEG of calves that were slaughtered in different ways. The researchers found that, as can be expected, neck incision alone, without any form of stunning causes changes in the calves' brain activity that can be interpreted as a painful stimulus. In order to determine whether such pain was caused due to either the physical injury to the soft tissues of the neck, or due to the sudden loss of blood pressure, the researchers looked at the EEGs of 1) cattle whose necks were cut, while maintaining blood flow to the brain, and 2) cattle whose blood flow to the brain was severed, with minimal damage to the neck tissues. The results demonstrated that it is indeed the cutting of the neck's soft tissues that causes the most pain. Next, the researchers investigated the effect of captive-bolt stunning on the brain activity of calves, and found that this technique is effective in quickly rendering the animals insensible. Finally, the effect of captive-bolt stunning following neck

incision was investigated; the results showed that this combination is able to prevent the continuation of painful sensations associated with neck incision.

Taken together, these results show conclusively that neck incision would be perceived as painful by conscious animals subjected to this procedure, and that the use of captive-bolt stunning can help to significantly reduce the distress suffered by these animals.

Mellor, D. *et al.* (2009) A re-evaluation of the need to stun calves prior to slaughter by ventral-neck incision: An introductory review, *New Zealand Veterinary Journal*, 57(2): 74-76.

Gibson, T.J. *et al.* (2009) Electroencephalographic responses of halothane-anaesthetised calves to slaughter by ventral-neck incision without prior stunning, *New Zealand Veterinary Journal*, 57(2): 77-83.

Gibson, T.J. *et al.* (2009) Components of electroencephalographic responses to slaughter in halothane-anaesthetised calves: Effects of cutting neck tissues compared with major blood vessels, *New Zealand Veterinary Journal*, 57(2): 84-89.

Gibson, T.J. *et al.* (2009) Electroencephalographic responses to concussive non-penetrative captive-bolt stunning in halothane-anaesthetised calves, *New Zealand Veterinary Journal*, 57(2): 90-95.

Gibson, T.J. *et al.* (2009) Amelioration of electroencephalographic responses to slaughter by non-penetrative captive-bolt stunning after ventral-neck incision in halothane-anaesthetised calves, *New Zealand Veterinary Journal*, 57(2): 96-101.

animals used for sport, entertainment, recreation and work

Punishment in horse training

Many of the training procedures used on horses involve the application of negative stimuli such as whipping (punishment or negative reinforcement) to stop unwanted behaviours. The authors of this paper state that punishment is often incorrectly used while training horses, and may in fact lead to further behavioural problems, instead of suppressing existing ones. The main reason is that punishment is non-directed, meaning that it has the potential to suppress a behaviour, but will not enhance an alternative one. It therefore carries the risk of causing harmful emotional changes if used incorrectly. In particular, if the timing of punishment is wrong, it can send mixed signals to the animal, causing it to react in unexpected ways.

To use negative reinforcement correctly, the response to be trained must be carefully targeted - negative stimuli such as pressure must only be applied as long as the incorrect behaviour is being performed, and must be lifted as soon as the correct behaviour becomes apparent. Failure to do so might lead to phenomena such as 'learned helplessness' or 'experimental neurosis' that have been documented in animals such as dogs and rats. In the first scenario, when animals were experimentally stripped of any ability to get away from a negative stimulus, this made them become passive, and unable to learn new tasks. In the second, trained animals were given unpredictable, contradictory stimuli, which led to aggressiveness and impaired learning. The authors conclude that techniques such as punishment should only be used as a last resort, and even then, with the utmost care.

McGreevy, P. & McLean, A. (2009) Punishment in horse-training and the concept of ethical equitation, *Journal of Veterinary Behavior*, 4: 193-197.

research animals

Gas euthanasia for laboratory mice

The mouse is a commonly used laboratory animal worldwide, and is frequently euthanised by means of carbon dioxide (CO²) gas. Recent research has shown that rats may find CO² to be an unpleasant and distressing stimulus - this is of concern, as animal ethics regulations in many countries state that animals should be euthanised in a manner that is pain free and minimally distressing. The authors of this paper used an experimental setup to determine whether CO² gas, along with three other commonly used gases - carbon monoxide, halothane and isoflurane - are aversive to mice.

Mice were placed in an experimental chamber, where they were provided with some shredded coconut, which they like eating. This chamber was connected to another 'refuge' chamber, where the mouse could escape to, if it wished. The experimental gas was then introduced into the reward chamber at different speeds - the researchers recorded whether the mouse remained in the chamber until it became

unconscious. The results showed that mice left the chamber long before any of the gases was able to render them unconscious, even when they had access to a food they liked to eat. The authors conclude that all four gases may be at least moderately aversive to mice, although in the case of isoflurane, two mice did remain long enough to become unconscious. This gas may therefore be less aversive than the other three.

Makowska, I. *et al.* (2009) Evaluating methods of gas euthanasia for laboratory mice, *Applied Animal Behaviour Science*, **121**: 230-235.

wildlife

Large scale euthanasia of pest birds

Non-native birds such as the common myna, the common starling and the house sparrow are considered to be pests in Australia, and are increasingly being trapped and euthanised by community groups such as the Canberra Indian Myna Action Group. The use of carbon dioxide (CO₂) gas is usually recommended for the euthanasia of large numbers of birds, as it is considered convenient, humane and safe to use. However, the cost of regularly purchasing CO₂ cylinders makes this form of euthanasia less appealing to community groups with limited funds. The authors of this paper compared the use of CO₂ with carbon monoxide (CO) in the form of petrol engine exhaust, in terms of their effectiveness and humaneness as euthanasia agents. Carbon monoxide is emitted at a relatively constant rate (peaking at 6.5-9%) in the exhaust of non-road petrol engines, such as in lawn mowers, pumps and generators, which are not fitted with catalytic converters. Concentrations of CO in exhaust from engines fitted with catalytic converters are initially high but drop to less than 1% within 100 seconds after a cold start.

The study looked at time to recumbency (assumed to equate to loss of consciousness) and last movement of groups of mynas, starlings and sparrows using cylinder CO₂ and CO emitted from a range of different engine and chamber sizes. A total of 119 birds in 13 groups were euthanased. Exhaust was cooled using a water bath or 4m hose. Time to recumbency ranged from 20-85s for CO₂ and 7-180 for CO; time to last movement ranged from 65-153s with CO₂ and 65-240s with CO. No statistical analysis was carried out to compare these results and each engine/chamber combination was tested only once, but in general, the smaller the engine, and the larger the chamber, the slower the process. The authors noted that head shaking and gaping were observed only with birds killed using CO₂ and conclude from this that CO₂ is therefore more aversive than CO.

The authors recommend the use of cooled petrol engine exhaust for the killing of pest birds, due to its cost-effectiveness and apparent humaneness. However, concerns over the use of exhaust as a means of delivering CO stem from both its temperature and its composition. Further research is required to determine the level of irritants present in exhaust and the variability between engines of different models, ages and capacity. Behavioural observations of individual birds and post-mortem analysis to look for signs of irritation to the respiratory tract would assist in validating the results of this study.

Tidemann, C. & King, H. (2009) Practicality and humaneness of euthanasia of pest birds with compressed carbon dioxide (CO₂) and carbon monoxide (CO) from petrol engine exhaust, *Wildlife Research*, **36**: 522-527.

other articles and publications of interest

Allain, V. *et al.* (2009) Skin lesions in broiler chickens measured at the slaughterhouse: relationships between lesions and between their prevalence and rearing factors, *British Poultry Science*, **50**(4): 407-417.

Bicalho, R.C., Machado, V.S. & Caixeta, L.S. (2009) Lameness in dairy cattle: A debilitating disease or a disease of debilitated cattle? A cross-sectional study of lameness prevalence and thickness of the digital cushion, *Journal of Dairy Science*, **92**(7): 3175-3184.

Cottee, S.Y. & Petersan, P. (2009) Animal welfare and organic aquaculture in open systems, *Journal of Agricultural and Environmental Ethics*, **22**(5): 437-461.

Cramp, A.P., Sohn, J.H. & James, P.J. (2009) Detection of cutaneous myiasis in sheep using an 'electronic nose', *Veterinary Parasitology*, **166**: 293-298.

Dúcs, A., Bilkó, A. & Altbäcker, V. (2009) Physical contact while handling is not necessary to reduce fearfulness in the rabbit, *Applied Animal Behaviour Science*, **121**(1): 51-54.

- Edge, M.K. & Barnett, J.L. (2009) Development of animal welfare standards for the livestock transport industry: process, challenges, and implementation, *Journal of Veterinary Behavior: Clinical Applications and Research*, 4(5): 187-192.
- Fredriksen, B. *et al.* (2009) Practice on castration of piglets in Europe, *Animal*, 3(11): 1480-1487.
- Klostermann, K. *et al.* (2009) Efficacy of a teat dip containing the bacteriocin lacticin 3147 to eliminate Gram-positive pathogens associated with bovine mastitis, *Journal of Dairy Research*, 29: 1-8.
- Mullan, S. *et al.* (2009) Interdependence of welfare outcome measures and potential confounding factors on finishing pig farms, *Applied Animal Behaviour Science*, 121(1): 25-31.
- Proudfoot, K.L., Huzzey, J.M. & von Keyserlingk, M.A.G. (2009) The effect of dystocia on the dry matter intake and behavior of Holstein cows, *Journal of Dairy Science*, 92: 4937-4944.
- Samarakone, T.S. & Gonyou, H.W. (2009) Domestic pigs alter their social strategy in response to social group size, *Applied Animal Behaviour Science*, 121(1): 8-15.
- Shum, L.W.C. *et al.* (2009) Environmental mastitis in intensive high-producing dairy herds in New South Wales, *Australian Veterinary Journal*, 87(12):469-475.
- Von Borell, E. *et al.* (2009) Animal welfare implications of surgical castration and its alternatives in pigs, *Animal*, 3(11): 1488-1496.
- Voulodimos, A.S. *et al.* (in press) A complete farm management system based on animal identification using RFID technology, *Computers and Electronics in Agriculture*.
- Wensley Koch, V. (2009) American veterinarians' animal welfare limitations, *Journal of Veterinary Behavior: Clinical Applications and Research*, 4(5): 198-202.

upcoming events

RSPCA AUSTRALIA SCIENTIFIC SEMINAR

Convergence or conflict: Animal welfare in wildlife management and conservation

Tuesday 23 February 2010, CSIRO Discovery Centre, Canberra

Managing wildlife populations and ecosystems or conserving threatened species are complex activities that include many interrelated elements, with consideration of animal welfare often only given a minor role. But the impact of human activity on wildlife and many of the conservation goals we set to protect biodiversity can have serious implications for animal welfare, in both positive and negative ways.

The 2010 RSPCA Australia Scientific Seminar brings the issue of animal welfare in wildlife management and conservation to the fore, examining the way in which these activities can at times come into conflict with animal welfare goals, or at other times converge to produce outcomes that benefit both welfare and conservation. The Seminar will broadly examine the animal welfare issues associated with the management of wildlife across four overlapping themes:

- the impact and management of threatening processes, such as invasive species
- the conservation of threatened species
- the impacts of urbanisation on wildlife
- the impact of climate change on wildlife conservation.

The topic raises some difficult questions, including: When should the welfare of wildlife override human interests? Should environmental impacts carry more weight than agricultural or direct economic impacts? When it comes to animal welfare and conservation, should we be concerned with the welfare of individual animals, populations, species, or ecosystems? And how much should we intervene to improve animal welfare when populations have been damaged by human activity or development? As is the tradition with this Seminar Series, the program aims to cross conventional topic boundaries, challenge current thinking, and stimulate further discussion. RSPCA Australia welcomes the participation of all interested people to help make this a fascinating and thought-provoking day.

The program will be available in early January 2010.

Register at: <http://www.rspca.org.au/what-we-do/our-work/science-and-policies/science-seminar.html>

To be added to our subscription list email: science@rspca.org.au