

animal welfare science update



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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.

Special Feature – Fish behaviour and welfare

The journal Applied Animal Behaviour and Science produced a special issue on fish behaviour and welfare in late 2006, covering a range of topics within this controversial theme. A major concern in the aquaculture industry is the welfare of the fish being reared in captivity, primarily because poor welfare can lead to economic losses. This special issue contains several aquaculture-related articles, including the importance of proper feed type (sinking versus floating), the consequences of genetically modifying fish, the effect of parasites on fish behaviour, and other important issues, such as stocking density, housing, transport and slaughter technique. The effect of heavy metal contamination on dominance hierarchies in wild salmon populations is also discussed, as are the welfare implications of recreational angling.

Two of the papers from the special issue are described in more detail below.

Recreational angling

This review of the literature on aspects of fish welfare in recreational angling starts with a brief look at the controversial topic of whether fish can feel pain. In spite of some reports to the contrary, many recent studies indicate that fish possess the neurons required to feel pain, and that they exhibit anomalous behaviour following a pain-inducing injection (such as rubbing the injected part against gravel, not feeding, and losing their fear of new objects). The authors suggest that such behavioural changes could indicate pain and suffering. Next, the authors discuss the potential harmful effects of recreational angling on individual fish. These include:

- Physical injury, both from the removal of hooks, and from hooks left embedded in the fish, as well as from nets and barbed gaffs;
- Stress and physiological impairments resulting from the physical effort trying to break free, and from being lifted and handled by the angler. Such impairments may reduce the fitness of the fish, leading to reduced reproductive success and growth rates;
- Death from catch-and-release angling, which may occur minutes to weeks after the event, and therefore go unnoticed by the angler.
- The authors also present some measures that could be taken by anglers to improve the welfare of angled fish:
- Minimising angling duration, and landing fish as quickly as possible, by choosing equipment matched to the size of the fish;
- Minimising air exposure and improving handling techniques. Hooks could be removed, and fish photographed, underwater, while livewells, coolers and keepnets should be used (depending on fish species) in preference over stringers;
- Using barbless hooks to minimise tissue injury on removal;
- Avoiding angling under extreme conditions, such as very hot or cold water, catching fish at great depths, or in the presence of large predator numbers; and

- Avoiding angling during the reproductive period, to preserve fish population levels.

Finally, the authors discuss humane ways of killing fish that are either being harvested, or that need to be dispatched due to injury. The authors suggest percussion stunning (hitting the fish on the head with a rock or club to render it unconscious) as the most acceptable method for anglers.

Cooke, S.J. & Sneddon, L.U. (2006). *Animal welfare perspectives on recreational angling. Applied Animal Behaviour Science. In press.*

Fish welfare in aquaculture

This paper extensively reviews recent studies on several issues concerning fish welfare in the aquaculture industry, which currently is responsible for roughly a quarter of global fish production. The review begins with a discussion on the very concept of ‘animal welfare’, given the controversy surrounding issues even as basic as whether fish can feel pain. Currently, most empirical measures of animal welfare are based on physiological indices, such as cortisol levels, and there is much scope for behavioural observations to facilitate the identification of stress and suffering in animals.

Stress is a particularly important issue in aquaculture, as stressed animals exhibit poor growth, are susceptible to a range of diseases and parasites, and perhaps most critically, are probably being exposed to conditions not conducive to their welfare. There are several ways of countering this problem, such as selectively breeding fish strains that are less responsive to stress, adding supplements that reduce stress to the diet, and altering handling, stocking and management regimes. Of these, determining the right stocking density is a particularly complex issue, with optimum concentrations depending on both the developmental stage and the species of fish being reared.

The author lists a range of aquaculture practices that might compromise fish welfare. Handling and transport prior to management procedures are extremely stressful to fish, especially when overcrowding or exposure to the air is involved. Food deprivation, a common practice prior to transport or slaughter, is usually considered beneficial to fish welfare. However, care must be taken not to starve the fish for prolonged periods, especially when the reared animals have become accustomed to regular feeding.

Next, the author criticises a range of slaughter techniques commonly used in the industry, as being inhumane and causing prolonged suffering: these include asphyxiation in an ice slurry, immersion in CO₂-saturated water, ‘de-sliming’ of eels in salt and liquid ammonia in a dry tank and live-chilling followed by freezing in cold brine. Electrical and percussion stunning are suggested as alternatives.

Fish behaviour is the last major topic discussed in this review. First, the author describes ways to prevent aggressive behaviour, which may be caused by social hierarchies among the fish, or by competition for food. Once again, suitable stocking densities and feeding regimes, as well as the presence of larger dominant individuals and, interestingly, the use of dark substrates in tanks were suggested as ways of reducing aggression. Abnormal behaviour in fish reared at high densities may be a sign of chronic stress, and therefore a welfare concern. While the above measures might help to reduce the incidence of abnormal behaviour, more research is needed to understand the exact reasons behind it.

Ashley, P.J. (2006). *Fish welfare: Current issues in aquaculture. Applied Animal Behaviour Science. In press.*

Research papers

COMPANION ANIMALS

Cat housing in animal shelters

Cats in North American animal shelters are commonly housed in barren steel cages in isolation, to prevent the spread of disease. Unfortunately, this type of housing is also associated with a range of abnormal behaviours, such as anxiety, fear, reduced playing, etc. As adult cats already have a much lower probability than other animals of being adopted, it is essential that they be managed (i.e. housed and handled) in such a way as to make their behaviour more appealing to potential adopters.

This study looked at the effects of improved housing conditions and handling regimes on the stress levels and adoption rates of adult cats in a Canadian animal shelter. A total of 165 cats were randomly allocated one of

four housing conditions, namely (a) basic single, where cats were housed singly in steel cages with food, water, litter, newspaper lining on the floor and a towel for bedding; (b) enriched single, which was furnished like the basic cages, but also had two toys and a horizontal shelf with a towel draped over it; (c) basic communal, which was a large, converted dog kennel, housing eight cats at a time, and containing litter, food, shelter and a horizontal shelf with bedding for each cat; and (d) enriched communal, which was furnished like the basic communal, but also had a large cat playhouse, larger shelves suited for many cats, several toys, several carpeted walkways and large hiding areas. In addition to the housing modifications, cats from the basic treatment were handled by various staff and volunteers without any consistent technique; cats from the other treatments, however, were handled by the experimenters using a set procedure, including slow movements, minimal restraint, vocal reassurance, playing and stroking.

Far fewer cats (only 45%) from the basic single group were adopted over the three weeks of data collection, compared to 69-76% from the other groups. Similarly, the cats from this group were also more stressed than the cats from the other three groups. Thus, all three modified housing types produced similar results, and were significantly better than the basic single housing. When adopters were asked for the reasons why they had chosen a particular cat, the most common responses were 'friendly', 'playful', 'happy', 'relaxed', 'friendly with other cats' and 'smart'. The authors conclude that a combination of consistent, reassuring handling and enriched environments can reduce stress and fearfulness in cats, and make them better candidates for adoption.

[Gourkow, N. & Fraser, D. \(2006\). The effect of housing and handling practices on the welfare, behaviour and selection of domestic cats \(*Felis sylvestris catus*\) by adopters in an animal shelter. *Animal Welfare*, 15: 371-377.](#)

Electric dog collars

Electric collars are sometimes used to eliminate undesirable behaviours in dogs by public organisations (e.g. the police), sporting organisations (e.g. to train dogs for hunting and competitive sport) and private citizens (e.g. to prevent barking or antisocial behaviour in pet dogs). While the supporters of this technique claim that it causes less injury and stress to dogs than traditional methods such as choke chains, opponents argue that electric collars can be easily misused, causing pain and fear in the animals.

This study investigated two key physiological measures of stress, namely heart rate and saliva cortisol levels, in beagles subjected to training with electric collars. The researchers divided the dogs into three groups: Group A was trained to avoid contact with a movable dummy rabbit, Group B was trained to obey a verbal command, while Group C was given random shocks through the collar at unpredictable times, so as to simulate misuse of the collar.

The researchers found that in Group A, where the association between incorrect behaviour and punishment was clear-cut, the dogs showed the least increase in cortisol levels. However, cortisol levels were much higher in Groups B and C, where the dogs were less able to predict the delivery of the electric shock. In particular, Group C dogs showed the highest relative cortisol increase (of over 300%), indicating the highest stress levels among these animals.

The authors conclude that the misuse of electric collars - for instance, through inappropriately timed electric shocks - could produce extreme states of anxiety in dogs. They suggest that the use of such devices be restricted to specific situations, and to individuals with both practical qualifications and suitable training in learning theory.

[Schalke, E. et al. \(2006\). Clinical signs caused by the use of electric training collars on dogs in everyday life situations. *Applied Animal Behaviour Science*. In press.](#)

FARM ANIMALS

Optimal group sizes for farm animals – a realistic goal?

For a social species, and this includes all farm animals, living in a group reduces the risk of predation, facilitates behavioural synchronisation (e.g. feeding, resting), provides companionship, allows for social thermoregulation, grooming and learning. On the other hand, group living also increases competition for food and access to other resources (e.g. feeding, drinking and resting places). For farm animals, an additional cost is the fact that they are being continuously regrouped at different stages of their life. This social instability together with exposure to novel situations and no possibility of escape can result in intense fighting.

With farm animals, group size (the number of individuals that form a group) and density (the number of animals per unit space) are designed to maximise economic returns, often without considering the animal's perspective. The traditional view that increased group size results in increased aggression has been contradicted by various studies and it appears that the social behaviour of farm animals is much more dynamic than originally thought, allowing them to adapt to changing social and physical environments. One theory suggests that a dominant individual within a group will only establish a social hierarchy if the possibility of meeting another dominant individual is very small. A second theory suggests that, as group size increases, more individuals will benefit from not getting involved in a fight (less risk of injury and greater access to resources). A third theory suggests animals perform a dominance interaction when in each other's personal space, the winner remains standing, the loser escapes. In large groups, these interactions continue until a relatively peaceful social hierarchy results.

It seems that the amount of space used is affected more by density than by social factors relating to group size and, for farm animals, social conflict will therefore be reduced if feed resources are distributed evenly throughout the facility. Also, providing opportunities to hide and retreat from aggressive individuals may reduce social conflict. However, the authors suggest that we don't know enough about the social dynamics that underpin optimal group size and density and that further research into social behaviour and use of space is necessary.

Estevez, I., Andersen, I.-L. & Naevdal, E. (2007). Group size, density and social dynamics in farm animals. *Applied Animal Behaviour Science*, **103**: 185-204.

Long distance transport of livestock for slaughter – quality rather than quantity

Most people would agree that it is more appropriate to transport animals to slaughter as close as possible to their point of production. However, there is very little agreement on specific maximum journey times for such animals. This paper looks at transport of sheep in the European context but its general approach can be extrapolated to other livestock species and other countries.

Research to investigate the welfare implications of long distance transport often provides conflicting information, which makes it difficult for regulatory bodies to set appropriate maximum journey times. Various research approaches have been used to look at the different reasons that form the basis of restricted journey times, including whether aspects of welfare are adversely affected after a certain journey time, whether transportation is an aversive experience, whether the risks associated with transportation increase with journey duration and whether the spread of infectious diseases can be reduced by restricting journey times.

The author suggests that perhaps a greater focus should be placed on the quality of the journey rather than on its length. For example, if environmental conditions, the fitness of the animals, and the pre- and post-transport handling of the animals is optimal, then perhaps such animals can be transported over longer distances without major welfare problems. However, these conditions must be regulated. If enforcement is inadequate, then there is all the more reason for journey times to be limited.

Cockram, M.S. (2007). Criteria and potential reasons for maximum journey times for farm animals destined for slaughter. *Applied Animal Behaviour Science*. In press.

Why do pigs root?

In their natural environment, pigs spend a large amount of time foraging for food and exploring their surroundings. Rooting, sniffing and chewing are important exploratory behaviours and, if prevented to do so, pigs will quickly show abnormal behaviours. Exploratory behaviour is stimulated by hunger or by curiosity. Pigs in an intensive housing system, whether fed ad libitum or restricted amounts will still perform appetitive foraging and will still explore their surroundings. In particular, it seems, pigs are interested in unfamiliar objects.

The author of this paper looks at the effectiveness of straw and various alternatives to straw in reducing abnormal behaviour. He concludes that the material needs to be complex, be able to be bitten or chewed, easy to manipulate, changeable and edible for it to provide sufficient stimulus to avoid abnormal behaviour in pigs.

Studnitz, M., Jensen, M.B. & Pedersen, L.J. (2006). Why do pigs root and in what will they root? A review on the exploratory behaviour of pigs in relation to environmental enrichment. *Applied Animal Behaviour Science*. In press.

Plastic mats for housed rams

The authors of this study look at the influence of galvanised mesh flooring and plastic floor mats on the behaviour of rams housed individually in pens and kept for semen collection. Mesh flooring is often used because it is easier to clean. Organic bedding may contaminate fleeces or block drains, so is not very popular. The study showed that rams spent more time lying on the mats than on the mesh. The authors suggest that rams find the wire mesh uncomfortable to stand on and provides insufficient support for rams to lie on comfortably. The results of this study deserve consideration by all those holding sheep on wire mesh flooring, e.g. in lairage or in pens during live export.

McGreevy, P.D., George, S. & Thomson, P.C. (2006). A note on the effect of changes in flooring on the behaviour of housed rams. *Applied Animal Behaviour Science*. In press.

ANIMALS USED FOR SPORT AND ENTERTAINMENT

Pacing in circus tigers

Circus tigers are required to travel frequently as the circus moves from one venue to the next. This need to be mobile places severe constraints on the size of the cages within which the tigers are transported, often leading to the development of stereotypical behaviours (repetitive behaviours with no apparent purpose) such as pacing. Although the exact causes of pacing are still being debated, it is generally accepted that extreme manifestations of such behaviour are detrimental to the animal.

One common way to attempt to prevent stereotypical behaviour in circus tigers is to provide them with regular periods of free time in an exercise yard or pen. This study investigated the effect of short daily sessions in an exercise pen on pacing behaviour in six tigers from two circuses. The tigers were each allowed 0, 20 or 40 minutes daily in an exercise pen over three days. During this period, the tigers also had to participate in one or two regular circus performances per day. Following their morning sessions in the exercise pen, the tigers were continuously videotaped in their cages, and their various behaviours (such as standing, lying, pacing, etc.) were analysed.

The researchers found that the time spent in the exercise pen had no significant difference to the pacing behaviour of the tigers. However, there was some indication that the distance travelled by the tigers within the exercise pen could reduce the amount of time spent pacing once back in the cage. An important observation was that many of the tigers showed bouts of activity throughout the longer (40 minute) exercise session. The authors suggest that the time periods trialled in their study were perhaps not long enough to cause a visible reduction in pacing behaviour. Moreover, the exercise and stimulation that the tigers obtained from their regular circus performances might have masked the effect of the free time exercise sessions. Therefore, longer exercise periods should be considered.

Nevill, C.H. & Friend, T.H. (2006). A preliminary study on the effects of limited access to an exercise pen on stereotypic pacing in circus tigers, *Applied Animal Behaviour Science*, **101**: 355–361.

WILDLIFE

Stereotypic behaviour in female Asian elephants

Elephants in circuses and zoos are known to engage in stereotypic behaviours, such as nodding, swaying and trunk swinging. As only a few studies to date have investigated stereotypic behaviours in zoo elephants in any detail, the current paper describes the effects of changing management regimes on a single female Asiatic elephant in Wroclaw zoo in Poland.

This elephant was either housed singly in a bare 30m² pen or let out into a paddock, depending on the weather. Feeding times were also changed, from 1 pm, when she was indoors for the whole day, to 3 pm, when she was let out.

The researchers found that the elephant's stereotypic behaviour consisted of bouts of complex, repeated movements, interspersed with periods of much more variable, casual-looking behaviour. Although the elephant spent over 50% of the observation time engaged in such behaviour, there were important seasonal differences. The highest levels of stereotypic behaviour occurred in the spring, when she was let out on some

days, but not on others, depending on the weather. The second highest period was in late autumn, when she was confined to the pen after a long summer of days spent outdoors. The lowest rate was observed in the winter, once the elephant had become accustomed to staying indoors all the time. The amount of stereotypic behaviour also varied with the time of day and, for example, was highest during the hour just prior to the indoor feeding time in the spring (1 pm), when the elephant was actually outdoors (and would have been fed at 3 pm). The authors conclude that changes in management regimes and confinement to a barren pen were responsible for the high levels of stereotypic behaviour observed in this elephant.

Elzanowski, A. & Sergiel, A. (2006). Stereotypic behaviour of a female Asiatic elephant (*Elephas maximus*) in a zoo. *Journal of Applied Animal Welfare Science*, **9**(3): 223-232.

And finally... from a member of our very own science team!

Why doctors should care about animal cruelty

Animal cruelty is a significant problem for society, and there are good reasons why doctors should be particularly concerned by it. Increasing evidence for links between animal cruelty and child or spousal abuse is an area of growing concern internationally and of real importance to health professionals. This article aims to raise awareness of the relevance of animal cruelty to medical practice. The links between animal cruelty and human health are discussed broadly and some wider ethical issues raised. Animal cruelty impacts on human health in disparate ways: intentional and unintentional acts of cruelty may reflect underlying mental health problems that need to be addressed. Cruelty within the family setting is an important sentinel for domestic violence and should prompt an assessment for possible child abuse. Furthermore, animal cruelty raises important questions about the nature of empathy, and the type of society that we wish to live in.

Sherley, M. (2007). Why doctors should care about animal cruelty. *Australian Family Physician*, **36** (1/2): 61-63.

Other articles of interest

Bas Rodenburg, T. & Koene, P. (2007). The impact of group size on damaging behaviours, aggression, fear and stress in farm animals. *Applied Animal Behaviour Science*, **103**: 205-214.

Croney, C.C. & Newberry, R.C. (2007). Group size and cognitive processes. *Applied Animal Behaviour Science*, **103**: 215-228.

Gerritzen, M. *et al.* (2006). A note on behaviour of poultry exposed to increasing carbon dioxide concentrations. *Applied Animal Behaviour Science*. In press.

Gifford, A.K., Cloutier, S. & Newberry, R.C. (2006). Objects as enrichment: Effects of object exposure time and delay interval on object recognition memory of domestic pigs. *Applied Animal Behaviour Science*. In press.

Hoerle Leone, E., Estevez, I. & Christman, M.C. (2007). Environmental complexity and group size: Immediate effect on use of space by domestic fowl. *Applied Animal Behaviour Science*, **102**: 39-52.

Kristensen, H.H. *et al.* (2007). The behaviour of broiler chickens in different light sources and illuminances. *Applied Animal Behaviour Science*, **103**: 75-89.

Prayaga, K.C. (2007). Genetic options to replace dehorning in beef cattle – a review. *Australian Journal of Agricultural Research*, **58**: 1-8.

Schwartzkopf-Genswein, K.S. *et al.* (2006). Effects of pre-haul management and transport duration on beef calf performance and welfare. *Applied Animal Behaviour Science*. In press.

Scobie, D.R. *et al.* (2007). A preliminary genetic analysis of breech and tail traits with the aim of improving the welfare of sheep. *Australian Journal of Agricultural Research*, **58**: 161-167.

Scott, K. *et al.* (2007). The welfare of finishing pigs under different housing and feeding systems: liquid versus dry feeding in fully-slatted and straw-based housing. *Animal Welfare*, **16**: 53-62.

ThePigSite. (2006). Docile sows push up Spanish performance, 21 November 2006, <http://www.thepigsite.com/swinenews/12730/docile-sows-push-up-spanish-performance>.

Watanabe, S. (2007). How animal psychology contributes to animal welfare. *Applied Animal Behaviour Science*. In press.