



# How much space does an elephant need?

## The impact of confinement on animal welfare

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RSPCA AUSTRALIA SCIENTIFIC SEMINAR 2007, TUESDAY 27 FEBRUARY, AUSTRALIAN WAR MEMORIAL, CANBERRA

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### Speaker abstracts

#### Space, time and unassuming animals

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Animals need sufficient space to ensure physical health and to permit the performance of their highest priority behaviours. In many countries, unassuming animals such as laying hens are kept under conditions of extreme spatial confinement where skeletal health is poor and behavioural needs unmet. After decades of argument and scientific debate in Europe this situation is gradually changing, and conventional cages for laying hens will not be permitted beyond 2012. However, minimum space allowances for alternative housing systems for hens, and for other animals such as laboratory rodents, continue to be recommended by regulatory bodies in the absence of relevant scientific information.

The amount of space needed by an animal may exceed that physically utilised for specific movements, if factors such as maintenance of distance from cage walls or from conspecifics are important. In addition, animals may not make use of all the space available to them at all times, but this does not show that the additional space is unimportant. Animals often have a strong but occasional need for additional space for the performance of specific behaviours.

In assessing the spatial needs of animals a useful first step is to record the behavioural repertoire at each of the spatial allowances under consideration. If certain behaviours are not performed under some space allowances then the impact of non-performance on the animals' welfare should be assessed. This can be done by investigating the underlying motivation of the relevant behaviour and/or by taking a range of relevant welfare indicators. This approach has been taken recently in our investigations of the impact of Council of Europe recommendations for space allowances for laboratory rats and mice. It has also been used in collaborative projects aimed at compiling information on laying hen welfare across all the different housing systems in current use in Europe (<http://www.laywel.eu/>). However, problems of interpretation can remain when few welfare indicators are available or when welfare indicators do not co-vary. It is therefore useful to perform supplementary investigations of the strength of animal preference or demand for additional space.

Finally, when animals are group housed there will be complex interactions between individual space allowance and group dynamics. Freedom of movement increases with both space allowance and group size, but there may be a point at which certain welfare disadvantages of increased group size outweigh the benefits. In poultry we have found that the results of small-scale studies do not always scale-up to the commercial situation. Assessing the impact of space allowance must therefore be done using commercially relevant house and flock sizes.

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## **Spatial requirements of animals: allometry and beyond**

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Critical aspects of confinement are its duration, and the quantity and quality of the space provided. This paper focuses on the quantity of space and although livestock research is used for examples, it is evident that there are principles that apply to all animals in confinement.

Animals managed by humans experience lengths of confinement that range from a few hours, as during short journey transportation, to years, as with captive wildlife. The quantity and quality of the space provided usually reflects the purpose of the space and the behavioural patterns that the animal managers want to be displayed e.g. for livestock, behavioural patterns associated with growth and weight gain are desirable, whereas for captive wildlife, the emphasis is on behavioural patterns performed in the natural environment.

For livestock at least, there is very limited information on the amount of space used by animals in performing behaviours. Allometric principles can be used to estimate the amount of space an animal occupies due to its size and shape, which is, evidently, an absolute minimum provision. Video-recordings have provided estimates of the space needed for cows and pigs to move between standing and lying and, interestingly, these can also be expressed allometrically.

It is interesting to note that guidelines for space allowance during land transportation of cattle and horses closely agree with the amount of space an animal physically occupies, indicating that the animals would have room for negligible movement. This amount of space may be appropriate for short duration confinement but, for confinement lasting days or weeks, as a minimum, sufficient space must be provided to allow an animal to perform behaviours essential for survival i.e. eating, drinking, resting, thermoregulation and excretion. For confinement lasting months or years, the minimum space needed is that which allows an animal to perform behaviours necessary for short-term and longer-term survival and those behaviours, the prevention of which is highly likely to negatively impact on welfare.

When animals are confined in groups, spatial requirements become increasingly complex. The formation of social relationships can impact on individual welfare and survival (e.g. through fighting), so the amount of space must allow for the establishment of these relationships and to minimise any adverse effects of them e.g. social stress and restricted access to resources, or access to poor quality resources. However, the design (quality) of the space has the potential to make a major contribution to minimising such adverse consequences.

There are further complexities with group confinement because group members share space in time and the amount of space available to be shared is not only dependent on the amount of space per individual, but also on group size; for the same amount of space per animal, larger groups have greater "free" space to share than small groups. At least for livestock, there is very limited information available on how group members time-share their space and whether there are implications for welfare if group members cannot conduct behaviours in synchrony.

It would seem that, at least for livestock, our knowledge of space use and the impacts of spatial restriction on behaviour and welfare has advanced little beyond the use of allometry that provides estimates of spatial requirements.

## Defining issues of space in zoos

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Debate about space in zoos is as old as the debate about confinement of wild animals. How should an animal's form and function – the role for which evolution has equipped it – be reflected in the environment provided when the animal is confined – captive in a zoo?

The goals of western zoos include changing human attitudes and behaviour towards wildlife, and in selected instances, the direct support of wild populations of species in various ways. For most of the larger more significant zoos of the west, there has always been a tension between such goals and the need to raise revenues to pay for zoo operations and development.

An examination of how zoos have confined animals through the last two centuries reveals a trend away from the closest forms of confinement in cages, towards larger spaces, often with open viewing for visitors. Generally though, for many decades, the notions of how much space a given specimen might need, remained primitive. From the 1940s onwards increasing attention has been paid in progressive zoos to what is termed “the quality of the space” available to the animal, the complexity of the space in terms of how it engages the animal, promoting physical and mental activity. A detailed scientific understanding of the wild biology of a species has come to be regarded as essential to the determination of what constitutes appropriate captive conditions for that species in the zoo.

Most zoos exist on confined sites, their absolute boundaries are usually fixed. The starting point in a discussion about an animal's perceived needs is necessarily immediately to be considered in terms of other demands upon the space available. The demands on space within the zoo are not only animal related but also human, staff and visitor related, so the notion of balancing different needs is constantly at work in zoo discussions. Despite the political nature of debates within zoos about space (and in fact about resources generally), the application of scientific knowledge in the management of wild animals has, in the last 50 years or so, resulted in a far more sophisticated and careful approach to zoo animal welfare.

Elephants have been found in western zoos for almost as long as there have been zoos. Through all this time they have largely been maintained under extraordinarily close human control, as if they were working animals. Looking at traditional captive elephant management practices however, does not provide any reasonably complete view of elephant needs if such needs are to encompass the range of wild characteristics of elephant species. It does seem clear at the outset that for elephants to enjoy anything approaching a natural social life with multiple relationships amongst related individuals through time, then relatively large spaces are required. Similarly it seems obvious that if elephants are to live more independently than they traditionally have done in zoos, less under the direct control of keepers, then the naturalistic occupation they will require means more extensive spaces in which to live.

## **Without the wisdom of Solomon or his ring: Setting standards for exhibited animals**

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Since the establishment of the Exhibited Animals Protection Act in New South Wales a number of standards have been developed to help regulate the animal exhibition industry, to improve the industry's professionalism and to satisfy society's desire for exhibited animals to be cared for appropriately. The task of setting such standards is a difficult one. Due to the diversity of animals and the complexities of their needs, the process depends on consultation with two major interest groups: the animal exhibition industry and the animal welfare lobby. Both groups claim to have animals' interests at heart but are often philosophically diametrically opposed. There are also frequently differences of opinion within each group. Science-based information that could assist in solving such disputes is frequently unavailable. This review of the standards creation process in New South Wales reveals that something akin to the wisdom of Solomon is often required. These difficulties are conveyed via a story involving King Solomon who is able to ask animals, such as elephants, to tell him exactly what they need. The NSW regulators have addressed the deficiency of information about captive animal spatial requirements by considering the space required to carry out particular behaviours. Other agencies involved in setting standards for exhibited animals can benefit from the New South Wales experience as they face similar difficulties. Interest groups, with a greater appreciation of the process, will hopefully support the acquisition of more science-based information.

## The challenge of developing regulations for production animals that produce the welfare outcomes we want

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In this paper, the welfare of the laying hen has been chosen to illustrate a proposed approach to regulation of the welfare of animals held in confinement. The majority of hens are presently housed in highly confined situations which are the subject of widespread criticism by scientists and the public and which are programmed for replacement in many countries. The search for facilities and management systems to replace cages has spawned a lot of research and innovation. The challenge is to develop regulations that achieve welfare outcomes consistent with current scientific thinking, meet public expectations for the welfare of hens, can be applied without constant alteration in an environment of inevitable dynamic change, are readily understood and accepted by those who must abide by the regulations and are effective tools for those who have to enforce them.

We believe the regulations should focus on defining welfare outcomes for the hen based on known needs in a manner that requires those outcomes to be delivered rather than prescribing the facilities and management systems that should be provided.

In 2004, the National Animal Welfare Advisory Committee (NAWAC) concluded that the cages currently used to house the majority (92%) of laying hens in New Zealand did not meet the requirements of the Animal Welfare Act 1999 primarily because they offer a barren environment that does not allow the hens to display normal behaviours. However, there was a dearth of information on suitable alternative systems. Some interim adjustments of the space available to the birds were made but a decision on what are acceptable alternative systems in the long term was deferred to 2009 when it was expected that better information would be available to the Committee. This decision was not a popular one among opponents of cages including a Parliamentary select committee.

It is unlikely that barn and free-range systems will expand to accommodate the entire national flock (approximately 3 million birds). It is likely that furnished (or enriched) cages will be adopted as a production system in the future but there is still considerable experimentation to achieve optimum performance in Europe, and no experience of their use in New Zealand. The transition of the national flock from present cage systems to a range of systems (likely to include varying degrees of confinement) in the future needs to be guided by regulations which act as a reference point and are not dependent on prescribing facilities and systems that are in a state of flux.

Our paper will present an outline of welfare outcomes for the laying hen referenced to the requirements of the Animal Welfare Act 1999 that could be the basis for a future Code of Animal Welfare under that Act. The definition of the outcomes draws on recently published international research on the needs of the laying hen.

## Does confinement improve the welfare of domestic cats?

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There are estimated to be more than five million domestic cats in Australia, with only just over half actually being owned. Around 1.7 million households (23%) own one or more cats; estimates of stray and feral cat numbers vary widely. Pet ownership provides people with stress relief, companionship and stability in their lives, and pet ownership may even improve their health.

There are a number of welfare problems associated with cats. Roaming cats may get lost, or may simply be perceived as a nuisance by neighbours. Last year more than 60,000 cats were received by RSPCA shelters alone, and more than 35,000 were euthanased. Native wildlife is at risk of predation by cats as both are active at dawn and dusk. As a result some councils require cats to be confined between dawn and dusk, or even 24 hrs a day. It is likely that in the future more and more councils will move to require 24 hr confinement.

While most cat owners believe that cats have a need to roam outdoors and that this benefits the welfare of the cat, roaming also carries welfare risks for the cat. They are involved in fights with other cats and may get injured, they may contract diseases such as feline AIDS, or they may get lost. Cats are territorial and even feral cats may live in fairly small natural territories such as the grounds of nursing homes or factories. Therefore, if the territory of the cat is limited to indoors and perhaps an outdoor run, they should be able to adapt to this lifestyle quite well. Cats spend up to 19 hr/day sleeping, and provided basic needs are met (water, food, a place to sleep and a litter tray) most cats should be able to cope with a confined environment.

However, the cat's environment should be such that in addition to meeting basic needs, it enables and encourages most natural behaviours of the cat and provides good opportunities for interaction between the owner (and family) and the cat. Certain behaviours that are natural to the cat can be seen as a problem, such as scratching furniture, spraying, climbing etc. So ideally the environment should hold features that will enable some of these natural behaviours without causing damage or being a nuisance. Unfortunately not all cats may be able to adapt to an indoor environment equally well, particularly as few cats are specifically bred to be pets. Many owners adopt their cat as a stray or from a shelter. Even when stray cats are adopted as kittens there may be insufficient socialisation in weeks 2-8 of life resulting in problems of adapting to an indoor environment and close proximity to people. Offspring from particularly shy cats may also make less suitable pets.

With this limited understanding of what a cat's environment entails and survey information on the issues of cat confinements and environmental features, the requirements of a suitable indoor environment will be discussed.

## Impacts of confinement and research needs to underpin welfare standards

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The term 'confinement' requires some consideration. Like the term 'welfare', it is open to interpretation. Confinement applies to wild animals, companion animals and farm animals, those on rangeland through to those that are intensively housed. Thus the issue is the level of confinement that is acceptable rather than confinement per se. This paper focuses on farm animals. Less confined systems such as free range are not always 'idyllic' and lower levels of confinement may be offset, in terms of welfare, by the need for other husbandry practices, such as beak trimming of free range or barn hens and nose-ringing of free range pigs. Two common criticisms of confined housing in pigs and laying hens are the lack of behavioural repertoire or the occurrence of stereotypies. Nevertheless, there are data showing similar levels of oral-nasal behaviours in pigs in stalls or pasture pens and comfort behaviours in hens in cages or aviaries. While confinement is controversial, research has clearly shown that the design and management of housing systems are more important than the design per se.

While we are unable to measure animal emotions there are a number of behavioural and physiological responses that collectively are used to measure welfare and that have been applied to the impacts of confinement. These include behavioural change (stereotypies, rebound behaviours, behaviours indicative of frustration and changes in time budgets) and physiological changes (acute phase proteins and stress and associated changes in immune function, health, growth, metabolism and nitrogen balance, and reproduction). We cannot agree on how to measure welfare, how to interpret some of the changes we see and how much confinement is acceptable. This has not stopped animal welfare standards being set in the form of Codes of Practice in various countries, EU directives and OIE standards for transport, slaughter and killing animals for disease control purposes.

One intention behind developing Standards is to include some of them in legislation. Thus in my opinion, they should be unequivocal, nationally consistent, measurable and verifiable. The latter requires systems for record keeping and auditing. Finally, a system is also needed to capture some of this audited information to demonstrate that the Standards are being met and that animal welfare is actually being improved.

The title of the paper implies, perhaps, that Standards should be underpinned by scientific evidence. However, for a number of issues considered important for animal welfare there is insufficient science to develop measurable standards. Thus, we use unequivocal science where we can and if it is lacking we need to be pragmatic and arrive at a consensus for a reasonable standard based on limited or equivocal science, the available knowledge of stakeholders, practicalities, whether it is achievable and whether animal welfare is likely to be improved or at least not made worse. The AWSC has had some success in doing this for a number of livestock industries and industry sectors. While the process to develop such standards identified gaps for research, is it realistic to expect that all standards must have underpinning science? For some issues there is a wide consensus or science may not yet be able to provide answers; to focus on such issues could divert valuable resources away from more important problems that have a greater impact on animal welfare. Nevertheless, if such issues are considered important to animals' welfare, such standards should be developed irrespective of whether they can be measured or legislated.

Research needed to underpin animal welfare standards includes achieving agreement on both welfare assessment criteria and measures, methods for public education and filling gaps in research for both across-species and species-specific issues.