

Diploma in the Management of Zoo and Aquarium Animals

**Unit 10:
Ethics and Welfare
in Zoos and Aquariums**





Contents

Introduction.....	2
Animal Welfare, Ethics and Legislation	3
What is Animal Welfare?.....	4
Assessing Animal Welfare	5
Zoo Animal Needs.....	10
How Do Animals Respond to Challenges?.....	Error! Bookmark not defined.
What Can Influence the Animals' Stress Response?	Error! Bookmark not defined.
Measuring What Animals Prefer	16
Ethics in zoos	20
Interactive Ethical Dilemmas.....	23
Recommended Resources:.....	Error! Bookmark not defined.
References & Further Reading	27

**Copyright reserved by Sparsholt College Hampshire and
The British and Irish Association of Zoos and Aquariums (BIAZA).**

**No part of DMZAA materials can be copied or shared
without specific written permission.**



Introduction

This Unit is delivered in collaboration with the Jeanne Marchig International Centre for Animal Welfare Education, University of Edinburgh, and the RZSS Highland Wildlife Park. It will introduce the concepts of animal welfare, ethics in zoos, and outline the relevant legislation relating to animal welfare in zoos and aquariums.

Traditionally zoos were menageries of exotic and wild animals displayed for public entertainment, with little thought given to the role of the animals that they housed. The modern zoo should be a very different institution, with a focus on excellence in animal housing and husbandry, staff training, public education, research and conservation.

Good animal welfare is essential in zoos. How animals are presented and exhibited will impact on the education of zoo visitors in the conservation, natural history and biology of the species. Healthy animals presented in naturalistic and dynamic environments and displaying a variety of natural behaviours represent the important conservation and biological role of zoos. Animals exhibiting abnormal behaviours, or used in performances for entertainment, or as photographic props, are presented to the public as an economic commodity and this may undermine their conservation value. Zoos have traditionally taken a cautious approach to engaging with animal welfare issues but increasingly modern zoos are empowered not just to rectify existing animal welfare problems, but to promote a proactive and preventative approach, providing animals with environments and husbandry routines which provide them with the opportunity to experience comfort and contentment and enjoy a good quality of life.

In this unit, learners will be able to:

- Understand the concept of welfare and the aspects relevant to animals in zoos and aquariums
- Understand the ethics and practice of keeping species for public engagement in zoos and aquariums
- Understand 'welfare in practice' and welfare assessment as they relate to zoo and aquarium animals

Animal Welfare, Ethics and Legislation

Animal welfare is a scientific discipline that gives us evidence about how animals experience the world. The field of animal welfare science includes cognition, emotion, ethology (behaviour), physiology, immunology and many other scientific disciplines. The evidence provided by animal welfare research allows us to better understand what animals need and what may cause them distress.

Animal Welfare Science is different from ethics. Animal ethics is a branch of moral philosophy which explores different views on the use of animals. Our moral viewpoints on what is acceptable are influenced by personal experience, education, culture, religion etc. and our personal ethics will influence the way we treat animals. When working as a zoo professional it is important that you are able to distinguish between personal, professional and societal ethics. For example you may feel personally uncomfortable with management euthanasia but recognise professionally that it can be a useful tool in ensuring good animal welfare and healthy populations in zoos, however it may not be well understood in society. These differing ethical stances can create problems for zoos.

Animal welfare law sets out our legal obligations to the animals that we manage. In the UK zoo animals are protected by several different pieces of legislation as well as the Secretary of States Standards of Modern Zoo Practice (SSSMZP) with which you should be familiar. In general, legislation requires public support and a good evidence basis in order to be enacted, and so often reflects a combination of societal ethics and scientific evidence.

In short:

- Animal welfare science tells us what animals **need**
- Animal ethics guide how we **should** treat animals
- Animal welfare law tells us how we **must** treat animals.

What is Animal Welfare?

Topics covered:

1. Describe and define the concepts of animal sentience and animal welfare
2. Categorise animal needs using an animal welfare framework
3. Interpret how different external factors may influence animal welfare
4. Understand how an animal's welfare state may change
5. Appraise the various factors that support the promotion of good animal welfare
6. Evaluate the potential consequences of poor welfare
7. Explain how observations (behavioural & physiological data) are used to produce indicators of welfare.

Under UK law (the Animal Welfare Act 2006), vertebrate animals are assumed to be **sentient**. Sentience describes the capacity to experience emotional states, make intentional decisions and to learn from experiences – basically it is the ability to experience 'feelings'. Vertebrate animal sentience was legally recognised across the European Union in the Lisbon treaty (2009). The same legal protections generally do not apply to non-vertebrate species such as crustaceans despite animal welfare science research showing that these species show similar behavioural and chemical responses to painful or fear-inducing stimuli, and are capable of long-term learning and memory.

Sometimes these legal protections don't even apply to lower vertebrates such as fish. For example fishing including sport fishing is exempted from the UK animal welfare act (and therefore legal), whereas any similar activity in mammals or birds would be illegal. This is because the development of legislation is usually driven by societal ethics (what society considers to be acceptable or unacceptable) and fishing is generally considered to be societally acceptable regardless of the animal welfare impact. This is an example of how understanding what animals need and how they feel (animal welfare), may conflict with what how think it is acceptable to treat them (animal ethics) or what legal protection they have (animal law).

Many definitions of animal welfare exist (Hill and Broom 2009, Tuyttens, Vanhonacker et al. 2010, Broom 2011, Ohl and van der Staay 2012) because 'welfare' is a difficult term to define. The words welfare and well-being are often used as equivalent terms. The definition of welfare often differs between the scientific and non-scientific communities. There have been several definitions of welfare proposed within the scientific literature, for example, "...the state of an individual as regards its attempts to cope with its environment" (Broom 2011).

Most animal owners attempt to care for their animals to the best of their ability, and try to make their animals 'happy'. They therefore think they are providing them with the best quality of life possible, and that their pet is experiencing a high level of welfare. Attempts to make their pets happy often result in pet owners treating their animals like people and, in some cases, even as substitute children. Most owners would not consider that they restrict their animals in any way, despite the fact that most pets live a completely unnatural life, particularly in terms of their social conditions. It should perhaps not be surprising that pet owners misunderstand the needs of their animals, as most children grow up reading books and watching cartoons where animals show many human

characteristics, such as talking, living in houses and showing human emotions. This conflict can also occur in zoos. As keepers it is likely that you will form an emotional bond with the animals that you care for and will care about them – this can make it challenging to recognise some welfare problems or make objective decisions about difficult issues e.g. euthanasia.

As human caregivers we often focus primarily on the things we provide for our animals e.g. food, shelter, enrichment, but what is most relevant to animal welfare is how an animal actually ‘feels’. i.e. how it reacts and responds to the things we provide for it. It is important that we remember that animals are **sentient** – they have feelings – and it is the capacity to feel that means that the animal can suffer. Unfortunately animal feelings can be incredibly challenging for us to evaluate, but an animal’s behaviour, physiology and health status can give us some clues in assessing its welfare and how it feels.

Animal Welfare Frameworks

Welfare assessment requires an understanding of a range of scientific disciplines such as behaviour, health and immunology (Dawkins 1998) and embraces a continuum from negative or poor welfare to positive or good welfare (Ohl and van der Staay 2012).

Welfare may also be considered as comprising three primary themes, all of which overlap and each is important.

Psychological – The animal’s state of emotional wellbeing. Pain, fear and distress may all compromise psychological health.

Physical – The animal’s state of physical wellbeing. Injury, disease and pain may all compromise physical health.

Behavioural – the animal’s ability to demonstrate a normal behavioural repertoire, and to respond normally to novel stimuli. Abnormal repetitive behaviours, stereotypy and compulsive behaviours may occur if normal behaviours are frustrated.

Because physical, behavioural and psychological aspects of welfare are all linked, a problem in one area may also impact on the others e.g. an injury (physical) may cause pain which is an unpleasant emotion (psychological) and animals may deal with this by reducing activity (behavioural).

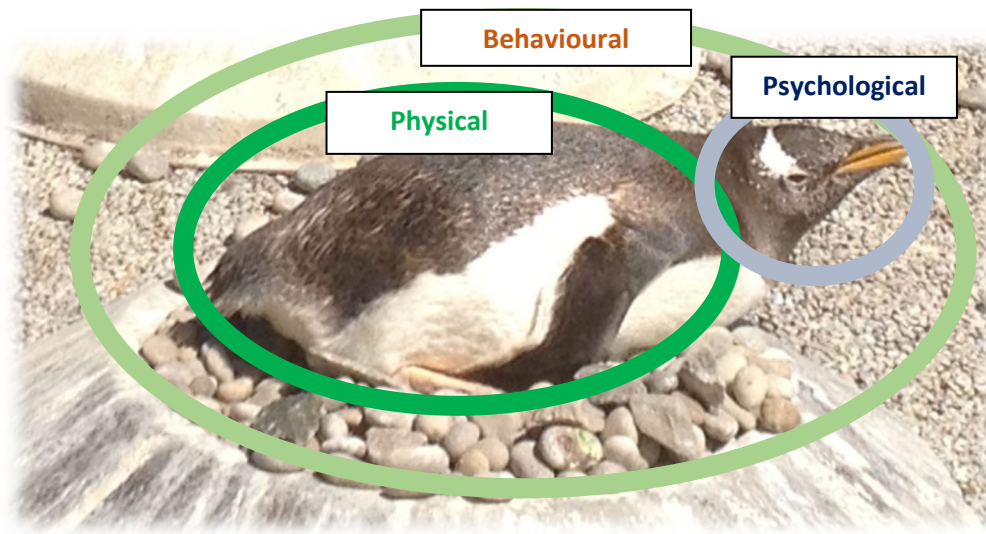


Fig. 1. Physical, psychological and behavioural health = three essential components of animal welfare

Animal welfare frameworks:

Traditionally, animal welfare science has focussed on removing negative influences from an animal's experience in order to enhance its welfare. In 1965 the Farm Animal Welfare Council (FAWC), an independent advisory body, developed the Five Freedoms framework aimed at improving the welfare of intensively farmed livestock:

1. **Freedom from hunger or thirst** by ready access to fresh water and a diet to maintain full health and vigour
2. **Freedom from discomfort** by providing an appropriate environment including shelter and a comfortable resting area
3. **Freedom from pain, injury or disease** by prevention or rapid diagnosis and treatment
4. **Freedom to express (most) normal behaviour** by providing sufficient space, proper facilities and company of the animal's own kind
5. **Freedom from fear and distress** by ensuring conditions and treatment which avoid mental suffering

Some of the problems with this framework include: It doesn't really promote good welfare experiences but only minimises poor welfare experiences, and it promotes unachievable goals as no one can realistically live their life entirely free of fear, pain or discomfort. More recently, scientists have focused on providing animals with positive emotional experiences by considering "what an animal likes" and "what an animal wants" (Yeates and Main 2008). These considerations have led to the development of frameworks such as the Five Needs, now enshrined in UK law (Act 2006), and adapted as the five provisions in the Secretary of State's Standards of Modern Zoo Practice which provides minimum standards for UK zoos

In 2006 the Five Freedoms were re-developed as the five welfare **needs** in the Animal Welfare Act (2006) and the Animal Health and Welfare (Scotland) Act (2006):

1. The need for a suitable environment
2. The need for a suitable diet
3. The need to be able to exhibit normal behaviour patterns
4. The need to be housed with, or apart, from other animals
5. The need to be protected from pain, suffering, injury and disease.

These needs take into account the physical and psychological well-being of the animal and apply to all vertebrate animals under human care in the UK.

The table below shows how the specific welfare needs of a bearded dragon may be categorised using the 5 needs framework:

5 needs framework:	Bearded dragon needs:
The need for a suitable environment	Space (minimum size 120 cm long, 60 cm high and 60 cm deep) Preferred optimal temperature zone 22 – 38C Humidity 30-40% Substrate Shelter Hiding spaces Ultraviolet index 3-5 Basking spot 38-42C
The need for a suitable diet	Invertebrates Multivit/mineral dusting powder Salad greens Fresh water in a shallow dish
The need to be able to exhibit normal behaviour patterns	Diurnal activity Basking spot Food finding Sand/soil substrate for digging Digging/nesting box for females

The need to be housed with, or apart, from other animals	Solitary housing (territorial)
The need to be protected from pain, suffering, injury and disease.	Need a vet experienced in exotic species Need a clinic stocking appropriate drugs and with reptile hospitalisation facilities. Secure enclosure to prevent escape Protected from direct heat/thermal burns

Using frameworks such as the five needs to categorise specific animal welfare needs ensures that all welfare needs are balanced against each other, otherwise it can be easy to focus on one aspect. For example we may provide an animal with all it needs for good physical health, such as food, water, warmth and shelter, therefore in terms of its health, the animal may be experiencing a high level of welfare. However, the same provisions may be very restrictive in terms of the performance of natural behaviour, and in that respect, the animal may be experiencing poor welfare, by considering each category in turn, we can avoid this. By using a welfare framework to plan our husbandry provisions, we can ensure that we are meeting all of the animal's welfare needs.

Another animal welfare framework is the Five Domains model (Fig. 2). The World Association of Zoos and Aquaria has adopted the 'Five Domains' framework to support positive welfare. The first 4 domains are physical or resource-based categories that influence the fifth domain – how the animal feels, which in turn influences its welfare status.

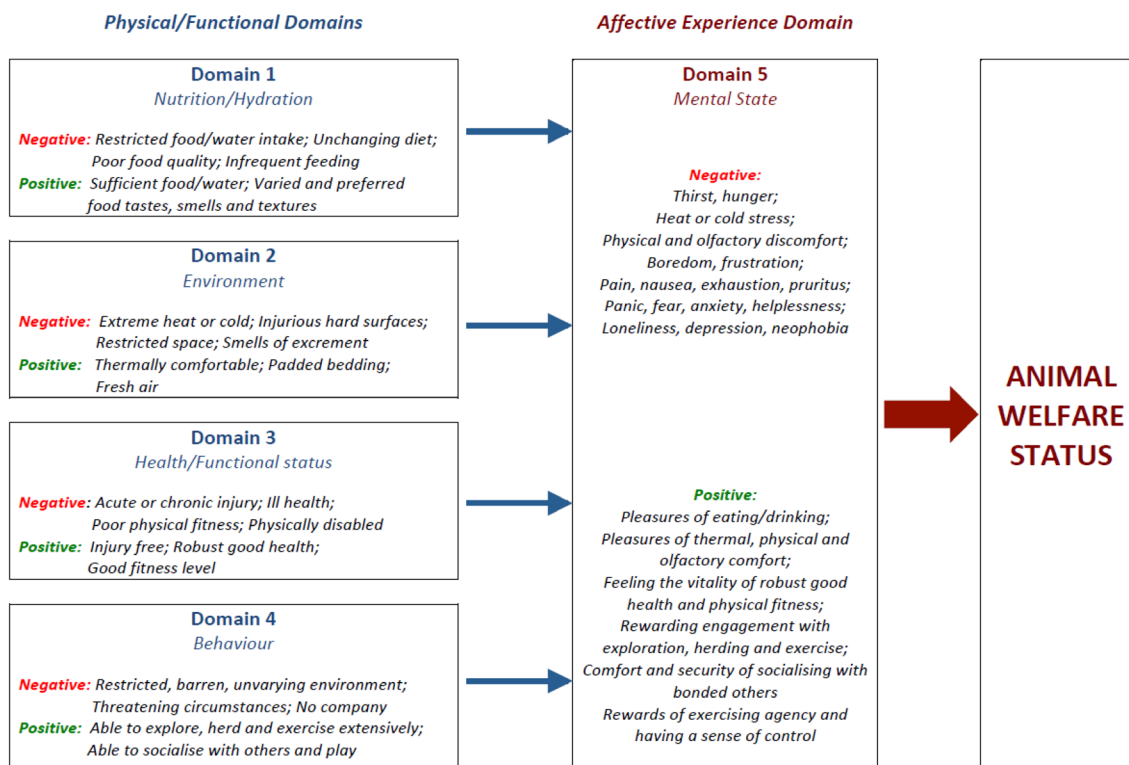


Fig. 2. Five domains model (reproduced from <http://www.mdpi.com/2076-2615/6/9/58> CC-BY 4.0)

Factors that influence Animal Welfare in the Zoo or Aquarium

Animal welfare exists on a spectrum from very good to very poor (Fig. 3), and animals may move along the welfare spectrum depending on their experiences and husbandry provisions, and how they respond to these provisions. In zoos we aim to provide animals with everything they need to experience good animal welfare.

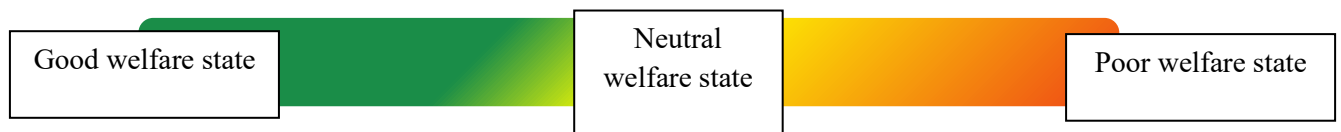


Fig.3. The welfare spectrum

Zoo animals have evolved in the wild to survive in specific ecological environments. When wild animals are kept in captivity, they must adapt to a new environment which sometimes requires new skills and behaviours. Factors such as husbandry routines, enclosure design, keeper relationships and diet provision may be considered as 'external factors' which influence an animal's welfare. Factors such as genetics, learning experience and personality are 'internal factors'. It is the interplay between these internal and external factors that determine an animal's welfare state. We may influence the internal factors to some extent through selective breeding and providing learning experiences, but mostly in the zoo we manage the external factors that can influence welfare. Adaptation is stressful and where possible, zoos should modify their environments and husbandry routines to accommodate the animal's evolved behaviours and welfare needs, as keeping animals in conditions that are very different from their evolved environment may result in a failure to cope and significant welfare problems. Figure 4. Shows how zoo animals might respond to different environmental factors that they experience

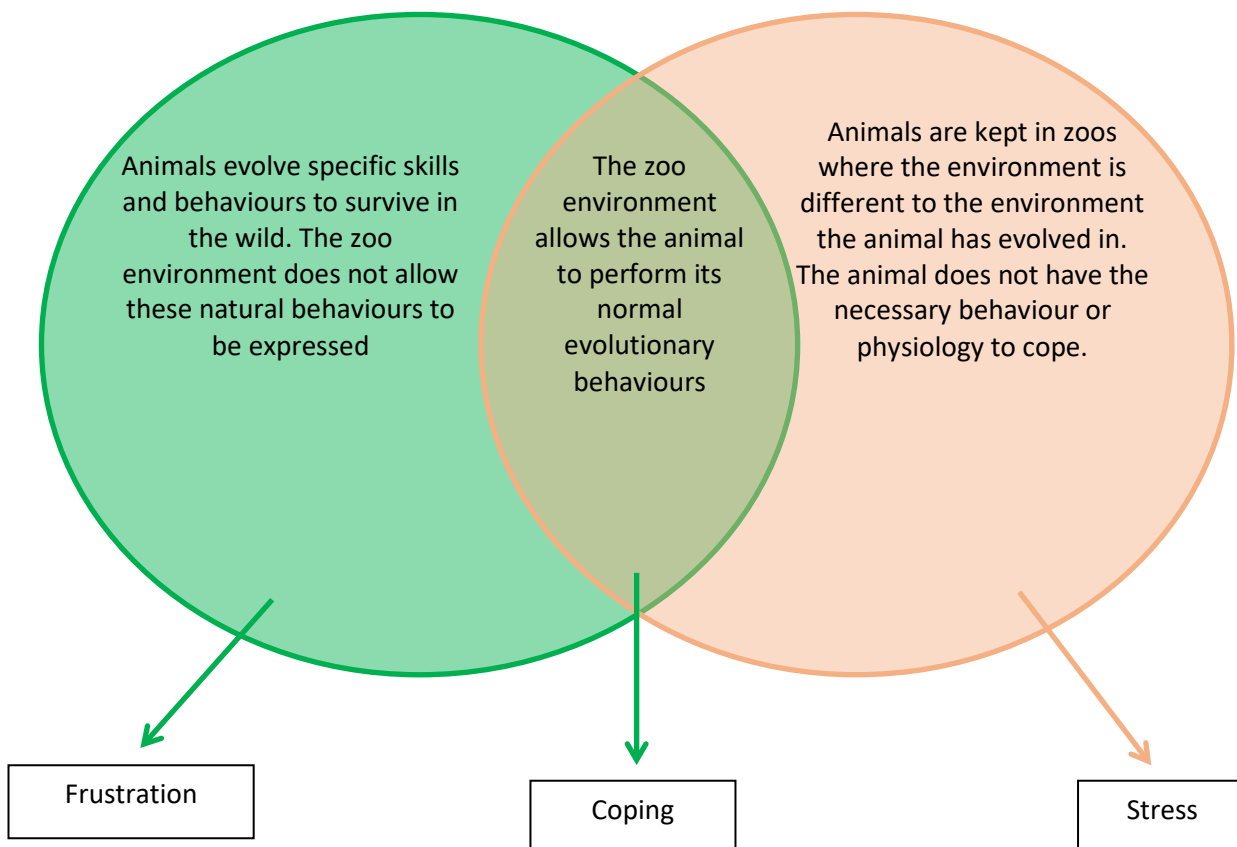


Fig. 4. The ability of wild animals to cope in the captive environment depends on the facilities provided for them and their own evolutionary behaviours

An animal's adaptation to captivity depends on the species and may vary widely, among closely related species or among individuals belonging to the same species. Differences between species can be due to divergent evolutionary history or different ecological requirements. Differences within the same species can be due to sex, age, physiological status, individual life history or different behavioural profiles. Due to these differences, animals of the same species may react towards sub-optimal conditions in different ways. Shy animals may respond to it with higher levels of inactivity, while bold animals may instead perform more stereotypic behaviour.

All species have specific behaviours that must be accommodated in the captive environment in order to support them in a state of good welfare for example reproductive, maternal and food-finding behaviours are highly conserved across generations of evolution, as these behaviours have conferred success in wild populations. Species-specific evolutionary behaviours may include social grooming in primates, rooting behaviour in pig species, or focussed-foraging behaviours in predatory or foraging species (Mellor 2011). In addition to these specific behaviours, animals should be encouraged to express a diversity of behaviours similar to those seen in the wild.

Human-Animal Interactions

One of the potential sources of stress in the zoo environment is the presence of humans – this includes both zoo visitors and also in some cases, zoo staff.

Visitor animal interactions.

There are many ways in which zoo animals and visitors may interact, from visual contact through enclosure barriers, to direct contact, visitor feeding activities, and animal demonstrations or performances. Additionally there are more indirect consequences of visitor-animal-interaction - for example the impacts of visitor noise (footsteps, talking, etc.) or odour (foodstuffs, perfumes and toiletries) which may not be immediately obvious to us, but which could be potential sources of stress for some zoo animals.

Some individual animals may find the proximity of visitors stressful, and this response may vary between individuals of the same species. Stress responses to visitors may be mitigated through visual screening, reducing visitor noise, providing zoo animals with the choice to retreat to an off-show area, managing visitor behaviour, and changing visitor viewing locations. Conversely some animals may enjoy interacting with visitors, or may find visitors a source of enrichment and engagement. Responses to visitors are complex and depend on many different factors. Evaluating the responses of individual animals to visitors is important in order to detect if any animals may find zoo visitors a source of stress.

Keeper animal interactions.

We generally assume that keeper-animal interactions are positive, and good for welfare – but is this always the case? Are there situations where we could improve this? Zookeepers care for their animals, but sometimes we can also get stuck in our own routines, and so reflecting on, and questioning our own behaviour is an important part of providing good animal welfare.

Are we performing husbandry duties because we know that the way in which we're delivering animal husbandry will result in good welfare outcomes? Or are we simply doing what we've always done? Is the enrichment we provide definitely enriching? Does it meet the animal's natural behavioural needs? Or is it simply 'variety'? When we train our animals are we offering them choices? Do they want to train with us or with a different keeper? Do they want to learn that particular task or a different one? Is their reward for learning really rewarding? If we have to lock them in for training, do they really want to be there? And is it really good for their welfare? What would they choose?

Asking these questions is important to ensure we really are giving our animals choice and control, which is very important for their welfare. Other aspects of husbandry to consider include daily routines and 24 hour welfare, seasonal routines and seasonal welfare, mate choice and social and reproductive welfare. All of these aspects of welfare are related to the husbandry choices that we as humans make and so it's important that we think about how we might improve welfare for zoo animals by changing our own behaviour and choices.

Consequences of Poor Welfare

Zoo animals have to face a number of challenges related to their housing, husbandry conditions and intra- and inter-species interactions, to which they may or may not be able to adapt. Regardless of the type of challenge, other components like intensity, duration, predictability, the effect of repeated stressors or the length of time left between different stressors may also affect the way animals respond to them.

When we assess welfare, what we are really trying to do is to determine how animals feel about what they are experiencing in relation to their housing, transport, management, handling etc. Animals experience a range of positive or negative emotional states that may affect their ability to cope with their environment. Examples of emotional states include boredom, fear, pain, frustration, distress, contentment and playfulness. Boredom can arise from barren, under-stimulating and excessively predictable environments. Boredom is regarded as a first stage of a path to apathy and depression. Frustration is very often triggered by the restriction of natural behaviours. Anxiety, fear and distress can be due to particular aspects or events in the captive environment e.g. chronic social tensions, an excess of unpredictable situations and over-stimulation.

Animals cope with stressful changes through physiological and behavioural mechanisms which are coordinated by the brain. In the short term there are adaptive responses to metabolism, immune and cardiovascular systems and their activation may restore the necessary balance without suffering. Animals may also learn from short-term stressful experiences and this can be a normal part of development e.g. appropriate social conflict leading to consolidation of social relationships in a group. However, if sub-optimal environmental or social conditions persist, the stress response will be prolonged (chronic), resulting in behavioural and physiological changes and potential changes in the brain. These stress responses may lead to pathologies such as changes to metabolism, reduced reproductive success, reduced immune function, abnormal repetitive behaviours including stereotypies, and a reduction in normal behavioural repertoire. Improvement of enclosure design, appropriate environmental enrichment including social stimulation or other husbandry practices may all contribute to reducing chronic stress and negative emotional states.

Zoo & Aquarium Animal Behaviour

Behavioural responses

Behaviour may be driven internally as a reflex response e.g. withdrawal from a painful stimulus, it may be self-rewarding through neurobiological mechanisms (feel-good chemicals) e.g. reproductive and maternal behaviours, or behaviour may be the result of the animal's decision-making processes i.e. an intentional choice. Behaviour is often the expression of the animal's psychological experiences and it can also reveal early health problems. Behavioural responses to challenging situations can be short-term or long-term. Short-term responses may be changes in posture or flight, whereas long-term responses may include the development of abnormal behaviour. The main advantage that behavioural assessment of welfare has over the physiological measures is that it is non-invasive, and assessment can be carried out without necessarily influencing the animals and their behaviour.

Simple observations can determine any changes in posture, inability to carry out normal movements, avoidance of an aspect of the environment, flight, changes in the 'normal' behaviour of an individual, lack of maintenance behaviours, such as grooming, and the performance of abnormal behaviour. As with physiological measures, knowledge of the natural behaviour of the animal is required when using behaviour to assess welfare, for example, vocalisation by an individual of one species may be of more concern than vocalisation from another. Similarly, some species naturally freeze in response to a threat whereas others do not and such a response would be of more concern in some species than others.

The species-specific natural repertoire of behaviour is the basis against which behavioural change in captivity is compared. But animals may not necessarily require the full expression of their natural behaviour to adapt well to captivity, or they can develop new patterns or frequencies of abnormal behaviour in response to the artificial stressors they experience.

There are 4 main 'categories' of behaviour and these categories overlap:

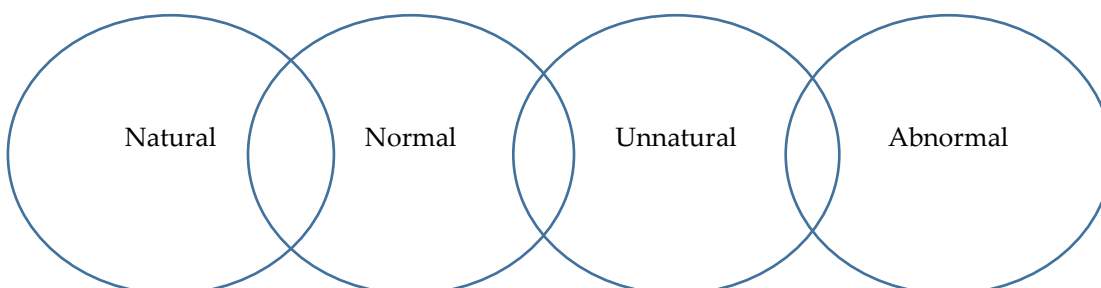


Fig. 5. Illustration of the four categories of behaviour and their overlaps

Natural behaviour has been defined as a behaviour that is

“typically observed in the wild; it is adaptive in the evolutionary sense... (i.e.) has evolved by natural selection which allows an individual to survive more easily in its particular environment and so gives it a better chance of leaving offspring than an animal not so adapted” (Poole, 1988, p. 3).

E.g. Predation, foraging, reproductive and maternal care behaviours are all natural behaviours in many species.

Normal behaviour will

“promote the success and survival of the individual and its genetic contribution to the population” and is “clearly appropriate to the particular situation”. It may also “be either natural or unnatural” (Poole, 1988, p. 4).

E.g. Natural behaviours such as social grooming in primates are also normal behaviours, so these categories overlap, but also unnatural behaviours such as adaptation to and breeding in the zoo environment, or behaviours that are learned through operant conditioning are not natural, but are perfectly normal responses and are appropriate to that particular situation.

Unnatural behaviour is defined as a behaviour that is

“not seen in the wild. Not all unnatural behaviours are regarded as abnormal, however, as they may promote success within the captive environment” (Poole, 1988, p. 3-4).

e.g. As above, behaviours that are learned through operant conditioning are unnatural, but are perfectly normal responses, so not all unnatural behaviours are a welfare problem, and some may even confer a welfare benefit.

Abnormal behaviour is defined as a behaviour that is:

“rarely seen in wild populations and does not promote the success and the survival of the individual or its close relatives (i.e. it does not increase fitness). It appears not to be goal oriented, so that its function is not apparent.” It “may include elements of normal activities, but they are performed in an inappropriate fashion” (Poole, 1988, p. 4).

“Repetitive behaviour is induced by frustration, repeated attempts to cope, and/or CNS dysfunction”
(Mason 2006)

Abnormal behaviours are maladaptive behaviours that lack a functional context, or those whose patterns, frequency or context are different from those identified as normal behaviour for the same individual, species or population. Abnormal behaviours may be used as a ‘coping’ mechanism for animals experiencing current or previous poor welfare. Chronic performance of abnormal behaviours can result in brain changes that mean these behaviours may persist even when the source of the stress is removed. Abnormal behaviours are not uncommon in zoo animals and can be a sign of chronic behavioural frustration or psychopathology. Abnormal behaviours should never be ‘blocked’ e.g. using logs to block a pacing path, as the behaviour is the mechanism the animal is using to cope with chronic stress or frustration. Instead we have a responsibility to acknowledge

that the animal is attempting to cope, and if we wish to modify the behaviour, then we need to address the cause of the animal's behavioural frustration.

Behavioural observations:

Assessment of the welfare of animals and the suitability of their captive environment has often been made using observations of the species in the wild or in semi-natural conditions which can be compared to observations of the animals in captivity. This is particularly useful for zoo animals, whose behaviour in captivity is likely to be closer to that of their wild counterparts than the behaviour of domestic species to their ancestors. The lack of performance of a behaviour by captive animals, that wild animals or animals in semi-natural conditions would perform, could be due to the animal adapting to its captive environment.

This could also be due to genetic differences which have arisen as a result of selective captive breeding, or the behaviour may be strongly dependent on external stimuli and in the absence of such stimuli the animal is unable to perform the behaviour e.g. nesting behaviour in birds and reptiles can only be performed when nesting substrate is provided. There is a risk of the behaviour being interpreted incorrectly due to assumptions being made about how the animal perceives the environment based on human perception e.g. if we only provide one den box or one feeding site to two animals, we can't know if they find sharing stressful but are coping or if they enjoy sharing the same spaces, by offering them choices, we can assess whether or not they enjoy sharing resources.

An assessment of the suitability of an environment is easier to make if the preferences and behavioural needs of a species have been investigated, and if the effect that the inability to satisfy these behavioural needs has on a species. The preferences of an animal may be assessed by carrying out observations of the animal in different social and physical environments, by offering them different options and by measuring the strength of their preferences, which gives an indication of how important something is.

Assessing Animal Welfare

We can use our knowledge of animal physiology and both normal and abnormal behaviour to assess the welfare of an animal in the zoo environment. We can also employ experimental techniques to determine the preferences of an animal, or how aversive it finds a procedure. These experimental techniques allow us to 'ask' the animals how they feel about their environment. We can then modify the captive environment accordingly, to improve the welfare of the animal.

Zoo animals like all other animals respond directly to the environment around them (Fig. 6). These responses can be measured and used as indicators of animal welfare

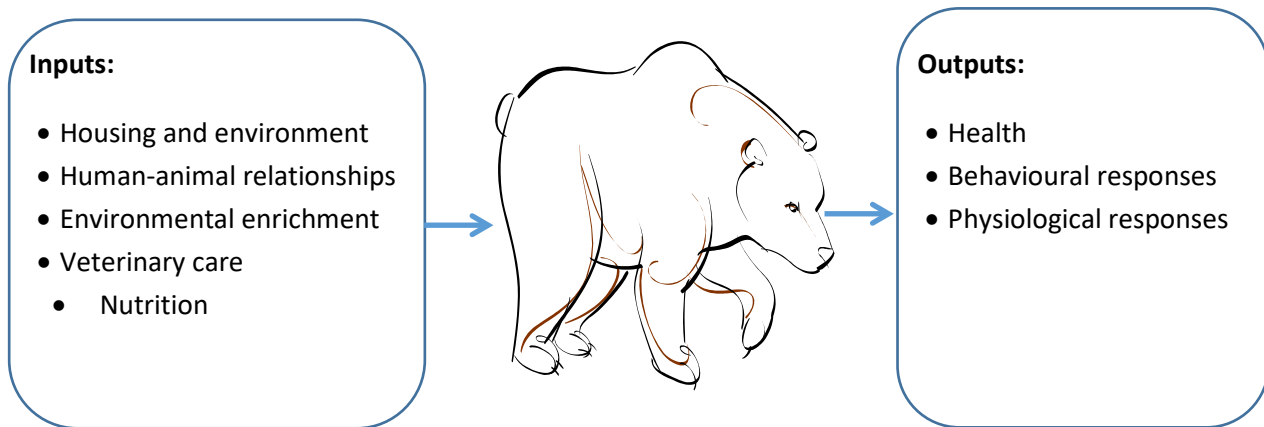


Fig. 6. The welfare of an animal is affected by the environmental inputs it experiences and may be assessed by looking at the animal's physiological, behavioural and health outputs.

Observations

Observations may be made of animals in different types of social and physical environments, and comparisons of behaviour can be made between them. For example, comparing the behaviour of rabbits in cages and in floor pens can provide information such as:

- How rabbits use different areas or features of the less restricted environment.
- How the behaviour of rabbits alters when they have a more appropriate environment.
- Whether any abnormal behaviours are only apparent in the restricted cages.

This information can be used to assess which environment the rabbits find preferable.

Preference tests

An alternative to simple observations as a means of investigating the environment of an animal is to 'ask' the animal. This has been carried out using preference tests, which allow the animal the choice of different types of a resource (e.g. floor surface) or between having a resource and not having it. The option chosen most often or for the longest duration is assumed to be the preferred option. Tests for aspects of the environment such as floor surface may be carried out using an enclosure with a different floor type in each half, where the animal can easily and quickly move from one type to the other.

Preference tests have been widely used to measure preferences of a range of species, mainly farm and laboratory animals but also in zoos, to test preferences for a wide range of resources. Preferences have been assessed in relation to temperature, bedding, flooring and illumination levels. The findings of such studies have been used in the design of loading ramps and nest boxes for example, and have been used to assess how aversive animals find restraint, vibration and noise levels.

Preference tests tell us what proportion of time the animals choose to spend with each of the options available to them. However, the animals only have a limited number of options available to them, and the resource taken as the preferred one may not be the animals favourite choice but simply the 'best of a bad bunch'.

Strength of preferences

An addition to straightforward preference tests is to determine whether the animal will learn to perform a task to gain the reward being offered. In these operant tests the animal 'operates' on the environment to achieve the desired consequences. This allows us to investigate whether the resource being offered is sufficiently rewarding for the animal to pay the cost (e.g. time or energy) involved in performing the task. Such studies tend to use an obstacle which the animal has to overcome between the animal and the resources. One of the most commonly used obstacles is a weighted push-door, where the weight on the door can be increased to increase the cost imposed. This approach has been used for assessing the motivation of mink for resources such as hay, a water bath, a raised platform and enrichment objects, of rats for nest-boxes, nesting material and either a grid or solid floor, of hens for perches, and laboratory rabbits for social contact and a cage platform.

Physiological responses

Animals show both short-term and long-term physiological responses to challenging situations. The nervous system and the endocrine system are involved in communication and co-ordination both within an animal and between an animal and its environment. Cues from the environment such as visual, olfactory and auditory cues cause messages to be sent via neurons in the form of nerve impulses. During short term responses to the environment, such as a sudden threat or emergency situation, the animal prepares for 'fight or flight' by secreting adrenaline.

The sympathetic-adrenal-medulla (SA) axis and the hypothalamic–pituitary–adrenal (HPA) axis are the most important neuroendocrine pathways involved in the stress response. The SA induces the release of catecholamines (adrenalin/noradrenalin). Adrenaline causes changes such as increased heart rate and more rapid breathing and diverts the blood to the muscles from the alimentary canal. When a stressful situation persists, HPA activation occurs and the adrenal glands produce a variety of glucocorticosteroids, which act on the liver causing increased glucose to be released into the circulation and therefore increasing the blood glucose levels to make energy available to the muscles. Glucocorticosteroids can be measured from a number of tissues (e.g. hair), body fluids (e.g. urine, saliva, blood) and holding-water (in fish). Plasma corticosteroids reflect the secretory activity at a given moment in time, whereas faeces, urine or water corticosteroids reflect a temporal integration of circulation levels.

Many other related hormones (e.g. ACTH, oxytocine), immune cells and brain changes also vary as a function of the HPA activation. Less accessible measurements include modifications in target-issue corticosteroid receptor abundance and gene expression.

Although physiological measures can be useful, there are problems associated with their use in welfare assessment. One of the problems is that obtaining the samples can be difficult and stressful for the animals, particularly wild animals. Obtaining the sample can itself influence the findings, for example, the activity of an animal may increase if it attempts to avoid handling. Changes in heart rate from increased activity cannot be distinguished from changes due to emotional responses.

As well as the process of actually obtaining the measurements, the timing of the measurements is also important and can have a huge effect on the findings.

Some measures may increase almost immediately and decrease quickly (e.g. heart rate), whereas others may take some time to occur and if exposed to chronic stress, animals may habituate. Although glucocorticoid levels can be a useful measure, their use also raises concerns, as the basal level of glucocorticoids shows a diurnal rhythm. Levels can also vary due to courting behaviour, mating and active food acquisition. Care must therefore be taken when interpreting the levels of glucocorticoids found. Knowledge of the biology of the species is required in order to identify the type of responses being shown, as responses may differ between species. Responses may also differ between animals of the same species, or of different ages, sexes or with different previous experience.

Health responses

Stress can affect reproductive fitness at various levels: reproductive hormones, gamete development and quality, egg and larval survival and development. Growth is also affected by stress through unbalance of complex endocrine pathways and due to metabolic effects. High corticosteroid levels are immunosuppressive which result in higher pathogen vulnerability and the consequent higher incidence of disease. Generally, diseases bring with them higher mortality, and both high levels of disease or unusually high mortality rates may be indicators of reduced welfare.

Cognitive responses

Learning abilities, anticipation capacities, memory, individual recognition, ability to understand what other animals have in mind, are different examples of cognitive abilities which are important to better manage welfare of animals in zoo environments. In the same way, changes in these abilities may occur due to sub-optimal environmental conditions. Animals in captivity experience many factors that might affect their welfare. These include the social conditions, dietary factors, management and behavioural restriction. As a result of differences between species and their behaviour, there are specific welfare concerns for different animals.

There are also welfare concerns over the way animals are trained. Many people who train animals do use appropriate reward based methods, however, often a lack of true understanding of learning theory may cause these techniques to be used ineffectively for example using food to train an animal is 'positive' but if that animal must be socially isolated from its group for training, then the overall experience may be negative, regardless of the food reward. Similarly if an animal is conditioned to perform behaviours in order to access food i.e. kept 'hungry' for training then the choice element of training is removed and again the experience may not be positive. If training signals are not clear, this can lead to confusion or frustration and the animals being unable to make the correct association between what is being asked of them and the reward. Breakdowns in training may lead to aversive and even inhumane techniques being used as frustration grows.

Ethics in Zoos & Aquariums

Animals and habitats have many uses, serving many industries e.g. tourism, research, timber, mining, palm oil, fur, meat, luxury goods, medicines...

Humans utilise wild animals and their habitats in many different ways: Often, unsustainable use of wildlife raises both conservation and welfare issues. Traditionally there has been little communication or cooperation between welfare and conservation initiatives and there is sometimes conflict as the two topics can be seen as mutually exclusive...

... But are they? Healthy populations need healthy individual animals and animals cannot be physically, psychologically and behaviourally healthy without good welfare.

Examples of Conservation ethical priorities

- Preservation of the species is a priority
- Preservation of a species can confer protection to other habitats and species
- Species management should consider criteria such as genetic diversity and biodiversity protection

Examples of Welfare ethical priorities

- All animals and species have intrinsic value
- We have a duty of care to animals
- An individual's sentience and its intrinsic value should be considered when it is used by humans

The management of wild animals in captivity throws up many ethical dilemmas and some welfare concerns. Our attitudes to the issues will be influenced by a variety of factors including our own experiences, culture, religion, gender, geographic location and knowledge. We are also influenced by how genetically related the animal species is to humans, the 'cuteness' of the animal, unfamiliarity or fear of the species, and the role of the species in society. This means we often make biased decisions for different species based on our feelings rather than on the needs of the animal. Good stockmanship and the reliance of zoo animals on the choices made by their keepers, significantly influence the welfare of the animals in zoos (Kagan and Veasey 2010). This confers an ethical responsibility upon us to provide for the animals that are reliant upon us.

Globally zoos may also act as consumers of wildlife. The legislation section at the end of this handbook outlines some of the extensive protection that zoo animals experience in the UK, but for many zoo animals around the world this level of protection does not apply. Unregulated zoos, roadside zoos or zoos which do not have adequate standards of animal care all contribute to international animal welfare and conservation problems. We should promote an evidence-based approach to zoo animal welfare globally, promoting positive welfare in zoo animals and assessment of mental state and motivation. Part of the problem within zoo animal management is that many health and husbandry practices are based on tradition rather than empirical evidence (Melfi 2009). However as zoo husbandry and welfare research increases and we learn more about the species

we care for, we should aim to continually improve our husbandry practice. It is also important that we as keepers are able to reflect on our own work and critically evaluate whether we are doing something because it makes us feel good or because we aim to do good, or whether we are doing it because it actually results in good welfare for the animal.

It is essential that high standards of welfare are practiced each day and that a transparent ethical review process is present in any zoological collection. This is not only good practice but also is required by the Secretary of State's Standards of Modern Zoo Practice (SSSMZP, 2004) and any ethics policy should comply with the Animal Welfare Act 2006.

Ethical review

Zoos should be aware of the importance of ethics and have their own policy for dealing with ethical issues. Zoos licensed under the Animals (Scientific Procedures) Act 1986 (ASPA) are required to have an ethical review process for this. All zoos should have some form of ethical review process, particularly in situations where the use of animals (e.g. acquisition, management or disposal for conservation, education or research) may be in conflict with the best welfare interests of the animal or animals involved. Most larger zoos will convene an annual ethics committee.

Issues that might be addressed include:

- in what circumstances an animal should be euthanased;
- whether waterfowl in enclosures should be pinioned;
- adequacy of procedures;
- transfer policy;
- culling policy;
- research projects;
- compliance with conservation and educational policies.

It may not be practical for smaller zoos to establish their own ethics committee – instead they may access another committee or independent ethical advisor. Whichever route is selected it should be independent, The committee should include a variety of representation, not just scientists and where possible, junior staff from the zoo and members of the local community should be represented on the committee. The committees work should be carried out openly whilst also respecting confidentiality where required.

Ethics and Zoo Practice

As mentioned above there are a variety of topics which may require ethical review. This is because they are topics where different people are likely to have different viewpoints, or where scientific evidence might conflict with personal ethics. Quite often within professional communities we have to separate our personal and our professional ethics, so whilst we may be comfortable with one course of action on a personal level, we should always strive to understand and be respectful of the ethical positions of our colleagues and zoological associations, even if we don't personally agree

Examples of ethical positions are given below (see the BIAZA and EAZA websites for full statements), read through each and consider

- Do you agree with this statement? If not why not?
- How does it make you feel? Are you comfortable with all aspects of this position?
- Why do you think this guidance is necessary?

From the BIAZA animal transfers policy:

“Collections must be able to document that every reasonable precaution is taken to ensure that a transfer involving specific animals/institutions will not contribute to the laundering of animals, the illegal sourcing of animals, poor welfare conditions, the unsustainable removal of animals from the wild (or without proper paperwork) or the support of ethically challenging industries (circuses, canned hunting etc.) In the case of dispositions to non-BIAZA or EAZA members, due diligence should include inspection of receiving facilities, or receiving suitable written references regarding facilities and expertise, from BIAZA or EAZA members.”

From the EAZA statement on animal demonstrations:

“EAZA does not support demonstrations which place humans or animals at a risk of physical or psychological harm, including:

1. Any situation where an animal, a staff member or guests safety is unnecessarily and knowingly placed at risk.
2. Any practice that requires physical disciplining of an animal to provide protection for a staff member who is in contact with that animal for any purpose other than the preservation or improvement of its health or wellbeing.
3. Direct physical contact between humans and animals in a demonstration for the sole purpose of entertainment, where there is no accompanying demonstrable educational value.”

From the BIAZA euthanasia policy:

“...euthanasia should be considered:

1. Where the animal poses a serious and unavoidable threat to human safety, e.g. escaped animals.
2. For injured animals, donated or otherwise acquired, that cannot be rehabilitated

3. Where, in the opinion of the staff responsible for the individual animal's health and welfare, an animal is suffering from a disease, detrimental psychological state or severe pain and stress which cannot be adequately alleviated.
4. Where the only alternative is permanent transfer to substandard accommodation.
5. For hybrids and animals of an unknown or undefined subspecies in cases where this is considered of importance in the context of a managed programme.
6. Where the continued presence of an individual animal is disruptive to the natural dynamic of a group within an individual collection and/or the demographic or genetic health and development of a BIAZA/EAZA approved ex situ conservation programme. Consequently, young animals (e.g. at weaning or when normally leaving parental care) and animals that are past breeding age or are senile (groups that are prone to deleterious geriatric conditions) may be considered for euthanasia as part of a balanced population management strategy."

Interactive Ethical Resources

Please visit the animal ethics dilemma website at <http://www.aedilemma.net/> and create a free account to work through case studies and better understand your own ethical viewpoint.

World Association of Zoos and Aquaria animal welfare strategy

<http://www.waza.org/en/site/conservation/animal-welfare-1471340294>

Legislation, Guidance and Welfare in Zoos

There are many different regulatory requirements which may impact upon zoo animal welfare. The primary pieces of legislation, policy and guidance, and the regulatory bodies which influence zoo animal welfare in the UK are discussed below, along with some very useful additional resources.

The EC Zoos Directive 1999. The EC Zoos Directive 1999 (EC Directive 1999/22/EC) is a piece of European legislation governing zoos across the member states of the EU. It sets out requirements for the licencing and inspection of zoos. This includes standards of animal care, record keeping, education and conservation. In terms of animal welfare article 3 is the most relevant:

Article 3 (3RD Indent): Accommodating animals

"Accommodating their animals under conditions which aim to satisfy the biological and conservation requirements of the individual species, inter alia, by providing species specific enrichment of the enclosures; and maintaining a high standard of animal husbandry with a developed programme of preventive and curative veterinary care and nutrition"

This requires species-specific husbandry routines, enrichment and enclosures as well as a high standard of veterinary care and nutrition.

Biological requirements can be assessed both through evaluation of environmental provisions (inputs) and animals' responses (outputs).

Conservation requirements involves the individual's ability to contribute successfully to the conservation of its species. For example, through its participation in a conservation breeding programme, as part of a programme of re-introduction of the species to the wild or as an educational ambassador for its species.

Zoos Directive – Accommodating Animals

Accommodating animals in a way that satisfies their biological requirements is an important contribution to meeting the conservation objective of zoos.

Standards of good practice and species-specific husbandry manuals are available and are important sources of information to keep zoo animals in good conditions.

Assessments of environmental provisions, physiological state and behaviour can be used to determine whether animals' biological requirements are being met.

Housing design, furnishing, surfaces, substrate and environment (e.g. temperature, humidity, light) are the key aspects for meeting accommodation requirements in zoos.

Environmental enrichment promotes natural and desirable behaviour in animals, occupying their time and encouraging physical, social and mental activity.

Human-animal interactions, both in relation to keepers and to visitors, can be significant to animal welfare.

Suitable health programmes are required to ensure good animal health.

All of these roles require the species to be physically and psychologically fit, with good physical and behavioural health, and an ability to adapt, cope and learn in a stimulating environment. Appropriate environment and husbandry practices require a good knowledge of both species-specific and individual needs which is, to date, absent for many species. However, many taxon-specific husbandry manuals based on natural history and on experience from captive husbandry exist and can be used. Decisions on species for which husbandry manuals are still non-existent are often based on analogies between closely related species. This approach is practical, and frequently useful, but care must be taken, even with some very closely related species that nevertheless have distinct ecological needs and therefore may require different provisions and husbandry procedures.

EU Zoos Directive Good practice Document

http://ec.europa.eu/environment/nature/pdf/EU_Zoos_Directive_Good_Practices.pdf

EAZA standards and Guidelines

<https://www.eaza.net/about-us/eazadocuments/>

Zoo Licensing Act 1981 (ZLA). The ZLA is a piece of UK legislation that incorporates the EC Zoos Directive through its 2002 amendment. The ZLA 1981 outlines the formal requirements for

obtaining and maintaining a licence for a zoological collection. A zoo is defined as a place where non-domesticated animals are kept and which is open for at least 7 days each calendar year. It excludes pet shops, circuses and private collectors, which are covered by other legislation.

Secretary of State's Standards of Modern Zoo Practice (SSSMZP, 2004) are guidelines produced by the UK Government that provide guidance and interpretation of principally the Zoo Licensing Act but also other legislative documents. It should be considered the first port of call when considering legislation and minimum standards of animal health, welfare and husbandry in a zoological collection in the UK. It is not limited to animal care but includes: provision of food and water, a suitable environment, provision of animal health care, provision of the opportunity to express most normal behaviour, protection from fear and distress, guidance on transportation and movement of live animals, conservation and education, public safety, stock records, staff and training requirements, public facilities, and display of the zoo licence of which a current copy must be displayed at each public entrance. The SSSMZP are regularly updated. The SSSMZP requirements for veterinary support must be consistent with the welfare needs of the collection.

SSSMZP

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69596/standards-of-zoo-practice.pdf

Zoos Expert Committee. The Zoos expert committee is an independent advisory body on zoo licensing matters. The members of the forum represent a broad range of expertise and experience in the world of animal welfare and conservation, from scientists and veterinary surgeons to educators and directors of animal conservation institutions. In addition they produce guidance, interpretation and support to the SSSMZP, the ZLA and other legislation that has an impact on zoos.

Zoos Forum Handbook

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69611/pb13815-zoos-expert-committee-handbook1.pdf

Animal Welfare Act 2006, Animal Health and welfare (Scotland) Act 2006. The AWA only applies to vertebrate animals, it does not apply to invertebrates, foetal or embryonic animals, wild animals that do not fit into the definition of a "protected animal" (see later) or research animals that are regulated by the Animals (Scientific Procedures) Act 1986. "Protected animals" are classed as animals commonly domesticated in the UK including feral cats and dogs, under the control of man (e.g. circuses and zoos or those caught in a trap), and those not living in a wild state (e.g. escaped wild animals that are non-native to the UK). The Act considers vertebrate animals to be sentient and places the responsibility for ensuring their welfare upon the responsible person. Animal owners/keepers are considered to have a duty of care to ensure the five welfare needs are provided. This is not limited to the organisation but also the individual keeper whom potentially could be prosecuted under this Act.

The Welfare of Animals (Transport) (England) Order 2006. This Act aims to ensure a high minimum standard of animal welfare for animals as they are transported. This applies to all zoo animals transported by road, sea, air or rail, from the moment animals are loaded on a vehicle, through to their care during transport and unloading at their final destination.



Professional Guidance

In addition to meeting legal requirements, many zoos are accredited by national, regional, and international membership association. In the UK the association is the British and Irish association of Zoos and Aquaria (BIAZA), at the European level it is the European Association of Zoos and Aquaria (EAZA) and on a global scale it is the World Association of Zoos and Aquaria (WAZA). Each of these associations will produce guidance for their memberships including policies and guidance relating to zoo welfare and ethics e.g. BIAZA welfare toolkit, minimum standards of husbandry and accommodation. Additionally there may well be policies and guidance on controversial practices such as euthanasia, population management and the use of animals in performances or demonstrations.

All zoo staff should be aware of their duties and responsibilities to their membership associations, and their websites can provide useful information, training and support.

<https://biaza.org.uk/projects/detail/biaza-welfare-toolkit-2>

<https://www.eaza.net/about-us/areas-of-activity/animal-welfare/>

<https://www.waza.org/priorities/animal-welfare/>

References & Further Reading

- Act, U. A. W. (2006). "<http://www.legislation.gov.uk/ukpga/2006/45/contents>." Retrieved 15.04.2013, 2013.
- Broom, D. (2011). "A History of Animal Welfare Science." *Acta Biotheoretica* **59**(2): 121-137.
- Broom, D. M. (2011). "A History of Animal Welfare Science." *Acta Biotheoretica* **59**(2): 121-137.
- Dawkins, M. S. (1998). "Evolution and Animal Welfare." *The Quarterly Review of Biology* **73**(3): 305-328.
- FAWC, F. A. W. C. (2009). *Farm Animal Welfare in Great Britain: Past, Present and Future*.
- Hill, S. P. and D. M. Broom (2009). "Measuring Zoo Animal Welfare: Theory and Practice." *Zoo Biology* **28**(6): 531-544.
- Kagan, R. and J. Veasey (2010). *Wild Mammals in Captivity: Principles and Techniques for Zoo Management*. D. G. Kleiman, K. V. Thompson and C. K. Baer. USA, University of Chicago Press.
- Melfi, V. (2009). "There are big gaps in our knowledge, and thus approach, to zoo animal welfare: a case for evidence-based zoo animal management." *Zoo Biology* **28**(6): 574-588.
- Mellor, D. J. (2011). "Animal emotions, behaviour and the promotion of positive welfare states." *New Zealand Veterinary Journal* **60**(1): 1-8.
- Ohl, F. and F. J. van der Staay (2012). "Animal welfare: At the interface between science and society." *The Veterinary Journal* **192**(1): 13-19.
- Tuytens, F. A. M., F. Vanhonacker, E. Van Poucke and W. Verbeke (2010). "Quantitative verification of the correspondence between the Welfare Quality® operational definition of farm animal welfare and the opinion of Flemish farmers, citizens and vegetarians." *Livestock Science* **131**(1): 108-114.
- Yeates, J. W. and D. C. J. Main (2008). "Assessment of positive welfare: A review." *The Veterinary Journal* **175**(3): 293-300.



Copyright reserved by Sparsholt College Hampshire and The British and Irish Association of Zoos and Aquariums (BIAZA).

No part of DMZAA materials can be copied or shared without specific written permission.

