Caring for Wildlife - The World Zoo and Aquarium Animal Welfare Strategy

Editors' Note
WAZA's Animal welfare strategy is a much needed and timely milepost. It provides approach for assessing and managing animal welfare and thus responds to concerns over welfare of zoo and aquarium animals. It also provides approaches for conservation activities of zoos and aquariums. We have the permission from WAZA to serialise *Caring for Wildlife: The World Zoo and Aquarium Animal Welfare Strategy*. There should be something for everyone to do to make the zoos and the animals in their locality better. Happy reading! - *Editor*

EXECUTIVE SUMMARY
In recent years, there have been significant advances in knowledge about animals and animal welfare science. This has resulted in big changes in modern zoos and aquariums. Whereas zoos and aquariums of the past were places where animals were 'displayed' for the pleasure of visitors, today's zoos and aquariums must be centres for animal welfare. They must ensure that the conditions for animals in their care are the best that can be delivered. As scientific knowledge about animals grows, this must be consistently applied.

While there continue to be challenges in the global implementation of animal welfare standards; with different attitudes, societal expectations and varied jurisdictional frameworks and legislation; all zoos and aquariums can take a significant stance to improve the lives of animals in their care. The World Zoo and Aquarium Animal Welfare Strategy recommends that zoos and aquariums should apply a simple welfare model—the 'Five Domains'—and make an ongoing commitment to animal welfare in all operations and to all animals in their care. The Strategy recommends continued education and training of staff in animal welfare, and a commitment to animal welfare research, to applying animal welfare knowledge to exhibit design and to being leading centres for animal welfare.

Pantanal, Brazil, Caiman

While the goal of the World Association of Zoos and Aquariums (WAZA) is collective conservation action, the Strategy affirms WAZA's commitment to leading its members and colleague zoos and aquariums to build expertise, leadership and capacity in animal welfare.

The World Zoo and Aquarium Animal Welfare Strategy provides guidance on how to establish and maintain acceptable animal welfare standards and related best practice. It outlines the animal welfare measures and conduct expected from WAZA members and it supports the ongoing evolution of positive animal welfare conduct within the wider zoo and aquarium community.

In doing this, WAZA calls on its members and all zoos and aquariums to:
• strive to achieve high welfare standards for the animals in their care;
• be animal welfare leaders, advocates and authoritative advisers; and
• provide environments that focus on the animals' physical and behavioural needs.

INTRODUCTION
This Strategy is a guide to zoos and aquariums to achieve high standards of animal welfare in support of their goals as modern conservation organisations.

BACKGROUND
In an increasingly urbanised world, zoos and aquariums aim to connect people to nature. As a key interface between humans and the natural world, zoos and aquariums enable people to experience wildlife in safe and engaging environments. They also contribute to conserving the world's biodiversity, and at the same time seek to increase understanding and appreciation of wildlife. In addition, through improving environmental education, community awareness, advocacy and other activities, zoos and aquariums aim to encourage conservation of wildlife and natural environments.

Leading zoos and aquariums situate animal welfare as primary to their operations. While conservation of wildlife is the core purpose of leading zoos and aquariums, seeking to achieve positive animal welfare states is a core activity.

Zoos and aquariums maintain high animal welfare standards using scientific knowledge and practical

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experience to guide the management of all species they hold. Moreover, they provide opportunities to combine wildlife science and animal welfare science to enhance the species-specific knowledge required to secure the survival and manage the welfare of the wildlife and other animals in their care.

Many of societies' expectations regarding what are acceptable and unacceptable ways of treating animals, principally mammals and birds, have changed as understanding of their physical and behavioural needs has grown. Today, there is significant interest in how good animal welfare standards can be maintained when conservation-related practices are applied to wildlife. Conservation and welfare management have become closely linked, providing opportunities to develop pragmatic solutions to furthering the purposes of animal welfare and species conservation whilst at the same time managing their sometimes conflicting requirements.

WHAT IS THE PURPOSE OF THIS STRATEGY?

Modern zoos and aquariums primarily exist for the purposes of wildlife conservation, using field engagement, environmental education, public awareness, advocacy, breeding programmes, fundraising, research collaborations and partnerships to achieve their goals. A modern zoo or aquarium uses the most up-todate information, evidence and knowledge to achieve its conservation mission and has an ongoing commitment to continued progression in best-practice holistic animal care.

The *World Zoo and Aquarium Animal Welfare Strategy* provides guidance on how to establish and maintain acceptable animal welfare standards and related best practice within this framework. It also provides information to assist zoos and aquariums to demonstrate an understanding of animal welfare and put this into action.

The diverse nature of animal collections in zoos and aquariums presents greater management challenges than are usually encountered by organisations that have a much narrower species focus, such as those in the farming sector. The breadth of knowledge required is correspondingly much wider. So are the demands of keeping up-to-date with new scientifically validated management practices aimed at supporting continual improvement in animal care. This requires a high level of organisational policy commitment and knowledgeable staff with appropriate practical expertise. These are essential components to achieving good animal welfare.

"Zoos and aquariums have a responsibility to achieve high standards of animal welfare in support of their goals as modern conservation organisations."

WAZA ANIMAL WELFARE COMMITMENT STATEMENT

World-leading zoos and aquariums that are members of WAZA should have a continuing commitment to animal welfare. The following statement outlines the basis of WAZA members' commitment:

OUR COMMITMENT IS TO:

- strive to achieve high welfare standards for the animals in our care;
- be animal welfare leaders, advocates and authoritative advisers; and
- provide environments that focus on the animals' physical and behavioural needs.

IN DOING THIS, WE COMMIT TO:

- treat all animals in our zoos and aquariums with respect;
- make high animal welfare standards a major focus of our husbandry activities;
- ensure that all husbandry decisions are underpinned by up-to-date animal welfare science and veterinary science;
- build and share with colleagues animal care and welfare knowledge, skills and best practice advice;
- comply with specific animal welfare standards set out by regional zoo and aquarium associations and WAZA; and
- comply with jurisdictional and national codes of practice, regulations and legislation as well as international treaties relating to animal care and welfare.

ANIMAL ETHICS AND ANIMAL WELFARE
It is helpful to distinguish between animal ethics and animal welfare. Ethics addresses questions relating to how groups of people decide to regulate their behaviour, such as the decisions they make about what is legitimate and acceptable in pursuit of their aims, and what is not, and the grounds for those decisions. Thus, animal ethics may be seen to identify a values-based impetus for all animal-holding organisations, including zoos and aquariums, to aim for high animal welfare standards in their activities. There are several ethical theories that are relevant to this, but a discussion of them is beyond the scope of this Strategy. Note, however, that in this context, a primary commitment to achieving the highest possible standards of animal welfare in the practical circumstances of each zoo and aquarium, and an equal commitment for these organisations to improve such circumstances where that is possible and necessary, are ethically driven.

There are two major features of animal welfare that are relevant to zoos and aquariums. The first is meeting animals' basic survival needs for food, shelter, health and safety. The second is to enhance their welfare above this survival minimum by increasing opportunities for animals to have positive experiences, focused, for example, on their comfort, pleasure, interest and confidence. Although the objective would be to achieve both, there are circumstances where that is not easy to apply. For example, a pressing conservation need to secure the survival of some threatened species may sometimes override this dual objective. It should be recognised that whilst suboptimal environments may achieve short-term success, they may be less likely to support long-term conservation outcomes. Managers and animal care staff must demonstrably attempt to provide positive experiences for animals, regardless of resource or facility limitations and conservation needs.

These and other matters are addressed in this Strategy. The first chapter provides a brief account of our current science-based understanding of animal welfare and its assessment. The subsequent chapters outline the welfare implications of monitoring and managing of animal welfare; environmental enrichment; exhibit design; breeding programmes and collection planning; conservation welfare; animal welfare research; partnerships in animal welfare; and engagement and interaction with visitors.

CHAPTER 1: ANIMAL WELFARE AND ITS ASSESSMENT

Our commitment is to develop excellence in zoo and aquarium animal welfare.

RECOMMENDATIONS
To realise our commitment to high animal welfare standards, the *World Zoo and Aquarium Animal Welfare Strategy* calls on member organisations to:
1. Develop an animal welfare charter for your organisation that reflects a clear commitment to animal welfare principles.
2. Cater to the physical and behavioural needs of animals when providing for their care. This includes creating opportunities for them to benefit from rewarding challenges and choices whenever that is practically feasible.
3. Seek to continuously improve animal welfare understanding to better promote positive welfare states in all species held by your organisation.
4. Implement science-based animal welfare monitoring processes that use indices aligned with the animals' physical/functional states and behavioural activities.
5. Use the 'Five Domains' model to understand and assess different animal welfare states.
6. Promote knowledge and understanding of animal welfare and its management within the wider community.

INTRODUCTION
What is animal welfare? How do ideas about animal welfare apply to zoos and aquariums? Although there are several different ways of thinking about animal welfare, the science underpinning it continues to advance, where the principal focus has been on mammals and birds. The following description of animal welfare provides helpful insights (World Organisation for Animal Health – OIE):

> *Animal welfare means how an animal is coping with the conditions in which it lives. An animal is in a good state of welfare if (as indicated by scientific evidence) it is healthy, comfortable, well nourished, safe, able to express innate behaviour, and if it is not suffering from unpleasant states such as pain, fear and distress. Good animal welfare requires disease prevention and veterinary treatment, appropriate shelter, management, nutrition, humane handling and humane slaughter/ killing. Animal welfare refers to the state of the animal; the treatment that an animal receives is covered by other terms such as animal care, animal husbandry and humane treatment.*

Animal welfare refers to the state of an animal, including the subjective feelings and sensations it experiences as a result of its physical health and surrounding influences. For example, an animal may experience negative states such as the feeling of hunger if there is insufficient food, pain if it is injured and fear if it is threatened. An animal would typically seek to reduce or avoid these and other such negative experiences, especially when they are intense, and would be considered to be in a negative (or poor) state of welfare if unable to do so.

Advances in animal welfare science have highlighted the importance of considering animals' psychological states when assessing welfare over time. Therefore, it is not just the physical/functional needs of animals that require attention in caring for animals in zoos and aquariums, but the integration of these with their potential to have a wide range of experiences. Thus, animal welfare science has not only confirmed that animals may have negative experiences, but has also

demonstrated the existence of positive experiences. Animal welfare is therefore understood to vary on a continuum from very poor to very good.

The promotion of positive animal welfare states requires different approaches to minimising negative animal welfare states. Modern zoos and aquariums should work to minimise the occurrence of negative states in their animals and, concurrently, should make efforts to promote positive states.

So what are positive animal welfare states? Animals experience a generally positive state of welfare when their physical and behavioural needs are met and when the environment provides them with rewarding challenges and choices over time. Throughout this Strategy, zoos and aquariums are urged to aim for high animal welfare standards using approaches designed to enable animals to have positive experiences. This involves understanding science-based principles, encouraging research and recognising the importance of staff expertise, monitoring skills and veterinary care.

Thousands of different species are held in zoos and aquariums worldwide, so managing their welfare is complex in terms of the diverse knowledge required. Up to now, the welfare of mega-fauna has received special attention. In some cases, such as elephants and some primate species, the welfare-related care standards are most understood. However, much still remains to be done, especially with less well-studied mammals and birds, and other sentient vertebrates. A major challenge is to continually expand the knowledge and expertise required to manage species, and to better understand how the zoo or aquarium environment and husbandry has an impact on animal welfare, so that eventually, positive welfare states may be promoted in all of them. A number of zoos and aquariums have established facilities dedicated to furthering our understanding of animal welfare (*see case study 1.1*).

SURVIVAL, CHALLENGES AND CHOICES

In order for an animal to have positive experiences, many of its basic physical/functional needs must be met first. An animal's basic needs play an important role in its survival; for example, its requirements for oxygen, water, food and thermal equilibrium, and the avoidance of significant injury and disease. Only when these and other such survival needs are met will minimisation of associated negative experiences (e.g. breathlessness, thirst, hunger, thermal discomfort and pain) be sufficient to enable the animal to have positive experiences. Addressing only the negative survival-related experiences will not necessarily give rise to positive experiences, but may merely change the welfare state from being negative to neutral.

An animal's experiences are also influenced by its perception of its external circumstances and the extent of its motivation to engage in diverse behaviours that it would find rewarding; that is, its lived experiences related to its behavioural opportunities. Therefore, zoo and aquarium management should meet the animals' basic survival needs in species-appropriate ways that minimise negative welfare states, and should also establish environments and associated care regimes that promote positive welfare states.

Case study 1.1:

Animal welfare research in zoological organisations

There are many zoos and aquariums conducting or contributing to research on animal welfare. For example, a consortium of US zoos undertook a multi-institutional study examining the welfare of elephants (*Elephas maximus* and *Loxodonta africana*). Although this was a very large study, many zoos and aquariums have conducted smaller studies on numerous other species (e.g. the welfare of great apes). As scrutiny of animal welfare continues to rise, continuing to build relevant expertise will be important; for example, by researching innovative ways to monitor animal welfare states. The Chicago Zoological Society created the Center for the Science of Animal Welfare, the Detroit Zoological Society established the Center for Zoo Animal Welfare and the San Francisco Zoological Society founded the Wellness and Conservation Center. It is anticipated that internationally, as zoos and aquariums move into the future, more and more of them will develop facilities with a focus on welfare and the aim of helping to ensure that the animals held can thrive.

- Houston Zoo, Tx, USA, Asian elephants

Many zoos and aquariums already aim to provide engaging challenges and choices for animals, and seek to develop innovative ways to broaden the range of positive experiences available to the animals. Choices may include where and what to eat, to interact or not with other animals, or to seek different environments that provide variable comforts. Challenges may be cognitive or physical, relating to opportunities to seek out desired food and other rewards. Challenges should be both species-specific and designed with the needs and ability of the individual animal in mind and continue to be progressively challenging and varied.

It is important for each organisation to have sufficient staff members with the required

knowledge and skills to ensure that animal welfare is addressed. This involves the ongoing assessment and management of the animals' welfare and living circumstances, including their physical health and responses to the environment. Staff must stay up to date and share skills through, for example, developing capacity, attending relevant workshops or symposia.

It is acknowledged that the knowledge base across all zoo and aquarium species is still developing. Zoos and aquariums should continue to use known indicators to assess animal welfare at the species-specific level and also source and lead sound research to build understanding to further improve animal welfare monitoring and outcomes for a wider range of species.

So how can we assess animal welfare? How do we assess an animal's negative and positive subjective experiences? Presented here is the 'Five Domains' model, which is a useful framework for undertaking systematic and structured assessments of animal welfare in these terms.

It is acknowledged that animals' subjective experiences cannot be measured directly. However, cautiously evaluating what they might be in species where there is sufficient knowledge to do so supports the application of species-specific husbandry routines, veterinary procedures and environmental enrichment activities that address animal welfare.

A USEFUL FRAMEWORK: THE 'FIVE DOMAINS' MODEL

The Five Domains model is not intended to be an accurate physical and functional representation of the body, but is designed to facilitate animal welfare understanding and assessment. This model outlines four physical/functional domains of 'nutrition', 'environment', 'physical health' and 'behaviour', and the fifth domain, which is the animal's 'mental' state (*Fig. 1.1*).

As welfare is a state within an animal and is understood in terms of what the animal experiences subjectively, this model identifies the two main sources of those mental experiences. The first is the feelings and sensations (collectively known as 'affects') that motivate animals to undertake behaviours considered to be essential for their survival. These include thirst motivating an animal to drink, hunger motivating it to eat and pain indicating things to avoid. These and other survival-related factors are typically covered within the domains of 'nutrition', 'environment' and 'physical health'.

The fourth domain of 'behaviour' captures the second source of subjective experiences, which can be negative or positive, and relates to animals' perception of their external circumstances. Negative examples include: threat eliciting fear, isolation leading to loneliness and low stimulation to boredom; and positive examples include: security engendering confidence and pleasure giving rise to a sense of reward.

FIVE DOMAINS MODEL

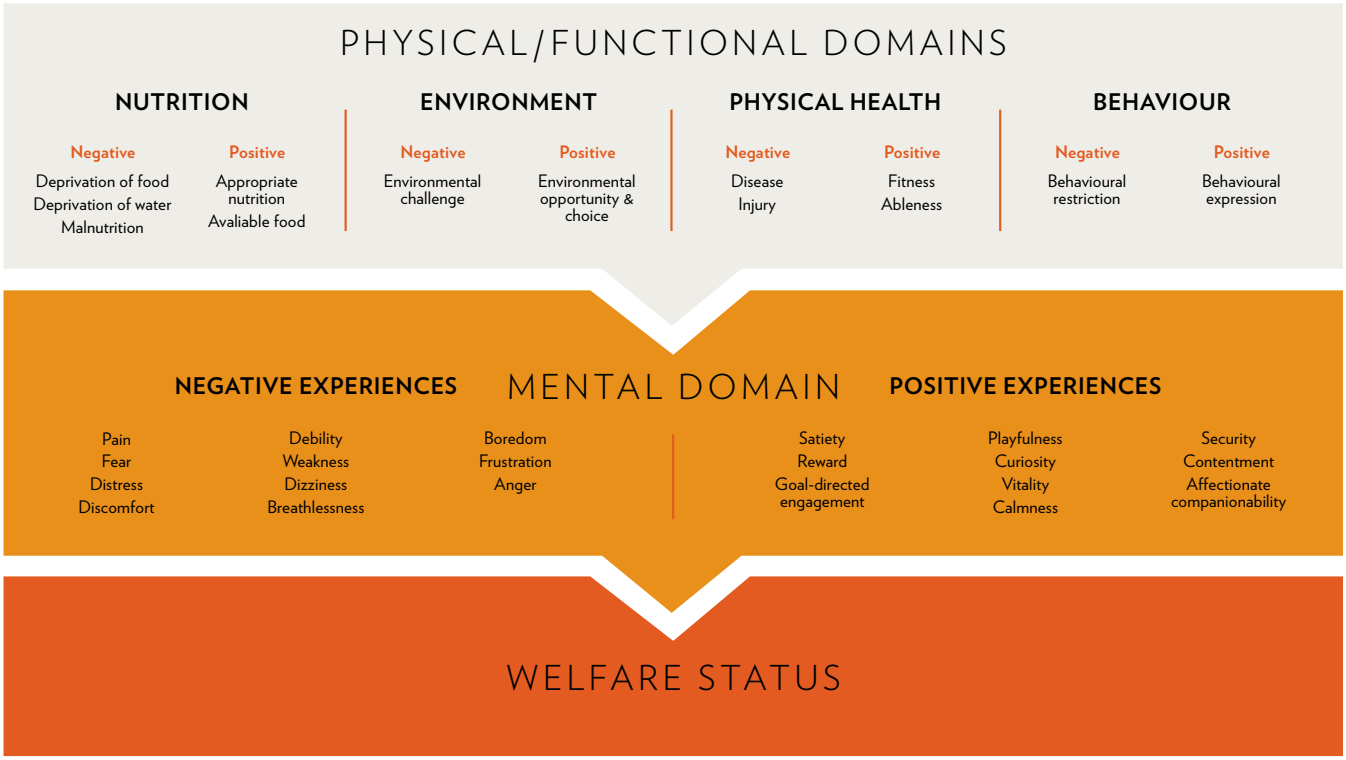

Fig. 1.1. The Five Domains model for understanding animal welfare, divided into physical/functional and mental components, provides examples of how internal and external conditions give rise to negative (aversive) and positive (pleasant) subjective experiences, the integrated effects of which give rise to an animal's welfare status (modified from Mellor & Beausoleil 2015).

Reference to the first four domains enables systematic consideration of a wide range of conditions that may give rise to a range of subjective experiences found within the fifth 'mental' domain. The net impact of all of these experiences is assessed as representing the animal's welfare status.

It is the nature of factors aligned with the physical/functional domains to change over time, as do the animal's related perceptions and experiences, which are assigned for consideration to the mental domain of the model. Thus, an animal's welfare state at any one time is located on a continuum between the extremes of very poor and very good, and at different times its welfare may decline or improve. The purposes of animal welfare assessment and management are to monitor, detect and correct poor welfare when it occurs, and to maintain good welfare and preferably very good welfare when that is practically feasible.

Opportunities for promoting positive animal welfare states aligned with the Five Domains model can include the following:
• Nutrition: the appropriate consumption of nutritious foods is an ongoing pleasurable experience.
• Environment: benign conditions offer ongoing comfort and safety.
• Physical health: ongoing good physical health secures robustness and vitality.
• Behaviour: activities involving variety, choice and benign challenge are rewarding.
• Mental or affective state: survival-related negative experiences are minimal, and comfort, pleasure, interest and confidence are common positive experiences.

As the key elements of this approach are based on biological understanding of well-studied mammals and birds, its wider application to other such species can occur, provided that unique features of their biology are taken into consideration. On the other hand, application of the model to other species in zoos and aquariums will require input from experts in their specific biology. Nevertheless, use of the model helpfully raises questions about how the basic survival needs of each species are met, whether or not they might have the capacity for pleasurable experiences and, if so, how those experiences might be expressed and under what circumstances.

ASSESSING ANIMAL WELFARE

A key part of protocols and practices designed to ensure that animal welfare remains at acceptably high levels is the need for ongoing assessment of an animal's welfare. It is apparent that both negative and positive experiences are of welfare significance and an animal's welfare state reflects the balance between them. In general, welfare will be negative when negative experiences predominate, *neutral* when the negative and positive experiences are in balance overall, and positive when *positive* experiences predominate.

It is also apparent that negative experiences are of two major types. The first includes those that *motivate survival-critical behaviours*. For example, breathlessness motivating breathing, thirst drinking, hunger eating and pain the avoidance of or withdrawal from injurious stimuli. The second type, designated *situation-related negative experiences,* includes those reflecting animals' adverse responses to their environment. For example, in mammals, barren surroundings leading to boredom, individual isolation to loneliness and threat to fear.

Regarding the first type, good animal husbandry and veterinary practices can at best only temporarily neutralise the negative survival-critical experiences. They cannot be eliminated completely. Biologically they are essential to motivate animals to behave in ways that enable them to acquire, for example, life-sustaining oxygen, water and food, and to avoid or minimise injury.

"Managing animal welfare in zoos and aquariums is a complex area where the science-based understanding and methods are developing rapidly".

Regarding situation-related negative experiences, these can be replaced, or avoided, by providing animals with opportunities to engage in behaviours they are likely to find rewarding. This is principally by environmental enrichment activities that generate positive experiences. Such experiences may include satiety, goal-directed engagement, interest, curiosity, satisfaction, bonded companionship, playfulness, comfort and confidence.

Knowledge and expertise is critical to the promotion of positive welfare states. Understanding species-specific needs can greatly reduce negative experiences by applying the relevant knowledge and skills to promoting positive states. For example, negative experiences of social animals are often related to unsuitable social structures of a group and can be remedied.

The objective in caring for zoo and aquarium animals is to avoid extremes of the survival-critical negative

Perth Zoo, Australia, A zoo staff member assesses the health of a red panda

experiences and with regard to situation-related experiences, to provide opportunities for animals to engage in behaviours they appear to find pleasurable or rewarding.

PHYSICAL AND CLINICAL INDICES OF ANIMAL WELFARE

Numerous indices (measurable variables) are available and provide checklists for monitoring welfare states. They show the presence or absence of the physical/functional states and behaviours that underlie the welfare state of an animal. These indices therefore allow negative, neutral and positive welfare states to be detected and changes in them to be monitored and managed. Their use in this way is based on many years of validating scientific and veterinary clinical research. The physical/functional indices are either *externally observable or internally measurable* and usually align with the nutrition, environment and health domains of the Five Domains model (*Fig. 1.1*).

Examples of *externally observable* indices include the appropriateness of growth rates and developmental milestones in young animals, age at maturity, lack of reproductive success in adults and the general appearance of the animals with regard to their health and their longevity in human care. Some are outlined below:

• Nutrition: weight change and/or body condition score, appropriateness of water or food intake, and/or the presence of aggression at feeding time that indicates hunger.

• Environment: injuries due to physical restrictions of close confinement, behavioural evidence of negative impacts of temperature extremes, and/or signs of irritation by polluting gases.

• Health: the presence of injuries such as cuts, bruises, abrasions and changes in behaviour such as demeanour, appearance, vocalisation and impaired movement; also presence of infections, fever and increased heart rate.

These externally observable indices, which can be seen easily during informed observational assessment by staff, are often the first sign of welfare problems. They also provide guidance on the likely cause and often point to the required remedial actions that would commonly involve husbandry or veterinary therapeutic interventions.

Internally measurable indices relate to physiological, pathological or clinical conditions. These indices would not usually be employed for day-to-day welfare monitoring unless related to a specific disease investigation or an otherwise intractable welfare problem. Examples include: measurement of specific blood parameters for hydration status, nutritional status, immunological competence, stress hormone release and release of other hormones; measurement of hormone levels in saliva, urine and faeces; also there are numerous established indices of the

Perth Zoo, Australia, Orangutans

functionality of the heart, lungs, blood vessel, kidneys, digestive organs, muscles, skeleton, nervous system and sense organs.

ANIMAL BEHAVIOURAL OBSERVATIONS

Behaviour is commonly considered to be a clear indicator of the welfare state and health of an animal, and has been used effectively for that purpose for many decades. Historically, many behaviour scientists were reluctant to link particular subjective experiences to particular behaviours, considering that to be unscientific.

However, animal welfare science is now providing increasingly strong support for three key propositions: first, that particular behaviours of mammals, birds and reptiles suggest what their goals might be; secondly, that such goal-directed behaviours themselves and the animals' behavioural responses when they do or do not achieve those goals may allow inferences to be made about the accompanying positive or negative experiences; and thirdly, that an animal's experience is likely to be positive whilst it actively engages in behaviours that involve impulse processing in reward-associated neural circuits of the brain. Taken together, this provides a basis for cautiously interpreting animal behaviour in terms of what the accompanying subjective experiences may be.

The behaviour domain of the Five Domains model (*Fig. 1.1*) incorporates this and refers to animals' likely perceptions of their external circumstances and the resulting associated negative or positive experiences. For example, there is strong behavioural evidence that social mammals kept closely confined in barren exhibits with no company and provided with food that takes little time to consume are likely to have negative experiences, such as anxiety, fear, frustration, loneliness, boredom and depression. At the other extreme, behavioural evidence suggests that such group-living species kept in extensive stimulus-rich environments with opportunities to, for example, explore, forage or hunt, bond and reaffirm bonds, care for young, play and be sexually active are more likely to have positive experiences, such as feeling energised, engaged, affectionately sociable and parentally rewarded.

Consideration of the wide range of experiential consequences of situation-related factors such as these highlights the need to evaluate the potential benefits of introducing, maintaining or extending environmental enrichment activities. These observations strongly support the well-demonstrated commitment to environmental enrichment within the zoo and aquarium sector (*see Chapter 3*), and indicate that behavioural assessment can beneficially provide information about the efficacy of environmental enrichment.

As noted above, these observations refer mainly to mammals and birds, and therefore may not be directly applicable to other vertebrate species. However, zoo and aquarium staff are well positioned to develop enrichments that are appropriate for the variety of species in their care and considerate care and research should be applied to all species held within these institutions.

CONCLUSION

The Five Domains provide a useful and practical model for zoos and aquariums. By applying knowledge of negative, neutral and positive welfare states, animal welfare assessment is possible and achievable. It is a framework that enables animal carers to recognise and meet animals' survival needs and helps to provide opportunities for animals to experience positive welfare states. This is the basis for creating pleasurable challenge and choice for zoo and aquarium animals.

Managing animal welfare in zoos and aquariums is a complex area where the science-based understanding and methods are developing rapidly. An area of particular challenge is the wide range of species held by zoos and aquariums. There is a consequent need to continue to acquire species-specific knowledge about less well-studied species to enable their welfare to be understood and managed appropriately. Ongoing input from experts and zoo- and aquarium based biological research will be required.

Animal welfare assessment is a critical component of modern animal care in zoos and aquariums. Assessment approaches have several facets and employ indices based on physical/functional conditions and behaviours that align with the negative and/or positive experiences animals may have.