

QUARTERLY PUBLICATION OF THE EUROPEAN ASSOCIATION OF ZOOS AND AQUARIA

ZOOQUARIA

SPRING 2018

ISSUE 100

#1000

ON THE 25TH ANNIVERSARY OF THE PUBLICATION OF ZOOQUARIA,
WE LOOK FORWARD ANOTHER QUARTER OF A CENTURY TO HOW
THE ZOO AND AQUARIUM COMMUNITY MIGHT LOOK IN 2043



Welfare state

WHEN IT COMES TO ANIMAL WELFARE, WE NEED TO PRIORITISE THE MEANINGFUL OVER THE MEASURABLE

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In the 25 years since *Zooquaria* was first published, the human population has grown by 2 billion, carbon dioxide emissions have risen by 40 per cent and biodiversity has declined by about a third to the point at which wild mammals make up around just two per cent of global terrestrial mammalian biomass.

Extinction is not the only inevitable consequence of these changes; welfare compromise also occurs on a massive scale. The loss of 150,000 Bornean orangutan in just 16 years doesn't happen without immeasurable suffering. Yet despite the shared issues, conservation and animal welfare have remained largely separate; conservationists have focused on population survival into the future, and advocates of animal welfare have focused on the feelings of individuals here and now. Zoos and aquariums are at the interface between conservation and animal welfare, and are therefore in the perfect position to lead the way in improving how we think about species welfare, focusing on the wellbeing of populations in the wild and in human care, both now and into the future. However, in order to do that, I believe that zoos need to reevaluate their approach to welfare and, subsequently, to conservation.

Central to most conceptions of animal welfare are feelings; states such as 'suffering' or 'contentment'. As we can only infer but not measure these states, science uses indirect metrics to provide insights into the feelings of animals and subsequently their welfare. These include factors that might affect the feelings of animals such as malnourishment, confinement and cold, as well as metrics affected by the feelings of animals such as fearfulness, pacing, weight loss, hypertension and disease.

Sadly, no welfare indicator is perfect; even apparently objective indicators can be difficult to interpret. For example, so-called stress hormones can be elevated when animals are excited



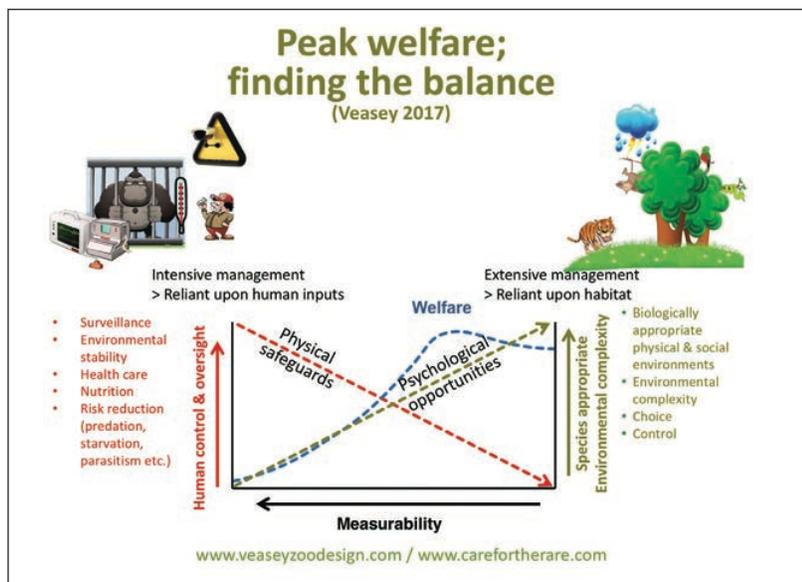
and lowered when chronically stressed and stereotypies can actually enhance welfare in stressful situations as well as be expressed in apparently non-stressful situations.

In contrast, welfare indicators relating to physical health such as longevity, body condition and disease benefit from being highly quantifiable and having a deceptively intuitive link to welfare, resulting in the widespread inclusion of health as a defining factor of welfare by many. Whilst this isn't necessarily wrong per se, the inclusion of health in welfare definitions is arguably redundant, because if health doesn't affect the emotional state of an animal, it doesn't affect its welfare, and more significantly, there are potentially negative consequences of its unqualified consideration as a defining factor of animal welfare.

In 2008 a leading veterinary medical association (unsuccessfully) opposed legislation in California requiring farm animals be able to turn around, stand up and lie down on the grounds that such freedoms would negatively impact the capacity of farmers to protect animals from disease and injury, ultimately compromising the welfare of farmed animals. The veterinary association's inclusion of physical health as a factor defining welfare combined with the comparative ease of measuring physical

health seems to have resulted in its elevation over the psychological wellbeing of animals to the potential detriment of the welfare of billions of animals.

This example is not a unique one; the first of the five freedoms – from hunger and thirst – requires the provisioning of a 'diet to maintain full health and vigour' on the premise that hunger and thirst are unpleasant mental states and a balanced diet promotes good health and subsequently welfare. Consequently, many zoos, but most notably in North America, favour commercially prepared diets resulting in many big cats being fed daily rations of nutritionally enhanced minced meat. Such diets eliminate natural hunting and food-processing behaviours as well as opportunities for big cats to feel as full as they would do in the wild when feeding on whole large carcasses. Since the motivation for big cats to hunt is regulated by stomach distension, big cats fed such processed rations are likely to be permanently motivated to forage and hunt in environments in which they are permanently prevented from doing so. And so the welfare of some of the most iconic species held in zoos may be systematically and unnecessarily compromised simply because it is easier to quantify micronutrients in a processed diet in support of health than



SCHEMATIC REPRESENTATION OF THE RELATIONSHIP BETWEEN EFFORTS TO SAFEGUARD PHYSICAL HEALTH AND THE AVAILABILITY OF PSYCHOLOGICAL OPPORTUNITIES FOR MANAGED ANIMALS AND HOW THIS MIGHT IMPACT POPULATION LEVEL ANIMAL WELFARE

it is to calculate the psychological harm that may arise as a consequence of that diet.

These examples highlight a tendency to focus on the measurable rather than the meaningful, and that a tension exists between protecting an animal's physical and psychological wellbeing. To illustrate this point further, consider the wellbeing of a frog destined to live in an amphibian ark configured to protect it from chytrid fungus compared to one living loose in an extensive, mixed-species, zoo rainforest building. The extensive rainforest habitat more closely replicates the 'wild', catering well for the frog's psychological expectancies; the animals are more reliant upon their surroundings for survival than on individualised human inputs, but are consequently exposed to risks to their health such as disease, injury and starvation. In contrast, the highly controlled environment of the amphibian ark protects residents well from many risks to their physical health, but probably caters less well for their psychological needs. The tension between these two aspects of care appear to be more or less inevitable; as requirements for observation, supervision and control are increased, freedoms for animals typically diminish, resulting in an increased likelihood of frustration and impoverished welfare, and vice versa. The graphic shown above illustrates how efforts to safeguard the physical wellbeing of animals interact with their psychological

opportunities and ultimately combine to influence their welfare, and how the approach of zoos to this balancing act might be influenced by the differential measurability of physical and psychological priorities.

To achieve what I refer to as peak welfare, zoos must better balance the physical and psychological priorities of animals and overcome the tendency to focus on the measurable rather than the meaningful aspects of welfare. To help achieve this, I developed a systematic framework to identify the psychological priorities of animals by examining the evolutionary and motivational characteristics of their behaviours and cognitive processes as well as considering evidence of known welfare impacts.

This methodology is based on the premise that the behaviours and cognitive process of high evolutionary significance are highly motivated to ensure animals express them when needed. Consequently, if animals are frustrated in their attempts to express behaviours or cognitive process, the resulting welfare compromise will be broadly proportional to their evolutionary significance. This relationship is modulated by the nature of the stimulus; behaviours with internal triggers or ones that cannot be eliminated, such as foraging or seasonal reproductive behaviours, are likely to be important regardless of the environment the animal finds itself in, whereas externally stimulated behaviours such

as escaping a predator need not be expressed if the trigger is absent. The output of this panel-based process are species-specific welfare priorities, which enable zoos to devise environments and management systems in which species can express those aspects of their life essential for welfare, without unduly compromising the capacity of zoos to protect them from physical harms.

Intriguingly, the development of this framework not only underlines the tension between protecting an animal's physical and psychological wellbeing, but also encourages us to accept that peak welfare is unlikely to be achieved simply by maximising physical and psychological aspects of care, but instead by optimising the relationship between the two. This in turn suggests that peak welfare is more likely to be experienced by animals protected from many natural stressors, whilst still being free to satisfy psychological priorities as might be identified by the framework referred to here. In other words, peak welfare is likely to be attainable in *ex situ* environments formulated around an understanding of the psychological needs of species, challenging a widely held belief that keeping animals in human care is inherently bad for their welfare, which has potentially profound implications for the management of zoos and their role in conservation.

I've always believed that conservation was the mandate of zoos, and animal welfare was our license to operate, but the failure of zoos to conclusively address the welfare concerns felt by many of our stakeholders over the past 25 years has constrained our capacity to deliver our true conservation potential, something future generations may find hard to forgive; despite the widespread acceptance that many species will not persist without well-resourced population management programmes, over the last 25 years the establishment of new breeding programmes has not kept pace with the volume of species that might benefit from them. For that reason, I believe the pursuit of peak welfare is both a welfare and conservation imperative for zoos and I look forward to seeing zoos emerge as champions of species welfare, providing leadership at the interface between animal welfare and species conservation over the course of the next 25 years.