TAIEX EPPA

National Workshop on Implementation of the EU Zoo Directive

Legislation on minimum standards for the housing of mammals in Flemish zoos: is an evidence-based approach possible?

Dr. Hilde Vervaecke & Dr. Jeroen Stevens

Odisee University of Applied Sciences & University of Antwerp
BELGIUM

1994 Limburg Zoo

Minimum standards (1999)

Espèces animales / Diersoorten (1)	Nombre / Aantal (2)	Dimensions minimales pour le nombre d'animaux indiqué Minimumafmetingen voor het aangegeven aantal dieren				Superficie ou volume supplémentaire par animal en plus / Bijkomende oppervlakte of volume per bijkomend dier (3)		Exigences particulières / Bijzondere eisen
		Enclos Extérieur / Buitenverblijf (5)		Enclos Intérieur / Binnenverblijf (5)				
		Superficie / Oppervlakte m^2	Volume m^3	Superficie / Oppervlakte m^2	Volume m^3	à l'extérieur / buiten	à l'intérieur / binnen	
Alopex lagopus	1-2	40	-	-	-	10 m^2	-	gn
Canis lupus	3	1200	-	2 / animal / dier	-	200 m^2	-	dg
Nyctereutes procyonoides	1-2	40	-	10	-	4 m^2	1 m^2	n
Speothos venaticus	1-2	100	-	-	-	10 m^2	-	cn
Vulpes vulpes	1-2	150	-	-	-	10 m^2	-	cn
Vulpes zerda	1-2	20	-	1 / animal / dier	-	2 m^2	-	cde(10)g
Acinonyx jubatus	1-2	400	-	4 / animal / dier	-	50 m^2	-	ade(10)l
Caracal caracal	1-2	-	-	30	90	-	-	ae(18)k
Felis chaus	1-2	-	-	30	90	-	-	ae(18)k
Felis silvestris	1-2	-	-	30	90	-	-	ae(15)f
Leopardus pardalis	1-2	-	-	40	120	-	-	ae(18)ku(3)
Leptailurus serval	1-2	-	-	40	120	-	-	ade(18)ku(3)
Lynx lynx Lynx rufus	1-2	60	180	-	-	20 m^2	-	alx
Puma concolor	1-2	60	180	-	-	5 m^2	-	alu(3)
Neofelis nebulosa	1-2	20	50	30	90	-	-	ae(0)n
Panthera leo	1-2	100	-	12 / animal / dier	-	20 m^2	-	lu(3)
Panthera onca	1-2	60	180	12 / animal / dier	-	-	-	ae(15)lu(3)
Panthera pardus	1-2	60	180	12 / animal / dier	-	-	-	ae(15)lu(3)
Panthera tigris	1-2	100	-	15 / animal / dier	-	-	-	ae(15)lou(3)f

Minimum standards (1999)

1999 – 2014: zoos adapted to legislation

In the mean time:

Some large discrepancies and inconsistencies between closely related taxa

Revision of legislation for mammals started with new expert group:
- zoo curators (3),
- zoo veterinarians (2),
- zoo scientist (1),
- independent scientists (2)

Gender: 2  6 

Requirements for revision of minimum standards

- Evaluation on-the-spot must be possible

- Method:
  - Based on animal needs
  - Resource-based + opportunities for the animal –> animal centered but not animal-based
  - Correct discrepancies and inconsistencies
  - Compromise between science & practice

Practice-based is not evidence based

There Are Big Gaps in Our Knowledge, and Thus Approach, to Zoo Animal Welfare: A Case for Evidence-Based Zoo Animal Management

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There are gaps in knowledge that hinder our ability within zoos to provide good animal welfare. This does not mean that zoos cannot or do not provide good welfare, only that currently this goal is hindered. Three reasons for these gaps are identified as: (1) there is an emphasis on the identification and monitoring of indicators that represent poor welfare and it is assumed that an absence of poor welfare equates to good welfare. This assumption is overly simplistic and potentially erroneous; (2) our understanding of how housing and husbandry (H&H) affects animals is limited to a small set of variables determined mostly by our anthropogenic sensitivities. Thus, we place more value on captive environmental variables like space and companionship, ignoring other factors that may have a greater impact on welfare, like climate; (3) finally, whether intentional or not, our knowledge and efforts to improve zoo animal welfare are biased to very few taxa. Most attention has been focused on mammals, notably primates, large cats, bears, and elephants, to the exclusion of the other numerous species about which very little is known. Unfortunately, the extent to which these gaps limit our ability to provide zoo animals with good welfare is exacerbated by our over reliance on using myth and tradition to determine zoo animal management. I suggest that we can fill these gaps in our knowledge and improve our ability to provide zoo animals with good welfare through the adoption of an evidence-based zoo animal management framework. This approach uses evidence gathered from different sources as a basis for making any management decisions,

Gap: Current Housing and Husbandry Practice Is Based Largely on Promulgation of Myth and Tradition

A review of national and regional zoo association H&H guidelines found that most recommendations for best practice are based on ‘‘current’’ practice and not supported by empirical evidence (Melfi et al., 2007).

“Much zoo husbandry and housing provision is based on what has worked previously (or is working currently) and this “status quo” is then adopted into best-practice guidelines, instead of from an evidence-based approach.” (Wolfensohn et al., 2018)

Method?

- Similar format with updates
- In line with current welfare definition
- Standards based on needs

Needs?

- Natural history & behavioural biology
- Needs & adaptive potential

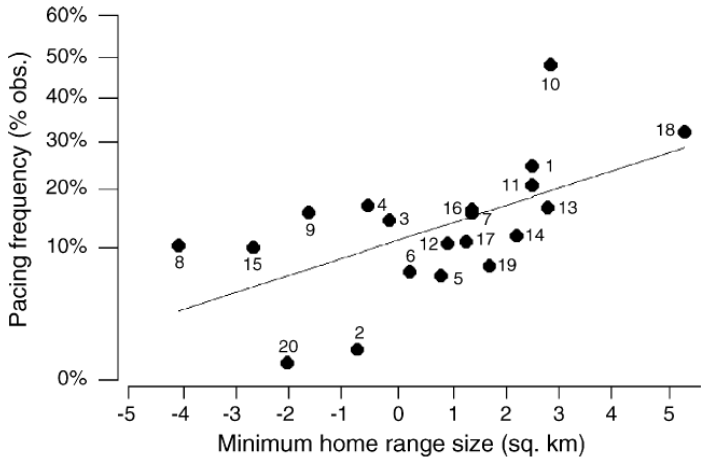

Fig. 1. Minimum home-range size (accounting for body size) and median % pacing frequency in affected individuals. Stereotypy data was arcsine transformed but units on the *y*-axis are given in the raw form for clarity. Species are labelled as follows: (1) *Acinonyx jubatus*; (2) *Alopex lagopus*; (3) *Caracal caracal*; (4) *Leopardus pardalis*; (5) *Lynx canadensis*; (6) *Lynx lynx*; (7) *Melursus ursinus*; (8) *Mustela vison*; (9) *Oncifelis geoffroyi*; (10) *Panthera leo*; (11) *Panthera onca* (12) *Panthera pardus*; (13) *Panthera tigris*; (14) *Puma concolor*; (15) *Suricata suricatta*; (16) *Ursus americanus*; (17) *Ursus arctos*; (18) *Ursus maritimus*; (19) *Ursus thibetanus*; (20) *Vulpes vulpes*.

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APPLIED ANIMAL BEHAVIOUR SCIENCE
Applied Animal Behaviour Science 102 (2007) 303–328
www.elsevier.com/locate/applanim

Natural behavioural biology as a risk factor in carnivore welfare: How analysing species differences could help zoos improve enclosures☆

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Available online 2 August 2006

Review

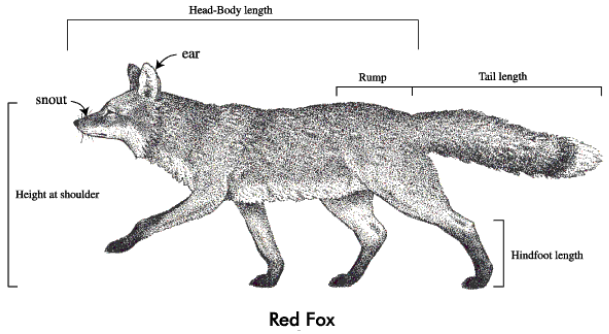
Cell PRESS

Species differences in responses to captivity: stress, welfare and the comparative method

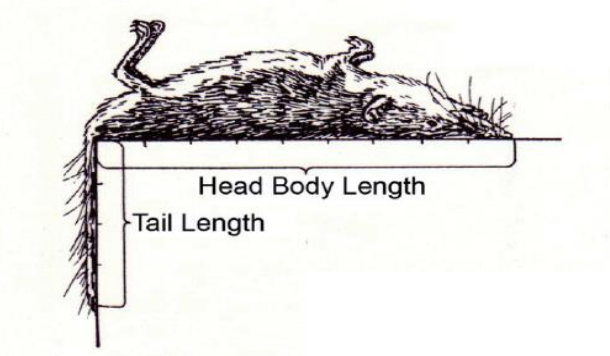
Georgia J. Mason

How to determine minimal enclosure size?

- Body length as biological criterion
- Data available for all species
- Rough correlation with home range size and spatial needs
- Space should allow for :
  - all locomotion types
  - social distances
  - keeping distance to public
  - “living space”: offering room for a variety of functions, …



Red Fox



Body length criterion (BLC)

- New Zealand Department of Primary Industries

Husbandry Guidelines
for

Hamadryas Baboon

Papio hamadryas

(Mammalia: Cercopithecidae)

Compiler: Lauren Turner
Date of Preparation: February 2009
Western Sydney Institute of TAFE, Richmond
Course Name and Number: Certificate III in Captive Animals, RUV30204
Lecturer: Graeme Phipps, Jacki Salkeld, Brad Walker

Formulae used to calculate the minimum dimensions (values are rounded to nearest 0.5 metres:

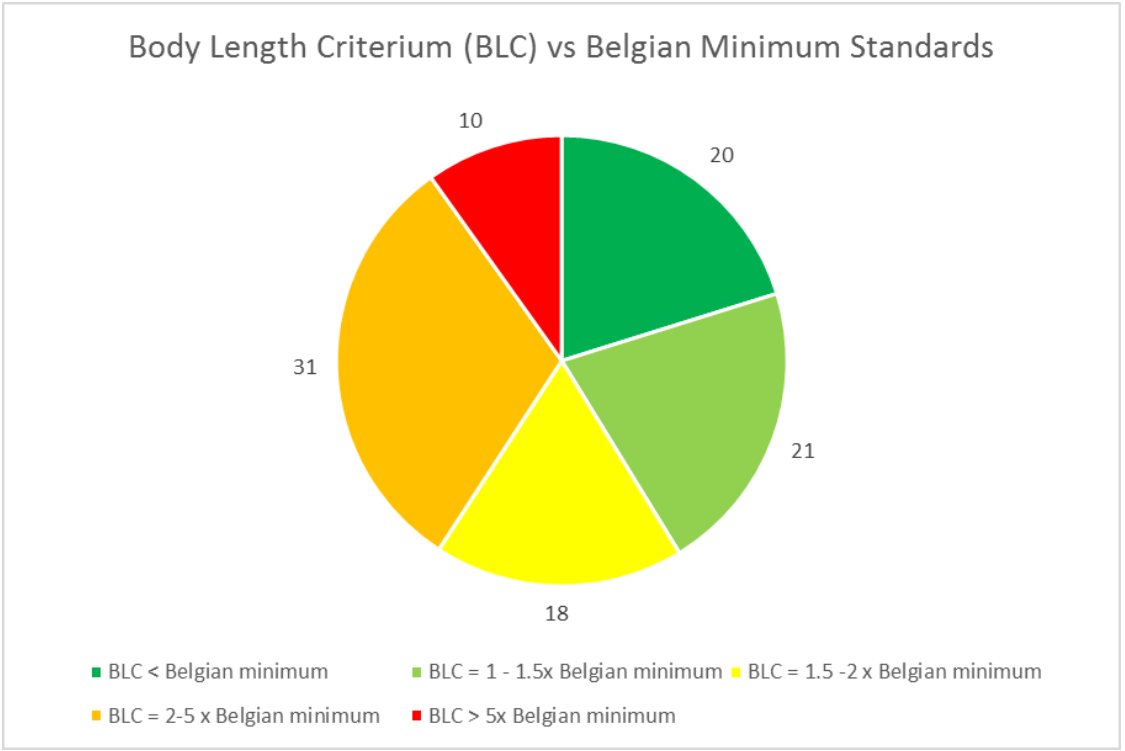
- For group housing of 2 or 3 animals (most species)
- Length of the enclosure = 15 x maximum body length
- Width of enclosure = 10 x maximum body length
- All roofed enclosures Minimum height of roof and fence = 2.4m + (2 x maximum body length)
- All enclosures Minimum height of climbing structures = 2.4m + (2 x maximum body length)

Minimum sizes have been based on the animal's body size and activity patterns, but no internationally agreed formula currently exists to calculate size requirements. These figures are the best fit from information available. They may be subject to change should new information come to light. Exhibitors should refrain from basing enclosure designs solely on the minimum size however. In order to provide an appropriate environment, many factors must be provided for, space being just one of these. The size of the enclosure must be based on ability to provide all of the factors including; social grouping, climbing structures, nesting and feeding station and predicted growth of the group (Department of Primary Industries 2010).

Body length criterion

(BL x 10)x(BLx15) for 3 individuals

- Looking for possible biases in 1999 minimum surfaces
- Comparison 1999 norms to body length formula



Body length criterion

- BLC-surface corrected downward for 3-D use of volume:
  - eg tree-dwelling animals, aquatic mammals, …
- BLC-surface corrected upwards:
  - species at risk of locomotory stereotypies
- Phylogenetic relatedness

Revision of extra requirements

- Larger focus on social needs
- Revision of behavioural opportunities translated in codes eg. possibility to swim, bathe, climb, dig, nest, hide, sleep, etc….
- Inspirational on-line codex.

New minimum legislation on primates

Species	Inds	outdoor m²	height	indoor m²	height	m²/extra ind		Extra requirements
Hylobates spec.	2	20	3,5	20	3,5	5	5	a b c d(15) f(175) k l(5)
Nomascus leucogynes	2	15	4	15	4	5	5	a b c d(15) f(200) k l(5)
Nomascus gabriellae	2	15	4	15	4	5	5	a b c d(15) f(200) k l(5)
Pongo spec.	2	75	5	75	5	30	30	a b c d(18) e f(250) i k l(2)
Gorilla spec.	3	175	4	175	4	30	30	a b c d(18) e f(200) k l(3)
Pan paniscus	4	100	4	100	4	20	20	a b c d(18) e f(200) k l(4)
Pan troglodytes	4	100	4	100	4	20	20	a b c d(18) e f(200) k l(4)

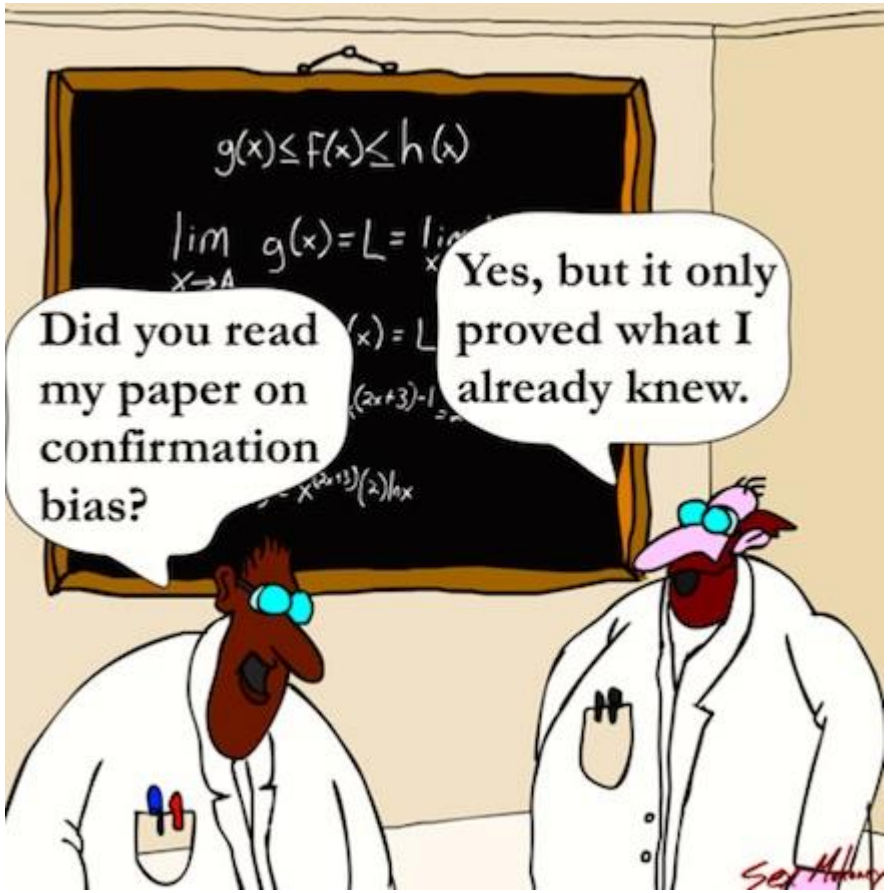
Tabel 2. Bijzondere eisen

Klimmogelijkheid met beweeglijke elementen.	a
Slingermogelijkheden.	b
Manipuleerbare bodembedekking over ten minste 90% van de oppervlakte van het verblijf.	c
De dieren hebben permanent toegang tot een ruimte waarin de temperatuur niet daalt onder de temperatuur in graden Celsius die tussen haakjes is aangegeven.	d(...)
Geschikt nestmateriaal.	e
Alle dieren hebben op elk moment een soortspecifieke rustplaats ter beschikking die ten minste op een hoogte, die tussen haakjes in centimeter is aangegeven, boven de bodem van het verblijf is geplaatst.	f(...)
Voor elk dier is in een individueel slaaphok voorzien dat ten minste op de hoogte, die tussen haakjes in centimeter is aangegeven, boven de bodem van het verblijf is geplaatst.	g(...)
Alle dieren hebben op elk moment een slaaphok ter beschikking dat ten minste op de hoogte, die tussen haakjes in centimeter is aangegeven, boven de bodem van het verblijf is geplaatst.	h(...)
Mannelijke dieren kunnen tijdelijk in een geschikt verblijf van de groep afgezonderd worden als dat noodzakelijk is om het welzijn van alle dieren te garanderen. De noodzaak en de tijdelijkheid worden gedocumenteerd.	i
Als de dieren compatibel zijn, mogen ze in groep gehouden worden. In dat geval wordt de minimale oppervlakte, vermeld in de kolom 'minimumafmetingen voor het aangegeven aantal dieren', vermenigvuldigd met het aantal dieren.	j
De dieren hebben de mogelijkheid om soortgenoten en het publiek te mijden en om zich te verstoppen. Er is een visuele barrière.	k
Als de groep groter is dan of gelijk is aan het getal tussen haakjes, wordt het binnenverblijf opgedeeld in twee compartimenten. Per veelvoud van het getal tussen haakjes wordt in een extra compartiment voorzien. Elk compartiment is minstens even groot als de minimumoppervlakte die voor het aanwezige aantal dieren voorgeschreven is, gedeeld door het aantal voorgeschreven compartimenten. Elk compartiment is altijd toegankelijk en heeft minstens twee bruikbare toegangen.	l(...)
De minimumhoogte van het dak van het verblijf boven de standplaats van de bezoekers is tussen haakjes aangegeven in meter.	m(...)

Hurdles and difficulties

There are no problems with that species

- “we see no problems”? Practice-based is not evidence-based…
- unclarity about “welfare”



There are no problems with that species

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RESEARCH ARTICLE

ZOOBIOLOGY WILEY

Differing animal welfare conceptions and what they mean for the future of zoos and aquariums, insights from an animal welfare audit

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Abstract

Animal welfare is a growing public concern that has the potential to undermine the social license of zoos and aquariums. The lack of consensus on how animal welfare is defined across such a diverse sector combined with and a widespread belief that commercial priorities such as entertaining visitors conflicts with animal welfare, hinders efforts to effectively address this fundamental issue for the sector. Data derived from an audit of habitats across a major North American wildlife attraction revealed that holistic animal welfare assessments undertaken by animal carers embracing three principal constructs of animal welfare, correlated strongly with visitor perceptions of animal happiness. Visitor assessments of animal happiness also correlated with animal carer assessments of social, behavioural and locomotor opportunities and inversely with the prevalence of stereotypic behaviours, supporting the proposition that folk conceptions of animal welfare are more accurate than may have previously been considered to be the case. However, the holistic animal welfare assessment inversely correlated with assessments of a habitat's capacity to safeguard welfare as determined by the facility's veterinary staff, supporting the proposition that tensions exist between physical and psychological components of captive animal welfare provisioning. This further underlines the importance of clarity on how animal welfare is conceived when developing institutional animal welfare strategies. Finally, the data also showed that both holistic animal welfare assessments and visitor perceptions of animal happiness strongly correlated with the level of enjoyment experienced by visitors, challenging the belief that animal welfare competes with the commercial priorities of zoos and aquariums. The audit supports the case that maintaining high animal welfare is a commercial imperative as well as a moral obligation for zoos and aquariums and underlines the necessity to utilize conceptions of animal welfare that acknowledge the centrality of the affective states of animals in maintaining those standards.

KEYWORDS
affective states, physical health, psychological wellbeing, public opinion, stereotypies, veterinary

There are no problems with that species

- Welfare concepts & evaluation not part of formal training of significant zoo persons
- Working with animals is not a guarantee for positive attitude towards welfare

There are no problems with that species

Article

Attitudes toward Animals and Their Welfare among Italian Veterinary Students

Federica Pirrone [1], Chiara Mariti [2,*], Angelo Gazzano [2], Mariangela Albertini [1], Claudio Sighieri [2] and Silvana Diverio [3]

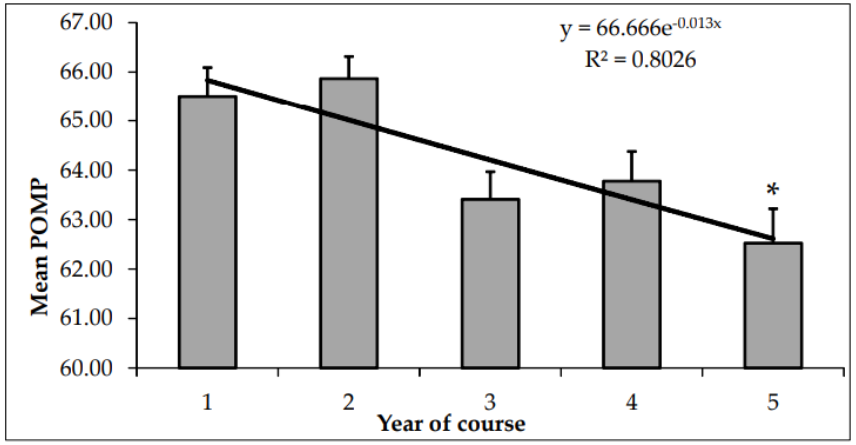
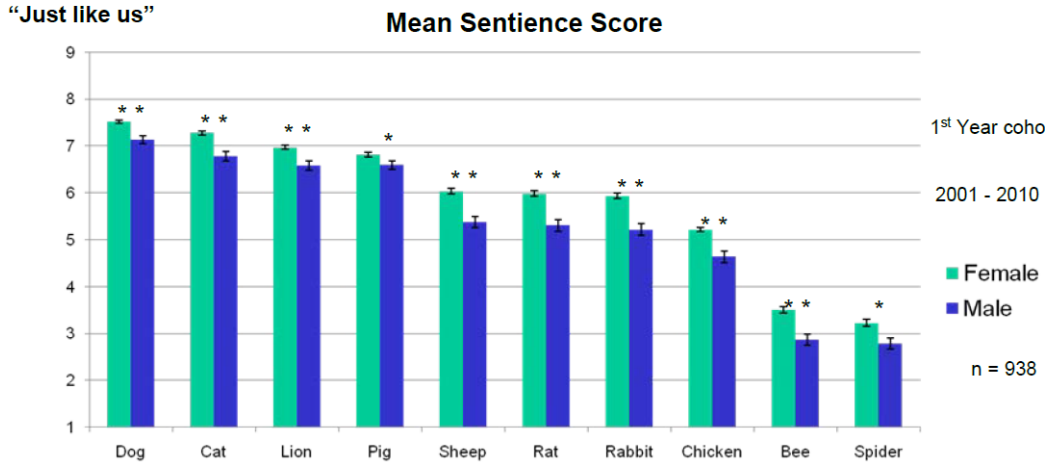


Figure 1. Comparison of mean ± standard error (SE) percentage of maximum possible (POMP) score of the Animal Attitude Scale (AAS) by year of course. Data were represented determining an exponential regression model equation and analyzed using the Kruskal–Wallis test with Bonferroni's correction (* = significant difference vs year 1 and 2; $p = 0.001$).

Belief in Sentience : affected by gender

Nancy Clarke, David Main, Elizabeth Paul

WSPA World Society for the Protection of Animals



MANOVA F = 6.063, P<0.001
Error bars show standard error
*P≤0.01, ** P< 0.001

University of BRISTOL

BL & corrections are rough & arbitrary criteria

- Available
- Applicable
- Biological relevance (social spacing & locomotion)
- Corrections for volume & sensitivity to stereotypical behaviour: based on available scientific information

It is not about quantity but quality

- Evidence on benefits of complexity
- Evidence on benefits of larger space

with regard to behaviour and affect (behavioural diversity, abnormal behaviours, positive behaviours, …)

- Space needs to be functional & qualitatively well-designed

→ Share evidence

It can never be big enough

Can marginal space increase meet the needs?

animals

MDPI

Perspective

Can Zoos Ever Be Big Enough for Large Wild Animals? A Review Using an Expert Panel Assessment of the Psychological Priorities of the Amur Tiger (*Panthera tigris altaica*) as a Model Species

Jake Stuart Veasey

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check for updates

Simple Summary: The reduction in space available to wild animals in zoos and aquariums is widely perceived to be detrimental to their welfare by scientists and the general public alike. Evidence suggests that naturally wide-ranging carnivores are more likely to suffer in captivity than those that travel less widely. Using the Amur tiger as a representative for wide-ranging species frequently held in zoos, an expert panel assessment was undertaken to identify psychological priorities in order to see how the negative welfare impacts of reduced ranging opportunities might be most effectively overcome. This assessment highlights that whilst reduced access to space may be central to compromised welfare for many species, there may be more effective strategies in safeguarding welfare than simply making captive habitats marginally bigger. Central to this for Amur tigers is providing appropriate mental stimulation rather than focusing only on behaviours linked to hunting. Various strategies intended to safeguard welfare are discussed for Amur tigers, which can also be considered for other wide-ranging species.

We all know you can prove anything with science

DOI: 10.1002/zoo.21506

HUSBANDRY REPORTS

ZOOBIOLOGY WILEY

The behavioral effects of exhibit size versus complexity in African elephants: A potential solution for smaller spaces

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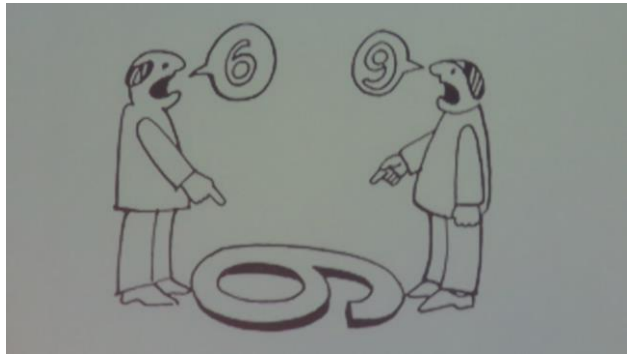
Abstract

Population-level analyses suggest that habitat complexity, but not necessarily space availability, has important welfare outcomes for elephants in human care. At the Dallas Zoo, the opening of a new exhibit complex allowed us to measure the behavior of two female African elephants across three treatments to evaluate the independent effects of complexity and space. Preoccupancy observations were conducted in the elephants' older exhibit, which consisted of a smaller, more simple yard (630 m^2). Subsequent postoccupancy observations measured behavior in two different spaces in the new exhibit: a larger, complex yard (15,000 m^2), and a smaller, but complex yard (1,520 m^2). The elephants' overall activity levels were greater in complex habitats, regardless of their size. Similar effects of habitat complexity oversize were observed with greater rates of foraging and lower rates of being stationary. Furthermore, elephants were out of view of visitors significantly more in the small, simple yard compared to either of the more complex habitats. However, exhibit size affected the incidence of stereotypic behavior (with lower rates of stereotypy in the larger exhibit compared to the smaller yards) and investigatory behavior (elephants investigated their environments more with increasing size and complexity). Behavioral diversity also increased with exhibit size and complexity. These results indicate that space availability alone is not sufficient to enhance the behavioral welfare of zoo elephants. Therefore, facilities with limited space can still encourage species-appropriate behaviors and improved welfare for the elephants in their care by converting a small, simple area into a more complex habitat.

KEYWORDS
animal behavior, case study, evidence-based management, zoo animal welfare



Share the facts & clarify standpoints

Welfare/zoo science is bad science

- Zoo research: small sample sizes & multiple variables
  → correct questions & designs & robust stats.
- Many measures developed on laboratory & farm animals.

JOURNAL OF APPLIED ANIMAL WELFARE SCIENCE
2018, VOL. 21, NO. S1, 23–33
https://doi.org/10.1080/10888705.2018.1513842

Routledge
Taylor & Francis Group

ARTICLE

OPEN ACCESS Check for updates

Advances in Applied Zoo Animal Welfare Science

Samantha J. Ward [a], Sally Sherwen [b], and Fay E. Clark [c]

[a]School of Animal Rural and Environmental Sciences, Nottingham Trent University, Southwell, United Kingdom; [b]Wildlife Conservation and Science, Zoos Victoria, Melbourne, Australia; [c]Bristol Zoological Society, Bristol Zoo Gardens, Bristol, United Kingdom

ABSTRACT

Nonhuman animal welfare science is the scientific study of the welfare state of animals that attempts to make inferences about how animals *feel* from their behavior, endocrine function, and/or signs of physical health. These welfare measurements are applicable within zoos yet inherently more complex than in farms and laboratories. This complexity is due to the vast number of species housed, lack of fundamental biological information, and relatively lower sample sizes and levels of experimental control. This article summarizes the invited presentations on the topic of "Advances in Applied Animal Welfare Science," given at the Fourth Global Animal Welfare Congress held jointly by the Detroit Zoological Society and the World Association of Zoos and Aquariums in 2017. The article focuses on current trends in research on zoo animal welfare under the following themes: (a) human–animal interactions and relationships, (b) anticipatory behavior, (c) cognitive enrichment, (d) behavioral biology, and (e) reproductive and population management. It highlights areas in which further advancements in zoo animal welfare science are needed and the challenges that may be faced in doing so.

KEYWORDS

Research; behavior; human–animal interaction; cognitive enrichment; management

Welfare/zoo science is bad science

A review of current indicators of welfare in captive elephants (Loxodonta africana and Elephas maximus)

Williams, E.; Chadwick, C.L.; Yon, L.; Asher, L.

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Animal Welfare 2021, 30: 1-18
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A critical review of animal-based welfare indicators for polar bears (Ursus maritimus) in zoos: Identification and evidence of validity

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Abstract

Captive polar bears (Ursus maritimus) are well-documented as being prone to behavioural disorders and, as a result, their welfare is the cause of increasing concern. There is therefore a need for an evidence-based approach to the assessment of the welfare of this species and identification of valid welfare indicators is the first step towards achieving this. To this end, a critical evaluation of peer-reviewed literature was undertaken. Searches of Web of Science and Scopus took place in May 2020 for publications relevant to the welfare of captive polar bears which met inclusion criteria. Further, validity of extracted indicators was assessed via investigation of evidence of content, construct and criterion validity along with strength of evidence at publication-level. Database searches and snowballing unearthed 46 publications included for review. Identified indicators were sorted into nine behavioural, four physiological (based on physiological or biological sampling) and five physical (based on visual inspection) categories. Among behavioural indicators, the strongest evidence of validity was found for abnormal behaviour. For the physiological indicators, validity was only established for faecal glucocorticoid metabolite concentration. Content validity was assumed for all physical indicators. Generalisability and strength of evidence was generally compromised by low sample sizes and experimental limitations, and only a small number of papers investigated welfare indicators directly, resulting in a paucity of validated indicators. Potential welfare indicators that warrant further validation are highlighted. Overall, this review provides an overview of current valid and promising welfare indicators along with identified gaps in knowledge, relevant for the provision of a methodology for assessing and monitoring welfare of captive polar bears.

Keywords: *animal welfare, behaviour, polar bear, welfare assessment, welfare indicators, zoo welfare*

animals

MDPI

Review

How Can We Assess Positive Welfare in Ruminants?

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Simple Summary: The concern for better farm animal welfare has been greatly increasing among scientists, veterinarians, farmers, consumers, and the general public over many years. As a consequence, several indicators have been developed to assess animal welfare, and several specific protocols have been proposed for welfare evaluation. Most of the indicators developed so far focus on the negative aspects of animal welfare (e.g., lameness, lesions, diseases, presence of abnormal behaviours, high levels of stress hormones, and many more). However, the lack of negative welfare conditions does not necessarily mean that animals are in good welfare and have a good quality of life. To guarantee high welfare standards, animals should experience positive conditions that allow them to live a life that is really worth living. We reviewed the existing indicators of positive welfare for farmed ruminants and identified some gaps that still require work, especially in the domains of Nutrition and Health, and the need for further refinement of some of the existing indicators.

Welfare is complex: scientists working on validation of welfare measures
Welfare science is booming & we need more.

Discussion

- Was it possible?

Discussion

Minimal standards

- Pros:

- we go for minimum in line with current welfare definitions
- no more very bad zoos, good zoos aim much higher
- provides clarity for controlling organism

Discussion

- Cons:

- may promote to only aim for minimum
- may promote a status-quo
- not yet animal-based criteria
- compromises → < clarity
- zoo pressure

Future challenges: merge conservation &welfare

- Culture of care for welfare in CEO
- Quality of life selection criterion in collection plan
- Enclosure design 24/7
- Capacity building
- Welfare scientists on decision level
- Training skills for ethical debates

- The workgroup members, as well as Leen Verbist, Isabelle Van Impe, Eveline Roose are kindlly acknowledged.

- Thank you for your attention

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