A critical review of animal-based welfare indicators for polar bears (Ursus maritimus) in zoos: Identification and evidence of validity

CR Skovlund* †‡, MK Kirchner‡, LW Moos‡, N Alsted‡, X Manteca§, O Tallo-Parra§, M Stelvig‡ and B Forkman‡

† Research and Conservation, Copenhagen Zoo, Roskildevej 38, 2000 Frederiksberg, Denmark
‡ Section of Animal Welfare and Disease Control, Department of Veterinary and Animal Sciences, University of Copenhagen, Groennegaardsvej 8, 1870 Frederiksberg C, Denmark
§ Zoo Animal Welfare Education Centre (ZAWEC), Veterinary Faculty, Universitat Autònoma de Barcelona, 08193 Bellaterra (Barcelona), Spain
* Contact for correspondence: ces@zoo.dk

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

Introduction

The role of modern zoos today extends beyond them being merely recreational facilities. Zoos are involved in education, research and, importantly, species conservation, yet the management of animal populations leads to inevitable trade-offs between the interests of the individual animal and broader species-specific interests (Cohen & Fennell 2016). In recent years, zoo animal welfare has become the subject of increasing focus from the media and NGOs and come under public scrutiny. The welfare of zoo-housed bears, in particular polar bears (Ursus maritimus), has been the subject of extra attention due to the species’ well-documented susceptibility to behavioural abnormalities associated with captivity (Vickery & Mason 2003a). Stereotypic behaviour has been reported in between 55–80% of individuals (Mason et al 2007; Shepherdson et al 2013), occupying a large proportion of their waking hours (eg Brando et al 2018 reported a mean of 40% in various studies). Combined with evidence of poor reproductive success in the ex situ population (Curry et al 2015), concerns over the welfare of polar bears in zoos have emerged. Information on the current welfare status of the captive population is limited, however, due to a lack of validated indicators and standardised methods of assessment. Recently, Brando and colleagues (2018) reviewed current knowledge and the future direction for marine mammals in zoos and aquaria, while Maślak et al (2016) investigated the welfare of captive ursids in Poland. However, as yet, there have been no studies looking specifically into welfare states incorporating multiple variables for polar bears.

In itself, compromised zoo animal welfare constitutes an ethical concern due to humans’ moral responsibility to animals. Additionally, poor welfare can lead to abnormal behaviour and reduced behavioural repertoire, weakening the educational value (Mason et al 2007; Rose et al 2017). Poor welfare may impact longevity and reproductive success undermining conservation efforts (Cameron & Ryan 2016). Considering polar bears’ current ‘Vulnerable’ status on the