Captive Polar bears: Understanding behavioural patterns and the practical implications for their housing and husbandry in zoos

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Introduction

Described as one of the 'charismatic mega fauna', the polar bear (*Ursus maritimus*) plays an important role in public education, particularly with regard to promoting awareness of global warming (Renner & Kelly, 2006). However, the behavioural patterns of polar bears have been difficult to observe in the wild (Greenwald & Dabek, 2003) and although zoos facilitate close scrutiny, the study of polar bear behaviour in captivity has been limited (Shepherdson & Carlstead, 2001 in Ross, 2006). Stereotypic behaviour such as pacing is particularly prevalent in polar bears and is considered to be an indication of reduced welfare (Shepherdson *et al*., 2004; Shyne, 2006). It can sometimes distress the public as well as raising welfare and practical concerns for carers and researchers. As a consequence, zoo-based research is emerging to help understand the social and stereotypic behaviour of captive polar bears and the implications for their management and enclosure design (Shepherdson *et al*., 2004).

Discussion

Polar bears are solitary animals, often moving over thousands of kilometres of sea ice while hunting and searching for mates (Parkes *et al*., 2006). Such a sparse environment allows for few social interactions between polar bears, in stark contrast to the living conditions of their captive counterparts. Renner & Kelly (2006) undertook research to explore the social interactions between two captive female polar bears and the spatial strategies used in their environment. A total 106 hours of observed behavioural and location data were collected over 10 months. Observations were taken every minute in 30-minute blocks, at varying times of the day. Division of the enclosure into eight zones allowed the distance between the bears to be estimated visually using a scan sampling method, based on centre points in the zones.

The results indicated that the polar bears tended to occupy areas of the enclosure that permitted a significant distance between them, and that the smaller the interindividual distance, the more they would move away from one another. Social interactions constituted a small percentage of observed data, contributing to evidence of social avoidance by the polar bears. Despite their confinement, spatial management was adopted to minimise social contact (Renner & Kelly, 2006). This study provides useful information for designing enclosures, as the provision of multiple pathways facilitates social avoidance, enhancing the welfare of captive polar bears (Renner & Kelly, 2006). With a focus on stereotypic behaviour, Ross (2006) and Clubb & Mason (2007) also acknowledge the potential benefits of multiple areas with more complex boundaries in zoo enclosures.

It has been suggested that the naturally expansive ranging zone of polar bears predisposes them to poor welfare in captivity (Clubb & Mason, 2004). Further study by Clubb & Mason (2007) unexpectedly found that home-range size and daily travel distance was a significant predictor of stereotypic behaviour of carnivore species, particularly polar bears. This finding has profound implications for the welfare of captive animals. Behavioural data (sourced from a number of journals and unpublished reports) were taken from 940 captive carnivorous individuals, resulting in a total of 426 stereotypical individuals. Stereotypic behaviour was averaged across individuals within each separate study and then a median was calculated (to prevent skewing). Median values were then regressed against wild behavioural biology, such as home-range size and natural foraging modes. The limited challenges and stimuli in captivity as well as differences from the natural environment may explain the high correlation between home-range size and stereotypic behaviour in polar bears (Clubb & Mason, 2007). In the wild, regular decision-making and navigation are required when changing location. Removing the bears' ability in captivity to exercise this level of choice and control in their environment could be potentially stressful (Clubb & Mason, 2007).

The elements of control and choice in captive environments were explored in greater detail by Ross (2006). Many investigators as cited in Ross (2006) have suggested that providing choice is vital to improved welfare as it allows captive animals to exert control over aspects of their environment. The behaviour of two sibling polar bears was investigated over a 12-week period. Of particular interest to the researcher was the polar bears' choice to access their indoor holding space. Data were based on eight behavioural categories, comparing rates of stereotypic, solitary and social behaviour. For the first six weeks, polar bears were denied access to the indoor den, whereas during the later six weeks they were allowed the option to access the off-exhibit enclosure. Opportunity to access the indoor den significantly reduced stereotypic pacing in both bears. This contributes to the notion that choice in captive environments can enhance the wellbeing of captive animals.

The research conducted by both Ross (2006) and Renner & Kelly (2006), while detailed and conclusive, is limited to a small sample size of two polar bears per study, suggesting that their results may not be representative of the whole captive population. However, increasing the sample size is largely impractical because of the limited numbers of polar bears in captivity in any one zoo. Multiple sources used by Clubb & Mason (2007) enabled a larger sample size to be achieved. However, cross-institutional studies can involve problems with standardised behavioural observations in a varied range of conditions (Shepherdson *et al*., 2004). A common limitation of the three studies includes difficulty characterising certain behaviours, such as differentiating stereotypic pacing from walking (Ross, 2006). Future research could use quantitative assessment, incorporating a combination of physiological and behavioural measurements to ensure a more accurate evaluation of captive conditions and behaviour (Shyne, 2006; Shepherdson *et al*., 2004).

Conclusion

Freedom to exert species-typical behaviour through provision of spacious, stimulating enclosures with multiple areas has been suggested as a means of enhancing the welfare of captive polar bears. The wellbeing of polar bears remains a high priority in zoos and further research is essential to ensure the long-term sustainability of the species in captivity. This aside, implementing the suggestions of current research will help prevent or reduce the severity of stereotypic behaviours, which, once acquired, can rarely be abolished (Shyne, 2006).

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