Journal of Applied Animal Welfare Science

Pond Use by Captive African Penguins (Spheniscus demersus) in an Immersive Exhibit Adjacent to Human Bathers

Laura Ozella\textsuperscript{a}, Livio Favaro\textsuperscript{a}, Irene Carnovale\textsuperscript{b} & Daniela Pessani\textsuperscript{a}

\textsuperscript{a} Department of Life Sciences and Systems Biology, University of Torino, Italy
\textsuperscript{b} Zoom Torino, Cumiana, Italy

Published online: 17 Nov 2014.


To link to this article: http://dx.doi.org/10.1080/10888705.2014.977384

PLEASE SCROLL DOWN FOR ARTICLE

Taylor & Francis makes every effort to ensure the accuracy of all the information (the "Content") contained in the publications on our platform. However, Taylor & Francis, our agents, and our licensors make no representations or warranties whatsoever as to the accuracy, completeness, or suitability for any purpose of the Content. Any opinions and views expressed in this publication are the opinions and views of the authors, and are not the views of or endorsed by Taylor & Francis. The accuracy of the Content should not be relied upon and should be independently verified with primary sources of information. Taylor and Francis shall not be liable for any losses, actions, claims, proceedings, demands, costs, expenses, damages, and other liabilities whatsoever or howsoever caused arising directly or indirectly in connection with, in relation to or arising out of the use of the Content.

This article may be used for research, teaching, and private study purposes. Any substantial or systematic reproduction, redistribution, reselling, loan, sub-licensing, systematic supply, or distribution in any form to anyone is expressly forbidden. Terms &
Pond Use by Captive African Penguins (*Spheniscus demersus*) in an Immersive Exhibit Adjacent to Human Bathers

Laura Ozella,¹ Livio Favaro,¹ Irene Carnovale,² and Daniela Pessani¹

¹Department of Life Sciences and Systems Biology, University of Torino, Italy
²Zoom Torino, Cumiana, Italy

Nonhuman animals in zoos are exposed to a continuous human presence, which affects their behaviors and welfare. However, little is known about what role the “visitor effect” has on penguins in captivity. The African penguin (*Spheniscus demersus*) is an endangered species commonly housed in zoos worldwide. The aim of this study was to evaluate whether the abundance of human bathers could reduce the average time spent in the water of a colony of African penguins housed in an exhibit where their pond habitat was adjacent to a swimming pool. Observations were carried out on 7 penguins in the summer of 2009. Data were collected during 3 time periods (Time 1 [T1] = opening of the swimming season, Time 2 [T2] = core of the season, Time 3 [T3] = late season) of 14 days each. The human disturbance caused by bathers strongly reduced the pond use by penguins at T1 and T2, especially when there were large numbers of visitors. However, at T3, we observed that the overall use of the pond by penguins increased, and the average duration of their diving was no longer dependent on the number of visitors.

**Keywords:** jackass penguin, animal welfare, visitor effect, captive birds

Nonhuman animals in zoos and aquariums are subject to a variety of physical, social, dietary, and ecological limitations. In addition, they are exposed to a continuous human presence, which influences their behavior and welfare. Such influence has been defined as the “visitor effect” (Bortolini & Bicca-Marques, 2011; Hosey, 2000; Margulis, Hoyos, & Anderson, 2003). A review by Hosey (2000) led to identification of three different classes in which zoo visitors can...
influence animals in exhibits—namely (a) being a source of stress, (b) being a source of enrichment, and (c) being relatively neutral.

In a more recent review, Davey (2007) suggested that behavioral responses to visitors are species-specific and related to body size. In particular, small animals, such as arboreal primates, are usually aware of people, and they are likely to respond with a behavior that tends to avoid massive audiences (Chamove, Hosey, & Schaezel, 1988; Fernandez, Tamborski, Pickens, & Timberlake, 2009). Larger animals are generally less responsive (Margulis et al., 2003), or they react by displaying aggressive behaviors (Anderson, Benne, Bloomsmith, & Maple, 2002; Lukas et al., 2002). The impact of the viewing public on a captive animal is also known to be affected by the habitat provided in the exhibit (Blaney & Wells, 2004). In particular, the visitor effect is more evident in impoverished environments (Broom & Johnson, 1993), whereas it is markedly reduced in naturalistic exhibits that offer shelter for animals to hide from visitors (Blaney & Wells, 2004; Mononen, Kasanen, Harri, Sepponen, & Rekila, 2001; Simpson, 2004).

One of the biggest challenges of modern zoos is meeting the expectations of visitors, which often include recreation and entertainment, while at the same time, providing education on the biology and conservation of endangered species. This goal can be achieved through creating immersive exhibits, which are fascinating to the public and attract visitors as they involve them in an interactive environment (Ross & Gillespie, 2009). However, little is known about the influence of these modern facilities on the behavior of exhibited animals.

Very few studies have investigated the effect of zoo visitors on penguins (Hosey, 2008). Warren, Parry, Cuthill, and Barham (2003) provided evidence that human presence can affect the behavior of gentoo penguins (Pygoscelis papua) and African penguins (Spheniscus demersus), and they observed, in both species, increased vigilance and activity associated with a persistently high number of people. In this study, the authors also carried out a “disturbance experiment,” consisting of a human stranger walking through the enclosure. During this experimental condition, the birds dramatically increased their walking behavior, and after the person had left the exhibit, vigilance became the dominant activity in the subsequent few minutes. However, a study by Brooking and Price (2004)—which investigated the behaviors of the same two species when exposed to visitors—only showed a decrease in resting behavior in the African penguins, without any reduction of the enclosure space utilization, dependent on increasing visitor density. Finally, Condon, Wehnelt, and Turner (2003) showed that, for the Humboldt’s penguin (Spheniscus humboldti), the presence of the viewing public both reduced the inactivity of these animals and increased their physical fitness, suggesting a positive response of the birds to the audience.

The African penguin is an endangered marine bird (BirdLife International, 2012) endemic in South Africa and Namibia. Small groups of S. demersus are also exhibited in zoos and aquariums all over the world; therefore, it is important that welfare specialists understand the impact of the audience on this species. To this end, we investigated the visitor effect on a colony housed in a zoological park in Italy to assess if the presence of visitors resulted in reduced pool use by penguins.

**MATERIALS AND METHODS**

The study was carried out on seven adult penguins (two males and five females) of the species S. demersus at the “Bolder Beach” enclosure of the biopark Zoom Torino (44° 56’ N, 7° 25’ E) in
Italy. This exhibit covers an area of 1,500 m², including a pond of 120 m² (water depth maximum = 3 m; temperature constantly maintained at 15°C). The enclosure reproduces the habitat of “Boulders Beach,” a natural nesting site in South Africa. The penguins’ pond is physically, but not visually, separated from a swimming pool by two glass panels, which allow a complete underwater view of the animals (Figure 1). The swimming pool has approximately 35,000 visitors per year, from late May to early September.

Data collection took place in 2009 during three time periods of 14 consecutive days each (Time 1 [T1], Time 2 [T2], and Time 3 [T3]), which are described in Table 1.

The penguins were naïve to human bathers, and the study was conducted when the novel immersive exhibit had opened to the public for the first time. Moreover, at that time, the penguins had just been transferred from another zoo, which did not have this structural condition. Observations were carried out following the focal animal sampling method (Altmann, 1974) and lasted 14 hr per sampling period (1 hr per day). Overall, each penguin was observed for 2 hr (30 min per 4 nonconsecutive days) per period. During observation sessions, the number of bathers facing the glass panels (i.e., those who could be viewed by penguins) was constantly monitored and categorized into classes according to abundance: 0 (no visitors), 1 (1–15), 2 (16–30), 3 (more than 30). The time spent by penguins in the water was recorded using a Konustart-3 stopwatch (Konus). The stopwatch was started when the focal bird spontaneously dove into the pond, and it was stopped when the same animal left the water. However, the birds usually entered and left the pool as a group.

Statistical analyses were carried out using the R software Version 3.0.1 (R Development Core Team, 2007) for Macintosh. Because the data did not follow a normal distribution, inferences were made using nonparametric statistical techniques.

FIGURE 1 View of the swimming pool adjacent to the “Boulders Beach” enclosure at Zoom Torino in Italy. The glass windows separate the penguins’ pond from the bathers.
RESULTS

Overall, the time spent by penguins in the pond significantly increased at T3 compared with T1 and T2 (Kruskal-Wallis $\chi^2 = 35.47$, $df = 2$, $p < .001$; Figure 2).

Moreover, at T1 and T2, the average time spent by penguins in the pond was strongly dependent on the abundance classes of the viewing public (T1, Kruskal-Wallis $\chi^2 = 17.28$, $df = 3$, $p < .001$; T2, Kruskal-Wallis $\chi^2 = 14.89$, $df = 3$, $p < .01$; Figure 3).

In particular, the Nemenyi Damico Wolfe Dunn post-hoc comparisons showed that, in these periods, the birds remained in the water for significantly less time when there was an abundance of bathers facing the glass panels; the comparisons were between classes 0 and 3 (T1, $p < .001$; T2, $p < .01$) and between 1 and 3 (T1, $p < .001$; T2, $p < .01$). Conversely, at T3, the time spent by penguins in the pool was not affected by the number of bathers facing the glass panels (T3, Kruskal-Wallis $\chi^2 = 7.44$, $df = 3$, $p > .05$; Figure 3).

DISCUSSION

We investigated whether the occurrence and abundance of human bathers would have an influence on pond use in a colony of African Penguins ($S$. demersus) housed in an exhibit adjoining a swimming pool. To this end, we monitored the average time spent in the water by

![Figure 2](image_url)

**Figure 2** Average minutes spent by penguins in the pond at Time 1 (T1), Time 2 (T2), and Time 3 (T3). The boxplots illustrate the interquartile range, and the bold lines indicate the median. The error bars extend from the box to the highest and lowest values.
seven adult birds during three separate time periods corresponding to the seasonal opening of the swimming pool (T1), the core of the season (T2), and the late season (T3).

We observed that the human disturbance due to bathers strongly reduced pond use by penguins during the T1 and T2 observation periods, especially when large numbers of visitors were present. However, at period T3, we observed that the overall use of the pond by the penguins increased, and the average duration of their diving was no longer dependent on the number of people present. This is in line with the study by van Heezik and Seddon (1990), who showed that wild African penguins exposed to a regular disturbance exhibit a high level of tolerance to visitors. More recently, Seddon and Ellenberg (2008) also confirmed that tolerance to human proximity by penguins varies according to many different factors, including their own previous experience.

Finally, a study by Condon et al. (2003), performed on 10 captive Humboldt’s penguins (*S. humboldti*) housed at Chester Zoo (United Kingdom) showed that the viewing public had a positive effect on the diving behavior of these birds. Specifically, the researchers observed an increase of submerged swimming relative to the presence of visitors, as a result of human interaction through glass windows. Conversely, in our scenario, we did not observe any positive influence exerted by human bathers in relation to pond use by the African penguins. In wild yellow-eyed penguins (*Megadyptes antipodes*), behavioral responses to human disturbance can vary according to both individuality and gender (Ellenberg, Mattern, & Seddon, 2009). However, these differences were not evident in other species (e.g., Ellenberg, Mattern, Houston, Davis, & Seddon, 2012) and have never been reported for the African penguin. Further studies carried out on a larger number of penguins of both sexes would be useful to investigate whether these differences exist in this species.

Immersive exhibits represent a modern and attractive alternative to traditional zoo enclosures (Ross & Gillespie, 2009). However, even if these exhibits provide a unique, interactive
environment for the viewing public, thus contributing added value for education and raising awareness, the disadvantage is they could affect the behavior of animals due to the penguins’ close proximity to humans. Beale and Monaghan (2004) suggested that seabirds perceive the human disturbance as a potential predation risk. Predators of the wild, adult African penguins are mostly aquatic animals such as the Great white shark (*Carcharodon carcharias*; Johnson, Venter, Bester, & Oosthuizen, 2006; Randall, Randall, & Compagno, 1988) and the Cape fur seal (*Arctocephalus pusillus pusillus*; du Toit, Barlett, Bester, & Roux, 2004; Johnson et al., 2006). Therefore, we hypothesize that at T1 and T2, the bathers facing the glass panels that separated the pond from the swimming pool were perceived by the members of the colony as a potential threat. Consequently, penguins avoided using the pond, particularly when there were large groups of visitors. We also suggest that the increased use of the pond, observed at T3, was a result of a gradual habituation to human visitors, who were no longer perceived by the birds as potential predators.

Further research that takes into account a larger number of penguins and compares similar scenarios would be especially valuable to gain a more complete understanding of this behavior. We also recommend that zoos and aquariums that do not exhibit penguins for extended periods of time throughout the year pay particular attention to the needs of these birds at the beginning of the opening season to rehabituate them to a massive audience exposure.

**CONCLUSION**

The presence of human bathers facing the glass panels reduced the average time spent by the penguins in the pond at T1 (opening of the swimming season) and T2 (core of the season). During these periods of observation, the time spent by the birds in the pond was also strongly dependent on the abundance classes of the viewing public. At T3 (late season), the penguins habituated to the presence of humans, and their use of the pond was no longer influenced by the presence or abundance of the public.

**ACKNOWLEDGMENTS**

The authors would like to thank Zoom Torino S.p.A. ([www.zoomtorino.it](http://www.zoomtorino.it)) for free access to their animals, and in particular, Daniel Sanchez and Valentina Isaja.

**REFERENCES**


