Initial Observation of Human-Bird Vocal Interactions in a Zoological Setting

Rébecca Kleinberger[1], Janet Baker[1], and Gabriel Miller[2]

[1]**MIT Media Lab, 75 Amherst Street, Cambridge MA**
[2]**Institute for Conservation Research - San Diego Zoo, 15600 San Pasqual Valley Rd, Escondido, CA**

Corresponding author:
Rébecca Kleinberger[1]

Email address: rebklein@media.mit.edu

ABSTRACT

Vocal interactions between humans and non-human animals are pervasive, but studies are often limited to communication within species. Here, we conducted a pilot exploration of vocal interactions between visitors to the San Diego Zoo Safari Park and Sampson, an 18-year-old male Hyacinth Macaw residing near the entrance. Over the course of one hour, 82 vocal and behavioral events were recorded, and various relationships between human and bird behavior were noted. Analyses of this type, applied to large datasets with assistance from artificial intelligence, could be used to better understand the impacts, positive or negative, of human visitors on animals in managed care.

INTRODUCTION

Interaction and communication between humans and domesticated animals (such as cows, horses, dogs, and cats) are well documented (eg. Saito et al. (2013)). However, interaction between humans and threatened or endangered wild species (like Hyacinth Macaws) are generally less characterized. Nevertheless, at zoological institutions, humans have extensive contact with rare species, and human interaction is an important element of the lives of animals in managed care.

When entering the San Diego Zoo Safari Park, a Hyacinth Macaw (Anodorhynchus hyacinthinus) named Sampson is the first visible animal. The largest (head to tail) flying parrot, his species is classified as vulnerable on the International Union for Conservation of Nature RedList (BirdLifeInternational, 2019). The San Diego Zoo Safari Park was visited by 1.5 million guests in 2018, meaning Sampson is passed by an average of 4,000 guests daily. We aimed to begin characterizing vocal interaction between Sampson and guests in order to better understand the dynamics of human-bird vocal communication in a zoological setting. Sampson's enclosure is about 4x8m and is surrounded by a waist-high fence (Fig. 1) which excludes guests from approaching too closely. Sampson can freely move within his enclosure.

Figure 1. Sampson, the Hyacinth Macaw, in his enclosure near the San Diego Zoo Safari Park entrance

BACKGROUND

The effects of the presence and behaviors of humans on animals at zoological organizations has been studied for several decades. The significance of humans for animals is important in at least five different ways: as enemies, prey, symbionts, pieces of the inanimate environment, or members of its own species (Hediger, 1969). The first and last cases have been studied to evaluate the contexts in which the presence of humans elicits positive, neutral, or negative effects on captive wildlife in zoos.

Humans (and human-generated sounds) sometimes have negative effects on other species. For example, visitors increased distress levels of wolfs (Pifarré et al., 2012), pandas (Owen et al., 2004), orangutans (Birke, 2002), and construction noises increased stress in of big cats (Chosy et al., 2014).

However, certain human-animal interactions clearly benefit particular animals. The uniqueness of each human-animal diad helps explain the rich connections between animals and their primary caregivers (Ward, 2015). Claxton (2011) also explores the effects of daily contact with both familiar and unfamiliar people and concludes that such interactions can lead to positive outcomes if human contact is intentionally designed to address environmental enrichment aims. She also emphasises the importance of tailoring human contact on a species-by-species basis. Understanding the interactions between animals and zoo visitors can allow determination of the visitor characteristics and behaviors which are most appealing to animals, and lead to higher levels of animal-human interaction (Cook, 1995), playfulness (Owen, 2004), and energy expenditure (Nimon and Dalziel, 1992).

In the specific context of the vocal interactions, researchers have recently explord the concept of zoo voices and the characteristics of the merged soundscape created from animal and human voices, as well as animal and human generated sounds. Tunnicliffe and Scheersoi (2012) discuss ways in which zoos make their voices available to visitors, creating dialogues and active listening. In the specific example of parrots, we interpret physical and vocal behaviors from the animal based on interviews with the bird's expert caregivers as well as previous research on parrots, in particular the important work from Pepperberg (1994) that revealed parrots abilities. Parrots are known to be vocal and social, and related parrot species exhibit head-bobbing as part of courtship behavior (Symes et al., 2004) or as a sign of playfulness.

METHODS

In this exploratory study, we recorded one hour of audio and video of a Hyacinth Macaw's enclosure, and analyzed interactions between humans and the bird. Six different types of behaviors were scored: three were human vocalizations (adult speaking to bird, child speaking to bird, and adult whistling to bird) and three were bird behaviors (bird vocalisation, bird head nodding, and bird moving toward a visitor). We recorded instances when visitors vocally addressed the bird (but did not score instances where humans conversed solely with one another nor when they stopped to look at the bird without talking to him). When guests vocalized toward the bird, they commonly (but not always) raised the tone of their voice and faced the bird. Throughout the trials, background noise (from entry gates and human-human conversation) was continual. These preliminary observations were obtained in the course of implementing a larger project exploring ways to provide audio enrichment for animals in managed care.

RESULTS

During one hour, we recorded 82 instances of the six target events. Between 300 and 400 visitors entered the park during this hour. Many visitors stopped to look at the bird and were engaged in human-human discussions while doing so, and 34 (approximately 10%) verbally addressed the bird. We recorded 41 unique human vocal events, including 3 instances of whistling and 14 instances of children talking to the animal. The macaw vocalized 16 times, nodded 19 times and physically approached visitors 7 times.

63% of the bird vocalisations (10/16) were preceded by less than 10 seconds by a visitor addressing the bird (2 adult whistles, 3 child vocalizations, 5 adult vocalizations). 43% of these times (3/7), the bird approached the visitor who just vocally addressed him. 58% of head nodding behaviors (11/19) were preceded by less than 10 seconds by a visitor addressing the bird (2 adult whistles, 4 child vocalizations, 5 adult vocalization). The bird often responded to visitors with a combination of several different behaviors (for example, five occurrences of vocalizing + head bobbing and two occurrences of approaching + head bobbing + vocalizing). In four instances, the interactions between visitor and bird contained turn-taking, dialog-like characteristics during which neither the bird not the visitor would vocalise during the other's turn and the bird would vocalise or nod more than once.

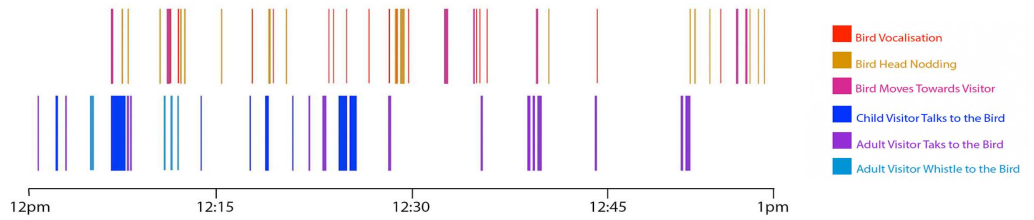

Figure 2. timeline of all scored behaviors of the bird (top row) and of the human visitors (bottom row)

DISCUSSION AND CONCLUSION

Generally, animal behavior studies focus on single species. However, in managed care, the interactions of animals with humans is of paramount importance. To our knowledge, this is the first description of unstructured human-bird vocal interaction in a zoological setting. Unstructured communication (in the absence of goal-oriented training, etc) comprises the majority of captive animals' experience, and yet these sessions are largely uncharacterized. Here we observe that Sampson's experiences are highly interactive, and that his vocalizations appear to be correlated with (and tend to follow) those of guests.

This study is extremely preliminary; by examining the temporal relationships between human and bird behaviors, we can begin to draw inferences about how guests influence the behavior and engagement levels of animals under managed care. Further studies could subdivide Sampson's vocalizations into various types, and the influence of variables like time-of-day, weather, and particular individual humans could be investigated. The influence of human speech on bird vocalization and behavior is likely to depend not only on the species of bird but also on the tendencies of individual birds. Sampson, in particular, is described by his keepers as less 'talkative' than other parrots in the collection, yet clearly still has vocal dialogue with guests. In the future, using large datasets comprised of many hours of audio recordings, algorithms can annotate bird and human vocalizations. Autocorrelation functions can then reveal the temporal dependence of these signals. AI approaches using deep learning could provide more in-depth ethological understanding. Previous instances of the use of deep learning for the recognition of animal behavior such as DeepLabCut (Mathis, 2018) could be used as a starting point. Better standards of care will be reached as we continue to understand the impact of human visitors on animal behavior.

We wish to thank Jenna Duarte and Michelle Handrus for their extensive support. All procedures described were approved by the Zoological Society of San Diego IACUC under proposal 19-002.

REFERENCES

BirdLifeInternational (2019). Anodorhynchus hyacinthinus. the iucn red list of threatened species 2016.

Birke, L. (2002). Effects of browse, human visitors and noise on the behaviour of captive orang utans.

Chosy, J. et al. (2014). Behavioral physiological responses in felids to exhibit construction. *Zoo biology*.

Claxton, A. M. (2011). The potential of the human–animal relationship as an environmental enrichment for the welfare of zoo-housed animals. *Applied Animal Behaviour Science*, 133(1-2):1–10.

Cook, S. (1995). Interaction sequences between chimpanzees and human visitors at the zoo. *Zoo Biology*.

Hediger, H. (1969). Man and animal in the zoo.

Mathis, A. (2018). Deeplabcut: markerless pose estimation of user-defined body parts with deep learning.

Nimon, A. and Dalziel, F. (1992). Cross-species interaction and communication: a study method applied to captive siamang and long-billed corella contacts with humans. *Applied Animal Behaviour Science*.

Owen, C. (2004). Do visitors affect the asian short-clawed otter in a captive environment. In *Proceedings of the 6th Annual Symposium on Zoo Research-BIAZA*, pages 202–211.

Owen, M. A. et al. (2004). Monitoring stress in captive giant pandas: behavioral and hormonal responses to ambient noise. *Zoo Biology: Published in affiliation with the American Zoo and Aquarium Association*.

Pepperberg, I. (1994). Vocal learning in grey parrots: effects of social interaction, reference, and context.

Pifarré, M. et al. (2012). The effect of zoo visitors on the behaviour and faecal cortisol of the mexican wolf (canis lupus baileyi). *Applied Animal Behaviour Science*, 136(1):57–62.

Saito, A. et al. (2013). Vocal recognition of owners by domestic cats (felis catus). *Animal cognition*.

Symes, C. et al. (2004). Behaviour and some vocalisations of the grey-headed parrot poicephalus fuscicollis suahelicus (psittaciformes: Psittacidae) in the wild. *Durban Museum Novitates*.

Tunnicliffe, S. D. and Scheersoi, A. (2012). Voices in zoos and aquariums. *IZE Journal*, (48).

Ward, S. (2015). Keeper-animal interactions: Differences in the behaviour of animals affect stockmanship.