

2015

Behavior of Captive Humboldt Penguin (*Spheniscus humboldti*) Chicks in Response to Environmental Enrichment

Emma Meteyer

Follow this and additional works at: <http://digitalcommons.esf.edu/honors>

 Part of the [Behavior and Ethology Commons](#), [Ornithology Commons](#), and the [Zoology Commons](#)

Recommended Citation

Meteyer, Emma, "Behavior of Captive Humboldt Penguin (*Spheniscus humboldti*) Chicks in Response to Environmental Enrichment" (2015). *Honors Theses*. Paper 71.

Behavior of captive Humboldt penguin (*Spheniscus humboldti*) chicks in response to environmental enrichment.

by

Emma Meteyer

Candidate for Bachelor of Science

Department of Environmental Forest Biology

With Honors

May 2015

APPROVED

Thesis Project Advisor: _____

William M. Shields, Ph.D.

Second Reader: _____

Barbara J. Hager, Ph.D.

Honors Director: _____

William M. Shields, Ph.D.

Date: _____

ABSTRACT

Environmental enrichment is an important part of animal husbandry. Enrichment can reduce and prevent the display of stereotypies, improving the wellbeing of captive animals. A video of penguins in a California aquarium explored the use of tablet computers as a form of enrichment. This research explored the effects of the novel form of enrichment on Humboldt penguin chicks at the Rosamond Gifford Zoo. I presented chicks with a tablet computer and assessed how they behaved in the presence of the new toy. I presented the tablet to the penguins in three different states then compared the frequency of observed behaviors to the control. I expected the chicks to approach the tablet and peck at the screen when the tablet was on. The chicks showed little interest in the device. Due to the limitations of individual animal statistics, I was unable to generalize to the larger population of Humboldt penguins and was only able to make claims to the effects of tablet interactions for the specific subjects in this study. The chicks in this study more frequently exhibited exploratory behavior, rather than self-maintenance in the presence of the tablet. It is possible that given reinforcement, other members of the colony would play with a tablet. Implementing novel environmental enrichment is important so that captive animals remain challenged, interested, and healthy.

TABLE OF CONTENTS

LIST OF FIGURES	i
LIST OF TABLES	i
GLOSSARY OF TERMS	ii
ACKNOWLEDGEMENTS	iii
INTRODUCTION	1
METHODS	3
<i>Species of study</i>	3
<i>Experimental setup</i>	3
<i>Sampling methods</i>	4
<i>Data analysis</i>	4
RESULTS	4
DISCUSSION	5
CONCLUSION	8
LITERATURE CITED	8
APPENDIX	9

LIST OF FIGURES

Figure 1. Mean frequency of behaviors exhibited by Humboldt penguin chicks per half hour of observation with no enrichment..... 10

Figure 2. Mean frequency of behaviors exhibited by Humboldt penguin chicks per half hour of observation with tablet present and off..... 11

Figure 3. Mean frequency of behaviors exhibited by Humboldt penguin chicks per half hour of observation with tablet present and displaying a picture..... 12

Figure 4. Mean frequency of behaviors exhibited by Humboldt penguin chicks per half hour of observation with tablet present and displaying game for cats application..... 13

Figure 5. Image of Calypso and Malia huddled together, resting in front of tablet during 5/1/2015 sampling date. 14

LIST OF TABLES

Table 1. Ethogram for captive Humboldt penguin chicks. Behaviors are categorized and defined. Some definitions were clarified using Seddon’s work (1991)..... 9

GLOSSARY OF TERMS

Ethogram- Catalog of behaviors for a specific species

Exploratory behaviors- Behaviors involving movement and exploration of room

Interactive behaviors- Behaviors involving interaction between both chicks

Self-maintenance behaviors- Behaviors necessary for cleanliness and general wellbeing

Sedentary behaviors- Behaviors not involving movement or activity

ACKNOWLEDGEMENTS

I'd like to thank my advisor Dr. William Shields for his patience and guidance before, during and after the research process. I'd like to thank the SUNY-ESF Honors Program for funding my research. I'd also like to thank Adrienne Whiteley of the Rosamond Gifford Zoo for approving my research. Finally, I'd like to thank Deborah DeLorenzo of the Rosamond Gifford Zoo for being so accommodating and supportive. Without all your help, my research would not have been possible.

INTRODUCTION

Zoos play an important role in preserving biodiversity in captivity. Studies suggest captive animals may exhibit stereotypical behaviors when conditions and stimulation are not adequate (Carlstead and Shepherdson 2000, Lussier and Renner 2002). Stereotypies include but are not limited to pacing, rocking, self-mutilation, and coprophagy (Clarke et al. 1982, Lussier and Renner 2002). These are atypical to what animals would naturally do. These may be signs of “boredom,” of something lacking in their captive environments (Hughes et al. 1996).

Environmental enrichment can reduce stereotypical behaviors (Carlstead and Shepherdson 2000, MacPhee and Mellen 2001, Shepherdson 2003). Environmental enrichment is defined as “an animal husbandry principle that aims to enhance the quality of captive care by identifying and providing environmental stimuli necessary for optimal psychological and physiological wellbeing” (Shepherdson and Swaisgood 2005:500). In simplest terms, enrichment provides tools or activities that mimic behaviors animals would exhibit in the wild. While environmental enrichment is often introduced after stereotypical behavior is exhibited, it is also introduced proactively, to prevent such behaviors from arising (Shepherdson 2003).

There are different recommendations for enrichment. The AZA Penguin Taxon Advisory Group notes that not all environmental enrichment must consist of permanent modifications to animal enclosures; interaction and mental stimulation are important and considered enriching (2014). There are a diversity of approaches to environmental enrichment. Not every strategy will work for every captive species therefore it is important to tweak and redefine “enrichment” for each species (MacPhee and Mellen 2001). It is important to make enrichment goal oriented in order to achieve the most out of the strategies (Carlstead and Shepherdson 2000, MacPhee and Mellen 2001). For example, zookeepers wishing to encourage exploration and creative play

might introduce new toys or unfamiliar objects to an animal's exhibit (Shepherdson and Swaisgood 2005).

The internet is filled with ideas for environmental enrichment. There are articles, message boards, and blog posts dedicated to zookeeper ideas of new toys and structures to add to animal exhibits. There are also videos of animals doing various interesting things. A video of penguins at the Aquarium for the Pacific in California playing with a tablet caught my attention (Aquarium of the Pacific, Utube video). The zookeeper presented the penguins with an interactive "games for cats" where mice were running around on the screen. The penguins seemed interested in the game. They responded by pecking at the moving mice with their beaks. This enrichment strategy was applied at the Rosamond Gifford Zoo.

This research was conducted on Humboldt penguins (*Spheniscus humboldti*). Humboldt penguins are native to the coasts of Chile and Peru. They spend much of their time swimming along the Humboldt Current, for which they are named. While Humboldt penguins are not adapted for flight, they are adapted to swim. Their torpedo shaped bodies, specialized feathers, and surprising agility allows Humboldt penguins to spend a lot of time swimming in search for food. Their diet consists of fish and crustaceans. Catching fish requires attentiveness, quick reflexes, and eye-beak coordination similar to those demonstrated in the videos of penguins playing with tablets.

During my undergraduate at SUNY-ESF, I had the opportunity to intern at the Rosamond Gifford Zoo. I learned a lot about penguin biology and spent a lot of time observing penguin behavior. I did not notice stereotypical behaviors in the penguins at Rosamond Gifford Zoo but I was interested in the idea of providing them with enrichment. The zookeepers provide various forms of enrichment. Enrichment at the Rosamond Gifford Zoo ranges from training penguins to

accept food from the zookeepers during daily feedings, to blowing bubbles in the exhibits, to placing wiffle balls and rubber ducks in the exhibit pools. Despite the creativity of the zookeepers at the Rosamond Gifford Zoo, they had yet to present the penguins with a tablet.

METHODS

Species of study

The Rosamond Gifford Zoo successfully hatched two chicks, Malia and Calypso, in January 2015. I conducted my research from April 24, 2015 to May 8, 2015, when the chicks were being weaned. During the weaning period, the chicks were removed from the husbandry room and placed in a smaller quarantine room, away from the rest of the colony. In order to minimize stress on the chicks, a condition of my research was that the chicks remain together during the trials.

Initial observations were conducted in order to create an ethogram (Table 1). During these initial observations, the chicks were more active when hungry. They paced or jumped in front of door, calling, as they waited for the zookeeper to come with food. As a result, observations were done about 30 minutes after the second feeding with the door closed. It was also noted that when door was open, the chicks stayed by the door. To avoid influencing their behavior, the door was kept closed during observations.

Experimental setup

Observations were performed standing on a chair outside the quarantine room door looking down at both chicks. There was almost a complete view of room from this position, however the chicks could not be seen directly below window. The chicks typically stood in this blind spot for a few minutes after the door closed as if expecting food or interaction with the zookeeper. The tablet used was a Samsung Galaxy Tab 3 Lite, “penguin proofed” with a

tempered glass screen cover and protective silicone case. In trials with the tablet, it was placed in the middle of the room, leaned on its side against a brick at a 60 degree angle hoping it would attract the chicks' attention.

Sampling methods

Observations were done in 30 minute trials. During that time the observer would tally the number of times each chick performed behaviors listed in the ethogram (Table 1). Due to time constraints, multiple trials were implemented on a given day of observations. This meant the chicks were observed for 30 minutes under one prescription then subsequently observed under another prescription. To get an idea of the chicks' normal behavioral routines, trials were performed in a different order every day. As a control, the chicks' activity was observed without the tablet.

Their activity was assessed when the tablet was present in various states. In one prescription, tablet off. In another prescription, the tablet was on displaying a screenshot of a game for cats application. In the final prescription, the tablet was on displaying an interactive, moving game for cats application.

Data analysis

The average relative frequency of the behavior categories in the ethogram of both chicks was determined.

RESULTS

After the chicks ate, they spent a large amount of time preening and paid little attention to the tablet in any state. This period of preening was followed by long periods of rest. Sometimes the chicks would stir, opening their eyes to stare at a wall or the door. This was usually triggered by a door closing in the building or the colony calling next door. Sometimes they would move to rest or stare in a different part the room.

Throughout the trials, the chicks most frequently exhibited preening, resting, and watching behaviors. The frequency of movement increased when the tablet was introduced. While the chicks most frequently performed self-maintenance in the control (Fig. 1). In trials with the tablet the chicks more frequently moved and watched around the room. There was an increasing trend in frequency of exploratory behaviors in the presence of the tablet (Figs. 2 -4). There were no noticeable differences in the chick behavior when exposed to the tablet off, the tablet with a picture, and the tablet with the game.

The chicks tended to stay together when moving around the room. If Calypso moved to a mat in the back corner of the room, Malia would never be too far behind and vice versa. The younger chick, Calypso was generally more curious. Several times she aggressed the tablet, walking behind it hunched over as if assessing the tablet as a threat. The most interaction with the tablet happened on May 1st. In the May 1st trial with the tablet displaying the game, Calypso directly approached the tablet, pecking the screen with her beak several times. She quickly lost interest and moved away to rest in the center of the room. Both chicks spent the rest of that trial huddled together laying down to rest in front of the tablet (Fig.5). Remaining trials evoked little interest from the chicks and consisted of the chicks resting or watching around the room.

DISCUSSION

Due to the limitations of sample size and individual animal statistics, I am unable to generalize to the larger population. I may only make claims to the observed effects of applied tablet interactions for the two chicks in this study. There were slight variations in the frequency of exhibited behaviors. Throughout the trials, the chicks most frequently exhibited preening, resting, and watching behaviors. The frequency of movement increased when the tablet was

introduced. While the chicks most frequently performed self-maintenance in the control (Fig. 1). In trials with the tablet the chicks more frequently moved and watched around the room. There was a trend of increased exploratory behaviors in the presence of the tablet while the frequency of sedentary behaviors remained relatively the same. Despite this trend, there was no significant difference observed between the overall behavior of the Humboldt penguin chicks in the control and after exposure to the tablet. There was also no significant difference observed in the behavior of the chicks in trials with the tablet off and the tablet displaying the game. This suggests that the penguins were not influenced by the status of the tablet. Slight variations in the data could be attributed to other factors, like the noise of the colony next door, or movement in the rest of the building.

The experimental trials did not recreate the behaviors shown in the California aquarium's video. The chicks were unexpectedly disinterested in the tablet. It is possible that after initial assessment of the tablet the chicks did not sense it was a threat worthy of aggression. It is also possible that after minimal interaction with the tablet the chicks did not get a reward or enforcement to encourage continued interaction. This suggests that the penguins in the California aquarium's video could have been trained to interact with the tablet. It is possible that a zookeeper physically presenting the chicks with the tablet evoked a more interested reaction (Carlstead and Shepherdson 2000, Shepherdson 2003). As Shepherdson and Swaisgood state, training has the potential for cognitive enrichment of captive animals (2005). This principle could be applied at the Rosamond Gifford Zoo in the future.

While the chicks did not play with the tablet as hypothesized, exposure to the technology served to acquaint them to things they would be exposed to when on exhibit. Though there was no difference in behavior without the tablet and with the tablet, the research served to expose the

chicks to novel things. This environmental enrichment was not implemented in order to reduce stereotypical behaviors; it was a proactive measure (MacPhee and Mellen 2001). This was an attempt to provide a cognitive challenge meant to keep the chicks active and engaged while apart from the colony (Carlstead and Shepherdson 2000). While this experiment did not seem to achieve the goal of eliciting play, such novel technology needn't be written off as an ineffective means of enrichment.

The timing of this research placed limitations on my ability to test this enrichment on the adult colony. The penguins at the Rosamond Gifford Zoo nest from November to July, making it difficult to experiment with enrichment during that time. If attempted outside of the nesting season, it is possible that other penguins in the colony would be interested in the tablet. Adult penguins have had more exposure to the people, cameras, and toys than chicks that are being weaned. Given this difference, adult penguins might be more engaged with the tablet than Malia and Calypso. Even if the zoo does not continue to pursue using a tablet as a form of enrichment in the future, the penguins at the Rosamond Gifford Zoo seem to do a good job of playing on their own.

From other observations of the colony, I determined that the Humboldt penguins are fairly self-enriching. While the zookeepers provided an array of toys and activities, the penguins reacted with moderate interest. The members of the colony seemed to stay active and engaged on their own. The colony frequently spent hours outside swimming together in the exhibit pool or sunning themselves on the cement beach. The penguins frequently stood at the windows jumping around and pecking at cleaning rags as I cleaned the outside of the windows. Some penguins would chase shadows on the floor. Others followed flies, attempting to catch them mid-air with their bills.

CONCLUSION

Zoos play an important role in conservation and education. The institutions are held to high standards to ensure the health, safety, and overall wellbeing are being met. Zoos closely monitor the animals and make changes to husbandry practices where appropriate. In the future, if the Humboldt penguin chicks at the Rosamond Gifford Zoo exhibit signs of distress or stereotypical behavior, environmental enrichment solutions should be taken into consideration. Environmental enrichment may be a key to providing captive individuals long, productive lives.

LITERATURE CITED

- AZA Penguin Taxon Advisory Group. 2014. Penguin (Spheniscidae) care manual. Association of Zoos and Aquariums, Silver Spring, Maryland, USA.
- Carlstead, K., and D.J. Shepherdson. 2000. Alleviating stress in zoo animals with environmental enrichment. Pages 337-354 in G.P. Moberg and JA Mench, editors. *The Biology of Animal Stress*. CABI Publishing, Wallingford, Oxfordshire, UK.
- Clarke, S.A, C.T. Juno, and T.L. Maple. 1982. Behavioral effects of a change in the physical environment: a pilot study of captive chimpanzees. *Zoo Biology* 1:371-380.
- Hughes, B.O., R.B. Jones, and C. Larkins. 1996. Approach/avoidance responses of domestic chicks to familiar and unfamiliar video images of biologically neutral stimuli. *Applied Animal Behavior Science* 48:81-98.
- Lussier, J.P., and M.J. Renner. 2002. Environmental enrichment for the captive spectacled bear (*Tremarctos ornatus*). *Pharmacology, Biochemistry and Behavior* 73:279-283.
- MacPhee, M.S., and J. Mellen. 2001. Philosophy of environmental enrichment: past, present, and future. *Zoo Biology* 20:211-226.
- Seddon, P.J. 1991. An ethogram for the yelloweyed penguin *Megadyptes antipodes*. *Marine Ornithology* 19:109-115.
- Shepherdson, D.J. 2003. Environmental enrichment: past, present, and future. *Int. Zoo Yb.* 38:118-124
- Shepherdson, D.J., and R.R. Swaisgood. 2005. Scientific approaches to enrichment and stereotypies in zoo animals: what's been done and where should we go next. *Zoo Biology* 24:499-518.

APPENDIX

Table 1. Ethogram for captive Humboldt penguin chicks. Behaviors are categorized and defined. Some definitions were clarified using Seddon's work (1991).

<i>Exploratory</i>	
Aggressed tablet	Approached tablet with shoulders hunched, head lowered, body leaning forward with wings spread
Aggressed penguin	Wings spread, neck extended, quickly peck other chick
Approached	Moved towards the tablet while looking at it
Jumped	Chick spread wings, jumped and left ground once, landed
Moved	Took several steps around the room
Peck	Head moves forward and down, uses beak to touch tablet
<i>Interactive</i>	
Allopreen	One chick preened the feathers of the other chick
Call	Tilted head back and vocalized
Follow	One chick moved when the other chick moved, staying together
Huddled	Chicks stayed in same area together, keeping close contact with their bodies
<i>Self-maintenance</i>	
Body shake	Wings spread, tail shaking, twisting body vigorously
Pooped	Raised tail and defecated
Preen	Rubbed beak through feathers
Roused	Wings spread, feathers fluffed, shook body
Shoulder rub	Rubs back or side of head against shoulder
Stretch	Bent body forward and threw wings back
Wing-rub	Rubs back or side of head against edge of wing
<i>Sedentary</i>	
Rested	Head and bill facing forward, eyes closed dozing while standing or while laying down. May open eyes occasionally, closed again within 5 seconds
Lay down	Lowered self onto floor, laid on belly with feet extended behind body or tucked beneath body
Watched	Eyes open, looking around room
Yawned	Bill open, neck withdrawn, head tilted back, closes bill, lowers head

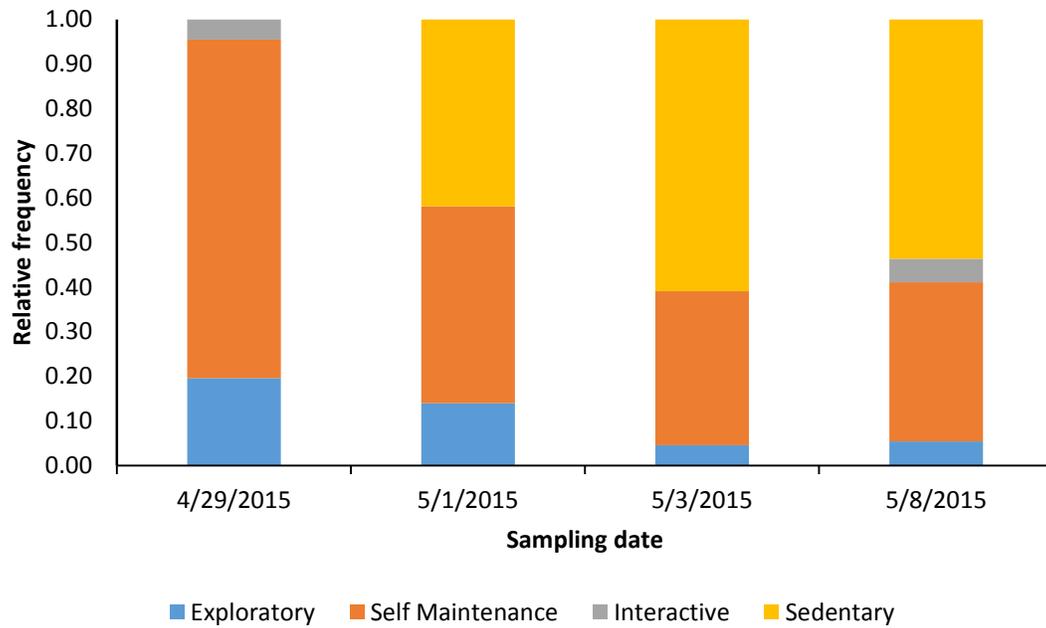


Figure 1. Mean frequency of behaviors exhibited by Humboldt penguin chicks per half hour of observation with no enrichment.

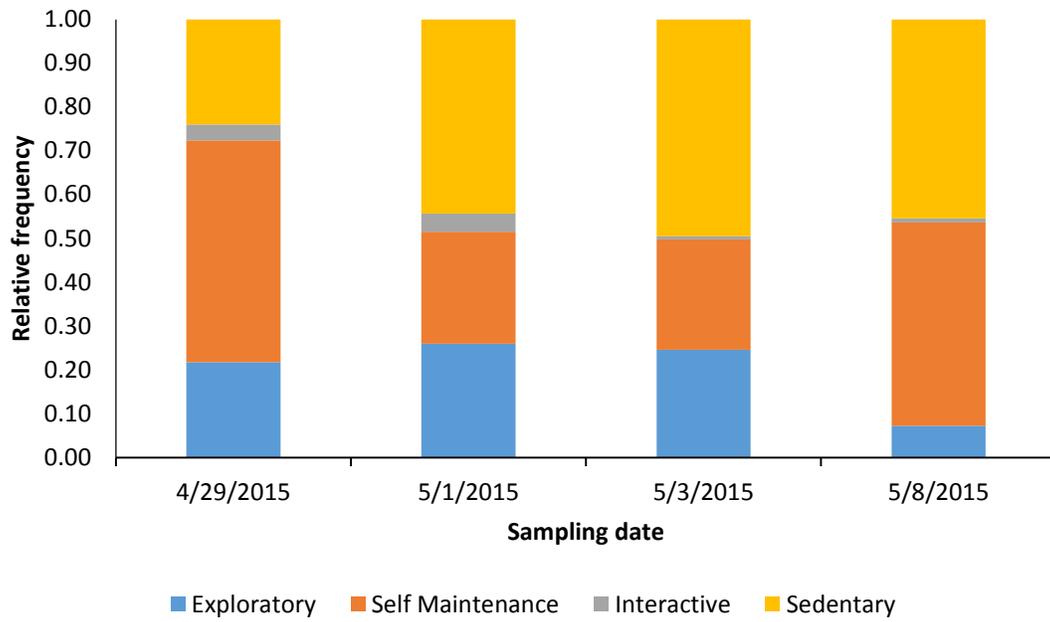


Figure 2. Mean frequency of behaviors exhibited by Humboldt penguin chicks per half hour of observation with tablet present and off.

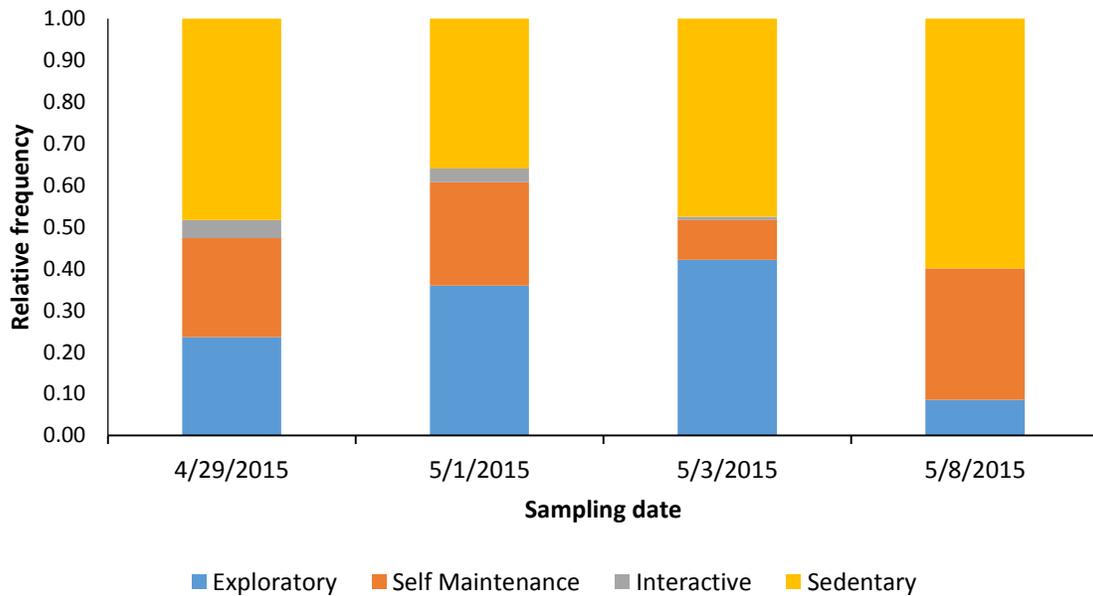


Figure 3. Mean frequency of behaviors exhibited by Humboldt penguin chicks per half hour of observation with tablet present and displaying a picture.

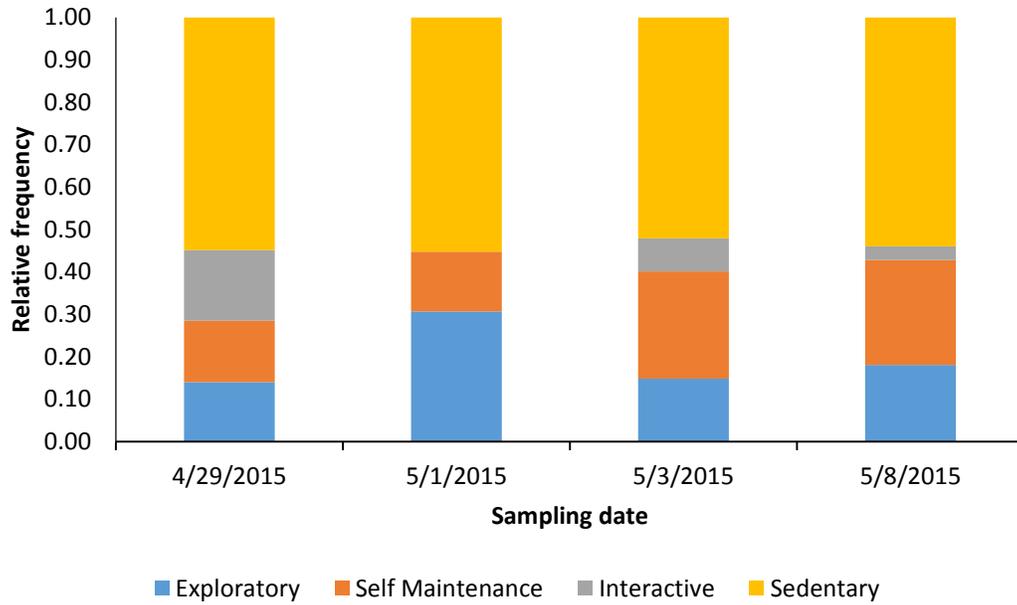


Figure 4. Mean frequency of behaviors exhibited by Humboldt penguin chicks per half hour of observation with tablet present and displaying the game for cats application.



Figure 5. Image of Calypso and Malia huddled together, resting in front of tablet during 5/1/2015 sampling date.