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Studying the Social Behavior and Preferences of Polar Bears at the Columbus Zoo and Aquarium

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Introduction

In the wild, polar bears (*Ursus maritimus*) are relatively solitary animals until breeding season occurs (Ehrich et al. 2009). Males actively seek out females when it's time to breed, traveling very long distances on the sea ice (Regehr et al. 2010) to track the female's scents when they are in eostrus (Laidre et al. 2013). Once breeding has occurred, the male and female polar bears will part ways. This behavior has also been shown in polar bear captive breeding research conducted at the St. Petersburg Zoo from 1932 through 1988 (Tumanov 2001).

Lee, an 19-year-old adult male, came to the Columbus Zoo in the Fall of 2018 based on AZA recommendation to participate in the Species Survival Plan (1). He was introduced to 12-year-old adult twin females Aurora and Anana in the hopes of breeding. Both Aurora and Anana have had successful cubs in the past, which have since been moved to various zoos for the purpose of also participating in the Species Survival Plan (2).

Because Lee's previous experience was only living with one female (Chitnis 2018), I wanted to observe whether he would have a preference for a particular female because he now had two females to choose from. Not only did I look for preference, but I also observed and analyzed the social behaviors of all three polar bears. I hypothesized that Lee would show a preference for one female over the other, perhaps based on the female eostrus cycles, and would show differences in interaction behavior and location proximity.

Methods

- I visited the Columbus Zoo and Aquarium approximately 2-3 times a week between January – March 2019.
- Observations regarding bear association (proximity), behavior (see table 1), and bear location (see figure 1) were written on an Ethogram and later inputted into an Excel spreadsheet.

Table 1. Ethogram of polar bear social behaviors.

Behavior	Aggression	Signs of Breeding	Successful Coitus	Sleeping	Resting	Locomotion	Stereotypic Behaviors
Code	A	B	I	S	R	W	P
Description	Chasing others, being chased, growling, and physical fighting.	Attempted mountings, sniffing external genital region.	When mounting is successful, and copulation is being done.	Eyes closed and laying down for long durations of time.	Not asleep, but laying down, standing for long periods of time, and sitting.	Walking, running, exploring, changing positions, scratching, and swimming.	Pacing, rubbing stomach and chin on glass, etc.

Figure 1. Location map of the 5 different regions used to observation bear proximity and exhibit location.

- Performed a Chi Square and Modified Chi Square tests using Rstudio.

Results

I found that there were significant differences between pair associations, behavior, and location proximity. For the Chi Squared test looking at pair associations, a p value of 2.2 e^{-16} was produced (Figure 2). The Two-Way Chi Squared tests produced p values as followed: Bear by Region=2.2 e^{-16} (Figure 3); Region by Behavior= 2.2 e^{-16} (Figure 4); and Bear by Behavior= 2.16 e^{-10} (Figure 5).

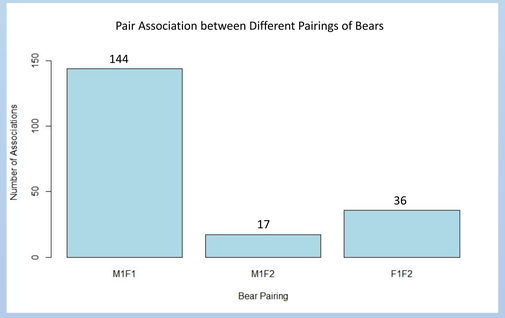

Figure 2. Pair Association between different pairings of bears. M1F1= Lee and Anana; M1F2= Lee and Aurora; F1F2= Anana and Aurora.

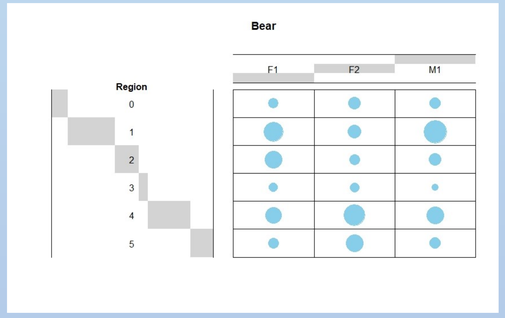

Figure 3. Balloon plot showing the relationship between bear and region. Grey bars represent number of observations in the row/column and the size of the dots represents the number of observations in that cell. For bear key see "Meet the Bears", and for region key see Figure 1.

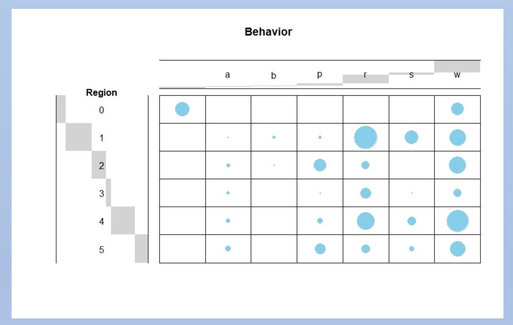

Figure 4. Balloon plot showing the relationship between region and behavior. For region key see Figure 1, and for behavior codes see Table 1.

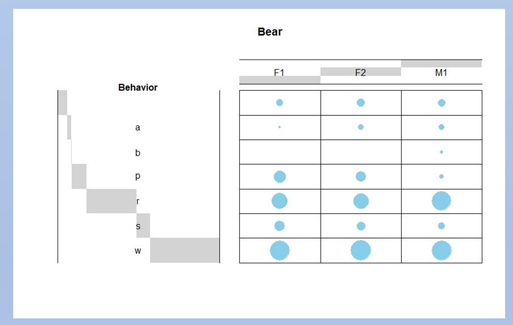

Figure 5. Balloon plot showing the relationship between behavior and bear. For bear key see "Meet the Bears", and for behavior codes see Table 1.

Meet the Bears

-Top Left: Lee; Male; 19 years old

-Top Right: Aurora; Female; 12 years old

-Bottom Left: Anana; Female; 12 years old

Lee and Aurora photos taken by Cyril Hicks, and Anana photo taken by Cat Collins.

Discussion

My original hypothesis of Lee preferring one female over the other and showing differences in interaction behavior and location proximity was supported! Lee spent most of his time interacting with Anana (see Figure 2) with 144 counted associations, and spent the least amount of time with Aurora with 17 associations. Lee and Anana spent most of their time in Region 1 (Figure 3) while displaying resting behaviors (Figure 4). Aurora kept to herself mostly in Region 4 (Figure 3). Lee also showed more signs of aggression toward Aurora (Figure 5).

The reasoning behind Lee's preference is unknown, however, it could be due to the females different eostrus cycles, but I had no way of knowing the cycles of the different females. It would be interesting to measure the females cycles and observe any behavior and proximity correlations for future research.

Acknowledgements

I would like to express my gratitude to Dr. Hankison, the Keepers and Seasonal Employees of North America at the Columbus Zoo and Aquarium, and my family for supporting me throughout this research. To my mother specifically, I thank her for being my rock and sharing her Docent animal knowledge with me.

Literature Cited

(1)(2) Both statements were from The Columbus Zoo's Social Media on the introduction of Lee to the Polar Frontier habitat.

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