MOTHER-CALF BEHAVIOR IN *DELPHINAPTERUS LEUCAS* IN THE SECOND YEAR OF LIFE

A Senior Scholars Thesis

by

JENNIFER MARY JOHNSON

Submitted to Honors and Undergraduate Research
Texas A&M University
in partial fulfillment of the requirements for the designation as

HONORS UNDERGRADUATE RESEARCH FELLOW

May 2012

Major: Psychology

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Approved by:

Research Advisor: Anthony Bourgeois
Associate Director, Honors and Undergraduate Research Duncan Mackenzie

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ABSTRACT

Mother-Calf Behavior in *Delphinapterus leucas* in the Second Year of Life. (April 2012)

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A longitudinal investigation of two beluga whale mother-calf pairs located at SeaWorld San Antonio was conducted in order to examine and describe the calves' change in swim positioning in relation to their mothers over time. Swim positions are considered to be indicators of behavioral development and a measure of the mother-calf relationship. While no formal research has been done on captive beluga calves for their second year of life, swim position developments have been previously recorded for their first year. Also, bottlenose dolphins have shown similarities in development to belugas and their developmental patterns have been documented as well. Results suggest that the patterns found in the previous research do not remain constant in the second year of life. There was a slightly significant increase in the mean duration of solo position, however there were no statistically significant changes in the mean durations of both echelon and infant swims.

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I would like to thank the Department of Honors and Undergraduate Research for providing me with the opportunity to write an honors thesis. I would also like to thank Dr. Heather Hill for supplying all the information and videos needed to accomplish my research. I would like to thank Dr. Anthony Bourgeois for his advice and trust. Last, but not least I would like to thank my parents: Rhonda and Fred Johnson, and my friends William Summers and Rigby Johnson for supporting me and sometimes pushing me throughout the last year and a half.

NOMENCLATURE

QIN	Qinu
BEL	Bella
SIK	Siku
CRI	Crissy

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CHAPTER I

INTRODUCTION

Beluga whales (*Delphinapterus leucas*) are one of the few captive species of whales in the world, and have been in the care of humans for over 30 years. The species is also considered near threatened by the International Union for the Conservation of Nature.

While Sea World San Antonio and other captive marine mammal facilities have been having some success with breeding belugas and maintaining the offspring, research is still needed to help improve their behavioral management plan. Although there are a few studies on the behavior of mother-calf relationship for the first year of life (Robeck, et al., 1995; Russell, Simongoff, & Nightengale, 1997; Hill, 2009), there is no research covering the second year of life. Similarities have been shown between behavior of captive belugas and wild belugas as well as other cetaceans (Mann & Smuts, 1999; Hill, 2009). Mother-calf behavior of other cetaceans, such as bottlenose dolphins has been extensively researched providing insight into possible similarities with beluga behavioral patterns (Mann & Smuts, 1999; Conner et al., 2006; Perelberg & Schuster, 2008; Hill, 2009). Differences found between bottlenose dolphins and belugas involve the frequency of solitary swim and distance between calf and mothers that beluga calves display at an early age (Smolker, et al., 1993; Hill et al., 2007). In bottlenose dolphins, positioning of calves relative to their mothers has been shown to change over time.

This thesis follows the style of *Animal Behaviour*.

Mann & Smuts, 1999 and Hill 2009 reported that there was an increase in the amount of solo swims, increase in distance from mother, increases in frequency of infant, and decreases in echelon position. Similar developmental changes are expected to be reflected in beluga behavior. As in bottlenose dolphin calves, it is expected that as the calf gets older, echelon position will decrease, and paradoxically, infant position will increase. Finally calves should engage in more solitary swimming over time (Mann & Smuts, 1999; Hill 2009).

The purpose of this study was to describe any changes in swim patterns for two Beluga calves during their second year of life. Please note that field research with a small sample size and number of observations typically involve descriptions of the animals behavior.

CHAPTER II

METHODS

Two mother-calf pairs of beluga whales (*Delphinapterus leucas*), at Sea World San Antonio (CRI and BEL, SIK and QIN), have been observed periodically since August 1, 2009, covering the second year of life for each calf. These observations served as data for the present study. Each calf was born in SeaWorld San Antonio. CRI had a female calf BEL on June 6, 2009; and SIK had a female calf QIN on July 31, 2008.

All mother-calf pairs were housed in the Viva! Stadium of Sea Word San Antonio, and were moved between seven pools.

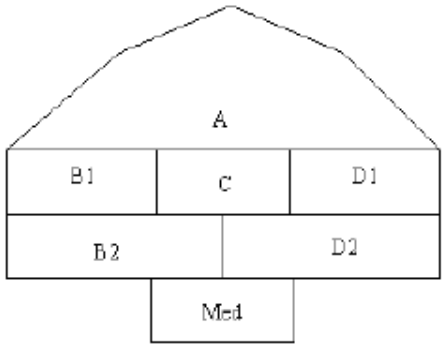

Figure 1. Pool layout of the Viva! Stadium SeaWorld San Antonio. Gates connect all pools together. Pools are not drawn to scale.

Each mother-calf pair was observed using the focal-follow technique, where the camera follows one mother-calf pair for the entire session, roughly two times a week. All

mother-calf pairs have about 50 fifteen-minute videos made of their second year of life. The total amount of video is roughly 20 hours of video.

An original ethogram was used to document time, and frequency, as well as other extraneous variables. Information includes mother-calf pair, time of day, date, age, pool, as well as the amount of time, frequency and distance in each position (e.g. infant, echelon, side, above, below, and solo).

Table 1. Operational definitions for swim positions

Swim Position	Operational Definition
Solo	Calf is swimming independently & located 5m or greater from mother
Echelon	Synchronous, parallel swim where calf is positioned to the side of, or just above, the dorsal ridge of other whale
Infant	Calf is positioned less than 1m away, under the mother's genital and mammary region
Above	Synchronous pair swim where calf is positioned above swim partner & within 5m
Below	Synchronous pair swim where calf is positioned below swim partner & within

Coded data was analyzed by converting duration data to proportions by dividing total duration time by the total session. The twelve months for each calf were divided into quarterly intervals.

CHAPTER III

RESULTS

As determined from previous research, the calves were expected to increase the overall proportion of duration in both solo and infant swim. The overall percentage of duration in echelon swim was expected to decrease. As shown in Figure 2, the overall mean duration of solo swim slightly increased across all four yearly quarters. The mean duration of echelon swim follows the expected pattern across the first three quarters by decreasing, and then drastically increases after the third quarter (Figure 3). Similarly, the mean duration of infant swim shows an increasing trend, but severely drops after the third quarter, as shown in Figure 4.

A Pearson's r correlation was computed to assess the relationship between the age of the calves, divided in quarters, and each position. As expected, there was a weak significant positive correlation between age and duration of solo position ($r = 0.319$, $n = 90$, $p = .002$). Infant position showed a non-significant correlation with age ($r = -0.27$, $n = 90$, $p = .80$). Also, there was no significant correlation between echelon position and age ($r = -0.09$, $n = 90$, $p = .397$).

Table 2. Descriptive statistics for each position for each quarter

Quarter		Solo	Echelon	Infant
	Mean	38.1493	8.5229	19.6514
1	N	28	28	28
	Std. Deviation	37.88877	22.36688	18.34605
	Mean	39.5430	3.7037	27.0678
2	N	27	27	27
	Std. Deviation	32.92653	19.24501	23.08951
	Mean	50.0294	.1111	35.1917
3	N	18	18	18
	Std. Deviation	25.37366	.47140	13.12544
	Mean	70.4935	5.6853	12.6471
4	N	17	17	17
	Std. Deviation	34.92006	17.85350	20.45098
	Mean	47.0529	4.8588	23.6613
Total	N	90	90	90
	Std. Deviation	35.25932	18.07292	20.60555

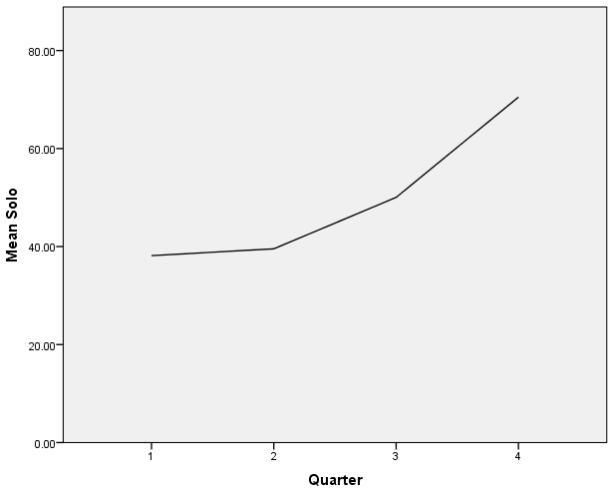

Figure 2. Quarterly trend for the mean duration (seconds) of solo swim. The graph reflects a weak positive correlation between the two variables. See text for details.

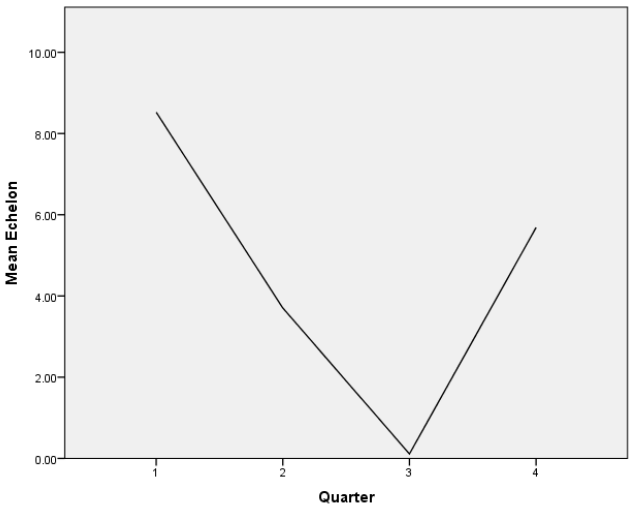

Figure 3. Quarterly trend for the mean duration (seconds) in echelon swim. The graph shows no correlation between the two variables. See text for details.

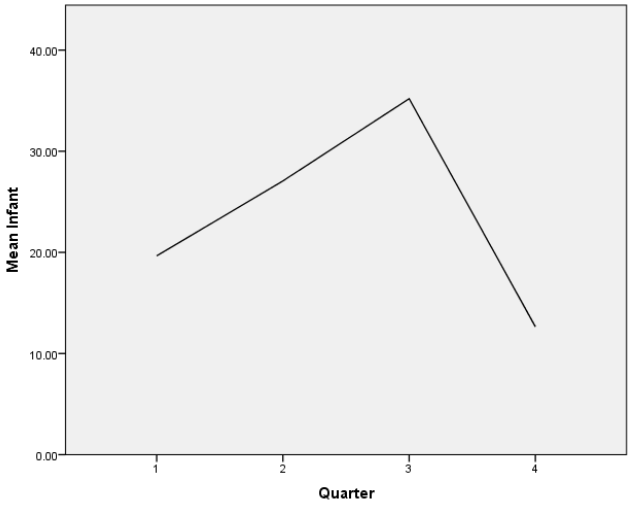

Figure 4. Quarterly trend for the mean duration (seconds) in infant position. The graph shows no correlation between the two variables. See text for details.

CHAPTER IV

CONCLUSIONS

The two mother-calf beluga pairs were expected to follow the patterns found in studies done with other cetaceans and beluga whales in their first year of life (Mann & Smuts, 1999; Hill 2009), where solo and infant position would increase over time, and echelon position would decrease overtime. The results of the current study did not follow the swim pattern predictions for both echelon swim and infant position after the third quarter, and there was only a weak significant positive correlation between age and solo swim.

The small sample size (two mother-calf pairs) decreased the effectiveness of most statistical procedures. Also, the lack of strong correlations between age and swim positions could be due to many confounding variables. The whales used in this study are in small captive environments, with no threats of predation, a constant food supply, and the calves are always located in the same tank as their mothers. These extraneous variables may cause the calves to become independent more quickly than their wild counterparts and other cetaceans. Captive Belugas are also trained at an early age, which may affect their developmental patterns.

There were also constant external stimuli occurring during filming of some of the videos, such as SeaWorld shows which included other Beluga whales, feeding times,

toys in the pools, and training sessions. All of these external stimuli could have affected the behavior of the Belugas being filmed.

Although the results of this study showed no strong correlations between age and swim positions, the information can still provides baseline descriptions of developmental trends for captive Beluga whales in their second year of life, which can be used by facilities such as SeaWorld to monitor calf development. Because the study did not follow the pattern predicted by the limited research on Beluga calf development, the study demonstrates the need for further research on developmental patterns across captive Beluga whales' lifespan.

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