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Postnatal Observations of Behavioral Patterns within the Social
Organization of Captive Bottlenose Dolphins (*Tursiops truncatus*)

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Thesis 499A
November 17, 1997

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LITERATURE REVIEW

The Mirage Dolphin Environment opened in 1991. The Mirage has eight Atlantic Bottlenose dolphins. Four of these dolphins were relocated to the facility from other facilities that were either overcrowded or shutting down. The other four were born at the Mirage. The purpose and intent of the Mirage Dolphin Environment is to provide a nurturing environment for the dolphins and to educate the public about marine mammals and their ecosystems. The increased awareness associated with education will hopefully encourage public support for efforts to conserve and protect marine mammals and their environment.

Facts about bottlenose dolphins:

- Full grown dolphins can weigh over 500 pounds and normally range between 9 and 10 feet.
- Each dolphin is fed several times a day and consumes approximately 20-30 pound of seafood per day.
- Diet consists of smelt, capelin, sardines, herring, and squid.
- Gestation period is 11 to 13 months.
- Calves will nurse anywhere from 1 1/2 years to 2 years.
- The female gives birth every two to three years.
- Sexual maturity is between 5 to 8 years for females and 10 to 12 years for males.
- Average lifespan is 30 to 35 years old.

The Mirage offers a unique opportunity to study the behavior of these animals. Observing a successful birth in captivity enables our facility to educate and provide insight to other facilities going through their first birth of a bottlenose dolphin. Recording the events of behavior among a nursery pod that includes a juvenile will increase awareness of discipline and acceptance of that juvenile. Separation of the juvenile is a possibility depending on the social structure of that pod. Through this study, I hope to inform others on nursery pod behavioral patterns that include discipline and aggressive behavior towards a juvenile female, separation if needed due to the animal's stress level, acceptance of various responsibilities of each dolphin in that pod, and finally, acceptance of the juvenile female.

Acevedo, A., Brager, S., Henningsen, T., & Wursig, B. (1994). Association Patterns of Bottlenose Dolphins (*Tursiops Truncatus*) in Galveston Bay, Texas. Journal of Mammalogy, 75 (2), 431-437.

^{association}
This article association patterns within groups of bottlenose dolphins to determine the social and environmental composition of their lives. This work is through the Marine Mammal Research Program at the Texas A & M University for the benefit of the scientific arena. Many aspects were studied including feeding, reproduction, communication, learning, defense, and response to environmental cycles. Much of the research was boat-based with photo-identification surveys for individual identification. It was observed that the dolphins who coordinated activities such as mating, caring for the young, resting, and travel, presumably benefit by enhanced fitness to themselves and their offspring. Studies have shown that these social animals do not need to regularly associate with the same individuals, because they recognize and remember each other as affiliates over long periods of time. Although much of the data is ^{speculative} hypothesis', ^{other} similar studies have ^{determined} ~~resulted~~ in similar results. While studying dolphins in a captive environment which enables complete observations, it is very important

to understand the animal in its natural environment. Studying wild populations will help me understand the behavior in the captive environment and if certain behaviors exist in the wild.

Bradbury, J. W. (1986). Social Complexity and Cooperative Behavior in

Delphinids. Dolphin Cognition and Behavior: A Comparative Approach.

Hillsdale, NJ: Lawrence Erlbaum Associates, Publishers.

This article defines areas of social cooperation, economics of cooperation in general, and measures of cooperation complexity.

Dolphins have a wide diversity of cooperative behaviors that are very complex. All species of dolphins are not alike in their behaviors and their cooperative efforts differ in many ways.

If a behavior is likely to be present the weighted difference between the summed benefits and the summed costs, when the act is performed, happens only if the act

exceeds the outcome if it were not present. Are consequences of prior evolution for or against costly cooperative networks? This is just one of

the many questions examined in this article. Cooperative behavioral studies could relate to “baby-sitting” duties of the dolphins I am

studying.

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Cockcroft, V. G., & Ross G. J. B. (1990). Observations on the Early Development of a Captive Bottlenose Dolphin Calf. The Bottlenose Dolphin. San Diego, CA: Academic Press.

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Mother-calf interactions was the main focus in the article. Developmental studies are rare due to the difficulties of observing free-ranging cetaceans. This study was conducted at Port Elizabeth Oceanarium in the Republic of South Africa. Observations were recorded over a period of 2 years. The development of the calf is marked by the progressive independence from the mother through physiological changes and the acquisition of behavioral skills. This study sufficiently covers the developmental aspects of young *Tursiops truncatus* through thorough observations. Tables and charts enhance the study, showing muscle mass, growth rates, respiration's, and daily food intake increases. The study is an excellent overview of the first two years of a bottlenose dolphin calf.

Good

Connor, R. C., & Smolker, R. A. (1990). Quantitative Description of a Rare Behavioral Event: A Bottlenose Dolphin's Behavior Toward Her Deceased Offspring. The Bottlenose Dolphin. San Diego, CA: Academic Press.

Opportunities to observe the behavior of dolphins toward their dead offspring are rare in nature. ^{discusses} In this chapter the behavior of a female bottlenose dolphin during the last hours in which she was sighted in the vicinity of her dead offspring. The female's behavior was observed and recorded from an aluminum boat. The female kept the calf in close proximity and appeared to be visually inspecting him. Reporting of the mother's behavior toward the deceased offspring can expand the understanding of this unusual phenomenon rarely seen. Deaths of infants in captivity are not uncommon. This article could enlighten behaviors indicative of such an occurrence.

Good

Cornell, L., & Leathered, S. (November 1985). Birth of a Dolphin: Success at Sea World. Oceans, 18, 46-9.

This article enlightens readers about the little known Commerson's dolphin. In 1985, a single male calf was born at Sea World of San Diego, California. The young calf was precocious, much more than the bottlenosed dolphin calves born at zoological parks. Stephen Leatherwood is senior staff biologist with Hubbs Marine Research Institute in San Diego and Dr. Lanny Cornell is a veterinarian with Sea World, also in San Diego. Dr. Lanny Cornell is currently the Mirage

Dolphin Facility's on-call veterinarian. Together, the two examined and studied courtship behavior, copulation, genetics, growth rates, physiology and behavior of the Commerson's dolphin. The information is valuable to all scientists and to readers with marine mammal interests. Although this article refers to Commerson's dolphins, cetacean behavior is sometimes similar and could be beneficial to examine. Dr. Lanny Cornell could also be of assistance to my thesis project.

Dohl, T. P. & Norris, K. S. (1980). The Structure and Functions of Cetacean Schools. Cetacean Behavior: Mechanisms and Functions. New York: A Wiley-Interscience Publication.

Topics such as food gathering, reproduction and growth, social integration and communication are studied. Social integration is mediated by various sensory and signaling systems. Sleep patterns consist of marked aggregation of school members, slowing of swimming, changes in diving rhythms, and a suppression or alteration of normal familial and habitual association patterns. Sexual segregation occurs commonly in dolphin schools. This article is filled with an enormous amount of information that pertains to my study.

Hopkins, W. D., & Savage-Rumbaugh, E. S. (1986). Awareness, Intentionality, and Acquired Communicative Behaviors: Dimensions of Intelligence. Dolphin Cognition and Behavior: A Comparative Approach. Hillsdale, NJ: Lawrence Erlbaum Associates, Publishers.

The evolution of the capacity to acquire new behavior is explained in depth in this ^{book} ~~article~~. In their study, evidence shows acquired patterns may replace or interface with FAA's (fixed action patterns) which are a set of predisposed behavioral patterns. The neurological evidence seems to suggest that they operate differently. Again, this paper provides insight to dolphin behavior.

Irvine, A. B., Scott, M. D., & Wells, R. S. (1980). The Social Ecology of Inshore Odontocetes. Cetacean Behavior: Mechanisms and Functions. New York: A Wiley-Interscience Publication.

Cetacean groups, especially among the odontocetes (toothed whales), may vary greatly from species to species or even among populations of a species. The variance of such species influences the study of their social organizations. Long-term studies are necessary on free-ranging cetaceans due to the difficulty of observing the highly mobile

mammals. Such areas of study cover movement patterns, composition, food and feeding behavior, and predation pressure.

Johnson, C. M., & Norris, K. S. (1986). *Delphinid Social Organization and Social Behavior. Dolphin Cognition and Behavior: A Comparative Approach*. Hillsdale, New Jersey: Lawrence Erlbaum Associates,

A detailed study of social orientation was recorded and examined. Dolphin gestures of aggression can include the display of teeth and the snapping of jaws, extreme undulating, as well as biting, swatting, and ramming. Other displays of social association are cooperative hunting, swimming configurations, social organization and behavior are communal and flexible. In my observations, aggression is common. Such information can help with identifying the typical aspects of this behavior.

McCowan, B., & Reiss, D. (1995). Whistle Contour Development in Captive-Born Infant Bottlenose Dolphins (*Tursiops truncatus*): Role of Learning. Journal of Comparative Psychology, 109 (3), 242-260.

Brenda McCowan is in the Department of Anthropology at Harvard University and is with the Marine World Foundation in Vallejo, California. Diana Reiss is with the Department of Biological Sciences

at Columbia University and is also with the Marine World Foundation. Together, they did a comparative study of whistle contour of bottlenose dolphins during normal social interactions from birth over the 1st year of development. The article depicts their findings. They analyzed the whistle for acoustic structure, use, and structure. Their results show that there are 2 predominant whistle types shared by all infants across all social groups. All vocals were recorded during this thesis study.

Schroeder, J. P. (1990). Breeding Bottlenose Dolphins in Captivity. The Bottlenose Dolphin. San Diego, CA: Academic Press.

This article examines anatomy of reproduction, reproductive cycle patterns, estrus cycles, pregnancy determination and gestation, birth and lactation, along with care and husbandry techniques of a newborn calf. The author, J. Pete Schroeder, is with the Naval Ocean Systems Center, Hawaii Laboratory, in Kailua, Hawaii. The research confirms that female bottlenose dolphins tend to have peak breeding seasons. Sperm production and serum testosterone levels are clearly seasonal. Different stages of sexual maturity can be classified according to serum testosterone levels. Artificial insemination is also possible; with

Group

the ability to freeze semen successfully, embryo transfer is a interesting possibility.

Wells, R. S. (1989). Secrets of a High Society: After Two Decades of Study, The Author Has Uncovered Some Intriguing Facts About The Complicated Social Lives of Dolphins. National Wildlife, 27 (5), 38-45.

Randall Wells is a behavioral ecologist that works with the Dolphin Biology Research Associates. Through intense studies, Randall has made great strides towards demystifying these intriguing sea mammals. In his article, Randall reveals information he has gathered throughout his field work on free-ranging dolphins. Working out of his marine laboratory in Sarasota, Florida, Randall has spent the last nineteen years devoted to dolphin research. Such subjects such as socialization, hetero- and homosexual copulations, and displays of aggression are examined.

Wells, R. (August, 1991). Bring Up Baby: Two Important Pieces Of Advice For Young Bottlenose Dolphins Are, Stick Close To Your Mother And Stay In School. Natural History, 8, 56-63.

Since 1970, Randall S. Wells and two colleagues have been studying behavior and ecology of resident dolphins near Sarasota, Florida.

Along with identification of 1,200 individuals are determinations of sex, age, size, weight, reproductive condition, and health of many resident dolphins. The article is very precise in the events of a newborn calf. It also points out behavioral and association patterns. The results of this study is the hopes of benefiting dolphins everywhere. For example, the study should lead to improved captive-breeding programs and increased success of breeding to reduce the pressures of removing individuals from the wild for captive display.