

ALLIANCE OF MARINE MAMMAL PARKS AND AQUARIUMS

Dedicated to Conservation through Public Display, Education and Research

RESEARCH BRIEFING BOOK

Compilation of Research Projects by Member Facilities

Ongoing

Edited in 2003

418 North Pitt Street
Alexandria, Virginia 22314

Facility Chicago Zoological Society
Project ID AMMPA-1-2
Project Name Sarasota Bottlenose Dolphin Research Project

Project Description Longitudinal studies provide one of the most effective means of learning about the lives of animals in their natural environment. Efforts since 1970 have resulted in the development of a natural laboratory situation for detailed, long-term studies of the behavior, population biology, health and ecological relationships of resident communities of bottlenose dolphins along the central west coast of Florida. From tagging activities and natural markings, over 1200 dolphins have been identified from the water of Sarasota-Bradenton, the Gulf of Mexico, Charlotte Harbor and Tampa Bay, Florida.

The primary goals of the project are: 1) to continue to work towards learning the sex, age, reproductive condition and familial relationships of all of the members of the Sarasota bottlenose dolphin community, 2) to monitor the health and body condition of the community residents and relate health parameters to body burdens of environmental contaminants, 3) to measure the energetic requirements of the resident dolphins and relate these to the dolphins' behavior and habitat use patterns, 4) to obtain comparison data on the ranging and social association patterns of dolphins in surrounding waters to help provide perspective for the Sarasota community, 5) to monitor populations in adjacent waters of the Gulf of Mexico for comparison with values for vital rates measured for the Sarasota community, and 6) to study, in collaboration with the scientists from Woods Hole Oceanographic Institution, the development and functions of the individually specific "signature whistles. "

This research also includes the study of the effects on the dolphin population of environmental contaminants and human interactions, such as boat traffic and feeding wild dolphins. This work is supported by a variety of organizations including the National Marine Fisheries Service, Dolphin Quest, and Disney's Wildlife Conservation Fund.

Investigators Randall Wells
Institutions Chicago Zoological Society
Start Date
Project Status Ongoing
Project Reports

Facility Dolphin Connection
Project ID AMMPA-2-5
Project Name A non-invasive technique for monitoring reproductive hormones using dolphin saliva to help better understand reproduction in dolphins.

Project Description Calibrate the hormonal levels found in saliva and in serum collected voluntarily from bottlenose dolphins to help better understand reproduction in dolphins.

Investigators Amy Samuels

Institutions Chicago Zoological Society

Start Date 1993

Project Status Continuing to collect data.

Project Reports

- Preliminary results show this will be a useful technique in determining hormonal status in bottlenose dolphins.

Facility **Dolphin Connection**

Project ID AMMPA-2-7

Project Name Development and implementation of a cooperative breeding and management plan for *Tursiops truncatus*

Project Description To develop a coordinated and cooperative breeding effort with bottlenose dolphins among various institutions.

Investigators Doug Messinger and Cheryl Messinger

Institutions Dolphin Connection

Start Date 1999

Project Status Ongoing

Project Reports

- "Cooperative Breeding and Population Management in *Tursiops truncatus*" International Marine Animal Trainers Association, 1999 conference. Currently six facilities participate. A studbook is maintained to manage the population of bottlenose dolphins into the future for public display, research, and education.

Facility **Dolphin Connection**

Project ID AMMPA-2-15

Project Name A non-evasive technique for studying baseline concentrated cortisol levels of bottlenose dolphins.

Project Description Calibrate the cortisol levels in serum collected voluntarily from bottlenose dolphins in non stressful situations and compare to wild dolphins involved in eastern tropical Pacific purse seine net fishery activity.

Investigators Randall S. Wells Ph.D., Howard Rhinehart, Michael Scott

Institutions Dolphin Connection, Mote Marine Laboratory

Start Date 1998

Project Status Ongoing

Project Reports

- Data collected at the Dolphin Connection through voluntary blood samples will be compared to samples taken from wild populations to help create a database. This database will be applied to the ongoing research being conducted on the wild dolphins involved in the purse seine fishery activity in the eastern tropical Pacific.

Facility **Dolphin Connection**

Project ID AMMPA-2-16

Project Name Protocol to monitor calf whistle development

Project Description The study of bottlenose dolphins vocalizations, specifically to identify the social contexts in which dolphins make their own signature whistle or imitate another's whistle.

Investigators Drs. Amy Samuels and Peter Tyack

Institutions Dolphin Connection, Woods Hole Oceanographic Institution

Start Date 2001

Project Status Project still in the data collection and analyses phase

Project Reports

- Project still in the data collection and analyses phase

Facility **Dolphin Connection**

Project ID AMMPA-2-17

Project Name Partitioning of environmental contaminants in bottlenose dolphin tissues

Project Description Analyses and interpretation of data on environmental contaminants and their effects on the health, survivorship, and reproduction of cetaceans through voluntary blood samples and food fish analyses.

Investigators Randall S. Wells, Ph.D., Dr. Teri Rowles

Institutions Dolphin Connection, Chicago Zoological Society, National Marine Fisheries Service

Start Date 2002

Project Status Sample collection phase

Project Reports

Facility **Dolphin Encounters**

Project ID AMMPA-3-1

Project Name Molecular ecology of bottlenose dolphins

Project Description 1. Maximize the number of genetic samples from Abaco, Bahamas, bottlenose dolphins under human care in order to examine hypervariable nuclear genetic markers. 2. To examine through absolute pairs of blood and fecal samples the feasibility of utilizing feces of small cetaceans as a source of genetic information.

Investigators K. M. Parsons

Institutions University of Aberdeen

Start Date 1999

Project Status Ongoing

Project Reports

Facility **Dolphin Encounters**

Project ID AMMPA-3-2

Project Name Marine Mammal Health - Development of immunodiagnostic and viral diagnostic methodologies and reagents

Project Description Determining the antibody levels that are specific for Erysipelothrix rhusiopathiae. 2. Determining individual immunoglobulin levels in order to establish normal levels for the species

Investigators R. A. Patterson
Institutions Univ. of Southern Mississippi
Start Date 1999
Project Status Ongoing
Project Reports

Facility: *Dolphin Encounters Ltd.*

Project ID AMMPA-3-3

Project Name: Identification of protective immune responses in dolphins to the bacterial pathogen, *Erysipelothrix rhusiopathiae*

Project Description

This project is designed to identify immune response(s) in dolphins that correlate with protective immunity to the bacterial pathogen, *Erysipelothrix rhusiopathiae*. Mononuclear leukocytes (the white blood cells that provide immunity to re-infection with a pathogen) are obtained from the peripheral blood of dolphins that have recently recovered from an *Erysipelothrix rhusiopathiae* infection and cryopreserved for analysis in the laboratory. They can then be incubated *in vitro* with proteins from the bacteria for characterization of the type of immune response. This information can then be used to assess potential efficacy of vaccines without requiring a virulent live bacterial challenge.

Investigators Jeffrey L Stott

Institutions Laboratory for Marine Mammal Immunology, Dept. of Pathology,
Microbiology & Immunology, School of Veterinary Medicine, University
of California-Davis

Start Date 1/04

Project Status Ongoing

Project Report(s): This project is in progress. Peripheral blood leukocytes have been collected from the dolphins, some of which were recently exposed to *E. rhusiopathiae*, and cryopreserved for future analysis. Molecular probes have been developed such that the dolphin immune response(s) to the bacterial pathogen, *E. rhusiopathiae*, can be identified. The latter part of this project is currently in progress.

Facility **The Dolphin Experience**

Project ID AMMPA-4-1

Project Name Development of diving and thermoregulation in bottlenose dolphins

Project Description Enduring long breath-hold periods and staying warm in the marine environment creates a challenge for mammalian existence, especially if the mammal experiences the demands of the marine environment immediately after birth. This project investigates how on group of mammals, the cetaceans (dolphins and whales), develop their diving and thermal capacity to meet these challenges. The ultimate goal is to understand how immature cetaceans develop the capability to dive and thermoregulate in the marine environment. Morphological, physiological and behavioral data are collected to quantify changes in dive and thermal capacity with age in the bottlenose dolphin (*Tursiops truncatus*). By monitoring the behavior and physiology of dolphin calves as they mature, we can understand more about the effects of diving and thermoregulation in the ocean on mammalian systems. The calf is completely dependent on the mother for protection and nourishment. The calf's diving and thermal constraints undoubtedly influence the lactating mother's foraging and distribution behaviors. Understanding the foraging and distribution constraints of the mom / calf pair is important for proper conservation and management of important prey species and shallow coastal waters which may be necessary for successful calf rearing.

Investigators S. Noren, T. Williams, P. Perry
Institutions University of California Santa Cruz, The Dolphin Experience
Start Date 06/99
Project Status Ongoing
Project Reports

Facility **The Dolphin Experience**
Project ID AMMPA-4-5
Project Name Use of acute phase proteins in the assessment of marine mammal health and exposure to environmental pollution

Project Description The aim of the project is to develop tests that will allow the assessment of an animal's health and exposure to environmental pollutants. In order to accomplish the above, examination of a group of proteins produced by the liver in response to tissue damage and/or infection will be carried out. Two groups, alpha-1 acid glycoproteins and monoclonal antibodies to dolphin AGP, are of particular interest. Voluntary husbandry behavior for blood collection enables The Dolphin Experience to supply serum for the study. Once assays are developed they could be significant for both wild and animals under human care as they require small amounts of blood and are simple to carry out.

Investigators R. Brotheridge, S. Evans
Institutions University of Leeds
Start Date 1997
Project Status Ongoing
Project Reports

Facility **Dolphin Quest**
Project ID AMMPA-5-3
Project Name Wild Dolphin Societies – Dolphin Research Program Sarasota, Florida

Project Description The Sarasota Dolphin Research Program began in 1970 and is the longest running wild dolphin research program in the world. The primary contributions to science have been to gain a better understanding of the biology, behavior, ecology, health, and population dynamics of coastal Atlantic bottlenose dolphins. Coastal dolphins are among those most affected by human activities around the world. Wildlife management agencies require the best information possible in order to develop reasonable conservation plans. This project serves as one of their primary sources for information on bottlenose dolphins.

Investigators Randall Wells, Ph.D.

Institutions Conservation Biology Department of the Chicago Zoological Society, Illinois, Conservation Biology Department of the Chicago Zoological Society, Dolphin Quest, Mote Marine Laboratory, Dolphin Biology Research Institute, and Earthwatch

Start Date 1997

Project Status Ongoing

Project Reports

Manuscripts In Press or In Review

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- Greene, J.V., W.M. Jarman, R.S. Wells, and A.A. Hohn. In review. Concentrations of organochlorine contaminants in milk of bottlenose dolphins (*Tursiops truncatus*) from Sarasota Bay, Florida. Submitted to The Science of the Total Environment.
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- Urian, K.W., R.S. Wells and A.J. Read. In prep. Community structure of bottlenose dolphins, (*Tursiops truncatus*), in Tampa Bay, Florida. To be submitted to Behavioral Ecology and Sociobiology.

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Facility	Dolphin Quest
Project ID	AMMPA-5-4
Project Name	Dolphin milk as an indicator of reproductive status

Project Description Milk sampling may offer a non-invasive alternative, method to blood collection for measurement of hormone levels which will allow for monitoring of ovarian activity in trained, lactating bottlenose dolphins. Potential applications of milk analysis include diagnosing pregnancy and predicting the time of ovulation, useful in breeding management. This method may contribute to increased understanding of dolphin reproduction by providing a means to ascertain the reproductive status of dolphins. This information may lead to greater reproductive success and a higher level of animal care for dolphins.

Investigators Kristi West, M.S. and Ph.D. Candidate, University of Hawaii and L'Universite de la Polynesie Francaise, James Carpenter, Ph.D., University of Hawaii, Olav Oftedal, Ph.D., National Zoological Park, Smithsonian Institution

Institutions University of Hawaii, University of the Ryukyus, Japan, and Dolphin Quest

Start Date 1997

Project Status Ongoing

Project Reports

- West, K.L., Carpenter, J., Atkinson, S., Sweeney, J.C., Krames, B., and J. Krames. 2001. Changes in milk composition during lactation and the relationship to reproductive status in the bottlenose dolphin, *Tursiops truncatus*. 14th Biennial Conference of the Biology of Marine Mammals. Abstracts.
- West, K.L., Carpenter, J., Atkinson, S., Sweeney, J.C., Krames, B., and J. Krames. 2000. The relationship between milk composition and reproductive status in bottlenose dolphins (*Tursiops truncatus*). 31st annual International Association for Aquatic Animal Medicine, joint with American Association for Zoo Veterinarians Conference. Abstracts.

Facility **Dolphin Quest**
Project ID AMMPA-5-5
Project Name The Ecology and Biology of Rough-Toothed Dolphins (*Steno bredanensis*) off Moorea, French Polynesia

Project Description This study will provide the first comprehensive report on the ecology and biology of French Polynesia's rough-toothed dolphins by researching a wild population in Moorea and the animals housed at Dolphin Quest French Polynesia. Information accumulated on this relatively unknown species will contribute to conservation management of this species in French Polynesia and other regions of the world.

Investigators Kristi West, M.S. and Ph.D. Candidate, University of Hawaii and L'Universite de la Polyne sie Francaise, Cecile Gaspar, DVM, Dolphin Quest French Polynesia, Claude Payri, Ph.D. L'Universite de la Polyne sie Francaise

Institutions University of Hawaii, Francaise Universite du Pacifique, Tahiti, Dolphin Quest French Polynesia, and Gump Research Station (University of California at Berkeley)

Start Date 1999

Project Status Ongoing

Project reports

- Mead, J.M., West, K.L., and C.W. Potter. 2001. Reproduction in the rough-toothed dolphin, *Steno bredanensis*: Attainment of sexual maturity. 14th Biennial Conference of the Biology of Marine Mammals. Abstracts.
- Gaspar, C., West, K.L., Atkinson, S., and J.C. Sweeney. 2000. Variations in blubber thickness of individual dolphins and between species. 31st annual International Association for Aquatic Animal Medicine, joint with American Association for Zoo Veterinarians Conference. Abstracts.

Facility **Dolphin Quest**
Project ID AMMPA 5-21
Project Name Dolphin Hormones: Establishing Baseline Values According to Reproductive Condition

Project Description This research utilizes both blood serum and milk samples voluntarily collected from bottlenose dolphins to determine factors affecting hormone levels. Our research at Dolphin Quest has previously validated dolphin milk as an effective means to measure

progesterone concentrations, and blood serum is also used to measure cortisol and thyroid hormone values. This hormone data from large numbers of dolphins from various age and sex classes are compared to reproductive condition, and trends determined for these unique animals. These research findings provide diagnostic value in dolphin medicine and may contribute to greater reproductive success and a higher level of animal care for dolphins.

Investigators Kristi West, M.S. and Ph.D. Candidate, University of Hawaii and L'Universite de la Polynesie Francaise, and Erin Hanahoe, Dolphin Quest

Institutions Dolphin Quest Bermuda, Dolphin Quest French Polynesia, Dolphin Quest Hawaii, Dolphin Quest Oahu, Dolphin lagoon, SeaWorld San Diego, Indiana Zoo, Minnesota Zoo, and Sea Life Park

Start Date 2001

Project Status Ongoing

Project Reports

- West, K.L., Hanahoe, E., Atkinson, S., Sweeney, J.C., and R. Stone. 2001. Thyroid hormones in female bottlenose dolphins: Establishing baseline values for medical management. 16th Big Island Science Conference, University of Hawaii at Hilo Chapter of Sigma Xi. Abstracts.
- West, K.L., Atkinson, S. Schwetz, C., Sweeney J.C., and Stone, R. 2001. Thyroid hormone concentrations during different reproductive states in adult female bottlenose dolphins (*Tursiops truncatus*). 32nd Annual International Association for Aquatic Animal Medicine Conference. Abstracts.

Facility **Dolphin Quest**

Project ID AMMPA 5-22

Project Name *Helicobacter cetorum* sp. nov., a Urease-Positive *Helicobacter* Species of Dolphins and Whales

Project Description *Helicobacter* species have been described for terrestrial animals but there have been no characterized species of *Helicobacter* for marine animals, to date. *Helicobacter cetorum* sp. nov., a fusiform Gram-negative bacterium was cultured from the main stomach of two stranded Atlantic white-sided dolphins and from the feces of three captive dolphins, Pacific white-sided dolphin, *Lagenorhynchus obliquidens*, Atlantic bottlenose dolphin, *Tursiops truncatus*, and beluga whale, *Delphinapterus leucas*. Endoscopic examinations revealed ulcers in the esophagus and forestomach of the beluga and bottlenose dolphin. Since gastric ulcers are a frequent finding in wild cetaceans, further studies are necessary to determine if *Helicobacter cetorum* plays a role in their development. Dolphin Quest Oahu's dolphins are trained for endoscopic examination so gastric fluid was easy to collect, along with feces, for this study.

Investigators Claudia Harper, Y. Feng, S. Xu, N. Taylor, M. Rogers, & J. G. Fox of the Division of Comparative Medicine, MIT, Cambridge, MA; F. Kinsel. of the University of Illinois Zoological Pathology Program, Maywood, IL; G. Greenwell of John G. Shedd Aquarium, Chicago, Illinois; Gregg Levine of Dolphin Quest Oahu, Honolulu, HI; M. Dewhirst, Forsyth Institute, Department of Molecular Genetics, Boston, MA

Institutions Massachusetts Institute of Technology, University of Illinois, John G. Shedd Aquarium, Dolphin Quest Oahu, and Forsyth Institute

Start Date 2002

Project Status Ongoing

Project Reports

- *Helicobacter cetorum* sp. nov., a Urease-Positive *Helicobacter* Species of Dolphins and Whales

Facility **Dolphin Quest**
Project ID AMMPA 5-23
Project Name Thermal Status of *Tursiops truncatus*

Project Description This research is aimed at understanding whether hyperthermia (excess heat) is a potential stressor experienced by dolphins that are chased and captured in the EPT tuna purse-seine fishery. By developing non-invasive methodologies for assessing changes in the dolphin's surface temperature (measured by infrared thermography), respiration and heart rates, and heat flow thermal windows (i.e. dorsal fin), we will provide new protocols for determining the thermal status of individual animals. Such protocol will be used to evaluate the thermal status of dolphins in the ETP tuna purse-seine fishery.

Investigators Terrie Williams, Ph. D., University of California, Santa Cruz, CA, and Anne Pabst, Ph. D., William McLellan, Andrew Westgate, Erin Meagher, University of North Carolina, Wilmington, NC

Institutions Dolphin Quest Oahu, University of California at Santa Cruz, and University of North Carolina at Wilmington

Start Date 2001

Project Status Ongoing

Project Reports

Facility **Dolphin Quest**
Project ID AMMPA-5-24
Project Name Marine Mammal Gill Net Detection Assessment

Project Description Dolphin by-catch within the gillnet fishing industry is exceedingly high. This project will investigate the acoustic reflectivity of the monofilament nets currently used in the industry and an alternative net made of barium sulfate, which is believed to be more reflective. Acoustic reflectivity is determined by a dolphin's ability to use echolocation to detect the presence of gillnets in time to avoid being entangled. The hypothesis is that barium sulfate reflects sounds, such as dolphin echolocation clicks, better than the traditional monofilament net material. The purpose of this study is to determine the maximum detectable distance of the two different gillnets by Atlantic bottlenose dolphins.

Investigators Paul E. Nachtigall, Aran Mooney, Billy Hurley, Dielle Havlis, and Heather Norman

Institutions Dolphin Quest Oahu and Marine Mammal Research Program at University of Hawaii, Manoa

Start Date 2002

Project Status Ongoing

Project Reports

Facility **Dolphin Quest**

Project ID AMMPA-5-25
Project Name Keeping the fetus cool: Reproductive thermoregulation during pregnancy in bottlenose dolphins (*Tursiops truncatus*)

Project Description Bottlenose dolphins possess a specialized vascular structure called a counter-current heat exchanger (CCHE), that functions to cool their reproductive tissues. Heat is transferred from the warm arterial blood to the relatively cool venous blood at a reproductive CCHE site in the reproductive tissue. This allows cooled arterial blood to supply the intra-abdominal testes and the pregnant uterus. To test whether CCHE functions to also deliver relatively cooled blood to the fetus, the following methods will be employed: 1) determine the position of the CCHE, 2) take body temperature at two positions (one at the CCHE and the other at an area unaffected by the CCHE), 3) maintain a log of deep body temperature over time, and 4) collect other husbandry and health data.

Investigators D. Ann Pabst, William A. McLellan, Erin Meagher, and Sentiel Rommel
Institutions Dolphin Quest, University of North Carolina at Wilmington
Start Date 2002
Project Status Ongoing
Project Reports

Facility **Dolphin Research Center**

Project ID AMMPA-6-1
Project Name Social functions of signature whistles and whistle imitation in Bottlenose dolphins, *Tursiops truncatus*

Project description For years, scientists have known that each bottlenose dolphin has an individually distinctive vocalization called a signature whistle. It is thought that these whistles allow dolphins to recognize each other and remain in contact in murky water. Dolphins also imitate the signature whistles of others. Scientists have two ideas about why dolphins do this: imitating another dolphins' whistle may be a way to initiate a friendly interaction, or this may be a way to aggressively challenge another dolphin.

It has been difficult to confirm these ideas about dolphin communication because we humans cannot localize the source of sounds underwater, and dolphins make few visible signs to tell us which one is vocalizing. Researchers from WHOI and CZS propose to resolve this by studying dolphins in naturalistic captive settings using computers and an array of underwater microphones to locate each whistle, and using an overhead video system to simultaneously locate each dolphin in the pool. Knowing which dolphin is making a sound while observing that dolphin's behavior will allow us to identify the social contexts in which dolphins make their own signature whistles or imitate other dolphins' whistles, and to determine how other dolphins respond to these whistles. We will also be able to monitor the development of signature whistles by observing Calusa, who was born last year, in addition to the three calves that are expected in the spring of 2002.

How this project benefits marine mammals in the wild: This project will yield information about the social context of specific whistle types. This project can be applied to better understand the vocalizations of wild dolphins

Investigators Peter L. Tyack, Amy Samuels, Rebecca Thomas, and Stephanie Watwood

Institutions Woods Hole Oceanographic Institution, Chicago Zoological Society
Start Date 2001
Project Status Ongoing
Project Reports

Facility **Dolphin Research Center**
Project ID AMMPA-6-3
Project Name Intermodal Matching

Project description This study examines whether dolphins can match sounds with their corresponding visual images, using a go/no-go procedure. Part A of the study uses trainers familiar to the dolphins, asking the dolphins whether the sound played through speakers is the trainer's voice. A trainer is seated on a dock, and a voice is played through a set of speakers. If the voice is that of the trainer, the dolphin signals a match by touching a target on the side of the dock. If the voice is different, the dolphin remains stationed in front of the dock. Part B of the study will be similar, except using video images of the trainers, rather than live people. Part C of the study will use video images of other dolphins as the visual stimuli, and various signature whistles as the auditory stimuli. This technique will thus enable us to directly ask whether individual dolphins.

Investigators Kelly Jaakkola
Institutions Boston College
Start Date 2000
Project Status Ongoing
Project Reports

Facility **Dolphin Research Center**
Project ID AMMPA-6-4
Project Name Numbers Concepts 1: Understanding the Concept of Numerically Less

Project Description Until recently, numerical competence was thought to be a human-specific ability, perhaps linked to the ability to use language. Data from many different laboratories, however, have now shown that terrestrial mammals and birds can understand various numerical concepts, and that in primates at least, these numerical concepts can be very advanced. There have been virtually no studies of number concepts in dolphins or other marine mammals, however, and so the level of their numerical understanding remains an open question. As the first in a projected series of studies on dolphin numerical cognition, this study examined whether dolphins can understand the mathematical concept of numerically less (an ability that has been convincingly demonstrated only in primates). The dolphin was presented with two “number boards” onto which various numbers of different-sized items were placed (e.g., one board might have 3 items, while the other might have 5), and was asked to choose the board with the fewer number of items.

How this project benefits marine mammals in the wild: Animals’ numerical concepts may play a significant role in how they approach such socio-ecological problems as foraging and inter-group competition and aggression. Thus, understanding their capacity for numerical representation might help us better understand their behavior in these numerically relevant situations. In

addition, educating the public about the extent of dolphin intelligence should lead to increased public support for conservation efforts.

Investigators Kelly Jaakkola, Dolphin Research Center Staff

Start Date 2001

Project Status Ongoing

Project Reports

- Erb, L., Fellner, W., Rodriguez, M., Sugarman, P., & Jaakkola, R. (2001). Conducting “Numbers” Research Training at the Dolphin Research Center. Paper presented at the 29th annual meeting of the International Marine Animals Trainers Association, Albuquerque, NM.

Facility **Dolphin Research Center**

Project ID AMMPA-6-12

Project Name Calf Independence/Alloparenting Study

Project Description Mother-calf social interactions are very difficult to observe in the wild. Therefore, valuable information can be learned from every dolphin birth at human-care facilities. The social development of each calf born at DRC is monitored closely to determine how much time the calf spends with his or her mother, how much time is spent with other lagoonmates, and how much time is spent alone. Changes in independence are tracked over time, and different mother-calf pairs can be compared. Particularly interesting will be comparisons involving the same mother with successive calves so that we may see if birth order has an effect on parenting style. In addition, we will be able to assess whether previous experience as an alloparent while “babysitting” another dolphin’s calf can be used as a predictor of good maternal care when the alloparent becomes a parent.

How this project benefits marine mammals in the wild: The occurrence of a long-term bond is a striking and significant aspect of any social system. This study will allow us to better understand the development and maintenance of the long-term bond between a mother and her calf. The information gained in this study can be applied to better understanding the association patterns of wild dolphins.

Investigators Dolphin Research Center Staff

Start Date 2002

Project Status Ongoing

Project Reports

Facility **Dolphin Research Center**

Project ID AMMPA-6-13

Project Name Dolphin Health Assessment Project: Optimization, Validation & Standardization of Procedures for Assessing Immune Function

Project Description This project will optimize, validate and standardize assays to assess immune function in Bottlenose Dolphins. This will determine the best assay methods for measuring immune parameters and will address collection, storage, and sample handling techniques as well. This work is being done to develop standard procedures so that data from various laboratories can be better compared and to insure that assays are being conducted with the best possible technique.

How this project benefits marine mammals in the wild: Findings from this study will help researchers more accurately assess the health of wild dolphins.

Investigators Patricia A. Fair, Ph.D. (NOAA, National Ocean Service), Greg Bossart, V.M.D., Ph.D. (Harbor Branch Oceanographic Institution), Margie M. Peden-Adams, Ph.D. (MUSC), Tracy Romano, Ph.D. (MUSC/Texas A&M), Charlie Rice, Ph.D. (Clemson), Sylvain DeGuise, Ph.D., D.M.V., (Connecticut University); Dick Lee, Ph.D. (Skidaway Institute of Oceanography).

Start Date 2002

Project Status Ongoing

Project Reports

Facility **Dolphin Research Center**

Project ID AMMPA-6-14

Project Name Sea Lion Activity Budget Study

Project Description The summer and fall of 2002 brought significant changes for Loki, a male California sea lion (*Zalophus californianus*) who has called the Dolphin Research Center home for the past 15 years. First an unrelated one-year-old male pup, Kilo, was introduced to a private section of the sea lion area. Shortly thereafter, major construction to expand and renovate the habitat began. The objective of this study is to quantify the effects of these changes on Loki's daily activities and habitat usage patterns to ensure that the new habitat design suits his and Kilo's behavioral needs. A secondary goal is to monitor Kilo's adjustment. The sea lions are monitored using instantaneous sampling and one-zero recording in seven intervals: before Kilo's arrival, at Kilo's introduction to his private enclosure, at the sea lion's introduction to their new houses, at Loki's introduction to the renovated habitat, at Kilo's introduction to Loki, and at least six months after both sea lions have been living in the renovated habitat. For each interval 15 hours of data will be gathered per sea lion under observation. Percentages of time engaged in discreet state behaviors and location in habitat will be calculated to determine how each sea lion spent his time and which areas of the habitat were used most frequently. These characteristics will be compared for each sampling period to determine what effect Kilo had on Loki and the effects of the new habitat on both. Of particular interest is whether the changes to the habitat succeeded in increasing the sea lions' variety of behavior and if those effects are long term.

How this project benefits marine mammals in the wild: One important role of sea lions in human care facilities is to encourage interest and compassion for their wild counterparts among the public. To do so effectively, it is imperative that the sea lions live in an environment that meets their physical, behavioral and psychological needs.

Investigators Dolphin Research Center Staff

Start Date 2002

Project Status Ongoing

Project Reports

Facility **Dolphin Research Center**

Project ID AMMPA-6-15

Project Name The Development of Synchrony in Mother-Calf Pairs of Bottlenose Dolphins (*Tursiops truncatus*)

Project Description Synchrony, which is two or more individuals engaged in simultaneous movement, is a common behavior of bottlenose dolphins. Although its occurrence is mentioned frequently in the literature, there have been no studies that examine behavioral synchrony systematically. Synchrony may serve several functions: energy conservation (slipstreaming), predator avoidance (calf blends in with mom), or as a communication tool. Without an accurate description of what occurs during synchronous interactions, it would be difficult to determine what the function of synchrony may be

This study looks at the synchrony between mother-calf pairs in order to follow developmental changes in synchrony characteristics. One of the goals is to assess whether synchronous swimming is a learned or instinctual trait by comparing different mother-calf pairs as to when changes occur. Some of the characteristics being observed include percentage of time spend synchronously (i.e., in the same activity state and oriented to within 10 degrees of the same direction), calf's position in relation to the mother when synchronous, calf's proximity to the mother when synchronous, and whether nursing is occurring.

This study will provide new information about dolphin social characteristics. This information can be used to monitor social interactions in captive settings so observers can be alerted to subtle but unusual behavior. The observation techniques can also be used to study wild populations.

How this project benefits marine mammals in the wild: By studying the development and characteristics of synchronous behavior in our dolphins, we come closer to understanding the significance of synchrony in wild dolphins.

Investigators Wendi Fellner, Gordon Bauer
Institutions New College of Florida, Epcot's Living Seas, Gulf World Marine Park
Start Date 2002
Project Status Ongoing
Project Reports

Facility **Dolphin Research Center**
Project ID AMMPA-6-16
Project Name Dolphin Immunology

Project Description This study is designed to better define the immune system profiles of dolphins that reside in a variety of environments and to define changes in immune systems as a function of water temperature, season, pregnancy, etc. By identifying baseline values for each dolphin in our colony, it will also have useful applications for maintenance of individual animal health. It will also have meaningful application in assessing the health of diverse groupings and populations of animals.

How this project benefits marine mammals in the wild: Findings from this study will help researchers more accurately assess the health of wild dolphins

Investigators Jeffrey T. Stott, Myra T. Blanchard
Institutions University of California at Davis, Sea World Parks, Dolphin Biology Research Institute
Start Date 2002
Project Status Ongoing
Project Reports

Facility **Dolphin Research Center**

Project ID AMMPA-6-17
Project Name Peduncle bands as a novel way for attaching transmitters to Bottlenose Dolphins, *Tursiops truncatus*

Project Description For any facilities housing dolphins in ocean pens, severe storms bring the threat of colony loss. High winds and rough seas may necessitate the opening of gates to the open ocean to allow the colony to seek shelter in deeper water away from shore. Once the storm has passed, it is critical that facility managers be able to quickly recover any animals that do not return on their own, as animals raised in human care lack the necessary skills to survive in the wild. By attaching a transmitter to the dolphins, rescue crews can efficiently search for any missing animals. Traditional methods for applying a transmitter require puncturing the dorsal fin and employing a bolt to secure the radio tag. Over time the tag may migrate or even rip through the dorsal fin. The Dolphin Research Center is investigating a novel way of applying a transmitter that will not cause any injury to the dolphins and will be safe to wear in the open ocean. We are developing a band to hold the transmitter that can be secured around the dolphin's peduncle, the narrowing of the body anterior to the flukes.

How this project benefits marine mammals in the wild: If the project is successful, researcher's monitoring the movements of wild dolphins would be able to attach the tag without puncturing the dorsal fin, or otherwise intentionally injuring the dolphin. This would also allow them to attach transmitters on dolphins whose dorsal fins are not suitable for traditional attachment techniques.

Investigators Adrian Dahood and Dolphin Research Center Staff

Institutions

Start Date 2002

Project Status Ongoing

Project Reports

Facility **Dolphin Research Center**

Project ID AMMPA-6-17

Project Name Synchrony in male bottlenose dolphins (*Tursiops truncatus*) at a human-care facility

Project Description This study investigated synchronous behavior and its relation to social bonds in six male bottlenose dolphins (*Tursiops truncatus*) at the Dolphin Research Center, a human-care facility in Grassy Key, Florida. History of living together was assumed to be positively correlated with the existence of social bonds. Several aspects of synchronous behavior were quantified using instantaneous scan sampling on a focal animal. A total of thirty hours of observations were made over a thirty-nine-day period. In these dolphins, history of living together did not relate consistently to amount of time spent synchronously or to synchrony partner preferences. This study may indicate that synchrony functions to both form new social bonds and to affirm or advertise existing bonds. The results also point to the possibility of important age-related differences in synchronous behavior.

How this project benefits marine mammals in the wild: This project sheds light on the social behavior of bottlenose dolphins. This could benefit wild marine mammals by increasing knowledge of and concern for dolphins among people.

Investigators Deborah Shelton

Institutions Wake Forest University

Start Date 2002
Project Status Ongoing

Project Reports

- **Shelton, D** (2003) Synchrony in male bottlenose dolphins (*Tursiops truncatus*) at a human-care facility, Poster presentation at Southeast and Mid-Atlantic Marine Mammal Symposium.

Facility **Gulf World Marine Park**

Project ID AMMPA-7-1

Project Name Can Bottlenose dolphins learn to perform a behavioral discrimination task through imitation?

Project description Two of Gulf World's bottle nose dolphins are learning to discriminate between a red or a white object. Once this task is taught, Dr. Harley will be coming up to Gulf World to monitor sessions where an untrained dolphin will watch the dolphin trained in the discriminative task. Dr. Harley hopes to discover if the untrained dolphin can pick up the discrimination task solely through observation and if they can, how long it takes them. Dr. Graziano Fiorito of Italy has determined that octopus can learn this task through observation and Dr. Harley is going to be using his procedure in her study.

Investigators Heidi Harley

Institutions New College - Univ. South Florida

Start Date 1999

Project Status Ongoing

Project Reports None

Facility **Gulf World Marine Park**

Project ID AMMPA-7-3

Project Name Dolphin calf independence

Project Description A year long study is occurring with Gulf World Marine Park's other/calf pairs. Fifteen minute observations are made twice a day, noting the location of the calves to other dolphins in the enclosure. From the data collected, information on associations between mother and calf can be analyzed. Future analyses on spatial relationships with second and even third calves can be examined to determine if spatial relationships change as the mother gains more experience with each successive calf.

Investigators Barb Losch

Institutions Gulf World

Start Date 1999

Project Status Ongoing

Project Reports None

Facility **Indianapolis Zoological Society**

Project ID AMMPA-8-6

Project Name Investigations into Etiology of Goiter in Neonatal Dolphins

Project Description The investigators paper "Congenital Diffuse Hyperplastic Goiter Associated with Perinatal Mortality in Eleven Captive Born Bottlenose Dolphins", and subsequent informal reports, has led to a series of studies intended to identify the etiology of this condition.

Investigators Dr. Michael Garner; Dr. Jan Ramer; Kristy West

Institutions Northwest Zoo Path; IZS; University of Hawaii

Start Date 2000

Project Status Ongoing

Project Reports Paper submitted to the Journal of Zoo Medicine

Facility **Indianapolis Zoological Society**

Project ID AMMPA-8-7

Project Name Reproductive Physiology of the Pacific Walrus

Project Description Correlate blood hormonal levels and assessment of corresponding changes in the reproductive tract through ultrasonography in the Pacific walrus.

Investigators Dr. Jeff Proudfoot; Jodie Baker; Dr. Janine Brown.

Institutions IZS, National Zoo, and CRC

Start Date 2001

Project Status Ongoing

Project Reports None

Facility **Institute for Marine Sciences**

Project ID AMMPA-9-1

Project Name Aerial surveys of the coastal waters of northwestern Honduras for marine mammals and other marine life

Project Description Little is known about marine mammals in the Caribbean. What is known is almost completely from the Eastern Caribbean. Our objective was to collect baseline data on the diversity, relative abundance and distribution of marine mammals and other marine life in the Caribbean waters of the north coast of Honduras. To our knowledge no such surveys have been conducted, except for manatees in lagoons and rivers on the coast, prior to our flights. The methodology used was similar to those used for coastal bottlenose dolphin in the US.

Investigators T. Bolton, E. Bolton, W. Hoggard, K. Mullin

Institutions Roatan Institute for Marine Science, NMFS

Project Status Ongoing

Project Reports

Facility **Institute for Marine Sciences**

Project ID AMMPA-9-2
Project Name Sightings and documentation of marine mammals in the waters off the northwestern coast of Roatan

Project Description A computer database has been implemented since 1992 to record all sightings of marine mammals and the parameters specific to each sighting. RIMS can be reached by telephone or VHF radio to receive information about a marine mammal sighting. The staff at RIMS responds to record species, numbers of animals, and to identify previously sighted individuals. In addition, ocean parameters, photographic and video documentation are recorded. The information is transferred to the database. The purpose of this study is to determine the diversity, abundance and distribution of marine mammals in an area that has not been previously studied. This platform offers the opportunity to observe the individuals in the group as well as the behavior of those individuals and the group as a whole. The data collected provides scientific documentation necessary for the marine mammal conservation and education efforts in Honduras.

Investigators E. Bolton, T. Bolton, G. Kieffer
Institutions Roatan Institute for Marine Sciences
Start Date
Project Status Ongoing
Project Reports

Facility **The Living Seas / Disney Wildlife Conservation Fund**
Project ID AMMPA-10-3
Project Name Disturbance responses of bottlenose dolphins to vessel traffic

Project Description Behavioral observations will be made of dolphins exposed to boats transiting Sarasota Bay. Controlled approaches of vessels and of dolphins carrying instrumentation to measure heart rate, fluke beats, and received sound levels will contribute to data to assess the effect of boat traffic on dolphin populations in the bay.

Investigators
Institutions Mote Marine Laboratory
Start Date
Project Status Ongoing
Project Reports

Facility **The Living Seas / The Walt Disney Company**
Project ID AMMPA-10-6
Project Name Dolphin tool use and problem solving

Project Description A study of dolphins' ability to learn to use tools to obtain otherwise inaccessible goals. Of particular interest is whether dolphins can invent new ways of using tools to solve novel problems. Related problem solving experiments analyze dolphins abilities to plan their future behavior.

Investigators J Gory, S. Kuczaj

Institutions The Living Seas; Univ. Southern Mississippi; Southern Methodist Univ.
Start Date 07/96
Project Status Ongoing
Project Reports

Facility **The Living Seas / The Walt Disney Company**
Project ID AMMPA-10-7
Project Name Rhythm discrimination and categorization

Project Description Dolphin vocalizations vary on prosodic features such as frequency, duration and amplitude. This study is an investigation of the dolphin's ability to perceive differences in sounds that vary based on ordered duration changes. A dolphin is being taught to perform specific behaviors to designated rhythms, e.g. the dolphin spins when it hears Rhythm 1, bobs when it hears Rhythm 2, etc. The rhythms consist of 11 kHz pulses that turn on and off at different times across a 4-second time span. The stimuli are presented via an underwater speaker. Currently, the dolphin can discriminate among five rhythms.

Investigators H. Harley
Institutions New College - University South Florida
Start Date 01/98
Project Status Ongoing
Project Reports

Facility **The Living Seas / The Walt Disney Company**
Project ID AMMPA-10-8
Project Name Visual/Echoic cross-modal matching in a bottlenose dolphin

Project Description Dolphins have excellent visual and bio-sonar abilities. This study is an investigation of the dolphin's ability to recognize objects across vision and echolocation. In this design, performance accuracy on identity matching (A-A) and conditional matching (A-B) tasks is compared in visual-to-echoic tasks and echoic-to-visual tasks. Current data suggest that the dolphin is better at matching in the echoic-to-visual condition.

Investigators H. Harley
Institutions New College - University South Florida
Start Date 02/98
Project Status Ongoing
Project Reports

Facility **The Living Seas / The Walt Disney Company**
Project ID AMMPA-10-9
Project Name Dolphin Keyboard Communication Project

Project Description A long-term study assessing bottlenose dolphins' ability to use symbols to communicate. Symbols are located on a large underwater keyboard used by dolphins and humans to communicate with each other about routine interactions within a large simulated coral reef environment. Researchers are interested in the extent to which the dolphins symbol use

approximates elemental features of language use. The findings will help to better understand how sophisticated a dolphin communication system may become.

Investigators J. Gory, M. Xitco, S. Kuczaj
Institutions The Living Seas; Southern Methodist Univ, Univ. Southern Mississippi
Start Date 09/92
Project Status Ongoing
Project Reports

Other Projects Supported By Living Seas:

Eckerd College

Dolphin Feeding Ecology and Trophic Relationships

Using fatty acid signature analysis to determine long-term feeding patterns of individual dolphins, assess changes in feeding patterns and establish a baseline against future changes in their ecosystem

Mote Marine Laboratory

Effects of Watercraft Noise on the Acoustic Behavior of Bottlenose Dolphins

Supporting the longest study of its kind (30 years) to document dolphin behavior related to human-generated noise. Characterizing the impact of disturbances on these dolphins in Sarasota Bay in feeding, nursing, mating and group cohesion.

Perry Institute for Marine Science

Designing and Building Support for a Marine Reserve in the Bahamas

Partnering with the Caribbean Marine Research Center to collect vital information for the creation of the Exuma Marine Reserve to protect coral reefs and inhabitants (such as dolphins and whales) in cooperation with the Bahamas Department of Fisheries.

Save The Manatee Club

Manatee Educator Guides and Activity Books

Printing and distributing manatee information packets to teachers and students to encourage responsible behavior toward protection of the West Indian manatee

Save The Manatee Club

Manatee Educational Boat Decals

Educating boaters on Florida waterways by providing a “manatee tips” decal for boats listing ways to avoid manatee-boat collisions. This simple sticker is also a constant reminder to boaters to be alert for manatees.

Waterway Signs

Providing public awareness signs to waterfront property owners that identify their area as manatee habitat and encourage boaters to slow down. The signs are distributed free of charge through Florida Marine Patrol offices

The Nature Conservancy

Keeping an Eye on the Keystone Species in the Florida Keys

Training a large pool of registered volunteers to assist research scientists in collecting field data. Areas of focus include: monitoring “no-take” areas in the Florida Keys, photo-identification for monitoring dolphin patterns, restoration of the queen conch, and monitoring spiny and spotted lobster.

Wildlife Preservation Trust International

Conserving Antillean Manatees in Southern Lagoon, Gales Point Belize:

A Long-term Program of Research, Professional Training, and Public Education

Using radio tracking and satellite telemetry to monitor the effects of tourism on manatees, their habitat and movement patterns, and reproductive biology. Results will be used as a basis for professional training of biologists and tour guides within Belize’s only official manatee sanctuary.

Wildlife Rescue and Conservation Association

Mayan Biosphere Reserve Environmental Education and Interpretation Center

Relocating and improving a wild animal rescue, rehabilitation and re-introduction facility. The center will act as a focal point for environmental education and awareness for residents, tourists and researchers who visit the region.

Wildlife Conservation Society

The Conservation of Brazilian Central Wetlands: The Pantanal

Developing a wildlife conservation center to carry out research, coordinate conservation initiatives throughout the region and act as a liaison between conservation scientists, ranchers, and other local stakeholders to explore how to balance conservation with local development, including a massive hydrovia project, which could have ramification for the giant otter.

National Fish and Wildlife Foundation

Educator’s Guide for Marine Biodiversity

Partnering with the World Wildlife Fund to create a kit including background information for educators (teaching strategies, unit plans and case studies) that focus on marine issues

<i>Facility</i>	Miami Seaquarium
<i>Project ID</i>	AMMPA-12-1
<i>Project Name</i>	Vocal imitation in a Pacific white-sided dolphin

Project Description Bottlenose dolphins appear to be flexible vocal imitators (Richards, Wolz, & Herman, 1984; Tyack, 1986). Pacific white-sided dolphins also make a variety of sounds, although the vocal repertoire of this species and the methods through which they acquire their vocalizations are unknown. The purpose of this study is to determine the extent to which a Pacific white-sided dolphin can learn through imitation to produce new vocalizations. If she can master this task, the features that she is able to imitate will also be investigated.

Investigators H Harley, J Caron
Institutions Miami Seaquarium, New College - Univ. of South Florida
Start Date 1998
Project Status Ongoing
Project Reports

Facility **Minnesota Zoo**
Project ID AMMPA-13-1
Project Name Echolocation development in infant bottlenose dolphins

Project Description Ongoing study examining and analyzing the development of communication, echolocation, and whistle vocalization in captive infant and juvenile bottlenose dolphin.

Investigators M. Kennedy
Institutions Univ. of St. Thomas
Start Date
Project Status Ongoing
Project Reports

Facility **Minnesota Zoo**
Project ID AMMPA-13-2
Project Name Comparative Analysis of Vocalizations and Body Language in the Bottlenose Dolphin

Project Description Correlation studies between acoustic and visual signals among marine mammals are few and largely confined to the realm of casual observations. This study is aimed to record both vocalizations and body language in the bottlenose dolphin in order to see if there is any correlation between both means of communication. The results of this study should provide a better understanding on communication and social structure of these mammals under captive conditions and the role played by each mean of signaling in their social behavior.

Investigators Dr. Aldemaro Romero
Institutions Macalester College
Start Date
Project Status Ongoing
Project Reports

Facility **Mystic Aquarium**
Project ID AMMPA-14-6
Project Name Seasonal dynamics of thyroid hormone secretion in phocid seals

Project Description As part of a study into seasonal adaptations in hormone activity, a sampling program was instituted to establish annual cycles in Arctic ringed seals, *Phoca hispida*. The findings will be compared with data that have already been collected from Pacific harbor seals, *Phoca vitulina richardsi*, and Atlantic gray seals, *Halichoerus grypus*, to provide a broad comparative view of thyroid function in phocids from contrasting habitats.

Investigators D. St. Aubin
Institutions Mystic Aquarium
Start Date 1993
Project Status Ongoing

Project Reports

- Haulena, M., D. J. St. Aubin and P.J. Duignan. 1997. Thyroid hormone dynamics during the nursing period in harbour seals, *Phoca vitulina*. *Can. J. Zool.* 76: 48-55.

Facility **Mystic Aquarium**
Project ID AMMPA-14-7
Project Name Population studies on beluga whales in the Canadian Arctic

Project description An international collaborative research effort involving the Canadian Department of Fisheries and Oceans, the Sea Mammal Research Unit (Cambridge, U.K.) and the Greenland Fisheries Research Institute, and MMA researcher, Dr. David St. Aubin. This program has deployed satellite transmitters on beluga whales, *Delphinapterus leucas*. The animals were captured and released at various locations in the Canadian Arctic. The movements and dive behavior of the animals are contributing to a better understanding of stock discreteness and habitat use to improve management strategies for these animals. Blood samples collected from each whale captured and released are analyzed for a broad range of constituents to establish the health of the individual to monitor the condition of the stock.

Investigators D. St. Aubin
Institutions Mystic Aquarium
Start Date 1993
Project Status Ongoing

Project reports

- Richard, P., M.P. Heide-Jørgensen and D.J. St. Aubin. 1998. Fall movements of belugas (*Delphinapterus leucas*) with satellite-linked transmitters in Lancaster Sound, Jones Sound and northern Baffin Bay. *Arctic* 51: 5-16.
- Orr, J., D.J. St. Aubin, P. Richard and M.P. Heide-Jorgensen. 1997. Recapture of beluga whales, *Delphinapterus leucas*, tagged in the Canadian High Arctic. *Marine Mammal Science*
- St. Aubin, D.J., S. DeGuise, P. Richard, T.G. Smith and J.R. Geraci Hematology and plasma chemistry as indicators of health and ecological status in beluga whales. *Delphinapterus leucas*. *Arctic* 54 in press.

Facility **Mystic Aquarium**
Project ID AMMPA-14-12
Project Name Seroprevalence of antibodies to Brucella sp.

Project Description Increasing awareness of the occurrence of infection with Brucella sp. in marine mammals has spawned a study into the prevalence of antibodies to this organism in free-ranging and captive marine mammals. A better understanding of the health implications of this zoonotic disease will guide management decisions regarding the significance of the condition and its diagnosis in marine mammals.

Investigators R. French, J. Maratea
Institutions University of Connecticut
Start Date 1998
Project Status Ongoing
Project Reports

Facility **Mystic Aquarium**
Project ID AMMPA-14-17
Project Name Health assessment of ringed seals, Phoca hispida, in the Canadian Arctic

Project Description Blood samples collected from ringed seal taken by Inuit subsistence hunters are analyzed to establish a health profile relative to morphometric indices of condition. Current studies have shown annual variations in condition related to environmental factors, principally ice conditions. Blood analysis is yielding metabolic correlates to these parameters.

Investigators D.J. St. Aubin
Institutions Mystic Aquarium
Start Date 2000
Project Status Ongoing
Project Reports

Facility **Mystic Aquarium**
Project ID AMMPA-14-18
Project Name Distribution and behavior of marine mammals in the mid Gulf of California

Project Description Aerial and small boat surveys were conducted to establish the distribution and abundance of marine mammals along the Gulf of California coast of Baja, CA. Patterns of habitat use and seasonal trends in abundance will be documented to support conservation efforts and identify potential impacts of human activity.

Investigators D.J. St. Aubin
Institutions Mystic Aquarium
Start Date 2000
Project Status Ongoing
Project Reports

Facility **Mystic Aquarium**
Project ID AMMPA-14-19

Project Name Toxicology of metals to marine mammal cells in culture

Project Description Marine mammals are exposed to a wide variety of metals that occur naturally and anthropogenically in their environment. Some of these substances are known to be carcinogenic in other species, including humans. Cell cultures derived from exhibited and stranded marine mammals are being immortalized using telomerase to create a tissue bank that would allow standardized investigations in different laboratories to investigate cellular aspects of toxicology in these species.

Investigators J. Wise, D. St. Aubin
Institutions Yale University, Mystic Aquarium
Start Date 2000
Project Status Ongoing
Project Reports

Facility **Mystic Aquarium**
Project ID AMMPA-14-20
Project Name Prevalence of *Helicobacter pylori* infection in marine mammals

Project Description *Helicobacter pylori* is a bacterium that has been associated with gastric ulcers and gastritis in humans and other species. Its distribution and pathogenicity in marine mammals is relatively unknown. Samples derived from exhibited and stranded marine mammals are being tested using specific antibodies, PCR techniques, bacterial culture, and gene sequencing to determine its presence in marine mammals.

Investigators C. Harper, D. St. Aubin, J.L. Dunn
Institutions Massachusetts Institute of Technology, Mystic Aquarium
Start Date 2000
Project Status Ongoing
Project Reports

Facility **Mystic Aquarium & Institute for Exploration**
Project ID AMMPA-14 -21
Project Name Investigation of retinol (Vitamin A) and tocopherol (Vitamin E) status in Steller sea lions: contribution to nutritional stress in declining populations.

Project Description This is a multi-phased study with the first phase addressing the concentration of vitamins A and E in the common prey species for Steller sea lions. Initial results suggest a possible toxic effect in animals consuming larger quantities of pollack. Dr. Mazzaro would like to test liver samples from these Stellers and will request samples from animals taken during the subsistence hunt. The next component of the project was a comparison of the serum vitamin concentrations in wild Steller pups in both eastern and western stocks. The third phase of the project investigates the utilization of vitamin tracer studies to estimate the vitamin A and E requirements of Steller sea lions using our collection animals as research models. The final phase of the study plans to monitor the transfer of these vitamins from mother to pup at different life stages (pregnancy, lactation and early development).

Investigators Lisa Mazzaro, Ph.D., Research Scientist

Institutions Mystic Aquarium & Institute for Exploration, Vancouver Aquarium, Oregon Zoo, Alaska SeaLife Center - Funding/NMFS Grant

Start Date July 2001

Project Status Ongoing

Project Reports

- Conference Abstracts IAAAM 2002 Meeting and Steller Sea Lion Symposium 2003

Facility **Mystic Aquarium & Institute for Exploration**

Project ID AMMPA-14-22

Project Name Nutritional assessment of stranded pinnipeds

Project Description The goal of this study is to develop an index to predict survivability of harp and hooded seals from the initial observational, health and nutritional status of the animals. Riverhead Foundation and University of New England are working in collaboration with Dr. Mazzaro. The next phase of the project is to expand the database with data from the remainder of the northeast stranding facilities.

Investigators Lisa Mazzaro, Ph.D., Research Scientist

Institutions Mystic Aquarium & Institute for Exploration, Vancouver Aquarium, Oregon Zoo, Alaska SeaLife Center, Riverhead Foundation, University of New England

Start Date November 2001

Project Status Ongoing

Project Reports

Facility **Mystic Aquarium & Institute for Exploration**

Project ID AMMPA-14-23

Project Name Cell culture and toxicology of metals in beluga whales, stranded cetaceans and Steller sea lions

Project Description The Wise Laboratory of Genetic and Environmental Toxicology has an ongoing initiative to create a repository of marine mammal cell lines. These cells are used by this laboratory to investigate the toxicological effects of exposure to metal contaminants but are also available for use by researchers in other fields such as physiology, immunology, and virology. Tissues samples from both cetaceans and pinnipeds have been collected by Mystic Aquarium, the Alaska Sea Life Center, The Marine Mammal Center, other stranding organizations, and by subsistence hunters. Primary cell cultures are derived from these tissues, tested to determine growth characteristics, manipulated to generate extended life-span cultures, and frozen in liquid nitrogen for future use by the Wise Laboratory and other researchers with appropriate permits.

Investigators John P. Wise, Sr., Ph.D.¹, Carrie. Goertz, DVM¹ and J. Lawrence Dunn, VMD²

Institutions ¹Wise Laboratory of Genetic and Environmental Toxicology, Biological Research Institute of Southern Maine, University of Southern Maine, ²Mystic Aquarium and Institute for Exploration - Funding/NMFS Grant

Start Date August 2000

Project Status Ongoing

Project Reports

Facility New York Aquarium - Wildlife Conservation Society
Project ID AMMPA-16-1
Project Name Mirror self-recognition in bottlenose dolphins

Project Description Recent attempts to determine whether bottlenose dolphins show behavioral evidence of mirror self-recognition (MSR), an ability only demonstrated in humans and great apes, have yielded provocative but inconclusive results. A captive-born, 12 year old male bottlenose dolphin at the New York Aquarium was observed over a two year period while exposed to various reflective surfaces under several conditions of baseline, sham and marking of the body. Data analysis included measures of a) duration of viewing, b) latencies to view after the differential experimental conditions and c) frequencies and duration of behaviors which were exclusively categorized as either mark-directed or not.

Investigators Diana Reiss & Lori Marino
Institutions New York Aquarium & Emory University
Start Date 10/98
Project Status Ongoing
Project Reports

Facility New York Aquarium - Wildlife Conservation Society
Project ID AMMPA-16-4
Project Name Radiation Therapy Techniques for Treating Corneal Opacities in Beluga Whales

Project Description
Investigators staff
Institutions Wildlife Conservation Society
Start Date
Project Status Ongoing
Project Reports

Facility New York Aquarium - Wildlife Conservation Society
Project ID AMMPA-16-6
Project Name Reversible Chemical Castration of Male Sea Otters in Captivity

Project Description This study tested the efficacy of leuprolide and cyproterone to control aggression in an all male California sea otter (*Enhydra lutris nereis*) colony
Investigators P.Calle, C. McClave, J. Basinger, H. Walters, B. Raphael and R. Cook
Institutions New York Aquarium
Start Date 7/96
Project Status Ongoing
Project Reports

- Calle, P., McClave, C, Basinger, J., Walters, H., Raphael, B. and Cook, R. 1998. Use of depot leuprolide and cyproterone to control aggression in an all male California sea otters

(*Enhydra lutris nereis*) colony. Abstract. Proceedings, American Association of Zoo Veterinarians and American Association of Wildlife Veterinarians, joint conference.

Facility New York Aquarium - Wildlife Conservation Society
Project ID AMMPA-16-8
Project Name Beluga whale reproductive physiology

Project Description WCS staff are coordinating a study of beluga whale reproductive physiology. Institutions from the U.S. and Canada which house beluga whales are contributing samples from male and female whales. These samples are being analyzed at the endocrinology laboratory at the National Zoo's Conservation and Research Center. Assays for beluga whale estrogen, progesterone, testosterone and metabolites are being developed and validated. Samples are being analyzed to determine and characterize the male and female reproductive cycles, the seasonality of the breeding period, length of the nonconceptive luteal phase and gestational length. The information will provide insights into the reproductive physiology of the beluga whale and practical information which will allow for improved reproductive management of the species.

Investigators P. Calle
Institutions New York Aquarium & the National Zoo
Start Date 1998
Project Status Ongoing
Project Reports

Facility Ocean Park, Hong Kong
Project ID AMMPA-17-7
Project Name Bottlenose dolphin reproduction

Project Description Collaborating with Hong Kong Polytechnic University, this research is monitoring reproductive cycles of bottlenose dolphins (*Tursiops c.f. T. aduncus*), particularly females, using ultrasound and correlating results with those from hormone assays. Results are used to manage the colony and have resulted in successful births. The females are introduced only briefly to the preferred adult male, with the timing of that introduction dictated by ultrasound indicators of ovulation. During pregnancy, ultrasound is also being used to monitor and document fetal growth and development (for comparison with work being done at Dolphin Quest on *Tursiops truncatus*). This project has been expanded to use ultrasound to pinpoint the time of ovulation and artificially inseminate the dolphin. This has been successfully accomplished in 2 dolphins using fresh, extended semen resulting in pregnancies. The use of cryopreserved semen for artificial insemination will take place in April – October 2001.

Investigators Dr. Fiona Brook, Dr. Todd Roebeck, Dr. Natalie Rourke, Dr. Reimi Kinoshita, Dr. Crista Rayner, Ms Mickey Cheung.
Institutions Ocean Park, Hong Kong Polytechnic University, Sea World USA
Start Date 1987
Project Status Ongoing
Project Reports

Facility Ocean Park, Hong Kong
Project ID AMMPA-17-8
Project Name Possible environmental sources of Pseudomonas (*Burkholderia*)
pseudomallei

Project Description An experiment to identify the epidemiology of this organism, specifically with respect to its possible sources for and distribution at mammal holding areas at Ocean Park. Strain typing of the *B. pseudomallei* found in Ocean Park is underway in order to better characterize the origin of the bacterium. This is part of a long-term project to control disease from this organism in captive colony. Molecular epidemiology of this organism is being investigated and includes isolates from human cases in. Also will try to isolate *B. pseudomallei* from outside Ocean Park during the monsoon season 2001. This is the first step in understanding the epidemiology of the disease.

Investigators Dr. Reimi Kinoshita, Chan San Yeun
Institutions Ocean Park, Hong Kong, Hong Kong University, Central Public Health
Lab., London
Start Date 1989
Project Status Ongoing
Project Reports

Facility Sea Life Park
Project ID AMMPA-18-12
Project Name Hormonal determination of estrous cycles using plasma and saliva in
female Hawaiian monk seals

Project Description
Investigators S. Atkinson, J. Pietraszek
Institutions Univ. of Hawaii
Start Date
Project Status Ongoing
Project Reports

Facility SeaWorld Parks
Project ID AMMPA-20-1
Project Name Reproductive biology of killer whales

Project Description A long-term study documenting estrous cycling and gestation via blood and urine hormone analyses. Documentation of variation in hormone levels in an individual female in successive pregnancies and between females. Documentation of the attainment of sexual maturity in males and females. Documentation of behavior during and after parturition.
Investigators SeaWorld staff
Institutions SeaWorld
Start Date 1985
Project Status Ongoing

Project Reports

- Duffield, D., D. K. Odell, J. F. McBain and B. Andrews. 1995. Killer whale reproduction at SeaWorld. Zoo Biology, 14:417-430.

Facility SeaWorld Parks
Project ID AMMPA-20-2
Project Name Bottlenose dolphin and beluga whale reproductive biology

Project Description Long-term studies to document the reproductive life histories of bottlenose dolphins and beluga whales. Data gathered include growth patterns, food consumption, reproductive hormones, growth and development of calves and nursing/suckling patterns.

Investigators SeaWorld staff

Institutions SeaWorld

Start Date 1970

Project Status Ongoing

Project Reports

- Robeck, T. R., J. F. McBain, S. Mathey, and D. C. Kraemer 1998. Ultrasonographic evaluation of the effects of exogenous gonadotropins on follicular recruitment and ovulation induction in the Atlantic bottlenose dolphin (*Tursiops truncatus*). Journal of Zoo and Wildlife Medicine, 29(1):6-13.

Facility SeaWorld Parks
Project ID AMMPA-20-5
Project Name Analysis of expired gas from killer whales and manatees

Project Description Application of HPLC and other techniques to determine the chemical composition of exhaled gases. Project has application to health assessments and reproductive biology.

Investigators L. Rasmussen

Institutions Oregon Graduate Institute

Start Date

Project Status Ongoing

Project Reports Progress reports

Facility SeaWorld Parks
Project ID AMMPA-20-8
Project Name Energetics of the Florida manatee

Project Description This study is assessing the water balance and thermoregulatory energetics of the Florida manatee. At the present time, it is not clear if manatees must drink fresh water. This knowledge is important for assessing and protecting critical manatee habitats. Manatees in Florida often die during extremely (for Florida) cold weather. This study is assessing the manatee's ability to respond to decreased water temperature.

Investigators G.A.J. Worthy

Institutions Texas A&M University

Start Date
Project Status Ongoing
Project reports Progress reports

Facility **SeaWorld Parks**
Project ID AMMPA-20-9
Project Name Marine mammal immunology

Project Description This study is the beginning of an assessment of the immune function of seals, sea lions, whales, and dolphins (both stranded and under human care). Results could lead to improved diagnostic capabilities

Investigators J. Stott, D. Ferrick, SW staff
Institutions Univ. of California Davis, SeaWorld

Start Date
Project Status Ongoing

Project reports

- Stott, J, et. al. 1999. Immunologic analysis of peripheral blood leucocytes: a sensitive measure of cetacean health. Abstract, 13th Biennial Conf. Biology of Marine Mammals, Maui, HI.

Facility **SeaWorld Parks**
Project ID AMMPA-20-10
Project Name Swimming mechanics in small cetaceans

Project description This study used high-speed cinematography to document the basic body motions made by several species of small cetaceans during swimming.

Investigators F. Fish
Institutions West Chester State University

Start Date 1987
Project Status Ongoing

Project reports

- Fish, F. 1993. Power output and propulsive efficiency of swimming bottlenose dolphins. J. Exp. Biology, 185: 179-193.

Facility **SeaWorld Parks**
Project ID AMMPA-20-11
Project Name Growth and development of killer whale calves

Project Description A long-term study documenting the physical and behavioral development of killer whales. Calves are measured biweekly beginning as soon as practical and continuing into adulthood. Detailed behavior records are kept and include nursing/suckling patterns, consumption of fish, etc. Acoustic recordings are made on a regular basis to document the development of vocal patterns.

Investigators SeaWorld staff
Institutions SeaWorld, Hubbs-Sea World Research Institute

Start Date 1985
Project Status Ongoing

Project Reports

- Clark, S.T. and D. K. Odell. 1999. Allometric relationships and sexual dimorphism in captive killer whales. *J. Mammalogy*, 80:777-785.
- Clark, S.T. and D.K. Odell. 1999. Nursing parameters in captive killer whales. *Zoo Biology*, 18:373-384.
- Clark, S.T., D. K. Odell and C. T. Lacinak. 2000. Aspects of growth in captive killer whales. *Marine Mammal Science*, 16:177-202.

Facility **SeaWorld Parks**
Project ID AMMPA-20-12
Project Name Manatee reproductive biology

Project Description A study to determine the feasibility of documenting reproductive hormone metabolites in manatees as a method for studying manatee reproductive biology.

Investigators I. Larkin
Institutions University of Florida
Start Date 1995
Project Status Ongoing

Project Reports

- Vandeveld, I. L., T. S. Gross, R. L. Reep and D. K. Odell. 1995. Abstract. Manatee fecal reproductive hormone concentrations. *American Zoologist*, 35(5):26A

Facility **SeaWorld Parks**
Project ID AMMPA-20-13
Project Name Food habits of the bottlenose dolphin

Project Description A broad based study to document the food habits of the bottlenose dolphin through the southeastern United States. Prey items from the stomach contents of dead, beached dolphins are identified based on cephalopod beaks, fish, otoliths and other hard parts. About 500 samples have been examined to date. As sample size increases, comparisons will be made on the basis of geographic location, age, sex and season.

Investigators N. Barros, D. Odell
Institutions Hubbs-SeaWorld Research Institute, SeaWorld
Start Date 1987
Project Status Ongoing

Project Reports

- Barros, N.B. and D.K. Odell. 1990. Food habits of bottlenose dolphins in the southeastern U.S. Pp. 309-328, IN: Leatherwood and Reeves (eds.). *The Bottlenose Dolphin*, Academic Press.

Facility **SeaWorld Parks**
Project ID AMMPA-20-15
Project Name Response of the Florida manatee to novel objects

Project Description A project designed to investigate manatee behavior in relation to the propensity of manatees, especially, females, to become entangled on crab pot float lines
Investigators Ann Bowles
Institutions Hubbs-SeaWorld Research Institute
Start Date 1999
Project Status Ongoing
Project Reports Progress reports.

Facility **SeaWorld Parks**
Project ID AMMPA-20-16
Project Name Hearing in California sea lions

Project Description This study is documenting the hearing sensitivity of California sea lions using state-of-the-art, non-invasive electronic methodology.
Investigators B. Stewart
Institutions Hubbs-SeaWorld Research Institute
Start Date
Project Status Ongoing
Project Reports

Facility **SeaWorld Parks**
Project ID AMMPA-20-17
Project Name Biology of the false killer whale

Project Description Observations on reproduction, growth and development of captive false killer whales
Investigators SeaWorld staff
Institutions SeaWorld Parks
Start Date 1987
Project Status Ongoing
Project reports

- Clark, S. T., and D. K. Odell 1999. Nursing behavior in captive false killer whales (*Pseudorca crassidens*). *Aquatic Mammals*, 25.

Facility **SeaWorld Parks**
Project ID AMMPA-20-18
Project Name Natural history of cetaceans
Project Description A wide range of studies on the natural history of marine mammals stranded in Florida. Includes geographic distribution, growth, development, mortality patterns, anatomy, food habits, parasites, etc. of species such as the bottlenose dolphin, dwarf and pygmy sperm whales, spotted dolphins, pygmy, killer whales, and beaked whales.
Investigators D. Odell, N. Barros
Institutions SeaWorld, Hubbs-SeaWorld Research Institute
Start Date 1987
Project Status Ongoing
Project Reports

- Barros, N. B., D. A. Duffield, P. H. Ostrom, D. K. Odell, and V. R. Cornish 1998. Near-shore vs. off-shore ecotype differentiation of *Kogia breviceps* and *K. simus* based on hemoglobin, morphometric and dietary analyses. Abstract, World Marine Mammal Science Conference, Monaco, January 1998., 12:10-11.
- West, Kristi et al. 1999. Progesterone concentrations associated with parturition in three species of odontocetes. In Proceedings of the 13th Biennial Conference on the Biology of Marine Mammals. P. 199

Facility **John G. Shedd Aquarium**
Project ID AMMPA-21-2
Project Name Biomarkers of genotoxicity in Beluga Whales

Project Description This study will establish the incidence of chromosomal aberrations, sister chromatid exchanges and micronuclei (indicators of DNA damage) in St. Lawrence beluga whales. Significance: Among St. Lawrence belugas, cancer has been diagnosed as the principal cause of death in 20% of examined animals. These examinations have also revealed high levels of PCBs, organochlorine pesticides, mercury and other carcinogenic or mutagenic compounds. Studies focused on St. Lawrence belugas will be compared to belugas from other geographic regions. This information will help us to understand the influence of environmental contaminants on the health of wild marine mammal populations.

Investigators Julie Gauthier, Helene Dubeau, Eric Rassart
Institutions University of Quebec at Montreal
Start Date 1998
Project Status Ongoing

Project Reports
 • Gauthier, Julie et al. 1999. Biomarkers of DNA Damage in Marine Mammals. In Proceedings of the 13th Biennial Conference on the Biology of Marine Mammals. P. 65.

Facility **John G. Shedd Aquarium**
Project ID AMMPA-21-8
Project Name Development of Cetacean Tissue Culture Lines

Project Description This study will support the need for the development of well-characterized tissue culture lines from cetaceans. Tissue culture lines are of use in the study of virology and in the development of immunodiagnostic assays. Significance: Studies like this will provide new tools to better understand and diagnose disease in wild cetaceans and those in public display facilities.

Investigators B L Middlebrooks and R A Patterson
Institutions University of Southern Mississippi
Start Date 1998
Project Status Ongoing

Project reports

Facility **John G. Shedd Aquarium**
Project ID AMMPA-21-18
Project Name Studies of Underwater Hearing in a Pacific White-sided Dolphin
Using Neural Response Techniques

Project Description The use of auditory brainstem response (ABR) and auditory evoked potential (AEP) in hearing studies allows for quick and non-invasive (painless) hearing studies that can be performed without the need for trained animals. This study will apply both techniques with an animal that has been part of a comprehensive traditional behavioral hearing sensitivity study (1996) and a masked audiogram (1998). The two behavioral studies will allow for calibration of data obtained through AEP. Collection of data with ABR procedures will allow comparison with hearing studies performed on other species. This has significance and applicability for further studies in both managed collections and field conditions.

Investigators Jeanette A. Thomas, PhD
Institutions Western Illinois University
Start Date Spring 2001
Project Status Ongoing
Project reports

Facility **Six Flags Marine World**
Project ID AMMPA-22-1
Project Name Mechanisms of vocal learning in captive adult bottlenose
Dolphins

Project Description An experimental study on the processes behind vocal learning in captive adult bottlenose dolphins. The study's focus is on the ability and process by which adult dolphins acquire novel signals into their vocal repertoire through the use of auditory information and feedback for comparison to data on young dolphins and to the processes of vocal learning in other species such as birds and humans.

Investigators B. McGowan
Institutions Six Flags Marine World
Start Date 11/99
Project Status Ongoing
Project Reports

Facility **Six Flags Marine World**
Project ID AMMPA-22-14
Project Name Study of killer whales in northern Washington State, British Columbia and
southern Alaska

Project Description Marine World's participation in this long-term study originated in 1981. A variety of issues have been examined, including population dynamics, social organization, communication, feeding ecology, effects of human activities. The population dynamics work developed techniques for estimating age and neonate survivorship to document a growth phase in

resident orcas. Currently, this work is comparing population parameters of these populations to determine the causes of the decline of Southern Residents. The social organization work has addressed kin and non-kin factors in association patterns, and social roles of various age and sex classes. The communication work addresses variation in call structure on the scale of individual, maternal group, and populations. The work on feeding ecology addressed total energy requirements and the relationships among predator and prey distributions, as well as the use of vocalization in foraging strategies. Human activities studied include the Exxon Valdez Oil Spill and whale watching in Johnstone and Haro Straits.

Investigators D. Bain, M. Bigg, G. Ellis, K. Balcomb, J. Ford, M. Dahlheim, et al

Institutions Six Flags Marine World, DFO Canada, Vancouver Aquarium, et al

Start Date 1981

Project Status Ongoing

Project reports

- Bain, D. E. and P. J. Miller. in review. Within-pod variation in the sound production of a pod of killer whales, *Orcinus orca*. Submitted to *Animal Behaviour*.
- Deecke, V. B. 1998. Stability and change of killer whale (*Orcinus orca*) dialects. Master's Thesis. University of British Columbia.
- Williams, R. 1999. Behavioural responses of killer whales to whale-watching: opportunistic observations and experimental approaches. M.S. Thesis. University of British Columbia.
- Nichol, L. M. and D. M. Shackleton. 1996. Seasonal movements and foraging behaviour of northern resident killer whales (*Orcinus orca*) in relation to the inshore distribution of salmon (*Onchorhynchus* spp.) in British Columbia. *Can. J. Zool.* 74:983-991.
- Kriete, B. 1995. Bioenergetics in the killer whale, *Orcinus orca*. Ph.D. Thesis. University of British Columbia.
- Bain, D. E. 1995. Non-kin association patterns of killer whales (*Orcinus orca*). Paper presented to the International Ethological Conference. Honolulu, HA.
- Bain, D. E. 1995. The role of communication in a predator-prey system. Paper presented to the Animal Behavior Society Conference. Lincoln, NE.
- Bain, D. E. 1995. The use of sound to guide killer whales (*Orcinus orca*) entrapped in Barnes Lake, Alaska, to open water. Poster presented to the Society for Marine Mammalogy Conference. Orlando, FL.
- Bain, D. E. and M. E. Dahlheim. 1994. Effects of masking noise on detection thresholds of killer whales. In (T. R. Loughlin, ed.) *Marine Mammals and The Exxon Valdez*. Academic Press. N.Y. 243-256.

- Dahlheim, M. E., D. E. Bain, and J. M. Waite. 1994. Recovery monitoring of Prince William Sound killer whales injured by the Exxon Valdez oil spill using photo-identification techniques. I.D. Number: Marine Mammals Study Project No. 93042. 12pp.
- Bain, D. E., and J. Olhiser. 1994. Factors affecting food intake of killer whales and dolphins. Paper presented to the International Marine Animal Trainers Association Conference. Tacoma, WA.
- Bain, D. E. 1991. Geometry for the informed school. Paper presented to the Society for Marine Mammalogy. Chicago.
- Bain, D. E. 1992. Multi-scale communication by vertebrates. In (J. A. Thomas, R. A. Kastelein, and A. Ya. Supin, eds.) Marine Mammal Sensory Systems. Plenum Press. New York. 601-629.
- Bain, D. E. 1992. Hearing abilities of killer whales (*Orcinus orca*). National Marine Mammal Laboratory Contract Report #43ABNF002499 and #43ABNF002500. 20pp.
- Bain, D. E. 1991. Vocal learning in killer whales. Paper presented to the Animal Behavior Society. Wilmington, NC.
- Bain, D. E. 1990. Examining the validity of inferences drawn from photo-identification data, with special reference to studies of the killer whale (*Orcinus orca*) in British Columbia. In (P.S. Hammond, S. A. Mizroch and G. P. Donovan, eds.) Individual Recognition of Cetaceans: Use of Photo-identification and Other Techniques to Estimate Population Parameters. International Whaling Commission. Special Issue 12:93-100.
- Bain, D. E. 1990. On the design of hydrophone arrays for localizing the underwater sounds of killer whales (*Orcinus orca*). Paper presented to the Third Orca Symposium. Victoria, B. C.
- Bain, D. E. 1988. An evaluation of evolutionary processes: studies of natural selection, dispersal, and cultural evolution in killer whales (*Orcinus orca*). Ph.D. Dissertation. University of California, Santa Cruz.
- Waite, J. M. 1988. Alloparental care in killer whales (*Orcinus orca*). Mater's Thesis. University of California, Santa Cruz.
- Bain, D. E. 1986. Acoustic behavior of *Orcinus*: periodicity, sequences, correlations with behavior, and an automated technique for call classification. In (B. Kirkevoold and J. Lockard, eds.) Behavioral Biology of Killer Whales. Liss. New York. 335-371.

<i>Facility</i>	Six Flags Marine World
<i>Project ID</i>	AMMPA-22-15
<i>Project Name</i>	Effects of noise on marine mammals

Project Description A combination of aquarium and open ocean studies have addressed effects of noise on marine mammals. These include the deleterious effects of noise on marine mammals (vessel noise, airguns), as well as the application of noise for the benefit of marine mammals (pingers) to reduce entanglement, acoustic deterrent devices as an alternative to lethal removal. These data will be used to develop regulations regarding noise in the ocean, reducing entanglement through the application active markers of net locations, and the use of noise as an alternative to lethal removal at sites such as Ballard Locks and fish farms, and perhaps additional marine mammal-fishery interactions.

Investigators D. Bain, M. Dahlheim, M. Fisher, J. Calambokidis
Institution Six Flags Marine World; NMFS, USGS, MMS, Cascadia Research
Collective

Start Date 1990

Project Status Ongoing

Project Reports

- Bain, D. E. 1998. Effects of airgun noise on marine mammals: responses as a function of received sound level and distance. Minerals Management Service Contract Report. 13 pp.
- Bain, D. E. 1997. Characteristics of the 1996-1997 acoustic barrier at Hiram M. Chittenden Locks. NMFS Contract Report No. 40ABNF601749. 12 pp.
- Bain, D. E. 1996. Sound Level Contours Produced by the 1995 Acoustic Barrier at the Hiram M. Chittenden Locks. NMFS Contract Report No. 40ABNF502019. 17 pp.
- Gearin, P. J., M. E. Goshko, L. Cooke, R. DeLong, J. Laake and D. Greene. 1996. Acoustic alarm experiment in the 1995 Northern Washington marine setnet fishery. NMFS Report. 16 pp.
- Bain, D. E. 1995. The use of sound to guide killer whales (*Orcinus orca*) entrapped in Barnes Lake, Alaska, to open water. Poster presented to the Society for Marine Mammalogy Conference. Orlando, FL.
- Bain, D. E. and M. E. Dahlheim. 1994. Effects of masking noise on detection thresholds of killer whales. In (T. R. Loughlin, ed.) *Marine Mammals and The Exxon Valdez*. Academic Press. N.Y. 243-256.
- Norberg, B. and D. E. Bain. 1994. Implementation and assessment of the acoustic barrier at the Hiram M. Chittenden Locks using calibrated measurements of the sound field. National Marine Fisheries Service. Seattle, WA. 238 pp.
- Bain, D. E. 1992. Hearing abilities of killer whales (*Orcinus orca*). National Marine Mammal Laboratory Contract Report #43ABNF002499 and #43ABNF002500. 20 pp.

Facility: Six Flags Marine World
Project ID: AMMPA-22- 16
Project Name: Pinniped Vocal Communication

Project Description: Vocalizations were recorded for 1.3 Pacific walrus and analyzed in comparison and contrast to free ranging pinnipeds and to other animals in zoo settings. Researchers explored the range of pinniped vocalizations, their importance and their relative functions.

Investigators: R.J. Schusterman and C. Reichmuth Kastak

Institutions: Six Flags Marine World and University of Santa Cruz Long Marine Lab

Start Date: July 2001

Project Status: Complete

Project Reports:

- Schusterman, R.J., Southhall, B.L., Kastak, D. and Reichmuth Kastak, C. (2001) Pinniped Vocal Communication: Form and Function

Facility: Six Flags Marine World
Project ID: AMMPA- 22- 17
Project Name: Use of vaginal cytology in determining estrous cycle in the Pacific walrus

Project Description: A study to test accuracy of routine vaginal cytology in determining the estrous cycle of the Pacific walrus

Investigators: D. Quihuis and L. Gage

Institutions: Six Flags Marine World

Start Date: 1997

Project Status: On-going

Project Reports:

Facility: Six Flags Marine World

Project ID: AMMPA- 22- 18

Project Name: Gastric disease in pinnipeds: Evaluating the prevalence and treatment of a novel *Helicobacter* species

Project Description: To screen the walrus feces for the presence of *Helicobacter* type bacteria to investigate the spread of *Helicobacter* among pinnipeds.

Investigators: J. Hurley

Institutions: Moss Landing Marine Labs, CA, Marine Mammal Center, CA and Six Flags Marine World

Start Date: 3/03

Project Status: Ongoing

Project Reports:

- Harper, G.C., Xu, S., Rogers, A.B., Feng, Y., Shen, Z., Taylor, N.S., Dewhirst, F.E., Paster, B.J., Miller, M., Hurley, J., and Fox, J.G. (2002) Isolation and Characterization of Novel *Helicobacter* spp. From the gastric mucosa of harp seals, *Phoca groenlandica*

Facility **Tampereen Sarkanniemi**
Project ID AMMPA-23-1
Project Name Bottlenose dolphin clinical studies
Project Description Basic studies on hematology, serum chemistry, ultrasound exams.
Investigators Liisa Hartman, staff
Institutions Tampereen Sarkanniemi
Start Date 1985
Project Status Ongoing
Project reports

Facility **Tampereen Sarkanniemi**
Project ID AMMPA-23-2
Project Name Killer whale biology
Project Description Studies on the ecology of killer whales in northern Norway
Investigators Dr. Tiu Simila
Institutions Andenes Cetacean Research Unit
Start Date 1987
Project Status Ongoing
Project Reports

- Similä, T, Holst, J.C, Øien, N, Hanson, B. 2001. Satellite- and radiotracking study of movements of killer whales in the wintering grounds of herring in Norway. European Cetacean Society, annual meeting, Rome 5-10.5.2001
- Domenici, P., Batty, R.S., Similä, T. and Ogam, E. 2000. Killer whales (*Orcinus orca*) feeding on schooling herring (*Clupea harengus*) using underwater tailslaps: kinematic analyses of field observations. *The Journal of Experimental Biology*, 203: 283-294.
- Similä, T., Holst, J.C and Røtting, I. 2000. Recent changes in the distribution pattern of killer whales and herring in the coastal waters of northern Norway. European Cetacean Society, annual meeting, Cork, Ireland, 2-5.4.2000.
- Similä, T. 1997. Sonar observations of killer whales (*Orcinus orca*) feeding on herring schools. *Aquatic Mammals* 23 (3): 119-126.

Facility **Tampereen Sarkanniemi**
Project ID AMMPA-23-3
Project Name Dolphinarium water quality
Project Description Studies on nitrification, foam fractionation, filtration processes.
Investigators Pertti Keskitalo, staff
Institutions Tampereen Sarkanniemi
Start Date 1985
Project Status Ongoing
Project Reports

Facility **Tampereen Sarkanniemi**
Project ID AMMPA-23-4
Project Name Detailed investigation of dolphin blow cytology
Project Description International comparing studies done of the dolphin cytology

Investigators Pierre Gallego, DVM, Ph.D. Student / Manuel García Hartmann, DVM, Ph.D. Promotor
Institutions Duisburg Dolphinarium, Tampereen Sarkanniemi (possibly others)
Start Date Spring 2002
Project Status Ongoing
Project Reports

Facility **Tampereen Sarkanniemi**
Project ID AMMPA-23-5
Project Name **Project MOSART** – Mobile Submarine Acoustic Recorder of Transients.
Project Description The MOSART project is aimed at studying the use of pulsed sound in the intra-specific communication of the bottlenose dolphin. It is focussing especially on directional, high-frequency components of these sounds

Investigators Principal investigator: Christer Blomqvist, Ph.D. Student, Gothenburg University, Sweden, Supervisor: Dr. Mats Amundin, Kolmårdens, Djurpark, Sweden.
Institutions Kolmården Djurpark, Sweden; Tampereen Sarkanniemi, partly Sarasota Bay NMFS -project
Start Date Summer 2002
Project Status Ongoing
Project Reports

Facility **Vancouver Aquarium Marine Science Centre**
Project ID AMMPA-24-2
Project Name Reproductive endocrinology of belugas
Project Description Collaborative study with various other aquariums holding belugas
Investigators S. Young
Institutions Vancouver Aquarium Marine Science Centre
Start Date
Project Status Ongoing
Project Reports

Facility **Vancouver Aquarium Marine Science Centre**
Project ID AMMPA-24-3
Project Name Acoustic relationships among transient killer whales in the northeastern Pacific
Project Description Calls from transient killer whales are compared using neural networks. This analysis will be used to determine acoustic relationships among groups and populations of transient killer whales. It will help identify unique transient groups so that conservation and management activities can be targeted most effectively.
Investigators V. B. Deeke
Institutions Vancouver Aquarium Marine Science Centre and University of St. Andrews
Start Date 1999

Project Status Ongoing

Project Reports

- Deecke, V.B., Ford, J.K.B., Spong, P. 2000. Dialect change in resident killer whales: implication for vocal learning and cultural transmission. *Animal Behaviour* 60: 629-638.

Facility **Vancouver Aquarium Marine Science Centre**

Project ID AMMPA-24-4

Project Name History of vocal clans in resident-type killer whales in the northeastern Pacific

Project Description A model of the cultural evolution of resident killer whales is being developed based on acoustic relationships between resident killer whales from different sub-populations. This work will help identify unique groups of resident killer whales and will help focus conservation efforts.

Investigators H. Yurk, L.G. Barrett-Lennard

Institutions University of British Columbia, Vancouver Aquarium Marine Science Centre

Start Date 1997

Project Status Ongoing

Project Reports

- Yurk, H., Barrett-Lennard L.G., Ford, J.K.B. and Matkin C.O. *in press*. Cultural transmission within maternal lineages: Vocal clans in resident killer whales in Southern Alaska. *Animal Behaviour*.

Facility **Vancouver Aquarium Marine Science Centre**

Project ID AMMPA-24-6

Project Name Diet of wild killer whales

Project Description The prey and foraging behavior of resident and transient killer whales is being analyzed to identify the ecological requirements of each killer whale ecotype.

Investigators J. Ford, G.M. Ellis, L.G. Barrett-Lennard, A.B. Morton, R. Palm, K.C Balcomb

Institutions Vancouver Aquarium Marine Science Centre, Canadian Department of Fisheries and Oceans, University of British Columbia.

Start Date 1995

Project Status Ongoing

Project Reports

- Ford, J.K.B., Ellis, G.M., Barrett-Lennard, L.G., Morton, A.B., Palm, R.,. 1998 Dietary specialization in two sympatric populations of killer whales (*Orcinus orca*) in coastal British Columbia and adjacent waters. 76: 1456-147 *Canadian Journal of Zoology*

Facility **Vancouver Aquarium Marine Science Centre**

Project ID AMMPA-24-7

Project Name Population status and natural history of resident killer whales

Project Description Killer whale natural history study, based on photo-identification, acoustic analysis, and genetic analysis

Investigators J.K.B. Ford, G.M. Ellis, L.G. Barrett-Lennard, K.A. Heise

Institutions Vancouver Aquarium Marine Science Centre, Department of Fisheries and Oceans, University of British Columbia.

Start Date 1985

Project Status Ongoing

Project Reports

- Ford, J.K.B., Ellis, G.M., Balcomb K.C. 1994. Killer whales. University of British Columbia press.
- Ford, J.K.B., Ellis, G.M., Balcomb K.C. 2000. Killer whales (second edition). University of British Columbia press.

Facility **Vancouver Aquarium Marine Science Centre**

Project ID AMMPA-24-8

Project Name Status of humpback whales in British Columbia

Project Description A study of feeding habits, population size, feeding behaviour and distribution of humpback whales in British Columbia.

Investigators J. Ford, G.M. Ellis, M. O, L.G. Barrett-Lennard

Institutions Vancouver Aquarium Marine Science Centre, Department of Fisheries and Oceans

Start Date 1990

Project Status Ongoing

Project Reports

Facility **Vancouver Aquarium Marine Science Centre**

Project ID AMMPA-24-10

Project Name Bioenergetics and growth of juvenile Steller sea lions

Project Description Study of metabolic efficiency, bioenergetics and growth of Steller sea lions on a variety of diets and feeding regimens, aimed at determining the cause of a dramatic population decline of Steller sea lions in western Alaska.

Investigators A.W. Trites, D. Rosen

Institutions Vancouver Aquarium Marine Science Centre, University of British Columbia, North Pacific Universities Marine Mammal Research Consortium

Start Date 1992

Project Status Ongoing

Project reports

Facility **Vancouver Aquarium Marine Science Centre**

Project ID AMMPA-24-13

Project Name Population status and natural history of transient killer whales

Project Description Study of the natural history of transient killer whales, including feeding habits, social structure, and distribution patterns.

Investigators JK.B. Ford, G.M. Ellis, L.G. Barrett-Lennard

Institutions Vancouver Aquarium Marine Science Centre, Canadian Department of Fisheries and Oceans, University of British Columbia

Start Date 1994

Project Status Ongoing

Project Reports

- Ford, J.K.B., Ellis, G.M. 1999. Transients: Mammal Hunting Killer Whales. University of British Columbia Press.

Facility **Vancouver Aquarium Marine Science Centre**

Project ID AMMPA-24-14

Project Name Population structure and mating patterns of killer whales

Project Description A genetic investigation of population segregation, social organization, and mating patterns in killer whales (*Orcinus orca*) of the northeastern Pacific Ocean based on the analysis of nuclear and mitochondrial DNA from skin biopsies obtained from photo-identified killer whales from British Columbia and Alaska.

Investigators L.G. Barrett-Lennard

Institutions Vancouver Aquarium Marine Science Centre and University of British Columbia

Start Date 1993

Project Status Ongoing

Project Report

- Barrett-Lennard, L.G. 2000. Population structure and mating patterns of killer whale populations in the northeastern Pacific, as revealed by DNA analysis. PhD Dissertation, University of British Columbia;
- Barrett-Lennard, L.G., Ellis, G.M. 2001. Population structure and genetic variability in northeastern Pacific killer whales: towards an assessment of population viability. Research Document 2001/065. Canadian Scientific Advisory Secretariat, Fisheries and Oceans Canada.

Facility **Vancouver Aquarium Marine Science Centre**

Project ID AMMPA-24-15

Project Name Killer whale predation on Steller sea lions in Western Alaska

Project Description A field-based study of killer whale abundance, distribution, and foraging in Western Alaska based on photographic, genetic and acoustic data collected by dedicated research vessels based near Kodiak, Dutch Harbour, and Unimac Pass.

Investigators L.G. Barrett-Lennard, C.O. Matkin, G.M. Ellis, J.K.B. Ford, A.W. Trites

Institutions Vancouver Aquarium Marine Science Centre, University of British Columbia, North Gulf Oceanic Society, North Western Universities Marine Mammal Research Consortium

Start Date 2001

Project Status Ongoing

Project Report

- Heise, K.A., Barrett-Lennard, L.G., Martell, S., Demaster, D.P., Trites, A.W. *submitted Aug 2002*. Killer Whale Predation on Steller Sea Lions in Western Alaska: A Simulation Study. Ecological Applications

Facility Vancouver Aquarium Marine Science Centre
Project ID AMMPA-24-16
Project Name Vocal learning in belugas in a public display facility

Project Description An examination of the communicative behaviours and perceptual abilities of belugas in a captive environment focusing on vocal learning and cultural transmission of information.

Investigators V. Vergara, L.G. Barrett-Lennard
Institutions Vancouver Aquarium Marine Science Centre, University of British Columbia

Start Date 2002
Project Status Ongoing
Project Reports

Facility Vancouver Aquarium Marine Science Centre
Project ID AMMPA-24-17
Project Name B. C. Cetacean Sightings Network

Project Description Study of the seasonal distribution, relative abundance, and travel patterns of British Columbian cetacean species. Emphasis is placed on species at risk, including northern right whales, humpback whales, southern resident killer whales, and blue whales.

Investigators L.G. Barrett-Lennard, M. McDonald, N.B. Dedeluk, J.K.B. Ford
Institutions Vancouver Aquarium Marine Science Centre, Canadian Department of Fisheries and Oceans, Canadian Ministry of the Environment

Start Date 2001
Project Status Ongoing
Project Reports

Facility Vancouver Aquarium Marine Science Centre
Project ID AMMPA-24-18
Project Name Adaptive and non-adaptive morphological divergence in resident and transient killer whales.

Project Description A comparison of the skeletal morphology of resident and transient killer whales in museum collections. The population type of each skeleton is determined by DNA analysis, and morphological comparisons are made using a combination of standard measurements and shape analysis.

Investigators C. Fung, L.G. Barrett-Lennard
Institutions Vancouver Aquarium Marine Science Centre, University of British Columbia

Start Date 2001

Project Status Ongoing

Facility **Zoomarine**

Project ID AMMPA-26-2

Project Name Social behavior and growth of an exhibited population of
Arctocephalus pusillus pusillus

Project Description As the basis of a Master's degree dissertation, the detailed study of Cape fur seals nutrition, growth and seasonal weight variation is being developed.

Investigators staff

Institutions Zoomarine

Start Date 1998

Project Status Ongoing

Project Reports

- A Master's dissertation, a paper and a talk at an international conference are expected from this study

Facility **Zoomarine**

Project ID AMMPA-26-4

Project Title The behaviour of *Tursiops truncatus* pre- and post-partum, including documentation of head-first delivery

Project Description Description of behaviors related to lactation, with collection and analysis of quantitative data.

Investigators Staff, with the involvement of undergraduate Biology students.

Institutions Zoomarine

Start Date 1992

Project Status Ongoing; the last birth included in this study occurred in September of 2000; the observation of a pregnant female will begin in upcoming April

Project Reports

- Project Reports in Portuguese available; several presentations at national and international conferences have so far resulted from this project.

Facility **Zoomarine**

Project ID AMMPA -26-5

Project Name ADEPTs - Pinger tests at Zoomarine

Project Description Determination of the acoustic threshold at which exhibited bottlenose dolphins start to react to the presence of a specified underwater sound signal.

Investigators A.D.Goodson, C.Ed.,M.Phil, FIoA., Chief Experimental Officer - Department of Electronic & Electrical Engineering, Loughborough University (UK); Manuel dos Santos - Unidade de Investigacao em Eco-tologia, Instituto Superior de Psicologia Aplicada, Portugal; Zoomarine Staff; one undergraduate Biology student and a Master's student.

Institutions Zoomarine, Loughborough University (UK), Instituto Superior de Psicologia Aplicada

Start Date February 2001
Project Status Ongoing
Project Reports Expected

Facility **Zoomarine**
Project ID AMMPA-26-6
Project Name Erysipelas vaccination in dolphins

Project Description To develop a vaccine to protect dolphins from this disease

Investigators E. Cox and B. Goddeeris, staff, et.al.

Institutions Zoomarine, Brugge

Start Date 1993

Project Status Ongoing

Project Reports

- "Onderzoek naar IgG - en IgM - antistoffen tegenover Erysipelothrix rhusiopathiae bij al dan niet gevaccineerde dolfljnen", Van Poucke, S., 1994. Promoters : Lacave, G., Cox, E. and Goddeeris, B. (Research on IgG and IgM antibodies against Erysipelothrix rhusiopathiae in vaccinated and non-vaccinated dolphins).
- "Identificatie en karakterisatie van immunoglobulinen isotypes bij de dolfijn", Goodman, G., 1995-1996. Promoters : Cox, E., Goddeeris, B. and Lacave, G. (Identification and characterisation of the immunoglobulins' isotypes in dolphins).
- "Kruisprotectie tussen vlekziekte-isolaten van het varken en de dolfijn", Hermans, J., 1996-1997. Promoters : Lacave, G., Cox, E. and Goddeeris, B. (Cross protection between the swine and the dolphin erysipelas strains).
- "Humorale immuniteit bij dolfijnen", Vandorpe, V., 1997-1998. Promoters : Cox, E., Goddeeris, B. and Lacave, G. (Humoral immunity in dolphins).
- "Vlekziekevaccinatie bij dolfijnen", Garré, S., 1998-1999. Promoters : Cox, E. and Lacave, G. (Erysipelas vaccination in dolphins).
- "Gemeenschappelijke antigenen bij vlekziekte-isolaten van Dolfijnen", Janssen D., 1999-2000. Promoter : Lacave, G. and Cox, E. (Common antigens in dolphins' erysipelothrix isolates).

Facility **Zoomarine**
Project ID AMMPA-26-7
Project Name Analysis of two experiments on numerical competency in the bottlenose dolphin, *Tursiops truncatus*

Project Description To see if this species possesses any kind of numerical competence, Zoomarine is using acoustic tones and visual sD as cues for the specimens to pick up a certain number of rings from their environment

Investigators Ana Martins, Master's student; Manuel Eduardo dos Santos, PhD; Teresa Garcia Marques, PhD

Institutions Zoomarine and ISPA - Instituto Superior de Psicologia Aplicada

(Institute of Applied Psychology)

Start Date April 2001

Project Status Ongoing

Project reports

- Master's report to be presented at ISPA: "Análise de duas experiências de competência numérica em golfinhos-roazes (*Tursiops truncatus*)"; 2 scientific papers, to be published in peer reviewed journals