SARASOTA DOLPHIN RESEARCH PROGRAM

NICKS'N'NOTCHES

Annual Summary of the Collaborative Dolphin Research and Conservation Efforts of the Chicago Zoological Society and Mote Marine Laboratory

January 2008

Visit our web site at: www.sarasotadolphin.org

Dear Friends and Colleagues of the Sarasota Dolphin Research Program,

The Sarasota Dolphin Research Program (SDRP) has completed another successful year as the "world's longest-running wild dolphin research program." Our research is in its 38th year since we asked the simple question: "Do the same bottlenose dolphins live in Sarasota Bay year-round?" In 1970 I was a high school student, assisting Blair Irvine on dolphin and shark research at Mote Marine Laboratory, including a dolphin tagging project. It was my first "real job," even though I was a volunteer.

We've come a long way since then. The answer to our original question from the tagging research — the first documentation of long-term, multi-generational residency by dolphins — set the stage for all that we have done over the decades since. Initial basic biological research has been expanded to investigate increasingly refined questions, and we have added a strong commitment to conservation action, education and training. Over the past 37 years, we have created a unique situation for learning about the needs of coastal dolphins in the wild, through understanding them as individuals and following them throughout their lives. As we learn what it takes for coastal dolphins to be able to survive and thrive, we improve our ability to evaluate how expanding human activities in coastal ecosystems may impact their lives, and what approaches may be most effective for keeping them and their populations healthy, while at the same time allowing humans to use and enjoy coastal waters.

In this newsletter you will find numerous accounts by staff, students, and colleagues about progress on their individual research, education, or conservation action projects during 2007. One of the strengths of our program is that it provides opportunities to integrate across a number of individual projects, to understand the complexities of the lives of animals with long life-spans. For example, through many disparate research and conservation projects we are beginning to develop a unique and important appreciation of the potential pervasive role of red tide (harmful algal bloooms, or HABs) in the lives of the Sarasota dolphins.

SDRP and Mote Marine Laboratory research efforts examining red tide toxin levels in dolphins demonstrated that local dolphins did not die directly from the toxin during the 2005 severe red tide. However, dramatic and unsustainable increases in dolphin deaths from attempts at stealing bait and catch from recreational anglers coincided with 1) a precipitous decline in dolphin prey fish in Sarasota Bay (determined from long-term dolphin stomach content analyses and ongoing purse-seining operations), 2) significant declines in dolphin body condition (determined through health assessments), and 3) unprecedented changes in group size and where the dolphins spent their time during the red tide (documented by surveys and behavioral observations). Although dolphin deaths from fishing gear have declined as fish stocks recover in the absence of red tide, supporting our hypothesis about the role of red tide as a driver of this issue at least in the Sarasota area, a new study indicates that some dolphins continue to show interest in bait and catch. This interest appears likely to have been reinforced by angler behavior, such as feeding and releasing catch near dolphins. SDRP is engaged in activities to educate anglers about how to deal with dolphins nearby, how to reduce the amount of discarded fishing gear in the water, and about the problems associated with feeding wild dolphins.

Harmful Algal Blooms, such as red tides, were identified in a December 2007 plenary talk at the Society for Marine Mammalogy's Conference on the Biology of Marine Mammals by Vice Admiral Lautenbacher, head of the National Oceanographic and Atmospheric Administration (responsible for protecting most of the nation's marine mammals), as one of the six greatest threats to marine mammals. Only three presentations of more than 800 given at this biennial international conference dealt with HABs, and all three were by the SDRP. This is just one example of how the long-term, integrated efforts of SDRP researchers are addressing emerging and pressing conservation issues.

The following pages summarize the efforts of our research team during 2007 in a variety of topic areas. Our 12 full- or part-time staff and 14 graduate students, working with colleagues from around the world, have been involved in publishing 7 peer-reviewed scientific articles, with another 20 in press, in revision, or submitted and in review. We have made, or been co-authors on, more than 25 scientific presentations and 14 university or public lectures. In addition to the research efforts, we have grown our international training program, with colleagues and students joining us from around the world to learn our approaches and techniques for application to their own dolphin conservation issues at home. We have been able to accomplish this research, conservation, and education work through the assistance of a number of organizations, including NOAA's Fisheries Service (NMFS), the Batchelor Foundation, Dolphin Quest, Disney, Earthwatch Institute and donations from generous contributors.

We expect another busy year in 2008, continuing many of our ongoing research efforts. In addition, with colleagues, we have submitted proposals to federal programs for new research on the effects of red tide and for using photographic identification surveys with documentation of dolphin skin lesions as an early warning system for emerging health issues in coastal dolphin populations. It will be a year of new challenges, as the federal support that has sustained our program since 2001 comes to an end. We will need to greatly increase private support of our program, in addition to seeking competitive grants, in order to be able to sustain our current highly-productive level of activity. By 2010, when we expect to produce a book summarizing our first 40 years, my hope is that we will have reached a level of self-sufficiency in terms of supporting the ongoing efforts of the Sarasota Dolphin Research Program. With your continued help and support, I am sure that we can achieve this important goal.

For now, my sincere thanks for helping to get us to this point. Please let me know if your travels bring you near Sarasota, so you can visit our lab and perhaps even the dolphins.

Randall Wells, PhD

OUR APPROACH TOWARD HELPING DOLPHINS

Our desire with each research or conservation project in Florida or elsewhere is to contribute to a better understanding of the structure and dynamics of populations of small cetaceans (dolphins, whales, and porpoises), as well as the natural and anthropogenic factors (factors of human origin) that impact them. We use an interdisciplinary and collaborative approach in conducting studies of bottlenose dolphins within a unique long-term natural laboratory. The primary goals of our program include:

(1) collecting biological, behavioral, ecological, and health data of importance to the conservation of small cetaceans, especially bottlenose dolphins,
(2) providing requisite information for bottlenose dolphin conservation to wildlife management agencies,
(3) disseminating the information generated by our program to scientific and general audiences in order to aid dolphin conservation efforts,
(4) using our model program to develop and refine hypotheses regarding bottlenose dolphins in other parts of the species' range as well as other species of small cetaceans,
(5) using the established natural laboratory to develop and test new research tools and methodologies of potential benefit to conservation efforts,
(6) training cetacean conservation workers and students from around the world in the use of these techniques,
(7) applying our unique program expertise to dolphin rescue operations and post-release follow-up monitoring, and
(8) applying the information we gather from free-ranging dolphins to improve the quality of care for dolphins in zoological park settings.

The work toward achieving these goals is conducted under the umbrella of the "Sarasota Dolphin Research Program" (SDRP). This name links the efforts of several organizations that work together to ensure the continuity of the long-term dolphin research in Sarasota Bay. The Conservation, Education, and Training Group of the Chicago Zoological Society (CZS) has provided core staff salaries and administrative and operational support for the program since 1989. Dolphin Biology Research Institute, a Sarasota-based 501{c}3 non-profit corporation established in 1982, provides logistical support with its fleet of six small research vessels, two towing vehicles, computers, cameras, field equipment, etc. Since 1992, Mote Marine Laboratory has provided a convenient base on City Island in Sarasota Bay, with office, storage, and dock space, and easy access to good boat launching ramps. The SDRP maintains academic connections including graduate student sponsorships primarily through the University of California at Santa Cruz, the University of North Carolina at Wilmington, and the University of South Florida. All bottlenose dolphin research reported in this newsletter was performed under the authority of NMFS Scientific Research Permit No. 522-1785.

IN THIS ISSUE

Depredation and fishing interactions involving bottlenose dolphins

By Jessica Powell, MS Candidate, University of South Florida

Over the past few years, the dolphins of Sarasota Bay and elsewhere in the southeastern United States have been increasingly engaged in depredation, the act of stealing or damaging a prey item already captured by some other process such as fishing. Dolphins are stealing bait or catch off fishing lines from piers or boats, stalking fishing boats in order to eat the catch thrown back by anglers, and even begging from boats. The consequences of such behaviors became evident in 2006 when 2% of the Sarasota Bay resident dolphin community died due to ingestion of monofilament line or lures and hooks. Modeling showed that such losses to this population were unsustainable. The purpose of my project is to investigate the relative contributions of a number of factors to the increase in dolphin interactions with anglers.

I am collecting data that will allow me to evaluate factors such as fishing effort, dolphin age, sex, maternal relationships, time spent foraging, habitat use, hearing capabilities, and social patterns. I am looking for significant differences that may exist between animals that interact with anglers and depredate versus those that do not. I am expecting to find depredating animals more often in the presence of fishing boats or piers as well as associating with other dolphins which interact with anglers. I am also exploring whether dolphins that depredate have reduced hearing abilities, making it more difficult for them to feed on their own. Data collection began in May 2007 and will continue through the summer of 2008. I am monitoring fishing piers, both acoustically and visually, in the Sarasota Bay area for dolphin-angler interactions. I am also conducting focal animal behavioral follows, collecting information on fishing line and boat presence, dolphin group compositions, and activities for seven angler-interaction and seven non-interaction animals.

Furthermore, in an effort to raise public awareness and support on this issue, a pamphlet is being created on "Dolphin-Friendly Fishing Tips." The overall goal of this study is to increase the sustainability of the Sarasota Bay dolphin community by reducing the number of dolphin deaths resulting directly or indirectly from entanglement or ingestion of fishing gear. Furthermore, since dolphin depredation and fisheries interactions have been shown to be a problem worldwide, I hope to develop methods that can serve as a template for evaluating and mitigating similar issues in other areas.

This project was made possible by funding provided by the USF College of Marine Science Graduate Assistantship and the Disney Wildlife Conservation Fund.

Angler trying to lure "FB 106" closer.

An angler pulls in his line with bait just before "FB 106" swims by.

"FB 246" swims by two anglers.

Assessing angler knowledge and experience with fishing line debris and wildlife interactions at the Sunshine Skyway Fishing Pier

By Robin Perrtree, BS and Kim Bassos-Hull, MS

Our pilot project on the South Sunshine Skyway Fishing Pier in 2006 demonstrated that the problem of dolphins stealing bait and catch from angler's lines was worse than we expected. In addition, a lack of monofilament recycling bins resulted in a littering problem, allowing potentially-entangling fishing line and tackle to get into the waters surrounding the pier. In 2007 we teamed up with the Ocean Conservancy and NOAA's Fisheries Service (NMFS) to clean-up the fishing line that accumulated on the pier and in the water under the pier. We also conducted surveys to assess the knowledge, awareness, and attitudes of fishermen towards discarded fishing line, and fishing around dolphins. The second phase of this project was to attempt to reduce the amount of monofilament fishing line that is going back into the environment through educational outreach and installation of recycling bins. The expectation is that all of these efforts will reduce the amount of fishing line in the environment, thereby reducing the chance of entanglement for marine life, including dolphins.

The main role of the Sarasota Dolphin Research Program in this project is to assess the effectiveness of the project. For the first phase, we completed pre-clean-up surveys of 400 fishermen in June and July to assess current knowledge about: 1) the harm monofilament can do in the environment, 2) current fishing practices, and 3) human-dolphin interactions. Sixty-five percent of the anglers surveyed had seen animals entangled in fishing line (including birds, dolphins, manatees, sea turtles, and fish), and 53% reported having a dolphin steal either their bait or catch, indicating that wildlife interactions are a very serious problem at this pier. Unfortunately, most of the fishermen (70%) toss leftover bait back into the water (Figure 1), which encourages wildlife to remain in the vicinity of the pier, where they could become entangled in the gear of other fishermen. Our survey showed that, not surprisingly, fishermen who have had dolphins steal their bait or catch tend to have a slightly more negative view towards dolphins than those who have not had interactions.

The underwater clean-up which occurred over a several week period in August and September, recovered 218 castnets and 4,600 pounds of entangling debris (including nets, ropes, and monofilament line, Figure 2). During the pier and surrounding area ground clean-up, which was part of the "International Coastal Cleanup" on 15 September, 170 volunteers recovered 2,023 pounds of litter including 1,737 pieces of fishing line. The next phase of this project began in October when the Ocean Conservancy installed 40 recycling bins and started a pier-walker program to educate fishermen about discarded fishing line and the new recycling program at the pier to prevent future accumulation of line in the environment. NMFS is also preparing to install ten signs with "dolphin friendly fishing tips," intended to reduce the incidence of both 1) dolphins stealing from the fishermen, and 2) fishermen feeding the dolphins both intentionally and accidentally (through released fish and leftover bait that is tossed into the water).

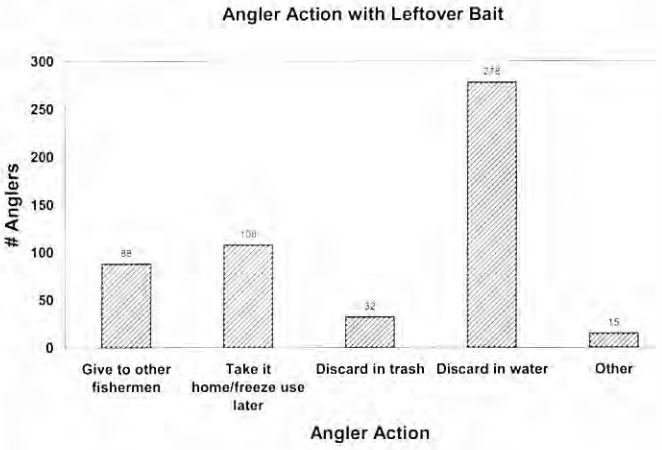


Figure 1. Fate of left-over bait.

The pier walkers who are talking to the fishermen and emptying the monofilament recycling bins have already reported a decrease in the amount of fishing line they are finding on the ground, and large quantities of line in the bins. As the educational component of this project continues into 2008 we plan to evaluate how angler knowledge about monofilament and wildlife issues change. We also hope to document quantitatively the decreased amount of monofilament going into the environment. Additionally, we hope that fishermen consider adopting the suggested "dolphin friendly fishing tips" (see next article), thereby reducing the number of dolphins stealing from fishermen and preventing dolphin deaths from recreational fishing gear. This has the potential to reduce the frustration felt by fishermen when their catch is lost to dolphins. This project was funded by a NOAA Marine Debris Prevention and Removal grant and a National Fish and Wildlife Foundation grant with matching funds provided by the Chicago Zoological Society and Mote Marine Laboratory.

Figure 2. Some of the underwater debris from the pier cleanup effort (218 castnets and 4,600 pounds of entangling debris were collected in total).

Dolphin-friendly fishing tips — Help protect wild dolphins while fishing

By Kristin Thoms, Stacey Carlson, and Laura Engleby, NOAA's Fisheries Service

As is evident from the previous two articles, dolphin interactions with recreational fishing gear are on the rise. Here are some tips to help maintain your bait, catch and gear, while helping to prevent serious or even fatal injuries to dolphins and other sea life. These "best fishing practices" were developed through the efforts of a team of researchers from NOAA's Fisheries Service, the Chicago Zoological Society, Mote Marine Laboratory and Hubbs-Sea World Research Institute. They were developed by reviewing information gathered from research observations at fishing piers and elsewhere, interviewing recreational anglers and fishing guides, and re-emphasizing current conservation efforts and existing regulations.

1) Never feed wild dolphins – it's harmful and illegal
- Feeding is illegal under the federal Marine Mammal Protection Act.
- Feeding teaches dolphins to beg for food and draws them dangerously close to fishing gear and boat propellers.

2) Reuse or share leftover bait
- Freeze leftover bait for later or give it to your fishing neighbor.
- Dumping leftover bait may attract dolphins to fishing areas to beg or steal bait and catch.

3) Reel in your line if dolphins appear
- Reel in and wait for dolphins to pass to avoid losing your bait or catch and prevent potential harm to dolphins.
- Never cast towards dolphins.

If a dolphin approaches your line, reel in and wait until it leaves.

4) Change locations if dolphins show interest in bait or catch
- Move away from dolphins to avoid unintentionally hooking one and prevent damage to gear or catch.

5) Release catch quietly away from dolphins when and where it is possible to do so without violating any state or federal fishing laws or regulations
- Feeding or attempting to feed a marine mammal in the wild is prohibited.

6) Check gear and terminal tackle
- Inspect your gear often to avoid unwanted line breaks – even small amounts of gear in the water can be harmful to wildlife if entangled or ingested.

7) Use circle and corrodible hooks
- Circle hooks may reduce injuries to fish, dolphins, and sea turtles.
- Corrodible hooks (any hook other than stainless steel) eventually dissolve.

8) Stay at least 50 yards away
- Stay a safe distance from wild dolphins to avoid causing potential harm.
- Maintaining a safe distance helps keep dolphins wild.

9) Recycle fishing line
- Place all broken or used fishing line in a Monofilament Fishing Line Recycling Bin.
- If no recycling bins are available, place broken or used fishing line that has been cut into pieces in a lidded trash can.

10) Stash your trash
- Littering is illegal and can be harmful to wildlife.
- Collect any trash you've left behind and place it in a lidded trash can.

To report feeding or harassment of wild dolphins, call the NOAA Fisheries Southeast Enforcement Division at: 1-800-853-1964. To report an injured or entangled dolphin, or other wildlife, call the Florida Fish and Wildlife Conservation Commission at: 1-888-404-FWCC (3922).

Sarasota dolphins serve as model for evaluating fates of dolphins injured in fisheries

By Randall Wells, PhD

NOAA's Fisheries Service (NMFS) is charged under the federal Marine Mammal Protection Act (MMPA) with responsibility for reducing deaths and serious injuries of marine mammals from fisheries. NMFS is tasked with determining whether injuries from entanglement in, or ingestion of, commercial fishing gear, or other interactions with humans are likely to lead to mortality. The determinations of numbers of mortalities lead to decisions about whether, for example, fisheries are allowed to continue or must modify their activities to come into compliance with the MMPA. When a dolphin is last seen swimming with gear attached to it, for example, as occurs with pilot whales or Risso's dolphins in pelagic longline fisheries, or with a major laceration from a vessel strike, it is difficult to evaluate the seriousness of the injury and predict whether the animal will survive. As an alternative to offshore studies, it has been possible to obtain relevant data under more tractable circumstances, from our long-term data on the bottlenose dolphins of Sarasota Bay, Florida

In September, I presented an invited paper on the consequences of serious injuries on dolphin survival and reproduction at the NOAA/NMFS Serious Injury Technical Workshop in Seattle. Our long-term research was acknowledged as being the best source of data available on this issue for small cetaceans. We are preparing a publishable manuscript based on the presentation, as defensible, peer-reviewed findings are needed by NMFS in making decisions that are likely to lead to law suits by the commercial fishing industry.

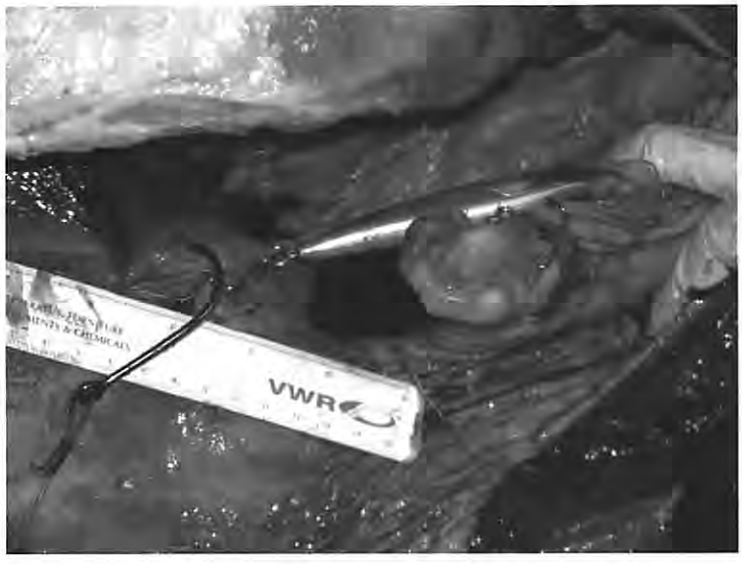


Figure 1. Sarasota Bay bottlenose dolphin "FB 100" upon necropsy by Mote's Stranding Investigations Program, showing the large single hook and the treble hooks of a fishing lure embedded in the throat and "goosebeak." Such injuries eventually result in death.

Figure 2. Flipper of bottlenose dolphin "Toro" showing the lesions resulting from multiple constrictive wraps of line.

Several kinds of injuries seem to have a high probability of leading to mortality, including ingestion of fishing gear when it involved hooks becoming embedded in the throat, the goosebeak, or the esophagus, and line wrapped around the goosebeak. Multiple, constrictive wraps of line around the body, and especially at the insertions of the fins, lead to deep lacerations that can result in amputation, blood loss, impaired mobility, or infection. Although dolphins with ingested gear and severe entanglements were often still able to swim following their initial encounter with the gear, mortality was likely to have occurred eventually. A reasonable precautionary approach would be to consider dolphins with ingested gear or severe constrictive entanglements around the flipper and fluke insertions as mortalities.

Other severe injuries are less likely to lead to death. Vessel strike injuries from propellers appeared to be survivable if they involved only soft tissue, and not bones. Dolphins have been observed to survive amputations or disfigurements of the distal ends of flippers, flukes, and dorsal fins from lines and undetermined causes. It is important to note, however, that evaluations of healed wounds do not take into account the possibility of immediate mortalities from similar injuries.

Extrapolations of findings and conclusions from injured coastal bottlenose dolphins to other cetacean species facing similar issues but with different gear or vessels must be done with caution and with consideration of the best information available from the specific situation of concern. However, in the absence of adequate information for specific species or fisheries, the bottlenose dolphins of Sarasota Bay can serve as a useful surrogate for modeling impacts. NOAA's Fisheries Service will be using a write-up of this presentation as a background document for its joint meeting of the Atlantic, Pacific, and Alaskan Scientific Review Groups in January 2008 in Monterey, California.

Juvenile dolphin behavioral development and survival strategies

By Katherine McHugh, PhD Candidate, University of California, Davis

The juvenile life stage is a fragile and formative time for young animals first learning to navigate complex social and ecological environments once independent of their mothers. While bottlenose dolphins are among the best studied cetaceans, virtually no work has focused on understanding behavioral development between weaning and sexual maturity or determining factors influencing survivorship of independent juveniles. Because of SDRP's long-term research on the bottlenose dolphin communities in the area, the "natural laboratory" of Sarasota Bay provides a unique opportunity to address these issues.

To this end, the main objectives of my dissertation project are: 1) to develop a better understanding of social and behavioral development of juvenile bottlenose dolphins and 2) to determine the major behavioral and ecological influences on survival of free-ranging juvenile dolphins. I am investigating these questions by combining long-term sighting and mortality data from the resident dolphin community in Sarasota Bay with new information collected via boat-based surveys and focal animal observations on individually-identifiable juveniles, which will allow for both a longitudinal and cross-sectional perspective on juvenile behavior.

Preliminary fieldwork on this project began in summer 2005 and continued in summer 2006, both of which were at least partially affected by red tide. In 2007, I spent the bulk of my time in the field, completing both winter and summer field seasons of behavioral observations. So far, I have collected over 375 hours of focal animal behavioral follow data on 27 individuals (14 females:13 males) ranging in age from 3 to 12 years old. While a few of these animals have died, gone missing, or had calves of their own since we first started the project, most are still frequently seen in Sarasota Bay, and I will finish observing the remaining focal juveniles in 2008.

Katie McHugh calls data from the observation tower of "Nai'a" to interns Mackenzie Consoer and Laura Bagge while intern Christina Toms photographs the dolphins in the group.

Behavioral observation research vessel "Nai'a" moves on to another group of dolphins after completing focal animal behavioral observations.

One of the main areas I've explored so far has been the effects of red tide on juvenile dolphin behavior. While not originally intended to be a focus of this study, the first two field seasons coincidentally took place during periods when red tide was a factor. Preliminary analysis has shown that both social behavior and activity budgets differ substantially during red tide. Juveniles associated in larger groups and with significantly more community members, and spent less time foraging and more time socializing during red tide events, potentially as a consequence of underlying changes in relative prey availability and distribution (see article in Ecology section).

Additionally, I've spent time this year working with long-term SDRP data to examine the transition to independence for dolphin calves, calculating ages of separation and exploring life history, body condition, and social factors influencing the timing of independence for calves born into the Sarasota community since 1980. I am now beginning to investigate sex and seasonal differences in juvenile behavior (primarily association patterns, habitat use, ranging patterns, and activity budgets) and will start analyzing age-related changes in behavior and exploring factors influencing survival to adulthood in the coming months. This research will reveal the range of variability in developmental trajectories of bottlenose dolphins and provide missing data on how juvenile dolphin behavior patterns vary by sex, age, season, and time since weaning. Such information will provide a more comprehensive understanding of dolphin life history and survival strategies, which may have implications for conservation and management of long-lived coastal cetaceans.

Support for this project has come from the Chicago Zoological Society, NOAA's Fisheries Service, the UC Davis Graduate Scholars Fellowship in Animal Behavior, the Animal Behavior Society's Cetacean Behavior and Conservation Award, and an NSF Graduate Research Fellowship.

Studies of whistle development and perception

By Laela Sayigh, PhD, Woods Hole Oceanographic Institution and University of North Carolina, Wilmington, and Vincent Janik, PhD, Sea Mammal Research Unit, St. Andrews, Scotland

We continue to work toward creating a fully digital whistle database that will be accessible to other researchers. During each capture-release session, high-quality recordings are obtained, making the Sarasota Whistle Database the most comprehensive of its kind in the world. Many individuals have been recorded on multiple occasions, over periods of many years, enabling us to examine questions about dolphin communication that are not possible elsewhere. This year, we used this database to address a claim made in a recent paper that signature whistles do not exist (McCowan & Reiss 2001; *Animal Behaviour* 62:1151-1162). In our study, we randomly selected 20 whistles from each of 20 randomly selected dolphins in the Sarasota Whistle Database, and asked judges to group whistles according to their overall contour, or pattern of frequency changes over time (Figure 1). Although the judges had no knowledge about the number of dolphins present in the sample, they consistently grouped together whistles produced by the same dolphin (an average of 18.9 out of 20 whistles of a given dolphin were grouped together, and an average of only 0.5 out of 380 possible whistles of other dolphins were included in these groups). Our paper, entitled "Facts about signature whistles of bottlenose dolphins" was published in the journal Animal Behavior, and provides unequivocal evidence for the production of individually distinctive signature whistles by bottlenose dolphins.

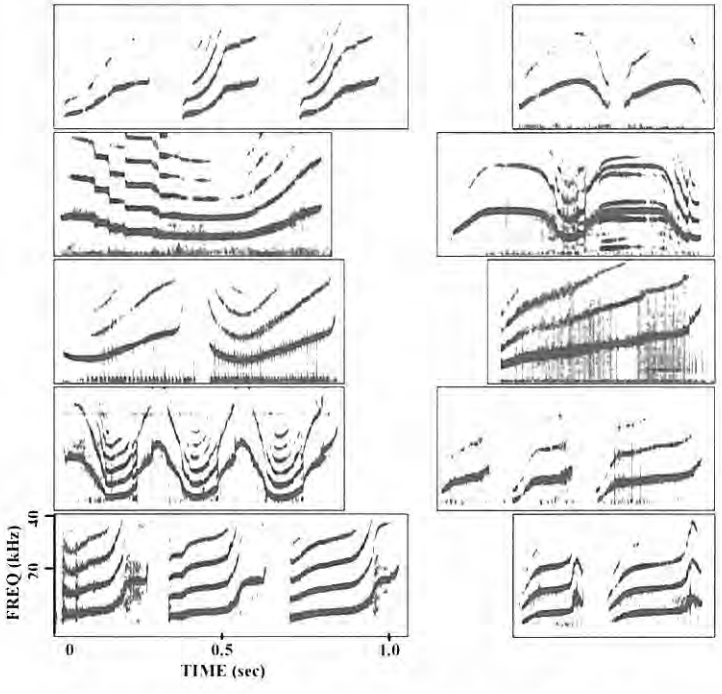


Figure 1. Examples of signature whistles of ten different individual bottlenose dolphins recorded during temporary capture in Sarasota, Florida. Spectrograms were made with AVISOFT SASLab Pro, at a sample rate of 80,000 Hz and a 256 point FFT.

Currently, we have several avenues of research underway:

1) We are carrying out playback experiments during capture-release to find out whether dolphins can recognize each other by means of voice cues. Experiments that have been described in previous issues of *Nicks 'n 'Notches* demonstrated that dolphins can recognize the frequency modulation patterns of the signature whistles of other individuals, but we do not know if they also can recognize animals by the tone of their voice. We are playing back non-signature whistles to dolphins to see whether they recognize who produced them.

2) We are also using playback experiments to look at how dolphins react when their own signature whistle is copied by someone else. Wild dolphins sometimes mimic the signatures of others, presumably to address or find a specific animal they are looking for. In this study we are looking at how dolphins react to a playback of a copy of their own whistle. This may help us understand whether dolphin signature whistles are used like human names to address individuals.

3) We are studying the factors influencing signature whistle development in bottlenose dolphin calves. Bottlenose dolphins are unusual among mammals in that they learn their individually distinctive signature whistles. We have recorded signature whistles of 111 bottlenose dolphin calves during brief capture-release events in Sarasota Bay, Florida since 1975. Social association data, consisting of at least 10 sightings during the first year of life, are available for 74 of these calves. We are assessing similarity of the calves' whistles to their mothers, siblings, close associates, and infrequent associates using quantitative comparisons. Visual assessment of whistles from 99 mother-calf pairs has found that 34% of calves had signature whistles similar to those of their mothers. Of the remaining calves, some still shared acoustic features with the mother, such as non-linear elements or constant frequency portions. Several calves produced whistles similar to those of older siblings. We are examining a variety of factors, such as sex, birth order, number of associates, and social association patterns of the mother as possible influences on vocal development. Our results show that more than half of all calves develop whistles that show little resemblance to the mother's whistle, but that mothers and siblings are often important vocal models to their calves.

This work was funded by a grant to L. Sayigh and R. Wells from Harbor Branch Oceanographic Institution's Protect Wild Dolphins Program, and a Royal Society University Research Fellowship from the UK to V. M. Janik.

Passive acoustic detection of dolphins in Sarasota Bay

By David Mann, PhD, and Peter Simard, PhD student, University of South Florida

Bottlenose dolphins produce a variety of sounds, most of which are either echolocation or whistles (Figure 1). Echolocation is used mainly in navigation and foraging; a rapid series of short "pulsed" broadband sounds are produced by the dolphin, and the returning echo is used by the animal to determine information about its environment (for example, the presence, size, and movement direction of a fish). Whistles are relatively long, lower frequency "tonal" sounds. These sounds are thought to be mostly used in social contexts. The Sarasota bottlenose dolphin community is one of only two populations of dolphins worldwide which have been shown to produce "signature whistles", whistles which are unique to an individual. The highly acoustic nature of dolphins makes the use of passive acoustics, or listening, a useful tool in detecting their presence. The purpose of this project is to use underwater recordings to detect bottlenose dolphins in Sarasota Bay and to monitor noise levels which could potentially disturb these dolphins.

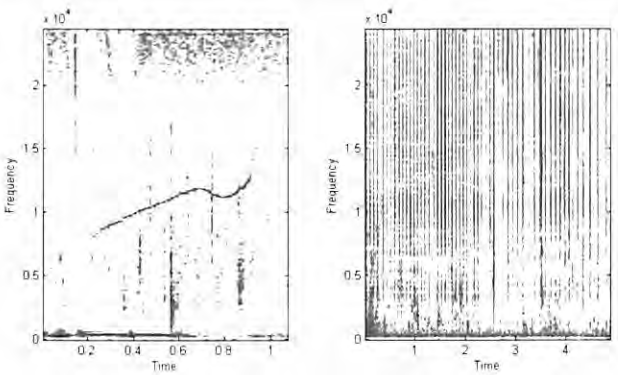


Figure 1: Bottlenose dolphin whistle (left) and echolocation (right), recorded in New Pass, Sarasota Bay (48,828 Hz).

Hydrophones were deployed in November 2005 in New Pass, Sarasota Bay (directly behind the Ann and Alfred Goldstein Marine Mammal Center at Mote Marine Laboratory; Figure 2). Hydrophone data were digitized and saved onto an external hard drive, and all processing and data storage components were housed in a waterproof "dock box" located near the hydrophone. Data from the external hard drives can be analyzed in two ways. Manual inspection of the data files is practical for small data sets (by listening to them or visually identifying the recognizable waveforms of dolphin vocalizations in acoustics software). However, for large data sets this method is too labor intensive. The MATLAB program DPASS (Dolphin Passive Acoustics Surveillance System) uses a series of mathematical functions to identify dolphin whistles and echolocation pulses from acoustic files. The New Pass recordings, which currently constitute several terabytes of data, can only be analyzed with such a technique.

One question that can be addressed with these data is the overlap between visual sightings conducted by SDRP and acoustic detection. To investigate this question, 38 visual survey times were selected and the detection of dolphins by visual and acoustic methods were compared. During a total of 10 visual sightings, four had corresponding dolphin vocalizations, and six did not. In addition, there were five incidences of dolphins being heard, but not seen. These results suggest that dolphins are frequently silent as they use the pass; however we are currently determining the precise acoustic range of the hydrophone. Once this is determined, we can use the exact GPS position of the dolphin sightings to test for overlap in a more rigorous manner. For this data set, whistles and echolocation clicks were identified manually; however DPASS was tested using a subset of the New Pass data. 50 files with dolphin whistles and 100 files without (and containing various levels of boat noise) were used to test DPASS. The program was able to correctly identify 92% of the dolphin whistles correctly, with a 2% false detection rate.

New Pass is a high traffic area for recreational boats, being one of the only passes between Sarasota Bay and the Gulf of Mexico. This results in a great deal of noise in the aquatic environment. High levels of background noise have been definitively shown to affect cetacean behavior. One of the goals in this project is to quantify the boat noise present in New Pass over time. This has important conservation implications for the bottlenose dolphins of Sarasota Bay and the Gulf of Mexico. In addition, the use of acoustics allows us to monitor these dolphins continuously, including at night and in poor weather conditions. In the winter of 2008 we will be wiring the hydrophones into the Marine Mammal Building and developing a web page to broadcast recordings from the hydrophones.

We wish to thank the Harbor Branch Oceanographic Institution's Protect Wild Dolphins program for providing the funding making this research possible.

Figure 2: Location of four hydrophone array (white circles) in New Pass, Sarasota Bay.

Bottlenose dolphin health assessments in Sarasota Bay

Health assessments were not conducted in Sarasota Bay during 2007, in order to provide breathing time for staff and colleagues to process samples, analyze data, prepare reports and manuscripts, and develop ideas for future research, as evidenced in the information presented below.

Persistent organohalogen contaminants in Sarasota Bay's bottlenose dolphins

By Jennifer Yordy, PhD Candidate, Medical University of South Carolina and National Institute of Standards and Technology.

Bottlenose dolphins are long-lived, fish-eating marine mammals that are at or near the top of the food web in coastal ecosystems. As a result, they are vulnerable to accumulating heavy burdens of persistent organohalogen contaminants (POCs). POCs are man-made compounds that are used in industry, agricultural and domestic settings as electrical insulating fluids, flame retardants and insecticides. They were released into the environment before their toxicities and environmental consequences were fully understood; however, we now know that POCs can persist in the environment for decades and can have effects ranging from cancer to effects on the immune system, and perhaps increase the rate of first-born mortality. POCs found in dolphins now include compounds such as the polychlorinated biphenyls (PCBs) and chlorinated pesticides (for example, DDT and its metabolites) which were banned from production in the 1970s, as well as compounds in active use such as the polybrominated diphenyl ethers (PBDEs). Mixtures of all of these compounds have been readily detected in the blubber, milk, and blood of the resident bottlenose dolphins of Sarasota Bay.

It is well known that contaminant mixtures may have toxicities differing significantly from those found for single compounds. Therefore, knowledge regarding mixture composition is important for understanding the link between contaminant burden, adverse health, and reproductive effects in marine mammals. Many factors influence how dolphins are exposed to contaminant mixtures, including maternal exposure, birth order, diet, age, sex, reproductive maturity, and nutritional state. The Sarasota Dolphin Research Program provides an unparalleled opportunity for assessing contaminant exposure at the population level as many of these parameters are known for the resident bottlenose dolphins.

Levels of POC's in prey fish are lower than those in dolphin blubber, suggesting that contaminants are magnified through the food web.

To assess the degree of POC exposure and potential health and reproductive effects in the Sarasota Bay bottlenose dolphin population, approximately 195 blubber, blood and milk samples were collected for contaminant analysis during capture and release health assessments since June 2000. In addition, major dolphin prey fish, including pinfish, pigfish, and mullet were analyzed for 81 POC compounds to assess the role of diet on contaminant exposure.

In dolphin blubber, legacy compounds such as PCBs and 4,4'-DDE (a toxic metabolite of DDT) were found at high levels (0.5- 52 parts per million or ppm). Previous work suggests that 17 ppm is a threshold level above which health and reproductive impacts might be expected for bottlenose dolphins. Emerging POCs such as PBDEs were still detected at significant concentrations (0.01-9.7 ppm). POC levels in dolphin milk (0.13- 2.3 ppm) and prey fish (0.002-0.08 ppm) were dramatically lower than those found in dolphin blubber suggesting that dolphins efficiently take up contaminants from their diet and that POCs are biomagnifying in dolphins within Sarasota Bay.

Statistical analyses of POCs in dolphin blubber and milk indicated that adult females and milk had POC mixtures that are different from those found in juvenile and adult male dolphins. These results suggest that females selectively offload POCs through the milk to their calves. Since POC mixtures differ in toxicity, there may be health implications for the different life history groups within the Sarasota population. Future plans include assessing the toxicity of these mixtures using *in-vitro* bioassays. This data may also be used in the future to assess potential health effects in other wild cetacean populations.

Funding for this project is provided by NOAA's Fisheries Service and the National Institute of Standards and Technology. Dolphin Quest provided opportunities for sample collection through the health assessment research.

Jennifer Yordy carefully places samples in liquid nitrogen for transport to the lab.

Effects of mercury on Sarasota's bottlenose dolphins

By Todd O'Hara, DVM/PhD, Victoria Woshner,DVM/PhD, Carla Willetto, DVM, and Debra Miller DVM/PhD, University of Alaska, Fairbanks

Blood and epidermal (outer layer of skin) samples from free-ranging bottlenose dolphins captured and released during health assessments in Sarasota Bay were evaluated for concentrations of mercury (Hg), selenium (Se), stable isotopes of carbon (C) and nitrogen (N) to address diet patterns of the dolphins, and blood glutathione peroxidase activity (antioxidant enzyme dependent on selenium) in conjunction with routine hematology (examination of blood) and serum chemistry panels (for example, measures of kidney, liver and other organ system function). We evaluated these multiple endpoints to determine if: 1) mercury could be producing adverse effects (toxicosis), 2) selenium may not be present in adequate chemical forms and amounts (deficiency), or 3) both (mercury toxicosis and selenium deficiency – a possible nutrient and chemical interaction).

Major objectives were to: 1) quantify and describe relationships among mercury, selenium, glutathione peroxidase, and stable isotopes of C and N in blood and epidermis; 2) elucidate major parameters that influence blood mercury and glutathione peroxidase activity; 3) relate measures of tissue mercury, selenium, and glutathione peroxidase to specific ecological, hematological, morphological, or life history parameters, including season, sex, age, and trophic level. This resulted in a manuscript that was recently submitted to a peer-reviewed scientific journal.

As expected, mercury in both epidermis and blood is almost exclusively methylmercury (the more bioavailable and toxic form as compared to inorganic forms). Epidermal concentrations of mercury and selenium reflect (correlate with) their respective amounts in blood, albeit at several times blood concentrations of mercury (epidermis has been proposed as a pathway for excretion of mercury as it sheds from the animal). The strong association between blood mercury and serum selenium, in conjunction with a lack of significant correlation between blood mercury and glutathione peroxidase, implies that a substantial proportion of blood mercury is affiliated with another selenium-containing moiety or is related to recent dietary intakes (for example, trophic level, intensive fish consumption). It is well known that mercury and selenium interact (selenium can make mercury less toxic) and we need to better understand how increased exposure to mercury may increase the demand for dietary selenium. Circulating blood mercury concentrations correlated with serum selenium concentration (age and the trophic level in the food web were found to be important considerations for the status of mercury and selenium). Current selenium concentrations in Sarasota Bay dolphins appear adequate for maintenance of blood glutathione peroxidase activity. However, dolphins appear to be subject to seasonal variability which might render them more vulnerable to toxic effects of mercury at some times of the year. We need to further assess the condition of these dolphins and their prey fish. This interaction could also be important for rehabilitation efforts to consider as well (for example, adequate selenium levels for dolphins). The support of Dolphin Quest for providing sample collection opportunities during health assessments is much appreciated, as is the support of NOAA's Fisheries Service for sample processing.

Dolphin health and human health

By Stephanie Venn-Watson, DVM/MPH

It is believed that humans and dolphins have shared blood glucose transport systems to support large brains Several collaborative efforts are underway to examine disease processes in dolphins relative to human medicine. Recent research has shown that bottlenose dolphins may get mild colds from a virus called Tursiops truncatus parainfluenza virus type 1(TtPIV-1). Parainfluenza viruses are commonly associated with colds in humans and dogs and have been found in many mammals throughout the world. A blood test was developed to test dolphins for exposure to TtPIV-1, and we used this test on stored, frozen samples collected from wild bottlenose dolphins living in Sarasota Bay. The study demonstrated that 66% of healthy Sarasota dolphins had evidence of exposure to parainfluenza virus during 2005-2006. Future research on TtPIV-1 may include its potential as a vaccine for humans against similar parainfluenza viruses.

Despite living in very different environments, bottlenose dolphins and humans have uniquely shared physical characteristics, including large brain size and red blood cells that can transport blood sugar (glucose). that require high amounts of glucose to function (Venn-Watson S., Ridgway SH. 2007. Big brains and blood glucose: Common ground for diabetes mellitus in humans and dolphins. *Comparative Medicine* 57:390-395). Recent studies have shown that healthy dolphins, after eating a meal, have a metabolism similar to people with diabetes. Ongoing collaborative research involves studying blood chemistries in healthy, wild bottlenose dolphins living in Sarasota Bay to try and identify clues about their metabolism that may benefit people with diabetes as well as enhance ideal diets for dolphins under the care of humans.

Sometimes humans and dolphins come into close proximity as occurred at Siesta Beach in March 2007.

Effects of red tide on dolphins, sea turtles and sea birds

By Deborah Fauquier, DVM, PhD student, University of California, Santa Cruz

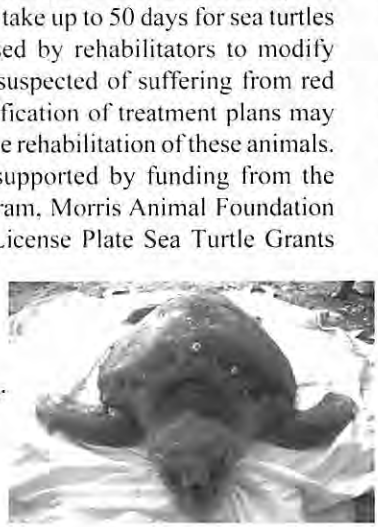
We have been investigating the impacts of red tide on Sarasota Bay dolphins, sea turtles and sea birds over the last several years. Although the Sarasota Bay area did not experience a red tide bloom during 2007 we are still investigating the impacts of the severe red tide blooms in 2005 and 2006 on these species. We have collected data from stranded dolphins, sea turtles, and sea birds to determine brevetoxin (the toxin produced by red tide organisms) levels in these species and the effects brevetoxin has on increasing morbidity and mortality in these species. In sea turtles and sea birds we have been able to collect blood and/or fecal samples from live animals suffering from brevetoxicosis and determine how quickly or slowly these animals clear the toxin from their blood.

Seventy-six percent of dolphins stranding during 2006-2007 (n=21) had brevetoxin levels above the detection limit and were classified as brevetoxin positive animals. Of these positive animals, 30% were determined to have died from brevetoxin intoxication or it was implicated as a contributory factor to death.

Sea birds and sea turtles stranding during 2005 and 2006 had clinical signs of red tide intoxication including circling, paralysis, and seizures. Red tide intoxication appeared to be the primary cause of stranding in 46 of 74 (62%) live stranded sea birds and 30 of 40 (75%) sea turtles. Sea birds were able to clear the toxin from their blood in 10 days, while it took up to 50 days for some sea turtles to clear the toxin due to their lower metabolic rate (Figure 1).

Findings from this study are only preliminary, but the fact that the majority of the live and dead sea birds and sea turtles sampled during the 2005 and 2006 red tide events were positive for the red tide toxin indicates that red tide intoxication plays a larger role in the morbidity and mortality of sea bird and sea turtles off the west coast of Florida than previously recognized. In addition, the information that sea birds can clear the red tide toxin from their bodies within 10 days of rehabilitation whereas it may take up to 50 days for sea turtles to clear the toxin can be used by rehabilitators to modify treatment plans for animals suspected of suffering from red tide intoxication. This modification of treatment plans may lead to increased success in the rehabilitation of these animals.

Our research was supported by funding from the John H. Prescott Grant Program, Morris Animal Foundation and the Florida Sea Turtle License Plate Sea Turtle Grants Program.



"Zach", a loggerhead turtle rescued near Boca Grande, Florida on 8 September 2006. He was treated for red tide toxicosis at Mote and then released on 17 November 2006.

Studies of dolphin milk composition

By Kristi West, PhD, Regina Eisert, and Olav Oftedal, PhD, Smithsonian Institution

Free-ranging bottlenose dolphin calves may consume milk as either a sole or combined energy source for the first several years of life. Our project aimed to determine the nutritional value of milk received by known-age bottlenose dolphin calves in Sarasota Bay including the percentage of fat, protein, water, sugar and caloric content. We were also interested in the relationship between milk and calf survivorship, age, size and body condition of both mothers and calves. Additionally, our group began research to determine when Sarasota Bay's dolphin calves are able to obtain nutritional resources (prey fish) for themselves. This objective was met through the first time application of a novel dietary biomarker technique to establish if any given dolphin has recently fed on solid food.

Our study results were obtained by the proximate analysis of forty-six milk samples that were collected between 1988 and 2006 during the temporary capture and release of 30 individually identified bottlenose dolphin mothers from Sarasota Bay. There was no significant relationship between calf survivorship and milk composition. However, calf mass increased significantly with the percentage of milk fat and varied inversely with milk water and potassium content. We have also analyzed serum samples obtained during temporary capture and release efforts from a number of known age mother and calf pairs in Sarasota Bay. These samples have been analyzed to determine the amount of dietary biomarkers which provide insight into recent feed history of the individual dolphins. A significant relationship was apparent between the ranking of biomarker concentrations in the paired mothers and calves. This suggests that paired mothers and calves do not forage separately, but instead if the mother is eating a large meal, the calf is likely to be simultaneously ingesting a substantial amount of food. It is likely that dolphin calves learn about foraging grounds and prey capture techniques from their mothers while continuing to suckle. Additionally, the concentration of dietary biomarker and age were significantly related in the Sarasota dolphin calves. It is likely that this reflects an increasing amount of solid food intake in growing calves. Our wild dolphin calves were aged between almost 2 years of age and 5 years, a period of rapid growth probably fueled by increased food intake.

Further investigations into dolphin calf nutrition are needed, but our research indicates that it is vital that sufficient prey is available for lactating mothers. This is important to ensure high fat milk can be provided to dolphin calves and that resources are available for simultaneous foraging of mothers and their calves.

This research was supported by the Harbor Branch Oceanographic Institution's Protect Wild Dolphins program, and samples were collected through Dolphin Quest's support of capture-release operations for health assessment.

Recording the thermal behavior of wild dolphins.

By Andrew Westgate, PhD, Ann Pabst, PhD, Bill McLellan, BS, and Erin Meagher, PhD Candidate, University of North Carolina, Wilmington.

Since 1999 we have been developing and testing new ways to study the thermal behavior of wild bottlenose dolphins. Over the course of this six-year project we were able to collect detailed data records from a large number of dolphins in the Sarasota community. Recently, we published the first in a series of papers that will examine this important data set. The paper, which came out this past summer, was published under the title "A new device to remotely measure heat flux and skin temperatures from free-swimming dolphins", in the *Journal of Experimental Marine Biology and Ecology* (JEBMB 346:45-59).

Our objectives for this project were to record how dolphins respond thermally to their environment. We all know that that if a dolphin gets too hot it can't just turn up the air conditioning! It must to be able to respond physiologically to keep its body at an optimal temperature, which is about 99 degrees. To meet this objective we developed a unique data logger that we could attach to the dorsal fin of a dolphin using a series of tiny suction cups (just like the ones on the back of your bathmat! - see Figure 1). The logger sat on the dorsal fin and, by way a small sensor, recorded how much heat the dolphin was giving off. The tags were designed to pop off after a few hours, and they floated so that the radio transmitter's antenna was above the water's surface, so we could retrieve them. Back at the lab, we downloaded the heat sensor data along with other information including: the depths to which the animal dove, water temperature, skin temperature, and the animal's speed through the water. By analyzing these data together it is now possible to see how heat loss patterns change as an animal moves about in its natural habitat.

Figure 1. A thermal logger positioned on the dorsal fin of a male bottlenose dolphin.

This first paper describes in detail how the pack was designed and built and gives examples of the kinds of data that it can collect. If we look at Figure 2 we can see records from two tag deployments; the upper collected in summer when water temperatures were warm, and the lower in winter when water temperatures were much cooler. Heat loss by the dolphin varies over the course of both these deployments but drops off to very low levels in the latter part of the winter deployment. We believe that this response is due to the cooler water temperatures and indicates that the animal is slowing down its heat loss to preserve body heat. These and other records will be analyzed in much more detail for upcoming publications. In the end, we will hopefully have a much clearer understanding of how dolphins cope in both warm and cold conditions. These insights may prove especially valuable as sea temperatures respond to global warming. We thank Dolphin Quest for support of the capture-release operations for health assessment that provided tagging opportunities, and NOAA's Fisheries Service for support for working up our data.

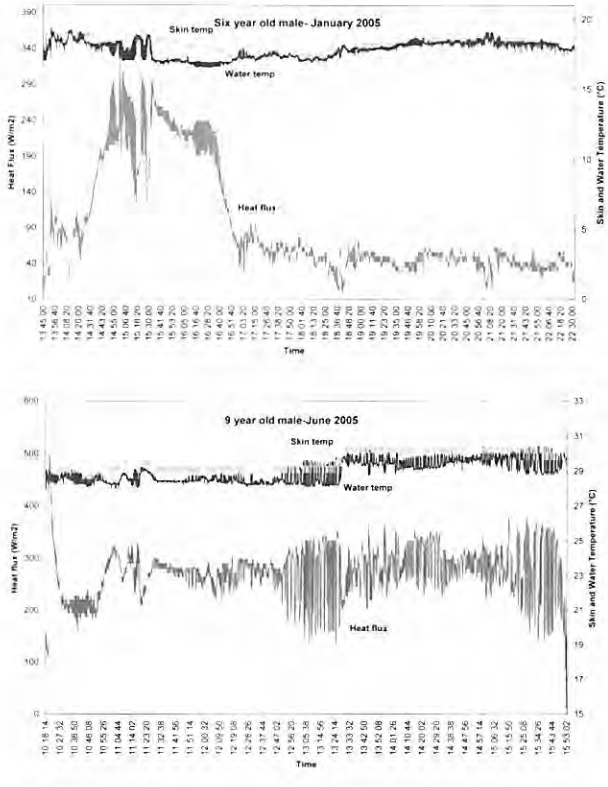


Figure 2. Temperature and heat flux records obtained from two dolphins; the upper in Winter and the lower in Summer.

Marine Mammal Unusual Mortality Events occurring at record levels

By Randall Wells, PhD, Chair, Working Group on Marine Mammal Unusual Mortality Events

Following the large-scale mortality of bottlenose dolphins along the U.S. Atlantic seaboard in 1987-1988, and the occurrence of even larger mortality events in European waters involving seals and dolphins, NOAA's Fisheries Service (NMFS), with involvement by the U.S. Fish and Wildlife Service, established the Working Group on Marine Mammal Unusual Mortality Events (WG) in the early 1990's. I was a charter member of the original WG, and after being asked to return to the WG in 2004, I currently serve as chair. The WG is tasked with determining when a situation involving unusual deaths or illnesses of marine mammals warrants formal designation as an Unusual Mortality Event (UME), which then sets in motion a scientific investigation process and makes federal funds available.

The following criteria are used to evaluate whether an event qualifies as a UME:

1. A marked increase in the magnitude or a marked change in the nature of morbidity, mortality or strandings when compared with prior records.
2. A temporal change in morbidity, mortality or strandings is occurring.
3. A spatial change in morbidity, mortality, or strandings is occurring.
4. The species, age, or sex composition of the affected animals is different than that of animals that are normally affected.
5. Affected animals exhibit similar or unusual pathologic findings, behavior patterns, clinical signs, or general physical condition (*e.g.* blubber thickness).
6. Potentially significant morbidity, mortality, or stranding is observed in species, stocks or populations that are particularly vulnerable (*e.g.* listed as depleted, threatened or endangered, or declining). For example, stranding of three or four right whales may be cause for great concern whereas stranding of a similar number of fin whales may not.
7. Morbidity is observed concurrent with or as part of an unexplained continual decline of a marine mammal population, stock, or species.

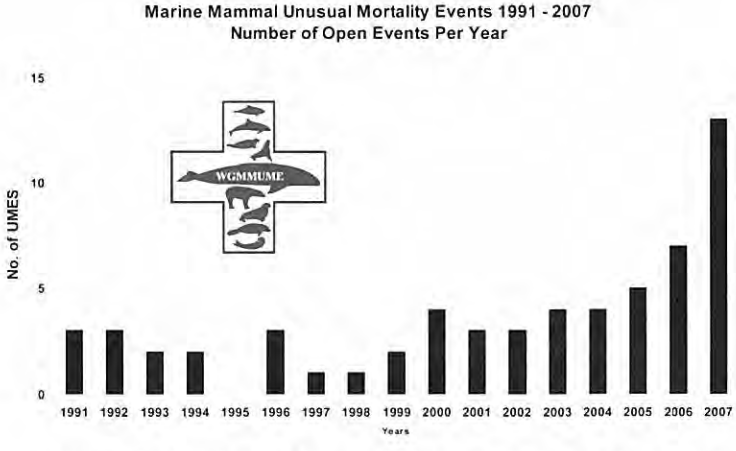


Figure 1. Numbers of Unusual Mortality Events in the United States, showing dramatic increase in recent years.

Members of the WG are consulted, and must vote on determination of a UME within 24 hours of submission of an initiation request for consideration. If a UME is designated, investigation coordinators are identified, investigation plans are reviewed by the WG, and a member of the WG becomes a liaison/mentor for that specific investigation. The number of open investigations has increased dramatically over the past three years, from five in 2005, to a record 13 events being investigated in 2007. Current UMEs cover the spectrum of marine mammals, from manatees and bottlenose dolphins in the Gulf of Mexico, to sea otters in Alaska and blue whales off California. Hypothesized causes for these UMEs are varied, but harmful algal blooms are associated with a number of them.

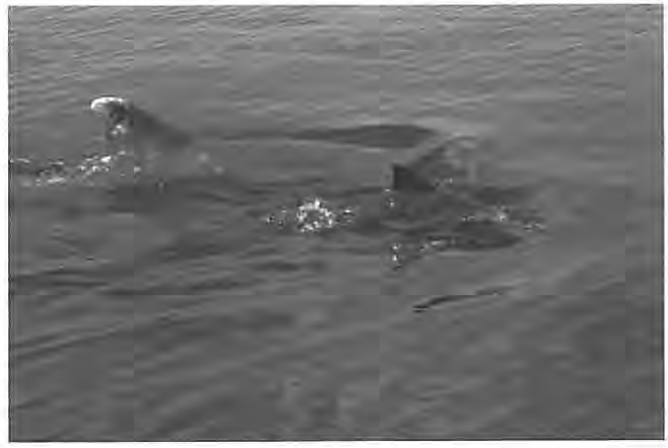


Figure 2. "FB28" with a fungal disease, lobomycosis, on his dorsal fin. Merrily's brand-new third calf swims alongside in July 2005.

Figure 3. Bottlenose dolphin "Val" with skin lesions, undergoing rehabilitation at Mote Marine Laboratory during Florida West Coast Multi-Species UME. "Val" was subsequently released and monitored for about one month.

Sarasota Bay dolphin monitoring program

By Jason Allen, BS

We have been able to continue our year-round monthly monitoring of the Sarasota dolphin community thanks to support from 15 Earthwatch Institute volunteers and NOAA's Fisheries Service (NMFS). The Sarasota bottlenose dolphin community is one of the most thoroughly studied free-ranging dolphin populations in the world. We continue to address increasingly refined questions about the lives of these animals with the benefit of information gained through our intensive year-round studies of their distribution, social and reproductive patterns.

Photo-identification surveys were conducted on 117 days from November 2006 through October 2007 with the assistance of Earthwatch volunteers and undergraduate interns. These volunteers contributed over 2,500 hours to our project. We had 813 group sightings that totaled 2,459 dolphins (including resighted animals). Monthly values varied (Figure 1), but overall we averaged about seven sightings and 21 dolphins per day. These values have remained fairly consistent over the past several years. We had a high of 20 sightings with 56 dolphins on 25 October 2007, the last survey day during this time period.

We documented 11 newborn calves during the spring/summer of 2007. "Lightning" and "Killer" both had their seventh calves, "FB 79" her sixth, and "Tramp" her fourth. Other 2007 mothers included "FB 55", "Lizzie", "Annie", "Big Shout", "C99-1" and "Hawk". "Annie's" calf, her second, is a fifth generation resident of Sarasota Bay. Its great-great-grandmother ("Cathy") is still seen in Sarasota Bay almost every month. Unfortunately, "Lightning", "Killer", "Lizzie" and "Square Notch's" calves have not survived. During 2007, carcasses were recovered for three other dolphins with sightings and medical histories: "Remo", "Beaker", and "F230". Of these, "Beaker" was not considered to be a resident of Sarasota Bay due to an extensive sighting history to the south, and "Remo" had emigrated to waters near St. Petersburg several years ago. In addition, "F201", a yearling seen frequently in southern Sarasota Bay during December 2006 – January 2007, was rescued, treated for severe monofilament injuries, and tracked following release, but was only seen for about one month following release.

Through our Earthwatch and NMFS-sponsored surveys, we have accounted for 145 recognizable dolphins using Sarasota Bay on a regular basis. Another 17 dolphins seen in 2006 were not seen in 2007; if they are not seen in 2008, they will be scored as permanent disappearances, which could include death, emigration, or changes to identifying features. Thus, 90% of the expected residents were found during 2007 surveys.

We would like to thank all of our Earthwatch Institute volunteers for their interest in, and support of, the Sarasota Dolphin Research Program over the past 26 years. The August 2007 team was our final team through the Earthwatch program.

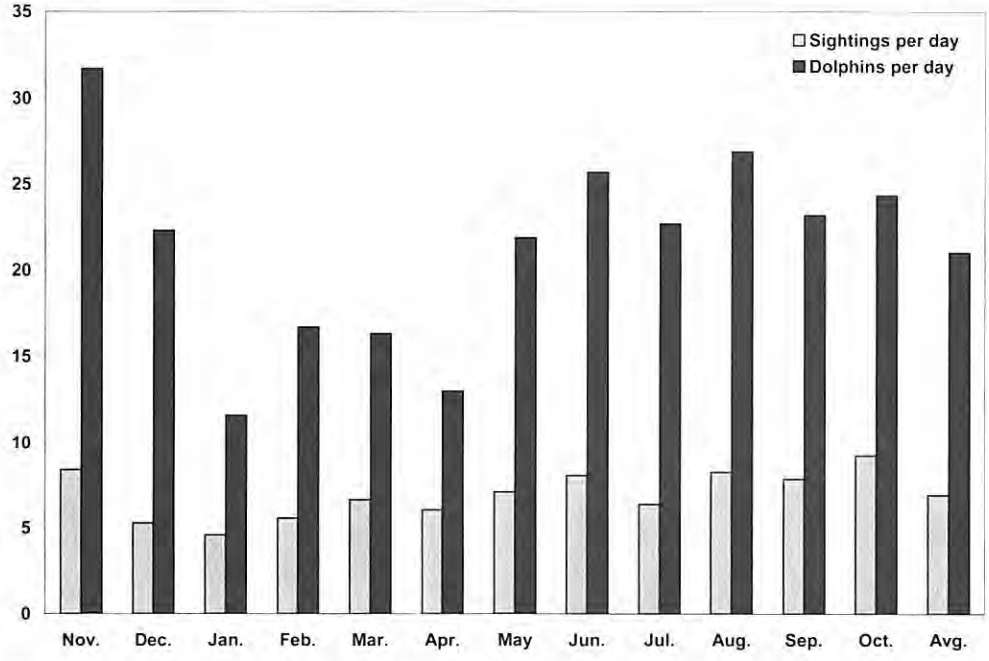


Figure 1. Average number of dolphin sightings and total dolphins per day from November 2006 through October 2007.

Table 1: Births, additions, deaths, and disappearances of well-known dolphins from Sarasota Bay and vicinity over the past year.

Births

ID	NAME	EVENT
FB07	Lightning	Seventh known calf
FB55	FB 55	Third known calf
FB65	Tramp	Fourth known calf
FB79	FB 79	Sixth known calf
FB87	Square Notch	Third known calf
FB90	Killer	Seventh known calf
F113	Lizzie	Second known calf
F125	Annie	Second known calf
F141	Big Shout	Third known calf
C991	C99-1	First known calf
HAWK	Hawk	Third known calf

Permanent Disappearances

ID	NAME	EVENT
F169	FB 169	Not IDed 2006, 2007
F189	Venice De Milo	Not IDed 2006, 2007
SBDO	Scooby Doo	Not IDed 2006, 2007
SHTC	Short Cut	Not IDed 2006, 2007
FB76	Racing Stripe	Not IDed 2006, 2007
F120	FB 120	Not IDed 2006, 2007
F136	Sawblade	Not IDed 2006, 2007
F226	FB 226	Not IDed 2006, 2007
1833	C183-3	Not IDed 2006, 2007

Deaths

ID	NAME	EVENT
F139	Remo	Died 31 January 2007
F195	Beaker	Died 26 July 2007
F230	FB 230	Died 17 July 2007
C077	C07-7	Missing, presumed dead
C873	C87-3	Missing, presumed dead
C907	C90-7	Died 7 July 2007
1132	C113-2	Missing, presumed dead

Some pleasure boaters get a surprise show from "FB 127," March 2007. It is important that boaters remember that they are a guest in the dolphins' home and safely admire them from a distance of at least fifty yards.

Three generations together, May 2007. "Scooter" and her yearling swim toward "Scooter's" mother, "FB 79."

"Annie" surfacing with her second calf less than two weeks after it was born, July 2007.

"Casper" catches a mullet, March 2007.

Comparing patterns of habitat selection at the levels of the population and the individual

By Damon Gannon, PhD, Ari Friedlaender, PhD, Duke University, Janet Gannon, MS, Elizabeth Berens, MS, Jason Allen, BS, Sue Hofmann, BS, and Randall Wells, PhD

Humans tend to think of animal species as being composed of individuals with identical habitat requirements and food preferences. In fact, many foundational theories in behavioral ecology assume that all members of a population behave in the same manner. This is a result of how most wildlife studies are conducted. It is often difficult to identify individual animals in the wild, so most studies of foraging ecology and habitat selection are conducted at the level of the population (aggregating all observations of animals rather than investigating how specific individuals behave). The problem with this approach is that if the assumption of all animals behaving similarly is incorrect, then the investigator may reach erroneous conclusions. If individuals within a population are habitat specialists but there are differences among them regarding the specific resources that they select, then population-level studies may lead to erroneous conclusions that all members of the population are habitat generalists.

Because the Sarasota Dolphin Research Program has been conducting photographic identification studies of bottlenose dolphins in Sarasota Bay for over 37 years, we are uniquely positioned to investigate how the results of habitat selection studies might differ depending on whether the population or individual approach is used. In conjunction with our studies of the distribution and abundance of dolphin prey fish, we have developed detailed classifications of habitats within Sarasota Bay, and can quantify the ranging patterns of resident dolphins relative to habitat features using GIS technology.

We have found that at the level of the population, dolphins did not use any habitat type disproportionately to its availability (meaning that as a group, the dolphins showed no preference for any particular habitat). In contrast, individual dolphins exhibited strong habitat selection, and there were differences among individuals regarding the specific habitats that they chose to use within the community range. Furthermore, patterns of habitat selection may be related to age, sex, reproductive condition, and maternal lineage. Therefore, this appears to be a generalist population composed of individual specialists. Differences in habitat selection likely reflect differences in prey preferences, foraging strategies, nutritional requirements, and/or social status. Attempting to manage bottlenose dolphin populations (or those of any species) without a proper understanding of individual variation in habitat selection may leave some elements of the population at risk. Support for this work has come primarily from NOAA's Fisheries Service.

Validating stranding data in feeding ecology studies of bottlenose dolphins from Sarasota Bay, using long-term observations

By Nélio Barros, PhD, Janet Gannon, MS, and Randall Wells, PhD

We have been using the ratios of stable isotopes in dolphin tissues to examine feeding patterns of bottlenose dolphins along Florida's west coast. Results from the stable isotope analyses suggest that differences exist at the population level, which allow us to distinguish offshore and various inshore dolphin populations, and we have started to examine potential individual variability in feeding preferences. We hope to accomplish this by examining inter-annual variability in isotopic composition of dolphin teeth (in progress) and by collecting tissues from known free-ranging animals during occasional capture-release health assessments in Sarasota Bay. As described above, it has been recently shown that individual dolphins strongly select the habitat they occupy, which in turn could reflect dietary preferences. Our previous stomach content analyses have also shown individual differences in dolphin food habits, with some individuals consuming seagrass-associated fish, whereas others preferred prey fish found around rocky structures and pilings.

Considering that feeding plays an important role in where the animals are found, and the habitats they select, particular interest has been paid to the affects of human-induced and natural disturbances in the environment that might negatively impact the dolphins. Those include perturbations in estuarine ecosystems caused by prolonged and intense red tide events, which may cause depletion of their food sources, a shift in the animals' distribution, and increased morbidity and mortality. As a possible result of decline of their preferred prey, known resident dolphins were impacted by increased mortality due to ingestion of recreational fishing gear (as described above). The magnitude of this mortality has raised concerns about the long-term survival of the resident dolphin community if this trend continues.

Our goal is to investigate the feeding ecology of Sarasota Bay dolphins at the individual and population levels, using data obtained from stranded and free-ranging animals. We plan to address seasonal as well as inter-annual variability in feeding and assess any dietary shifts that might take place as a result of environmental disturbances (for example, red tide). As isotopic ratios in dolphin teeth represent the feeding history of the animal over its entire life, we will use tissues that reflect a briefer history (weeks to a few months), such as skin and muscle. To be able to use archived samples collected from stranded animals in addressing these ecological questions, we tested the hypothesis that dolphin stranding location reflected the area occupied by the animals when they were alive. We analyzed historical sighting data from 42 resident bottlenose dolphins and created three measures of home range.

With only a few exceptions, dolphins stranded where they had been historically sighted, and the three home range measures largely reflected those findings – dolphins typically strand well within the confines of their home range (Figure 1). Those who deviate from this pattern don't seem to stray too far, being typically found within 13 km of their home range boundaries. With these results we feel confident that data derived from strandings can be applied to the population at large for these resident dolphins.

Figure 1. Sighting history of long-time resident female "FB29." She died in 1998 at 35 years of age, and stranded in Palma Sola Bay. "FB29" died from ingestion of a fishing lure, and her newborn calf disappeared upon her death.

Diet determination of Sarasota Bay bottlenose dolphins, using DNA-based identification of prey remains in scat samples

By Glenn Dunshea, PhD student, University of Tasmania and Australian Antarctic Division, Nick Gales, PhD, and Simon Jarman, PhD, Australian Antarctic Division, Mark Hindell, PhD, University of Tasmania, Nélio Barros, PhD, and Randall Wells, PhD

This work is part of larger on-going studies being conducted by the Australian Antarctic Division, developing and applying methods to determine the diet of free ranging cetaceans, non-invasively. We are using the simple concept that if prey is eaten, then prey remains will be present in fecal matter ('scat') and the prey can be identified by unique DNA sequences that are present in all different species. Put simply: 'prey goes in, prey DNA comes out'. Generally in cetaceans, diet can only be specifically examined either by observation (which is rare and inevitably biased towards surface activity) or by examining prey remains in the stomachs of stranded or incidentally killed individuals. These data may not be representative of healthy free-ranging individuals so the advantage of DNA techniques is they can examine the diet of free ranging animals in a minimally biased, non-invasive fashion. These data can then be used not only to further understand the ecology of the focal species and ecosystem processes but also to examine whether the assumptions of more traditional diet analysis techniques are valid for estimating the diet of healthy, free ranging individuals.

The basic way these techniques work involves collecting feces from free-ranging animals, extracting DNA from the scat sample in the laboratory and analyzing the scat derived DNA for prey DNA sequences. When prey sequences are found, they can be compared to large on-line databases that can match a specific sequence to a specific prey species or groups. How do we collect scat from a live free-ranging marine mammal you may ask? Well, there are a number of different (rather glamorous) ways, however in the case of Sarasota dolphins scat is collected opportunistically during the capture-release process for health assessment. When scat is collected it is preserved in buffer for the long trip back to Tasmania where the sample analysis takes place. So far we have results back for scats from 15 different Sarasota dolphins and we have discovered 19 different prey items in their scats. Two species, pinfish (*Lagodon rhomboides*) and spot (*Leiostomus xanthurus*), were found in most scats (71% and 57% respectively) indicating that they are important prey items in the time of year when the samples were collected. These results fit in well with Dr. Nélio Barros's work on prey consumption in this population.

These results are important as they demonstrate for the first time the ability to gain unbiased specific prey information from multiple live free-ranging individual cetaceans. This proves the utility of DNA methods as a viable alternative, as well as being able to further complement, stomach contents analyses. These methods can also help us to understand the prey range and foraging ecology of top level predators such as bottlenose dolphins, which can inform us as to possible adverse effects human actions might have on ecosystems. For example, we can better understand the direct and indirect effects of fisheries and environmental catastrophes that result in large scale mortalities of focal species if we know where they fit in food webs. I wish to acknowledge the financial support of the Australian Antarctic Division and the Ian Holsworth Wildlife Research Trust Fund. Dolphin Quest provided support for the health assessment operations. I am also especially grateful to the staff at Mote Marine Laboratory and the Chicago Zoological Society, who have made the field component of this work possible (and a pleasure).

Effects of red tide on dolphin prey fish availability

By Damon Gannon, PhD, Elizabeth Berens, MS, and Sandra Camilleri, BS

Karenia brevis, the single-celled alga responsible for Florida red tides can affect fishes in several ways. *Karenia brevis* produces lethal neurotoxins, called brevetoxins, which affect the respiratory system. Fishes can be exposed to the toxins by inhaling them directly from the water through their gills or by consuming food that contains the toxin. Also, the many dead and decomposing organisms associated with a red tide can lead to hypoxia, or dangerously low levels of oxygen in the water (the process of decomposition uses oxygen). Hypoxia can kill more fishes and invertebrates. Red tides are a natural phenomenon, but they may be increasing in frequency and/or intensity. In Sarasota, red tides occur almost every year.

Our program is interested in finding out whether the episodes of high fish mortality that occur during red tides cause significant decreases in fish abundance (particularly for species that are important food sources for dolphins) or change the species composition of the fish community. We also would like to know how long it takes for the fish community to recover once a red tide has ended. Our sampling efforts of the fish community in Sarasota Bay continued this year. Since the summer of 2004, we have completed 790 purse seine sets (a type of fish sampling net) and sampled 268,291 fish. The vast majority of our work involves catch and release sampling. This summer we set a record for both the number of purse seine sets completed (146) and the number of fish caught (85,032).

Two red tide events have occurred in Sarasota Bay since we started this research: a prolonged and intense one from February to December of 2005 and another from Mid-August to December of 2006. In seagrass beds (one of the most productive habitats in Sarasota Bay), the average abundance of fish during the red tides was 10.3% lower during red tide conditions. However, the changes in the abundance of fish species that are typically eaten by dolphins were much greater. For example, pinfish (-71%), pigfish (-97%), silver perch (-94%), spotted seatrout (-85%), and mojarra (-55%) all decreased sharply. One species, Atlantic thread herring, actually increased by 140% in the seagrass habitat during red tide. Thread herring appear to be more tolerant of brevetoxin than do other species. They are not normally an important part of the dolphin diet, but it is possible that thread herring are an alternative food source during red tides. One of the more striking effects of red tide is its effect on biodiversity. The number of fish species caught per purse seine set was cut in half during the red tide.

So red tide reduces fish abundance, causes a decrease in species diversity, and causes a shift in the fish community from dominance by bottom-dwelling species like pinfish, mojarra, silver perch, and pigfish toward dominance by pelagic filter feeders, such as the thread herring. The good news is that the estuarine fish community appears to be quite resilient and most species returned to pre-red tide abundance levels within two years. There are still many unanswered questions regarding the effects of red tide on fishes, such as how it might affect growth rates, body conditions, reproductive rates, habitat selection, and behavior. We hope to be able to answer more of these questions with continued sampling of Sarasota Bay's fish community in 2008.

Striped (black) Mullet
(*Mugil cephalus*)

Pinfish
(*Lagodon rhomboides*)

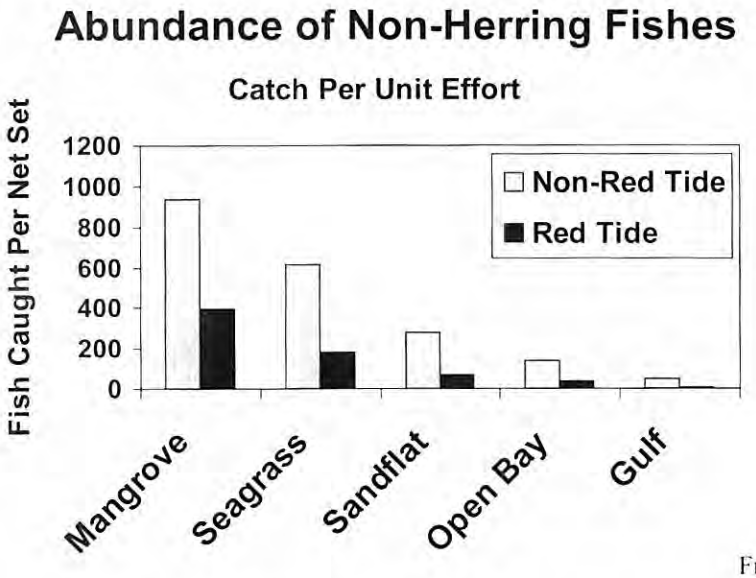


Figure 1. Differences in relative abundance for non-herring fishes between red tide and non-red tide conditions for five marine habitats in and around Sarasota Bay. Abundance trends are represented by purse-seine catch rates.

Sheepshead
(*Archosargus probatocephalus*)

From top to bottom (perch, spot, seatrout)
(*Bairdiella chrysoura*)
(*Leiostomus xanthurus*)
(*Cynoscion nebulosus*)

Shark tracking in Sarasota Bay

By Aaron Barleycorn, BS

Part of understanding dolphin behavior is learning how these animals interact with their predators. Large sharks are the only known natural predator of dolphins in the Sarasota Bay area; about 31% of Sarasota's dolphins bear shark bite scars. Bull, tiger, and dusky sharks are the most likely dolphin predators, based on historic shark stomach content data. Beyond a paper published by Mote's Dr. Eugenie Clark and Kay von Schmidt back in 1965, very little is known about the distribution, abundance, or ranging patterns of large sharks in this area, especially within Sarasota Bay. Previous efforts have been unable to locate large sharks inshore, yet there have been several instances where dead dolphins have been found deep inside the bay with fresh shark bite wounds. Further evidence of shark presence inside the bay came on the night of 15 August 2007 when a New College student was bitten by a shark while swimming off the school's seawall along the eastern shore of Sarasota Bay. A shark expert at Mote Marine Laboratory believed the bite pattern was that of a 2 m (6 ft) long bull shark (Figure 1). This project, planned well in advance of the attack on the coed, was designed to gain a better understanding of large (≥2m) shark abundance and habitat use within Sarasota Bay waters.

Baited hooks were attached to drum lines which are designed to select for large sharks. Hooked sharks are able to swim easily and relatively unharmed until retrieved by researchers. Over nine field days, 280 drum lines were set for about two hours each. On 21 August, fishing effort was concentrated in the area around the 15 August shark incident near New College. Two hooks came up without bait and with cut lines, but no sharks were caught. The cut lines were considered reasonable evidence of large sharks taking bait, and the two locations were noted as probable areas of shark use. Overall, three animals were caught: two nurse sharks that were not considered potential dolphin predators, and one 2.3 m bull shark (Figure 2). An ultrasonic tag was attached to the bull shark in order to track its movements. Unfortunately, the tracking boat lost the shark's signal almost immediately after release. Over the next few weeks several attempts were made to reacquire the bull shark using the ultrasonic receiver, but no positive signals were acquired. This study has, however, shown that large sharks do inhabit Sarasota Bay but more effort is needed to further understand shark use in this area.

Mote's Shark Research Center, especially Armando Ubeda and Beau Yeiser, was integral to the project with initial advice and hands on field assistance. This project was supported with funding from NOAA's Fisheries Service.

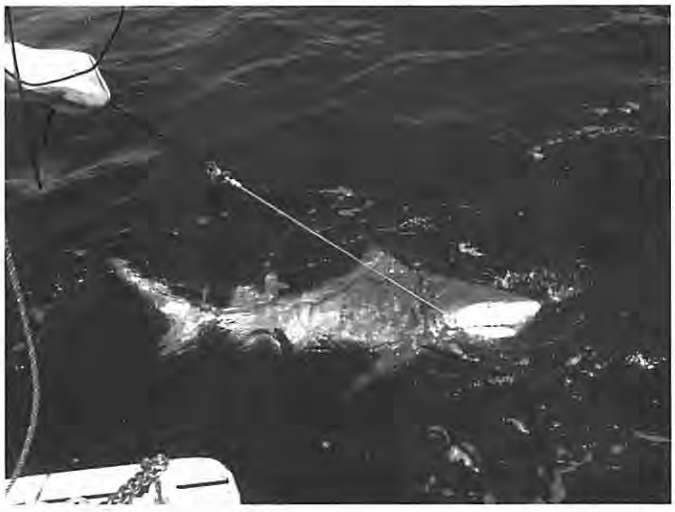


Figure 1. Bull shark caught by Mote Marine Laboratory scientists.

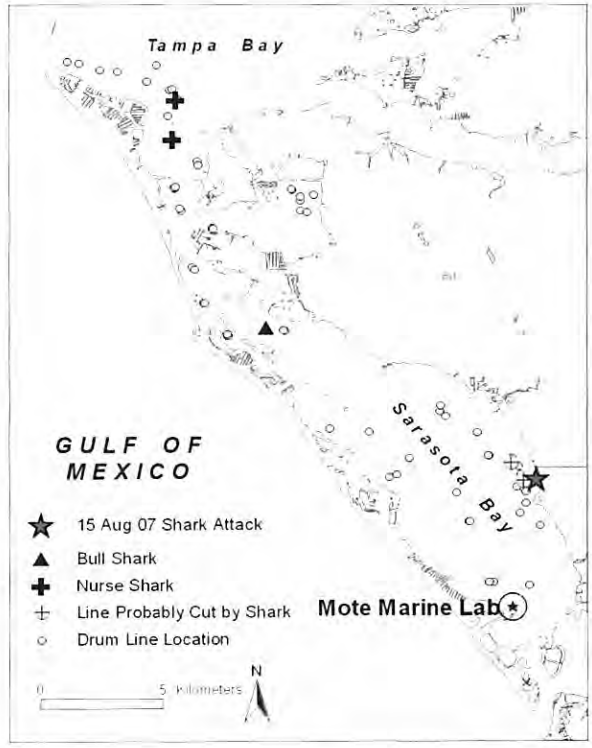


Figure 2. Locations of shark attack and fishing activities in 2007.

Dr. Blair Irvine (left) and Dr. Jackie Ogden (of Disney's Animal Programs) supporting a bottlenose dolphin during health assessment. Blair began the SDRP while working on shark-dolphin research at Mote in 1970.

Investigating impacts of Hurricane Charley and red tide on dolphin abundance, reproductive rates, distribution, and residency in Charlotte Harbor and Pine Island Sound.

By Kim Bassos-Hull, MS

Do major ecological disturbances impact resident dolphin populations? The Sarasota Dolphin Research Program was in a unique position to evaluate this question as both Hurricane Charley in August 2004 and a severe red tide in 2005 impacted Charlotte Harbor and Pine Island Sound. These combined events may have affected habitat health, including prey fish availability, in ways that could have short or long-term implications for the bottlenose dolphins that use this estuary. The SDRP has been working with the dolphin population in these areas since its start in 1970, with photographic identifications since 1982, and baseline data on dolphin abundance, reproductive rates, distribution, and site fidelity from intensive seasonal surveys immediately prior to the 2004 hurricane. Knowledge of the status of the dolphin population units inhabiting Charlotte Harbor and Pine Island Sound is important for protecting dolphin stocks in the area, and follow-up surveys would provide a unique opportunity to investigate the adaptability of these animals to large scale disturbances.

With funding from Harbor Branch Oceanographic Institution's "Protect Wild Dolphins" program, we were able to conduct a comprehensive, multi-week, photographic-identification survey in Charlotte Harbor and Pine Island Sound in September 2006, at the same scale as our 2001-2003 September surveys. This allowed us to examine trends in abundance, distribution and reproductive rates pre-and post-Hurricane Charley. These surveys also allowed us to gather additional sighting information on distinctively marked individuals to examine long-term and seasonal site fidelity and reproductive status of females.

Hurricane Charley devastated the shoreline, terrestrial flora, and man-made structures along its path through Charlotte Harbor. However, two years later, and one year after a major red tide event, we found no indications of impacts on the resident dolphins. The 2006 abundance estimate was within 10% of the range of abundance estimates from previous years, by all measures. Similarly, reproductive rates were within the previously-documented range for the area. Of the 206 identifiable dolphins seen 10 or more times, 94% were found in the same region of Charlotte Harbor two years after the storm as before. The level of resilience documented for the Charlotte Harbor dolphins provides important perspective for evaluating the threats to dolphin populations from a variety of natural and anthropogenic sources. Many additional funding sources contributed to this project and the earlier surveys, including: Mote Scientific Foundation, the Chicago Zoological Society, Mote Marine Laboratory, NOAA's Fisheries Service, Dolphin Biology Research Institute, and Earthwatch Institute.

Mangrove damage from Hurricane Charley in August 2004 is still evident on Cayo Costa in March 2007, two and a half years later.

"SPKY" has been observed in Pine Island Sound 16 times between 1996 and 2007, both before and after Hurricane Charley.

Population structure of bottlenose dolphins in and around St. Joseph Bay, Florida

By Brian Balmer, MS, PhD Student, University of North Carolina, Wilmington

During three Unusual Mortality Events (UMEs), (1999-2000, 2004, and 2005-2006), more than 300 bottlenose dolphins died along the Florida Panhandle. St. Joseph Bay was the geographic focus of the 2004 mortality event. The most recent (1994) NOAA's Fisheries Service abundance estimate for bottlenose dolphins in St. Joseph Bay is zero, but dolphins are currently observed in the region throughout the year. Thus, critical gaps exist in our knowledge of bottlenose dolphin abundance in this region. The goals of this study were to estimate seasonal abundance, identify site-fidelity patterns, and determine utilization areas (region in which an animal conducts its normal activities during the study period) of bottlenose dolphins in the St. Joseph Bay region.

Mark-recapture photo-identification surveys were conducted during each season to estimate abundance using closed and robust population models. Site-fidelity indices (i.e. the amount of time individuals were spending within the St. Joseph Bay region) were calculated from the total number of sightings of each identified individual during all photo-identification efforts carried out in the region (April 2004-July 2007). Mark-recapture abundance estimates were highest in spring (327-480) and fall (282 - 462) and lowest in summer (116-176) and winter (122-184). Individuals with low site-fidelity indices were sighted more often in spring and fall than in summer and winter. Individuals sighted during summer and winter displayed higher site-fidelity indices.

As a result of two NOAA-sponsored bottlenose dolphin health assessments (April 2005, July 2006), 23 dolphins were radio-tagged and monitored for up to three months. Dolphins tagged in spring 2005 displayed variable utilization areas and variable site-fidelity patterns. In contrast, during summer 2006, the majority of radio tagged individuals displayed similar utilization areas and moderate to high site-fidelity patterns. These results suggest that during the summer, St. Joseph Bay hosts dolphins that spend most of their time within this region. In spring, St. Joseph Bay is visited by dolphins that range outside of this area.

These results suggest that the impacts of UMEs in the St. Joseph Bay region will vary by season. During spring or fall a UME will likely affect both those dolphins with high site-fidelity indices, as well as dolphins moving into or through the region, and, thus, may have a wider regional impact. Mortality events that occur during summer and winter will be focused on a smaller number of individuals that may represent the resident community of the St. Joseph Bay region. The impacts of past and potential future UMEs in the St. Joseph Bay region likely are affected by these seasonally variable patterns of habitat utilization.

This research would not have been possible without funding from NOAA's Fisheries Service and the Disney Wildlife Conservation Fund.

"X14" (2001) and "X16" (2002), the first two cataloged dolphins in the St. Joseph Bay project in April 2004.

Abundance, site-fidelity, and habitat utilization patterns of bottlenose dolphins near a National Priority List polluted site and an adjacent reference site in Georgia

By Brian Balmer, MS, PhD student, University of North Carolina, Wilmington

This project is part of a larger research effort by NOAA to assess the health and contaminant exposure of bottlenose dolphins, an apex predator and sentinel species for ecosystem health, at a National Priority List (NPL) polluted site in Brunswick, Georgia [Turtle/Brunswick River estuary (TBRE)] and a nearby, relatively pristine, reference site [Sapelo Island National Estuarine Research Reserve (SINERR)] (Figure 1).

The TBRE encompasses the Turtle and Brunswick Rivers, Blythe Island State Park, St. Simons Sound, St. Simons Island, Jekyll Island, and the city of Brunswick. LCP Chemical located on the west side of Brunswick, is classified as an Environmental Protection Agency (EPA) Superfund Site that is currently on the NPL. Additionally, there are several other waste sites in the vicinity of the LCP site for which EPA and the State of Georgia are conducting remediation.

In contrast to the TBRE, the SINERR, about 30 km northeast of Brunswick, is the fourth largest, and one of the most pristine, barrier island areas along the Georgia coast. Smooth cord grass is the dominant vegetation type throughout this region with numerous tidal creeks bisecting the marsh and draining into Doboy Sound. The SINERR is part of the National Estuarine Research Reserve System, and is a focus for long-term ecological research projects such as water quality monitoring, primary productivity assessment, and fisheries biology.

This project will evaluate and compare seasonal abundance, site-fidelity, and habitat utilization patterns for bottlenose dolphins across these two adjacent geographic regions. An understanding of dolphin abundance and habitat utilization within these areas is essential to support effective management, and knowledge of site fidelity and movement patterns of dolphins between the two areas is critical for accurate interpretation of health data. Intensive seasonal photographic mark-recapture surveys will be used to determine dolphin abundance in both regions. Comparing sighting histories for all identified individuals will provide site-fidelity indices (i.e. amount of time dolphins are spending within each of the two areas. Environmental data (i.e. salinity, temperature, water depth, velocity, turbidity, bottom habitat type, tidal state, and chlorophyll *a*) in relation to dolphin, and perhaps dolphin prey, distribution, will be used to assess dolphin habitat preferences within and between the two regions. Further, this research will enhance current knowledge of coastal bottlenose dolphin population structure along the east coast of the U.S. The first mark-recapture surveys for this project will begin in February 2008.

This research would not be possible without funding from NOAA's Fisheries Service and the Georgia Department of Natural Resources.

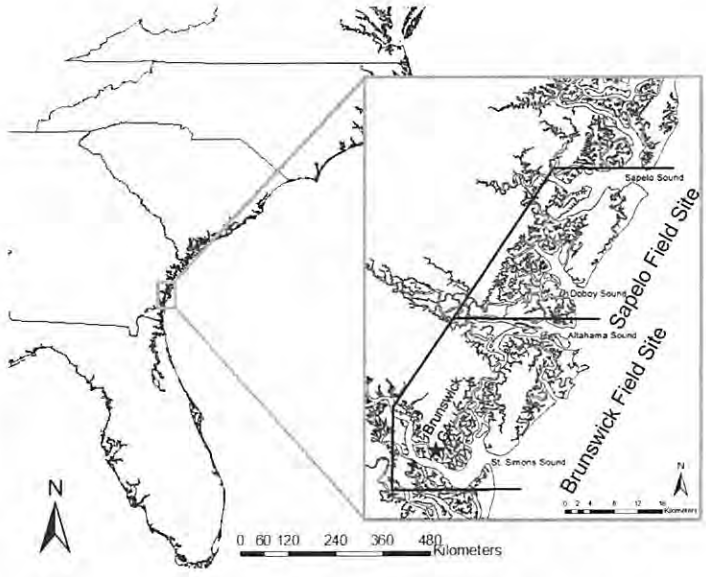


Figure 1. Georgia study area, including both field sites; Brunswick (TBRE) and Sapelo (SINEER).

DOLPHIN RESCUES, RELEASES, AND FOLLOW-UP MONITORING

Rescue, rehabilitation, release, and follow-up monitoring of bottlenose dolphin "Filly"

By Randall Wells, PhD

A young (1.5 years old) female calf ("Filly") of a dolphin known from our research efforts in waters to the south of Sarasota Bay, was observed near Mote Marine Lab with healed boat propeller wounds on her caudal peduncle (tail stock) and monofilament fishing line trailing from one of the wounds at the insertion of her flukes on 12 December 2006. She re-appeared 5 weeks later, and after subsequent observations indicated that she was unable to shed the line on her own (Figure 1), we performed a rescue capture on 30 January 2007. Upon examination, it was determined that the line was too deeply embedded for field treatment, and she was admitted to Mote Marine Laboratory's dolphin hospital. Three constricting wraps of monofilament line down to the level of the bone were removed in two surgeries, and she was released in good health after three months of rehabilitation. She was freezebranded and tracked via small VHF radio transmitter over the next month, and then disappeared unexpectedly. A combination of factors, including her extreme young age (1 year) at the time of premature separation from her mother (mother remained in the area, but not with Filly), loss of high frequency hearing, and a tendency to swim in areas of recreational fishing as indicated by small pieces of line collected on her radio transmitter, may have contributed to her disappearance and probable death.

Figure 1. "Filly" with line trailing from multiple constrictive wraps of line at the insertion of her flukes.

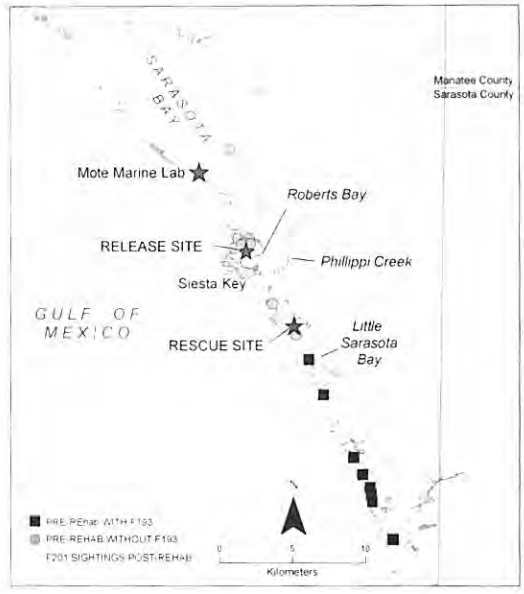


Figure 2. Sightings of "Filly", before and after treatment for her fishing line injuries.

Field disentanglement of "FB28"

By Aaron Barleycorn, BS

On 22 June 2007, "FB28", a 42-year-old male Sarasota Bay resident dolphin first identified in the 1970's, was seen entangled in monofilament fishing line. Photos revealed the line was tightly wrapped three times from the leading edge of the dorsal fin to its tail fluke. "FB28" also suffers from a condition called lobomycosis, a fungal infection causing large white lesions to protrude from the skin. The fishing line appeared to be caught on some of the lesions and was beginning to cut into the dorsal fin, as well as pull on the fluke (Figure 1). The dolphin was observed with this entanglement five times through early July. The tension on the fluke was considered a serious threat to the life of the dolphin, and a rescue effort was planned.

On 6 July a rescue team was able to cut the line just behind "FB28's" dorsal fin using an extendable cutting tool while the dolphin swam freely. This removed the tension but the dolphin evaded attempts to approach again and remove the line entirely. Since the rescue, "FB28" has been seen eight times. Follow up observations have shown no line on "FB28's" dorsal fin and a small amount of line trailing from the fluke. However on two occasions several months later, "FB28" was seen cooperatively "fish-whacking" with "FB48", the oldest known male in the area. Fish-whacking is a foraging behavior that involves striking a fish with a rapid movement of the fluke, sometimes sending the fish into the air. It could not be determined if any line remained on the fluke, but it is encouraging that he can still use his fluke so actively.

Finding "FB28" for the disentanglement, as well as for follow up monitoring, involved the efforts our Earthwatch survey teams, staff, interns, and graduate students. Funding for rescue efforts was provided by NOAA's Fisheries Service.

Figure 1. "FB28" with monofilament line cutting into his dorsal fin and leading to his fluke.

Follow-up tracking of rehabilitated Risso's dolphin "Betty"

By Randall Wells, PhD

A mass stranding on 5 May 2007 involved two mother-calf pairs of Risso's dolphins coming ashore near Bonita Beach, Lee County, Florida. Both pairs were transported to Mote's dolphin hospital, where one pair died, but the other pair was successfully rehabilitated (Figure 1). The surviving mother, "Betty", was admitted with septicemia caused by a very drug-resistant bacterium and internal abscesses that required a long course of treatment. The calf, "Big Al", was thought to be only several weeks old at the time of stranding. He appeared healthy initially, but soon developed an infection. Both dolphins eventually responded to treatment, and on 27 September 2007 they were transported aboard the yacht "Tomcat" about 100 nautical miles southwest of Sarasota. "Betty" was tagged with a satellite-linked transmitter for remote tracking and collection of dive data (Figure 2), and both were released together over the edge of the continental shelf. Since release, "Betty" has covered much of the Gulf of Mexico, mostly remaining near the continental shelf edge and slope (Figure 3), in habitats of the kinds known to be used by Risso's dolphins. Much like "Clyde", the adult male Risso's dolphin tracked following rehabilitation and release in 2006, "Betty" spends most of her time in waters less than 50 m deep, but she makes occasional dives to 600-800 m, and can remain on a dive for 11-15 minutes.

Figure 1. "Betty" and son "Big Al" at Mote's dolphin hospital.

Figure 2. Satellite-linked transmitter on "Betty's" dorsal fin.

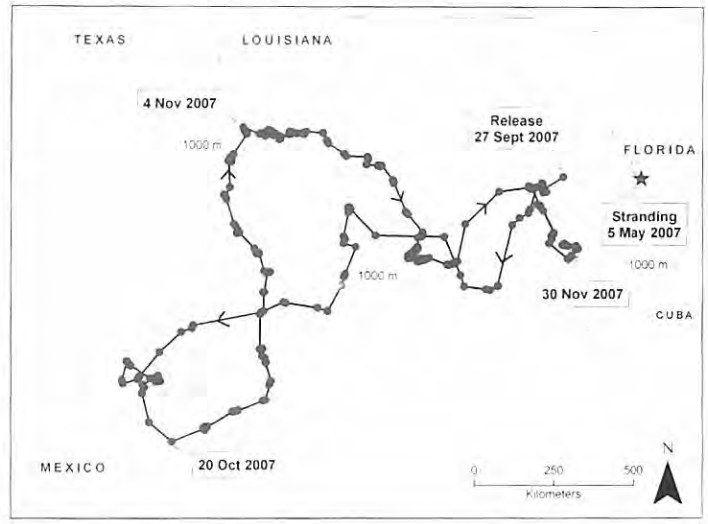


Figure 3. "Betty's" track since release on 27 September 2007.

Update on "Scrappy," rescued in 2006 from a poor apparel choice

By Jason Allen, BS

Last year we reported on the rescue of "Scrappy", an eight-year-old Sarasota Bay resident dolphin which was entangled in a men's Speedo bathing suit. He was first observed with material tightly draped over his back on 6 July 2006. On 3 August 2006, our rescue team captured "Scrappy", removed the material, evaluated and treated his wounds, and returned him to the wild.

Since "Scrappy's" rescue, he has been observed 42 times, apparently without any log-term effects from his poor apparel choice. He has been observed feeding, traveling and socializing with other dolphins, generally in the deeper waters of Sarasota Bay that he inhabited before his entanglement. His respiration and diving behavior seem normal and his body condition appears satisfactory. Unfortunately, we have not had any direct observation of the wounds on his pectoral fins, but can assume from behavioral observations that they have not significantly hindered his ability to forage, interact with other dolphins, or avoid predators. Support for rescue operations has been provided by NOAA's Fisheries Service.

Figure 1. "Scrappy" from a sighting on 31 October 2006, almost three months after his rescue. The superficial teeth scratches (or "rake marks") on his body are normal and probably occurred while he was socializing with other dolphins.

Tagging and tracking of Franciscana dolphins in Argentina: Year 3

By Randall Wells, PhD, and Pablo Bordino, MS

Franciscana dolphins, a species of small dolphin found only in the coastal waters of Argentina, Uruguay, and Brazil, continue to be killed in large numbers in artisanal fishing nets. Little is known about their biology and behavior, beyond what has been gleaned from fishing bycatch. In 2005, following several training sessions for Argentine researchers in Sarasota Bay, Pablo Bordino of AquaMarina and Wildlife Trust initiated a collaborative field project with the Sarasota Dolphin Research Program and Disney's Animal Programs to begin to study the ranging patterns of these tiny dolphins in the waters of Bahia Samborombon, in Buenos Aires Province, Argentina. The research team, composed primarily of Argentine researchers, students, and veterinarians, attached small VHF transmitters to the dorsal fins of three dolphins – the first time this species had ever been tagged. Tracking from a lighthouse and other shore vantage points suggested that the dolphins were much more localized in their movements than had been thought previously, but the location data from primarily shore-based tracking were very imprecise.

In 2006, we built upon this pilot study by using small satellite-linked tags to provide more precise location information, over a longer period of time. Four dolphins were tagged in Bahia Samborombon, and they were tracked over periods ranging from one week to 261 days. The satellite-linked tracking confirmed the patterns suggested from 2005, with all four dolphins remaining within an area of less than about 25 km distance from the capture-release sites.

In March 2007, we moved our operations several hundred km to the south, to Bahia San Blas, in northern Patagonia (Figure 1). We tagged another four franciscana dolphins (Figure 2) with satellite-linked transmitters, and tracked them for periods as long as six months. The San Blas dolphins showed the same degree of site fidelity as the Samborombon dolphins, moving from inside the bay to waters immediately outside, and returning (Figure 3). They also showed the same significant tidally-related movement patterns, being found farther inside the bay on high tides, and towards the mouth or outside on low tides.

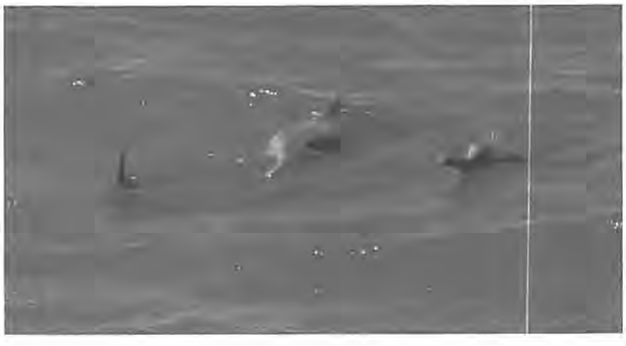


Figure 1. Three franciscana dolphins surface in Bahia San Blas in March 2007.

Figure 2. Franciscana dolphin "Marta" during tagging in March 2007.

Such a high degree of site fidelity at multiple sites along the Argentine coast, consistent with the findings from ongoing genetic research by PhD student Martin Mendez, should provide important guidance to Argentine wildlife managers as they determine how best to protect this species – it is a very different picture from the original management scheme of wide-ranging movements along the entire coast of the country.

Funding from Disney will support additional tagging in Bahia San Blas in 2008, this time with satellite-linked transmitters with time-depth recorders that will allow us to learn more about how the dolphins use the water column, and to determine if fishing nets set at specific depths might be more likely to entangle the dolphins.

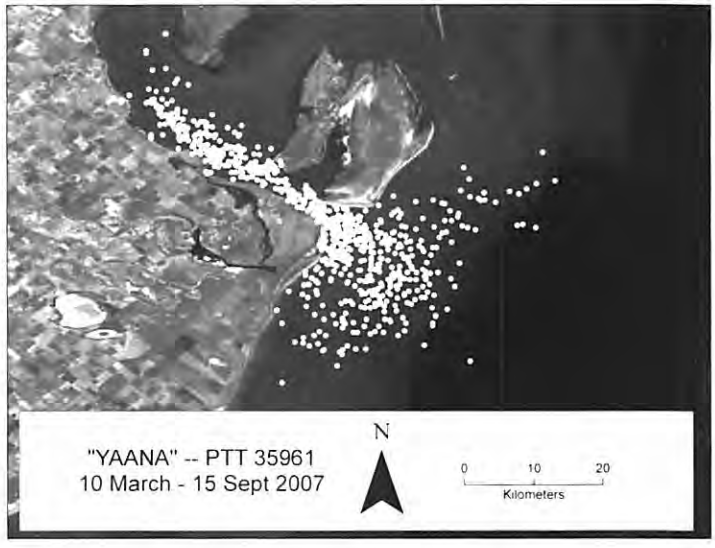


Figure 3. Positions of franciscana dolphin "Yaana" over six months of satellite-linked tracking.

INVOLVEMENT IN OTHER MARINE MAMMAL CONSERVATION AND RESEARCH ACTIVITIES

Gannon and Wells participate in NOAA/NMFS Take Reduction Teams

By Damon Gannon, PhD

The goal of the U.S. Marine Mammal Protection Act is to reduce incidental mortality and serious injury of marine mammals in commercial fisheries to "insignificant levels approaching zero." NOAA's Fisheries Service (NMFS), part of the Department of Commerce, convenes Take Reduction Teams (TRTs) for marine mammal stocks subjected to incidental "takes" in fisheries. TRTs are composed of experts and stakeholders—representatives from the fishing industry, environmental organizations, government agencies, and the scientific community—who work collaboratively to develop strategies for reducing bycatch of marine mammals. Damon Gannon and Randall Wells served during 2007 as scientific representatives to three TRTs. Wells served on the Bottlenose Dolphin Take Reduction Team, while Gannon is on the Pelagic Longline Take Reduction Team and the Atlantic Trawl Gear Take Reduction Team. The Pelagic Longline and Trawl Gear teams have both been convened to develop plans for reducing the unintended catch of pilot whales. NMFS published the Bottlenose Dolphin Take Reduction Plan in 2006. The Pelagic Longline TRT released a Draft Take Reduction Plan in May 2006, which should be released in final form by the end of 2007. The Longline Take Reduction Plan focuses on modifying fishing practices, improving handling and release procedures when marine mammals become entangled in fishing gear, and increasing research efforts to get a better understanding of the scope and nature of the bycatch problem in that fishery. The Atlantic Trawl Gear TRT has met twice and is still working on developing a consensus Take Reduction Plan, a draft of which will be released for public comment. Once the Take Reduction Plans go into effect, the TRTs meet periodically to assess whether the plan is working satisfactorily and to make any changes that may become necessary as situations such as fisheries change or new information becomes available.

Entanglement Working Group update

By Kim Bassos-Hull, MS

The Entanglement Working Group (EWG) for the State of Florida is focused on marine wildlife entanglement issues and ways to reduce marine debris in the environment. One of the primary programs supported by the EWG is the Monofilament Recovery & Recycling Program (MRRP) which is a statewide effort to educate the public on the problems caused by monofilament line left in the environment, to encourage recycling through a network of line recycling bins and drop-off locations, and to conduct volunteer monofilament line cleanup events (see www.fishinglinerecycling.org).

The EWG was originally established to deal with entanglements of manatees, but we brought our concerns about increasing entanglements of dolphins to the EWG in 2005, and the SDRP has been a part of the EWG ever since. We are working with other EWG members studying manatees and sea turtles to identify "hot spots" of entanglement in Florida. Such information will help counties and management agencies to promote education, recycling, and cleanup efforts. The EWG and several collaborating organizations including the Ocean Conservancy and NOAA's Fisheries Service secured two grants (NOAA Marine Debris Prevention and Removal Grant and National Fish and Wildlife Federation Grant) to perform clean-up and education projects at several sites around the state (see Skyway Fishing Pier survey article above).

The EWG shares education and outreach ideas amongst group members. SDRP has piloted two such ideas with local school groups and family programs at Mote Marine Lab: personal-sized fishing line recycling bins ("mini bins") and "The Entanglement Game." The "mini-bins" are built from recycled tennis ball cans with Velcro® strips that allows attachment on personal docks, tackle boxes, boats, kayaks etc. and are a temporary receptacle to hold fishing line until the angler (or collector) can get to an MRRP bin or box at a pier, dock, tackle shop, or marina. "The Entanglement Game" involves elementary school-aged kids who "swim" in an ocean full of trash and fishing line and then learn how to clean it up and properly recycle it. We have had great feedback during our pilot outreach efforts and now hope to promote these ideas to other education institutions.

First graders at Southside Elementary learn what it feels like to swim in an ocean full of trash in "The Entanglement Game"...

...and then learn how to clean it up and recycle fishing line.

"Mini-bins" are created from recycled tennis ball cans and can be attached on docks, boats, tackle boxes etc. to store pieces of fishing line until they can be recycled.

INVOLVEMENT IN OTHER MARINE MAMMAL CONSERVATION AND RESEARCH ACTIVITIES

Helping to conserve manatees in Southern Mesoamerica

By Ester Quintana-Rizzo, PhD

The Chicago Zoological Society (CZS) continues to expand its efforts to conserve endangered species. The Antillean manatee is an endangered species found throughout the Caribbean and along the Atlantic coastal waters from Mexico to Brazil. Some of the major threats affecting the species include illegal hunting, habitat destruction, water pollution, and uncontrolled tourism along coastal areas. In order to help conserve and better understand the species, 16 people from research institutions, environmental agencies, and local governments from Nicaragua, Costa Rica, and Panama met in Tortuguero, Costa Rica in April 2007, to create a regional manatee management plan for Southern Mesoamerica. This is the first effort initiated by local organizations to conserve manatees at a regional level, although the Environmental Program of the United Nations (UNEP) has also developed a management plan for the 21 countries in which manatees are found. The meeting was mainly funded by the Critical Partnership Ecosystem.

CZS supported development of the regional plan for Southern Mesoamerica by supporting my participation in the meeting. I was one of the authors of the 2007 UNEP plan, and was invited to present and participate at the meeting. Participants were very involved and excited about the development of a regional manatee plan. A draft plan was developed after three days of discussions, including goals and research activities for the three countries. The document is currently under review and it is expected to be available to the public in the spring 2008.

After the meeting, several of us traveled to Panama to test equipment brought from the United States to study manatees in Southern Mesoamerica. The equipment included a side-scan sonar, a new technology that is being developed to study manatees inhabiting dark waters. The trip to Panama also involved giving talks and having discussions of ideas for future manatee research projects including radio tagging, aerial surveys, and genetic studies.

Figure 1. First day of the manatee meeting in Tortuguero, Costa Rica. Representatives from Nicaragua, Costa Rica, and Panama are giving the opening remarks.

This royal tern has captured a fish driven to the surface by a dolphin.

Mother and calf "surfing" a boat wake. Newborns learn very early in life how to take advantage of pressure waves.

Socializing often involves several dolphins.

White pelicans feed cooperatively; in this case in Sarasota Bay the efforts produced a mackerel.

EDUCATION AND TRAINING

Education continues to be a major component of SDRP activities, directed toward the general public, students, colleagues in the United States and abroad, and wildlife management agencies.

Public Education and Outreach: We work to educate the general public regarding bottlenose dolphins and conservation issues through public presentations at Brookfield Zoo, Mote Marine Laboratory, and elsewhere, through articles and interviews, and through volunteering opportunities. We also produce books for the general public and students. One of these, "*Dolphins, Whales, and Manatees of Florida: A Guide to Sharing Their Waters*," by John Reynolds and Randall Wells, was published in 2003 to fill a niche for teaching people about how to better appreciate and treat marine mammals in their environment. Another, "*Dolphin Man: Exploring the World of Dolphins*," by Laurence Pringle and Randall Wells, was published in 2002 to provide middle school students with an opportunity to learn about Sarasota Bay's dolphins and about one pathway for becoming a marine biologist engaged in dolphin biology research and conservation.

Human feeding of wild dolphins is an increasing problem in the southeastern United States, and is likely contributing to the increase in dolphin deaths from ingestion of, and entanglement in, recreational fishing gear. We are working with NOAA's Fisheries Service, the Dolphin Research Center, Tinsley Advertising of Miami, and Wit Animation of Venice, CA, to develop a 30-second high-definition public service announcement (PSA) that will hopefully discourage the public from feeding wild dolphins. The spot depicts a computer-animated dolphin in a rehab setting, along with an assortment of other wild animals that get food from humans: a bear, a raccoon, a squirrel, and a seagull. The dolphin describes how it got started taking food from people, the risks it faces as a result, and how it needs people to stop feeding it in order to get through its addiction. Comedian and National Public Radio celebrity Paula Poundstone is generously contributing the voice of the dolphin. Distribution will include broadcast networks, in-house programming for hotels, cruise ships, and other businesses, schools, conservation groups, etc. Production has begun, with an expected release during early 2008. Support for production and distribution of the PSA has been provided by Harbor Branch Oceanographic Institution's Protect Wild Dolphins Program, NOAA's Fisheries Service, Disney, Sea World-Busch Gardens Conservation Fund, Dolphin Quest, Dolphin Connection, Marineland, Gulf World, and the U.S. Marine Mammal Commission.

In another effort to address the closely-related issues of human feeding of dolphins and dolphin depredation of fishing gear, we have worked with NOAA's Fisheries Service and others to develop a consortium of stakeholders, including representatives of the marine mammal public display industry, angler groups, conservation organizations, research institutions, educators, and others. The basic idea behind the consortium is to try to create a common understanding and to develop and disseminate effective and consistent messages dealing with these issues. The inaugural meeting of the group took place at Mote Marine Laboratory on 14 November 2007, and was chaired by Randall Wells. Subgroups were established and sent away with assignments to be completed prior to the next meeting in 2008.

An Immersion Cinema interactive program, "*Dolphin Bay*," loosely based on our long-term dolphin research and conservation program in Sarasota Bay, is aired during multiple daily showings at Mote Marine Laboratory's 165-seat theater. Participants are able to investigate realistic threats to bottlenose dolphins in the imaginary bay, and attempt to resolve the threats for the animals by applying field research techniques and performing rescues. The program is designed to entertain as well as educate young people, especially, about the threats faced by coastal dolphins, and about the means available to them for making a positive difference in the dolphins' lives. It tries to present a balanced selection of realistic alternatives. The consequences of the choices made by the participants are shown through modeling of the Dolphin Bay population using the program "*Vortex*" (developed by the Chicago Zoological Society's Dr. Robert Lacy), indicating the population size 50 years hence.

Sharing Scientific Findings and Participation on Government Panels: Our efforts to provide information to our colleagues and wildlife management agencies continues, through publication of numerous peer-reviewed scientific articles, through invited presentations at various scientific conferences and through participation in national/international panels such as the Atlantic Scientific Review Group (R. Wells), Take Reduction Teams (D. Gannon, R. Wells), the Working Group on Marine Mammal Unusual Mortality Events (R. Wells, chair), the IUCN Cetacean Specialist Group (R. Wells), and the IUCN Reintroduction Specialist Group (R. Wells).

International Training Opportunities: The SDRP is a component of the Chicago Zoological Society's Conservation, Education, and Training Group (CET). As part of the CET program, we provide training opportunities for scientists and students from outside of the United States. These sponsored training opportunities allow foreign scientists to participate in SDRP field and laboratory research activities, and discuss with staff how such activities might be applied to their own situations at home. Standardized research methodologies facilitate comparisons across research sites. During 2007, we hosted three people: Dr. Abdul Wakid of India, Agustin Echezarreta, part of the AquaMarina franciscana dolphin research team from Argentina, and Ibiza Martínez-Serrano, a PhD student

Cuban and Mexican scientists and students participating in a training program at Isla Mujeres in September 2007.

from Mexico. Each of the 2007 participants describe their experiences below. Support for this program was provided by Dolphin Quest and private donations.

We continue to be involved in a joint effort with Mote Marine Laboratory's Shark Research Center to provide field training for scientists with the University of Havana. This program acknowledges the importance of Cuba as one of only three countries surrounding the Gulf of Mexico, and the need to work with Cuban scientists to better understand the biodiversity of the Gulf, and the status of its biota. To this end, we have developed a plan for training Cuban scientists in field research techniques that have proved effective elsewhere in the Gulf of Mexico with regards to studying sharks and dolphins. Long delayed by political obstacles, a first step was accomplished in September with the completion of a course in Isla Mujeres, Mexico, attended by both Cuban and Mexican scientists and students. The next step, involving surveys of the waters off the north coast of Cuba in October, was delayed due to mechanical difficulties with the Cuban vessel. Support for this program, administered through Mote Marine Laboratory, is provided by the Reynolds Foundation.

Graduate Students: As described throughout this newsletter, graduate students come to our program from a variety of institutions, especially through the University of California at Santa Cruz, the University of South Florida, and the University of North Carolina at Wilmington, to conduct their thesis or dissertation research. To date, 19 doctoral dissertation and 24 master's thesis projects have been conducted in association with our program. During 2007, two master's students (Brian Balmer and Virginia Fuhs) and one doctoral student (Victoria Thayer) successfully defended theses or dissertations which were based at least in part on data, samples, or guidance from the Sarasota Dolphin Research Program. Currently, eight doctoral students and two master's students are conducting work in association with our program.

Undergraduate College Internships: At the college level, we are fortunate to have access through Mote Marine Laboratory to high quality, dedicated undergraduate student interns who volunteer with our program for at least 3 months at a time (for more information on internships, please contact Jason Allen, SDRP Lab Manager, at: allenjb@mote.org). During 2007, 32 interns participated in this program, contributing more than 15,000 volunteer hours to our program.

High School Programs: SDRP is excited to introduce a new joint project with Mote's Education Program that encompasses both research and education. In response to increasing concerns about dolphin interactions with anglers and boats, SDRP staff member Kim Bassos-Hull and Mote educators have initiated a pilot project involving monitoring of dolphin behavior in high boat traffic areas of Sarasota Bay by students in Mote's High School Intern Program. The goals of the project are: 1) to gather, evaluate, and disseminate data on human-dolphin interactions in Sarasota Bay, and 2) to expose high school students to real-life scientific research and instruct them in field and laboratory research methodologies. Research questions include: 1) how often are dolphins observed within 100 m of recreational boats, 2) how do dolphin dive patterns change in the presence of boat traffic, 3) are there identifiable "hot spots" of human-dolphin interaction? Based on their findings, students will develop an array of audience-appropriate communication strategies to address the negative affects these interactions can have on dolphin populations. Students will present their findings at the Annual Conference of the Florida Marine Science Educators Association. This pilot project will serve as a model for collaborative monitoring programs in other areas where human-dolphin interactions are on the rise. Support for this project was provided by The Association of Zoo's and Aquariums (AZA) through their Conservation Endowment Fund, and the Chicago Zoological Society.

Mote high school intern Genny Cassagrande photographs a dolphin while interns Hannah Conlisk and Marina Knapp watch out for dolphins and passing boats near downtown Sarasota, 1 December 2007.

Intern Todd Musgrove takes a break from radio-tracking.

Intern Nicole Kierl collecting fish from a net pen.

Interns Mackenzie Consoer and Brooke Kelly

Intern Catherine Deveau records data.

SDRP participation in the biennial Society for Marine Mammalogy conference

By Janet Gannon, MSNR and Damon Gannon, PhD

SDRP made a strong showing at the 17th Biennial Conference on the Biology of Marine Mammals, held in Cape Town, South Africa in December. The conference is an important forum for marine mammal biology, ecology, and conservation around the world. Of 940 international attendees, about 800 gave talks or presented posters, all of which were selected on scientific merit. A highlight of the conference was the Norris Award for Lifetime Achievement, given to Dr. Toshio Kasuya of Japan for his efforts to present solid scientific evidence of Japanese over-harvest of whales and dolphins. With sadness, the scientists also discussed the likely extinction of the Baiji, or Yangtze River dolphin, and the importance of action for conservation of other endangered species of marine mammals.

Twelve SDRP presentations included genetics, acoustics, social behavior, strandings, effects of red tide, habitat selection and human impacts on Sarasota Bay bottlenose dolphins, as well as presentations on marine mammals from Argentina and Colombia. As one of the longest-running longitudinal studies of marine mammals, we are able to address questions about the biology and ecology of marine mammals that cannot be answered by any other program. For example, Vice Admiral Lautenbacher, head of NOAA (the U.S. government agency responsible for managing most of the nation's marine mammals), gave a plenary speech in which he outlined the six greatest threats to marine mammals, as perceived by NOAA. Harmful algal blooms were included in this list and it is worth noting that there were only 3 presentations at the conference on the effects of harmful algal blooms on marine mammals, all of which were given by SDRP staff.

At the Society's business meeting, SDRP's Randall Wells was recommended by the Board of Directors as one of two nominees for President of the Society. The election for a two-year term will occur in April 2008.

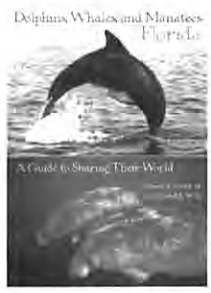
Before the conference, SDRP biologists Damon and Janet Gannon visited Hermanus, on the south coast of Africa, where they saw southern right whale mom-calf pairs lolling in the surf. They also visited the Atlantic coast of the country, where they were lucky to see Heaviside's dolphins, African penguins, baboons, and hyrax.

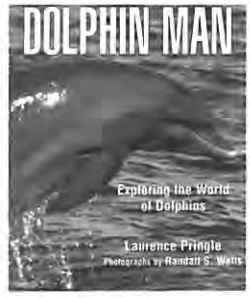
Figure 1. SDRP Staff Scientist Dr. Damon Gannon at the end of the earth, demonstrating the far-reaching influence of the SDRP!

Want to learn more?

The following books on dolphins and manatees, produced by our staff or by colleagues working closely with our program, are currently available. To purchase copies, please stop by the Brookfield Zoo or Mote Marine Lab gift shops, contact your local bookseller, or look for them on-line.

Reynolds, John E., III, and Randall S. Wells. 2003. Dolphins, Whales, and Manatees of Florida: A Guide to Sharing Their World. University Press of Florida, Gainesville, FL. 150 pp. ISBN 0-8130-2687-3





Pringle, Laurence and Randall S. Wells. 2002. Dolphin Man: Exploring the World of Dolphins. Boyds Mills Press, Honesdale, PA. 42 pp. ISBN 1-59078-004-3

Reynolds, John E., III, Randall S. Wells, and Samantha D. Eide. 2000. The Bottlenose Dolphin: Biology and Conservation. University Press of Florida, Gainesville, FL. 289 pp. ISBN 0-8130-1775-0

Norris, Kenneth S., Bernd Würsig, Randall S. Wells and Melany Würsig. 1994. The Hawaiian Spinner Dolphin. University of California Press, Berkeley, CA. 435 pp. ISBN 0-520-08208-7

Reynolds, John E., III and Sentiel A. Rommel, (eds.). 1999. Biology of Marine Mammals. Smithsonian Institution Press, Washington, DC. 578 pp. ISBN 1-56098-375-2

Howard, Carol J. 1995. Dolphin Chronicles. Bantam Books, New York, NY. 304 pp. ISBN 0-553-37778-7

Conservation research training for an Indian scientist

By Abdul Wakid, PhD

The Brahmaputra River system within India is one of the major habitats of the Gangetic dolphin (*Platanista gangetica gangetica*), which is an endangered species of freshwater dolphin found in India, Nepal, and Bangladesh. Due to various anthropogenic pressures, the species has been declining at a rapid rate over the past two decades, to only a few hundred individuals today. With an aim to reduce this rate of decline, the Gangetic Dolphin Research and Conservation Programme of Aaranyak has been working systematically on the conservation issues in this habitat from 2004 onwards, and I have been leading the programme from its inception.

My experience on the Gangetic dolphin over the past several years has led me to understand that to develop our research-based conservation initiatives, it is essential to learn the latest research techniques from highly professional dolphin research groups. To this end, I was able to work with the SDRP from 10 July until 5 September 2007.

Within this two-month period, I worked with seven different research projects: juvenile study, depredation study, biopsy darting, prey-base study (purse seining), dolphin monitoring, necropsy, and acoustics. Besides the SDRP scientists, I also worked with colleagues from Argentina, Mexico, Switzerland, Ireland, Scotland, Italy, USA, UK, and Japan on different aspects of dolphin research and conservation. With an extension of the training, I also got the opportunity to work with the University of South Florida (Dr. David Mann) and the Disney Wildlife Conservation Fund.

The whole experience in SDRP was wonderful and very effective for me. The professionalism, management and the hospitality of the staff and biologists of the SDRP are very impressive. All the new techniques that I learned with the researchers of the SDRP are new and promising for me, and some are likely to be effective in Gangetic dolphin research and conservation in India.

Dr. Abdul Wakid (front left), intern Laura Bagge (front right), intern Mackenzie Consoer (back left) and graduate student Katie McHugh (back right).

From franciscanas to bottlenose dolphins

By Agustin Echezarreta, AquaMarina, Argentina

I come from Argentina, where dolphins are mostly found in waters very different from the warm and clear seas seen in documentaries or Sarasota. Within our cold and turbid coastal waters lives a small and threatened species, the franciscana dolphin.

I am a member of AquaMarina, an Argentinean NGO directed by Pablo Bordino, who has been working on the conservation of marine biodiversity for the past 10 years. One of the goals of AquaMarina is to focus on the conservation of franciscana dolphins, working in association with local communities and artisanal fishermen to reduce the incidental by-catch of franciscana dolphins in gillnets. Different techniques have been developed and tested, including acoustic alarms or alternative fishing gear like hand-lines. Other research activities, such as abundance estimation, necropsies, and mortality estimation, are conducted every year. During the past three years, radio and satellite tags were attached to franciscana dolphins in different bays of Buenos Aires province in order to know more about their utilization area and movement patterns. This work in Argentina was made possible thanks to the capture-release, tagging, and tracking technical support provided by the SDRP and Disney.

Two hours after arriving in Sarasota I was on board with a crew motoring through clear water, and fifteen minutes later I was watching bottlenose dolphins and manatees for my first time. For three months I have been living my dream, working in the field with wild dolphins. The SDRP, in the context of their International Training Program, invited a member from the Franciscana Dolphin Project to work in various projects of the program. In the first month working at their facilities at Mote, I helped with each of the different projects and learned many things about birds, fisheries, dolphin behavior, etc. But in the last two months I was trained in photo-identification techniques. We will start working with this tool soon to improve the research process on the South Atlantic bottlenose dolphin population in my country, and see if it possible to be used with the franciscana dolphins. This technique will allow us to know more about this amazing animal. I feel very lucky because is not easy to have this kind of experience in my country and I am so grateful to the excellent SDRP team who inspired and taught me so many things, and more important, showed me all the many things I need to learn and go through to do similar work in my country.

Bottlenose dolphins on both sides of the Gulf of Mexico

By Ibiza Martínez-Serrano, PhD student, Universidad Veracruzana

I'm a PhD student, conducting research about distribution and movement patterns of bottlenose dolphins near Veracruz, México. My research project is part of a bigger one, with the goal of monitoring marine ecosystem health, studying dolphins as biological indicators. This big project is the first effort involving systematic research with marine mammals in the northern Veracruz region, and it has been a great opportunity to generate data from Mexican populations of bottlenose dolphins.

When I was first told about doing an internship, I wished to do it in the best place I could. During the second year of my dissertation research, my advisor asked me about where I would like to do my internship... I had read about the Sarasota Dolphin Research Program and I thought it would be a great opportunity for me to learn directly from the world's longest-running wild dolphin research program...and the wish came true...

I spent two months in Sarasota, working as an intern on different research projects. I participated in the Sarasota Bay surveys, learning how to take field data, how to recognize the dolphins' activities, to take useful pictures for photo-id purposes, and even to drive the boat in order to approach them correctly. I learned enough to be able to recognize some dolphins in the field, and that was very exciting! I also worked in the laboratory, working with the sighting and photo-id databases. I was trained in the photo-identification process, and I learned how to build and manage a photographic catalogue. I received training both in field and lab phases, in a very comprehensive manner, so, at the end I was able to realize and to learn first hand how the dolphins use Sarasota Bay, how they form groups and pair bonds, and how they behave and adapt their lives to the changing environment.

During my stay, I found not only excellent training to study dolphins in the wild, but also, friends, kind and warm people who always were ready to explain and to teach me different things every day. All of these things will be useful for me as I apply them in my research program in Mexico and teach other Mexican students. I feel very fortunate and I'm very grateful to the Chicago Zoological Society, Mote Marine Laboratory, and all the SDRP staff for this opportunity to improve the research about marine mammals in countries like mine. I'm sure that the conservation efforts are stronger when people work together as a team.

Interns Ibiza Martinez-Serrano, Agustin Eschezarreta and Elly Roland (back)

A day in the life of a college intern

By Elly Roland, BS

Work starts at the crack of dawn (which for a college student is defined: before noon). We arrive at the lab and check in, also seeing if the weather is good enough to go out. Then we prepare and check that all the necessary gear is ready: GPS (with batteries), water cooler, data sheets in the data cooler, and other things such as radio tracking gear. With our skipper, we head down to the boat, get everything loaded, and then our day really starts.

On the dolphin behavior boats we begin by anchoring in the sailing squadron and estimating how far away boats are. We start off horribly wrong all the time but by the end of a season we are only horribly wrong occasionally. Then we commence the work of driving around and looking for dolphins. This part can take a while. When we see dolphins we stop and take some data and some pictures and figure out who the dolphins are. By the end of the season the interns even know a few animals like Riptorn and Killer. If we see a dolphin our skipper (the researcher, often a graduate student) is studying, then we will get out other data sheets and prepare to follow that dolphin. At first it is frantic trying to get down all the data and the confusion of the skipper/researcher calling out multiple sets of data at once. Soon we get the hang of things and have time to look at the dolphins as well. We also have time to observe the antics of other boats on the water reacting to us and the dolphins. The most common reaction is that a boat comes by, takes pictures, and possibly asks us what we are doing before moving on. Sometimes the boaters have more interesting questions for us. Once when following an animal that was part of a socializing group we heard a boater ask (though not of us) "Do they have *beer* under the boat?" Our skipper explained our research to them, as we always do when asked. At the end of our day we return, clean the boat and gear, and then download the data to the computer so we can do it all again the next day.

Some days we do other things. On those bad weather days when we cannot get out on the water there are plenty of lab tasks to learn and complete such as: Photo-Id, data entry in Access, and working with GIS, a mapping program. Field work is not all fun and games with (non-alcoholic) dolphins, there are also fun and games with fish and birds. The bird boat, which looks for seabirds, gets up even earlier than the dolphin boat, but they get in earlier too. The fishing boat, uses a purse seine to collect dolphin prey fish. After catching the fish, we count and measure them, and have a lot of "fun" trying to hold on to slippery squirming fish, before returning them to their home. My dolphin interests have varied from social communication to the hormones of stress, and the staff at SDRP have helped me find the resources and connections to pursue it all. I want to thank them for all the help and advice that they have given me.

The joys of field research

By Bill Scott, FM, long-time SDRP volunteer

Lightning had struck the radar at Buenos Aires airport so all flights were being handled manually. We sat around for five hours or so watching the departure notice screen change from one bewildering message to another until it said board for the flight to Viedma. Shortly after take off there was a resounding bang, followed by the smell of burning and an announcement to fasten seat belts. Since we had just taken off and had our seat belts on, the combined effect of this was silence, nervous glances, thumping hearts and lots of grimacing as people attempted to keep their sphincters under control. Some hardy souls were pointing cameras out of the window trying to get pictures of the blood left by the big bird that had just rendered the port engine with somewhat diminished function. This was not the first time that an Argentine bird had tried to kill me – but that's another story.

After a nervous return to Buenos Aires we were informed that our choices were – wait two days or fly to Bahia Blanca and catch a specially arranged bus. We chose the latter. Arriving at Bahia Blanca at midnight we were loaded on to a 30-40 year old Mercedes bus that as far as we could tell had no discernable braking system and a suspension that at about 35-40 mph resulted in the thing rocking from side to side at interesting angles. Quite soothing to the rattled traveler you might think until one noticed the road was quite narrow and huge trucks were hurtling in the other direction – passing within inches of the bus. After four and a half hours (supposed to be three) we arrived at Viedma to find Pablo, his friend Tony and some park rangers waiting for us. Above and beyond the call I have to say as it was approaching dawn. Bags were thrown into the various vehicles. The driver of the vehicle I was in thought all the others following were "soft" for not keeping up with us but I do not recall who drove it. We charged off down the road to Bahia San Blas – population 600. Most of the journey was on unlit dirt roads at speeds ranging up to 100kph. All-in-all an interesting journey.

Hotel Pueblo Viejo – built in 1897 and still mostly un-modernized – was our base. It had no potable water, roof leaks, and a wind generated water pump that had not been oiled in a while. It turned out to be run by a truly great couple. Olga and Tom made a great fuss of us and the food was terrific - way better than expected. Except that is for one or two folks who turned decidedly green after being informed one evening that the meal we had just eaten was "rodent". Actually it was a kind of rabbit but it made a great story at the time.

Pablo forgot to mention before we went down to Argentina that San Blas is world renowned for really big sharks. We saw real evidence of this one afternoon when some local fishermen were posing next to their 9 foot catch-of-the-day!! Knowing this did wonders for bladder control and very few went swimming.

Hotel Pueblo Viejo was a palace compared to the coastguard station where all the female Argentine students and volunteers stayed. 12 of them slept on ratty mattresses arranged around the pool table in the coastguard recreation space. On top of that it was the place where we all hung out when it was too windy to get out on the water. Just to top it off there was one bathroom with no hot water. The guys all slept in Tony's 35 year old bus that he has converted to a camper. They really are truly great people and unbelievably dedicated.

OH YES. We managed to successfully tag four franciscana dolphins and thereby add more data to the project, while spending more time with some wonderful people who are fast becoming my heroes!

Argentine colleagues from AquaMarina prepare to release a tagged franciscana dolphin in Bahia San Blas in March 2007.

Bill Scott assists Argentine colleagues with th release of tagged franciscana dolphins in Bahia San Blas.

Members of the "gringo" team assisting Argentine colleagues with tagging franciscana dolphins with satellite-linked transmitte (from left to right) Jason Allen, Bill Scott, Aaron Barleycorn, James Thorso and Brian Balmer (kneeli

SARASOTA DOLPHIN RESEARCH PROGRAM OPERATIONS

SDRP personnel during 2007

Staff

Randall S. Wells, PhD, Program Manager
Jason Allen, BS, Lab and Field Coordinator
Kim Bassos-Hull, MS, Senior Biologist
Damon Gannon, PhD, Staff Scientist, Deputy Program Manager
Janet Gannon, MSNR, Senior Biologist
Stephanie Nowacek, MS, Research Associate
Elizabeth Berens, MS, Staff Biologist
Brian Balmer, MS, Research Associate
Aaron Barleycorn, BS, Research Assistant
Robin Perrtree, BS, Research Assistant
Sandra Camilleri, BS, Staff Biologist
Gene Stover, BS, Operations Specialist
Michael Scott, PhD, Secretary-Treasurer, DBRI
Blair Irvine, PhD, Vice-President, DBRI

Master's Students During 2007

Brian Balmer, University of North Carolina, Wilmington
Virginia Fuhs, Western Illinois University
Jessica Powell, University of South Florida
Laura (Monaco) Torelli, Western Illinois University

Doctoral Students During 2007

Brian Balmer, University of North Carolina, Wilmington
Glenn Dunshea, University of Tasmania
Salome Dussan-Duque, University of Saint Andrews
Deborah Fauquier, University of California, Santa Cruz
Katie McHugh, University of California, Davis
Erin Meagher, University of North Carolina, Wilmington
Martin Mendez, Columbia University
Peter Simard, University of South Florida
Vicky Thayer, Duke University
Jennifer Yordy, Medical University of South Carolina

Interns During 2007 (*indicates international interns)

Kim Atwater
Laura Bagge
Gemma Barnacle
Caroline Baumgartner*
Deanna Beatty
Natalya Blumenfeld
Nicole Brown
Kristen Burtch
Stefania Clemente*
Ashley Collins
Mackenzie Consoer
Karen Coomer
Catherine Deveau
Agustin (Carpi) Echezarreta*
Rachel Eubank
Adrienne George
Elizabeth (Brooke) Kelly
Nicole Kierl
Genine Lipkey
Ibiza Martínez-Serrano*
Jordan Matley*
Lauren McGuire
Todd Musgrove
Jessica Owens
Victoria Pearson
Kristal Richardson
Elly Roland
Katie Schierer
Christina Toms
Dr. Abdul Wakid*
Shimpei Yamamoto*
Phillip Young

Volunteer Research Assistants 2007

Bill Kayser
Cathy Marine
Norma Pennington
Sally Senger
Bill Scott
James Thorson
Lorry Stover

SDRP database status

By Janet Gannon, MSNR

The SDRP database is going strong! We've had a very busy year in the field, which means many new additions to the long-term dolphin sighting database. For every day we spend collecting data on dolphins in Sarasota Bay and the surrounding waters, we spend even more entering data, verifying them, and analyzing them.

Our database is carefully designed to ensure data integrity while allowing researchers to access, manipulate and analyze data. We maintain a "front end-back end" arrangement for this database, keeping our valuable verified data on a server and accessing it through interfaces on each workstation. Because we have designed the database with built-in analyses, we can quickly answer questions about the bottlenose dolphins of the central west coast of Florida. The database is constantly expanding. We currently have 32,781 dolphin group encounters (sightings) entered into the database (and double-checked, as the interns would be quick to point out). Our identification catalog contains 5,777 images of 3,499 distinctively marked individuals plus some of their calves. The database provides 92,541 identifications of these individuals from 1975 through mid-2007.

SDRP field and laboratory methods available on-line

By SDRP Staff and Students

Our program's "Manual for Field Research and Laboratory Activities" is now available as a downloadable pdf file at our website, www.sarasotadolphin.org. This 62-page document provides detailed documentation of the protocols used for field operations and data processing. It includes chapters on: 1) Field survey protocols, 2) Post-survey lab protocols, 3) Photo-identification protocols, 4) Database entry, verification, and management, and 5) SDRP operations protocols. The accessibility of these protocols to colleagues and students promotes and facilitates standardization of methodologies across research sites, and provides incoming students and interns with background materials prior to their arrival. This is considered to be a "living document" that will be constantly evolving as we improve and refine our approaches.

SDRP sample archives

By Brian BalmerMS, Aaron Barleycorn BS, and Robin Perrtree BS

Archived tissue samples can be very important for retrospective studies of emerging diseases or for tracking the occurrence of diseases or concentrations of environmental contaminants over time. Our inventory shows that we currently have more than 4,800 tissue samples archived at Mote Marine Laboratory (n = 4,349) and Brookfield Zoo (n = 477). These samples, including whole blood, serum, plasma, milk, urine, blubber, skin, gastric, feces, and parasites, have been collected from 1988 to the present. Most of the samples are preserved in ultracold freezers. These precious and unique samples from our health assessments and from stranded dolphins are provided to collaborating investigators for specific research projects. Most recently, samples have been provided for investigations of morbillivirus, biotoxins in dolphins, trophic studies, immunological analyses, environmental contaminant measurements, genetic studies, and milk composition analyses.

PROFESSIONAL ACTIVITY SUMMARY

One accepted measure of the productivity of a research program is its record of achievement in providing information to the scientific community, wildlife management agencies, and the public. The following list includes our program's products since the publication of our last newsletter, including the relevant work of our collaborators from partner institutions. Copies of specific papers can be obtained upon request for the cost of copying and postage, or as electronic pdf files.

Peer-reviewed Journal Articles and Book Chapters

Bryan C.E., S.J. Christopher, B.C. Balmer, and R.S. Wells. 2007. Establishing baseline levels of trace elements in blood and skin of bottlenose dolphins in Sarasota Bay, Florida: implications for non-invasive monitoring. Science of the Total Environment 388:325-342.

Fire, S.E., D. Fauquier, L.J. Flewelling, M. Henry, J. Naar, R. Pierce, and R.S. Wells. 2007. Brevetoxin exposure in bottlenose dolphins (*Tursiops truncatus*) associated with *Karenia brevis* blooms in Sarasota Bay, Florida. Marine Biology 152:827-834.

Gannon, D.P. 2007. Acoustic behavior of Atlantic croaker *Micropogonias undulatus* (Sciaenidae). Copeia 2007(1):186–192

Hall, A.J., R.S. Wells, J.C. Sweeney, F.I. Townsend, B.C. Balmer, A.A. Hohn, and H.L. Rhinehart. 2007. Annual, seasonal and individual variation in hematology and clinical blood chemistry profiles in bottlenose dolphins (*Tursiops truncatus*) from Sarasota Bay, Florida. Comparative Biochemistry and Physiology Part A 148:266-277.

Klatsky, L.J., R.S. Wells, and J.C. Sweeney. 2007. Offshore bottlenose dolphins (*Tursiops truncatus*): movement and dive behavior near the Bermuda Pedestal. Journal of Mammalogy 88:59-66.

Moore, M.M., G. Early, K. Touhey, S. Barco, F. Gulland, and R. Wells. 2007. Rehabilitation of marine mammals in the United States: risks and benefits. Marine Mammal Science 23:731-750.

Westgate, A.J., W.A. McLellan, R.S. Wells, M.D. Scott, E.M. Meagher, and D.A. Pabst. 2007. A new device to remotely measure heat flux and skin temperature from free-swimming dolphins. Journal of Experimental Marine Biology and Ecology 346:45-59.

Manuscripts in Press, In Revision, or In Review

Brueggen, M.K., and D.P. Gannon. In review. Responses of chorusing male spotted seatrout (*Cynoscion nebulosus*) to acoustic cues associated with predators. Journal of Fish Biology.

Buckstaff, K.C., R.S. Wells, J.G. Gannon, and D.P. Nowacek. In review. Responses of bottlenose dolphins to construction and demolition of coastal marine structures. Aquatic Mammals.

Dunshea, G., N. Barros, R.S. Wells, M. Hindell, N. Gales, and S. Jarman. In review. Pseudogenes and DNA based diet analyses; a cautionary tale from a relatively well sampled predator/prey system.

Dunshea, G. In review. A generic molecular diet assay for Carnivora and Odontoceti mammals and a framework to use similar methods for any predator group.

Gannon, D.P. In press. Passive acoustic techniques in fisheries science: a review and prospectus. Transactions of the American Fisheries Society.

Gannon, D.P. and J.G. Gannon. In review. Can passive acoustic methods be used to assess trends in abundance of soniferous fishes? Canadian Journal of Fisheries and Aquatic Sciences.

Meagher, E., W.A. McLellan, A. Westgate, R.S. Wells, J. Blum, and D.A. Pabst. In review. Seasonal patterns of heat loss in wild bottlenose dolphins (*Tursiops truncatus*). Journal of Comparative Physiology B.

Mintzer, V.J., D.P. Gannon, N.B. Barros, and A.J. Read. In press. Stomach contents of mass-stranded short-finned pilot whales (*Globicephala macrorhynchus*) from North Carolina. Marine Mammal Science.

Naar, J.P., L.J. Flewelling, A. Lenzi, J.P. Abbott, A. Granholm, H.M. Jacocks, D.P. Gannon, M. Henry, R. Pierce, D.G. Baden, J. Wolny, and J.H. Landsberg. In press. Brevetoxins, like ciguatoxins, are potent ichthyotoxic neurotoxins that accumulate in fish. Toxicon.

Remington, N., R.D. Stevens, R.S. Wells, A. Hohn, S. Dhunganae, C.H. Taboye, A.L. Crumblisse, R. Henkins, and C. Bonaventura. In review. Genetic diversity of coastal bottlenose dolphins revealed by structurally and functionally diverse hemoglobins.

Sayigh, L.S., H.C. Esch, R.S. Wells, and V.M. Janik. In press. Facts about signature whistles of bottlenose dolphins (*Tursiops truncatus*). Animal Behaviour.

Sayigh, L.S. and V.M. Janik. In press. Signature whistles. *In:* W.F. Perrin, B. Würsig, and J.G.M. Thewissen, eds., Encyclopedia of Marine Mammals. Elsevier, Inc., San Diego, CA.

Urian, K.W., S. Hofmann, R.S. Wells, and A.J. Read. In review. Fine-scale population structure of bottlenose dolphins, *Tursiops truncatus*, in Tampa Bay, Florida. Marine Mammal Science.

Wells, R.S. In press. Dolphins and porpoises. *In:* J.H. Steele, S.A. Thorpe, and K.K. Turekian (eds.), Encyclopedia of Ocean Sciences – on line. Oxford, UK: Elsevier.

Wells, R.S. In review. Identification methods. *In:* W.F. Perrin, B. Würsig, and J.G.M. Thewissen, (eds.), Encyclopedia of Marine Mammals. Elsevier, Inc., San Diego, CA. Updated from 2002.

Wells, R.S. and M.D. Scott. In review. Common bottlenose dolphins (*Tursiops truncatus*). *In:* W.F. Perrin, B. Würsig, and J.G.M. Thewissen, (eds.), Encyclopedia of Marine Mammals. Elsevier, Inc., San Diego, CA. Updated from 2002.

Wells, R.S., C.A. Manire, D. Smith, J.G. Gannon, D. Fauquier, and K.D. Mullin. In revision. Movements and dive patterns of a rehabilitated Risso's dolphin, *Grampus griseus*, in the Gulf of Mexico and Atlantic Ocean. Marine Mammal Science.

Wilson, J.Y., R.S. Wells, A. Aguilar, A. Borrell, V. Tornero, P. Reijnders, M. Moore, and J.J. Stegeman. In press. Correlates of Cytochrome P450 1A1 (CYP1A1) expression in bottlenose dolphin (*Tursiops truncatus*) integument biopsies. Toxicological Sciences.

Wong, S.K., R. Rivera, C.R. Smith, J.T. Saliki, R.S. Wells, and H. Nollens. In press. Evidence of exposure to a novel parainfluenza virus in two bottlenose dolphin (*Tursiops truncatus*) populations: Clinical implications of a common respiratory virus. Emerging Infectious Diseases.

Woshner, V., K. Knott, R.S. Wells, C. Willetto, R. Swor, and T. O'Hara. In review. Mercury and selenium in blood and epidermis of bottlenose dolphins (*Tursiops truncatus*) from Sarasota Bay, Florida (USA): interaction and relevance to life history and hematologic parameters. EcoHealth.

Theses and Dissertations

Doctoral Dissertations

Balmer, B. In progress. Environmental influences on bottlenose dolphin *(Tursiops truncatus)* community structure and dynamics in the Southeastern United States. University of North Carolina, Wilmington.

Dussán-Duque, S. In progress. Biology of coastal tucuxi dolphins off Colombia. University of St. Andrews, Scotland.

Fauquier, D. In progress. Effects of red tide on seabird ecology. Ocean Sciences Dept., University of California, Santa Cruz.

McHugh, K. In progress. Behavior of juvenile bottlenose dolphins in Sarasota Bay. Animal Behavior Group, University of California, Davis.

Meagher, E. In progress. Heat flux and thermoregulation of bottlenose dolphins. University of North Carolina, Wilmington.

Mendez, M. In progress. Ecological and environmental factors to population structure in highly mobile marine organisms: a combined genetic-oceanographic approach in coastal cetaceans. Columbia University.

Simard, P. In progress. The abundance and distribution of cetaceans on the west Florida shelf: a synoptic study based on acoustics, visual surveys and remote sensing. University of South Florida.

Thayer, V.G. 2007. Life history parameters and social associations of female bottlenose dolphins (*Tursiops truncatus*) off North Carolina, USA. Duke University.

Yordy, J. In progress. Characterization of complex organohalogen mixtures in bottlenose dolphins (*Tursiops truncatus*). Medical University of South Carolina.

Master's Theses

Balmer, B.C. 2007. Seasonal abundance, site-fidelity, and utilization areas of bottlenose dolphins in St. Joseph Bay, Florida. M.Sc., University of North Carolina, Wilmington.

Fuhs, V.S. 2007. Spatial relationships of spinner dolphin *(Stenella longirostris)* mother-calf pairs, Island of Hawaii. M.Sc. thesis. Western Illinois University. 37 pp.

Monaco, L. In progress. Defining success for cetacean rehabilitation. Western Illinois University.

Powell, J. In progress. Depredation and fishing interactions involving bottlenose dolphins (*Tursiops truncatus*) in Sarasota Bay, Florida. University of South Florida, St. Petersburg, FL.

PROFESSIONAL ACTIVITY SUMMARY

Technical Reports

Bassos-Hull, K. and R.S. Wells. 2007. Investigating potential hurricane and red tide related impacts on bottlenose dolphin (*Tursiops truncatus*) abundance, reproductive rates, distribution, and site fidelity in Charlotte Harbor and Pine Island Sound, Florida. Final Technical Report to Harbor Branch Oceanographic Institution Protect Wild Dolphins Program for Award 2006-3. 43 pp.

Fauquier, D.A., L. Flewelling, J. Landsberg, N. Barros, J.G. Gannon and R.S. Wells. 2007. Investigating brevetoxin-induced mortality in bottlenose dolphins stranded in central west Florida. John H. Prescott Stranding Grant Program Final Performance Report for Grant Award # NA06NMF4390161.

Wells, R.S., G.A. Early, J.G. Gannon, R.G. Lingenfelser, and P. Sweeney. In review. Tagging and tracking of rough-toothed dolphins (*Steno bredanensis*) from the March 2005 mass stranding in the Florida Keys. NOAA Tech. Memo.

Presentations at Professional Meetings

Barros, N.B., J.G. Gannon, and R.S. Wells. 2007. Combining long-term photo-identification and stranding data from west-central Florida, USA, resident bottlenose dolphins: a synergistic approach with implications for ecological studies. 17th Biennial Conference on the Biology of Marine Mammals, 29 November – 3 December, Cape Town, South Africa.

Bordino, P., R.S. Wells, and A.M. Stamper. 2007. Site fidelity of franciscana dolphins *Pontoporia blainvillei* off Argentina. 17th Biennial Conference on the Biology of Marine Mammals, 29 November – 3 December, Cape Town, South Africa.

Dunshea, G., S. Jarman, M. Hindell, R.S. Wells, D. Duffield, and N. Gales. 2007. Telomeres of cetaceans and pinnipeds: initial experimental genomic characterization and examination of age related dynamics. 17th Biennial Conference on the Biology of Marine Mammals, 29 November – 3 December, Cape Town, South Africa.

Fauquier, D.A., N. Barros, L. Flewelling, V. Socha, R. Pierce, J.G. Gannon, M. Kinsel, M. Stolen, J. Landsberg, and R.S. Wells. 2007. Brevetoxin induced mortality in stranded dolphins from central west Florida during 2005 and 2006. 17th Biennial Conference on the Biology of Marine Mammals, 29 November – 3 December, Cape Town, South Africa.

Gannon, J.G., J.B. Allen, D.P. Gannon, E.J. Berens, S.Hofmann, and R.S. Wells. 2007. Effects of harmful algal blooms on bottlenose dolphins (*Tursiops truncatus*): changes in distribution and behavior. 17th Biennial Conference on the Biology of Marine Mammals, 29 November – 3 December, Cape Town, South Africa.

Gannon, D.P., A.S. Friedlaender, J.G. Gannon, E.J. Berens, J.B. Allen, S. Hofmann, and R.S. Wells. 2007. Seeing the forest for the trees: comparing patterns of habitat selection at the level of the population and of the individual for bottlenose dolphins in Sarasota Bay, Florida. 17th Biennial Conference on the Biology of Marine Mammals, 29 November – 3 December, Cape Town, South Africa.

Gannon, D.P., A.S. Friedlaender, J.G. Gannon, E.J. Berens, J.B. Allen, S. Hofmann, and R.S. Wells. 2007. Seeing the forest for the trees: comparing patterns of habitat selection at the level of the population and of the individual for bottlenose dolphins in Sarasota Bay, Florida. Southeast and Mid-Atlantic Marine Mammal Symposium, 16-18 March, Beaufort, NC.

Gannon, J.G., R.S. Wells, J.B. Allen, D.P. Gannon, E.J. Berens, and S. Hofmann. 2007. Effects of harmful algal blooms on bottlenose dolphins (*Tursiops truncatus*): changes in distribution and behavior. Southeast and Mid-Atlantic Marine Mammal Symposium, 16-18 March, Beaufort, NC.

Gridley, T., N. Quick, L. Sayigh, and V.M. Janik. 2007. Signature whistle type diversity in captive and wild bottlenose dolphins (*Tursiops truncatus*). 17th Biennial Conference on the Biology of Marine Mammals, 29 November – 3 December, Cape Town, South Africa. (poster)

Kucklick, J.R., A. Guichard, J. Yordy, J. Litz, R.S. Wells, B. Balmer, A. Hohn, E. Zolman, L. Schwacke, T. Rowles, L. Hansen, C. Berrie, and P. Rosel. 2007. Concentrations and patterns of lipophilic pollutants in bottlenose dolphins (*Tursiops truncatus*) as a function of geographical scale and implications to dolphin health. 27th International Symposium on Halogenated Persistent Organic Pollutants. Tokyo, Japan.

Kucklick J.R., A. Guichard, J. Yordy, J. Litz, R.S. Wells, B. Balmer, A. Hohn, E. Zolman, L. Schwacke, T. Rowles, L. Hansen, C. Berrie, and P. Rosel. 2007. Concentrations and patterns of lipophilic pollutants in bottlenose dolphins (*Tursiops truncatus*) as a function of geographical scale and implications to dolphin health. 28th Annual Meeting of the Society of Environmental Toxicology and Chemistry. Milwaukee, WI, 11-14 November.

Mann, D. A. 2006. Passive Acoustic Sensing. Florida Coastal Ocean Observing Systems (COOS) Caucus Meeting, Mote Marine Laboratory, Sarasota, FL, USA, April 2006.

McHugh, K.A. and R.S. Wells. 2007. Red tide effects on juvenile bottlenose dolphin behavior in Sarasota Bay, FL. 44th Annual Meeting of the Animal Behavior Society, 21-26 July 2007, Burlington, VT.

McHugh, K.A. and R.S. Wells. 2007. Red tide effects on juvenile bottlenose dolphin behavior in Sarasota Bay, FL. Southeast and Mid-Atlantic Marine Mammals Symposium, 16-18 March, Beaufort, NC.

McHugh, K.A., S. Hofmann, J.B. Allen, M.D. Scott, and R.S. Wells. 2007. Factors influencing variation in age at independence for free-ranging bottlenose dolphin calves in Sarasota Bay, Florida. 17th Biennial Conference on the Biology of Marine Mammals, 29 November – 3 December, Cape Town, South Africa.

Quintana-Rizzo, E. 2007. Manatí Antillano (*Trichechus manatus*) en el Caribe y métodos de estudio. Primer Taller Trinacional para la Conservación del Manatí Antillano. April 16-18, Tortuguero, Costa Rica.

Quintana-Rizzo, E., D. Mann and R.S. Wells. 2007. Rango de comunicacion de los sonidos sociales de los delfines nariz de botella (*Tursiops truncatus*). Tercer Congreso de la Comisión Nacional de Ciencia y Tecnología, Converciencia. 24-27 July, Ciudad de Guatemala, Guatemala.

Quintana-Rizzo, E. and R.S. Wells. 2007. The definition of a group in species with fluid relationships: the case of the bottlenose dolphin (*Tursiops truncatus*). 17th Biennial Conference on the Biology of Marine Mammals, 29 November – 3 December, Cape Town, South Africa. (poster)

Sayigh, L., H.C. Esch, J. Blum, and R. Wells. 2007. Whistles as potential indicators of stress in bottlenose dolphins. 21st Conference of the European Cetacean Society, San Sebastian, Spain, 23-25 April 2007. (poster)

Sayigh, L.S., R.S. Wells, and V.M. Janik. 2007. Signature whistle development in bottlenose dolphins. 17th Biennial Conference on the Biology of Marine Mammals, 29 November – 3 December, Cape Town, South Africa.

Scott, M.D., R.S. Wells, and A.B. Irvine. 2007. Long-term studies of bottlenose dolphins: an assessment of costs and benefits. 17th Biennial Conference on the Biology of Marine Mammals, 29 November – 3 December, Cape Town, South Africa.

Simard, P. and D. Mann. 2007. Automatic detection of dolphin vocalizations using DPASS (Dolphin Passive Acoustic Surveillance System). 30th International Ethology Conference, Halifax, NS, Canada, August 2007.

Simard, P., R.S. Wells, J.B. Allen, M. Cook, and D. Mann. 2007. Boat-based visual surveys and acoustic detection using manual methods and automatic recognition software: results from bottlenose dolphins (*Tursiops truncatus*) in Sarasota, Florida. 17th Biennial Conference on the Biology of Marine Mammals, 29 November – 3 December, Cape Town, South Africa.

Wells, R.S. and J.B. Allen. 2007. Consequences of injuries on survival and reproduction of bottlenose dolphins in Sarasota Bay, Florida. NMFS Serious Injury Technical Workshop, 10-12 September 2007, Seattle, WA.

Wells, R.S., S. Hofmann, J.B. Allen, K.W. Urian, K. Bassos-Hull, S.M. Nowacek, J.G. Gannon, N.B. Barros, D.A. Fauquier, M.D. Scott, and R.C. Lacy. 2007. Impacts of human activities and natural events on the abundance and vital rates of bottlenose dolphins in Sarasota Bay, Florida. 17th Biennial Conference on the Biology of Marine Mammals, 29 November – 3 December, Cape Town, South Africa.

West, K.L., R. Shah, O.T. Oftedal, R.S. Wells, D.P. Costa, and M.B. Kretzmann. 2007. Milk composition and calf growth in free-ranging bottlenose dolphins (*Tursiops truncatus*) from Sarasota Bay, Florida. 17th Biennial Conference on the Biology of Marine Mammals, 29 November – 3 December, Cape Town, South Africa.

PROFESSIONAL ACTIVITY SUMMARY

Yordy, J., R. S.Wells, A. Guichard, B. Balmer, L. Schwacke, T. Rowles, and J. Kucklick. 2007. Shift of PBDE mixtures within a coastal bottlenose dolphin population in relation to life history and dietary exposure. 28th Annual Meeting of the Society of Environmental Toxicology and Chemistry. 11-14 November, Milwaukee, WI,

Invited Public and University Lectures

Barros, N.B. 2007. Trophic ecology of bottlenose dolphins from west Florida: insights from long-term studies. Michigan State University. Ecology, Evolutionary Biology and Behavior Program Seminar Series. 7 November 2007.

Bassos-Hull, K. 2007. Dolphin research along the west coast of Florida. Sarasota Scuba Club, Sarasota, FL. 4 October 2007.

Bassos-Hull, K. 2007. Bottlenose dolphin abundance, distribution, seasonal and long-term site fidelity in the Charlotte Harbor ecosystem. Shell Point Retirement Community, Ft. Myers, FL. 13 June 2007.

Bassos-Hull, K. 2007. Bottlenose dolphin abundance, distribution, seasonal and long-term site fidelity in the Charlotte Harbor ecosystem. Captiva Cruises, Captiva, FL. 16 April 2007.

Bassos-Hull, K. 2007. Bottlenose dolphin abundance, distribution, seasonal and long-term site fidelity in the Charlotte Harbor ecosystem. Burnt Store Yacht Club, Punta Gorda, FL. 18 January 2007.

Gannon, D.P. 2007. Ecological effects of *Karenia brevis* harmful algal blooms on estuarine communities. Florida State University.

Gannon, D.P. 2007. Noisy fishes, silent dolphins, and the toxic tide that plagues them. Mote Marine Laboratory's Scientific Seminar Series.

Gannon, D.P. and J.G. Gannon. 2007. Effects of *Karenia brevis* blooms on fishes and bottlenose dolphins. Eckerd College.

Wells, R.S. 2007. The secret life of dolphins. Bedford Court Retirement Community, Silver Spring, MD. 8 December 2007.

Wells, R.S. 2007. The bottlenose dolphins of Sarasota Bay: lessons from 37 years and 5 generations. Sigma Xi Lecture, Eckerd College, St. Petersburg, FL. 13 November 2007.

Wells, R.S. 2007. Cetaceans of the Gulf of Mexico: Biology and research. Training class for Cuban and Mexican scientists and students, Isla Mujeres, Mexico, 14 September 2007.

Wells, R.S. 2007. University of Chicago Field Ecology Course, Sarasota Bay, 24 March 2007.

Wells, R.S. 2007. Wild dolphin societies: a tale of two cetaceans. Whale Quest, Kapalua, Maui, Hawaii. 17 February 2007.

Wells, R.S. 2007. The bottlenose dolphin community of Sarasota Bay: Lessons from 37 years and 5 generations. Siesta Key Chapel. 16 January 2007.

HOW YOU CAN HELP

We need your financial help to continue this important work. Continuity is the essence of a long-term research program. As the federal support that has sustained the program comes to an end, we must rely increasingly on competitive grants and contributions from donors to keep our program operating. Funding opportunities through competitive grant programs have declined in recent years, and competition for the few available grants is fierce. Our projected program budget for 2008 is about $1 million, including support for staff and graduate students, facility and administrative costs, boat operations, health assessments, international training programs, dolphin rescues and follow-up monitoring, field research supplies, and travel to field sites and conferences. In addition, we are seeking to establish an endowment of **$2,000,000** to ensure the continuity of the most basic monitoring activities of the world's longest-running dolphin research program.

Examples of some of the expenses for which we are seeking assistance include:

- Annual support for field research expenses for one graduate student = $10,000
- Support for franciscana dolphin research in Argentina = $10,000
- Replacement 4-stroke outboard engine = $8,000
- Support for intern from Argentina to come to Sarasota for training = $5,000
- Satellite-linked tag and 6 months of satellite data processing for monitoring a rescued dolphin = $5,000

If you can help, **contributions of funds** should be directed to your choice of the following:

"**Chicago Zoological Society**," Brookfield Zoo, 3300 Golf Road, Brookfield, IL 60513, c/o Steve Birkhauser, Director of Major Gifts, Tel: (708) 688-8316, stbirkha@brookfieldzoo.org – please indicate "**Dolphin Conservation Program**" on the memo line. In 2007, the number of supporters who made contributions to the Chicago Zoological Society's Dolphin Conservation Program doubled. Many were participants in our 2006-2007 Batchelor Challenge, an effort to match the generous funds awarded by the Batchelor Foundation. In addition, donors and prospective donors attended the Third Annual Chicago Zoological Society Dolphin Conservation Program Dinner held at Brookfield Zoo on 8 November 2007. The 60 guests received updates on the research done by the SDRP over the past year. Similar events to highlight the program will be held on both Florida's east and west coasts in early spring 2008.

"**Mote Marine Laboratory**," 1600 Ken Thompson Parkway, Sarasota, FL 34236 c/o Randall Wells, Tel: (941) 388-2705, rwells@mote.org – please indicate "**Sarasota Dolphin Research Program**" on the memo line.

"**Dolphin Biology Research Institute**," 708 Tropical Circle, Sarasota, FL 34242, Tel: (941) 349-3259, randallswells@comcast.net. DBRI can accept **donations of funds, boats, vehicles, and other field equipment** in good condition. DBRI is a Sarasota-based 501{c}3 not-for-profit corporation (IRS-EI#59:2288387); thus donations of funds and/or equipment are tax-deductible (Florida State Solicitations Registration No. SC-01172). Our current fleet of active research boats and trucks is composed largely of donated equipment. Funds from sales of such donations go entirely to offset research and education program expenses. During the most recent fiscal year, only 1% of funds received by DBRI were spent on fund-raising activities. No salaries are paid by DBRI to any of its Officers or Directors.

THANK YOU FOR YOUR HELP!

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In memory of Frances S. Wells

Ed Blair (left), Ralph Piland (middle), and James Thorson (right) help to support a bottlenose dolphin during a Sarasota Bay health assessment. The suction cup hydrophone ("party hat") behind the blowhole records the dolphin's whistles.

Long-time volunteer Bill Scott maintains his focus on the job at hand while helping to support a bottlenose dolphin during a health assessment.

Stacey Carlson (left) of the Southeast Region Office of NOAA's Fisheries Service and Dr. Jackie Ogden (right), Vice President of Animal Programs and Environmental Initiatives for Disney's Animal Programs, support a bottlenose dolphin in Palma Sola Bay for a health assessment.

Dr. Jay Sweeney of Dolphin Quest performs an ultrasound exam on a bottlenose dolphin during health assessments in Sarasota Bay.

The Sarasota Dolphin Research Program is...

Conservation

Research

Education

Sarasota Dolphin Research Program and Disney staff assist colleagues in Argentina with release of a franciscana dolphin tagged with a satellite-linked transmitter.

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