NICKS *n* NOTCHES

Annual summary of the activities and findings of the Sarasota Dolphin Research Program, a collaborative component of the Chicago Zoological Society's Dolphin Research and Conservation Institute

Chicago Zoological Society

A year of conservation capacity building

By Randall Wells, PhD, Director, Sarasota Dolphin Research Program

Conservation research, education, and training are among the core activities of the Sarasota Dolphin Research Program. Professional training, especially as it relates to conservation capacity building, is an important aspect of our program's mission and that of its parent division of the Chicago Zoological Society, the Conservation, Education, and Training group. The year 2011 provided a number of opportunities for our program to help build dolphin conservation capacity at sites across the globe. Research teams from Brazil, Taiwan, and Cuba participated in our bottlenose dolphin health assessment in Sarasota Bay to learn safe and proven techniques for potential application to dolphin conservation situations in their own countries. The Brazilian team was preparing for the first-ever tagging of endangered Franciscana dolphins in their country, to learn about ranging patterns and habitat use of dolphins threatened by coastal development and gill-netting. The Taiwanese team came to determine if such an approach would be appropriate and feasible for use with an endangered population of humpback dolphins in a region of Taiwan threatened with extensive coastal development. The Cuban team, one of the first marine research teams to get U.S. state department clearance to come to this country, came to learn how to standardize sample and data collection to facilitate comparisons of bottlenose dolphin health in two of the three countries bordering the Gulf of Mexico.

As you will read inside this issue, our work with the Brazilians was the culmination of several years of preparation and training in Argentina and Sarasota. We have worked with Argentinean Franciscana researchers, led by Pablo Bordino, since 2005, helping to develop their capacity for field work including tagging, tracking, and photo-identification. In preparation for the project in Brazil, several members of the Brazilian team participated in the 2010 Franciscana tagging project in Argentina and in the Sarasota Bay health assessment. Additional Brazilian team members came to Sarasota for training in May 2011. In October 2011, experienced Argentinean Franciscana researchers and Sarasota Dolphin Research Program staff converged at São Francisco do Sul, Brazil, to assist Dr. Marta Cremer and her team with tagging Franciscana dolphins. The tri-national collaboration could not have worked any better!

Closer to home, over the past year we engaged in capacity building within our own program, as Katie McHugh and Brian Balmer, who both started with the SDRP as interns in 2000, completed their doctoral dissertations and became CZS post-doctoral scientists working with our program. These newly fledged scientists will greatly expand our ability to seek and engage in new research. Another SDRP intern from 2000, Leslie Burdett Hart, completed her dissertation in 2011 and is working as a post-doctoral scientist with NOAA's National Ocean Service, engaged in dolphin health research including ongoing collaborations with the SDRP. One of our 2010 interns, Sunnie Hart, joined our program's staff in the past year, and another, Mary Gryzbek, enrolled as a Master's student at the University of Florida, engaged in bottlenose dolphin health research through our program. Among the 17 new interns training with our program in 2011 were participants from Argentina, Canada, and Denmark, who we hope will apply their training in their own countries.

Conservation capacity building, in the form of developing collaborations among researchers across the Gulf of Mexico, should provide benefits for coastal bottlenose dolphins. A 3-year grant from the Disney Worldwide Conservation Fund is facilitating the development of a Gulf-wide bottlenose dolphin photographic identification catalog, integrating the work of researchers engaged in photo-ID efforts throughout the region. Compilation and sharing of identification images will help with definition of ranging patterns, habitat use, and stock identification, detection of long-range movements, abundance estimation, and assessment of body condition. In light of the ongoing unusual mortality event(s) in the northern Gulf and large-scale environmental perturbations to the Gulf of Mexico from such sources as the Deepwater Horizon oil spill and floodwaters from the Mississippi River, the combined, collaborative efforts of large numbers of dedicated scientists have the potential to make an important difference for these animals.

2011 - a year of much activity for the resident Sarasota Bay dolphins as well as the resident dolphin research team

Our approach toward helping dolphins

By Randall Wells, PhD

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 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 collaborative work done in partnerships toward achieving these goals is conducted under the umbrella of the "Sarasota Dolphin Research Program." This name links the efforts of several organizations and individuals that work together to insure the continuity of the long-term dolphin research in Sarasota Bay. The SDRP has been operated by the Chicago Zoological Society (CZS) since 1989, and is administered through the CZS Dolphin Research and Conservation Institute. Dolphin Biology Research Institute, a Sarasota-based 501{c}3 non-profit corporation established in 1982, provides logistical support with its fleet of four small research vessels, two towing vehicles, computers, cameras, field equipment, etc. The program got its start at Mote Marine Laboratory during 1970-72, and since 1992, Mote 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 opportunities primarily through the University of California at Santa Cruz, the University of North Carolina at Wilmington, Duke University, University of Florida, and the University of South Florida.

All of our bottlenose dolphin research in the United States is conducted under NOAA Fisheries Scientific Research Permits and Institutional Animal Care and Use Committee approvals through the appropriate institutions.

Chicago Zoological Society
Inspiring Conservation Leadership

MOTE MARINE LABORATORY

In This Issue

Deepwater Horizon Oil Spill: Responding to threats to dolphins along the central west coast of Florida

By Brian C. Balmer, PhD, Jason Allen, BS, and Randall S. Wells, PhD, Chicago Zoological Society

Much concern surrounded the potential catastrophic impacts of the April 2010 Deepwater Horizon (DWH) oil spill on wildlife and habitats in the Gulf of Mexico. The most common cetaceans in inshore waters of the Gulf, bottlenose dolphins, reside in coastal waters and bays, sounds, and estuaries where exposure to oil from the DWH incident was likely to occur. Prior to the DWH spill, little was known about the effects of oil spills on dolphins. There are a number of potential routes by which dolphins may be exposed to oil or associated chemicals such as inhalation, ingestion, and direct contact. Without the ability to predict the extent to which the spill would impact the Gulf coast and associated marine mammals, there was a strong need to collect baseline and control data for dolphin populations that might have been impacted directly or that might serve as comparative populations for those that are directly impacted, so that we can better understand the impacts of oil spills on cetaceans.

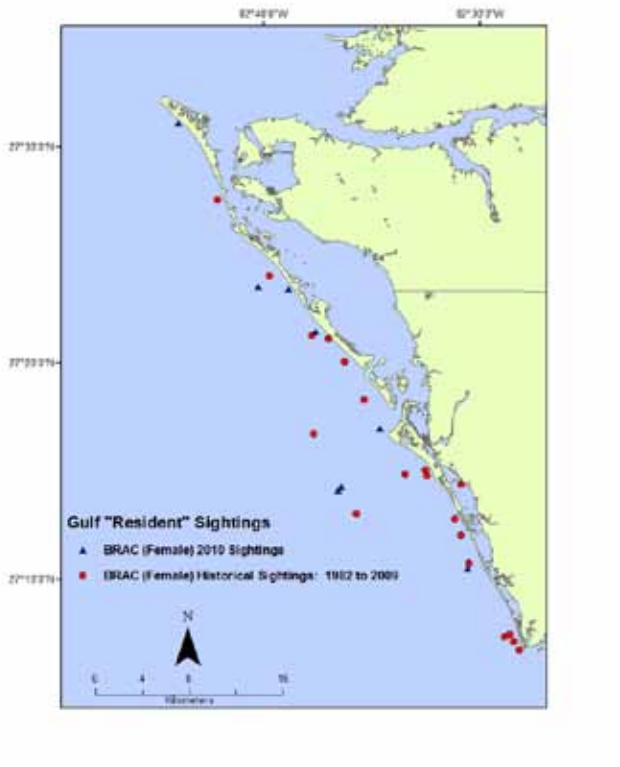
With the help of the Morris Animal Foundation's Betty White Wildlife Rapid Response Fund, we initiated a project to address potential impacts on Gulf of Mexico bottlenose dolphins, specifically targeting stocks off the central west coast of Florida. The targeted stocks included the resident Sarasota Bay dolphin community, for which long-term health and population data were available, and the dolphins inhabiting the coastal waters of the Gulf of Mexico immediately offshore of Sarasota Bay, which likely would be exposed to oil before Sarasota Bay. Baseline data were collected on contaminant exposure, reproductive status, abundance, and distribution patterns of dolphins in these regions. We could not assign a probability to the oil spill spreading to Sarasota. If oil had arrived, then we would have collected exposure-response information that may be applicable for estimation of risks to other Gulf of Mexico cetacean populations. However, since the oil did not reach Sarasota Bay and the surrounding Gulf waters, the results of this study are being used by NOAA as control data for interpretation of data arising from potentially impacted populations elsewhere in the Gulf, such as Barataria Bay, Louisiana.

Two well-tested approaches were used to obtain information on contaminant exposure, abundance, distribution, and residency patterns of bottlenose dolphins in Gulf of Mexico and Sarasota Bay waters: 1) biopsy sampling, and 2) photo-identification. A total of 61 tissue samples for contaminant exposure assessment were obtained from Gulf dolphins through remote biopsy sampling and from Sarasota Bay resident dolphins through capture-sample-release techniques. Currently, all biopsy samples are being analyzed by NOAA and other collaborators.

Photo-identification surveys were conducted in the Gulf study area during June/July 2010 and August/September 2010, and in Sarasota Bay surveys were ongoing, 10 days each month. Data obtained from the photo-identification surveys were utilized to estimate abundance, and identify distribution and residency patterns. There were no significant changes in overall dolphin abundance between survey periods, or as compared to normal, pre-spill patterns. However, dolphin distribution seemed to vary somewhat from one survey period to the next, with more individuals being sighted closer to the coast during June/July and a higher number of individuals offshore during August/September. These results suggest that there may be differences in the distribution of Gulf dolphins through the year. Project findings also support the concept of long-term residency for Gulf dolphins in addition to those in Sarasota Bay. Over the past three decades, about 900 individuals have been identified at one time or another in the study area for this project. Of these, 218 were identified from our 2010 photographs, including four individuals first identified as far back as 1980, when the Sarasota Dolphin Research Program initiated systematic photographic identification surveys.

It will be important to monitor the dolphins in oil-impacted bays and elsewhere in the Gulf of Mexico over time (years) to see if health or reproductive problems develop as a result of their exposure to oil and dispersants, either from direct contact or from transfer through the ecosystem. To facilitate accurate interpretation of subsequent data from the oil-impacted areas, it is necessary to have control data from sites that were in the same general region but were spared from the original spill. The samples collected from Sarasota Bay and associated Gulf of Mexico waters in 2010 are serving as important controls for such comparisons.

Long-term Gulf resident "Bracket" and her most recent calf, seen here in September 2010.



Sighting locations for "Bracket," one of several potential long-term resident Gulf animals identified during this project.

Deepwater Horizon Oil Spill: Natural Resource Damage Assessment (NRDA) of the St. Joseph Bay bottlenose dolphin community

By Brian C. Balmer, PhD, and Carolyn C. Cush, BS, Chicago Zoological Society

In response to the Deepwater Horizon oil spill, a Natural Resource Damage Assessment (NRDA) was performed on the St. Joseph Bay bottlenose dolphin community. The overall goals of the NRDA process, which is part of NOAA's Damage Assessment, Remediation, and Restoration Program (DARRP), are to:

1) Identify the extent of resources that were damaged
2) Determine methods for resource restoration
3) Assess the amount of restoration required to bring the resources back to levels pre-oil spill

The goals for this particular NRDA assessment were to monitor the St. Joseph Bay bottlenose dolphins before, during, and after the oil spill. Although the oil spill never reached St. Joseph Bay, the bottlenose dolphins in this region are one of the best-studied communities along the northern Gulf of Mexico coast. Following an Unusual Mortality Event in 2004, health assessments and follow-up radio tracking were performed during 2005 and 2006 on 29 individuals. In addition, 103 remote biopsy samples were collected, and 165 photo-identification surveys were performed on the St. Joseph Bay bottlenose dolphin community, resulting in a catalog of over 350 individuals. Thus, the bottlenose dolphins in St. Joseph Bay could be considered a reference group to other coastal bottlenose dolphin communities that were directly affected by the Deepwater Horizon oil spill.

Photo-identification surveys with capture-recapture techniques were utilized to estimate seasonal abundance during June and August 2010, and February 2011. In addition, 38 remote biopsy samples were collected for genetic and contaminant analyses. Photo analysis on these surveys is nearly complete. Eighteen of the 29 tagged individuals from the 2005 and 2006 health assessments were sighted during the 2010 and 2011 survey effort. In addition, 6 females from these health assessments were also sighted with new calves.

As part of the Gulf-wide photo-identification catalog (see article in this newsletter), the entire St. Joseph Bay database is currently being converted to Finbase, a Microsoft Access database developed and maintained by NOAA that standardizes all photo-identification records and associated field data for each identified dolphin. The goal of Finbase is to enable photo-identification searches across catalogs and promote collaborations between various research groups in the Gulf of Mexico.

This material is based upon work supported by BP and NOAA. Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of BP and/or state or federal natural resources trustees. Additional support has been provided by the Disney Worldwide Conservation Fund.

Dolphin X25 with new calf in St. Joseph Bay, Florida during August 2010 photo-identification surveys. X25's previous calf, X27, is now on her own and has been observed during the 2010 and 2011 surveys socializing with other subadults.

Deepwater Horizon Oil Spill: Biopsy sampling of estuarine dolphins in the western Florida Panhandle potentially exposed to contaminants from the spill

By Graham Worthy, PhD (UCF), Steve Shippee (UCF), Randall Wells, PhD, Jason Allen, Aaron Barleycorn (CZS/Mote Marine Laboratory), and Peggy Ostrom, PhD (MSU).

The 2010 MC-252 disaster (Deepwater Horizon spill) caused weathered oil to wash ashore along the north central Gulf coast and impacted estuarine communities of plants and animals. We assembled a collaborative team from three Florida Institute of Oceanography (FIO) institutions (faculty and graduate students from the University of Central Florida, researchers from the Sarasota Dolphin Research Program based at Mote Marine Laboratory, and scientists from the Florida Fish and Wildlife Research Institute) to study the ecological impacts in two connected estuaries in the Florida Panhandle. Our project encompasses Choctawhatchee Bay, Santa Rosa Sound and Pensacola Bay. The two inlets at Destin and Pensacola were impacted by oil slicks, and significant amounts of oil product were drawn into Pensacola Bay during incoming tides throughout the height of the spill. There is still residual oil and tar being found on local beaches and submerged in the bottom sediments, resulting in a lingering exposure to the ecosystem.

The primary goals of this ongoing project are to assess population size and genetic discreteness of oil spill impacted bottlenose dolphin communities in these bays, determine stable isotope and fatty acid signatures to define their feeding habits, and examine the relationship between feeding and trophic interactions in these apex predators as a means to assess the potential impacts of oil and residual contaminants throughout the region. The principal mechanism for assessing contaminant exposure is the collection of tissue samples from wild dolphins using remote biopsy darting. Samples acquired from resident dolphins are used in standard toxicological and enzyme marker assays from the blubber, genetic analysis, stable isotope analysis of skin (to assess feeding ecology and habitat utilization), and fatty acid signature analysis of blubber (feeding ecology). This project also incorporates samples collected from stranded animals by the Emerald Coast Wildlife Refuge, and the ongoing photo-ID work conducted by UCF grad students to identify habitat use and movement patterns of dolphins in this region.

Our small expert team (Allen, Barleycorn, and Shippee) ventured out in a 5.5 m boat during November 2010 and April 2011 to locate and sample select dolphins across the study area. In total, 66 samples were collected (34 in Nov, 32 in Apr) from a variety of sites in each of the estuarine regions on both occasions (Fig. 1). The resulting samples were processed and express shipped overnight for analysis at several laboratories.

To date, we have compiled the stable isotope results and compared them to the movement and habitat use patterns of the subject dolphins determined through photo-ID (Fig. 2). We are finding significant differences between dolphins that inhabit the inner bays and those found primarily around the inlets at Destin and Pensacola, as well as seasonal differences. Further exploration of these patterns will help determine correlates between movement patterns and dietary compositions, which will be facilitated through comparison to samples of putative prey fish species collected during this period by our colleagues at Florida FWRI. Other sample components (genetics, fatty acid signature, and contaminants) will eventually be analyzed and available for comparison to the stable isotope and habitat use data. Ultimately, pre- and post-spill knowledge of the spatial and temporal scales of these animals' movements, population structure, specific habitat utilization and feeding preferences will allow interpretation of the toxicological and medical data. Our findings will assist resource managers with understanding the impacts of stressors at all levels of the ecosystem, which can be used to improve response strategies in future environmental disaster events.

This project is funded by grant number 4710-1101-00-D from the Florida Institute of Oceanography to GAJW.

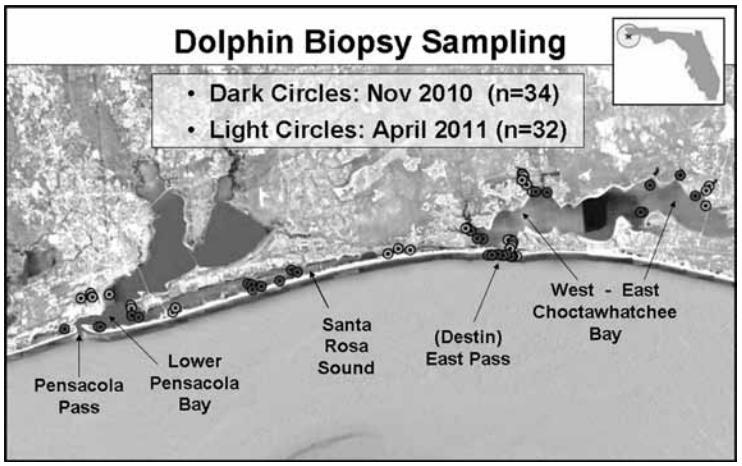


Fig. 1: Map of biopsy sampling locations in the western Florida Panhandle in 2010 and 2011.

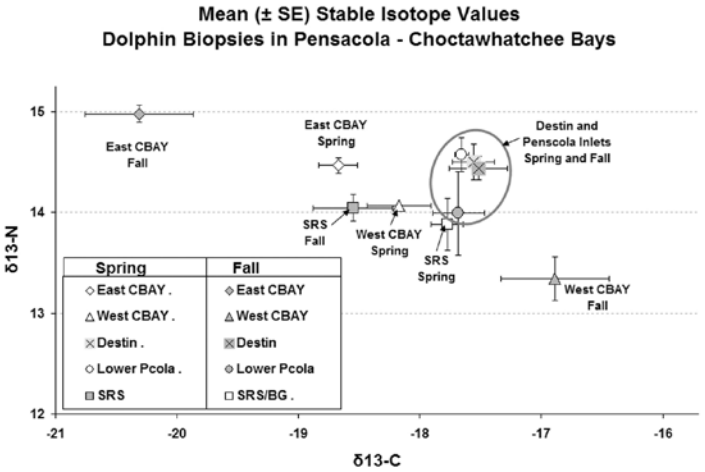


Fig 2: Seasonal and habitat based differences in stable isotope values from biopsy samples.

Assessing the potential sublethal and chronic health effects of dolphins from an area oiled by the Deepwater Horizon Oil Spill

By Randall Wells, PhD and Brian Balmer, PhD, Chicago Zoological Society

SDRP staff lent their expertise as part of a multi-agency team that conducted a health assessment of bottlenose dolphins in Barataria Bay, Louisiana during August 3-16, 2011. The health assessment was one of several efforts being conducted as part of the Natural Resource Damage Assessment (NRDA) for the Deepwater Horizon (DWH) Oil Spill. Barataria Bay waters were oiled following the DHW spill and there is concern that dolphins in the area could be suffering sublethal and/or chronic health effects such as organ damage or immune dysfunction.

The Barataria Bay capture-release health assessment involved a team of veterinarians, biologists and wildlife epidemiologists that conducted comprehensive health evaluations of 32 dolphins (20 females, 12 males) over the 2-week period. Blood samples were taken for hematology, serum chemistry, endocrinology, and functional immunology in conjunction with a physical examination and diagnostic ultrasound. Blood and urine samples were also taken and will be tested for oil-associated chemicals. Satellite-linked and/or VHF tags were attached to most of the dolphins for determination of their movement patterns (see related articles elsewhere in this newsletter). Sampling protocols were standardized with those used for the ongoing, long-term Sarasota Bay health assessments so that results can be compared between the two sites.

This material is based upon work supported by BP and NOAA. Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of BP and/or state or federal natural resources trustees.

Scientists take samples from a resident dolphin in Barataria Bay, LA for medical analyses while in the water during the dolphin health assessment. The study is part of the Natural Resource Damage Assessment for the Deepwater Horizon Oil Spill. Photo by NOAA.

Deepwater Horizon Oil Spill: Bottlenose dolphin tracking in Barataria Bay, Louisiana

By Brian C. Balmer, PhD, Chicago Zoological Society

In response to the largest oil spill in the history of the U.S., as part of a Natural Resource Damage Assessment, a NOAA-sponsored health assessment of bottlenose dolphins was conducted in Barataria Bay, Louisiana, during August 3-16, 2011. The primary goal of this health assessment was to determine the potential health impacts from the Deepwater Horizon Oil Spill on the dolphins within the Barataria Bay estuary. In addition to receiving a physical exam, each dolphin was fitted with a satellite-linked and/or VHF radio transmitter to determine individual dolphin ranging patterns and assess dolphin habitat preferences within Barataria Bay. These data can provide insight into potential differences in oil exposure among individual dolphins as well as help to identify appropriate habitat restoration efforts for dolphins in the region.

In total, 30 dolphins were tagged during the Barataria Bay health assessment (19-♀/11-♂). Of these, 25 were tagged with a newly redesigned Wildlife Computers SPOT satellite-linked tag which resulted from the testing described elsewhere in this newsletter. Satellite-linked telemetry and direct VHF tracking over several months allowed fine-scale movement data to be obtained for individual dolphins within Barataria Bay. Continued tracking of the remaining tags, along with NOAA's ongoing photo-identification surveys and analysis of the health assessment data, will help to determine long-term residency patterns of the dolphins within the Barataria Bay estuary as well as the effects that the Deepwater Horizon Oil Spill may have had on these animals.

This material is based upon work supported by BP and NOAA. Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of BP and/or state or federal natural resources trustees.

Dolphin Y00 with satellite-linked (lower) and VHF radio (upper) transmitters in Barataria Bay, Louisiana.

Testing the effectiveness of enforcement and education activities at reducing human interactions at the "Beggar" hotspot

By Katie McHugh, PhD, Chicago Zoological Society

Human interactions (HI) with wild dolphins are a problem of increasing conservation concern. This year we conducted a controlled experiment testing the effectiveness of law enforcement and educational outreach at reducing interactions at an HI hotspot near Sarasota Bay. The project centered on a notorious begging bottlenose dolphin ("Beggar") that has frequented a small portion of the Intracoastal Waterway for more than 20 years, along with occasional associates. "Beggar" is well-known in this area; he has continued to approach or be approached by boaters and be illegally provisioned by humans frequently (up to 2 boats/min and 6 provisioning events/hr), despite signs discouraging these activities and several past projects aimed at mitigating these interactions.

In order to provide a better understanding of human interactions under different mitigation strategies, we conducted 100 hours of observation during weekends from March to June 2011, collecting information on the dolphin's behavior, boat traffic, and human interactions during four experimental phases: 1) Baseline (pre-mitigation), 2) Enforcement (a marked law enforcement boat patrolling the area), 3) Follow-up, and 4) Education (public distribution of educational cards at local waterfront businesses). During the entire project, we observed over 6,000 potentially interacting boats (up to 120 boats/hr), with boaters engaging in nearly 3,600 human interactions with "Beggar" (up to 70 interactions/hr). Of these interactions, 169 were illegal provisioning events, during which "Beggar" was fed at least 520 items ranging from fish, shrimp, and squid to human snack foods, beer, hot dogs, and fruit. In addition, we observed 121 boaters attempt to touch the dolphin, resulting in 9 confirmed bites by "Beggar".

A man's hand gets dangerously close to Beggar's mouth while he illegally feeds the dolphin shrimp as his family looks on.

During our baseline experimental phase, we witnessed frequent provisioning and attempts to touch "Beggar," resulting in confirmed bites on nearly every observation day. However, during four days of continuous law enforcement patrols, we found significant reductions in both provisioning rates and number of items fed to "Beggar," as well as fewer attempts to touch the animal and no observed bites. In fact, provisioning dropped almost to zero after the first day of enforcement presence on the water. Four written warnings were issued during that first day, and over the course of the weekend nearly 70 boats were approached by uniformed enforcement agents who talked with boaters about Marine Mammal Protection Act (MMPA) regulations and proper dolphin viewing behavior. Despite the short time period of this experimental enforcement phase, we also observed some improvements in the dolphin's behavior coinciding with reductions in human provisioning, including increased natural foraging and fewer "dolphin-initiated" interactions, indicating that at least some long-term HI animals have the capacity to display more natural behavior when not rewarded for begging. In our follow-up observations post-enforcement, we found no evidence that people continued to comply with the MMPA for any substantial "halo" period after enforcement activities had ceased.

Agents from NOAA's Office of Law Enforcement educate local boaters about the Marine Mammal Protection Act while "Beggar" looks on.

During the educational experimental phase, we distributed 6,250 "*Dolphin-friendly fishing and viewing tips*" cards to local water-oriented businesses. We found many businesses to be very receptive and cooperative in our efforts to educate boaters, and several boat rental companies were particularly proactive in helping to educate their renters. Unfortunately, to date, we have found no substantial reduction in provisioning rates following educational card distribution, and observed rates of human interactions were similar to the baseline period.

While we are still double checking and analyzing the copious data collected during this project, indications are that provisioning at the "Beggar" hotspot primarily involved local boaters who probably already knew their behavior was illegal. Only 10% of provisioning events observed during the course of the project involved people on rental boats, and provisioning was almost nonexistent with an enforcement presence in the area. Thus, we recommend that in the future, enforcement action should be combined with publicity for greater effect. NOAA personnel were on the water with us both in March and June and have already pursued at least two cases of MMPA violations from incidents that they witnessed. We will also be sharing video and photo documentation of violations observed during the course of this project with NOAA's Office of Law Enforcement. While we did not find immediate benefits of educational card distribution, longer term education and outreach projects focused on local boat owners may prove fruitful.

Support for this project came from the Disney Worldwide Conservation Fund. We would especially like to acknowledge our partners at NOAA, including Stacey Horstman, Jessica Powell, Laura Engleby, and Office of Law Enforcement agents Rick Hawkins and Rich Chesler who made this project possible. Many thanks go to Gene Stover, who distributed our educational cards to local businesses. We are also indebted to our interns, local volunteers, and coworkers who spent many weekends helping with the intense field effort that this project required. In particular, volunteers Cathy Marine, Norma Pennington, and Scott Pasawicz provided many hours to the project, and Krystan Wilkinson and Marcela Salazar, continued to assist with field work, data entry, and cross-validation well past the official end dates of their internships.

Update on human interaction trends in Sarasota Bay

By Celeste Bollini, National University of Mar del Plata, Argentina, and Katie McHugh, PhD, Chicago Zoological Society

After Sarasota Bay lost 2% of its long-term resident dolphins due to interactions with recreational fishing gear in 2006, the SDRP increased research efforts aimed at providing a better understanding of unnatural dolphin foraging behaviors and other human-dolphin interactions of increasing concern. As a part of this effort, graduate research by Jessica Powell (MS, 2009) documented long-term trends in depredation (dolphins taking and feeding on bait or catch from anglers' lines) and related unnatural behaviors such as scavenging (feeding on anglers' throwbacks), patrolling near fishing activity, begging, and illegal feeding of dolphins by humans (provisioning) in Sarasota Bay from 2000-2007. She found that both the number of resident animals involved in depredation-related behaviors and dolphin-angler interaction rates began rising in 2004 and continued increasing through 2007. Her findings highlighted the potential contributions of both severe red tide blooms that deplete prey fish and increasing numbers of anglers and boaters on the water seasonally to the periods with the greatest observed numbers of human-dolphin interactions (see Powell and Wells 2011).

Because any behaviors that bring dolphins into contact with fishing activity have the potential to seriously injure or kill animals through entanglement or ingestion of gear, the SDRP partnered with NOAA Fisheries and others to implement several different mitigation measures, such as the "*Dolphin-Friendly Fishing and Viewing Tips*" cards and the "*Don't Feed Wild Dolphins*" public service announcement in order to educate the local and visiting public (especially anglers and boaters) about these issues. To assess whether these measures may have helped to reduce behaviors of concern and update our understanding of human interaction trends in Sarasota Bay after 2007, Celeste Bollini has worked with the SDRP this year on a senior thesis project evaluating dolphin-angler interaction rates as well as annual and cumulative proportions of the resident population engaged in unnatural behaviors from 2008 to 2010.

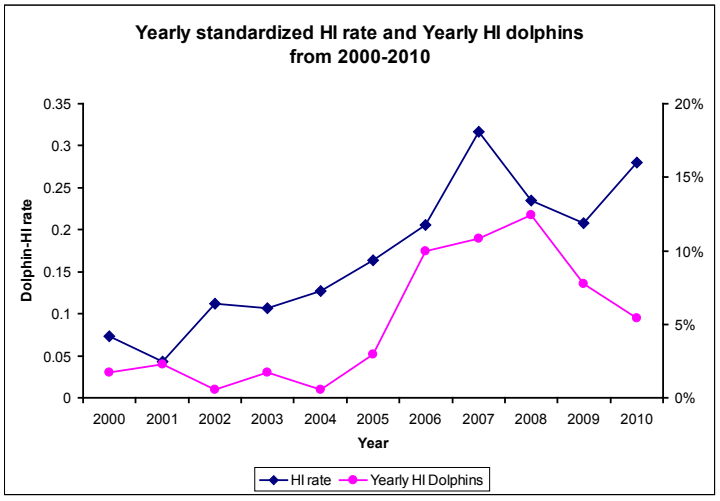
Fortunately, analysis of long-term data sets available for the SDRP from 2008 to 2010 has shown that dolphin-angler interaction rates for 2008 and 2009 decreased progressively. While there was a slight rate increase in 2010, interactions still remain less frequent than at their peak in 2007. When we looked more closely at angler interaction rates on a monthly basis for 2010, we found that rates were significantly higher in the winter. While we are still unsure of the reason for this, one possible explanation might be differences in prey availability or distribution during the unusually cold weather that caused large scale fish kills in January. When we analyzed the percent of the dolphin population engaged in depredation-related behaviors per year we found that the proportion began to level off in 2008 and then decline in 2009. However, although the annual proportion of resident dolphins engaged in unnatural behaviors is now declining, there were new individuals involved in these types of interactions each year while others stopped interacting. Thus, as new animals incorporate these behaviors in their daily activities, angler interactions may remain an issue for this population, as evidenced by recent cases of resident dolphins becoming entangled in fishing gear.

Rates for each type of interaction were also calculated from monthly photo-identification surveys from 2008 to 2010. Without including interactions involving "Beggar" (our only resident begging dolphin), we found that the most frequent angler interaction behaviors still observed among resident Sarasota Bay dolphins were patrolling, scavenging, and interactions with fixed gear, such as crab pots. Other behaviors, such as provisioning, begging, and line depredation were virtually absent by 2010 (although begging and provisioning remain a serious issue for "Beggar" as discussed in the previous article).

As we have worked over the past year to update our understanding of human interaction trends in Sarasota Bay, we have also begun to expand beyond depredation-related angler interactions to explore a broader suite of human interactions of concern. For example, we began mining the long-term SDRP database and collecting information during monthly photo-identification surveys on additional types of human-dolphin interactions, including instances of people taunting or attempting to attract dolphins, touching or attempting to touch dolphins, or attempting to swim with dolphins, as well as observations of vessel harassment. Analysis of long-term trends in these broader human interactions has shown that some interactions such as taunting/attempting to attract may be increasing in the area and that instances of vessel harassment are also an issue for the resident dolphin population. These findings are beginning to highlight additional human behaviors of concern that may warrant new educational efforts focused on a broader segment of the local and tourist population in our area.

Educating the local and visiting public, in addition to anglers and boaters, is an important means of reducing dolphin-human interactions and depredation behaviors. While instances of line depredation may be declining in Sarasota Bay, our long-term survey data have shown that other human interactions, including patrolling, vessel harassment, taunting/attempting to attract, fixed gear interactions and scavenging were all present within the Sarasota Bay area from 2008-2010. These interactions could be better controlled if the human component was addressed more comprehensively through both education and enforcement activities.

Support for this project came primarily from the Disney Worldwide Conservation Fund. Celeste would like to express her gratitude to Randy Wells for giving her the opportunity to do her senior thesis in Sarasota, introducing her to a wonderful community of dolphins, and being there to teach her in every step of the project. Thanks also to all the staff members of the SDRP and Jessica Powell for providing data necessary to make this project possible.



Long-term trends in human interaction rates and the proportion of resident Sarasota Bay dolphins engaged in unnatural foraging behaviors from 2000-2010.

Young female dolphin TORO was first seen with a entangled fin by Florida Fish and Wildlife Research Institute biologists in Tampa Bay in May 2003.

TORO was observed by SDRP in Charlotte Harbor in February 2004. Because of the severity of her entanglements (dorsal fin (above), flipper (below)), we rescued TORO and brought her to Mote Marine Lab for treatment. TORO was released back into Charlotte Harbor in May 2004. Through 2006, she has been observed 18 times since release, sometimes near fishing boats.

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)**.

For more information on fishing line recycling and bin locations, please visit: **www.fishinglinerecycling.org**

For more information on dolphins and interactions with anglers, please visit: **www.mote.org** or **www.sarasotadolphin.org**

MOTE MARINE LABORATORY

NOAA

Chicago Zoological Society

Dolphin-Friendly Fishing & Viewing Tips

Dolphins Need Your Help. Serious and even fatal dolphin injuries from interactions with recreational fishing gear and boats are on the rise. **You can prevent injuries to dolphins and other sea life – and have a better day on the water – by following a few tips designed to protect marine animals.** These "Best Practices" were developed by marine scientists and wildlife managers working with boaters, anglers, and fishing guides:

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

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 toward dolphins.

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 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) Prevent wildlife entanglements – 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.

Entanglement hotspots along the Florida coastline: a need for outreach and action

By Kim Bassos-Hull, MS, SDRP/Mote Marine Laboratory and Jessica Powell, MS, NOAA

Entanglement in fishing gear is a significant conservation concern for marine species in the state of Florida and worldwide. The Florida Entanglement Working Group (FEWG) was formed in 2003 to focus on these issues in Florida state waters and includes several state (FWC), federal (NOAA), and non-profit organizations as contributing members (the Sarasota Dolphin Research Program has been a contributing member since 2005). This group has organized and promoted fishing line recycling programs (www.fishinglinerecycling.org) and marine debris cleanups. The FEWG realized a need to provide crucial data to wildlife and habitat managers from around the state as to the status of entanglement problems involving dolphins, manatees, and sea turtles. In 2009 a subgroup of the FEWG formed the Multi Species Analysis working group with a goal to evaluate stranding data and identify entanglement problem areas (or "Hotspots") around the state.

Stranding data sets for bottlenose dolphins, manatees, and sea turtles in Florida coastal waters were analyzed for evidence of gear-on entanglement and/or ingestion. Entanglements from both live and dead stranded animals were classified into categories of: hook and line (HL), trap/pot (TP), and other (OT) which includes nets, ropes, and other fishery-related gear. During 1997-2009, 132 dolphins (32 live and 100 dead) stranded with gear-on entanglement and/or ingestion (97 HL, 27 TP, 4 OT, 4 multiple gear, Figure 1). During that same time period, 190 live and 243 dead manatees stranded or were rescued with gear-on entanglement and/or ingestion (285 HL, 80 TP, 59 OT, 9 multiple gear). A total of 635 live and 582 dead sea turtles stranded or were rescued with gear-on entanglement and/or ingestion between 1997 and 2008 (878 HL, 174 TP, 137 OT, 27 multiple gear). While entanglement strandings occurred statewide, hotspots were observed along Florida's central and southwest and central east coasts, and in the Florida Keys. Results support the need for an increase in statewide outreach initiatives, with targeted actions in "hotspot" areas. Outreach includes educating anglers about safe angling practices including monofilament fishing line recycling and responsible fishing near marine wildlife. Actions include the removal of entangling marine debris such as derelict crab traps and fishing line, especially in high risk entangling areas such as piers and reefs. The cumulative effects of fishing gear debris and entanglements on the recovery and persistence of local marine mammal and sea turtles populations are currently unknown. Management recommendations include working with fishing communities to develop solutions that will be mutually beneficial to fishers, wildlife and habitat.

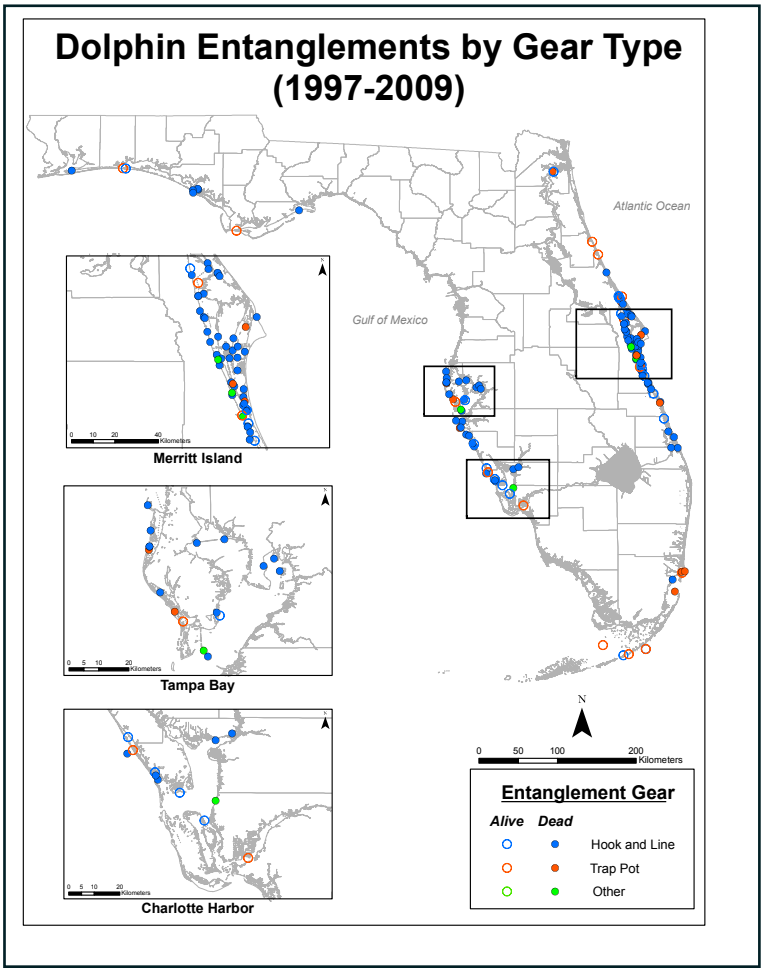


Figure 1. Dolphin entanglements in Florida between 1997 and 2009.

This female dolphin calf (MML 0602) was found floating off Englewood, Florida just south of Sarasota on 12 January 2006. Her flukes were nearly severed by wrapped monofilament fishing line.

Bottlenose dolphin stock structure within the estuaries of southern Georgia

By Brian Balmer, PhD, Chicago Zoological Society

Bottlenose dolphins within southern Georgia estuaries have been exposed to extremely high levels of persistent organic pollutants (POPs). Dolphins in this region have the highest polychlorinated biphenyl (PCB) levels recorded for any marine mammal, and these levels are related to distance from a known EPA Superfund point-source in the Turtle/Brunswick River Estuary (TBRE). Prior to this study, little was known about the population structure of dolphins in this region. This study provided baseline data on abundance, site-fidelity, and habitat use of dolphins across two adjacent field sites defined as the Brunswick field site, which included the TBRE, and the Sapelo field site, which included the Sapelo Island National Estuarine Research Reserve (SINEER). The Sapelo field site is relatively undeveloped and was selected for comparison to the more contaminated TBRE. Despite similar survey areas, total dolphin abundance, calculated using photo-identification surveys and capture-recapture techniques, in the Sapelo field site was higher in almost every season surveyed than in the Brunswick field site. Dolphin density, measured as the number of dolphins per kilometer of survey effort, was also significantly higher in the Sapelo field site than the Brunswick field site across all seasons. Within both field sites, there were seasonal fluctuations in abundance, with highest numbers observed in summer and/or fall. The majority of dolphins sighted during these peak abundance periods had low site-fidelity and were sighted within larger tributaries, suggesting that these individuals may be visitors to the region. During seasons with lower abundance, most dolphins had moderate to high site-fidelity and were sighted across all tributary sizes, suggesting that these individuals may be estuarine residents.

There are a number of factors that may be contributing to these differences in dolphin abundance and density between field sites. The Brunswick field site may have a lower carrying capacity for bottlenose dolphins than does the Sapelo field site. Development of salt marsh estuaries into high density suburban housing, shopping centers, and industrial sites significantly reduces the productivity of adjacent coastal ecosystems. Currently, there are four EPA Superfund sites and numerous other industrial influences in the TBRE, suggesting that land use within the TBRE differs dramatically from that of the SINERR. Future research investigating land use classifications and determining primary productivity in the TBRE would be useful to determine whether differences in primary productivity may be contributing to the differences in dolphin abundance between field sites. POP contamination can negatively affect reproduction in known prey species of bottlenose dolphins and thus, also influence carrying capacity. Within the TBRE, high levels of PCBs have been identified in dolphin prey species which may be negatively impacting their reproduction, and thereby lowering the abundance of dolphin prey in this region. Contaminant analysis of dolphin prey species, size, and age class in both field sites is required to test this hypothesis.

Increased localized stressors that impact dolphin demographic parameters, such as birth and survival rates, could also result in abundance differences between the Brunswick and Sapelo field sites. The Brunswick field site includes the city of Brunswick, Georgia, which is the sixth-busiest automobile port along the east coast of the U.S., the four EPA Superfund sites, and numerous other industrial influences. In contrast, the Sapelo field site is relatively undeveloped, experiences less vessel disturbance, and is the focus of long-term salt marsh habitat restoration projects. In other regions of the world, such as Shark Bay, Australia, dolphin abundance was lower in areas with higher vessel activity. Focal follows of individual dolphins across both field sites, as performed in Sarasota Bay, would be useful to identify if the differences in abundance between the Brunswick and Sapelo field sites may be a result of different levels of human activity between the two field sites.

Extremely high levels of PCBs have also been identified as potential stressors to marine mammals. The high PCB levels identified in Brunswick female dolphins may promote an increased risk for reproductive failure. Thus, reproductive effects associated with a PCB point-source in the TBRE could be contributing to the differences in dolphin abundance between field sites. However, bottlenose dolphin survival rates often vary greatly from year to year. Thus, continued photo-identification surveys in the region are necessary to determine if dolphin survivorship differs between the Brunswick and Sapelo field sites.

This research formed part of my doctoral dissertation, completed in 2011. Support for my time to work on this project was provided by the Chicago Zoological Society. Funding for field work was provided by NOAA's Ocean and Human Health Initiative and NOAA's Marine Mammal Health and Stranding Response Program. This research would not have been possible without additional support from the University of North Carolina Wilmington and the Georgia Department of Natural Resources.

Dolphin bowriding automobile carrier ship in St. Simons Sound, near Brunswick, Georgia.

Mercury in Sarasota Bay

By YS Hong, PhD, Postdoctoral Scholar, Johns Hopkins University & the National Aquarium Conservation Center

Mercury is a metal contaminant that can be found in the environment all over the world. Volcanoes are a natural source of mercury pollution, but most mercury contamination comes from human activities, particularly coal-fired power plants. Because it is released directly into the air, mercury can be transported long distances in the environment. Eventually, mercury contamination gets washed out of the air by rain and it becomes a water pollutant. Rivers run to the sea, so mercury ends up in the ocean, where the metal attaches to small particles that sink to the bottom. In the sediments, microbes convert the mercury to a different chemical form, called methylmercury. Unfortunately, methylmercury is quite toxic, and it can easily accumulate in the bodies of small sea creatures, a process called bioconcentration. When these organisms are eaten by other sea creatures higher up the food chain, the methylmercury gets more and more concentrated. This is called biomagnification. Methylmercury is eventually transferred to the top predators, and it accumulates in their bodies (a process called bioaccumulation). So even when methylmercury levels in the environment are very low, top predators like bottlenose dolphins and long-living piscivorous (fish-eating) fish can accumulate enough mercury in their bodies that this toxic metal might become harmful to their health.

To help understand the effects of mercury in the environment, scientists from Johns Hopkins University and the National Aquarium Conservation Center are collaborating with Mote Marine Laboratory and the Chicago Zoological Society to learn more about how mercury moves through ecosystems. Researchers travelled to Sarasota Bay in November 2010 and June 2011 to collect samples. In order to measure low (nanogram per liter or "part per trillion") levels of mercury, they deployed specially-developed passive sampling devices called diffusive gradient thin film (DGT) probes. They fastened these probes underwater or planted them in the sediments of the bay. While the DGT probes were out in the environment, different chemical forms of mercury accumulated inside of them. After three weeks, once the accumulated mercury levels were high enough to measure, the researchers returned to collect the probes. They also collected environmental samples including water, sediment, benthic organisms (snails, lightning whelks, sunray venus, pen shells, quahogs), plankton, turtle seagrass, and fish (sea trout, grunt, spot, pinfish, white mullet). Back in the laboratory, they analyzed the mercury concentrations in all of the samples and in the DGT probes.

Left: the white circular DGT probe is about one inch in diameter. Top right: benthic organism samples. Bottom right: fish samples.

The mercury concentrations in the waters and sediments of Sarasota Bay turned out to be very low, as expected for uncontaminated coastal areas (less than 1.0 ng/L in water and 1.0 ng/g in wet sediment). However, mercury levels were slightly higher in plankton, seagrass and benthic organisms. Increased mercury concentrations in organisms like these from the lower trophic levels are a sign of bioconcentration. When the researchers analyzed samples from aquatic creatures that are higher up the food chain, they found even higher concentrations of mercury, clearly indicating that mercury biomagnification is occurring in the Sarasota Bay ecosystem. In addition, the fraction (%) of methylmercury among total mercury tends to increase in higher trophic levels.

In the next phase of study, researchers will assess the mercury exposure risk for the bottlenose dolphins that reside in Sarasota Bay. First, they will estimate how much mercury the dolphins are exposed to every day in the fish they eat and "normalize" the result by the dolphin's body weight. To know how much the dolphins eat and what they weigh, the researchers will use information from the Sarasota Dolphin Research Program database. Information about mercury concentrations in the fish the dolphins eat will come from the samples collected in November 2010 and June 2011. After they estimate the Sarasota dolphins' mercury uptake, the researchers will compare it to a standard value from the US Environmental Protection Agency's Wildlife Exposure Factors Handbook. This helps to build an idea of whether the Sarasota dolphins are at risk of higher mercury uptake in their diet. It will also be interesting to compare the mercury exposure of the Sarasota Bay dolphins with exposure for dolphins that live elsewhere in the world – either in the wild, like the Atlantic Ocean or the Mediterranean Sea, or in dolphinaria.

Riptorn, a 39-year-old male, catches a mullet, one of the Sarasota Bay dolphins' more common prey.

Signature whistle studies

By Laela Sayigh, PhD, WHOI, Vincent Janik, PhD, SMRU, St. Andrews, UK

During health assessment sessions in 2010 we began a new set of playback experiments to begin looking at whether dolphins discriminate between signature whistles produced by the owner vs. copies of these whistles that are produced by another dolphin. We experimented with a new playback design, the habituation-dishabituation design, in which we played back a series of signature whistles that were previously recorded from the owner of that whistle, followed by a series of copies of that whistle produced by a different dolphin. Preliminary analysis of two of these playbacks yielded promising results. In one trial, the target animal showed a markedly different vocal response to playbacks of the original vs. the copied signature whistle. In response to the former, she primarily produced short "chirps," and in response to the latter, she produced a variety of non-signature whistles. In the second trial, the animal showed a pronounced physical response (turning energetically toward the speaker) when the second stimulus began. We are planning to carry out additional experiments in 2012 and hope that they will set the stage for further studies with tagged, free-ranging dolphins, to investigate how whistle copies function in the natural communication system of dolphins.

Last year, we started looking more systematically at occurrences of whistle matching, in which one dolphin copies another's signature whistle in vocal interactions. Over the years we have observed several such events during handling. It turns out that this matching only occurs between animals that spend a lot of time together: either mothers with calves of all ages, or male pairs that form alliances. Furthermore, dolphins that copy the signature whistle of another dolphin modify that whistle slightly so that it is recognizable as a copy. Signature whistles have often been referred to as dolphin names, and this finding further supports the notion that signature whistles are mainly used by individuals to identify themselves to family and other close associates. We hope to learn more about this when we get a closer look at dolphin communication in free-swimming animals wearing the new DTAGs (see article by Tyack et al.).

We continue to build up the Sarasota dolphin whistle database, which currently contains signature and other whistles of 252 individuals that have been recorded during brief capture-release events over the last 35 years. The database contains multiple recordings of individuals that cover time spans of up to 34 years, with up to 16 recordings of each individual. We are currently working on putting sample data sets of whistles on the Woods Hole Oceanographic Institution Marine Mammal Center website, to make them openly accessible to anyone wishing to work with them.

Laela Sayigh attaches a DTAG.

Dtagging Sarasota dolphins

By Peter Tyack, PhD, Nicholas Macfarlane, Laela Sayigh, PhD, Woods Hole Oceanographic Institution, and Vincent Janik, PhD, SMRU St. Andrews, UK

The main motivation for all of us to move into the field of marine mammal communication was to find a way to identify which dolphin makes a sound within an interacting group. This is critical for untangling the patterns of signal and response that make up a system of communication, but it is difficult with dolphins, which seldom make visible cues that they are making a sound. Peter Tyack first went to Sarasota to record wild dolphins in 1984, but it has taken years of effort to develop methods to record sounds from individual dolphins in the wild. One method involves timing the arrival of the same sound at several underwater microphones or hydrophones. This method has led to breakthroughs in studying call and response, but is difficult to apply to tracking the calls and responses of the same individuals for hours.

Just last May, 27 years later, imagine our excitement when we finally succeeded at this task. While at Woods Hole, since the late 1990s Peter Tyack has worked with engineer Mark Johnson to develop tags that can record sound while directly on a cetacean. The early tags were big enough that they were only suitable for large whales. Just last year, they developed a third version of the tag, called the DTAGV3, which was thought to be small enough to be suitable for dolphins. Bottlenose dolphins are notorious for not liking suction-cup-mounted tags, but in 2010, we tried dummy DTAGV3s, which the Sarasota dolphins did not seem to mind. In May 2011, we attached DTAGV3s to seven dolphins. The first tag may not have been attached correctly; the dolphin seemed a bit agitated and the tag came off early, after about 1 hour and 45 min. None of the other animals showed any sign of being disturbed by the tag after attachment. Two animals breached the tag off, one after 50 min and one after 3 hours and 34 min. We view this as a feature of the tag – animals can release it easily if they are at all bothered by it.

The rest of the tags stayed on until the electronics released them after 6, 6, 5 and 24 hours. The 24-hour attachment breaks a tag record and allows us to look at diurnal changes in behavior. We attached tags simultaneously to two animals. This way we can look at exchanges of whistles between tagged animals, and if they are separated from other dolphins, we can judge which dolphin made which whistle. We are hoping to continue this work next spring by putting tags on multiple animals within a group, which will enable us to get a more detailed look at call and response patterns in the natural communication system of dolphins.

DTAG on "Killer," the first dolphin tagged for a full 24-hour deployment.

Bottlenose dolphin health assessment in Sarasota Bay

By Randall Wells, PhD, Chicago Zoological Society

We conducted a 5-day capture-release dolphin health assessment project in Sarasota Bay in May 2011. The primary impetus behind the project was to obtain data and samples to serve as controls for comparison to samples to be collected by NOAA in oil-impacted Barataria Bay, Louisiana in August. An additional goal included training foreign scientists for work with threatened or endangered dolphin populations elsewhere. The 116-person team included veterinarians, researchers, and trained volunteers. We caught, examined, and released 15 dolphins. This year we were joined by three members of the staff of the National Aquarium of Cuba. This is part of our plan to facilitate standardized dolphin health assessments in Mexico, Cuba, and the US Gulf of Mexico waters under the Trinational Initiative. Until now, capture-release efforts in each of these countries have used different protocols that do not allow comparison of health information across sites. The three Cubans joined a contingent of three workers from Brazil, six from Taiwan, and one from Argentina. They were here to participate in training for possible dolphin capture-release and health assessments in their own countries - with endangered Franciscana dolphins in Brazil and Argentina, and potentially with humpback dolphins in Taiwan. Besides obtaining control data for oil spill research and training foreign scientists, the thrusts of this year's health assessment included obtaining background information on previously unsampled Sarasota resident dolphins (6 of these were sampled), obtaining samples for an Office of Naval Research-sponsored study of stress responses, and experimental 24-hr deployment by Woods Hole Oceanographic Institution and the University of St. Andrews of a new digital archival tag. This year's project was supported primarily by Dolphin Quest, NOAA, BP, and ONR.

The Balmer brothers and Spencer Fire get ready to release "Bud" during May 2011 health assessments.

Bottlenose dolphin visual health index

By Mary Gryzbek, MS Student, University of Florida, and Chicago Zoological Society

Bottlenose dolphin health assessments offer valuable insights into the condition and status of wild individuals and populations. However, the capture-release efforts of such health assessments require a restrictive set of conditions to be conducted safely, and they are expensive and logistically complex. A quicker and easier means of obtaining preliminary information on the health of individuals and populations is greatly needed. This information might be used to identify emerging threats to populations or to determine if the more comprehensive capture-release efforts might be warranted.

My thesis project will try to provide this initial evaluation technique by creating a visual health index with the use of photographs. The index will be made by quantifying the severity of specific external features of dolphins that are visible in photographs, which will result in relative health scores for individuals. Both body and skin condition will be used to determine the index, but an emphasis will be placed on body condition. Specific areas reflective of body condition that will be investigated include "peanut heads" (defined as a depression behind the skull), visibility of the rib cage, and hollowing out in the area below the dorsal fin. Aspects of skin condition that will be examined are skin disease, entanglement wounds, conspecific tooth rakes, and predation marks. Some of these features may be quantified through the digitization of photographs, while others may be binary in nature (i.e., rib cage is or is not visible). Once each feature available in photographs of an individual is analyzed, that dolphin will be given a relative health score for the time period from which the photographs were collected. The validity of these scores will be tested by examining their relationship with various measurements taken during health assessment captures (length, weight, girths, blubber thickness). The measurements used in this analysis will be chosen based on their observed sensitivity to stressful events such as severe red tides or the year before an individual's death. The end result will be a non-invasive, relatively inexpensive, and logistically simple method of monitoring the health of wild bottlenose dolphin individuals and populations.

This visual health index project, made possible by an anonymous donation to the Chicago Zoological Society and by the University of Florida, will allow researchers to detect and monitor declines in population health. Early recognition of such declines could potentially aid in the mitigation of unusual mortality events (UMEs), which have had a negative impact on bottlenose dolphin populations in the past two decades. In the Gulf of Mexico alone, 8 bottlenose dolphin UMEs occurred from 1992-2010, resulting in at least 950 deaths, and another UME declared in the northern Gulf in February 2010 is still ongoing. In addition to benefitting bottlenose dolphin conservation and management, the visual health index will provide insight into the health of marine ecosystems because bottlenose dolphins are sentinels for their marine environment. Therefore, the visual health index has the potential to not only improve the understanding of dolphin population status but also the status of the ecosystem they inhabit.

St. Joseph Bay resident 7010 showing an example of a "peanut head," a defined depression behind the skull that is indicative of poor body condition.

Kidney ultrasound and bubbles

By Michael Moore, Vet MB, PhD, Woods Hole Oceanographic Institution

For the second consecutive year, the May dolphin health assessment project in Sarasota proved to be pivotal in our study of bubbles that can surround the kidney of dolphins. With support from the Office of Naval Research we have been examining stranded dolphins on the beaches of Cape Cod for the presence of bubbles. The organ that is easiest to examine using ultrasound is the kidney. We have routinely found bubbles in stranded animals. Such animals are quite often released into deep water and do very well. With the help of Dr. Cynthia Smith we were able to acquire a further set of renal ultrasound examinations from the 2011 project as further control material for our beached animal data. In contrast to the beached animals, the animals restrained briefly for health assessment did not show significant bubbling.

The significance of this work is to show that while bubbles are not necessarily ubiquitous in diving mammals, they can be observed quite routinely. Comparable to humans that dive under pressure, it seems that dolphins also have to manage gases that have gone into solution as an animal goes deeper, and then run the risk of coming out of solution as the animal swims to shallower depths.

This work was published recently in *Proceedings of the Royal Society B* (Dennison et al. 2011).

Veterinarian Cynthia Smith performs an ultrasound examination during the May 2011 Sarasota dolphin health assessment project.

Skin lesion assessment of bottlenose dolphins from coastal areas in the southeast U.S.

By Leslie Burdett Hart, PhD, NOAA Marine Animal Health Program, Hollings Marine Laboratory

Skin lesions on bottlenose dolphins from Charleston, SC, Brunswick and Sapelo Island, GA, and Sarasota, FL were retrospectively examined using images from photo-ID surveys conducted during the months of February, April, July and October 2009. Skin lesion prevalence was calculated for each geographic site, as well as for each month within a particular site. The highest prevalence of skin lesions, overall and for each month, occurred on dolphins from Georgia, whereas Sarasota Bay dolphins had the lowest prevalence of lesions. A similar seasonal trend in lesion occurrence was observed across all three sites, where most lesions were seen in April, followed by February, October and July.

The consistent seasonal trend in lesion occurrence suggested an environmental influence; therefore, statistical models were used to examine associations between skin lesions and environmental parameters such as water temperature and salinity. For all three sites, skin lesion occurrence was significantly associated with colder water temperatures. Among Georgia dolphins, lower salinity waters were also significantly associated with skin lesion occurrence. These findings were consistent with results from previous studies examining environmental influences on skin disease.

Figure 1 – Bottlenose dolphin from coastal Georgia with spotted skin lesions. Photo credit: Brian Balmer.

Figure 2 – Bottlenose dolphin from Charleston, SC with mottled skin lesions. Photo credit: NOAA/NOS/HML.

In addition to the overall assessment of skin lesion occurrence, the types of lesions presented on dolphins at each site were evaluated based on 11 previously described categories, as well as two new types: spotted (Figure 1) and mottled (Figure 2). Although Sarasota Bay had the lowest prevalence of skin lesions compared to the other two sites, these dolphins had the greatest variety of skin lesion types (n =11), including lacaziosis lesions (Figure 3), which were not observed on any dolphins from the other two locations. The most common lesion type among Sarasota Bay dolphins were tattoos (Figure 4), and these were significantly more common among animals in this population compared to Georgia and Charleston.

This study highlights geographic differences in skin lesion occurrence and type, which could be due to disparities in host susceptibility or possibly pathogen distribution or infectivity. Statistical models of environmental parameters suggested a potential role of climatic factors on the occurrence of lesions; however, it is likely that biological factors (e.g., immune status), anthropogenic influences (e.g., contaminants) and population dynamics also contribute to the development of skin disease. Future epidemiological research should evaluate skin lesions among different age and sex cohorts and examine associations with health parameters and contaminant concentrations to further identify factors contributing to a geographically widespread health condition.

Funding for this research was provided by NOAA's Center of Excellence for Oceans and Human Health at the Hollings Marine Laboratory.

Figure 3 – Bottlenose dolphin from Sarasota Bay with lacaziosis lesions. Photo credit: SDRP.

Figure 4 – Bottlenose dolphin from Sarasota Bay with tattoo skin lesions. Photo credit: SDRP.

Using exhaled breath condensate for marine mammal health assessment

By Alexander A. Aksenov, PhD, and Cristina E. Davis, PhD, University of California, Davis

For centuries, anecdotal evidence has suggested that some human diseases have a certain "smell" associated with them. Ancient Chinese and Greek medical texts both refer to a patient's breath and body odor as an important diagnostic element, and modern doctors often utilize patient breath odor for informal health assessment as well. For example, ketones in human breath have long been associated with diabetic ketoacidosis. In addition there is recent evidence that dogs are able to distinguish health-related odors in human samples as well. Recently there was a published study where dogs smelled test tubes containing breath samples from patients with and without lung cancer, and the dogs were able to correctly identify most of the sick and cancer-free samples (the dogs were also able to "sniff out" other cancer types as well as type 1 diabetes, albeit with varying degrees of accuracy).

Not surprisingly, the field of diagnostic breath research has developed rapidly in recent years. Breath analysis is painless and non-invasive and can be used in conjunction with other diagnostic tools. Given that cetacean lung physiology is not significantly different from that of humans or other terrestrial mammals, it actually may be possible to adapt the same promising techniques that are used in human breath studies to be used for marine mammals such as dolphins. The greatest advantage of this approach is, of course, the fact that breath monitoring is the least invasive method of marine mammal health assessment because it does not require physically harming the animal or causing an excessive amount of stress.

We have developed an exhaled breath condensate (EBC) collection device that allows for relatively simple and fast collection of EBC from both trained and wild dolphins over the time frame of a few minutes. The breath is collected by holding collection device over an animal's blow hole so the expired breath is condensed onto a chilled glass surface. For the collection, the trained animals could be asked to swim to the surface and allowed to breathe normally, while held in place by trainers. For wild animals, the EBC can be collected during capture-and-release exercises by transferring the animal onto the deck of a boat or holding the animal in place in shallow waters while the collection device is held over the blow hole. After collection, the breath condensate is taken to the laboratory and analyzed using advanced analytical chemistry methods such as gas chromatography mass spectrometry (GC/MS) and high performance chromatography mass spectrometry (HPLC/MS). The links between chemical composition and health status can be established using bioinformatics approaches to quantify chemicals that are present in different groups of animals (e.g., healthy versus sick, or animals from oiled areas versus clean waters).

The exposure to petroleum products is of particular concern for marine mammal populations. Oil spills (such as the BP Deepwater Horizon disaster) and subsequent environmental contamination with petrochemicals are very detrimental to the surrounding environment and pose great health risks for humans and animals in affected areas. Cetaceans are often thought not to be affected by oil spills or petroleum products as they can "swim away" from exposed habitats. However, due to their surface breathing behavior, approximately 80% of their total lung volume is exchanged in less than 0.3 seconds. This makes them potentially very vulnerable to the vapor layer at the water surface resulting from oil spills, even if there appears to be no oil present.

We are currently studying the chemical content of dolphin breath in control healthy (Sarasota Bay, FL) and oiled (Barataria Bay, LA) wild dolphin populations during health assessments. We have also been studying a healthy population of trained dolphins and those afflicted with certain health conditions such as pneumonia, fungal infections and kidney stones. The initial results indicate that dolphin breath, similarly to human breath, is a very complex mixture of various compounds (most of which are present in trace amounts). A variety of alcohols, aldehydes and amines (and many, many other compounds) could be detected.

In the future, when we establish which chemicals (biomarkers) in dolphin breath can be reliably linked to petroleum exposure or certain diseases, we are planning to monitor for the presence or absence of these compounds during routine surveillance of wild populations in oil exposed regions. This can provide diagnostic information about a specific dolphin, and also can be helpful in tracking the effects of environmental stress, such as oil spills, in marine life populations. There are clear evidences that the petrochemical exposure leads to immediate and long-term health effects in both humans and animals; however, exposure monitoring and metabolomic studies are very difficult to perform in wild marine mammal populations.

The application of the breath analysis technology may significantly benefit conservation efforts by providing a robust and reliable method for assessing the effects of oil exposure on marine mammals. The data from breath studies, compiled with information on known wildlife migration patterns and sites of oil exposure will aid in assessing population fitness and help to appreciate the impact of oil spills and their detrimental health effects on ecosystems. Monitoring of petroleum-related chemicals will also allow estimating the magnitude of exposure as well as the time periods necessary for ecosystem recovery. Such data can be used as a specific tool in guidance of the spill response teams by helping them in evaluation of marine life oil exposure reliably and non-invasively.

A breath sample is collected from a dolphin during the May 2011 health assessment.

Understanding stress in bottlenose dolphins

By Randall Wells, PhD, Chicago Zoological Society, and Lori Schwacke, PhD, NOAA/National Ocean Service

The overarching goal of this collaborative project is to develop indicators and methods to quantify chronic stress in bottlenose dolphins. Much research has focused on the stimuli which induce stress in marine mammals as well as the hormonal mediators of the stress response. Stress may be induced by a variety factors, including noise, pollutant or toxin exposure, presence of predators, loss of prey, and/or habitat changes. The stress response is complex and difficult to study, but has been well characterized in other laboratory mammal species, and studies of both captive and free-ranging individuals support the existence of these same stress response pathways in marine mammals. Prolonged stimulation can overly burden the body's regulatory systems and induce deleterious effects, including chronic immune suppression and inhibition of other energy expending hormonal systems, including disruption of reproductive function, all of which may cumulatively lead to decreased survival and/or inability to reproduce. For this reason, developing indicators and methods to quantify chronic stress in marine mammals is essential for understanding risks and long-term consequences for populations.

We are using the bottlenose dolphin as a model species and attempting to: 1) determine correlation of hormone measures between blood and blubber, 2) develop a comprehensive understanding of factors that influence stress hormone levels and establish reference intervals for blood and blubber measurements, and 3) examine relationships among the various hormone measures and conduct preliminary screening analysis to examine potential relationships between the stress hormones and other health measures including immune function. Samples are being obtained from dolphin health assessments and other sampling in the southeastern U.S., from Sarasota Bay and populations in heavily impacted coastal sites to gain an understanding of the effects of biological and chemical stressors on dolphin population health. Capture-release studies have been conducted in the Florida Panhandle, where we are investigating the effects of chronic algal toxin exposure, and along the Georgia coast, where we are examining the impacts of high exposure to legacy chemical contaminants. In all of these capture-release projects, we have collected data on reproductive and thyroid hormones, as well as indicators of functional immunity, all measured simultaneously from the same individuals and processed by the same laboratories to ensure inter-study comparability.

We expect to better define the range of natural variability of stress hormones for bottlenose dolphins, as well as stress hormone responses to a variety of natural and anthropogenic stressors. By examining relationships between stress hormones in blood and blubber, we hope to enhance the utility of remote blubber biopsy sampling as a tool for measuring stress hormones and reduce the need for dolphin capture-release to obtain stress hormone measures. We will also examine potential relationships between stress hormone measures and longer-term dolphin health indicators in order to identify potential impacts of stress.

This project, funded by the Office of Naval Research, is a collaborative effort, in conjunction with Eric Zolman, NOAA/ National Ocean Service, Hollings Marine Laboratory, Dr. Nicholas Kellar, NOAA Fisheries, Southwest Fisheries Science Center, Dr. Patricia Rosel, NOAA Fisheries Southeast Fisheries Science Center, Dr. Stephanie Venn-Watson, National Marine Mammal Foundation, and Dr. Teresa Rowles, NOAA Fisheries, Office of Protected Resources.

The importance of ultrasound examination for dolphin health evaluation

By Cynthia Smith, DVM, National Marine Mammal Foundation

Ultrasound examination is a useful, non-invasive way to rapidly evaluate organ health in animals and humans. Marine mammal veterinarians are using ultrasound with dolphins for routine physical exams, diagnosis of disease, and disease monitoring. In order to accurately assess health and disease, there is a need to standardize ultrasound techniques. The clinical team of the National Marine Mammal Foundation has collaborated with the Navy Marine Mammal Program and the Tufts Veterinary Diagnostic Imaging Service to standardize ultrasound examination of dolphins. This approach was applied during the dolphin health assessments conducted in Sarasota Bay this May of 2011.

Ultrasound was used to evaluate 14 bottlenose dolphins; one of the exams was shortened due to animal instability on the deck. Female exams began in the water with reproductive ultrasound evaluations to determine pregnancy status. If pregnant, a decision was made based on fetal age and animal stability whether or not it would be examined further on the boat. Once animals were transferred to the boat deck, they were gently rolled onto their right side so that their left side could be scanned. Ultrasound times were kept to 10 minutes or less. The following organs were evaluated: lymph nodes, lung, pericardial space (area around the heart), liver, pancreas, stomach chambers, intestines, kidney, bladder, and reproductive tract (left ovary, uterus, mammary glands if female; testicles if male).

Ultrasound health assessments of these wild Sarasota dolphins were made based on clinical expertise gained while working with managed dolphins, as well as the published literature on cetacean health and disease. Normal versus abnormal findings were documented on each organ. An example of a normal dolphin lung field can be seen in the image below. Although further standardization is needed of certain organs, we were able to make important assessments of animal health based on our findings. Ultrasound should be considered an important component of a comprehensive dolphin health evaluation based on the wealth of information gained in a short period of time.

Dorsal plane sonogram of healthy lung in an Atlantic bottlenose dolphin examined in Sarasota, May 2011. Image acquired with a GE Voluson i portable ultrasound unit and a 2-5MHz 3d/4d RAB transducer.

Comparing dietary consumption of iron in wild versus captive dolphins

By Rita Stacey and Melissa Zabojnik, Brookfield Zoo, Chicago Zoological Society

Iron storage disease is becoming a more frequently diagnosed condition in bottlenose dolphins in human care. In other animals and humans, this disease occurs when the body absorbs too much iron usually through the diet. Extra iron in the body builds up in the liver and other organs and this build up can lead to health problems such as liver damage. One of the causes of iron overload in other mammals in human care is often attributed to non-native diets. Iron ranges from the CRC Handbook of Marine Mammal Medicine show a distinct difference between captive and wild animals (captive 120-340 mcg/dl; wild 74-176 mcg/dl).

We performed a preliminary examination of iron overload and found that for 175 wild dolphins sampled in Sarasota Bay during 1990 to 2011, iron levels decreased with age. We then compared these data to a sample of 16 captive dolphins. This comparison suggests that iron levels are trending higher in captive dolphins as they age. We also analyzed small samples of native and non-native fish types for iron content. Based on these preliminary data, it appears that captive dolphins consume equal to or smaller quantities of iron than wild dolphins.

In September 2011 we were awarded an IMATA Research Grant to continue to investigate and compare the dietary consumption of iron in wild dolphins to that of dolphins in human care and investigate whether an animal's diet can be a significant cause of iron overload. We will continue to perform nutritional and mineral analyses of fish in dolphins' native and non-native diets and examine data for clues pointing to the causes of increased iron levels in captive dolphins. Our results will lead to an increased understanding of how much iron marine mammals are consuming. We hope to use our findings to consider whether captive marine mammal diets need modification. Further investigations will include increased captive dolphin blood data sample size and an analysis of seasonal changes in the native diet.

Sarasota Bay dolphin community status

By Jason Allen, BS, SDRP Field Coordinator

For a second year, the story continues to be calves, calves and more calves. We have followed up last summer's 17 new babies with a very respectable eight newborns in 2011. It has been a decade since so many calves have been born into the population over only two years. 2011 moms included three first time mothers (F165, Holly, and F199) as well as three well experienced mothers. FB25, Moonfin Look-a-like, and Tramp gave birth to their 8th, 7th, and 5th calves, respectively. In addition, Annie gave birth to her third calf this year, another in one of the two lineages we have studied across five generations. Is this calf a girl, who seven years from now will give birth to the great-great-great-grand-calf of Cathy? Only time will tell.

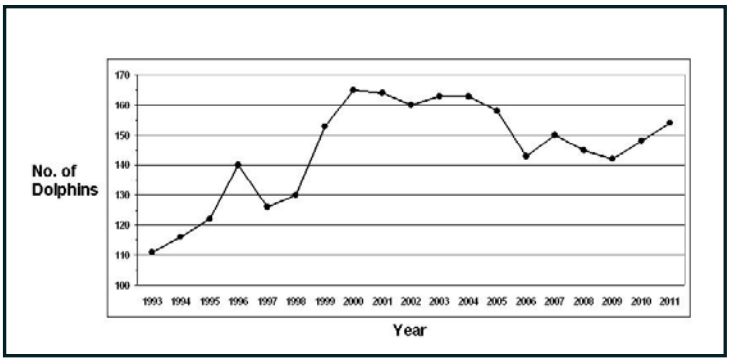
While it is too soon to know the long-term fates of these little guys and gals, we are happy to report that 21 of the 25 have survived to date. The 2010 calves of FB55 and Trisha, as well as the 2011 first calf of F199 (Wanda's 2002 calf) have not been observed with their mothers for some time and are assumed gone. Before Trisha's calf disappeared, it was seen with fishing line on its right tail fluke. We were successful in removing some of it with a long-handled cutting tool; the small amount of line remaining likely did not play a significant role in the calf's disappearance. Unfortunately, the 2010 calf of FB79 (C797) was entangled much more severely in fishing line from at least five different entanglements. In spite of our disentanglement efforts, he did not survive (an article describing his ordeal is included in this issue).

The majority of our elderly animals have survived another year, with the exception of FB36 who died this fall at age 39. The oldest male observed this year was FB28 (age 46), but he is a youngster compared to female Nicklo, who remains our oldest resident at 61 years young. She is often accompanied by Black Tip Double Dip (age 58), and the two are frequently seen just behind Mote Lab's docks chasing fish over the seagrass meadow before whacking them out of the water with their tail flukes. They are occasionally joined by another of the oldest females, Squiggy (age 55). In combination, the large number of successful calves and the small number of mortalities has the resident Sarasota Bay dolphin community at about 160 individuals, on a positive trajectory, moving in the direction of abundance levels reached at the turn of the century.

We have been able to continue our year-round monthly monitoring of the Sarasota bottlenose dolphin community thanks largely to support from the Batchelor Foundation, the Disney Worldwide Conservation Fund, and private donations, as well as the continued dedication of our core volunteers and undergraduate interns. Thanks to these efforts, this community remains one of the most thoroughly studied free-ranging dolphin populations in the world.

Annie surfacing with her third calf, less than two months old at the time. This calf is the great-great-grand-calf of Cathy (age 45), who is still alive and observed in Sarasota Bay year round. Can you imagine being a great-great-grand parent at only 45 years old?

Nicklo (age 61, background) and Black Tip Double Dip (age 58, foreground) surface together as they head through Big Pass, probably on their way to feed in the seagrass meadow behind Mote Marine Laboratory.



Number of identifiable dolphins using Sarasota Bay on a regular basis; 96% of dolphins seen in the bay are identifiable.

A Gulf-wide photographic identification catalog for bottlenose dolphins

By Randall Wells, PhD, Chicago Zoological Society

The Deepwater Horizon oil spill and several Unusual Mortality Events (UMEs) in the Gulf of Mexico have shown that knowledge of bottlenose dolphins in much of the Gulf is insufficient to meet the mandates of the federal Marine Mammal Protection Act. In much of the Gulf, stock boundaries have been assigned arbitrarily based on geography rather than on dolphin biology. Abundance estimates for putative stocks are out of date for most of the Gulf and are unusable for stock assessments. These problems have precluded assessment of the impacts of large scale environmental or mortality events, and inadequate baselines exist for accurately evaluating recovery.

With a pledge of 3-years of support from the Disney Worldwide Conservation Fund, we are developing a long-term, broad scale conservation tool to begin rectifying these issues and to meet the urgent need to monitor dolphins following the oil spill. We are compiling a Gulf-wide photographic identification catalog involving contributing researchers from Texas to Key West. Photo-identification of individual dolphins allows for abundance estimation and provides opportunities to determine residency and transience. By accurately assigning specific individuals to specific areas, biologically based stocks can be defined, and exposures to threats can be evaluated. Had these kinds of efforts occurred before the oil spill and UMEs, it might have been possible to evaluate which specific stocks were impacted, to what extent, and to focus resources for monitoring recovery.

In response to the oil spill, increased bottlenose dolphin photographic identification efforts are underway along much of the northern Gulf of Mexico coastline (including and in addition to the efforts described elsewhere in this newsletter). While it is too late to develop pre-spill baselines, it is worthwhile to establish current patterns of residency and abundance and to begin to look for movements of individuals outside of the oil-impacted area as ecological effects of the spill may begin to occur. To detect larger-scale individual movements between the study areas of different investigators, a central clearinghouse for identification photographs and associated meta-data will be helpful. In addition to developing and maintaining a Gulf-wide bottlenose dolphin photographic identification catalog, we will implement an updated and standardized database system for dolphin sighting data and identification images to facilitate data sharing. This database will be based on the Finbase system developed and currently maintained by NOAA.

Photographic identification leads to the compilation of individual animal histories. As another goal of the project, we plan to apply the histories of "real dolphins" to develop "dolphin stories" that can exemplify aspects of their biology and conservation issues and to disseminate these stories to elementary schools and the general public.

West Florida Shelf bottlenose dolphins: Population structure, health, and oil spill impacts

By Randall Wells, PhD, Chicago Zoological Society and William Hurley, IV, Georgia Aquarium

In contrast to the decades of information available from bottlenose dolphins inhabiting some of southwest Florida's bays, sounds, and estuaries, little is known about the health, stock structure, ranging patterns, and dive behavior of bottlenose dolphins in West Florida Shelf waters, 10-30 miles offshore. Information is needed to define population units for management purposes; data on ranging patterns, genetics, and contaminant profiles can help to refine stock identification. Dolphins living in these offshore waters may have been impacted by oil from the 2010 Deepwater Horizon spill. It is important that baseline information be collected on shelf dolphins to allow for future evaluation of changes that may be associated with long-term impacts from the spill. With support from the Georgia Aquarium, Dolphin Quest, and Dolphin Connection, we will perform standard health assessments and sample collection for 6 bottlenose dolphins over the shelf, and we will tag them with satellite-linked transmitters that will provide data on movements and dive patterns for up to several months post-release. Remote tracking of the dolphins via satellite will allow evaluation of their movements, dive depths, duration of dives, and time spent at depth. Dolphins riding at the bow of Mote Marine Laboratory's *R/V Eugenie Clark* will be captured via standard hoop-net technique, brought aboard the *Clark* for a brief health assessment and tagging by an experienced team of researchers and veterinarians, and then released immediately onsite. Sample collection will follow established NOAA protocols to facilitate comparisons with samples collected elsewhere in the Gulf of Mexico in association with oil spill research. Efforts to initiate this research in late October were thwarted by persistent high winds and rough seas; the project has been rescheduled for spring 2012.

Research Assistant Carolyn Cush performing photo-identification analyses.

A tagged offshore bottlenose dolphin dives off Bermuda in 2005. Photo courtesy of Dolphin Quest.

Historical ecosystem disturbance and recovery of Sarasota Bay recorded in bottlenose dolphin stable isotopes

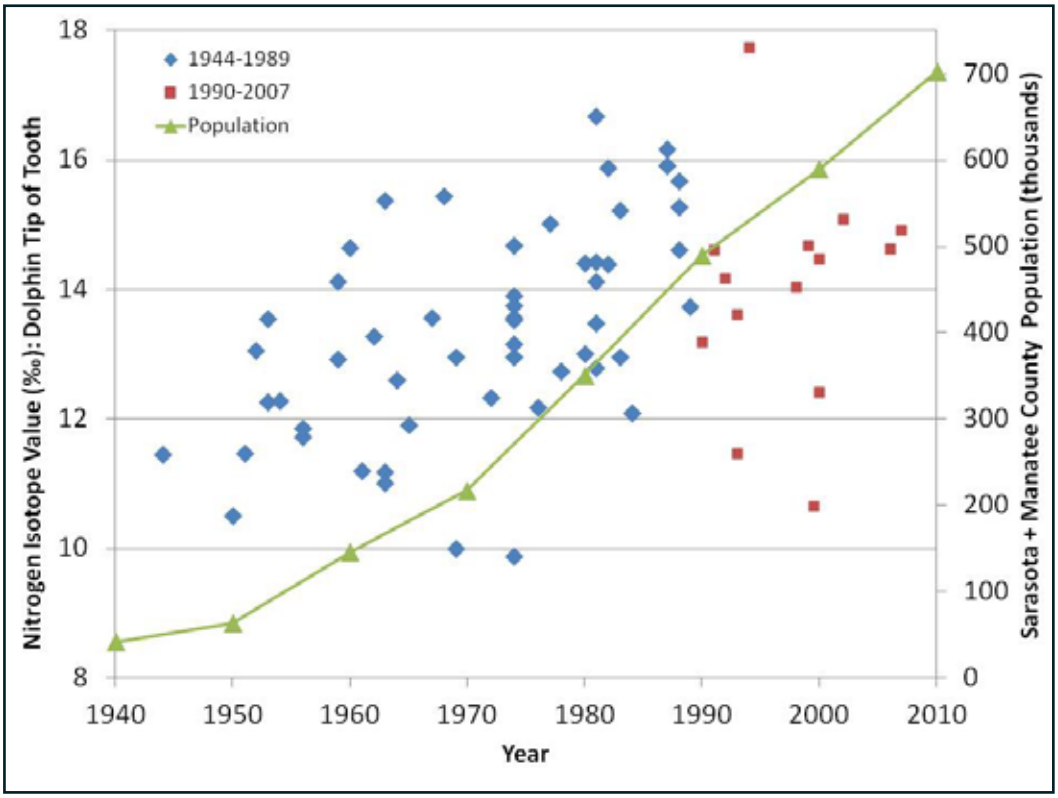
By Sam Rossman, PhD candidate, Michigan State University, Peggy Ostrom, PhD, Michigan State University, Craig Stricker, PhD, United States Geological Survey, Nélio Barros, PhD, and Randall Wells, PhD, Chicago Zoological Society

Coastal estuaries such as Sarasota Bay are reservoirs of biological diversity; however, out of the thousands of species that inhabit Sarasota Bay, bottlenose dolphins are of special ecological importance for at least two reasons. They are large predators near the top of their food web and they are long-lived. Top predators are useful indicators of marine ecosystem health because they depend on linkages throughout the food web. In addition, some bottlenose dolphins in Sarasota Bay can live well over 50 years. During its lifetime a 50 year old Sarasota Bay dolphin would have experienced numerous alterations to their habitat including dredge and fill habitat alteration, human population growth, the 1995 net fishing ban, and severe red tides. This ecological history of Sarasota Bay is recorded in the tissues of bottlenose dolphins. Using stable isotope analysis, we can learn how dolphins responded to disturbances that changed their ecosystem for over six decades.

Stable isotopes are unique forms of the same element which differ only in mass. For instance, in nature the most abundant form of nitrogen is ^{14}N or "nitrogen 14" meaning that it has an atomic mass of 14 derived from 7 protons and 7 neutrons. Less abundant is ^{15}N, which is like ^{14}N but has one additional neutron. The ratio of the abundance of ^{15}N to the abundance of ^{14}N is an indicator of an animal's place in their food web also known as trophic level. This is because animals preferentially excrete more ^{14}N than ^{15}N and, thus, the ratio of ^{15}N to ^{14}N of an organism will be higher than that of their diet. Nitrogen isotope ratios are unit-less but are commonly expressed as isotope values which are denoted with a per mil (‰) sign. One trophic level results in a 3.2‰ difference between diet and consumer. For example, if a dolphin fed exclusively on a single prey species which had a nitrogen isotope value of 4‰, the dolphin in question would likely possess an isotope value of 7.2‰. The tips of bottlenose dolphin teeth record an animal's diet prior to 1 year of age and remain inert for the rest of the dolphin's life. Thus, by sampling a tooth from a dolphin which died in 1994 and was 50 years old, we can assess the diet of the dolphin from 1944. We analyzed stable nitrogen isotopes from the tips of teeth from 69 dolphins from the Sarasota Bay population to assess how their trophic position may have changed in response to ecosystem disturbances occurring between 1944 and 2007.

The most striking feature of our data was a 3‰ increase in average nitrogen isotope value of dolphins from 1944 to 1989. Traditionally, this would indicate the increase of one whole trophic level. However, such an increase is highly unlikely for this time period in which fishing pressure increased, the human population in the area quintupled and there was wide spread habitat destruction. Nitrogen isotope values increased as human population grew in the Sarasota Bay area. We determined that the increase in nitrogen isotope value was not caused by an increase in trophic level but rather probably the incorporation of human produced wastewater, high in ^{15}N, into the Sarasota Bay food web. Since 1989 the amount of human-produced nitrogen entering Sarasota Bay has been greatly reduced predominately through advances in wastewater treatment. Nitrogen isotope values show no trend after 1989, indicating improved wastewater treatment was successful in reducing the amount of human produced nitrogen entering not only Sarasota Bay but its food web as well. In this capacity the dolphins of Sarasota Bay serve as historians of ecological change, allowing us to reconstruct disturbances that occurred more than 60 years ago.

This work was conducted as part of Sam Rossman's dissertation at Michigan State University and is being funded though a National Science Foundation Graduate Research Fellowship.



Nitrogen isotope values from teeth of bottlenose dolphins resident to Sarasota Bay highlighting the incorporation of nitrogen pollution into the Sarasota Bay food web prior to 1989.

Energy content of dolphin prey

By Elizabeth Berens McCabe, MS, Chicago Zoological Society, and Andrew Westgate, PhD, UNC-Wilmington

In Sarasota Bay, the occurrence of a severe red tide in 2005 was followed by increases in dolphin depredation behaviors, declines in body condition, decreased abundance (through temporary and permanent movements to neighboring waters or disappearances), and increased mortality of weaning and newly independent calves. These changes in the dolphin population correlated with dramatic declines in nearshore estuarine fish abundances, including reductions of more than 90% for the primary prey fish. In spite of fish abundances returning to near pre-red-tide levels in recent years, some of these dolphin parameters still have not returned to normal. In the summer of 2010 and the winter of 2011, we measured the calorie content of common prey species to see if there were differences in their energy content and if these differences changed between seasons and years.

A total of 12 different species known to be primary dolphin prey species (ladyfish, pinfish, pigfish, spot, spotted seatrout, Gulf toadfish, striped mullet, scaled sardines, Atlantic threadfin herring, red drum, sheepshead, and silver perch) were sent to UNC-Wilmington for energetic analysis. In total 95 individual fish were collected over the summer of 2010 and the remaining 63 from winter 2011. We found that the total caloric density (kJ) of individual prey items increased with increasing fish length and with fish wet weight. Two species had higher mean energy density values in the summer months while eight species were more calorie dense in the winter months. This suggests that dolphins can maximize energy intake by targeting larger sized fish and that seasonal dietary shifts may in part be driven by energy content. The overall mean caloric energy density from individual prey fish was 5632 J/g, but varied by species. Of the 12 species tested, soniferous (i.e., noise-making) prey accounted for the highest and the four lowest mean energy densities in summer.

Previous work has shown that coastal bottlenose dolphins often use passive listening to locate and select soniferous prey. Results from this study indicate that soniferous prey species were generally lower in energy density than other available prey. Variation in individual foraging specialization and time spent locating, capturing, and handling prey may in some cases be a more important aspect of prey selection than energy density for resident bottlenose dolphins in Sarasota Bay.

Some species, such as pinfish, one of the most common dolphin prey fish, experienced statistically significant declines in mean body size since 2004. While the 13 mm difference in average body length between a 83-mm-long pinfish and a 70-mm pinfish may seem small, the difference represents more than a 50% decline in available energy. Prior data from stomach contents of stranded dependent calves indicated that pinfish were the most common prey fish in their diet. If calves continued in recent years to prey on pinfish at previous high levels, then the energy return for each capture event would be less with smaller fish, and this might impact body condition.

Examples of dolphin prey fish species for which we now have energetic data (top to bottom): silver perch, spot, and spotted seatrout.

If pinfish continued to be important for weaning calves, then smaller pinfish could lead to smaller calves, and potentially to a greater need for their mothers to provide supplemental support with milk at the time the calves should be transitioning to fish, thereby potentially reducing mother's weight. More detailed analyses of diets and other factors that might impact body condition, including contaminants or other health parameters, remain to be performed.

We thank the many interns and volunteers who worked on this project. The Batchelor Foundation, Disney Worldwide Conservation Fund, NOAA Fisheries Service, Harbor Branch Oceanographic Institution's Protect Wild Dolphins Program, and the Florida Fish and Wildlife Research Institute provided funding for this work.

Diets of Risso's dolphins and offshore bottlenose dolphins

By Nélio Barros, PhD (deceased), Deborah Duffield, PhD, and Dalin D'Alessandro
Department of Biology, Portland State University

The objective of the study was to develop and compare information on diet from stomach content analysis of stranded specimens of two dolphin species that are known to use offshore habitats. Data were available from eight Risso's dolphins and 17 offshore bottlenose dolphins, stranded along the Gulf of Mexico, on the east coast of Florida and on the coast of North Carolina.

Contents of the Risso's dolphin stomachs were predominantly squid and/or octopus beaks. The squid species consumed ranged from neritic and epipelagic species (found at 0-300 m depth), to mesopelagic and bathypelagic species (found from 1000 - 3000 m depth). They were generally bottom dwellers, exhibiting vertical migration towards the surface at night. These prey distributions fit with deep water-upper continental slope and shelf habitats proposed for Risso's dolphins. Contents of the offshore bottlenose dolphin stomachs were more cosmopolitan, but contained deep water, oceanic shelf and pelagic squid that exhibit vertical migration at

night, as well as occasionally coastal squid species, as seen in the Risso's dolphin stomachs. Offshore bottlenose dolphin stomachs also contained fish common to offshore banks and fish seasonally found in deep, as well as shallow, water from the Western Atlantic to the Gulf of Mexico (i.e., found inshore for part of the year and offshore at other parts of the year). Of approximately 45 fish species identified as prey for Sarasota Bay resident bottlenose dolphins, only five species were found in the offshore bottlenose dolphin samples. These five fish species either migrate between inshore and offshore waters seasonally or are found on the continental shelf and offshore banks.

Based on this initial comparison of stomach contents, it would appear that both Risso's dolphins and offshore bottlenose dolphins share deep water to upper continental slope and shelf habitats, but that Risso's dolphins concentrate more on the deep water to continental slope-shelf habitats, while offshore bottlenose dolphins seem to concentrate more on the upper continental slope and shelf habitats, and less frequently on deep-water (or nearshore) habitats.

This work was supported by NOAA's John H. Prescott grants program.

Stranded Risso's dolphins Betty and Big Al undergoing rehabilitation at Mote Marine Laboratory prior to release in 2007. Tracking of Betty via a satellite-linked tag showed her using the kinds of habitats where the prey identified from stomach contents would be found.

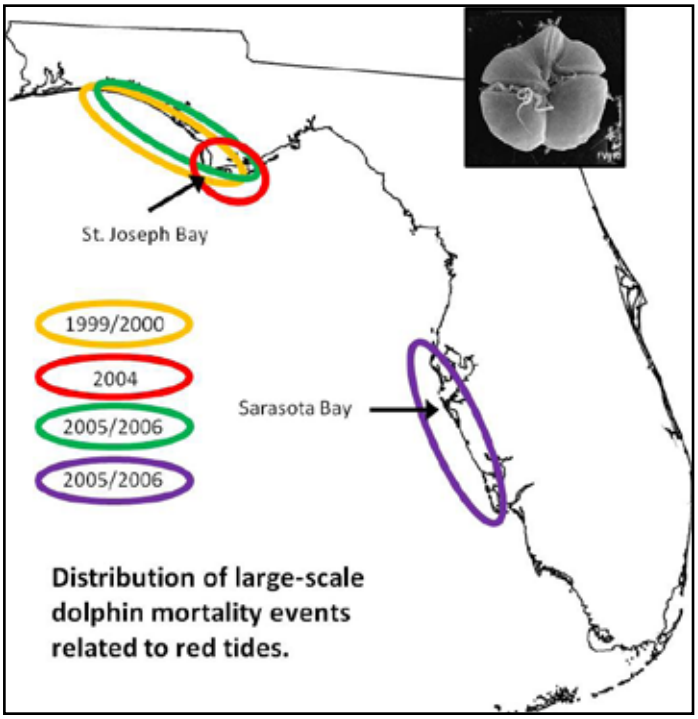
Genetic susceptibility to red tides

By Kristina Cammen, PhD student, Duke University

In the past two decades, we have observed that harmful algal blooms, or red tides, of the toxic algal species *Karenia brevis* appear to have varying effects on bottlenose dolphin populations. Red tides have been associated with several large-scale mortality events of dolphins in the Florida Panhandle, whereas dolphin populations in central-west Florida, including Sarasota Bay, have suffered little red tide-related mortality although they are frequently exposed. We hypothesize that this difference in dolphin susceptibility to algal toxins is due to the evolution of resistance over time in areas, like central-west Florida, that have been historically and regularly exposed to red tides.

We have developed protocols to analyze several genes that may be involved in the susceptibility of dolphins to red tides. In particular, we are investigating genetic variation at three steps in the biological pathway of response to toxin exposure: 1) toxin binding, 2) detoxification, and 3) the immune response. *K. brevis* naturally produces neurotoxins that cause harm by binding to voltage-gated sodium channels on neurons. Genetic mutations in these sodium channels may affect the ability of the toxins to bind and therefore may affect dolphin resistance. So far, we have identified variation at seven sodium channel genes in bottlenose dolphins. In addition, we have found variation at two detoxification enzymes and two immune system components. We are in the process of evaluating the frequency of these genetic variants in dolphin populations from the Florida Panhandle, which appear to be susceptible to red tides, and dolphin populations from central-west Florida, which appear to be relatively resistant to red tides. From both populations, our samples include dolphins that died during red tides and dolphins that survived these events. This research could identify a genetic basis for resistance to red tides in bottlenose dolphins. Any genetic biomarkers of susceptibility that we identify could be used to evaluate the susceptibility of additional dolphin populations and estimate the likelihood of dolphin mortality events should future red tides occur.

This research is supported by funding from the Duke University Marine Lab, the PADI Foundation, and the American Fisheries Society. Samples were provided by the Sarasota Dolphin Research Program and the NOAA Fisheries SEFSC Marine Mammal DNA Archives.



Map of recent dolphin unusual mortality events (UMEs) related to red tides.

Abundance of fish and select prey species in Sarasota Bay post-red tide

By Elizabeth Berens McCabe, MS, and Sunnie Hart, BS, Chicago Zoological Society

Predation constitutes a suite of behavioral, individual, and population effects and plays a critical role in population regulation. One important effect is the influence that predatory pressures exact upon the abundance and distribution of prey species. Conversely, individual predators such as bottlenose dolphins can be affected by changes in prey density by consuming more of a particular type of prey, or the dolphin population as a whole may respond by changing density within certain areas. In 2004 the Sarasota Dolphin Research Program initiated an ongoing seasonal multi-species fish survey in Sarasota Bay to investigate the distribution and abundance of prey fish available to resident bottlenose dolphins. This work has allowed us to look at fine-scale habitat and prey selection in bottlenose dolphins, as well as the ecological effects of *Karenia brevis* red tide events on the nearshore fish community upon which the resident dolphins depend.

Each field year consists of a winter fishing season, January-March, and a summer season, June-September, during which we catch, measure, count and release fish from the *R/V Flip* using a 183 m-long purse seine. In the summer of 2010 we completed 40 seine sets in seagrass habitats, catching a total of 35,787 fish of 66 different species. From the 30 seine sets performed during our 2011 winter season we caught a total of 3,820 fish of 59 different species in seagrass habitat. Mean catch-per-unit-effort (CPUE), or the number of fish caught at each sampling station, was 624 fish per set for summer 2010, and for winter 2011 it was 127 fish per set. This seasonal variation is seen each year.

To look at potential annual trends in fish abundance, we compared the mean CPUE across years and found that summer 2010 was not significantly different than any previous years with the exception of 2005, the year of a severe red tide, which was lower. The long and protracted *K. brevis* red tide event in 2005 corresponded with sharp decreases in the CPUE of nearshore estuarine fishes and changes in fish community structure. There were no significant differences in CPUE between this past 2011 winter season and previous winter seasons. Excluding the 2005 severe *K. brevis* bloom event, fish abundance in the seagrass habitats of Sarasota Bay appears to be fairly stable within each season. Species-specific trends in abundance were investigated for nine select dolphin prey species: ladyfish, pinfish, pigfish, spot, spotted seatrout, Gulf toadfish, striped mullet, scaled sardines, and Atlantic threadfin herring. While we did not find any consistent annual trends from 2004-2011, CPUE's of seven out of nine select dolphin prey species were not significantly different than any other year in summer 2010 and winter 2011. Many factors can contribute to changes in overall and species-specific fish abundances such as natural mortality, immigration, emigration, prey availability, recruitment, and differential habitat use. Changes can occur quickly or over long periods of time and can have a profound impact on higher level predators like the bottlenose dolphin. Long-term multi-species fisheries-independent monitoring surveys, such as ours, are crucial for documenting ecosystem changes, including changes in fish abundance, and for evaluating the effects of disturbance on a system. With the help of Harbor Branch Oceanographic Institution's Protect Wild Dolphins Program, we plan to continue monitoring fish abundance and species composition in Sarasota Bay.

We thank the many interns and dedicated volunteers who have worked on this project. This work would not be possible without them. The Batchelor Foundation, Disney Worldwide Conservation Fund, NOAA's Fisheries Service, Harbor Branch Oceanographic Institution's Protect Wild Dolphins Program, and the Florida Fish and Wildlife Research Institute provided funding for this work.

The prey sampling team, including project leader Elizabeth Berens McCabe and local volunteer Jeff Hollway, completes a purse seine set.

Impacts of red tide toxins on seabirds

By Deborah Fauquier, DVM, MPVM, PhD Candidate, University of California, Santa Cruz

Estuaries are highly productive and ecologically rich areas that are important habitats for fish and bird species. Over the past few decades, the frequency and duration of harmful algal blooms (HABs) have been increasing globally in coastal areas. HABs, especially those caused by the red tide organism, *Karenia brevis*, occur frequently along Florida's west coast, causing episodes of high mortality in fish, sea turtles, birds, bottlenose dolphins and manatees. Although red tide is known to cause episodes of mass mortality among marine animals, it is not known whether this disturbance results in significant declines in animal populations or changes in community structure. This project determined the extent that the red tide toxin, brevetoxin, contributed to illness and death in stranded fish-eating birds from the Sarasota Bay area. In addition, how red tide influenced the abundance, habitat use, and behavior of fish-eating birds in the Sarasota Bay estuary was investigated.

Red tide bloom events caused by the dinoflagellate *K. brevis* occurred along the central west Florida coast from February 2005 through December 2005, and August 2006 through December 2006. During these events, from February 4, 2005 through November 28, 2006, sick sea birds admitted for rehabilitation showed clinical signs including disorientation, inability to stand, incoordination, and seizures. Testing for brevetoxin by enzyme-linked immunosorbent assay found toxin present in 69% (n=95) of rehabilitating sea birds. Twelve of the 19 species of birds tested positive for brevetoxin exposure. Double-crested cormorants were the most commonly affected species and presented with more severe neurological signs as compared to other species. Serial blood and fecal samples taken from several live sea birds during rehabilitation showed that brevetoxin was cleared within 5-10 from the animals' bodies.

Two white pelicans and a double-crested cormorant on the shores of Sarasota Bay.

A double-crested cormorant feeding on a catfish in Sarasota Bay.

More than 34,000 bird observations from boat-based surveys were obtained during summer and winter seasons from 2006 through 2009 in Sarasota Bay, involving more than 20 different species. The most abundant bird species were double-crested cormorants, laughing gulls, and brown pelicans. Periods of high red tide cell densities ($>10^5$ cell l^{-1}) occurred during the summer 2006 and the winter 2007 seasons. Overall bird densities were lower during red tide blooms than they were during non-red tide bloom conditions. In particular the lower density of birds was attributed to decreased abundance of double-crested cormorants in all habitats during red tide bloom conditions. In contrast, brown pelicans and laughing gulls had no change or increased in abundance during red tide conditions. It is probable that cormorants are consuming different prey than pelicans and gulls and may be exposed to a higher dose of toxin leading to increased illness and death, and lower abundances during red tide events.

This project was supported by a Morris Animal Foundation Research Grant, Florida's State Wildlife Grants Program, and an EPA Star Fellowship

A flock of diving pelicans take to the water.

Dolphin Rescues, Releases, and Follow-up Monitoring

Recent dolphin rescues and disentanglements

By Aaron Barleycorn, BS, and Randall Wells, PhD, Chicago Zoological Society

Dolphin entanglements and strandings in the Sarasota Bay area and elsewhere in recent years have led to rescues involving the SDRP. We were involved in three bottlenose dolphin disentanglements in 2011. The ongoing field efforts of the SDRP provide opportunities to follow-up on local rescue cases, as summarized below.

Ginger: In December 2008, a 3-year-old female resident dolphin named Ginger stranded on Siesta Beach and was taken to Mote Marine Laboratory for treatment for gastrointestinal and respiratory problems. She was released 2 months later, with a small VHF tag and she was closely monitored for two months. After the radio tag stopped transmitting and was jettisoned, we kept track of Ginger during our monthly photographic identification surveys. Over time, her range has increased, and she has been seen in larger groups, often socializing with other juveniles including her recently independent younger brother, Wasabi. She was seen 26 times in 2011, and appears to be in good health.

In the case of Ginger, the reason for her stranding was unclear. However, in many other cases, human interactions are the primary cause necessitating a dolphin rescue.

Scrappy: In July 2006, Scrappy, an 8-year-old male, was observed in a large men's bathing suit. His head had gone through the waist and one of the leg holes, and the suit was cutting deeply into the leading edge of his flippers. Scrappy was briefly captured, examined, treated and released on 3 August 2006, and the bathing suit was removed. Since his rescue, he has been seen more than 100 times, including 13 times in 2011. Recently, he was observed cooperatively herding fish with several other young adults in mid-Sarasota Bay.

FB28: On 22 June 2007, FB28, a 42 year old male, was seen entangled with monofilament fishing line, which was tightly wrapped three times from the dorsal fin to the fluke. On 6 July 2007, a SDRP rescue team was able to approach FB28 with a long handled cutting tool and remove the line from the dorsal fin. The line was still draped across his fluke, but cutting the tension allowed the line to eventually clear the fluke on its own. Now 46 years old, FB28 is one of our oldest known males. During most of the 40 years we have known him, FB28 has emphasized the northern portion of our Sarasota Bay study area, and southern Tampa Bay. FB28 was seen 3 times in 2011, including a sighting on 27 October in the mouth of Tampa Bay, where he was showing off his line-free fluke while catching fish.

FB28 showing off his line-free fluke during his most recent sighting on 27 October 2011. FB28 suffers from a chronic fungal disease called lacaziosis.

Nellie: In February 2010, SDRP staff noticed the 9-month-old calf of resident dolphin FB25 had some plastic twine and a metal hook entangled around her head. She was briefly captured on 1 March 2010, and the entanglement was successfully removed. Nellie has since become independent of FB25 (who had her 8th calf this year) and has been seen 32 times since her rescue, including a recent occasion where she was socializing with a group of 9 dolphins.

Nellie in Big Pass on 17 October 2011.

C797: Although the three prior cases were successful rescues/disentanglements, occasionally an individual is not as fortunate. On 18 March 2011, SDRP staff observed C797, the 9-month-old calf of long-term Sarasota resident FB79, entangled in fishing line. There appeared to be a hook inside the mouth, and line extended from the mouth around the body, cutting into the leading edge of the dorsal fin, and trailing behind the dolphin's fluke. Over the next 3 months, a number of attempts were made to disentangle C797. Both approaching the free swimming dolphin to cut line with a long handled cutting tool and temporary capture-release were tried a number of times. C797 was seen by SDRP staff 20 times during his entanglement. On 10 occasions, we were able to attempt disentanglement with a long handled cutting tool. Unfortunately, he was very evasive and our attempts were mostly unsuccessful. Efforts to locate, temporarily capture, and remove the gear from C797, involving 5-10 boats and 30-80 people, were made on 8 different days, but we were unable to find him in a safe capture situation. On 17 June, an emaciated C797 was seen with FB79, swimming lethargically. We were able to use the long handled tool to cut a small amount of line from him and eventually hooked some line, allowing us to pull him close to the boat, where we worked rapidly to remove all the remaining gear. He was released quickly and was soon seen surfacing next to his mother, completely free of gear!

FB79 was next seen on 22 June, without her calf. Despite our efforts, C797's condition had probably deteriorated too far for him to be able to recover, but at least he was able to spend his final days clear of the painful line. Examination of the gear suggested at least five different entanglements, involving more than 25 meters of monofilament and braided fishing line as well as 3 different hooks/lures.

C797 with his mom on 23 March 2011. Other than the entanglement, he appears to be in good health.

C797 on 24 May 24 2011. Just two months later he is extremely emaciated, the line has cut deeply into the dorsal fin, and he has become entangled in even more fishing line.

C797 was covered in more than 25 meters of various types of fishing gear. The increased use of braided fishing line in the Sarasota area is concerning as it may do more damage more quickly than monofilament.

Although SDRP staff and our numerous collaborators and volunteers have been successful in rescuing entangled dolphins in the past, this case tragically highlights that we will not always be able to help despite our best efforts. The entanglement of C797 is unfortunate; however, this case study is an excellent example to be utilized by conservation educators on the importance of responsible fishing practices. The best way to help is to reduce the chances of a dolphin encountering fishing line in the first place. Remember not to discard your fishing line into the water as it can be deadly to marine life. Please refer to the "*Dolphin friendly fishing and viewing tips*" card in this newsletter for other ways to reduce negative impacts on dolphins.

Y06: On 8 August 2011, during NOAA health assessments in Barataria Bay, Louisiana, we caught a young male with healed presumed boat propeller wounds on his dorsal fin. The remaining pieces of fin had collected monofilament line, which we removed prior to release of the animal.

Tt256: On three occasions in July 2011, Dr. Ann Weaver observed an entangled 6-month-old calf with its mother in John's Pass, near St. Petersburg. Monofilament line formed a bridle through the calf's mouth, wrapped around its right flipper, cut into the base of the dorsal fin, and trailed behind. The dolphin was not seen again until late October, at which point NOAA asked SDRP to lead a rescue capture. On 15 November, after many days of high winds precluding rescue attempts, a team of 35 people including Larry Fulford, and staff from the SDRP, NOAA Fisheries Service, University of Florida, Mote Marine Lab, Florida Fish and Wildlife Research Institute's Marine Mammal Pathobiology Lab, Busch Gardens, SeaWorld, Clearwater Marine Aquarium, and the Florida Aquarium was able to capture the calf and its mother in shallow water and remove the gear. Although the line had cut deeply into the calf in several places, he was in generally good body condition, he responded well during the treatment, he exchanged frequent whistles with his mother throughout the brief procedures, and he swam off strongly with his mother upon release – we have every expectation that he will do well in the absence of gear.

Tt256 with entangling monofilament fishing line and remoras on 21 October 2011. Photo by Ann Weaver.

Post-release monitoring of pilot whales from a mass stranding in the Florida Keys

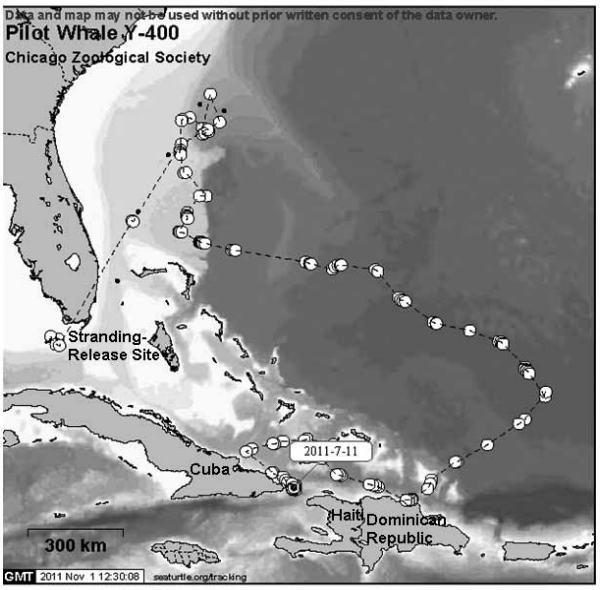
By Randall Wells, PhD, Chicago Zoological Society

Responding to a request by NOAA Fisheries on Friday night, 6 May, SDRP staff drove to Cudjoe Key in the lower Florida Keys early on the morning of 7 May to tag two male short-finned pilot whales from a mass stranding of about 21 whales. The animals were initially scattered through the area when the stranding began on 5 May. The Marine Mammal Conservancy and others were able to move all of the whales to a more centralized location and set up a temporary enclosure for initial treatment and evaluation. The two adult males were determined by the attending veterinarians and NOAA Fisheries to be in adequate health and condition for immediate release. The remaining live whales were subsequently transported to a rehabilitation center for continuing care.

The males were tagged with single-point attachment satellite-linked transmitters produced by Wildlife Computers. These tags provided data on location, dive depths, and dive durations. One of the males was tracked for 17 days, and the other for 66 days, until the tag's AA battery was drained. Both whales remained close together for the entire period both tags were transmitting, as they moved northward, and the dive patterns of the two whales were very similar to one another. Given the whales' previous behavior, researchers speculate that the abrupt loss of the signal from one whale resulted from failure of the transmitter or attachment on the whale's dorsal fin rather than a gradual decline in the health of the whale.

As can be seen from the map, the remaining whale, Y-400, continued around the north and east side of the Bahamas and then southward to the northern shore of the Dominican Republic, often moving with prevailing currents. It continued to the northeast tip of Cuba, and then remained in the Windward Passage, separating Cuba from Haiti, for the last days signals were received. The whale made occasional dives to 1,000-1,500 meters and occasionally stayed down for more than 40 min, among the deepest and longest documented dives for this species.

One of the concerns for mass strandings has been that retaining all of the members of the group in rehab until all are sufficiently healthy to be released at once may be detrimental to those individuals who were initially healthy. The apparently successful release of these whales supports the idea of evaluating initial health and releasing individuals from the stranding site rather than retaining entire groups. The tagging and follow-up monitoring were supported by the NOAA John H. Prescott grants program.



Map of satellite tracking locations for stranded pilot whale Y-400.

One of two adult male pilot whales tagged with a satellite-linked transmitter prior to his release.

Assessing post-release success of rehabilitated odontocete cetaceans

By Randall Wells, PhD, and Deb Fauquier, DVM, Chicago Zoological Society

Important questions have been raised regarding the relative risks and benefits of rehabilitating and releasing stranded odontocete cetaceans, but until recently few data have been available to support an appropriate evaluation. In the early years of cetacean rehabilitation, success in getting the animals to the point of release was infrequent, but success rates have improved markedly in recent years thanks to increased experience and knowledge and improved diagnostics and facilities. Concurrently, safe and practical techniques for monitoring rehabilitated cetaceans post-release have become available, especially involving radio telemetry, providing the potential for assessing the success of the animals released back into the wild. Decreased tag size and increased experience with attachments lasting for periods of months have helped to allay concerns about safety risks from the tags themselves. Recognizing that rehabilitation can be a very expensive undertaking, requiring extended allocations of limited medical, facility, and staff resources, increasing effort has been made in recent years to monitor rehabilitated cetaceans post-release in order to be able to evaluate the success of the treatments. With support of the NOAA John H. Prescott grants program and collaborative efforts involving Dr. Forrest Townsend, Dr. Frances Gulland, and Rob DiGiovanni, we engaged in a systematic review of post-release success relative to initial cause of stranding, aspects of rehabilitation, treatments, or life history parameters.

We compiled and reviewed 69 cases from 1986-2010 involving 10 species of small odontocete cetaceans. Of these, 41 cases involved single strandings or rescues, while 28 of the cases involved mass strandings. Thirteen of the bottlenose dolphin cases and all 38 of the cases involving other species were strandings with subsequent rehabilitation efforts. Eighteen bottlenose dolphin cases were rescue captures brought about by entanglement, out-of-habitat, or maternal death situations. Seven of these interventions led to rehabilitation, while the remaining 11 rescues involved on-site examination, treatment if necessary, and release without rehabilitation.

A final report for this review is currently being prepared. Among the preliminary findings is a definition for release success: following release, the cetacean exhibits ranging patterns, habitat use, locomotion, behavior, and social interactions typical for the species, stock or individual, and/or at least does not exhibit abnormal behavior, for a minimum of six weeks. Not all of these data will be available in all cases. To obtain these data, direct visual observations are best, but in the absence of observations, some of these data may need to be inferred from radio-telemetry. Based on this criterion, 80% of cases were identified as successful or unknown but likely to have been successful. In general, interventions prior to stranding led to higher success rates than did stranding with rehabilitation. Mass stranded individuals demonstrated greater success than single stranders. Young calves without their mothers, old animals, and animals with hearing deficiencies exhibited poor success post-release. In all cases, the importance of post-release monitoring was noted.

Franciscanas in South Brazil: A tri-national effort to understand the behavior of the most threatened dolphin in South America

By Marta J. Cremer, PhD, Universidade da Região de Joinville, and Randall Wells, PhD, Chicago Zoological Society

Coastal areas where Franciscana dolphins live, such as Babitonga Bay, are highly threatened by coastal development and pollution along in Brazil. The construction of harbors, dredging, and the growth of cities with the associated destruction of coastal ecosystems and industrial and urban pollution, along with boat traffic and noise pollution, have been increasing in recent years. Habitat degradation represents a chronic impact, and it is irreversible. However, the strongest impact in the moment is the accidental captures of the species in fishing nets. Entanglement in fishing nets kills thousands of animals per year along the limited range of the species. In this context, we have poor information about the species behavior, including its movements, dive patterns, home range and group stability. These data will be very important for the development of conservation strategies.

Babitonga Bay, South Brazil, has been show to have an estuarine population of about 50 Franciscana dolphins. They can be seen in the bay around the year, engaged in foraging and reproduction. Babitonga Bay has an area of 160 km^2, with 6,000 ha of mangroves surrounding the bay as well as the largest industrial port of Santa Catarina State.

With the aim to understand Franciscana dolphin movements in Babitonga Bay, including dive and distribution patterns, between September 28 and October 08, 2011, we conducted the first capture and tagging operation of this species in Brazilian waters. The combined efforts of our Argentinean colleagues from AquaMarina, the SDRP and UNIVILLE teams, and researchers of different Brazilian institutions, such as ICMBio, UFSC and UFRJ, led to the creation of a wonderful staff, who worked in an integrated manner for the efficiency and safety of the entire operation. The experience of AquaMarina and SDRP teams, which worked together for the past eight years in the capture and tagging of Franciscanas in Argentinean waters, was crucial for the success of this work. This was also an important opportunity for the training of Brazilian researchers considering future projects. In the last two years five Brazilian researchers have been trained with the SDRP in Sarasota. There was also important cooperation in proposal development by the Consortium Franciscana, formed by researchers of Brazil, Uruguay and Argentina with the purpose of strengthening research and environmental education actions for the conservation of the species.

A newborn white Franciscana calf observed by the UNIVILLE team in Babitonga Bay in November 2011. Photo credit: Projeto Toninhas/UNIVILLE.

In this first effort we successfully attached small satellite-linked transmitters equipped with time-depth recorders to two males, and location-only tags to two females and one male. For the first time tagged Franciscanas are being observed from boats. In this way, we hope to contribute to the improvement of the transmitters and generate more detailed information on the groups' stability. Our preliminary results suggest that the animals stay in the same area where they were captured and no movements out of the bay were recorded. Males and females seem to use the same habitat.

So far, the tag data confirm our previous knowledge about Franciscana distribution in Babitonga Bay, from our boat-based observations. However, the observations by boat have always been limited by sea conditions, as Franciscanas can be observed only in calm seas, with little wind action. For this reason, the continuity of studies with the use of satellite-linked transmitters is very important to verify the occurrence of seasonal variations in distribution, as well as verify the occurrence of movements in and out of the bay.

Many threats are impacting this area and protective measures are urgent. The establishment of a Conservation Unit was very necessary, but economic interests are making it very difficult. Besides housing an endangered population of Franciscanas, the area is also the home of a diverse and abundant wildlife, including other endangered species (like sea turtles) and important fishery resources. The results of this project will help us to give more strength to this proposal. The data show that Franciscanas probably have small home ranges and Babitonga Bay could be the habitat of a small resident population.

Support for this project was provided by UNIVILLE, Petrobras, through Programa Petrobras Ambiental, and the Chicago Zoological Society.

A tri-national team prepares to release a tagged Franciscana dolphin in Babitonga Bay, Brazil, on 6 October 2011. Project leader Dr. Marta Cremer is holding the front of the dolphin.

AquaMarina-CECIM: A brief overview after a decade of marine conservation in Argentina

By Pablo Bordino, MS, AquaMarina Director

Our lives are full of dreams. Some come true, and others remain on a list. My dream to develop AquaMarina as a team to run marine conservation action based in science in my country, Argentina, followed the typical process from a wish to a challenge. Established in 1998 as a non-profit organization, its mission has been to protect coastal ecosystem health and to advance marine biodiversity conservation, promoting the sustainable use of marine resources. Our work has been done through interdisciplinary research in applied science and environmental education with an informal approach, in collaboration with local and international institutions and organizations. During more than a decade, AquaMarina has been focused on coastal Buenos Aires, learning ways to accomplish conservation in urbanized places. Some lessons have been learned, while others still remain on our list. Being conducted on a relatively small scale, it seems that our approach to protect threatened marine wildlife, to develop strategies for sustainable artisanal fisheries, to promote and collaborate in management plans for coastal protected areas, and to conduct research on beach restoration, were reasonable and worthwhile. However, it is difficult to be sure that we are making a significant difference. Once, somebody told us "it is time for a strategic plan." That person was Bill Scott in 2005. He helped us to develop a realistic strategic plan that has been our new goal.

In 2010 and 2011, our most relevant work has been focused on cooperative research and policy, as well as environmental education. After several years of being trained at the SDRP, and with experience obtained in tagging Franciscana dolphins in Argentina from 2005 to 2010, our team has collaborated to conduct similar studies in Brazil as a clear example of capacity building initiated by the SDRP and the Chicago Zoological Society. We also have continued, although not systematically, our efforts to run photo-ID studies of this species. Currently 17 Franciscana dolphins have been photo-identified in Argentine waters. Also, AquaMarina conducted satellite-linked tracking of 1 leatherback, 3 loggerhead, and 5 green sea turtles, and succeeded in having Argentina included within the Inter American Convention for the Conservation of Sea Turtles supported by the Federal government.

Research was also conducted to find ways to mitigate the current Franciscana dolphin bycatch in gillnets. Such efforts were focused on the use of experimental gillnets and in implementing the use of hand lines by switching the current use of gillnets within an ecosystem perspective. We also have reinforced our cooperation and commitment with the artisanal fishery community in Buenos Aires. Biodiversity will only be conserved if local people and interests want to save it for ethical and broadly utilitarian purposes. Our commitment has to be sufficient to resist a minority that may seek alternative practices for narrowly selfish utilitarian reasons. AquaMarina has been one of the few NGOs invited to participate in the development of an Action Plan for the Conservation of Marine Mammals as requested by the Federal Government. Regarding education, we have continued providing training opportunities to undergraduate students and offered talks in public schools.

Our last accomplishments only partially represent the effort done by more than 40 volunteer students collaborating with us during the last decade. Some of those students in the past are active members nowadays and are key to holding the line where success has been obtained.

The tri-national Franciscana tagging team in Brazil included many members of the Argentinean AquaMarina team as well as CZS staff and volunteers.

Our initiatives for 2012 include establishing the "Escuela del Mar" (School of the Sea), a place where science, art and aquatic sports are used as tools for environmental education. The place was generously offered by the Pinamar County at the beach. We are currently working hard to have it available by December 2011. As a potential summer resort we expect to reach a wide audience that helps us to accomplish our objectives. We have plans to continue research on threatened wildlife and coastal ecosystems. As part of this effort, an initiative in cooperation with the Universidad de Cordoba (Spain), Universidad Javeriana (Colombia), Universidad Nacional de Mejico (Mexico), Instituto Argentino de Oceanografia IADO (Argentina), James Hutton Institute (UK) and NILU (Norway), we will try to identify and analyze solutions to prevent and resolve tensions arising from the use of natural resources, including ecosystem services, due to environmental and climate changes. The artisanal fishery in northern Buenos Aires is one of the potential study cases for community based management in Latin America.

AquaMarina has not been immune to a lack of funding, as expected in many other developing countries where philanthropy is not common. Despite these struggles, the local community has shown an increasing interest in marine conservation. We expect to be increasingly successful in funding in order to reach the proposed goals for the years ahead.

Recent efforts by AquaMarina have made been possible thanks to the support provided by the Chicago Zoological Society, the Ecohealth Alliance (formerly Wildlife Trust), the Disney Company, and WWF. Other sources of funds provided specific resources to conduct field research.

Single-pin satellite-linked transmitter design and testing

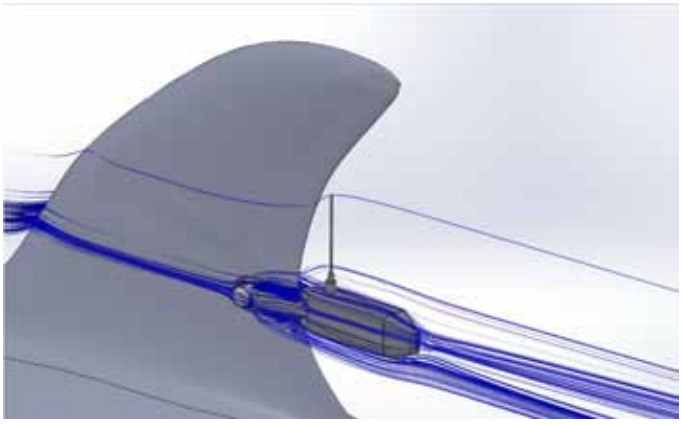
By Brian Balmer, PhD, and Randall Wells, PhD, Chicago Zoological Society, and Laurens Howle, PhD, PE, Duke University and BelleQuant Engineering, PLLC

Electronic tags have proven to be valuable tools in assessing small cetacean movement patterns and habitat use. While tag design and success rates have varied, problems associated with package size, attachment position on the dorsal fin, and number of attachment pins have, in some cases, shortened the predicted attachment duration or caused adverse impacts to the dorsal fins of the animals. These results motivated the development of a new satellite-linked tag attachment design that would minimize negative impacts to the dorsal fin while maximizing transmitter longevity.

In 2009, SDRP researchers along with collaborators from Bayside Hospital for Animals, NOAA, SirTrack Tracking Solutions, and the University of North Carolina Wilmington developed a new prototype satellite-linked transmitter that was lighter than its predecessors and was attached to the trailing edge of the dorsal fin via a modified plastic housing and two semi-rigid, plastic flanges with a single plastic pin. The goals of this new transmitter design aimed to minimize detrimental effects on tagged individuals while maximizing satellite-linked transmission duration. In August 2009, three adult male bottlenose dolphins along the Georgia coast received this prototype, single-pin satellite-linked transmitter. All three tags transmitted over the 50 day estimate of battery life, and subsequent follow-up tracking suggested that the single-pin attachment design was less traumatic to the dorsal fin than previous tag designs. However, the reason for tag failure in all three cases varied (plastic pin sheering, migration, and battery failure).

Although this prototype tag was a step in the right direction, there have been few quantitative studies that have investigated the influence of hydrodynamic drag on tag retention. The aim of this current study was to simulate hydrodynamic drag on the single-pin satellite-linked tag utilized in Georgia and provide alternatives for drag reduction to be incorporated into future tag designs. Computational Fluid Dynamics studies were used to measure the drag on a variety of tag designs. Based upon the simulations, the regions of most significant drag were identified to be directly behind the attachment hex nuts, antenna, and aft end of the tag. To reduce drag behind the hex nuts, self-threading pan head screws replaced the hex nuts, which are flatter and minimize the drag in this region. The drag behind the antenna and trailing edge of the tag was reduced by fabricating drag-reducing fairings in these two regions of the tag. A larger plastic attachment pin (5/16 in diameter as opposed to 1/4 in) was also selected to reduce potential migration of the tag through the dorsal fin.

In August 2011, a NOAA sponsored health assessment of bottlenose dolphins was conducted in Barataria Bay, Louisiana, in response to the Deepwater Horizon oil spill that had occurred a year prior. In addition to determining the health effects caused by the oil spill, it was also necessary to identify ranging patterns of dolphins within the region. Thus, 25 dolphins were tagged with this new single-pin satellite-linked transmitter design to determine ranging patterns of individual dolphins within the Barataria Bay estuary. Follow-up monitoring of animal and tag condition was conducted by the Louisiana Department of Wildlife and Fisheries with training and assistance from SDRP staff, and more in-depth follow-up is being performed by NOAA and SDRP in November 2011. Preliminary results suggest that these new satellite-linked tags are transmitting, on average, for more than 70 days, which is a significant improvement over previous tag designs. In addition, five of these tags were deployed on Franciscana dolphins in Brazil in October, and Marta Cremer and her team are performing follow-up monitoring. Once follow-up monitoring has been completed, analysis of digital photographs detailing individual dolphins and their attached transmitters will provide insight into the reasons for tag failure and what modifications are necessary for improving this tag design.



Computer flow simulation of an electronic tag mounted on a bottlenose dolphin dorsal fin. The lines represent flow trajectories. Flow trajectory recirculation, such as just behind the attachment point, represents a region of higher drag.

Sampling dolphins in the wake of the Deepwater Horizon oil spill

By John Kucklick, PhD(NIST), Amanda Moors, BS (NIST), Colleen Bryan, PhD(NIST), Jennifer Hoguet, MS (NIST), and Brian Balmer, PhD(CZS)

The National Institute of Standards and Technology (NIST) continues to help the Sarasota Dolphin Research Program (SRDP) in the area of bottlenose dolphin health assessment. Since 2002, we have assisted the program by developing sample collection procedures, archiving samples in the NIST Marine Environmental Specimen Bank (Marine ESB), assisting in field collections, and analyzing dolphin samples for pollutants.

The Deepwater Horizon oil spill was a major factor influencing how we collaborated with the SRDP this year. NIST was asked by the National Oceanic and Atmospheric Administration (NOAA) to help in collecting data for use in assessing injury to bottlenose dolphins that resulted from the oil spill.

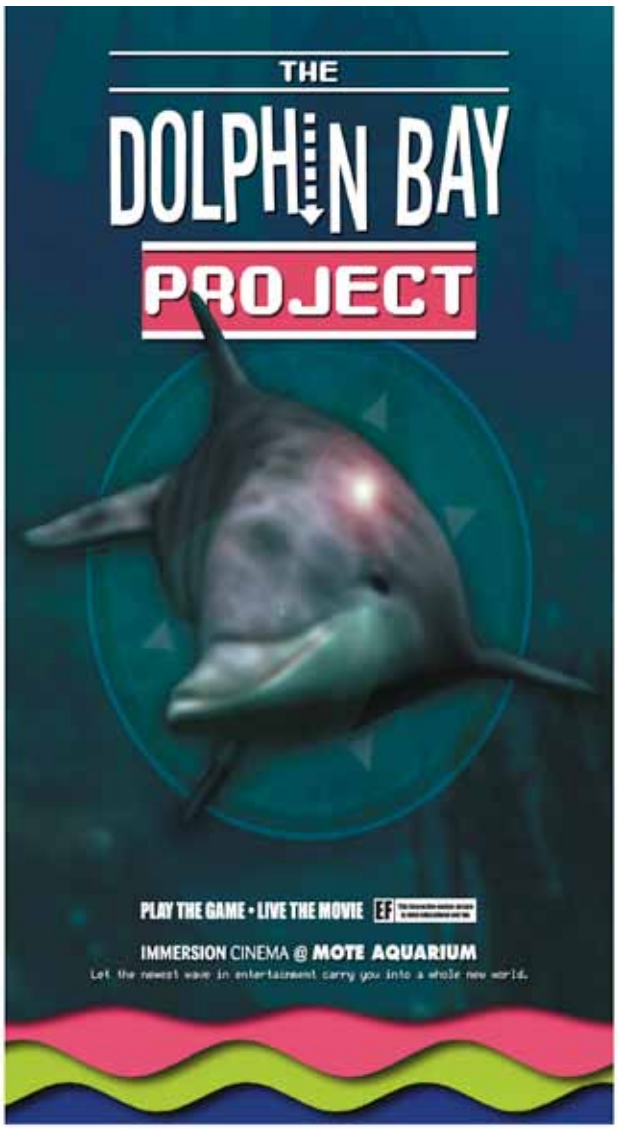
NIST helped NOAA's assessment of the effects of the Deepwater Horizon oil spill on bottlenose dolphins by participating in dolphin health assessments at two locations, a reference location, Sarasota Bay, in collaboration with the SRDP, and in Barataria Bay, LA, a location that was oiled during the oil spill. In addition, remote biopsy samples that were collected in St. Joseph Bay, FL, a region where oil was expected to reach but never did, have been stored at NIST for analysis. We modified our existing sampling protocols for bottlenose dolphins that had focused mainly on the collection of samples for chlorine and bromine pollutants analysis to also include the collection of samples specifically for oil and oil metabolites. NIST personnel were deployed to both dolphin health assessments to assist in sample collection and processing. Unlike previous years, NIST will have a minimal role in the analysis of samples. This work will be done by a special NOAA laboratory dedicated to the analysis of oil spill-related samples. Results from sample analysis should shed light on the extent to which Barataria Bay bottlenose dolphins are exposed to oil relative to non-impacted Sarasota Bay and St. Joseph Bay dolphins. Aside from oil spill-related samples, blood samples were collected from the two health assessments for archival in the Marine ESB in order to continue the time series of samples collected from the Sarasota bottlenose dolphin population. In addition, a pilot project was started to archive serum from dolphins for future use in understanding disease outbreaks or for use in health-marker related research.

Education continues to be a major component of our program's 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 the Chicago Zoological Society's Brookfield Zoo, Mote Marine Laboratory and Aquarium, and elsewhere, 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.

An Immersion Cinema interactive program, "*Dolphin Bay*," loosely based on our long-term dolphin research and conservation efforts 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.

In response to an increase in dolphins taking bait, catch and discards from anglers, we worked with NOAA Fisheries Service, Hubbs-Sea World Research Institute, and fishing guides and anglers to develop an educational card displaying 10 tips intended to improve the experience of the angler or boater while enhancing protection for dolphins. By making these cards available to boaters, anglers, and the general public, we hope that more individuals will become aware of the risks and legal issues involved when interacting with wild dolphins and choose to engage in responsible viewing and fishing practices when dolphins are present. These "*Dolphin-friendly fishing and viewing tips*" cards (see page 10) were initially developed through the support of the Disney Worldwide Conservation Fund, with additional funding for re-printings coming from Marineland: Dolphin Conservation Center, Harbor Branch Oceanographic Institution, and Fish Florida. Distribution throughout Florida and the southeastern United States has been coordinated by the SDRP, and the United States Coast Guard and Coast Guard Auxiliary recently began distributing our cards to fishermen and marinas up and down the eastern seaboard. More than 288,850 cards have been distributed since January 2008, including 13,450 in Spanish. Please contact our website if you have any further questions or would like to help distribute the cards. We will continue to make them available at no cost to those who can effectively distribute them to people likely to come into contact with wild dolphins. The cards are available in English and Spanish as downloads at: www.sarasotadolphin.org.



With the help of a generous donation from Wing and Jan Park, we are also working with Mote Marine Laboratory to update their marine mammal educational display materials. One phase of this effort involved placing a new display near Mote's Dolphin and Whale Hospital that features the "*Don't Feed Wild Dolphins*" public service announcement (developed in 2009 in part by the SDRP), presented alongside the list of 10 "*Dolphin-friendly fishing and viewing tips*" discussed above. This display is located in a high-traffic area of the aquarium and highlights the dangers of feeding wildlife along with ways that members of the public can interact with wild dolphins in a more responsible manner. This PSA is also available online at: www.dontfeedwilddolphins.org.

Sharing Scientific Findings and Participation on International and 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, Bottlenose Dolphin Take Reduction Team, the Working Group on Marine Mammal Unusual Mortality Events (chaired until May 2011 by Randall Wells), the IUCN Cetacean Specialist Group, the IUCN Reintroduction Specialist Group, and the Board of Governors of the Society for Marine Mammalogy (SMM) the largest association of marine mammal scientists and students in the world (Randall Wells, President). The SMM's Biennial Conference on the Biology of Marine Mammals, held in Tampa, Florida during 27 November through 2 December 2011, involved more than 300 talks and more than 600 posters, presented to about 2,000 attendees.

International Training Opportunities: The SDRP is a component of the Chicago Zoological Society's Dolphin Research and Conservation Institute (DRCI). As part of the DRCI, 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 2011, we hosted three people from Argentina: Solange Faura, Celeste Bollini, and Yamila Rodriguez. Celeste and Yamila each spent eight months in Sarasota working on senior thesis projects and assisting with lab activities, while Solange spent two months training with the SDRP as part of our ongoing collaboration with AquaMarina. In addition, a number of international trainees participated in our 2011 bottlenose dolphin health assessment in Sarasota Bay, including researchers from Taiwan and Cuba as well as a Brazilian team whose participation helped them prepare for the first-ever tagging of Franciscana dolphins in their country, which successfully took place in October.

Graduate Students: As described throughout this newsletter, graduate students from a variety of institutions, especially the University of California-Santa Cruz, the University of South Florida, the University of North Carolina-Wilmington, the Medical University of South Carolina, Michigan State University, Duke University, the University of Florida, and the University of St. Andrews involve the resources of our program as they conduct their thesis or dissertation research. To date, 25 doctoral dissertation and 30 master's thesis projects have benefited from association with our program, through field research opportunities or access to data, samples, or guidance. During 2011, two doctoral students involved with our program successfully defended their dissertations: Brian Balmer and Leslie Burdett Hart. Currently, seven doctoral students and one master's student are making use of resources provided by our program.

Undergraduate College Internships and Other Volunteers: 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 2-3 months at a time (for more information on internships, please contact Katie McHugh, SDRP Intern Coordinator, at: kmchugh@mote.org). During 2011, 17 interns and out-of-town volunteers provided approximately 7,500 hours of assistance to the program. In addition to the three international training participants from Argentina described above, we had several other interns from outside the USA, including three interns from Canada. Many of our undergraduate interns apply their training with the SDRP towards advanced study in the areas of marine animal conservation, research, and management, including five 2010-2011 interns who are now graduate students in the U.S., Australia, and the United Kingdom. During 2011, we also had 9 local volunteers assist with our rescues, surveys, prey sampling, and capture-release operations.

High School Programs: We offer both formal and informal educational opportunities for high school students. A formal curriculum, "*The Secret Life of Dolphins*," was developed by the Chicago Zoological Society in collaboration with Mote Marine Laboratory, and focuses on high interest dolphin research ongoing at the two institutions. The formal curriculum models a set of technology-based educational components, enabling students and teachers to work with real dolphin data from Sarasota Bay and Brookfield Zoo dolphins, using interactive data analysis software. It has been designed to offer teachers and students a dynamic array of experiences and scientific inquiry tools that can be used together or independently, centered on an overall theme of understanding the nature of science and the role of research in conservation. The curriculum immerses students in scientific investigation. They can manipulate and analyze real dolphin data, while gaining an appreciation for the uncertainty of science. The downloadable curriculum unit (approximately 4 weeks long) includes background information for the teachers and classroom-based activities and lesson plans related to: 1) basic content on dolphin research, 2) computer software, and 3) a field trip to either Mote Aquarium or the Chicago Zoological Society's Brookfield Zoo. The materials are available as downloads at no cost at www.sarasotadolphin.org.

2011 SDRP interns Brianne Miller and Marcela Salazar during observations of human interactions with "Beggar."

Where are they now? An SDRP past intern's perspective

By Dee Allen, MS, National Marine Mammal Laboratory

This past May, I found myself smiling as I packed my bags for a week of field research with the Sarasota Dolphin Research Program. I was reflecting on the fact that in 1991, I had boarded my very first flight, enroute to Sarasota for the first time. Now, 20 years and a couple hundred thousand air miles later, I was joining the SDRP team for dolphin health assessments, or as I fondly refer to it, our family reunion.

I was extremely fortunate to first meet Randy Wells, Blair Irvine, Michael Scott, and the rest of the SDRP team when I was an 18-year old Towson State University undergrad volunteering for a dolphin health assessment project through Earthwatch. Growing up in central Maryland farm country, I had a deep appreciation for the natural world; playtime was spent outside exploring the local flora and fauna - I did not realize at the time that I was a scientist in-training. Randy and the SDRP team helped to foster that scientist by exposing me to field research – in conservation biology, health and medicine, population management, measuring human impact on the environment, and education. I spent the summers of 1992-93 as an assistant to Randy's UCSC grad student, Danielle Waples. I learned skills in conducting focal animal behavioral follows, photo-identification, radio-telemetry, small boat operations, and most importantly, teamwork. I volunteered as an exhibit guide with the National Aquarium in Baltimore through the school year and spent summers volunteering with the SDRP. At the encouragement of my SDRP mentors, I joined the Society for Marine Mammalogy and attended my first scientific conference in 1993. The exposure and networking opportunities I received as a college student, both through my work with the SDRP and through membership in a professional scientific society, have proven invaluable in my career.

In 1996, I began working with Charley Potter and Jim Mead at the Smithsonian Institution's Marine Mammal Program. Not having been exposed to the importance of museum research before, I recall thinking to myself on my first day, "Wow, everything is dead; what can you learn from a dead thing?" Today, I can respond: "You can conduct necropsies to determine cause of death; research life history, biomechanics, or anatomical and physiological adaptations of the mammalian system to aquatic and extreme environments; study evolution, taxonomy, and systematics and describe new species; monitor marine mammal, ocean, and human health; provide data in support of conservation and management, investigate unusual mortality events, and stranding patterns; use medical imaging techniques to guide anatomical dissections, examine injuries, or to obtain 3-dimensional body surface data for optimizing the design of equipment based on an animal model."

While working at the Smithsonian, I conducted my Masters thesis research at The George Washington University (GWU) on a morphometric analysis of beaked whale mandibles to determine species and sex, receiving the John G. Shedd Award for Best Overall Student Presentation at the 14th Biennial Conference on the Biology of Marine Mammals and the Sylvia Bunting Prize from GWU. I also worked with the Marine Mammal Program staff on developing an online beaked whale identification guide, making this research collection virtually available to researchers around the world. I received a Peer Recognition Award for Leadership from the Smithsonian for successfully applying for and managing program support grants. Many of my duties at the Smithsonian involved collaborating with colleagues, hosting 70-80 national and international visiting researchers annually. My involvement with the SDRP, particularly working with international teams, set the stage for my interactions with the marine mammal community. I continue to collaborate with my Smithsonian colleagues as a Research Associate.

My field training with the SDRP provided me with the skills to participate in other marine mammal field projects. I met Peter Tyack, Doug Nowacek, and Mark Johnson from Woods Hole Oceanographic Institution through tagging studies with the SDRP. I worked with the WHOI team on studies using digital archival, acoustic, and orientation tags to examine risk factors for vessel collisions for right whales in the Bay of Fundy, the response of sperm whales to seismic air gun noise in the Gulf of Mexico, and dive behavior of Cuvier's beaked whales in the Ligurian Sea. I was invited by Andy Read, Danielle Waples, and Kim Urian from Duke University, all whom I first met in Sarasota in 1991, on a short-finned pilot whale project in the Gulf Stream waters off NC. I participated in a humpback whale survey, pelagic odontocete biopsy cruise, and a large whale survey on the Scotian Shelf, and gave marine mammal lectures in Iceland, Greenland, and Labrador.

In 2007, I accepted a position with NOAA's National Marine Mammal Laboratory (NMML) in Seattle, which conducts research in support of conservation, policy, and management of Alaska marine mammal stocks. I currently serve as a member of the NMML Directorate, leading the annual development of the Alaska Marine Mammal Stock Assessment Reports, serving as Executive Secretary to the Alaska Scientific Review Group, assessing severity of marine mammal injuries, participating in activities related to the implementation of the Marine Mammal Protection Act, and working on field studies of critically endangered North Pacific right whales, aerial surveys of bowhead whales in the Chukchi and Beaufort Seas, and tagging studies of California sea lions and Northern fur seals in the California Channel Islands.

Safety of field team participants and the animals has always been first and foremost for Randy and the SDRP. I pursued a unique route for sharing my field experience and knowledge of safely working in remote environments by instructing wilderness medicine part-time with Remote Medical International. I currently hold EMT-B, Wilderness EMT, USCG Medical Person-in-Charge, and CPR instructor certifications, and I volunteered as a firefighter/EMT-B.

The SDRP truly is a unique and remarkable world-recognized marine mammal research program. Through every aspect of my career over the past 20 years, I have encountered individuals who have been involved with this program. I am proud to be a part of it. I have learned from them how to be a good scientist, how to work as a member of a team, how to pursue your passion, strive for better, and create opportunities. Most importantly, it has taught me how to be a colleague, a mentor, and forever a student of your chosen discipline. It also taught me perseverance. We will all encounter challenges in our careers, and the marine mammal field is certainly a challenging, competitive, yet rewarding field to pursue. Don't give up on your passion, stay driven, and challenge those who tell you something is not possible.

I am indebted to the SDRP and Randy in particular, and the best way I believe I can repay that debt is to give back to the research community and inspire others to achieve their goals. I appreciate this opportunity to say "thank you". And to those who have supported this program over the past 41 years, know that you are making a difference.

Where are they now? Graduate student update

By Martin Mendez, PhD, Wildlife Conservation Society

Martin Mendez as a young student working with AquaMarina (left) and in the field in 2003 (right).

I was fortunate to start working on conservation very early in my (short) career. It all started in Argentina in the mid-nineties, during my undergraduate studies, when Pablo Bordino took me in as an intern to do Franciscana dolphin behavior and conservation work with AquaMarina. These were my first conservation lessons at a time when conservation was not formally taught in Argentina (it still isn't, for the most part), and Pablo was (and still is) a terrific instructor and mentor. Right after a few field seasons with AquaMarina, the same institution granted me an amazing opportunity to come to the U.S. to explore Conservation Biology at Columbia University and work as an intern at one of our partner institutions, the Eco-Health Alliance (Wildlife Trust at the time). After a one-year program abroad and after finishing my undergrad at the University of Buenos Aires, I decided to come back to the US to keep studying. So I started my PhD at Columbia under the guidance of Howard Rosenbaum and George Amato, working on cetacean population structure and conservation – I focused on the endemic Franciscana dolphins and the humpback dolphins, in partnership with AquaMarina and the Wildlife Conservation Society.

During my PhD, I met Randy Wells, as he and the entire SDRP were working very closely with Pablo and AquaMarina on the first-ever efforts to tag Franciscana dolphins, which is now a well known success story in conservation research. Randy kindly accepted to help mentor me and serve on my PhD committee, and offered a variety of resources at the SDRP, including biopsy dart and photo-ID training and, most importantly, the best-known population of cetaceans on the planet. The collection of experiences at SDRP working with small cetaceans and the long-term knowledge about cetacean populations allowed me to push the envelope formulating a scientifically sound and conservation-relevant work plan, while tackling a difficult issue: that of environmental drivers to population structure. While this is a very complex set of questions that are still not resolved to their full extent, we made tremendous progress.

Having completed my PhD, I embarked on postdoctoral research at the Sackler Institute for Comparative Genomics (American Museum of Natural History) under the guidance of Dr. George Amato, expanding on my PhD work and broadening my research to other aspects of Conservation Genetics, both in the marine and terrestrial realm. More than 10 years have passed since those first conservation lessons in Argentina. During this decade, my formal and informal training, the collaborative work with different NGOs and research programs, and the amazing group of people who have been kind enough to mentor me along the way made a huge impact on me, and reinforced my passion to do conservation. Now I am transitioning into a new position as the Assistant Director of the Latin America and Caribbean Program at the Wildlife Conservation Society. This position will allow me to focus on my commitment to help advance conservation in the region, which has been a lifelong goal.

Where are they now? Graduate student update

By Deborah Fauquier, DVM, MPVM, PhD Candidate, University of California, Santa Cruz

My interest in marine species and the marine environment began when I started volunteering at The Marine Mammal Center (TMMC) in 1991, where I was first exposed to the impact that disease can have on marine mammal species. I returned to TMMC a decade later, as their first veterinary intern, after earning my veterinary degree at the University of California, Davis. Following my completion of the internship at TMMC, I obtained a position as a staff scientist and deputy program manager of the Stranding Investigations Program at Mote Marine Laboratory, where I studied the health of marine species and their environment. During this time, I served as the field veterinarian for the Sarasota Dolphin Research Program, conducting health assessments on the local bottlenose dolphin population and conducting research into causes of mortality in this population. I returned to California to pursue a PhD in Ocean Sciences at the University of California, Santa Cruz. My PhD dissertation research focused on investigating the effects of red tides (*Karenia brevis*) on sea birds in Florida.

As my doctoral research nears completion I am excited about the opportunity awaiting me in Washington D.C. as a Knauss Marine Policy Finalist. The National Sea Grant College Program, John A. Knauss Marine Policy Fellowship, was created in 1979, and provides a unique educational experience to students, exposing them to national policy decisions affecting ocean, coastal, and Great Lakes resources. I will be spending a year in Washington D.C. learning how decisions are made to establish scientific priorities and how sound science can be implemented into policy on the national level. The marine ecosystem is undergoing rapid changes, some natural and some man-made, including increases in harmful algal blooms, changes related to climate change, and the impacts of marine debris. I feel there is an urgency to confront these issues and to formulate policies that will protect the marine environment in a timely manner. Although I enjoy being a veterinarian and conducting research, I believe I can make a larger impact by participating in the policy arena. Therefore, the Fellowship will give me the skills I will need in the future to pursue a career where I can advocate for the best possible science to be utilized in protecting the marine environment.

Dr. Deb Fauquier examining "Dante," a melon-headed whale rescued by Mote Marine Laboratory in October 2011. Photo credit: Mote Marine Laboratory.

International training perspective

By Solange Faura, AquaMarina

Solange Faura (front, center) with other members of the AquaMarina team in Brazil.

I am from Argentina. I am a member of the AquaMarina team, a group of biologists, students and fishermen working together on different projects in marine biology. In 2005, some members of the SDRP went to Argentina to help us with our Radio Tracking Franciscana Dolphin Project. It was a challenge for all, because it was the first time that this species was tagged. That's how this story began…

In the subsequent years, the people of the SDRP kept coming to Argentina to help us tag Franciscana Dolphin, using satellite-linked tags. Then, in 2009, I was invited to participate in the Sarasota Dolphin Health Assessment Project. That was my first time in this country, my first flight and the first time to see bottlenose dolphins (I was very excited!).

This year I was in Sarasota for two months with the SDRP and many things happened… I was trained in photo-ID; I helped with the data we obtained in the Franciscana Dolphin Satellite-linked Tagging Project 2010. I also participated in synoptic surveys; I helped Katie McHugh with the project on interactions between humans and dolphins. I was involved in bottlenose dolphin capture-release efforts in Sarasota Bay as part of their Dolphin Health Assessment Project. I spent my last two days helping in the fishing boat.

It was an enriching experience. I learned many things which allowed me to gain skills to apply working in my country; I put into practice things I already knew, and the most important is that I could reaffirm my commitment to what I do.

I just want to thank Randy and all the friends of the SDRP for teaching me and making me feel at home. And especially to thank Bill Scott for making this possible.

Bill Scott, Natalia Asplanato, Solange Faura, and Ariana Oberti helping with Sarasota dolphin health assessments in 2009.

International training perspective

By Yamila Rodriguez, National University of Mar del Plata, Argentina

I have been very lucky to participate once again in the Sarasota Dolphin Research Program, but this time working on my senior thesis which will allow me to get my degree when I go back to Argentina. I've always been attracted to how a simple algal cell could cause such a big change in the ecosystem. This is one of the reasons that I have focused my research on investigating how severe red tide blooms (caused by the toxic dinoflagellate *Karenia brevis*) affect the activity patterns and group size of the local dolphin community. In order to study this I used the data from regular, systematic photo-identification surveys conducted for the SDRP during the 2000-2009 period in Sarasota Bay. After the analysis I found that the activity patterns of Sarasota dolphins show changes during severe red tide events that mirror recent findings which focused on juvenile dolphins during a shorter time period. More specifically, foraging activity decreased, which might be related to changes in fish abundance and community structure. I also noticed an increase in social activity and group size during the red tide years, perhaps related to a shift in their diet which maybe requires different foraging strategies. Finally, I observed that the dolphins' interaction with boats became higher in those years with *K. brevis* blooms. This suggests that some animals may turn to anglers and boaters as a potential source of food or that they may bow or wake ride to save energy. In conclusion, these results indicate that several red tide events have induced changes in the activity patterns of bottlenose dolphins over that time, showing that this species can change their habitual routine to adapt to the new conditions that *K. brevis* induces.

I'm very grateful for all the help I have received from my advisor Randall Wells and the SDRP's dedicated staff. Without their support my thesis wouldn't be possible. Working with the SDRP has been a wonderful opportunity for me to learn from the best, and I'm certain that all the knowledge and skills that I have acquired are going to be very helpful in this magical career for which I'm just beginning.

Yamila Rodriguez returning from a hard day of purse seining.

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 as electronic pdf files.

Peer-reviewed Journal Articles

Balmer, B. C., R. S. Wells, L. H. Schwacke, T. K. Rowles, C. Hunter, E. S. Zolman, F. I. Townsend, B. Danielson, A. J. Westgate, W. A. McLellan and D. A. Pabst. 2011. Evaluation of a single-pin, satellite-linked transmitter deployed on bottlenose dolphins (*Tursiops truncatus*) along the coast of Georgia, U.S.A. Aquatic Mammals 37:187-192.

Balmer, B. C., L. H. Schwacke, R. S. Wells, R. C. George, J. Hoguet, J. R. Kucklick, S. M. Lane, A. Martinez, W. A. McLellan, P. E. Rosel, T. K. Rowles, K. Sparks, T. Speakman, E. S. Zolman, and D. A. Pabst. 2011. Relationship between persistent organic pollutants (POPs) and ranging patterns in common bottlenose dolphins (*Tursiops truncatus*) from coastal Georgia, USA. Science of the Total Environment 409:2094-2101.

Burdett Hart, L., D.S. Rotstein, R.S. Wells, K. Bassos-Hull, L.H. Schwacke. 2011. Lacaziosis and Lacaziois-like prevalence among common bottlenose dolphins (*Tursiops truncatus*) from the west coast of Florida, USA. Diseases of Aquatic Organisms 95:49-56.

Dennison, S., M. J. Moore, A. Fahlman, K. Moore, S. Sharp, C. T. Harry, J. Hoppe, M. Niemeyer, B. Lentell, and R. S. Wells. 2011. Bubbles in live-stranded dolphins. Proceedings of the Royal Society B: Biological Sciences. Published online 12 October 2011, doi: 10.1098/rspb.2011.1754.

Dunshea, G., D. Duffield, N. Gales, M. Hindell, R.S. Wells and S.N. Jarman. 2011. Telomeres as age markers in animal molecular ecology. Molecular Ecology Resources 11:225-235.

Janik, V. M. 2011. Vocal communication and cognition in cetaceans. In: Tallerman M & Gibson KR (eds) OUP Handbook of Language Evolution. Oxford University Press

Kucklick, J., L. Schwacke, R. Wells, A. Hohn, A. Guichard, J. Yordy, L. Hansen, E. Zolman, R. Wilson, J. Litz, D. Nowacek, T. Rowles, R. Pugh, B. Balmer, C. Sinclair, and P. Rosel. 2011. Bottlenose dolphins as indicators of persistent organic pollutants in waters along the US East and Gulf of Mexico coasts. Environmental Science & Technology 45:4270-4277.

McHugh, K.A., J.B. Allen, A.A. Barleycorn and R.S. Wells. 2011. Severe harmful algal bloom events influence juvenile common bottlenose dolphin behavior and sociality in Sarasota Bay, Florida. Marine Mammal Science 27:622-643.

Powell, J.R. and R.S. Wells. 2011. Recreational fishing depredation and associated behaviors involving common bottlenose dolphins (*Tursiops truncatus*) in Sarasota Bay, Florida. Marine Mammal Science 27:111-129.

Rowles, T.K., L.S. Schwacke, R.S. Wells, J.T. Saliki, L. Hansen, A. Hohn, F. Townsend, R.A. Sayre and A.J. Hall. 2011. Evidence of susceptibility to morbillivirus infection in cetaceans from the United States. Marine Mammal Science 27:1-19

Twiner, M.J., S. Fire, L. Schwacke, L. Davidson, Z. Wang, S. Morton, S. Roth, B. Balmer, T. Rowles and R. Wells. 2011. Concurrent exposure of bottlenose dolphins (*Tursiops truncatus*) to multiple toxins in Sarasota Bay, Florida, USA. PLoS ONE 6(3): e17394. doi:10.1371/journal.pone.0017394

Manuscripts in Press

DeLynn, R.E., G. Lovewell, R.S. Wells and G. Early. In press. Congenital scoliosis of a bottlenose dolphin. Journal of Wildlife Disease.

Janik, V., S. King, L. Sayigh and R.S. Wells. In press. Identifying signature whistles from recordings of groups of unrestrained bottlenose dolphins (*Tursiops truncatus*). Marine Mammal Science.

McHugh, K. A., J. B. Allen, A. A. Barleycorn and R. S. Wells. In press. Natal philopatry, ranging behavior, and habitat selection of juvenile bottlenose dolphins in Sarasota Bay, Florida. Journal of Mammalogy.

Miller, D.L., V. Woshner, E.L. Styer, S. Ferguson, K.K. Knott, M.J. Gray, R.S. Wells and T.M. O'Hara. In press. Histological findings in free-ranging Sarasota Bay bottlenose dolphin (*Tursiops truncatus*) skin: Mercury, selenium and seasonal factors. Journal of Wildlife Diseases.

St. Aubin, D.J., K.A. Forney, S.J. Chivers, M.D. Scott, K. Danil, T. Romano, R.S. Wells and F.M.D. Gulland. In press. Hematological, serum and plasma chemical constituents in pantropical spotted dolphins (*Stenella attenuata*) following chase, encirclement and tagging. Marine Mammal Science.

Schwacke, L.H., E.S. Zolman, B.C. Balmer, S. De Guise, R.C. George, J. Hoguet, A.A. Hohn, J.R. Kucklick, S. Lamb, M. Levin, J.A. Litz, W.E. McFee, N.J. Place, F.I. Townsend, R.S. Wells, T.K. Rowles In press. Anemia, hypothyroidism, and immune suppression associated with polychlorinated biphenyl exposure in bottlenose dolphins (*Tursiops truncatus*). Proceedings of the Royal Society B: Biological Sciences.

Simard, P., N. Lace, S. Gowans, E. Quintana-Rizzo, S. Kuczaj II, R.S. Wells and D. A. Mann. In press. Low frequency narrow-band calls in bottlenose dolphins (*Tursiops truncatus*): signal properties, function and conservation implications. Journal of the Acoustical Society of America.

Venn-Watson, S., F.I. Townsend, R. Daniels, J. Sweeney, J. McBain, L. Klatsky, C. Hicks, L. Schwacke, R.S. Wells and C.R. Smith. In press. Hypocitraturia in Atlantic bottlenose dolphins (*Tursiops truncatus*): Assessing a potential risk factor for urate nephrolithiasis. Comparative Medicine.

Manuscripts in Review

Bassos-Hull, K., R. Perrtree, C. Shepard, S. Schilling, A. Barleycorn, J. Allen, B. Balmer, W. Pine, and R. Wells. In review. Long-term site fidelity and seasonal abundance estimates of common bottlenose dolphins (*Tursiops truncatus*) along the southwest coast of Florida and responses to natural perturbations. Journal of Cetacean Research and Management.

Burdett Hart, L., Rotstein, D.S., Wells, R.S., Allen, J., Barleycorn, A., Balmer, B.C., Lane, S.M., Speakman, T.S., Zolman, E.S., Stolen, M., McFee, W., Goldstein, T., Rowles, T.K., and L.H. Schwacke. In review. Skin lesions on common bottlenose dolphins (*Tursiops truncatus*) from three sites in the northwest Atlantic, USA. PLoS One.

Burdett Hart, L., R.S. Wells and L.H. Schwacke. In review. Body mass index and maximum girth reference ranges for common bottlenose dolphins (*Tursiops truncatus*) in the Southeastern United States: Indices of nutritive condition. Journal of Wildlife Diseases.

Fauquier, D.A., L.J. Flewelling, J.M. Maucher, M. Keller, M.J. Kinsel, C.K. Johnson, M. Henry, J.G. Gannon, J.S. Ramsdell and J.H. Landsberg. Submitted, Sep 2011. Brevetoxicosis in sea birds naturally exposed to Karenia brevis blooms along the central west coast of Florida. Journal of Wildlife Diseases.

Rossman, S., N.B. Barros, P.H. Ostrom, C.A. Stricker, A.A. Hohn, H. Gandhi and R.S. Wells. In review. Retrospective analysis of bottlenose dolphin foraging: a legacy of anthropogenic ecosystem disturbance. Marine Mammal Science.

Tornero, V., K. Taranjit, R.S. Wells and J. Singh. In review. Eco-toxicants: A growing global threat. Pp. xx-xx In: J. Yamagiwa and L. Karczmarski, eds., Field Studies of Primates and Cetaceans: Understanding and Conserving Complex Mammalian Societies. Springer.

Wells, R.S. In review. Social structure and life history of common bottlenose dolphins near Sarasota Bay, Florida: Insights from four decades and five generations. Pp. xx-xx In: J. Yamagiwa and L. Karczmarski, eds., Field Studies of Primates and Cetaceans: Understanding and Conserving Complex Mammalian Societies. Springer.

Wilson, R. M., J. R. Kucklick, B. C. Balmer, R. S. Wells, P. Rosel, J. P. Chanton, and D. P. Nowacek. In review. Variations in priority organic pollutants reveal habitat utilization patterns of bottlenose dolphins (*Tursiops truncatus*) occupying Florida (USA) NE Gulf of Mexico coastal sites. Marine Pollution Bulletin.

Contract and Other Reports

Rosel, P.E., K.D. Mullin, L. Garrison, L. Schwacke, J. Adams, B. Balmer, P. Conn, M.J. Conroy, T. Eguchi, A. Gorgone, A. Hohn, M. Mazzoil, C. Schwartz, C. Sinclair, T. Speakman, K. Urian, N. Vollmer, P. Wade, R. Wells and E. Zolman. 2011. Photo-identification Capture-Mark-Recapture Techniques for Estimating Abundance of Bay, Sound and Estuary Populations of Bottlenose Dolphins along the U.S. East Coast and Gulf of Mexico: A Workshop Report. NOAA Technical Memorandum NMFS-SEFSC-621. 30 p.

Doctoral Dissertations

Balmer, B. C. 2011. Bottlenose dolphin (*Tursiops truncatus*) stock structure within the estuaries of southern Georgia. Dissertation, University of North Carolina Wilmington. 134 pp.

Burdett Hart, L. 2011. The use of longitudinal and cross-sectional photographic data to study skin disease in wild bottlenose dolphins (*Tursiops truncatus*). Dissertation, The Medical University of South Carolina. 184 pp.

Presentations at Professional Meetings

Balmer, B. C. 2011. Mark-recapture abundance estimates for BSE stocks- in practice: an "open water" estuary case study: St. Joseph Bay bottlenose dolphin community structure. Estimating Abundance for Estuarine Populations of Bottlenose Dolphins Workshop. 19-21 January 2011. Atlanta, GA.

Balmer, B. C., L. H. Schwacke, R. S. Wells, J. D. Adams, R. C. George, S. M. Lane, W. A. McLellan, P. E. Rosel, K. Sparks, T. Speakman, and D. A. Pabst. 2011. Bottlenose dolphin (*Tursiops truncatus*) stock structure within the estuaries of southern Georgia. 19th Biennial Conference on the Biology of Marine Mammals. 27 November – 2 December 2011. Tampa, FL. (poster)

Balmer B. C., L. H. Schwacke, R. S. Wells, J. Adams, R. C. George, S. M. Lane, W. A. McLellan, P. E. Rosel, K. Sparks, T. Speakman, E. S. Zolman, and D. A. Pabst. 2011. Seasonal abundance, site-fidelity, habitat use, and ranging patterns of bottlenose dolphins (*Tursiops truncatus*) along the southern coast of Georgia, U.S.A. Seamamms 2011, Coastal Carolina University, Conway, South Carolina, 1-3 April 2011.

Barbieri, M. 2011. Understanding thermoregulatory physiology in a community of wild bottlenose dolphins and its implications for marine mammal population and ocean health. 19th Biennial Conference on the Biology of Marine Mammals. 27 November – 2 December 2011. Tampa, FL. (invited plenary talk, F. G. Wood Memorial Scholarship Award)

Bassos-Hull, K., N. Adimey, C. Hudak, J. Powell, K. Minch and V. Socha. 2011. Entanglement hotspots along the Florida coastline: a need for outreach and action. 19th Biennial Conference on the Biology of Marine Mammals. 27 November – 2 December 2011. Tampa, FL. (poster)

Berens McCabe, E. J., A. Westgate and R. S. Wells. 2011. Prey energy density and bottlenose dolphin (*Tursiops truncatus*) foraging implications. 19th Biennial Conference on the Biology of Marine Mammals. 27 November – 2 December 2011. Tampa, FL. (poster)

Burdett Hart, L., Rotstein, D.S., Wells, R.S., Allen, J., Barleycorn, A., Balmer, B.C., Lane, S.M., Speakman, T.S., Zolman, E.S., Stolen, M., McFee, W., Goldstein, T., Rowles, T.K., and L.H. Schwacke. Skin lesion prevalence and type in common bottlenose dolphins (*Tursiops truncatus*) from waters near Sarasota, FL, Brunswick and Sapelo Island, GA, and Charleston, SC, USA. 19th Biennial Conference on the Biology of Marine Mammals. 27 November – 2 December 2011. Tampa, FL. (oral)

Cammen, K., P. Rosel, R. Wells and A. Read. 2011. The influence of variation in voltage-gated sodium channel genes on susceptibility of bottlenose dolphins to harmful algal blooms. 19th Biennial Conference on the Biology of Marine Mammals. 27 November – 2 December 2011. Tampa, FL. (oral)

Cammen, K., P. Rosel, R. Wells, and A. Read. 2011. A candidate gene approach to investigating resistance to harmful algal blooms in bottlenose dolphins. 6th Symposium on Harmful Algae in the US. November 2011. Austin, TX. (poster)

Fauquier, D.A., E.J. Berens McCabe, S.A. Camilleri, D.P. Gannon, R.S. Wells. 2011. Effects of *Karenia brevis* harmful algal blooms on piscivorous bird communities in Sarasota Bay, Florida. International Aquatic Animal Medicine Conference**.** Las Vegas, NV. (oral presentation)

Janik, V. M. 2011. Why do bottlenose dolphins copy each other's signature whistles? Workshop on vocal communication and social cognition. 3-5 March, 2011. University of Zuerich, Switzerland.

Janik, V. M. 2011. Information transfer in marine mammals. Kerteminde Marine Mammal Bioacoustics Workshop. 9-10 April 2011. Kerteminde, Denmark.

King, S. L., L. S. Sayigh, R. S. Wells, W. Fellner, and V. M. Janik. 2011. Vocal imitation of individual signature whistles in bottlenose dolphins. The Association for the Study of Animal Behaviour Summer Conference 2011. 18-19 August 2011. St Andrews, UK.

Lane, S.M., B.C. Balmer, J. G. Moore, T. K. Rowles, J. R. Stewart, F. I. Townsend, and L. H. Schwacke. 2011. Bacterial pathogens in bottlenose dolphins of Brunswick and Sapelo, GA, USA. 19th Biennial Conference on the Biology of Marine Mammals. 27 November - 2 December 2011. Tampa, FL

Mancia, A., J. Baatz, J. Kucklick, T. Rowles, R. Wells, P. Rosel, L. Wilcox, J. Ryan, A. Hohn and L. Schwacke. 2011. Wild dolphin transcriptomes: identification of ocean health risk through gene expression information. 19th Biennial Conference on the Biology of Marine Mammals. 27 November – 2 December 2011. Tampa, FL. (oral)

Macfarlane, N., L. Sayigh, V.M. Janik, T. Hurst, M. Johnson, R. Wells, P. Tyack. 2011. Tagging wild bottlenose dolphins (*Tursiops truncatus*) with digital acoustic recording tags (DTAGs). 19th Biennial Conference on the Biology of Marine Mammals. 27 November – 2 December 2011. Tampa, FL. (poster)

McHugh, K., L. Engleby, S. Horstman, J. Powell, R. Chesler, R. Hawkins, M. Salazar, B. Miller and R. Wells. 2011. To beg or not to beg? Testing the effectiveness of enforcement and education activities aimed at reducing human interactions at a hotspot near Sarasota Bay, Florida. 19th Biennial Conference on the Biology of Marine Mammals. 27 November – 2 December 2011. Tampa, FL. (oral)

McHugh, K., J. Allen, A. Barleycorn, and R. Wells. 2011. Natal philopatry, ranging, and habitat use of juvenile bottlenose dolphins in Sarasota Bay, Florida. Behavior 2011. Joint meeting of the International Ethological Conference and the Animal Behavior Society. July 25-30, Indiana University, Bloomington, IN.

Rossman, S.L., N.B. Barros, H. Gandhi, C.A. Stricker, P.H. Ostrom and R.S. Wells. 2011. Foraging ecology of bottlenose dolphins: a stable isotopic reconstruction over six decades. 19th Biennial Conference on the Biology of Marine Mammals. 27 November – 2 December 2011. Tampa, FL. (oral)

Schwacke, J., B. Balmer, B. Danielson, T. Rowles, K. Sparks, and L. Schwacke. 2011. Taskable wireless sensor network for VHF tracking of coastal and marine mammals. 19th Biennial Conference on the Biology of Marine Mammals. 27 November – 2 December 2011. Tampa, FL. (oral – speed presentation)

Schwacke, L. H., J. R. Kucklick, and B. C. Balmer. 2011. Dolphin studies from the Georgia Coast: PCB concentrations, congener patterns, and health effects. Chemical Contaminants in the Coastal Food Web and Impacts on Ecosystem and Human Health along the Georgia Coast Collaborative Research Meeting. 8 Sept 2011. Charleston, SC.

Shippee, S.F., R.S. Wells, J.F. Luebke and T.K. Kirby. 2011. Evaluation of harmful interactions between bottlenose dolphins and sport fishing in Northwest Florida and Alabama. 19th Biennial Conference on the Biology of Marine Mammals. 27 November – 2 December 2011. Tampa, FL. (poster)

Stacey, R. and M. Zabojnik. 2011. A preliminary review of iron overload in common bottlenose dolphins. Annual Conference of the International Marine Animal Trainers Association. Miami, FL. (poster)

Wells, R.S. 2011. Patterns of residency for bay, sound, and estuary bottlenose dolphins. NMFS Workshop on Estimating Abundance for Estuarine Populations of Bottlenose Dolphins. January 19-21, 2011, Atlanta, GA

Worthy, G.A.J. S. Shippee, P. Ostrom, R. Wells, J. Allen and A. Barleycorn. 2011. Fine scale feeding habits of bottlenose dolphins in the western Florida panhandle as assessed by stable isotope signature analysis. 19th Biennial Conference on the Biology of Marine Mammals. 27 November – 2 December 2011. Tampa, FL. (poster)

Invited Public, University, School Lectures

Bassos-Hull, K. 2011. Dolphin research along the west coast of Florida: 40 years of study. Punta Gorda Islanders Boat Club, Punta Gorda, FL 3 Feb 11.

Bassos-Hull, K. 2011. Dolphin research along the west coast of Florida: 40 years of study. Peace River Power Squadron, Port Charlotte, FL 24 May 11.

Bassos-Hull, K. 2011. Dolphin research along the west coast of Florida: 40 years of study. Sarasota Newcomers Club, Mote Marine Laboratory, 15 Jun 11.

Wells, R.S. 2011. The world's longest-running study of a dolphin population: Lessons from four decades and 5 generations. Mote Marine Laboratory Volunteer Class. 31 Oct 11

Wells, R.S. 2011. Dolphin conservation research in Sarasota Bay, Florida: Lessons from 4 decades and 5 generations. Sierra Club, Sarasota, FL 13 Oct 11

Wells, R.S. 2011. Factors influencing wild bottlenose dolphin health and survival. SEAVET, U. of Florida, College of Veterinary Medicine. 8 Jun 11.

Wells, R.S. 2011. The world's longest-running study of a dolphin population: Lessons from four decades and 5 generations. Mote Marine Laboratory Volunteer Class. 2 Mar 11

Wells, R.S. 2011. Dolphin conservation research in Sarasota Bay, Florida: Lessons from 4 decades and 5 generations. U. of Miami RSMAS Marine Mammal Conservation and Management class, Mote Marine Laboratory, Sarasota, FL.

Want to Learn More?

The Sarasota Dolphin Research Program website contains archived articles from previous issues of *Nicks'n'Notches* as well as updates.

http.//www.sarasotadolphin.org

Another excellent resource is the Society for Marine Mammalogy (SMM) website, which provides up-to-date descriptions of marine mammal species (fact sheets) at:

http://www.marinemammalscience.org/factsheets

In addition, the SMM provides the most current accepted marine mammal taxonomy list at:

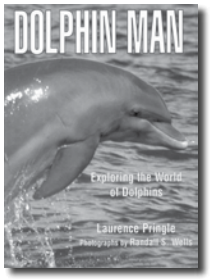
http://www.marinemammalscience.org/taxonomy

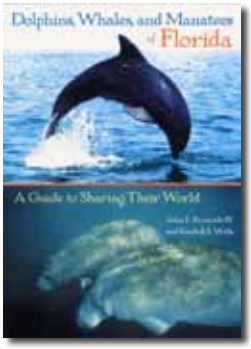
The IUCN develops and maintains the most widely-accepted descriptions of the status of animal and plant species around the world. For the most up-to-date information on the status of cetacean species, please visit:

http://www.iucn-csg.org/

THE IUCN RED LIST
OF THREATENED SPECIES™

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

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

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

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

Population Dynamics (of SDRP staff and students)

By Randall Wells, PhD, Program Director

Mirroring the stability of the Sarasota Bay resident dolphin community, most of the staff members of the SDRP have been with the program for at least 8 years. We saw a few changes this year. Operations Specialist Gene Stover retired after many years of dedicated and much-appreciated service as a volunteer and part-time CZS employee (but he promises to continue to help with rescues as needed). Brian Balmer completed his PhD at UNCW, and returned to Sarasota full-time as a post-doc with the program, along with long-time SDRP collaborator and new Mote Marine Lab post-doc Jennifer Yordy. Lab Manager Jason Allen announced his engagement to Mote Development Officer Stacy Alexander.

Gene helping with a recent dolphin survey in Sarasota Bay.

Gene and his son Jeff Stover during May 2011 health assessments.

The SDRP loses a dear friend and colleague: Bill Scott

By James Thorson, Randall Wells, and Martha Wells

In April of 2011 the SDRP community was saddened by the passing of its dear friend Bill Scott following his long fight with cancer. Bill had been a valued and beloved colleague since he first came to work with us as an Earthwatch volunteer back in the fall of 1990. Over the next 21 years he and his camera became fixtures on SDRP projects ranging from the release of Echo and Misha to summer health assessments, from photo ID surveys to all five of our tagging projects in Argentina, as well as at various conferences around the world.

Bill's leadership skills were much appreciated by those with whom he worked. He served as the President of the Bermuda Zoological Society. He was made a Vice President of Dolphin Biology Research Institute because we came to rely so heavily on Bill for his wise counsel based on his extensive experience in the business world. But perhaps the title that meant the most to Bill was that of "Presidente" of the Franciscana dolphin research project, conferred on him by our Argentinean colleagues. Bill became enamored with the research and the people of Argentina (and vice versa), and he made extensive efforts to find support for continuing their ground-breaking conservation work. He and his loving wife Sandra personally made it possible for interns from Argentina to train with the SDRP in Sarasota.

Bill Scott (second from right, back row) with our Tampa Bay survey/Echo-Misha Release team in October 1990, at the infamous "Wimpy House" field station. Other long-term members of the SDRP "family" in the photo include Kim Bassos (Hull), James Thorson, Kim Urian, and Andy Read.

Bill was the kind of person who made every project, every trip, and every shared meal more enjoyable just by being present. He was always ready with a funny story, a silly walk, a heartfelt toast, or good practical advice. He was extremely generous with his time, his labor, and his resources, especially with people starting out in the research field. He will be remembered and missed by everyone who had the honor and the pleasure of meeting him. And for those who ask the big philosophical questions like, "How does one best live life?" or "What sort of person should I aspire to be?" there is no better answer than "Be like Bill Scott."

Program Operations

Chicago Zoological Society Staff

Jason Allen, BS, Lab and Field Coordinator
Brian Balmer, PhD, Post-Doctoral Scientist
Aaron Barleycorn, BS, Research Assistant
Elizabeth Berens McCabe, MS, Research Associate
Carolyn Cush, BS, Research Assistant
Sunnie Hart, BS, Research Assistant
Katie McHugh, PhD, Post-Doctoral Scientist
Gene Stover, BS, Operations Specialist (retired in 2011)
Randall Wells, PhD, Program Director

Mote Marine Laboratory Staff

Kim Bassos-Hull, MS, Research Associate

Dolphin Biology Research Institute Officers

Blair Irvine, PhD, President
Michael Scott, PhD, Secretary
Bill Scott, Vice President (passed away in 2011)
Randall Wells, PhD, Treasurer

Master's Students During 2011

Mary Gryzbek, University of Florida

Doctoral Students During 2011

Brian Balmer, U. of North Carolina-Wilmington (grad 2011)
Leslie Burdett Hart, Medical U. of South Carolina (grad 2011)
Kristina Cammen, Duke University
Glenn Dunshea, University of Tasmania
Salomé Dussan-Duque, University of Saint Andrews
Deborah Fauquier, University of California-Santa Cruz
Sam Rossman, Michigan State University
Steve Shippee, University of Central Florida
Peter Simard, University of South Florida

2011 SDRP Interns Marcela Salazar, Krystan Wilkinson, and Brianne Miller, with manatee biologist Jenn Helselth and international trainees Celeste Bollini and Yamila Rodriguez during an attempted rescue of C797 this spring.

Interns and Other Visiting Volunteers During 2011

Dee Allen
Stan Balmer
Julia Behler
Celeste Bollini (Argentina)
René Byrskov (Denmark)
Boyd Carnal
Jenna Conversano
Molly Ehm
Solange Faura (Argentina)
Sara Golaski
John Hamilton
Gabrielle Macklin (Canada)
Brianne Miller (Canada)
Kara Moore
Orla O'Brien
Jenna Peterson (Canada)
Yamila Rodriguez (Argentina)
Marcela Salazar
Jeff Stover
Sarah McKay Strobel
Mary Kate Swenarton
James Thorson
Krystan Wilkinson
Alexandra Workman

Our new research assistant, Sunnie Hart, conducting dolphin surveys in November 2011.

Local Volunteers During 2011

Catherine Deveau
Sondra Fox
Jeff Hollway
Charlie Key
Cathy Marine
Nigel Mould
Scott Pasawicz
Norma Pennington
Sally Senger

Master's student Mary Gryzbek working on her first dolphin health assessment project.

SDRP's lab and field coordinator, Jason Allen, takes a break during May 2011 health assessments.

Long-term Datasets

Research since 1970 has been based on compiling longitudinal records of individually distinctive bottlenose dolphins from the central west coast of Florida. Identification efforts have occurred from Tampa Bay through Charlotte Harbor and Pine Island Sound and associated Gulf of Mexico waters. The most intensive efforts have focused on the long-term resident community of dolphins in Sarasota Bay, spanning at least five generations. During 1970-1976, individual identifications were made primarily through tagging and resighting or tracking. Since the mid-1970s, photographic identification has been the primary tool for compiling individual records. Dolphins are identified from photos showing natural markings, tag scars, and from freeze-brands applied during capture-release activities for health assessment. Freeze-brands, applied to the dorsal fin and to the body below the dorsal fin, serve as a kind of "medical ID bracelet" and facilitate unambiguous identifications of dolphins through time, even if the identifying features on their dorsal fins change. Over 260 dolphins have been freeze-branded since the inception of the program in 1970.

More than 400,000 dolphin photographs from 1970 to the present are currently archived by the Sarasota Dolphin Research Program. They have been collected during more than 38,839 dolphin group sightings. Our digital photographic identification catalog currently includes 6,367 images, including 4,199 distinct individual dolphins (alive and dead) plus some of their calves (young animals are often not individually distinctive). The sighting database results from photographic records yielding more than 111,004 sightings of these identifiable individuals, over periods of more than 40 years. Some individuals have been identified more than 1,380 times.

We are continuing our initiative to archive all behavioral data collected on the dolphins of Sarasota Bay over the years. The SDRP has now compiled datasets from 9 of the 16 past research projects that conducted focal animal behavioral observations (also known as 'follows') on Sarasota Bay dolphins. While each project has had its own specific aim, many behavioral parameters have been collected consistently across researchers, and this archive will provide a unique opportunity to follow the behavior of some individuals over time, answer new research questions with existing data, and supply important baseline and background information for future projects. So far, the archive contains over 1,200 focal follows conducted on 110 different individuals from 1992 to 2011. We currently have data on adult males, adult females both with and without calves, and juveniles of both sexes collected in all seasons of the year. With the most recent additions to the archive, "Beggar" is now our most-followed male, with nearly 60 follows! Also, we have three females, FB65, F131, and F109, who have each been followed by four different studies over the years, both with and without calves by their side. As more projects contribute data, this archive will provide a unique resource to current and future studies on the dolphins of Sarasota Bay and elsewhere.

Field and laboratory methods available on-line

Our program's "Manual for Field Research and Laboratory Activities" published in 2006 is 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) 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 Website: A new look

By Blair Irvine, PhD, President, Dolphin Biology Research Institute

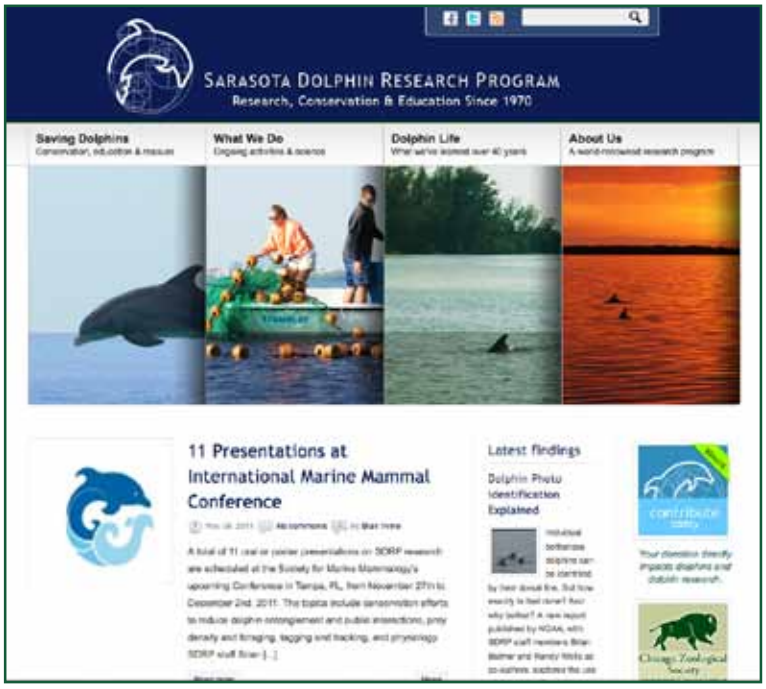
An investment by the Dolphin Biology Research Institute (DBRI) plus a ton of volunteer time have resulted in a remodeled SDRP website. With the help of ace graphic designer-programmer-teacher Michel Fougeres, the new website is bigger, faster, and prettier to look at throughout.

Now visitors can learn about Saving Dolphins, How Dolphins Live, and What We Do, which includes publications by SDRP staff and collaborators. There are also lots of pictures and several search functions.

The website is unusual in that it is designed to bridge public and professional audiences. Brief articles written for the public describe SDRP conservation activities and recent news. New publications are summarized and include the scientific abstract (written for the professional) plus a downloadable pdf or a link to the journal.

The SDRP is one of most productive marine mammal programs in the world, but the work is largely unrecognized by the public. The revised website is also designed to better fulfill DBRI's educational mission. It's a great place for students to find content for school projects at all levels. Several school curricula are available, and more will be added.

Follow us on Facebook or Twitter to receive updates on what the SDRP crew is doing year round. And if you have ideas or time to help, contact me at info@sarasotadolphin.org.



Opportunities for You to Help Dolphin Research and Conservation

We need your financial help to continue our important work. Continuity is the essence of a long-term research program. We rely 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 remaining grant programs is fierce. Our projected program budget for 2012 is about $800,000, including support for staff and graduate students, facility and administrative costs, boat operations, international training programs, dolphin rescues and follow-up monitoring, field research supplies, and travel to field sites and conferences. Examples of some of the expenses for which we are seeking assistance include:

- Annual support for stipend, tuition, fees for a U. of Florida graduate student = $30,000
- Annual support for field research expenses for one graduate student = $5,000
- Replacement 4-stroke outboard engine = $15,000
- Rescue of entangled dolphin = $5,000
- Replacing 9-yr-old program pick-up truck = $25,000
- Rigid-hulled inflatable boat for dolphin rescues and remote field projects = $35,000
- Support for Franciscana dolphin research in South America = $25,000
- Support for training intern from Argentina, Brazil or Cuba in Sarasota = $5,000

If you can help, contributions of funds should be directed to the Chicago Zoological Society or Dolphin Biology Research Institute, as described below:

A word of thanks from the Chicago Zoological Society

The Chicago Zoological Society is honored to recognize the following donors for their generous contributions to the Sarasota Dolphin Research Program.

Anonymous
The Batchelor Foundation
Steve and Anne Bent
BP Exploration & Production, Inc.
Charles J. Bruch
Mr. and Mrs. Robert J. Darnall
Disney Worldwide Conservation Fund
Mrs. Glen Dittus
Melanie Dolcimascolo
Dolphin Quest, Inc.
Rick Elfman
The Georgia Aquarium
Harbor Branch Oceanographic Institute at Florida Atlantic University
National Oceanic and Atmospheric Administration Fisheries
Mr. and Mrs. Peter S. Hellman
Office of Naval Research

If you would like to make a gift to support the Sarasota Dolphin Research Program, please contact Terrence Sykes, Vice President of Development, at (708) 688-8379 or Sarah Breen-Bartecki, Vice President of Conservation Funding Initiatives, at (708) 688-8974. The Chicago Zoological Society operates under Florida State Solicitations Registration No. CH19258. A COPY OF THE OFFICIAL FLORIDA REGISTRATION AND FINANCIAL INFORMATION MAY BE OBTAINED FROM THE DIVISION OF CONSUMER SERVICES BY CALLING TOLL-FREE (800-435-7352) WITHIN THE STATE. REGISTRATION DOES NOT IMPLY ENDORSEMENT, APPROVAL, OR RECOMMENDATION BY THE STATE.

Dolphin Biology Research Institute

Dolphin Biology Research Institute (DBRI) would like to thank the following 2011 Major Contributors:

Edward M. Blair, Jr.
Cannons Marina
Dolphin Connection
Ronnie and John Enander
Jim Gutner
Don and Lee Hamilton
John Hamilton
Dr. Blair and Barbara Irvine
Nigel Mould
Sarasota Bay Parrot Head Club, Inc.
William and Sandra Scott
James Thorson
Woods Hole Oceanographic Institution

In addition to funds, our Florida-based not-for-profit corporation "Dolphin Biology Research Institute" can accept donations of boats, vehicles, cameras, computers, and other research equipment and assets 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. A COPY OF THE OFFICIAL FLORIDA REGISTRATION AND FINANCIAL INFORMATION MAY BE OBTAINED FROM THE DIVISION OF CONSUMER SERVICES BY CALLING TOLL-FREE (800-435-7352) WITHIN THE STATE. REGISTRATION DOES NOT IMPLY ENDORSEMENT, APPROVAL, OR RECOMMENDATION BY THE STATE.). Our current fleet of research boats and trucks is composed largely of donated equipment. Cash realized from sales of such donations goes entirely to offset research and education program expenses. During the most recent fiscal year, no funds received by DBRI were spent on fund-raising activities. No salaries are paid by DBRI to any of its Officers or Directors. For more information, please contact:

Dolphin Biology Research Institute
708 Tropical Circle
Sarasota, FL 34242
Tel: (941) 349-3259
randallswells@comcast.net

People and Partners Make the Program

From top, left to right: tri-national Franciscana research team members in Brazil; NRDA project team in St. Joe Bay; health assessment veterinarians Forrest Townsend, Jay Sweeney; James, Sol, Aaron, Katie in Brazil; Brazil project leaders Paulo Simoes-Lopes, Cláudia Cavalcante Rocha Campos, Marta Cremer, Pablo Bordino; SDRP founder Blair Irvine; Bill and Sandra Scott; bottlenose dolphin calf Tt256 rescue.

The Sarasota Dolphin Research Program has been tagged!

Sarasota Dolphin Research Program

More than four decades of dolphin research, conservation, and education