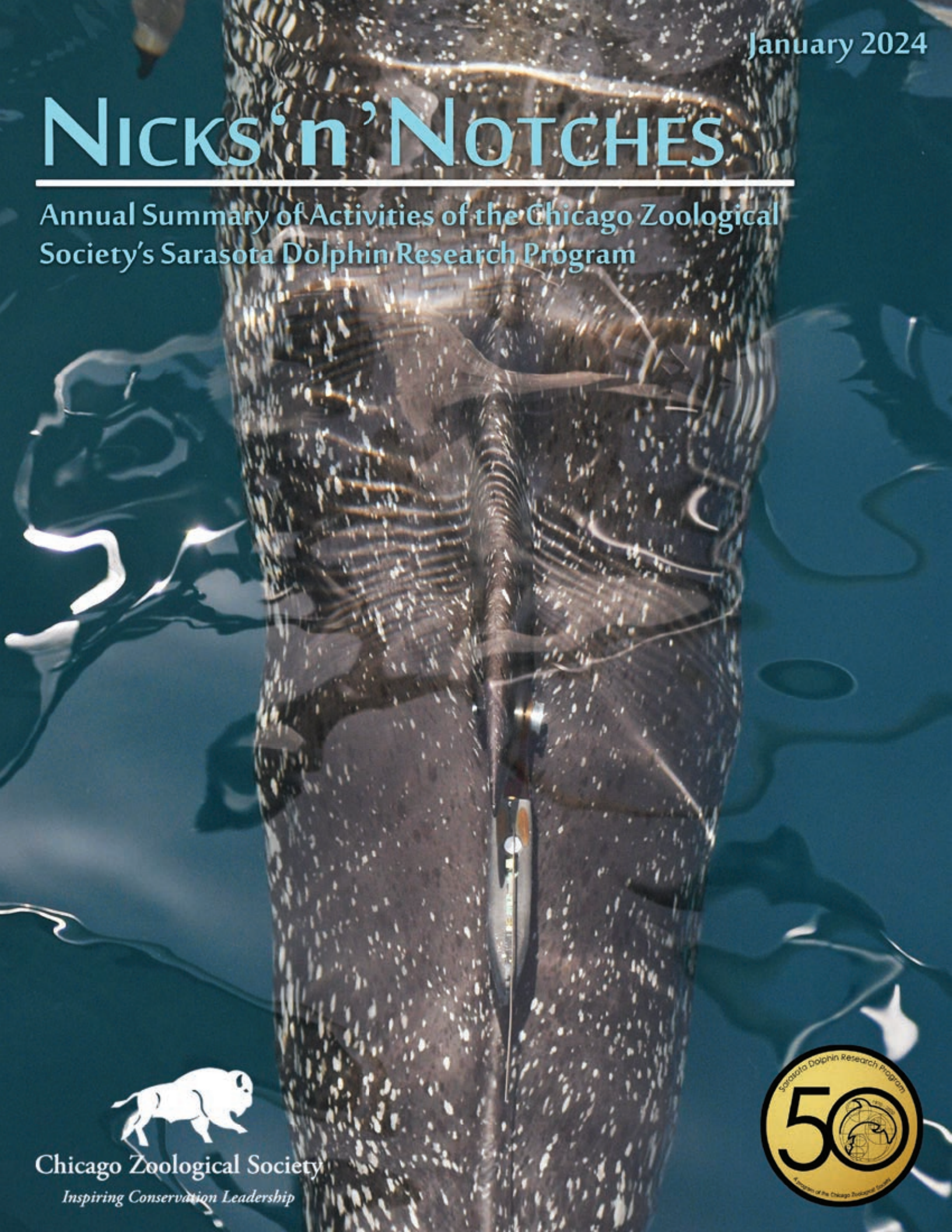
January 2024

Nicks 'n' Notches

Annual Summary of Activities of the Chicago Zoological Society's Sarasota Dolphin Research Program



Chicago Zoological Society

Inspiring Conservation Leadership

Sarasota Dolphin Research Program

50

A program of the Chicago Zoological Society

The mission of the

Chicago Zoological Society

is to inspire conservation leadership by engaging people with wildlife and nature

Contact us:

The Chicago Zoological Society's Sarasota Dolphin Research Program

708 Tropical Circle, Sarasota, FL 34242 USA

Tel: (941) 374-0449

rwellsdolphin@gmail.com, www.sarasotadolphin.org

Sarasota Dolphin Research Program

@sarasotadolphinresearch

@dolphinsarasota

Sarasota Dolphin Research

Conservation Benefits from the Intersection of Art, Science, and Creativity

Our cover photo this year can be appreciated as artwork, even in the absence of knowledge about what went into creating it or why the photo is important. Diving deeper, the tag that is central to the image, on the dorsal fin of a beautiful, free-swimming Atlantic spotted dolphin, was attached by means of a new, state-of-the-art research tool, the culmination of nearly a decade of creative efforts by scientists, veterinarians, and engineers. Our newly demonstrated capability to attach multi-month, satellite-linked transmitters to free-swimming dolphins with our pole-mounted Tag Attachment Device (TADpole, see page 30) should, after further testing and refinement, have the potential to create new opportunities to obtain much-needed data on dolphin movements and behavior in some previously intractable situations in deep, offshore waters. The TADpole's creation involved an iterative process, as we incrementally gained knowledge about the dolphins' innate abilities with each prototype, and learned how those abilities pushed the limits of engineering solutions.

Dolphins in offshore waters face unique threats, as well as some of the same ones faced by their counterparts in inshore waters, where researchers have had greater access to study them and their responses. What behavioral or physiological options do the offshore animals have for responding to situations such as the extreme heating of the Gulf of Mexico that occurred during the summer of 2023? Preliminary analyses of tracking data from the small sample of dolphins we have tagged to date over the West Florida Shelf suggest that the dolphins moved farther offshore as waters warmed. Farther offshore, the waters were cooler near the seafloor, where the animals do much of their foraging. Is this a typical seasonal pattern, or a response to an extreme situation? Were the dolphins following prey movements and/or avoiding dangerous water temperatures, as their temperature differential with the surrounding waters decreased, leading to a decline in their ability to dump excess body heat? Recent dolphin deaths in the Amazon River basin where water temperatures exceeded dolphin body temperatures raise warning flags about warming temperatures elsewhere, including Gulf bays, where cooler, deep-water options do not exist.

More tracking data are needed to define the range of potential offshore dolphin responses to threats, and to define the habitats that will be crucial to their survival in a changing world. The TADpole will be a useful addition to the dolphin conservation toolbox to address these questions. But it will take the creative efforts of diverse groups of caring scientists, students, stakeholders, wildlife managers, politicians, and the public to find viable solutions to the increasing number of existing and emerging threats the dolphins are facing. Innovation of new tools and approaches will be crucial. This remains one of the core priorities of the SDRP, positioning us well to continue to make important contributions to conservation.

Many thanks for caring about the dolphins of Sarasota Bay and beyond,

Director, Chicago Zoological Society's Sarasota Dolphin Research Program

In This Issue

Sarasota Dolphin Research Program staff and collaborators aboard the R/V Eugenie Clark *during offshore health assessments in May 2023.*

Cover photo – Overhead view of a satellite-linked tag on the dorsal fin of Atlantic spotted dolphin "Hannah" while she was riding again at the bow of the *R/V Eugenie Clark*, within minutes of having become the first dolphin to ever be tagged by our pole-mounted Tag Attachment Device (TADpole).

Our Approach Toward Helping Dolphins

Our desire with each research or conservation project in Florida or elsewhere is to contribute to a better understanding of the structure and dynamics of populations of small cetaceans (dolphins, whales, and porpoises), as well as the natural and anthropogenic factors (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 toward achieving these goals is conducted under the umbrella of the "Sarasota Dolphin Research Program" (SDRP). 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. Dolphin Biology Research Institute, a Sarasota-based 501{c}3 non-profit corporation established in 1982, provides logistical support with its fleet of small research vessels, vehicles, computers, cameras, field equipment, etc. Since 1992, the program has been physically based at Mote Marine Laboratory, with office, lab, storage and dock space within the resident Sarasota Bay dolphins' home range. The SDRP encourages and supports academic development by providing graduate student and undergraduate internship opportunities through a variety of colleges and universities.

All of our dolphin research in the United States is conducted under NOAA Fisheries Service Scientific Research Permit No. 26622 and Institutional Animal Care and Use Committee approvals through the appropriate institutions.

The Year in Review

Some of our accomplishments, over the decades and by the numbers

Randall Wells, Chicago Zoological Society's Sarasota Dolphin Research Program

The "natural laboratory" situation of Sarasota Bay facilitates cutting-edge work done by a diverse group of specialists who complement the expertise and interests of the SDRP. Over the past 53+ years, staff, students, and collaborators have produced more than 350 peer-reviewed publications (many available at: https://sarasotadolphin.org/publications/), 4 books, and more than 100 technical reports, and we have made more than 860 presentations to scientific audiences, students, stakeholder groups, and the general public. Perhaps the most meaningful component of our legacy, though, involves training the next generation of conservation leaders. To date, 47 master's and 51 doctoral students have benefited from SDRP data collection opportunities, data, samples, or guidance. In addition, 493 interns have received multi-month training by the SDRP. Foreign participants in our training programs have come from more than 45 countries, and include 73 of the interns, 43 post-graduate scientists, and 128 health assessment project participants. A number of the alumni from our training programs have moved into key positions in wildlife management, at NOAA and the Marine Mammal Commission, or engaged in conservation activities elsewhere around the world. We have participated in or led 32 bottlenose dolphin rescues, and participated in responses to 12 mass strandings of: short-finned pilot whales, false killer whales, pygmy killer whales, Fraser's dolphins, clymene dolphins, and spinner dolphins. The accomplishments of the program over the decades reflect the efforts of many staff, students, volunteers, and collaborators, and the long-term support of several key individuals and organizations.

Skipper and Fergie in the net compass during a rescue in April 2023.

Sarasota Dolphin Research Program project summary

Randall Wells, Chicago Zoological Society's Sarasota Dolphin Research Program

We have spent much of the past year continuing to work through a back-log of research, education, or conservation projects postponed by the pandemic and hurricanes. These delays, along with some cancellations, have had adverse implications for program support, as we do not have access to the grant or contract funds until we do the proposed work. We appreciate the flexibility of funders who allowed us to use alternative approaches to accomplish at least some of the goals of our field work, and to reprogram funds to address emerging issues. We are very appreciative of donor support to fill funding gaps, allowing our team to remain intact, and to put their non-field time to good use analyzing data and preparing scientific publications. This momentum has continued. As of September 2023, we have been working on more than 25 different scientific manuscripts in 2023, including 13 already published.

The following list provides information on some of the funded projects in which we have been engaged over the past year, or will begin soon. The projects listed on the next page are either being led by CZS researchers, or in some cases, these are subawards to the Chicago Zoological Society's Sarasota Dolphin Research Program. The CZS researchers responsible for overseeing the SDRP portions of the projects are listed as Principal Investigators. Funding for the projects is being administered primarily through the Chicago Zoological Society. More details about some of these projects are presented in the pages that follow.

1334, FB65, F133 surfacing together in Sarasota Bay.

SDRP staff and collaborators radio tracking tags in Barataria Bay.

The Year in Review

	PROJECT: Dates, Funder, Title (ordered by size of award)	SDRP PIs
1	2022-25 - Charles and Margery Barancik Foundation - Bottlenose dolphins as sentinels of coastal ecosystem health	Wells
2	2020-25 - DOD/Strategic Environmental Research and Development Program (through University of St Andrews) - Towards an understanding of the cumulative effects of multiple stressors on marine mammals	McHugh/Wells
3	2020-24 - FL Restore Act Centers of Excellence Program - Health and movements of Florida's Gulf dolphins (through Mote Marine Laboratory)	Wells
4	2022-24 - Anonymous - Kim Bassos-Hull Research	Bassos-Hull
5	2020-23 - National Science Foundation Graduate Research Fellowship (through UCSC) - Advancing the study of diet and vulnerability to disturbance for cetaceans	Tatom-Naecker
6	2020-24 - NOAA Prescott - Continuation of a national service center for post-release monitoring of small cetaceans	Wells
7	2023 - Dolphin Quest - Sarasota Bay bottlenose dolphin health assessment	Wells
8	2021-24 - NOAA RESTORE Act (through Woods Hole Oceanographic Institution) - Assessment of movement patterns and critical habitat for coastal and continental shelf small cetaceans in the Gulf of Mexico using newly developed remote satellite tagging techniques	Wells
9	2018-24 - Disney Conservation Fund - Franciscana interactions with Argentinean fisheries	Wells
10	2020-23 - Mote Scientific Foundation - Biopsy darting of bottlenose dolphins	Wells
11	2022-24 - Disney Conservation Fund - Sarasota Bay Dolphin Listening Network	McHugh
12	2024-25 - Mote Scientific Foundation - Ray Guardians: Empowering conservation of marine ray species in the Galapagos Islands through capacity training, telemetry science, and biosampling	Wilkinson/ Bassos-Hull
13	2020-23 - Disney Conservation Fund - Knowledge sharing for dolphin conservation	McHugh
14	2022-24 - Mote Scientific Foundation - A preliminary assessment of movement patterns of dolphin prey fish	McCabe/Wells
15	2023 - Mote Scientific Foundation - Sarasota Dolphin Research Program internships	McHugh/Wells
16	2021-23 - Mote Scientific Foundation - Human-animal conflict Stage 2: Shark behavior near commercial fishing activity	Wilkinson
17	2022-24 - National Institute of Environmental Health Sciences (through College of Charleston) - Investigating trophic exposure to marine microplastics and plasticizers in a sentinel species and the implications for seafood safety	Wells
18	2021-23 - Danish Research Council - In-natura hearing measurements from moving Odontocetes	Wells
19	2023 - Mote Scientific Foundation - Sarasota Bay Listening Network	McHugh/Wells
20	2023-24 - Mote Scientific Foundation - Sarasota Coast Acoustic Network - 2023 Telemetry array servicing	Wilkinson
21	2022-24 - Batchelor Foundation - Program operations	Wells
22	2023-24 - Mote Scientific Foundation - Pole-mounted Tag Attachment Device (TADpole): Further development and application	Wells
23	2023-24 - HBOI/FAU- Impacts of disturbance, disease, and environmental degradation on estuarine and oceanic wild Florida dolphins	Wells
24	2022-25 - Office of Naval Research - VESOP II: Developing broadly applicable models to predict vital rates from remotely sampled health measures including epigenetics	Wells
25	2023 - Dolphin Quest Conservation Fund - Capacity building for AquaMarina team members with the Sarasota Dolphin Research Program	Wells
26	2023 - Fahlo (through Florida International University) - Support for offshore tagging and tracking	Wells
27	2023 - Aarhus University (LMR) - DTAG deployment in Sarasota Bay	Wells
28	2023-24 - CZS Women's Board - Sarasota Dolphin Research Program conservation training	McHugh
29	2023-24 - Mote Scientific Foundation - Eugenie Clark Field Research Skills and Leadership Program: Continuation	Wilkinson
30	2021-24 - NOAA Prescott (through Mote Marine Laboratory) - Rapid detection and response to cetacean strandings in central west Florida and enhancement of the tools for small cetacean interventions and forensics	Wells
31	2023-24 - Fundación Oceanogràfic - Dolphin health assessments	Wells
32	2022-23 - CZS Women's Board - Sarasota Bay bottlenose dolphin abundance estimate for NOAA management	Wells/Toms/ Allen/Wilkinson
33	2023-24 - Marine Mammal Commission (through Galveston Bay Foundation) - Developing a standardized data-driven approach to visually characterize freshwater-associated skin lesions in common bottlenose dolphins	Toms

Sarasota Bay dolphin community status

Jason Allen and Kylee DiMaggio, Chicago Zoological Society's Sarasota Dolphin Research Program

We keep track of the Sarasota Bay dolphin community through photographic identification (photo-ID) surveys conducted on 10 boat-days each month. One of the primary goals of our monitoring is to track additions, losses, and condition of the resident Sarasota Bay dolphin community members. We are happy to report that we observed five new calves in 2023, four of whom appear to be doing very well as of this writing.

This year, FB19's (nicknamed 'Granny', 1944-1994) lineage takes the cake for the most calves born. Two of her granddaughters, 35-year-old Claire and 21-year old F179, gave birth to their tenth and fourth calves, respectively. Additionally, Ginger, who was rescued as a calf in 2008 had her fourth calf, and Nellie, who was rescued as a calf in 2010, had her third! Unfortunately, this year Mote Marine Laboratory's Stranding Investigations Program also recovered two premature fetuses. Genetic tests by Debbie Duffield of Portland State University revealed the fetuses to be the third calf of FB19's great-great-grandcalf, F233, and the fourth calf of F207.

We have lost community members since our last update, sadly some we have known for decades. Forty-five-year-old Moonfin Lookalike died in August. She was observed 986 times and gave birth to at least 10 calves. During our last sighting of Moonfin Lookalike and her three-year-old calf, she was observed with several fresh shark bites, however, these were determined to be unrelated to her cause of death. Well-known adult female Saida Beth, who has been seen every year since 1982, but not since October 2022, is also presumed dead. During her 41 years, she was observed more than 1,300 times and gave birth to at least 11 calves, one of which went on to have Saida Beth's first grandcalf in 2022. This year we also lost 10-year-old F290, and FB25's 2021 calf. Lastly, F229 and her yearling, not seen since January, and F179's newborn, not seen since July, are also presumed dead.

Thirty-five-year-old Claire alongside her 10th calf. At less than a week old, you can still see its fetal folds.

C558, the eighth calf of FB55 leaping during a survey in August. Her bright pink belly is indicative of the process of heat exchange, likely as a combined result of her level of activity and the warm water.

Our long-term, monthly photo-ID surveys are one of the core efforts of our program, supporting all other projects. More than 58,300 dolphin group sightings since 1970 have yielded more than 177,000 identifications of more than 5,750 individually distinctive dolphins. In support of these identifications, more than one million (!) dolphin photographs and videos are currently archived by the Sarasota Dolphin Research Program. Data from monthly monitoring surveys and all of our photo-ID efforts are archived in a relational Access database (FinBase) designed specifically for bottlenose dolphin photo-ID data and images. Work has begun to integrate this database with our focal animal behavioral follow database, which contains 2,727 follows on 229 individual dolphins from 27 projects dating back to 1989. This database also includes current and historic opportunistic respiration data taken on potentially compromised individuals. We will begin integrating our dolphin health database in the near future as well. Many thanks to NOAA's Jeff Adams for his continued support as our database guru!

We have been able to continue our year-round, monthly monitoring of the Sarasota bottlenose dolphin community thanks to support from the Charles and Margery Barancik Foundation, as well as the continued dedication of our core local volunteers and interns. Thanks to these efforts, this community remains one of the most thoroughly studied free-ranging dolphin populations in the world.

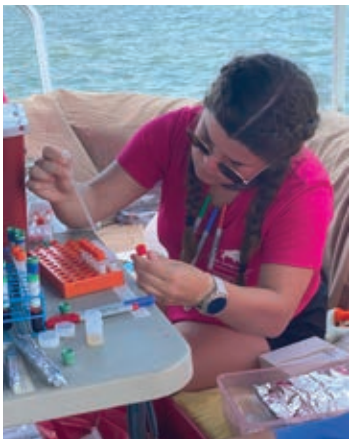
Well-known community member 45-year-old Moonfin Lookalike during our 986th and final sighting of her on 8 August 2023. She was seen with several fresh shark bites that were determined to be unrelated to her cause of death.

Assessing exposure to plastic pollution in Sarasota Bay dolphins

Leslie Hart, College of Charleston, and Miranda Dziobak, University of South Carolina

Plastics and their chemical constituents are pervasive in the marine environment. Exposure to these contaminants of concern may lead to adverse impacts on reproduction, growth, metabolism, and heart and lung function. Since 2016, we have studied indicators of plastic pollution exposure in Sarasota Bay dolphins. This began as an exploratory project to see if we could detect metabolites of plastic-associated chemical additives (*i.e.*, phthalates) in urine, following methods used for human health studies. Findings from this early research indicated widespread exposure to these chemicals, revealing that 75% of Sarasota Bay dolphins are exposed. Additionally, our studies have identified that Sarasota Bay dolphins have significantly higher concentrations of some of these chemicals than humans. Although phthalate exposure is common among dolphins in Sarasota Bay, the sources are currently unknown. As part of a new three-year project funded by the National Institutes of Health's (NIH) National Institute of Environmental Health Sciences (NIEHS), we are investigating microplastic contamination in prey fish as a potential source of phthalate exposure. We are looking for evidence of microplastic ingestion in Sarasota Bay dolphins and common prey fish (for example, menhaden, spot, sheepshead, Gulf toadfish, pigfish, pinfish), which involves collecting gastric and fecal samples from dolphins, as well as gastrointestinal tracts and muscle tissue from fish. Characteristics such as color, type, and texture of ingested microplastics will be compared between dolphins and fish. Phthalate metabolite concentrations in dolphins and fish will also be examined relative to individual particle abundance. This analysis will help us understand if high quantities of ingested plastic are correlated with high concentrations of chemical plasticizers. Finally, our team is comparing microplastic abundance and physical properties between different fish tissues (for example, muscle/filet vs. gastrointestinal tract), so that we can better understand exposure risks for human seafood consumers.

Miranda Dziobak and Maggie Knight reviewing sample processing protocols.



Maggie Knight processing blood samples during 2023 Sarasota health assessments.

The H.O.P.E. lab's whole crew!

Eric Conger collecting a water sample to screen for microplastics.

Leslie Hart and Tita Curtin preparing a blank for sample analysis.

To date, we have evaluated microplastics in seven bottlenose dolphin gastric samples collected during 2022. The results of this pilot study were published in Frontiers in Marine Science, which revealed that white foams and plastic films were most common (Hart et al., 2022). Our team is screening microplastics in the muscle and gastrointestinal tracts of the 136 prey fish collected since September 2022. To date, the particles observed in prey fish have different physical properties than the particles detected in dolphins. For example, suspected tire wear particles (TWP) were observed in the gastrointestinal tract of several fish in our dataset; however, TWPs have not yet been detected in our dolphin samples (Hart et al., In press). Despite this substantive difference, multiple colors of films and fibers were detected in both fish and dolphins. While these findings are preliminary, continued analyses of fish and dolphin samples in the next few years will improve our understanding of the potential for contaminated prey to expose dolphins to harmful chemical plasticizers.

Human interactions in Sarasota Bay

Katie McHugh, Chicago Zoological Society's Sarasota Dolphin Research Program

2023 has been a fairly stable year for Sarasota dolphins relative to human impacts (HI), with few human-related injuries or deaths and similar human interaction rates compared to the recent past. We have engaged in only one local intervention since 2020 (see page 26), as compared to 8 during 2006-19. Since last year, we have slowly gotten back up and running with our community engagement and outreach activities, supported by the Disney Conservation Fund, after most of our in-person initiatives were put on hold during the pandemic. These efforts primarily focus on ways people can support dolphin conservation by using best practices for safely interacting with dolphins when fishing, boating, or viewing, preventing injuries from entanglement and ingestion via proper disposal of trash and fishing line, and reporting injured and sick animals to stranding network partners for potential early intervention.

While we remain cautiously optimistic about recent HI-trends, our long-term analyses have shown that the drivers of adverse human interactions within our resident community are complex, with social learning of risky behaviors, periodic prey depletion from environmental disturbance (such as red tide), and increased frequency of contact with boaters, anglers, and other human sources of food all contributing to continued HI. Graduate students working with the SDRP are further exploring these long-term drivers as well as the fitness consequences of unnatural foraging behaviors. Past work has shown that dolphins who engage in HI are more likely to suffer from human-related injuries, and Kylee DiMaggio's recent research (see next article) indicates that calves of mothers who engage most frequently in HI may be at greater risk as well, with reduced survivorship to age 4 compared to calves of females who tend to forage naturally. We have also noted a sustained issue in Sarasota Bay with disturbance and harassment of dolphins by boaters of all kinds being the most-frequently observed type of adverse human interaction during our population monitoring surveys. Post-pandemic, our area has seen an influx of additional people both moving to and visiting this part of the Florida coast. Outreach to new boaters, boat rentals, and ecotours remains a high priority, and we hope to revamp our outreach efforts for these audiences in order to promote responsible viewing practices to reduce harassment.

F215 and her ~6mo old calf dive ahead of an approaching vessel. Boat disturbance and harassment remain real issues for resident dolphins who must contend with and adjust to frequent vessel encounters in their daily lives. Slowing down and giving dolphins space can help reduce these impacts.

The fitness consequences of human interaction on foraging dolphins in Sarasota

Kylee DiMaggio, Chicago Zoological Society's Sarasota Dolphin Research Program

With an increasing human population, human-wildlife interactions are becoming more prevalent. Adverse human-wildlife interactions have been identified as being among the most critical threats to wildlife. In Sarasota, the human population has more than tripled, and the number of boats has quadrupled since 1970, providing more opportunity for humans and dolphins to cross paths. By 2007, at least one instance of human-dolphin interaction occurred on 26% of all of our dolphin survey days. These interactions present substantial risk to the members of the long-term resident Sarasota dolphin community by bringing them closer to boats and fishers, increasing the likelihood of injury or death due to boat strikes and entanglement in, hooking by, or ingestion of fishing gear.

To better understand the influence of human-dolphin interactions on an individual's fitness (the ability to survive and pass its genes on) we explored the reproductive output and reproductive success of adult females of two categories. The first category included females that engage in human-related foraging behaviors such as begging, depredation of fishing gear, and patrolling to obtain food (referred to as HI females), and those that forage more naturally (referred to as non-HI females). Reproductive output was measured by the number of calves born to a female of each category during their lifetime, and reproductive success was measured as calf survival from birth to year one, and then from year one to year four. It was hypothesized that HI females would be able to save time and energy when foraging on more predictable human sources of food, and that time and energy could then be used for reproduction. However, due to the increased risk of injury and death associated with human-related foraging, calves born to HI females would be less likely to survive the vulnerable stages in the first few years of life.

Well-known resident female F247 patrolling near a recreational angler releasing his catch.

We found that engaging in human-related foraging behaviors has a mixed effect on female reproductive output and reproductive success. HI females who engaged in low to moderate frequencies of human-related foraging were able to increase their reproductive output by up to 94% when compared to non-HI females, while individuals that participated in HI activities at high frequencies increased reproductive output by only ~60%. However, this short-term benefit was offset by reduced calf survival from years 1-4. Our survival analysis found that calves born to HI females had a 31% lower chance of survival and were nine times more likely to die when compared to non-HI calves. On the other hand, we found no significant difference in survival for calves in their first year of life, likely because of newborn dependence on lactation, rather than learned foraging strategies.

The persistence of human-related foraging behaviors through generations and the resulting impact on survival, and therefore recruitment, has the dangerous potential for population level consequences. These findings provide evidence of how a clear understanding of how individual life-history is influenced by threats from human activities is essential to conservation management. Moreover, this work highlights the importance of long-term studies and the data they provide to answer detailed questions about individual life-history. We are beginning to understand how wildlife populations are adapting to human pressures, and with that knowledge we can hope to improve the co-existence of humans and wildlife.

Measuring responses of dolphins to multiple stressors

Peter Tyack, University of St Andrews, Ryan Takeshita, National Marine Mammal Foundation, and Katie McHugh, Chicago Zoological Society's Sarasota Dolphin Research Program

Marine mammals are exposed to multiple stressors, including man-made underwater sound, chemical pollution, and interactions with fisheries. The overall goal of this project, led by the University of St Andrews, is to advance understanding of the cumulative effects of multiple stressors on marine mammals. The common bottlenose dolphin (*Tursiops truncatus*) is an ideal model species for such studies because well-established methods exist for temporary catch-and-release health assessment and also for experiments that test reactions of dolphins to controlled dosages of stressors.

For this project, we specifically focused on dolphins in Barataria Bay (BB), Louisiana, which was impacted by the *Deepwater Horizon* oil spill in 2010. Members of our team have been studying BB dolphins over the years since the spill and have documented persistent, chronic health effects associated with the oil exposure.

This summer, the National Marine Mammal Foundation led a team of more than 50 veterinarians,

Meg Dire helps monitor an adult male dolphin prior to its release. A digial-acoustic archival tag (DTAG) has temporarily been placed on the animal with suction cups. The tag will collect acoustic information for the controlled exposure experiments team, informing them about the animal's echolocation and communication as well as fine-scale movements. A measuring tape is seen next to the DTAG, which provides a quick reference for photographer Todd Speakman. Also pictured: Geo Biedenbach, Nicole Kieda, and Sylvain DeGuise. Photo obtained under NOAA Permit No. 24359

The collaborative team gathered on the boat ramp at Louisiana Department of Wildlife and Fisheries on Grand Isle, just before heading out to sea.

The focal follow and DTAG team in June. They performed controlled exposure experiments on dolphins after their health assessment exams.

Katie McHugh driving R/V Nai'a *in Barataria Bay while Marco Casoli and Peter Tyack track a radio tag.*

Todd Speakman measuring range and bearing of the dolphin's position in relation to R/V Nai'a.

Aaron Barleycorn on the personal watercraft making a controlled approach on a focal animal.

biologists, technicians, and animal care experts from ~20 organizations to conduct health assessments involving our typical, comprehensive suite of health measurements, including physical examination, morphometrics, diagnostic ultrasound, and sampling of blood and urine for standard diagnostics. In addition, we also conducted hearing tests and refined, systematic scoring for evidence of prior boat, predator (shark), and conspecific interactions, all of which are relevant for interpreting results and integrating into a Population Consequences of Multiple Stressors (PCoMS) model. We evaluated the health of 24 dolphins, and attached radio-tags to their dorsal fins so that we could track the movements of these individuals. With these data in hand, and the results from previous health assessments in BB, we were able to sort BB dolphins into healthy and unhealthy cohorts for the second part of our experiment, led by the Sarasota Dolphin Research Program.

Over the course of two field sessions in June and July 2023, we were able to complete controlled exposure experiments (CEEs) on 31 different identifiable individuals of varying health status, bringing our total number of experimental subjects to 43 over the course of the project. We used the experimental approach developed during testing over the past several years in Sarasota Bay and Barataria Bay, involving controlled erratic approaches by a personal watercraft (PWC), focal dolphin behavioral observations from the tower on our observation boat, acoustic recordings, and overhead video from a drone.

Nine of these experiments took place while the dolphins were carrying DTAGs, which are suction-cup-mounted, short-term tags that record sound and animal movements. These tags will help us assess any fine-scale responses to the PWC approaches that were not visible from surface or drone observations in murky Barataria Bay waters. Data analysis is underway to examine whether there are different patterns in CEE responses for animals relative to their health status, which may affect the risk that they could collide with a vessel.

Our collaborative science will help inform future response and restoration activities for wildlife species in the Gulf of Mexico and beyond. In 2012, concern over these health impacts and the lack of understanding about potential cumulative effects from additional stressor exposure prompted the Bureau of Ocean Energy Management to temporarily halt some seismic surveys near BB. While this halt has since been lifted, activities that have potential to produce additional stress on the BB dolphins and other *Deepwater Horizon*-exposed marine mammal populations still concern managers.

A big thanks to the incredible team that made this field effort a success! It takes your collective passion, dedication, and expertise to understand and ensure the health and welfare of these marine mammals. And thank you to the Strategic Environmental Research and Development Program, Office of Naval Research, U.S. Marine Mammal Commission, NOAA, and the Gulf of Mexico Research Initiative for supporting this project.

International Conservation Activities

Research on the Critically Endangered Mekong River dolphin

Jason Allen, Chicago Zoological Society's Sarasota Dolphin Research Program

The Cambodian Mekong River Irrawaddy dolphin is Critically Endangered, fewer than 100 remain. These blunt-nosed cousins of bottlenose dolphins face threats from gill nets, longlines, electrofishing, dams, and overfishing. Sarasota Dolphin Research Program has advised and assisted the Cambodian World Wildlife Fund (WWF) research team since 2012. We hosted four of their key staff for field and lab training in Sarasota in 2019 and have continued to work with them to upload sighting data, individual dolphin identifications, and supporting photographs to a modified and Khmer-translated version of our highly-functional database "FinBase" in order to facilitate population monitoring and abundance estimation.

In January 2023, Lab Manager Jason Allen was invited by the Chair and Executive Director of the U.S. Marine Mammal Commission to travel with a small group of international experts to Cambodia to assist the local WWF team on a survey of the river. The team loaded onto two small boats called "long tails" in the city of Kratie and surveyed north ~80 miles to the city of Stung Treng. Nights were spent camping at community centers or on the river bank.

Above, researchers photograph a critically endangered Mekong River dolphin as it surfaces close to the boat during a survey of the river in January 2023. Like bottlenose dolphins, their dorsal fins can have distinctive nicks and notches, below.

The trip was successful and several groups of Mekong River dolphins were observed. Data and photographic analysis from this survey are ongoing. This first-hand experience will allow Jason to provide more detailed and situationally relevant assistance to their team as we continue to help them try to save this critically endangered species.

Two Mekong River dolphins socializing.

A Mekong River dolphin shows off its rounded head and blunt nose while doing a back dive.

Sampling of Critically Endangered bottlenose dolphins in Greece

Aaron Barleycorn, Chicago Zoological Society's Sarasota Dolphin Research Program

In 2001, the Tethys Research Institute started a study in the Ambracian Gulf in Western Greece. The Ambracian Gulf consists of about 250 square miles of water with only one 2,300-foot opening to the Ionian Sea. Tethys found a resident population of bottlenose dolphins numbering about 150 in the gulf, and have been monitoring the population ever since through the Ionian Dolphin Project (IDP). This resident population is rather unusual in an area where most other dolphin populations are more migratory. The isolated nature of the Gulf has led to an environment with high pollution from runoff and habitat degradation. The dolphins, as top-level predators, are likely bioaccumulating much of that pollution and the population qualifies as Critically Endangered by the IUCN Red List of Threatened Species.

IDP lead scientist, Dr. Joan Gonzalvo, asked a team to come from the Sarasota Dolphin Research Program to help

collect remote biopsy samples from the dolphin population to gain a better understanding of the dolphins' contaminant loads and population structure. A remote biopsy sample uses a modified dart to collect a bit of skin and blubber from a free-swimming dolphin. The biopsy sample can be sub-sampled and used for multiple analyses making them a powerful tool to better understand wild dolphins. The information obtained from these samples can be used to inform managers on best practices to conserve the dolphin population, as well as the Ambracian Gulf ecosystem in general. Both Dr. Gonzalvo and IDP field investigator Carmen Andrés have been to Sarasota for prior training with the SDRP.

In June 2023, I joined Joan and Carmen for two weeks of remote biopsy darting field work. We had many challenges including faulty biopsy darts, windy days, and shy dolphins, but we managed to get nine precious samples during the effort. We are hoping to return in the future, during a different time of year when dolphin behavior will be a bit more conducive, and collect more samples to help understand this at-risk population.

Left to Right: Aaron Barleycorn, Carmen Andrés, and Joan Gonzalvo getting ready for a field day on the IDP vessel Saganaki.

Training opportunities for scientists from outside the United States

As an important component of our mission, we provide training opportunities for scientists and students from outside of the United States. These training opportunities allow foreign scientists and students 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. We are pleased to be able to have international involvement in our work again, post-COVID. During the past year, we were joined in Sarasota by colleagues and students from Argentina, Bermuda, Brazil, Cambodia, Canada, Denmark, France, Italy, Kenya, Norway, Peru, Slovenia, Spain, and Sweden. The following are a few examples of how SDRP training over the past year, in Sarasota and in-country, benefited foreign colleagues.

Training to benefit Franciscana dolphins: Argentina

Ximena Merelle Dherve, AquaMarina

I am the coordinator of the educational program "School of the Sea" of the AquaMarina association. We are based in Argentina and one of our main objectives is the conservation of the Franciscana dolphin (*Pontoporia blainvillei*). This dolphin is threatened and is endemic to Brazil, Uruguay and Argentina. The Franciscana dolphin is accidentally entangled in the nets of artisanal fishermen and that is the main conservation problem. We work together with fishermen to seek mitigation measures for this problem. AquaMarina has been working together with the SDRP team since 2003 in the placement of transmitters to better understand the movements and biology of this dolphin.

At the beginning of 2023, I had the opportunity to do an International Traineeship with the SDRP. I participated in two projects, monitoring of the *Tursiops truncatus* community in Sarasota Bay, and offshore in the "Health and Movements of Florida's Gulf Dolphins" project.

It really was a super enriching professional experience and on a personal level as well. I was able to strengthen my knowledge of photo-ID and observations onboard, incorporate new tools and methodologies in terms of recording and subsequent data work, generate and strengthen relationships with colleagues from many countries and different work topics, and strengthen my level of English by having to use it in a work environment.

Left to Right: Agustina Caride, Ximena Merelle Dherve, and Dr. Jennifer Langan during Sarasota health assessments.

Training to benefit Franciscana dolphins: Brazil

Ashley Barratclough, National Marine Mammal Foundation

As part of the National Marine Mammal Foundation Conservation Medicine's "Operation GRACE" (Global Rescue of At-Risk Cetaceans and Ecosystems), we were able to partner with Yaqu Pacha and SDRP to bring Dr. Aricia Benvenuto from Brazil for her first Sarasota dolphin health assessments. Aricia has just obtained her PhD in addition to her veterinarian degree and is currently working with Franciscana dolphins in São Paolo. Her experience at Sarasota health assessments had a lasting impact on her and the knowledge she gained during this week will be applied to her work moving forward to try and improve the survival outcome of stranded Franciscana dolphins in Brazil. Aricia was able to join the NMMF ultrasound team of Dr. Jenny Meegan, Katie Hodges and Conservation Medicine team members Ross Martinson and Ashley Barratclough to learn more about the different roles required during bottlenose dolphin health assessments. Aricia was able to work with the phenomenal Sarasota dolphin research team and meet other marine mammal veterinarians, biologists and scientists from multiple institutions which will help with her future research endeavors – highlighting the really important aspect of health assessments allowing networking between international colleagues allowing future collaboration projects.

Left to Right: Ashley Barratclough, Aricia Benvenuto, and Ross Martinson at Sarasota health assessments.

Training in shark and ray conservation: Galapagos, France, and Mexico

Kim Bassos-Hull and Krystan Wilkinson, Chicago Zoological Society's Sarasota Dolphin Research Program

Conservation capacity training with international research colleagues is an important part of the work done by the Sarasota Dolphin Research Program. While the majority of SDRP research involves cetaceans (dolphins and whales), the program has also developed research projects that aim to better understand what their predators (sharks) and prey fish are doing and other natural causes of mortality (e.g. stingray spines). We initiated the spotted eagle ray research and conservation project (collaborative with Mote Marine Laboratory's Sharks and Rays Conservation Research Program) in 2009 to better understand the biology and life history of these endangered rays. It has since expanded to documenting other shark and ray megafauna present in the Sarasota Bay area, along with their movements, diets, predation and injury impacts on dolphins. Kim Bassos-Hull and Krystan Wilkinson have provided training opportunities to international colleagues for hands-on shark and ray handling, sample collection and tagging research, as well as providing guidance on data analysis.

One example of this international collaboration is with Dr. Diana Pazmiño in the Galapagos region of Ecuador. Diana reached out to Kim in 2020 for guidance as she was initiating a project with eagle rays and manta rays in the Galapagos. Fast forward a few years and Diana was able to travel to Florida to participate in the research Kim and Krystan are doing with rays and learn new skills with handling and tagging (and gear!) to take back to her research in the Galapagos. Kim went to San Cristobal in

Dr. Diana Pazmiño (Universidad San Francisco de Quito and Galapagos Science Center) and Kim Bassos-Hull pose with a sculpture of a whitespotted eagle ray in Mote Aquarium courtyard during Diana's training visit in April 2022.

the Galapagos to assist in Diana's research with rays in 2022 and 2023. It became apparent that there was a need to bring guidance and training to the Galapagos to help organize an acoustic receiver network and collaboration amongst researchers. With a new grant from Mote Scientific Foundation, Kim and Krystan will be offering a workshop in the Galapagos on acoustic telemetry networks and data analysis in 2024. They will also participate in and support research on endangered ray species and build partnerships with the local ecotourism industry. We are also helping to collect samples for University of North Carolina PhD student Salome Jaramillo Gil (a Colombian Fulbright Scholar) to support her research comparing diets of eagle rays in the Galapagos and the west coast of Florida. In September, Salome came to Sarasota to gain skills in capture, handling and tagging techniques on rays, as well as active tracking technology.

Kim has also been supporting and mentoring another International PhD student, Atlantine Boggio-Pasqua, from Aix-Marseille University in France. Atlantine completed her master's thesis in July 2020 working with Kim on age and growth in eagle rays (with a resulting publication in September 2022). After a few return trips to Sarasota to help Kim with ray fieldwork, Atlantine realized her passion for ray conservation and decided to pursue her PhD studying another ray species that is sometimes observed in the Sarasota region, the lesser pygmy devil ray. Devil rays, sometimes called "mini mantas," are filter feeding rays that are observed more sporadically than other species of rays in the region. Kim and Atlantine will collect life history and movement ecology information on this data-deficient ray through a two-year grant from Save Our Seas Foundation. The research is off to a great start with 18 devil rays acoustic-tagged and pinging away in the SCAN, iTAG and FACT arrays (page 33).

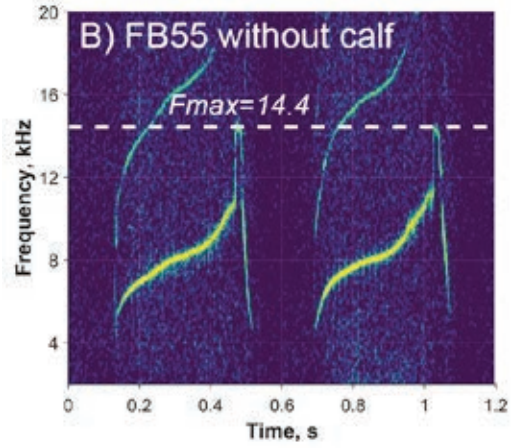
Kim and Krystan have also been providing guidance for several years to colleagues in Mexico on rays and sharks in the Mexican Caribbean. Dr. Maria Pilar Blanco-Parra from Quintana Roo University and Ximena Arvizu are working in the Mexican Mesoamerican Reef and coastline areas with interest to set up an acoustic array and tag bull sharks and eagle rays in the region, especially in Chetumal Bay on the Mexico/Belize border. Pilar and Ximena have been to Florida multiple times to participate in our shark and ray research and learn more about the logistics of working with an acoustic array, especially gear deployment and data downloading and analysis. All of the projects and collaborations have been rewarding and productive for all involved, and we look forward to continuing to learn about our dolphins' neighbors – the sharks and rays!

Dr. Diana Pazmiño (Universidad San Francisco de Quito and Galapagos Science Center) helps Kim Bassos-Hull examine and photograph the unique spot patterns on a whitespotted eagle ray during Sarasota-based field research in April 2022. All research conducted under FWC SAL-1140-SRP.

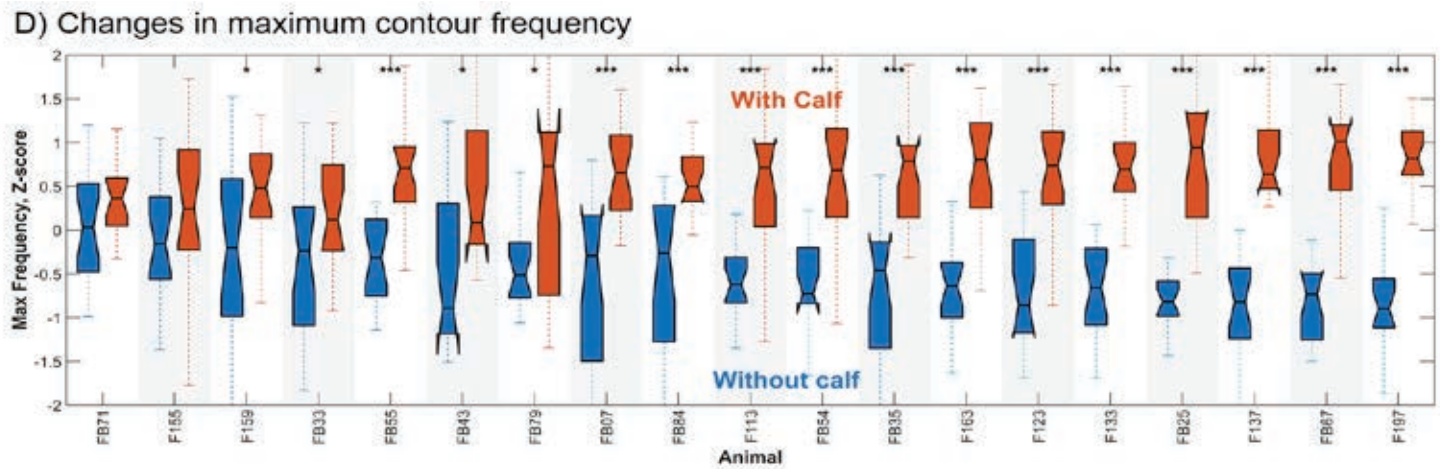
"Motherese" in Sarasota dolphins

Laela S. Sayigh and Nicole El Haddad, Woods Hole Oceanographic Institution, Vincent M. Janik and Peter L. Tyack, University of St Andrews, Randall Wells, Chicago Zoological Society's Sarasota Dolphin Research Program, Frants Havmand Jensen, Aarhus University

Bottlenose dolphins produce individually distinctive signature whistles that are learned early in life and that help animals recognize and maintain contact with conspecifics. Much of the early research confirming and defining signature whistles was done with Sarasota dolphins. We have continued to work on developing a systematic database of whistles recorded during brief catch-and-release health assessments (the Sarasota Dolphin Whistle Database, or SDWD). This long-term dataset enables studies that are not possible anywhere else, such as the one we completed this year about dolphin "motherese." For this study, we identified 19 females in our data set that had been recorded both with and without calves, across different years. By comparing the time-frequency pattern of each of these animals' signature whistles, we found that dolphin females produced signature whistles with significantly higher maximum frequencies when with vs. not with their calves (see figure below). This is similar to the higher pitch sounds that human caregivers make when communicating with infants and young children, and is the first demonstrated example of this kind of child-directed communication in a non-human mammal. This parallel between dolphin and human communication suggests that convergent evolution has occurred, whereby similar selective pressures have led to these vocal modifications in both species. We were very excited to publish this study in the Proceedings of the National Academy of Sciences of the USA this past June, and also very pleased by the press coverage (where it was referred to as dolphin "baby talk"), including on National Public Radio's "Wait, Wait Don't Tell Me"!



(A) Bottlenose dolphin mother/calf pair being recorded with suction-cup hydrophones directly on the melon (forehead) during health assessments in Sarasota Bay, Florida. Comparison of maximum frequency of signature whistles (each with 2 loops) of FB55 when (B) she was not with a calf, and (C) when she was with a dependent calf.



(D) Changes in maximum contour frequency across 19 adult females with (red) or without (blue) dependent calves.

Understanding foraging ecology of offshore delphinids in the Gulf of Mexico

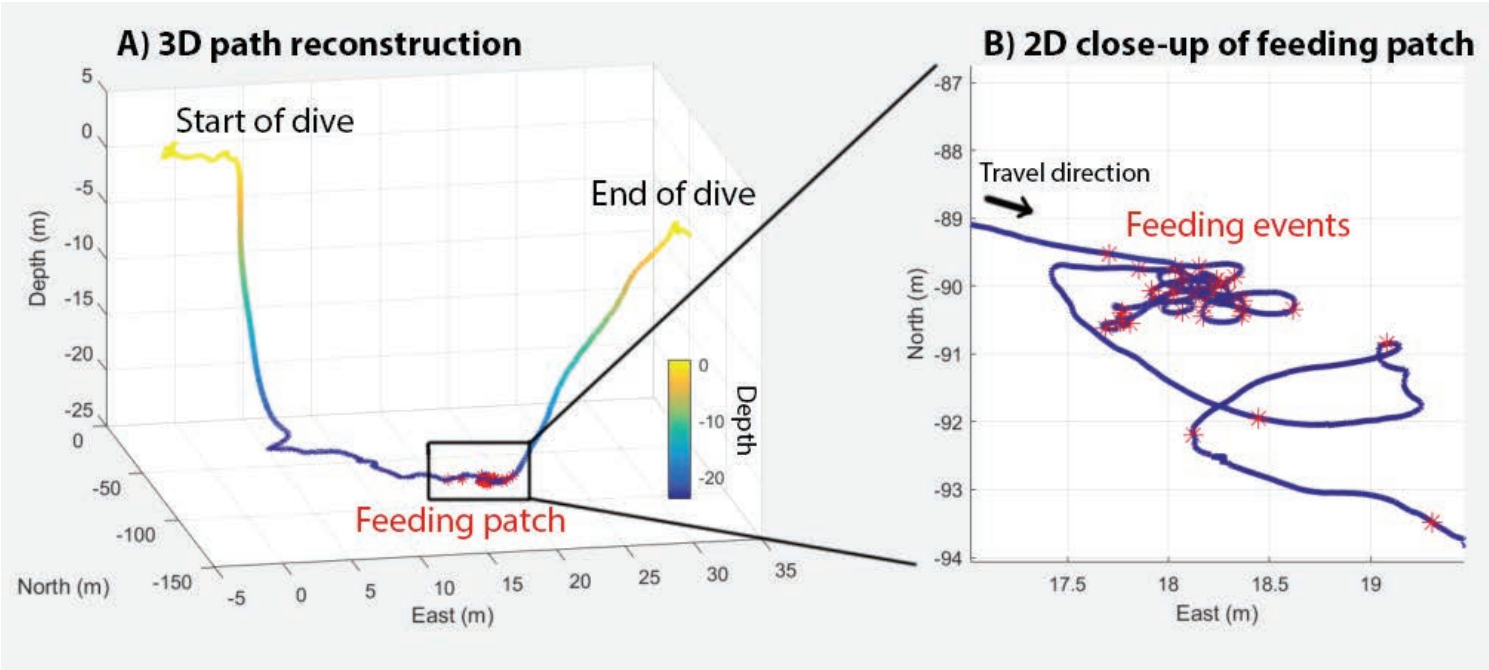
Jeanne Shearer, Austin Allen, Frants Havmand Jensen, Aarhus University

Offshore health assessments of Gulf of Mexico delphinids have been taking place over the last two years as part of a Florida RESTORE Act Centers of Excellence Program grant. As part of this effort, and with additional support from Dolphin Quest, we have instrumented a total of 4 Atlantic spotted dolphins and 5 bottlenose dolphins some 25-50 miles offshore of Sarasota with sound and movement recording DTAGs. These tag deployments constitute the first DTAG attachments to Atlantic Spotted Dolphins, and the first DTAG deployments on the shelf bottlenose dolphin stock in the Gulf of Mexico.

These suction-cup-attached tags record fine-scale movements as well as the sounds that the animals produce, including echolocation signals and characteristic changes to echolocation behavior when delphinids find and catch prey. At the same time, depth and kinematic sensors allow us to understand diving behavior and movement associated with foraging events and foraging strategies in these habitats, as well as helping to interpret data from longer-duration satellite-linked tag deployments. Acoustic recordings also help us understand communication behavior and signature whistle use and may ultimately be helpful for larger-scale passive acoustic monitoring efforts. Preliminary analyses show that dolphins of both species forage extensively along the sea floor and use a variety of foraging strategies when catching prey items (see graphs below).

DTAG attachment on G002, an offshore bottlenose dolphin nicknamed "Ken" for pioneering researcher Ken Norris.

Katy Holmes and Frants Jensen with a DTAG after a successful deployment on an offshore bottlenose dolphin.



Left: 3D dive reconstruction for a single dive from a bottlenose dolphin tagged offshore in September 2023, color-coded by depth and with foraging buzzes plotted as red stars. Right: Zoomed-in portion of the dive showing extensive circling behavior during foraging.

Sarasota Bay dolphin health assessment: May 2023

Randall Wells, Chicago Zoological Society's Sarasota Dolphin Research Program

Following months of intensive preparations by SDRP staff, we conducted dolphin health assessments in Sarasota Bay during May 8-12, 2023. In total, 142 researchers, veterinarians, students, handlers, trainees, stranding network members, law enforcement agents, and NOAA and Marine Mammal Commission personnel from the U.S., Argentina, Brazil, Denmark, France, Germany, Italy, Peru, Spain, and Sweden participated in the unique opportunities offered by this project. There were about 105 people on the water each day in 13-14 boats, helping to safely and successfully conduct 44 different research, monitoring, and training projects involving each of the 6 dolphins handled. Four of these dolphins were first-time handling events, our highest priority. One of the dolphins was a 2-year-old female (F295) orphaned in August 2022 by the loss of her mother "Vespa." In spite of the fact that she had been on her own since she was only 17 months of age, F295, Vespa's 11th calf, was in very good body condition. We also worked with Vespa's 8th calf, 11-year-old daughter (F277) and 3-year-old grand-daughter (F297). A 4-year-old male nick-named "Squirt" was of particular concern because of a shark bite he had received on his underside that had caused severe damage to his urinary tract (see page 24). Following his first sighting in the area in November 2022, Squirt has been seen regularly in waters in the vicinity of Siesta Key.

We thank Dolphin Quest, NOAA Prescott, NIEHS (College of Charleston), University of Southern Denmark, Harbor Branch Oceanographic Institution/FAU, Aarhus University, Fundacion Oceanografic, National Marine Mammal Foundation, Clearwater Marine Aquarium, and several generous donors for their support of this project.

Veterinarian, and Chicago Zoological Society President and CEO, Dr. Mike Adkesson, obtains a blood sample from the fluke of dolphin F295, being held by Jonathan Crossman. Long-term Sarasota dolphin health assessment coordinating veterinarian Dr. Deb Fauquier is behind Dr. Adkesson.

Understanding breathing as an indicator of dolphin health

Andreas Fahlman, Fundación Oceanogràfic and Kolmården Wildlife Park, Josefin Larsson, Kolmården Wildlife Park, Guillermo Sanchez, The Dolphin Company, and Shelly Marquardt, Clearwater Marine Aquarium

Energy, as a unit of life, is typically measured in calories. Usually, we count these units of energy to make sure we do not consume too many, but other animals are generally concerned with finding sufficient calories to survive and reproduce. For wild animals, survival is a matter of gaining more calories than they spend each day. Understanding this balance in energy use is an important component to better understand how climate change may alter the ability for wild animals to survive, and is vital for conservation efforts. As dolphins are air-breathing mammals that use oxygen stored in the body to catch prey underwater, the ability to take up oxygen and to transport the available oxygen from the lung to the cell is crucial. Thus, health of the lungs plays a crucial

A spirometer is held over a dolphin's blowhole by Andreas Fahlman to measure lung function.

Andreas Fahlman monitors the computer while the dolphin breathes through the spirometer, an apparatus that measures lung function.

role in the survival of dolphins and problems with the respiratory system, such as pneumonia, may be especially challenging when trying to catch sufficient amounts of food. It is therefore not surprising that respiratory disease is one of the most common causes of mortality among dolphins, but its prevalence among different populations is not well-established. Different lung disease cases could have different origins (for example, bacterial, fungal). Lung disease resulting in reduced lung capacity may decrease the volume of air with each breath, increase the respiratory effort and reduce the ability of the lungs to exchange gas. Thus, any disease that reduces the capacity to exchange gas could decrease the available oxygen during diving, limiting diving capacity, time underwater, and thereby their chances to obtain sufficient food. A primary focus of the SDRP's dolphin health assessment and tagging research offshore of Sarasota is to better understand the relationships between respiratory health and energy use and needs.

To assess the effect of lung disease in offshore dolphins, we are working with the SDRP to perform dolphin spirometry, a diagnostic technique also used in humans, that allows detection of lung disease and can assess how the illness affects function. This technique can then evaluate the prevalence of disease in wild populations. However, to be able to identify changes in lung function there is a need to also understand how the lungs work in healthy dolphins of different species of dolphins. For this reason, we performed lung function testing on rough-toothed dolphins (*Steno bredanensis*) housed in professional care to obtain baseline values for lung function in this species. These data have then been used to evaluate how common lung disease is in the dolphins examined during the offshore health assessments, helping to improve our understanding, and conservation efforts of different dolphin species in the Gulf of Mexico.

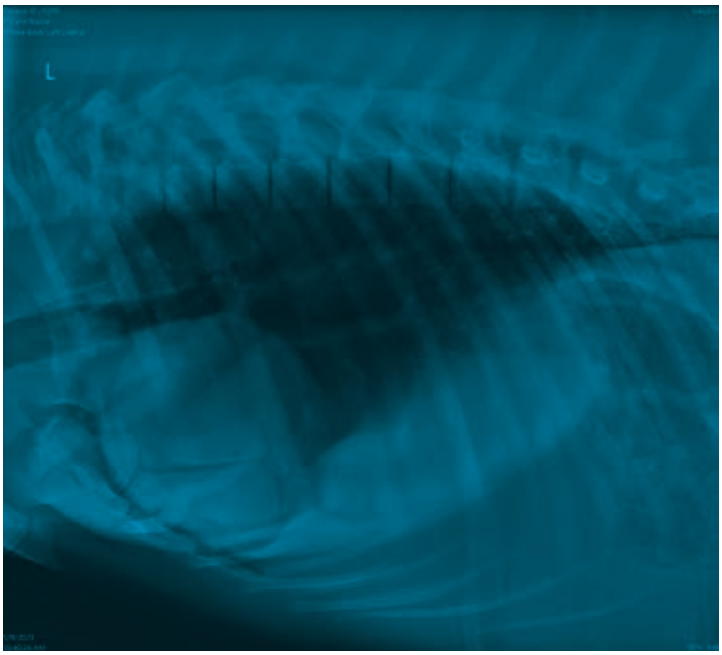
Seeing beyond our visual exams

Mike Walsh, University of Florida

The Aquatic Animal Health Program and the UF Marine Animal Rescue Program have dually benefitted from a long history of collaboration with the SDRP in the periodic dolphin health assessments. This partnership is obvious when freeing dolphins from entanglements that threaten their lives and in working with SDRP in the Sarasota Bay dolphin health assessments.

So much of illness and disease is found beyond our visual exams of a dolphin with the use of new or improved technology. The longest-running project for UF, repeated this year with the dolphin health assessments in Sarasota Bay, was the use of a portable x-ray system to evaluate the health of the lungs. The images that result are reviewed by radiologist Eric Hostnik at Brookfield Zoo to look for any signs of disease in the lungs. The project has shown a wide range of changes in individual lung health. This information can help to understand what the state of lung disease is in each dolphin and the population over time, guiding conservation and potentially mitigation of causes of lung disease in cetaceans close to human population centers. This can then be used to add to information of lung disease from ultrasound and spirometry, and to compare to other individuals and populations in other locations. Monitoring lung disease in wild dolphins helps us to understand what factors like air quality changes in the environment or challenges from disease may be involved in the health of the bay's animals over the life of the population. An example of a radiograph is shown below.

Another valuable project that has been ongoing for a few years is monitoring dolphins in the bay for signs of abnormal growths in the oral and genital areas. These may be associated with viral infections and possible tumors. Animals in some facilities have occasionally shown changes that may include cancer of the mouth. Wild dolphins in the bay can act as a comparison for how often these growths occur in the wild, if there are similar causes or numbers that help scientists and veterinarians to understand the reasons for their presence in either population. Each population contributes to a database to support conservation of the wild individuals.



This radiograph shows the entire chest of F295 taken from the side with the head out of picture on the left, the oval-shaped thick tissue of the heart in the left lower, and darker triangular-shaped lungs extending back over the organs of the abdomen. These organs are surrounded by the dense white vertebrae of the back and sternum with the white bone of the ribs overlaying the chest area.

F295 in Roberts Bay coming up to the surface to breathe.

Benefits of contributing to SDRP fieldwork and conservation – Insight from a zoo and wildlife veterinarian

Jennifer Langan, Chicago Zoological Society

I have worked as a board-certified clinical veterinarian at Brookfield Zoo (BFZ) and the University of Illinois for over two decades. As a zoo and wildlife veterinarian, I provide health care to a wide variety of individual animals, focus on population-level health, teach, and participate in research. Over the past 20 years, I have been fortunate to participate in many hands-on dolphin health assessments and research projects led and facilitated by the Sarasota Dolphin Research Program (SDRP). This work has been tremendously impactful and has provided many valuable benefits to me personally and professionally.

Participating and contributing to SDRP's conservation fieldwork with wild dolphin populations has deepened my understanding and knowledge of these species and their unique health needs. These opportunities have in turn helped me contribute to advancing the care of dolphins at BFZ as well as allowed me to share specialized skills and expertise with other zoos, aquaria, and conservation programs outside the United States. The chance to participate in this work and the experiences I gained through the SDRP have fostered a deep and strong connection to this unique conservation program. It allowed me to learn from and collaborate with biologists, scientists, and veterinary colleagues from around the world and it helped me develop a network of colleagues with which to collaborate and exchange knowledge. It provided access to cutting-edge research, encouraged scientific inquiry, and gave me a better understanding of wild dolphins' disease, behavior, and ecology. Another major benefit has been participating in educational outreach; including the opportunity to teach aspiring veterinarians, residents, and students about marine mammal medicine and ecosystem health; raising awareness about critical conservation issues through scientific presentations and publications, and helping inspire and connect people to wildlife and nature through programing for the public through Brookfield Zoo. These efforts are directly supporting the conservation and care for dolphin populations and their environments globally through the open sharing of knowledge and hands-on training opportunities.

The time I've spent working with the team and the Sarasota Dolphin Research Program through my position with Chicago Zoological Society's Brookfield Zoo has provided much personal fulfillment and has led to many long-lasting, valued friendships. Being able to contribute to this outstanding model wildlife program and the conservation of free-living populations is one of the most deeply rewarding personal and professional aspects of my career as a zoo and wildlife veterinarian.

Dr. Jennifer Langan checks the heart rate of an offshore bottlenose dolphin while on-board during a health assessment.

Dr. Jennifer Langan obtains a blood sample from the fluke of an Atlantic spotted dolphin during offshore health assessments.

The use of D-dimers as a diagnostic tool for dolphins

Ashley Barratclough, National Marine Mammal Foundation, and Nicole Stacy, University of Florida

D-dimers, measured in blood, are produced when a blood clot breaks down, therefore high levels in most species indicate previous blood clots have formed such as during hemorrhage, trauma, or disease. In dolphins, however, they are missing one of the clotting factors (Factor XII), resulting in differences in their coagulation system, which are thought to be linked to their diving physiology and the need to prevent blood clots from forming at depth. We have been collecting D-dimer blood samples during the Sarasota dolphin health assessments since 2016 and now have samples from more than 70 dolphins. The results are super interesting, with really high levels observed in some of these dolphins compared to their counterparts in human care. With the recent offshore health assessments also collecting D-dimer samples, we are looking to compare the levels in the dolphins which live in the relatively shallow waters of Sarasota Bay, Florida to those from individuals living in the deeper shelf waters. The most recent sample was collected in September 2023 from bottlenose dolphin "Jay," with an impressive value of 1,581ng/ml. In most species, including humans, normal levels are generally less than 500ng/ml. Comparing the results from the offshore dolphins to inshore dolphins is a critical part of understanding the use of D-dimers as a diagnostic tool in bottlenose dolphins. Improving our understanding of the dolphin coagulation system could help treatment of sick dolphins either in managed care or stranded individuals.

Health and movements of Florida's Gulf dolphins

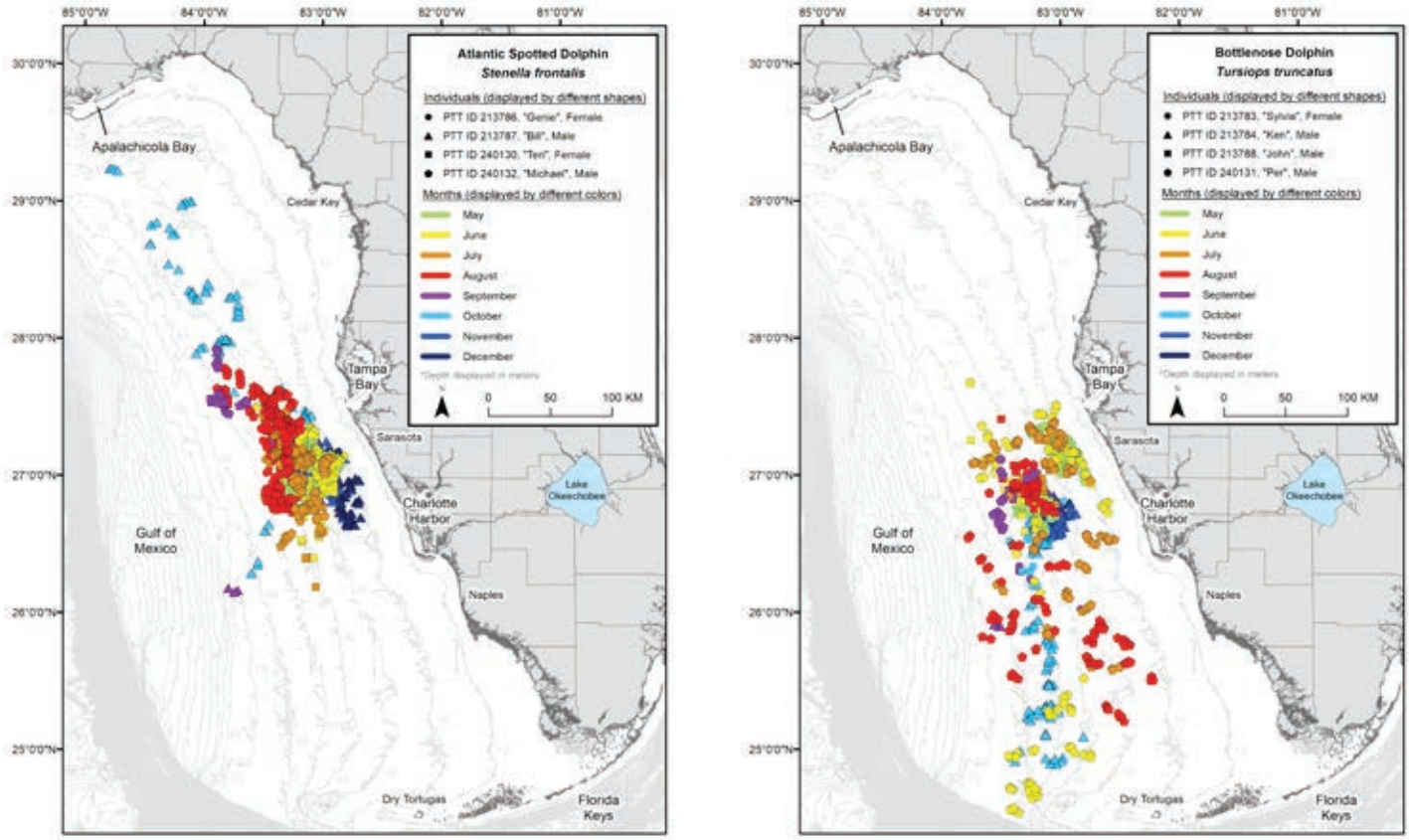
Randall Wells, Chicago Zoological Society's Sarasota Dolphin Research Program

The SDRP is leading a project involving a multi-institution team to conduct dolphin health assessment and tagging offshore of Sarasota. The project is funded by the Florida RESTORE Act Centers of Excellence Program, through the Florida Institute of Oceanography. With the overarching goal of providing requisite information for conservation and management, the project is addressing critical information gaps for the two species of cetaceans that regularly inhabit Florida's Gulf coastal and shelf waters. Our specific objectives include:

1) Improve understanding of dolphin stock structure and habitat use through tagging, tracking, and genetic sampling.
2) Establish baseline data on environmental contaminant concentrations in dolphin tissues.
3) Obtain baseline dolphin health data.
4) Evaluate potential relationships between lung disease and respiration and diving patterns.
5) Investigate feeding patterns through stable isotope and fatty acid analyses.
6) Maintain and expand the long-term Gulf of Mexico Dolphin Identification System (GoMDIS).

The project involves hoop-netting individual dolphins (bottlenose or Atlantic spotted) up to about 50 miles offshore, over the West Florida Shelf, performing a health assessment, and tagging them with satellite-linked transmitters for monitoring movements and dive patterns. In addition, some of the dolphins also have received short-term, suction-cup-mounted digital archival tags (DTAGs) for recording acoustics and behavioral details for the first few hours post-release (see photo on the next page).

To date, we have conducted offshore catch-and-release sessions in June and September, 2022, and in May and September, 2023. Five Atlantic spotted dolphins, four bottlenose dolphins, and one rough-toothed dolphin have been tagged and tracked for ~3 months each, on average. Results from tracking are the first data of their kind available for helping to refine understanding of dolphin stock structure. In contrast to NOAA's published stock assessment reports which show the stocks ranging through continental shelf waters across the entire northern Gulf of Mexico, but consistent with some recent NOAA genetic sampling, movements of the dolphins tagged during June 2022 – May 2023 have been concentrated off the west central coast of Florida (see maps below). While there were a few excursions to the north or south, most of the locations were concentrated in the eastern half of the West Florida Shelf, within about 10-50 nm of shore, and at least ~75 nm from the shelf edge, roughly ranging from offshore of the mouth



High-quality Argos locations from satellite-linked transmitters on four Atlantic spotted dolphins (left) and four bottlenose dolphins (right) tagged during 2022-23.

Adult male Atlantic spotted dolphin nick-named "Michael" upon release over the West Florida Shelf, on May 18, 2023. The dolphin has a satellite-linked tag on its dorsal fin, and a short-term digital acoustic archival tag (DTAG) attached by suction cups to its back.

of Tampa Bay to offshore of Sanibel Island. We resighted one previously tagged, freeze-branded bottlenose dolphin within 8 miles of his original capture site, 237 days after capture. Preliminary photographic identification analyses have found 25 other bottlenose dolphins that have been resighted offshore of the central west coast of Florida, over periods as long as 6.5 years. If ranging patterns have not changed since the *Deepwater Horizon* disaster, then it is likely that the portions of the stocks using waters off Sarasota were not exposed to oil from the spill.

Initial analyses suggest seasonal east-west movements, with dolphins moving farther offshore to deeper waters as the waters warmed, at least during the unusual heat of the summer of 2023. Bottlenose and Atlantic spotted dolphins moved through waters of similar depth ranges (15-74 m), and preliminary analyses of dive data indicate that they are using the entire water column. DTAG data show that the animals are feeding at or near the seafloor. For the first time in the Gulf of Mexico, dolphins were tracked during passing hurricanes (Ian and Idalia), and the movements seen for the 8 animals were generally consistent with hurricane-driven wind and wave directions.

We are in the process of analyzing samples, as well as lung function, health, feeding, movement and dive data from all nine dolphins tagged for this project through September 2023. The lead organizations on the project, the Chicago Zoological Society and Mote Marine Laboratory, greatly appreciate the involvement of a number of programs in the fieldwork, including the National Marine Mammal Foundation for involvement of their veterinarians, the University of Florida College of Veterinary Medicine, and Aarhus University.

Gulf of Mexico Dolphin Identification System: Archiving for the future

Carolyn Cush and Randall Wells, Chicago Zoological Society's Sarasota Dolphin Research Program

The Gulf of Mexico Dolphin Identification System (GoMDIS) is a collaborative effort between photo-identification (photo-ID) and stranding groups throughout the Gulf of Mexico, including Mexico and Cuba, to standardize, archive and curate bottlenose dolphin fin catalogs in one location, accessible online. This is done through the OBIS-SEAMAP photo-ID portal, thus allowing for ease of matching between different groups. The matching allows for identification of range shifts, and for determining the locations of origin of stranded dolphins. This information can facilitate returning stranded or rehabilitated dolphins to the wild by identifying the most appropriate release sites. Now in its eleventh year, GoMDIS includes representative images from 45 catalogs with approximately 26,900 animals and more than 49,000 images. Gulf-wide, 2,200 matches between groups have been made to date, strengthening and stitching together data from individual research groups.

Recently, one of our dear colleagues from the Naples, Florida area, Kent Morse, passed away and left his life's passion in the care of SDRP. Over the years, Kent was a wonderful asset to the program, notifying and assisting with rescues of entangled dolphins, including follow-up monitoring, and keeping us apprised of the dolphins south of our area. Kent collected records of more than 600 identifiable individual dolphins, with records spanning more than 17 years for some. We are honored to hold such a valuable dataset in our care, and GoMDIS is the perfect archival system to ensure these data are protected, preserved and utilized to their fullest potential.

Support for the ongoing operations of GoMDIS this year came from a Florida RESTORE Act Centers of Excellence Program grant, and a John H. Prescott Marine Mammal Rescue Assistance grant.

Kent Morse's long-term data were of crucial importance for several of the dolphin rescues in southwest Florida. Above, Skipper, a previous rescued animal (see page 28) in front of the FWC net boat during the rescue of her calf, Fergie (see page 27).

Red tide and the status of fish populations in Sarasota

Elizabeth J. Berens McCabe, Chicago Zoological Society's Sarasota Dolphin Research Program

The Sarasota Dolphin Research Program (SDRP) explores the relationship between wild dolphins and their prey by conducting seasonal multispecies fish surveys to monitor fish abundance, diversity, and size structure in Sarasota Bay, Florida. Data from this project enable us to investigate fine-scale habitat and prey selection in wild dolphins, and to explore the effects of *Karenia brevis* red tides on different fish species and community structure across the bay. Since 2004, this project has also facilitated a variety of novel research and new collaborations; most recently, quantifying microplastic loads in dolphin prey fish and the potential effects of phthalates in the diet of bottlenose dolphins (see page 8). Based on our 2023 fish survey data and *K. brevis* cell concentrations, the Sarasota Bay fish community experienced significant declines in winter fish abundance and species density during the 2022-23 red tide bloom. Despite this, the fish community appears to be recovering quickly!

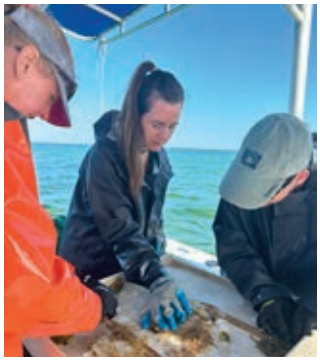
Our standardized multi-species fish survey consists of a winter and summer fishing season (10 sets per month; Jan-Mar; Jun-Sept), during which we catch, measure, count, and release fish from the *R/V Flip* using a 183 m-long purse seine in seagrass habitats. During the winter of 2022-23, we caught a total of 2,024 fish of 42 different species, an average of 67.4 fish per set and 28.5 dolphin prey fish per set. This summer yielded 34,737 individuals of 61 different species, averaging 868.4 fish per set and 683.2 dolphin prey fish per set. To put these numbers into perspective, we caught our lowest average winter fish abundance since sampling began in 2004, but our eighth highest average summer abundance. From 2022 to 2023, our average winter fish and dolphin prey fish catches declined by 57% and 67%, respectively. Our average summer catches were comparable to those in summer 2022, increasing by just 2% and 8% for fish and dolphin prey species, respectively.

K. brevis red tide blooms occur regularly along Florida's west coast, often resulting in massive fish kills and marine mammal, sea bird, and sea turtle mortalities. Our low winter catches were likely due to the effects of red tide, as samples taken by the Chicago Zoological Society's Sarasota Dolphin Research Program and Mote Marine Laboratory's Phytoplankton Ecology Lab indicate bloom conditions were present in Sarasota Bay estuarine waters from November 1, 2022 to April 8, 2023. Specifically, cell concentrations jumped from background levels to 1,246,000 cells per liter at City Island on November 1, 2022. From November 2, 2022 through March 8, 2023, concentrations varied widely and suggest a patchy bloom distribution in estuarine waters, fluctuating from 0 to more than 388 million cells per liter, with an average and median sample concentration of 1,671,459 and 21,000 cells per liter, respectively. Concentrations then lingered at low or background levels (≤79,000 cells per liter) until May 1, 2023. In total, the 2022-23 bloom spanned 23 weeks, and contained periods of 8 consecutive weeks and 4 consecutive weeks of cell counts greater than 100,000 cells per liter, a threshold concentration level typically required for fish kills and/or respiratory irritation in humans.

Our previous work has shown that bloom intensity, timing (season), and frequency affect dolphin prey fish resistance to bloom events, their resilience following bloom events, and prey assemblage structure, or the composition of the prey community. Prey assemblage structure is strongly influenced by *K. brevis* density and population recovery generally occurs within one year post-bloom. Preliminary analyses of our 2023 data indicate ecological response patterns similar to those seen in past red tide events in Sarasota Bay, namely significant declines in fish abundance, species density, and species diversity during bloom conditions, with the fish community experiencing a relatively rapid recovery post-bloom. In fact, summer fish abundance and species density were above average this year. Pinfish, scaled sardines, and mojarra were very abundant, as is typical in the summer months. Unusually abundant species included Gulf toadfish, gag grouper, and hardhead catfish. The timing of the recent bloom was likely important, as the bloom was dissipating at the same time seasonal larval movement into Sarasota Bay was occurring. But while prey abundance is important, dolphins can only consume prey within a certain size range. This summer the proportion of pinfish within the size range that dolphins typically consume (≥96.3 mm) was 9.9% lower compared to 2022. The proportion of consumable pigfish was comparable to 2022.

Ongoing efforts seek to examine the effects of red tide on fish, dolphins, and sharks in Sarasota Bay, as well as community recovery post-bloom. In addition, a new project seeks to collect baseline data on striped mullet movement patterns, space use, and residency in Sarasota Bay, in an effort to monitor changes in movement and potential refuge areas associated with ecological disturbances, such as *K. brevis* red tides, and to begin to assess the spatial ecology of dolphin-prey interactions (see page 33).

We thank the many interns and dedicated volunteers who have worked on this project. The work would not be possible without you! Funding for this project was provided by the Charles and Margery Barancik Foundation. This research was authorized by the Florida Fish and Wildlife Conservation Commission (22-0809-SR, current Special Activity License) and by Mote Marine Laboratory's Institutional Animal Care and Use Committee (22-09-RW2).



Elizabeth Berens McCabe measures fish with intern Jaime Rae and volunteer Sarah Dill before releasing them back into the bay.

Shark research in Sarasota Bay

Krystan Wilkinson, Chicago Zoological Society's Sarasota Dolphin Research Program

The SDRP has documented eight Sarasota resident dolphins with fresh shark bites during monthly photo-ID surveys so far in 2023. Bull sharks are thought to be the most frequent predator of the nearshore Sarasota Bay dolphin residents, but tiger sharks are also likely predators. During the Sarasota Bay health assessment project in May, we documented a very interesting shark bite on a juvenile male bottlenose dolphin, F326 (aka "Squirt"). We first documented F326 in the Sarasota study area during November 2022 photo-ID surveys (where he came from remains unknown). At that time, he had a healed shark bite on his peduncle. During the May health exam, it was discovered that the shark bite caused scar tissue to form in his urinary tract resulting in a fistula (or abnormal connection) between his bladder and his body wall. As a result, urine sprayed out of the side of his body. Given the shape of the scar, we believe this may have been caused by a tiger shark. F326 continues to be observed locally following the May health assessment project and we will monitor his long-term health during monthly surveys.

To better understand shark-dolphin interactions and predator-prey dynamics, we have been tagging coastal shark species (largely focused on bull sharks) with acoustic transmitters to track their patterns of movement and habitat overlap with the Sarasota Bay dolphin community. In collaboration with Mote Marine Laboratory's Shark and Ray Conservation Research Program, we tagged 14 bull sharks in 2023, bringing our total to 40 bull sharks that are being monitored with 7-9-year acoustic transmitters. We also continue to monitor five tiger sharks, nine sandbar sharks, and one scalloped hammerhead shark using the same acoustic technology.

Shark bite scar on the peduncle of F326 ("Squirt"), left (top) and right (bottom) side of peduncle shown, respectively.

We track local shark movements using underwater receivers that make up the Sarasota Coast Acoustic Network (SCAN; see page 33). Additionally, the neighboring collaborative networks iTAG (in the Gulf of Mexico) and FACT (along the east coast of the U.S.) help document movements after they have left the local area, using the same receiver technology. In a previous issue of Nicks 'n' Notches, I reported on "Dona" – a female bull shark we tagged in Dona Bay, just inside Venice Inlet, on July 2nd, 2020. Until recently, most of Dona's movements have been concentrated between Charlotte Harbor and off of St. Pete, Florida, but in May 2023, she was detected by an iTAG collaborator off Destin, Florida in the northern Gulf!

Funding for this research was provided by an anonymous donation to the Chicago Zoological Society, Mote Scientific Foundation, and the Women's Board of the Chicago Zoological Society. Special thanks go to Jack Morris, Val Hagan, Dr. Bob Hueter, Dr. Demian Chapman, Capts. Dean Dougherty, Greg Byrd, Pete Hull and Cody Cole (Mote Marine Laboratory), Dr. Jayne Gardiner (New College of Florida) and Tonya Wiley (Havenworth Coastal Conservation) for their assistance with shark tagging and sampling.

Crunchers, suckers and barbers: Update on ray research activities in Florida

Kim Bassos-Hull, Krystan Wilkinson, Chicago Zoological Society's Sarasota Dolphin Research Program, and Atlantine Boggio-Pasqua, Aix-Marseille University

In collaboration with Mote Marine Laboratory's Sharks and Rays Conservation Research Program, we have been studying the life history, feeding ecology and movement patterns of a few ray species in Florida since 2009. Understanding their role in the ecosystems shared with other megafauna, such as dolphins and sharks, helps researchers investigate trophic relationships and competitor/predator impacts and interactions. The whitespotted eagle ray (*Aetobatus narinari*) is a large pelagic ray ("Endangered" on the International Union for Conservation of Nature (IUCN) Red List) that can reach up to 2.5 meters in disc width (wing tip to wing tip). Whitespotted eagle rays have up to six large venomous stinging barbs (or spines) at the base of their tail. Along with other stingray species, they use these barbs to defend themselves when predators such as sharks come after them as prey. Sometimes sharks are found with stingray spines in their jaws. Dolphins in Sarasota Bay and elsewhere have also come into contact with stingrays and been "barbed," likely through accidental encounters in shallow seagrass areas where both dolphins and rays hunt for food. These barbs have caused serious injury and even death to dolphins. We found the majority of injuries to dolphins occurred in the top half of the body just below the dorsal fin and towards the head.

Our current research investigating the diet and feeding behavior of whitespotted eagle rays is finding that they are noisy when they eat! They are durophagus predators (prey crushers) with a diet comprised mostly of clams, snails, and crabs. We can detect the fine differences between when they are eating a clam (lots of little crunches) as opposed to a snail (a big CRACK followed by fewer crunches). While initial research occurred in large tanks at Mote, we have begun field deployments of both hydrophones (underwater microphones) at shellfish aquaculture and restoration sites and animal-borne tags that record audio, video and fine-scale movements, to learn more about what rays are targeting as prey. Preliminary acoustic data at one of these clam sites in northeastern Sarasota Bay recorded a few instances of ray predations. Acoustic tagged eagle rays (along with ray predators) have also been detected at clam sites by SCAN receivers. Another approach we are taking to understand diet is to examine gastric contents and use DNA barcoding. In these gastric contents we found 33 unique prey items; none of the commercially valuable hard clams but several of the snail predators of these clams. Whitespotted eagle rays may be helping maintain healthy shellfish beds by eating other clam predators! These results were just published July 2023 in the journal *Fishes*.

To learn more about the importance of Sarasota Bay as a potential nursery habitat for whitespotted eagle rays, we are catching and tagging young rays and following them using active tracking technologies (directional hydrophone). To date, we have tagged 15 young-of-year eagle rays with passive “coded” tags that allow them to be detected

Kim Bassos-Hull and visiting researchers from Florida Atlantic University, Manta Trust, and University of North Carolina at Chapel Hill prepare to measure and tag young-of-year whitespotted eagle rays in Sarasota Bay (September 2023). All research conducted under FWC-SAL-1140-SRP permit.

Left to Right: Kirsty Ballard (FWC/Manta Trust), Kim Bassos-Hull (CZS-SDRP/Mote Marine Lab), Jessica Valek (Destin Fort Walton Beach Coastal Resources) and Atlantine Boggio-Pasqua (Aix-Marseille University) prepare to release a devil ray near Navarre Pier off Florida’s Panhandle (November 2022). All research conducted under FWC-SAL-1140-SRP permit.

in our SCAN array and four rays also received active tags. Preliminary tracks from these four rays show that they like to hang around bridges, often in areas of high current, and during overnight hours they will spend time in channels or basins with seawalls. Next steps will be to see where these rays move within the SCAN array and investigate bottom type and benthic prey at their most frequented sites. This will help to better identify important habitat areas for these young rays which will aid in conservation and management.

Another type of ray we are studying, the West Atlantic pygmy devil ray (*Mobula hypostoma*), has a completely different feeding strategy compared to eagle rays…they suck their tiny planktonic invertebrate prey in and filter them out. These miniature manta-like rays reach a maximum of ~1.5m across, and are most commonly seen in groups of 2-10 individuals in coastal waters of the Western Atlantic Ocean. We know very little about them, but they are threatened with extinction in most of their range, likely due to bycatch, leading to their designation as “Endangered” on the IUCN Red List. Since 2013, we have caught, sampled, pit tagged and released 129 devil rays. Fin clips from many of these rays were contributed to a worldwide genetic description study of Mobular rays published in 2020. Furthering our research to better understand movement patterns of these small, filter-feeding rays (with initial support from the Mote Scientific Foundation and Georgia Aquarium and a new grant in 2023 from the Save Our Seas Foundation), we have acoustically tagged 18 devil rays. Preliminary results from acoustic tags deployed in the Florida Panhandle and in Sarasota show that the species is highly mobile with seasonal long-distance migrations. Both juveniles and adults seem to migrate more than 500 km from the central west coast of Florida to the Panhandle in the fall, with a return migration in the spring/summer. We suspect they are taking advantage of seasonal food sources. Additional tagging (including satellite-linked tagging!) later this fall combined with stable isotope analysis to examine diet will help to further advance our understanding of these rays.

Dolphin Rescues, Releases, and Follow-up Monitoring

Sarasota Dolphin Research Program involvement in interventions and stranding response

Randall Wells and Aaron Barleycorn, Chicago Zoological Society's Sarasota Dolphin Research Program

We have worked in partnership with Mote Marine Laboratory's Stranding Investigations Program (SIP) for decades, helping to investigate reports and recover stranded dolphins to try to better understand the threats to Sarasota Bay's long-term resident dolphins, and leading rescue for those for which interventions are recommended. This builds on our published findings that these individual interventions can have population-level conservation benefits. We also receive support from NOAA John H. Prescott Marine Mammal Rescue Assistance Grants to: 1) provide tags and tracking services to stranding response programs around the country for follow-up monitoring of rescued and/or rehabilitated dolphins, 2) for consultations on responses to potential rescue cases, 3) for training personnel for tag attachment and monitoring, and 4) for assisting stranding programs with dissemination of information resulting from follow-up monitoring of their cases.

As part of another John H. Prescott Marine Mammal Rescue Assistance Grant, through SIP, we are working with a team of veterinarians and DANiNJECT to try to develop capabilities for sedating free-swimming dolphins in need of intervention. This capability, which already exists for pinnipeds and large whales, would allow rescuers to save many more dolphins when they are in situations where traditional catch-and-release techniques are not feasible or safe.

We consulted with NOAA on a number of potential interventions around the southeast this year, and engaged in three rescues of bottlenose dolphin calves on Florida's west coast:

Sarasota Bay bottlenose dolphin calf disentanglement (2094)

A multi-agency team of 51 individuals, including veterinarians, biologists, stranding responders, trained handlers, and law enforcement officers, came together on February 21st to successfully catch, treat, and release a 2-year-old female bottlenose dolphin calf with fishing lines cutting deeply into her tail flukes. The nearly 10 feet of monofilament and micro-multifilament braided lines, which had accumulated barnacles and algae and other biofouling, were trailing behind the calf, creating drag (see photos to the right). The entanglement was pulling the lines deeper into the calf, preventing normal swimming and activities.

The calf, known as 2094, is the fourth offspring of her 19-year-old mother (F209). Born in the spring of 2021, she is a fourth-generation member of a resident Sarasota Bay maternal lineage that has been observed by the SDRP since 1971. Entangled line was first seen trailing behind 2094 in early January, by a tour boat operator. At that time, the NOAA's National Marine Fisheries Service (NMFS) granted permission to Mote Marine Laboratory's Stranding Investigations Program and its designee, the Chicago Zoological Society's Sarasota Dolphin Research Program (SDRP), to attempt a remote disentanglement if conditions were favorable and opportunity arose. Several days after the initial sighting, while performing routine surveys, SDRP staff found the impaired calf and her mom. They were able to use a long-handled cutting tool to remove approximately two-thirds of the line from the calf.

After the line was cut, the pair eluded biologists for the next several weeks and when spotted again a great deal more biofouling had accumulated on the fishing gear. After assessing the calf's life-threatening situation, NMFS approved a catch-and-release rescue to remove the remaining line. The day before the rescue, the calf was observed no longer using its flukes to swim, but instead was slipstreaming its mother and sculling with its flippers.

The rescue effort was led by the Chicago Zoological Society's SDRP in collaboration with Mote Marine Laboratory's Stranding Investigations Program and partners that included Clearwater Marine Aquarium, Florida Fish and Wildlife Conservation Commission's Marine Mammal Pathobiology Laboratory, Florida Fish and Wildlife Conservation Commission's Southwest Field Lab, Florida Fish and Wildlife Conservation Commission Law Enforcement, Harbor Branch Oceanographic Institution/ FAU, Mote Marine Laboratory and Aquarium Animal Hospital, Sarasota Police Department, SeaWorld of Florida, and University of Florida College of Veterinary Medicine. In addition to removing the fishing line and debris from the calf, both animals were examined, measured, sampled for blood, and monitored for heart rate and respirations. Additionally, an antibiotic was administered to the calf to help prevent infection, and the mother was fitted with a satellite-linked tag so that biologists could continue monitoring the calf's healing progress. They were released within less than an hour of when they were encircled by the rescue net.

Since its rescue, 2094 has been seen 24 times (through September 12th, 2023). She has fully regained the use of her flukes, and is behaving normally. She was bitten by a shark in late spring, but the wound has healed nicely.

Left: Drone view, February 20th: Biofouled fishing line trailing behind calf 2094 (L) the day before her rescue.
Right: At rescue, February 21st: Lines cutting deeply into both fluke blades, precluding fluke pumping for swimming.

Marco Island, Florida, bottlenose dolphin calf disentanglement (Fergie)

On April 7th, 2023, Florida Fish and Wildlife Conservation Commission's Southwest Field Lab (FWC-SWFL) received the first report of an entangled bottlenose dolphin calf near Isle of Capri and Capri Pass. The entangled dolphin was the ~1.5-yr-old calf of Skipper (FMMSN1453), a female we disentangled in 2014. Following several additional reports of the calf with line trailing from its flukes, and direct observations by Denise Boyd (FWC-SWFL) and her team, the National Marine Fisheries Service (NMFS) consulted with experienced marine mammal veterinarians and biologists. They determined that the entanglement was potentially life-threatening. This triggered the development of plans for a disentanglement intervention on April 25th involving catch-and-release. NMFS asked Randall Wells, Chicago Zoological Society's Sarasota Dolphin Research Program (SDRP), to lead the rescue, working closely with Denise Boyd who handled the logistics since this is her stranding response area. Andy Garrett (FWC-Marine Mammal Pathobiology Lab (MMPL)) was asked to serve as the catcher. The team included personnel and resources from: 1) FWC-MMPL, 2) FWC-SWFL, 3) Mote Marine Laboratory's Stranding Investigations Program, 4) Clearwater Marine Aquarium, 5) University of Florida College of Veterinary Medicine (UF), 6) SeaWorld of Orlando, 7) Harbor Branch Oceanographic Institution, 8) Rookery Bay National Estuarine Research Reserve, 9) SDRP, and 10) Collier County Sheriff's Office.

The mom-calf pair was found fairly quickly in deep water along the seawalls behind homes on the Isle of Capri in Capri Pass. At 12:32 we set on the animals in a cove just west of the Naples Fire and Rescue pier, where there were some suitable shallows near mangroves, with a step drop-off into a channel. Once the net circle was entirely on the shallows, the calf gently bumped the net, stopped, and was restrained. The mom caught the tip of her fluke in the net, and she was quickly restrained.

Fergie's entangled flukes – fishing line is cutting deeply into the leading edges of his flukes.

Healed 2014 entanglement wound on Skipper, where her flukes connect to her peduncle.

Veterinarian Mike Walsh (UF) removed the line from the calf's flukes (see photo of entanglement with gear below to the left). He cleaned the wounds and administered an injection of a long-lasting antibiotic, Excede. The calf's dorsal fin was notched and photographed to facilitate future identification, and the entanglement wounds were photographed, as were older wounds on the mother, Skipper (see photo to the bottom left). The pair was released on-site and observed together following release.

The calf, known as "Fergie," was a male. This maternal lineage has a history of fishing line entanglements, going back to 2012, at least. We had previously caught and disentangled Skipper from fishing leader wire around her tail stock on September 4th, 2014. Her brother, Seymour (FMMSN1204), had been caught and disentangled from fishing line around the base of his fluke on March 9th, 2012. Skipper's niece, Ariel (FMMSN1903), was reported with fishing line entangling her dorsal fin in January, 2019. She shed the gear prior to the arrival of the SDRP and SWFL remote disentanglement team. The transmission of risky feeding-related behaviors through maternal lineages has been documented for Sarasota dolphins as well.

Cedar Key, Florida, bottlenose dolphin calf disentanglement (Dit)

On July 18th, a survey team from the Cedar Key Dolphin Project (CKDP) found a known 5-month-old dolphin calf of "Nail", named "Dit," entangled around the head and pectoral fins with plastic netting associated with the local clam farming industry. They reported the entanglement to the National Marine Fisheries Service (NMFS) and continued to monitor the dolphin. After repeated sightings NMFS determined the entanglement was life-threatening and a remote disentanglement should be tried. NMFS contacted the Sarasota Dolphin Research Program (SDRP) to ask for help with the disentanglement.

SDRP staff members Aaron Barleycorn, Jason Allen, and Jonathan Crossman met with folks from University of Florida Marine Animal Rescue (UFMAR) and CKDP at a dock in Cedar Key on August 9th. The team searched the area using two boats and eventually found Nail and Dit near Dog Island. Water clarity was poor, and Dit was doing the fast, unpredictable surfacings typical of newborns. However, the dolphins didn't seem to mind close approaches by the boat so the team decided to try a remote removal of the netting. The UFMAR boat was

Dit entangled in plastic mesh, swimming alongside its mother, Nail.

maneuvered close to Dit, and a long pole with a grappling hook at the end was deployed to try to snag the netting. Dit dove before the hook made contact, but the sweep was continued and made contact under water. While it was initially thought to be a missed attempt, the next time Dit surfaced, it was completely free of the entanglement! The hook on the pole must have made enough contact underwater to break the mesh free. The team stayed with Dit and its mom for another hour to monitor them. They both were acting like normal, healthy dolphins, so the team left them after a very successful day! CKDP observed Dit with its mom regularly through August 23rd. They continued to behave normally, and the calf didn't appear to have any long-lasting adverse effects from the entanglement. Unfortunately, the pair as not been seen again since the passage of Hurricane Idalia on August 30th.

Screen grab from the video of the rescue showing the grapple just before making contact with the mesh.

Updates from previous rescues

Aaron Barleycorn and Randall Wells, Chicago Zoological Society's Sarasota Dolphin Research Program

Merrily: In 1985, a young Merrily was rescued from a commercial fisherman's net by the SDRP. Now 39 years old, Merrily has been seen more than 1,540 times, and she has produced 5 calves.

Scrappy: In July 2006, Scrappy, a juvenile male was observed entangled in a men's Speedo bathing suit. He had managed to put his head through the waist and one of the leg holes, and the suit had worked its way back to the point where it was cutting into his pectoral fins. On August 3rd, 2006, we caught Scrappy, removed the suit, treated his injuries, and released him on-site. Now 24 years old, he and C835 have formed a male alliance. They have been seen together several times in 2023.

Ginger: In December 2008, Ginger, a recently independent juvenile female dolphin stranded on Siesta Beach. SDRP personnel were among the first to reach her to stabilize her for the trip to Mote's dolphin hospital. She was treated for complications from the stranding, and released with a VHF radio-tag two months later. The SDRP closely monitored her for two months after release until the tag transmissions ceased. She is regularly seen during our monthly population monitoring surveys. Ginger's story inspired SDRP volunteer Cathy Marine to write a children's book about her time at Mote called "No Dead Fish for Ginger." Ginger has a new calf this year, her fourth!

Nellie: In February 2010, the 9-month-old calf of resident dolphin FB25 was seen with plastic twine and a metal hook tightly wrapped around her head, embedding in her tissue. She was temporarily captured, disentangled, her wounds were treated, and she was released on-site on March 1st 2010. She was named "Nellie" in honor of Dr. Nelio Barros, a great friend and colleague, who had recently passed away. We see her regularly during our surveys, and she has had three calves to date, the most recent in 2023.

Lizzie: One of our Sarasota residents, Lizzie, had an eventful 2013. She was given a temporary satellite-linked tag during our health assessment in May, and she and her 3-year-old calf were regularly followed to compare their behavior with and without the tag. During one of these follows SDRP staff noticed that Lizzie had become entangled with monofilament line around one of her flukes. Shortly after, her calf was struck by a boat propeller that left a large gash on his dorsal fin. Lizzie and her calf were temporarily captured on July 20th to remove the fishing line and the tag. Lizzie and her current two-year-old calf (her 8th!) are doing well.

Skipper: On September 4th, 2014, the SDRP led a rescue near Marco Island, and caught and disentangled a female calf known as Skipper from fishing leader wire wrapped and deeply embedded around her tail stock and fluke. On April 7th, 2023, we caught Skipper again, this time to disentangle her own calf, Fergie (see page 27). Her injuries from 2014 were well-healed.

F314: On March 11th, 2019 the SDRP led a team to rescue an entangled dolphin calf near Stump Pass in Englewood, Florida. We were able to catch him (now F314) and his mom, and remove the line that was cutting deeply through his mouth and approaching his eye, and through his fluke. The calf was disentangled and his wounds were treated, mom was given a satellite-linked tag to facilitate follow-up monitoring, and they were released on site. Despite their distance from Sarasota, we have been able to make occasional trips down to the area to check up on them. Both appear to be in good shape, but they still spend a lot of their time around fishing boats.

Scrappy on July 6th, 2006 wearing a large men's bathing suit that was removed during a rescue.

F316: On April 1st, 2019 we rescued F199's calf (now F316) who had braided monofilament fishing line cutting 85% of the way through his fluke, and was incredibly emaciated. Honestly, we did not have high hopes that he would survive, but veterinarians determined his best chance was to be released to recover in the wild. Having beaten the odds, he is seen regularly during our surveys. F316 is doing well and his fluke is well-healed.

Hurricane related out-of-habitat bottlenose dolphin strandings in Louisiana

Gabriella Vazquez, Audubon Nature Institute, and Randall Wells, Chicago Zoological Society's Sarasota Dolphin Research Program

Hurricane related out-of-habitat strandings occur in Louisiana when powerful storm surge and coastal flooding push bottlenose dolphins into undesirable locations. This includes creeks, ponds, canals, and ditches that do not have access to open water. During the 2021 Atlantic hurricane season, a powerful category 4 Hurricane Ida slammed into Southeastern Louisiana on August 29th, 2021.

Often times, dolphins are not reported as out-of-habitat until months later, when property owners or residents begin to rebuild after a storm. In January 2022, a mom and calf pair, referred to as "Moira" and "Alexis," were reported to be in a pond system on private property near Grand Isle, Louisiana. This mom was a known Barataria Bay dolphin (BAR_2086) who had been seen 4 times since 2010 during photo-identification surveys. This was the first time this female had been documented with a calf. The pond system Moira and Alexis were trapped in was a large area with plenty of food, depth, and salinity. However, the calf was considered too small to safely launch an intervention. Due to the stability of the environment the mom and calf were in, the decision to wait until the calf was larger was made.

On June 17th, 2023, a successful rescue was led by Audubon Nature Institute, National Marine Mammal Foundation, SeaWorld Orlando, with other collaborating partners such as Dauphin Island Sea Lab, Institute for Marine Mammal Studies, and South Carolina Aquarium. During this rescue, Moira and Alexis were moved from the inland pond and returned into Barataria Bay near Moira's last known sighting in 2019. SDRP provided a satellite-linked tag and tracking services for this dolphin. This dolphin was tracked for 82 days, well beyond the 42-day threshold defining a successful intervention. She initially spent time near the west end of Grand Isle, but then shifted to waters near Port Fourchon, to the west of Grand Isle.

Rescue personnel move bottlenose dolphins, Moira and Alexis, off floating mats for veterinary exams and satellite tag application before being transported for release into Barataria Bay, Louisiana.

The satellite-linked tag and tracking services were provided through a John H. Prescott Marine Mammal Rescue Assistance Grant

Update on Bahamian Atlantic spotted dolphin Lamda

Denise Herzing, Wild Dolphin Project, and Randall Wells, Chicago Zoological Society's Sarasota Dolphin Research Program

An Atlantic spotted dolphin known as "Lamda," rescued, rehabilitated, and released in the Bahamas in 2018, continues to be observed regularly by the Wild Dolphin Project (WDP) near Bimini. In September of 2018, WDP was notified that a male spotted dolphin had stranded. He was flown to the Atlantis Animal Rescue Center in Nassau, Bahamas, where he received critical medical treatment and made a full recovery. WDP provided early identification of the individual and his sighting history which led to gaining support from the Bahamas Government that was necessary to return Lamda to the wild.

WDP first observed this individual in 2013. He was frequently seen with a large group and had been observed engaging in courtship and mating behavior. In preparation for his release, WDP spent two days locating Lamda's group and on the morning of Monday, October 29th 2018, a seaplane brought Lamda from Nassau to Bimini then he was ferried on a small boat. Lamda was released nearby where his group was last seen by our team, after receiving a satellite-linked transmitter provided by the Sarasota Dolphin Research Program for post-release monitoring. SDRP tracking over more than three months followed the dolphin as he moved back and forth along the SW edge of the Great Bahama Bank before ending up near his release site. Watch Lamda's full story at:
https://www.youtube.com/watch?v=bAcuW9tN9vM

Lamda has been observed by WDP during every field season post-release. He is still being sighted with some of his regular associates from before his stranding, as well as in encounters with both the residents as well as immigrants from Little Bahama Bank off Grand Bahama Island. He has been in encounters that have involved aggression, courtship, foraging, and play, and seems to be doing very well.

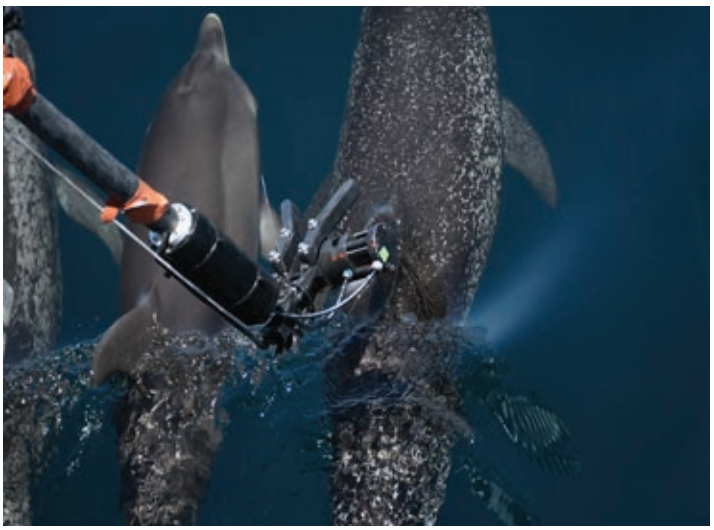
Bahamian Atlantic spotted dolphin Lamda 5 years after his return to the wild following rescue and rehabilitation.

Successful test of our pole-mounted Tag Attachment Device (TADpole)

Randall Wells, Aaron Barleycorn, Jason Allen, and Jonathan Crossman, Chicago Zoological Society's Sarasota Dolphin Research Program, Michael Moore, Woods Hole Oceanographic Institution

On August 15th, 2023, SDRP staff accomplished the first successful deployment of a satellite-linked tag on a bow-riding dolphin with our pole-mounted Tag Attachment Device, affectionately known as the TADpole. The SDRP has engaged in tagging dolphins with satellite-linked transmitters since 1990, and has been involved in preparation, deployment and/or tracking of more than 250 such tags. Previously, attachments of satellite-linked tags by SDRP or others had required catch-and-release, or use of a rifle or crossbow to attach a projectile tag via embedding barbs. The former is expensive and logistically complex — especially with animals in deeper water — and the latter was an approach the SDRP did not want to employ. So, in 2014 we began working with Woods Hole Oceanographic Institution (WHOI) veterinarian Michael Moore and WHOI engineers to develop a new approach.

The prototype design developed by WHOI uses pneumatic pressure to secure a tag to the trailing edge of the dorsal fin of a bow-riding dolphin with a single pin, in just a fraction of a second (see photo below). The development process was iterative. Designs were tested in the lab on dorsal fins from dead stranded animals. After tweaking, field testing was done in Florida and Hawaii, followed by more tweaking and lab tests, and then more field tests of the tagging system and attachments in Florida. The primary issue we encountered was the great speed with which dolphins can move out of the device when they feel its touch, before the device could trigger and attach a tag. This rapid response time is great for thwarting toothy grabs by potential predators, but not so good for potential taggers.



The TADpole is placed around the dorsal fin of a bow-riding adult female Atlantic spotted dolphin.

Left to Right: Aaron Barleycorn, Jonathan Crossman, Jason Allen, Randy Wells, and Captain Greg Byrd after the first successful tag deployment.

After further modifications, we took the TADpole offshore of Sarasota, Florida, in August. Under nearly ideal conditions of calm seas, slow-moving dolphins, and slow-moving boat, we used the TADpole to deploy a satellite-linked tag on a bow-riding Atlantic spotted dolphin 45 miles offshore. A standard Wildlife Computers SPLASH tag was attached to track and obtain dive data from the dolphin, nicknamed Hannah. Hannah returned to the bow of the boat repeatedly after tagging, affording us good opportunities to document the attachment.

We will be conducting further tests over the next few months to refine the system and our skills in using it. While work remains to be done before the tool is fully ready for prime time, our most recent test proved the engineering concept. Once fully developed, the TADpole has the potential to facilitate much-needed research on offshore dolphins around the world. It has already proven its conservation value for tagging great white and whale sharks, as we reported last year. We greatly appreciate the help of the groups that have provided support along our development journey, including Dolphin Quest, Inc., Mote Scientific Foundation, NOAA's RESTORE program, National Marine Mammal Foundation, Cascadia Research Collective, WHOI, and an anonymous donor through the Chicago Zoological Society.

"Hannah" becomes the first dolphin tagged with the system.

Sarasota Bay Listening Network (SBLN)

Katie McHugh, Katy Holmes, and Cecilia Thompson, Chicago Zoological Society's Sarasota Dolphin Research Program

The Sarasota Bay Listening Network (SBLN) uses hydrophones (underwater microphones) to continuously record sounds made by animals, human activities, and geophysical sources (such as storms) at 12 shore-based passive acoustic listening stations (PALS) around the Sarasota Bay estuary. This passive acoustic monitoring (PAM) network is a non-invasive research tool with conservation applications such as assessing the biodiversity and presence of sound-producing animals and how they are affected by stressors, such as red tides and human activities. It also facilitates research on dolphins and manatees, such as how they communicate, avoid boats by using sound, use different habitats, and move throughout the estuary.

This past year, Kathryn Holmes was hired to be the full-time manager for the SBLN. Katy is a former SDRP intern who finished her PhD in 2022 at the University of Western Australia, where she studied how juvenile male bottlenose dolphins develop social and vocal alliance behaviors that are important for their adult reproduction. Thanks to the efforts of Katy and our SBLN contractor, Cecilia Thompson, the SBLN has recovered from past hurricane damage and all stations are now operating simultaneously for the first time! Cecilia recently moved to Scotland to undertake a masters degree in marine mammal science at the University of St Andrews, where some of our SBLN research partners are based.

The SBLN supports the SDRP's training of interns and other trainees, student projects at collaborating colleges and universities, and outreach to K-12 students and the general public. As part of our outreach in 2023, Cecilia attended the SEAMAMMS conference to present her SBLN work identifying the major sources of sound in Sarasota Bay. SDRP interns and trainees now regularly participate in SBLN activities (photo below), providing experience

Katy Holmes, intern Ana Fernandes Costa, and Cecilia Thompson install a hydrophone in a protective pipe sleeve at the SBLN's station in New Pass.

F213 swims by Katy Holmes and Katie McHugh as they reinstall a listening station near Palma Sola Bay after Hurricane Idalia.

with PAM, which is an increasingly important tool for management of shallow-water marine ecosystems. Laela Sayigh, an SBLN board member, uses data from the network to teach high school students to identify whether tonal sounds are dolphin whistles and to match signature whistles (dolphin "names") to a catalogue of signatures of known individuals. The SBLN also engages with high school students through the CZS King's Scholars Program. At New College of Florida, which now hosts one of our PALS, SBLN board member Athena Rycyk supervises SBLN-related student projects, including an undergraduate honors thesis by Vivian Cargille (page 40).

In the most recent SBLN-related publication, Emma Longden and coauthors investigated effects of the COVID-19 pandemic restrictions on vessel traffic and dolphin presence at two sites in Sarasota Bay. Whereas many urban environments became quieter during the pandemic, vessel traffic markedly increased at one of the Sarasota study sites. Contrary to expectations, dolphin presence did not decrease at this site, but did decrease at the other site, where vessel traffic remained the same. The authors suggest that since the pandemic did not have uniform effects on human noise and animal presence on this local scale, we should not assume they were uniform at larger scales. This study demonstrates how the SBLN can be used to monitor the interactions between animal presence and noise, and we are working to increase its monitoring capabilities. To do this, we are collaborating with SBLN board member Frants Jensen at the University of Aarhus in Denmark to develop better methods for detecting different species, and even individual dolphins, with machine learning algorithms. We are also fundraising with the Sarasota Coast Acoustic Network (SCAN, see page 33) to expand the area that both networks cover. SBLN and SCAN can collectively detect dolphins, manatees, sharks, rays and other fish, and invertebrates such as snapping shrimp and whelks, as well as boat traffic. With a joint expansion of these networks, we will have a greater ability to monitor animal movements and responses to natural and human-caused stressors.

New AI tools for recognizing individual bottlenose dolphins by their distinctive signature whistles

Frants Havmand Jensen, Aarhus University, Laela S. Sayigh and Evan Morrison, Woods Hole Oceanographic Institution, Vincent M. Janik and Peter L. Tyack, University of St Andrews, Piper Wolters, Allen Institute of AI, Gracie Ermi, Impact Observatory, Louisa van Zeeland, Scott Smith, and Sam McKennoch, EarthSense AI

Bottlenose dolphins produce individually distinctive signature whistles that have highly stereotyped time-frequency patterns. Plots of frequency against time, called spectrograms, allow human analysts to differentiate signature whistles from different dolphins, which offers great potential for monitoring populations of dolphins through their individually distinctive sounds. However, the process takes carefully trained analysts and extensive time. Over the last few years, we have worked with a team of AI engineers to develop deep-learning based AI algorithms that can detect the same time-frequency patterns in spectrograms. Leveraging a novel benchmarking dataset composed of hundreds of signature whistles recorded with suction cup hydrophones from 70 different individual bottlenose dolphins, the team was able to train a deep learning model to automatically recognize the signature whistles of each of these animals.

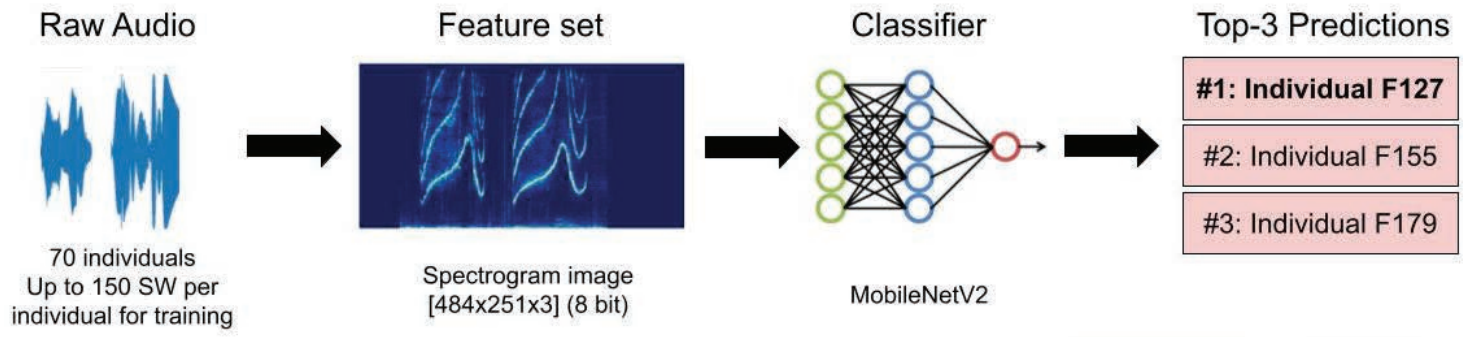
To do this, the team used a MobileNetV2, an efficient deep learning framework. The network was trained on spectrogram images generated from each of these whistles, but subtle variation was introduced artificially to make the network more robust to natural variation in signature whistles as well as variations in naturally occurring background noise conditions. Following an intensive training and testing process, the AI model was able to correctly classify 96% of bottlenose dolphin signature whistles, an accuracy that is hard to match even with trained acoustic analysts.

Importantly, we also showed that we can achieve good model performance even with very few signature whistles if we synthetically simulate natural variation during the training process. This is important to scale up these tools to work with individuals for which only very limited data are available, and thus to cover a large fraction of the natural population.

These tools will help contribute to conservation and management of dolphins both within the Sarasota community and beyond. In Sarasota, the expanding network of Passive Acoustic Listening Stations located in strategic areas allow for collecting acoustic data and eavesdropping for the signature whistles of specific animals. The integration of these new deep learning algorithms enhances our ability to monitor these dolphins effectively and will soon help us track movements of well-known individual animals remotely as they move around their natural habitat.

Part of the AI team has founded EarthSenseAI, a nonprofit organization fiscally sponsored by WildMe and working to facilitate worldwide animal conservation through innovative application of AI technologies.

Left to Right: Frants Jensen, Vincent Janik, and Laela Sayigh during Sarasota health assessments.



An overview of the data processing, feature extraction and model inference using new AI algorithms capable of recognizing individual bottlenose dolphins with high accuracy.

Expanding the Sarasota Coast Acoustic Network (SCAN) to monitor fish movements in Palma Sola Bay

Krystan Wilkinson, Kim Bassos-Hull and Elizabeth McCabe, Chicago Zoological Society's Sarasota Dolphin Research Program

The Sarasota Coast Acoustic Network (SCAN) is made up of more than 80 underwater acoustic receivers in and near Sarasota Bay, Florida and is a collaborative research project with partners from Sarasota Dolphin Research Program, Mote Marine Laboratory, New College of Florida, Florida Atlantic University-Harbor Branch Oceanographic Institute and other Florida-based institutions. How do acoustic receivers work? When an animal is tagged with a small acoustic transmitter and swims near a receiver, the receiver "hears" the transmitter and records the tag ID, date and time. The receivers have to be physically retrieved and downloaded to get the data off of them; we download each station about once per year. SCAN has receivers located in: (1) passes connecting Sarasota Bay to the Gulf of Mexico and Tampa Bay, (2) creek mouths, (3) clam restoration sites, and (4) artificial reefs. This acoustic network collects data which inform us about the movement patterns and habitat use of a variety of tagged animals – some of which are endangered or threatened – such as bull and tiger sharks (common predators of Sarasota Bay dolphins), snook, blacktip sharks, as well as spotted eagle rays and lesser devil rays. This year we will be adding another species to our tagging list – mullet!

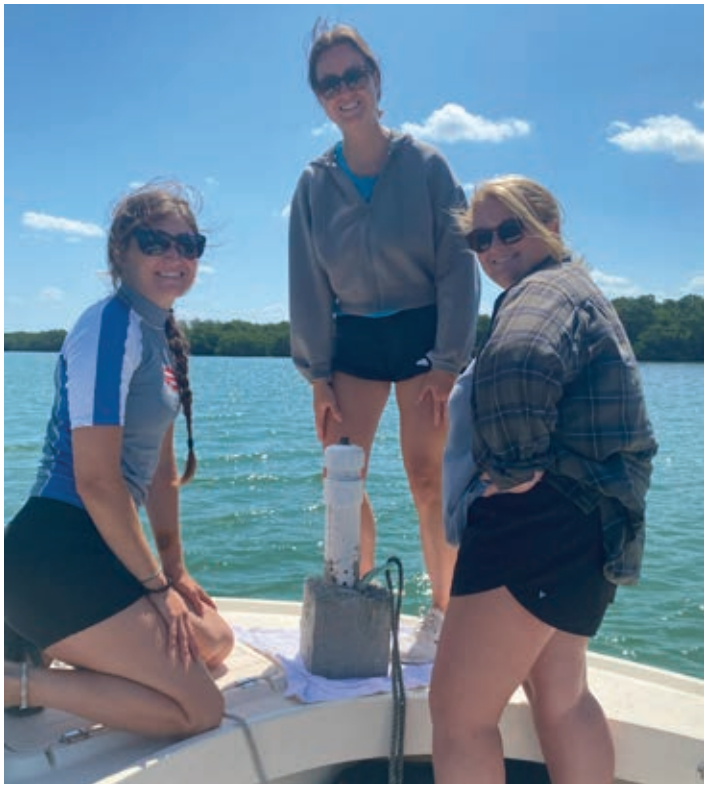
Previous work by the SDRP and colleagues using observations, stomach contents, and stable isotope analyses have identified striped mullet as important prey for resident Sarasota dolphins. The objective of this new project is to collect baseline data on striped mullet movement patterns, space use, and residency in Sarasota Bay. These data are necessary to assess the spatial ecology of dolphin-prey interactions, and to monitor changes in movements and potential refuge areas associated with ecological disturbances, such as *Karenia brevis* red tides. We plan to use a combination of passive and active telemetry that will allow the collection of short-term, fine-scale, precise movement data within the estuary (via active tracking which involves following a tagged fish for a 24-hr period), as well as longer-term, broad-scale movement data throughout the area (via passive tracking with the fixed SCAN receiver array). Eighteen acoustic receiver stations have been added as part of SCAN in Palma Sola Bay to support mullet tracking efforts. Palma Sola Bay was selected for this work as this area is consistently used by Sarasota dolphins, especially mom-calf pairs. Acoustic tagging of mullet will begin this fall.

Sharing the science with research colleagues and resource managers is another important aspect of the work we do with SCAN. This summer, Kim Bassos-Hull traveled to two conferences to present data collected from SCAN

A large school of mullet jumping by Long Bar in Sarasota Bay.

(and the regional iTAG and FACT networks) to highlight spotted eagle ray and devil ray movements. In France, at the International Conference on Fish Tagging (ICFT), she presented research on spotted eagle ray visitation at clam restoration sites in Sarasota Bay. Eagle rays were present at clam restoration sites more often at night compared to daytime, and the highest number of detections occurred at a site in the northeast corner of Sarasota Bay compared to southern sites. In Norfolk, Virginia, at the American Elasmobranch Society (AES) conference, she presented preliminary data on devil ray movements in Florida. Some devil rays tagged off Sarasota were found to migrate to Florida's Panhandle region in fall/winter months and return to the west coast of Florida in summer.

We would like to thank Mote Scientific Foundation and an anonymous donor through the Chicago Zoological Society for their generous support for the development of SCAN and for funding the 2023 receiver downloads and mullet tagging project.



SDRP interns helping to deploy acoustic receivers in Palma Sola Bay.

Proving a new method for determining bottlenose dolphin diet using fatty acid analyses

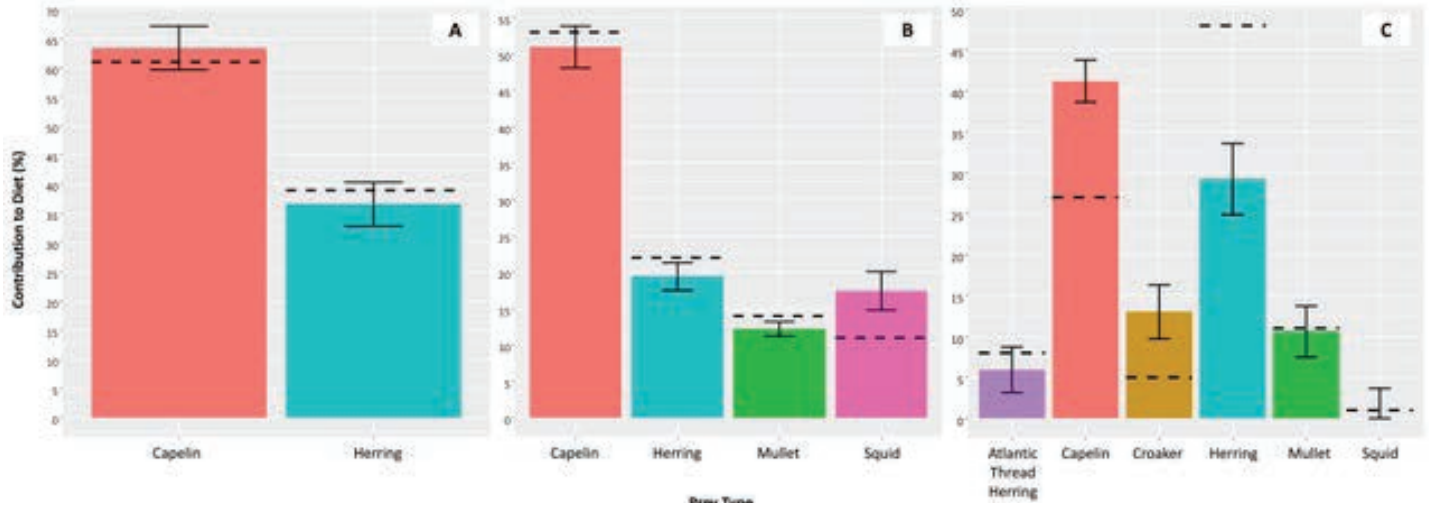
Theresa Tatom-Naecker, University of California, Santa Cruz, and Chicago Zoological Society's Sarasota Dolphin Research Program

My PhD research is focused on the validation and application in bottlenose dolphins of quantitative fatty acid signature analysis (QFASA), a method for determining a marine mammal's diet from dolphin blubber samples. In the past year, I have shown that the method can successfully estimate the proportions of different prey species that bottlenose dolphins under professional care have eaten over the span of several months, opening this method for use in free-ranging dolphin populations and allowing me to move forward with the second part of my dissertation research.

As scientists, we have several key techniques for indirectly figuring out what marine mammals like bottlenose dolphins eat, including 1) analyzing the hard parts (fish bones, squid beaks, shrimp tails, etc.), 2) analyzing DNA found in their fecal and stomach content samples, 3) determining the proportions of bone and muscle stable isotopes that indicate the environments and trophic levels where they are feeding, and 4) comparing the fatty acids in their prey to the fatty acids in their fat storage tissues. My dissertation focuses on the last method, QFASA. When dolphins consume their prey, certain fatty acids (chains of carbon, hydrogen, and oxygen atoms that form the building blocks of fat and energy storage in mammals, including humans!) are transferred from the prey into the thick layer of blubber (fat storage tissue) beneath a dolphin's skin, where the fatty acids remain for several weeks to months. Scientists can then estimate the proportions of different prey species that a dolphin ate over those weeks to months by taking a tiny piece of blubber and samples of possible prey fish, using several lab analyses to measure the amounts of different fatty acids (known as fatty acid signatures) in the tissue samples, and applying mathematical models to compare the fatty acid signatures in the prey and dolphins. However, while QFASA has successfully been used to estimate diet in pinnipeds (seals and sea lions), polar bears, and killer whales, it has not yet been validated in bottlenose dolphins.

I have now applied QFASA to bottlenose dolphins in professional care, with known diets, and demonstrated that it's accurately estimating their diets. In collaboration with my home institution, the University of California Santa Cruz, and Dalhousie University, I applied the QFASA method using fatty acid signatures of samples of blubber and prey fish from three US Navy dolphins, generously donated by the National Marine Mammal Foundation. The dolphins had known diets of varying complexity, including 1) 61% capelin and 39% herring, 2) 53% capelin, 22% herring, 14% mullet, and 11% squid, and 3) 27% capelin, 48% herring, 11% mullet, 1% squid, 8% Atlantic thread herring, and 5% croaker. Total errors for the estimated diets compared to the actual diets were 4.77%, 12.87%, and 44.50%, respectively (see graph below). Increasing error as diet complexity increases is unfortunate but expected: more prey species raises the possibility that similarities in their fatty acid signatures will make it harder for the QFASA model to distinguish between them and accurately estimate their diet proportions. However, QFASA's ability to identify all prey and their relative proportions supports the validity of this method in bottlenose dolphins and makes it available for use in free-ranging bottlenose dolphins.

This sets the stage for the next part of my dissertation research, where I will apply QFASA in the Sarasota Bay dolphins and use the detailed, long-term diet estimates that it provides to quantify how dolphin diet varies under normal conditions and when prey availability changes during and after harmful algal blooms. This will elucidate dolphin vulnerability and adaptability to short-term disturbances while also making it easier to predict and mitigate the impacts of future short- and long-term disturbances, such as those associated with global climate change.

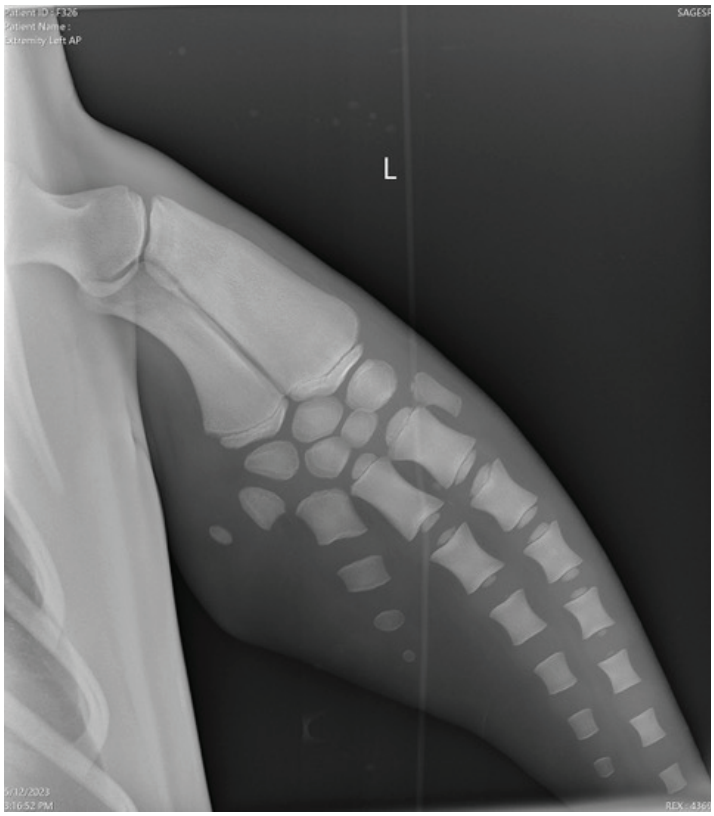


QFASA diet estimates (with standard error bars) for three bottlenose dolphins (panels A, B, C) with known diets of different complexities. Dashed lines indicate known dolphin diet.

Pectoral flipper radiography to facilitate age estimation

Ashley Barratclough, National Marine Mammal Foundation, and Daniel Garcia Parraga, Fundación Oceanogràfic

We continued to perform x-rays on pectoral flippers to estimate the ages of the dolphins during the May 2023 health assessments. Usually most dolphins in Sarasota are already of known age due to the extensive (and impressive!) long-term photo-ID surveys conducted all year round. This year, however, we had the privilege of examining a dolphin (nick-named "Squirt") who was recently arrived and previously unknown to the Sarasota team, so finding out his age was really important. As you can see in the image below, his radiograph shows that his growth plates between bones are still open, which means that he is sexually immature. From our pectoral flipper-aging protocol we estimated the young male's age to be 4.4 years. We are continuing to apply this new technique to wild dolphins, replacing the previous approach of learning ages from growth layer groups in teeth. We recently published a comparison of this method to the tooth-age estimation technique, which can be found open access in Frontiers in Marine Science (Barratclough et al., 2023).



Above: Flipper radiograph (x-ray image) of bottlenose dolphin "Squirt" indicating an estimated age of 4.4 years. Thanks to Shelly Marquardt, Mike Walsh and Vet Rocket for the radiograph.

Tag-based measurements of hearing in free-swimming wild dolphins

Adam B. Smith and Magnus Wahlberg, University of Southern Denmark

Hearing is a vital sensory modality for dolphins. They use their sense of hearing to gather information about the environment which can be used for orientation, predator and prey detection, and social or reproductive communication. Thus, auditory research is an important component of understanding dolphin biology and behavior and has been an important component of cetacean conservation efforts. For example, studying the hearing of dolphins helps us better understand how man-made noise can have negative impacts on them.

One of the primary ways we can study dolphin hearing abilities is to measure specific auditory brain signals, called Auditory Evoked Potential Responses (AEPs), using non-invasive electrodes embedded in suction cups that are attached to the surface of a dolphin's skin. Typically, AEPs are collected from animals under direct human care, either as trained subjects or subjects that have stranded and are undergoing rehabilitation. Such circumstances allow us to measure these auditory brain signals from individuals that are lying still or motionless, which makes it easier to separate the neural responses of the hearing system from neural signals generated by other parts of the body. Yet such stationary circumstances don't fully reflect the natural and complex acoustic scenes encountered by dolphins in the wild. Thus, to better understand how the hearing system of dolphins performs within the complexities of the natural environmental soundscape, we are developing new methods to measure AEPs from freely-moving individuals in the wild.

For the past few years, we've been collaborating with the Sarasota Dolphin Research Program to use non-invasive, suction cup tags to record AEPs from free-swimming, wild dolphins. During the 2023 health assessment effort in Sarasota Bay, we successfully tagged three dolphins with a specialized AEP-tag, which recorded data for three hours from each dolphin as they explored their natural environment. While the analysis is ongoing, we expect this data will give us a unique insight into how the highly specialized auditory system of dolphins is performing during their natural behavior.

Right: AEP-tag on a bottlenose dolphin in Sarasota Bay in 2023.

Education, Outreach, and Training

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 and displays at the Chicago Zoological Society's Brookfield Zoo and elsewhere, articles and interviews, and through volunteering and citizen scientist opportunities. We also produce books for the general public and students. For more information on our program's books and publications, please visit www.sarasotadolphin.org.

In response to an increase in dolphins taking bait, catch and discarded fish from anglers, we worked with NOAA Fisheries Service, Hubbs-Sea World Research Institute, Disney Conservation Fund, 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. The cards are available in English and Spanish as downloads through the SDRP website at: sarasotadolphin.org/videos-and-downloads/.

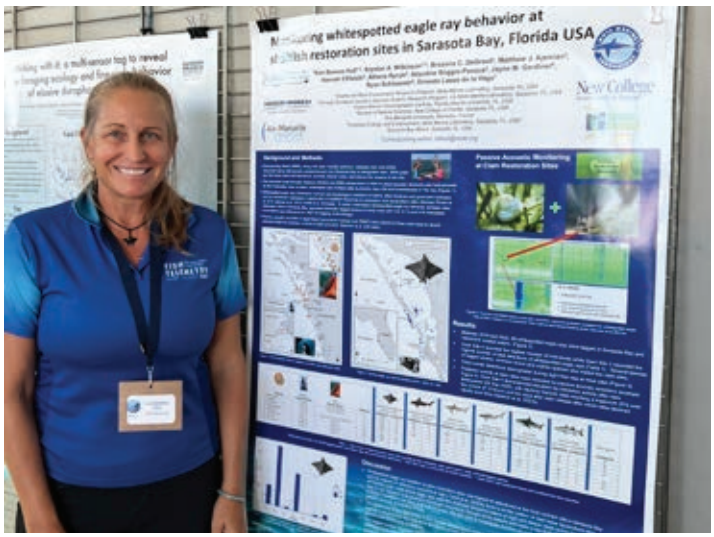
As a complement to the cards, we helped to develop a 30-second public service announcement (PSA), "Don't Feed Wild Dolphins." This animated PSA highlights the dangers of feeding wildlife, along with ways that members of the public can interact with wild dolphins in a more responsible manner. This PSA, along with brief (2-8 min) educational videos we have produced about dolphin conservation and biology, are available through the SDRP website, at sarasotadolphin.org/videos-and-downloads/.

We are now participants in the Science and Environment Council of Southwest Florida's Watershed Audio Tour. This program features stops at sites across Sarasota and Manatee Counties, where stands with interpretive materials provide phone numbers that lead to more detailed descriptions. Each stop delivers watershed highlights, interesting facts, and suggestions for easy ways to help protect watersheds. While the tour can be accessed free from anywhere, visiting the featured locations at outdoor sites provides listeners an up-close and personal experience. Stops describing the dolphins of Sarasota Bay have been installed at Nora Patterson Park at the north end of Siesta Key, and at Historic Spanish Point. More information is available at: http://watershedtour.org/.

If you have not visited our website sarasotadolphin.org recently, you should take a look (and listen). Links to our publications are now provided (sarasotadolphin.org/publications). The dolphins that have been featured as "Fin of the Month" in our e-newsletters over the years are compiled on the website, and in addition to photos and background information, recordings of their signature whistles have also been provided by our collaborator, Laela Sayigh (sarasotadolphin.org/meet-dolphins). Check out sarasotadolphin.org/learn/fun-facts!

Sharing scientific findings and participation on international and governmental 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 working groups and panels such as the U.S. Marine Mammal Commission Committee of Scientific Advisors on Marine Mammals, the NOAA/USFWS Atlantic Scientific Review Group, the NOAA/NMFS Bottlenose Dolphin Take Reduction Team, the U.S. Animal Telemetry Network, the Florida Marine Debris Reduction Guidance Plan Working Group, and the IUCN Cetacean Specialist Group.



Kim Bassos-Hull presenting her poster in France at the International Conference on Fish Telemetry in June 2023.

Sarasota health assessments 2023 processing team, of which several students from the College of Charleston learned valuable sample processing skills in the field.

Graduate Students

As described throughout this newsletter, graduate students from a variety of institutions involve the resources of our program as they conduct their thesis or dissertation research. To date, 51 octoral dissertation and 47 master's thesis projects have benefited from association with our program, through field research opportunities or access to data, samples, or guidance. Over the past year seven doctoral students and two Master's students have been making use of resources provided by the SDRP:

Doctoral Dissertations – Underway

Adamczak, Stephanie. In progress. A dynamic state model for assessing the population-level consequences of acoustic disturbance on oceanic dolphins. Doctoral dissertation. University of California, Santa Cruz.

Asplanato, Natalia. In progress. Abundance, spatial and temporal distribution and trophic ecology of Burmeister's porpoise, *Phocoena spinipinnis*, at the Beagle Channel, Argentina. Doctoral dissertation. Universidad de Buenos Aires, Facultad de Ciencias Exactas y Naturales, Departamento de Ecología, Genética y Evolución.

Boggio-Pasqua, Atlantine. In progress. Life history, spatial ecology and population genetics of the West Atlantic pygmy devil ray (*Mobula hypostoma*). Doctoral dissertation. Aix-Marseille University, France.

Casoli, Marco. In progress. Mating strategies in bottlenose dolphins: fine-scale behaviour and acoustics during male-male and male-female interactions. Doctoral dissertation. University of St Andrews, Scotland.

Dziobak, Miranda. In progress. Investigating trophic exposure to microplastics and phthalates in bottlenose dolphins: could seafood consumers be at risk? Doctoral dissertation. University of South Carolina.

Tatom-Naecker, Theresa-Anne. In progress. Quantitative fatty acid analysis in bottlenose dolphins: Technique validation and application. Doctoral dissertation. University of California, Santa Cruz.

Young, Jordann. In progress. Maternal bioenergetics and reproductive success in bottlenose dolphins. Doctoral dissertation. University of California, Santa Cruz.

Masters Research Projects - Underway

Bankhead, Kyra. In progress. The diffusion dynamics of human-induced food provisioning on Sarasota dolphins. Master's thesis. Oregon State University.

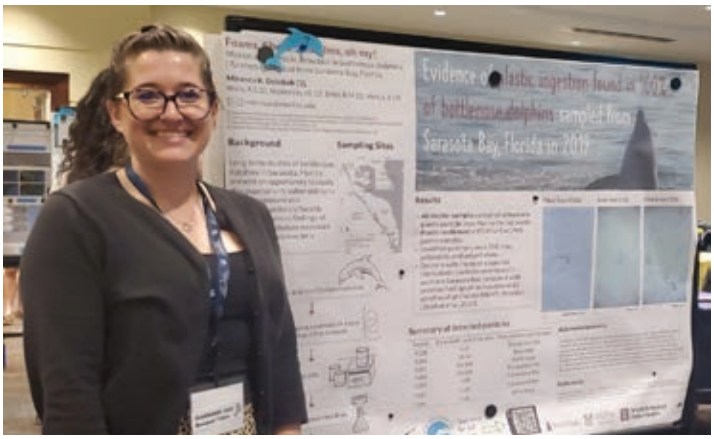
Knight, Maggie. In progress. Characterization of phthalate metabolites in the blubber of common bottlenose dolphins (*Tursiops truncatus*). Master's thesis. College of Charleston.

New College of Florida's Master's in Marine Mammal Science – a work in progress!

Heidi Harley, New College of Florida

New College of Florida is excited to announce that we are currently working on creating a Master's program in Marine Mammal Science. The program builds on New College's long-standing history of successfully supporting student research, our accomplished and varied marine mammal faculty (Professors Gordon Bauer, Peter Cook, Heidi Harley, & Athena Rycyk), our location on Sarasota Bay, and our strong partnerships within and beyond Sarasota including the remarkably productive Chicago Zoological Society's Sarasota Dolphin Research Program.

The 2-year Master's program will take an interdisciplinary approach by including research in behavior, acoustics, cognition, neuroscience, and more, with the goal of producing adept scientists who will have logged experience with the same species (bottlenose dolphins and/or manatees) both in the wild and under human care. Every student will design a study, collect and analyze data, and produce a thesis, as well as strengthen their ability to communicate to a wide variety of audiences across different media. We expect our graduates will leave the college ready to work in research programs, zoos and aquaria, non-profits, national parks, agencies, as analysts, and to enter reputable Ph.D. programs around the world.



Miranda Dziobak presenting her poster at the Southeast and Mid-Atlantic Marine Mammal Symposium in Mobile, Alabama.

Kyra Bankhead while out on a photo-ID survey in Sarasota Bay.

Grad Student Update – Where are they now?

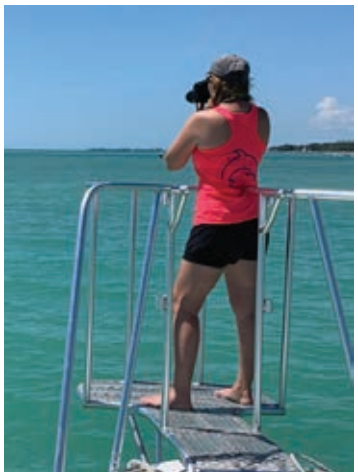
Krystan Wilkinson, Chicago Zoological Society's Sarasota Dolphin Research Program

Sometimes when you know, you know. For example, when I did a book report on Dr. Eugenie Clark (aka "The Shark Lady" and founder of Mote Marine Laboratory) in third grade, I knew I wanted to be a marine biologist. And when I began interning for the Sarasota Dolphin Research Program (SDRP) in 2011, I knew this was the place for me to become one.

Interning with SDRP was my first opportunity to experience field-based research. I enjoyed photo-ID surveys and learning about the individuality of the Sarasota dolphins. Participating in dolphin prey fish sampling was a way to explore what was beneath the water, and it was fascinating to see the diversity of fish in the Sarasota estuary. After my internship ended, I wasn't ready to leave so I extended my stay and assisted with additional research. Dr. Katie McHugh had a new project starting which involved following a well-known Sarasota dolphin named "Beggar" to better understand human-wildlife interactions and ways to mitigate these interactions. Beggar, in particular, was most often seen engaging in begging and sometimes dangerous behaviors. At the same time, Kim Bassos-Hull was also looking for assistance with spotted eagle ray research (in collaboration with Mote Marine Laboratory's Shark and Rays Conservation Research Program) to better understand their seasonal presence, habitat use and collect baseline life history information on this data-deficient marine ray species. Both projects provided me opportunities to explore various aspects of wildlife ecology – specifically, species interactions and movement patterns – themes that still are central to my research today. Additionally, I received mentorship from two outstanding scientists whom I still have the honor of calling friends and colleagues.

When Dr. Randy Wells offered me a graduate student position with the lab, I don't think I could have said "yes" faster. Starting research on shark-dolphin interactions in Sarasota seemed like a no-brainer for me – sharks were my childhood passion thanks to the book report on Dr. Clark and every other report I had to write for school which I always somehow made about sharks – and my recent research experiences as an intern with SDRP and Kim solidified my excitement for this research topic.

Thanks to an anonymous donor through the Chicago Zoological Society (CZS), which helped fund my graduate work, I completed my MSc and PhD at the University of Florida and was co-advised by Randy and Dr. Bill Pine. I credit Bill for inspiring my enjoyment of data analysis and R-coding. To this day, he continues to help me sharpen these skills and data analysis continues to be an enjoyable part of my job. Following grad school, I began my post-doc with CZS-SDRP which allowed me to expand my research interests in species interactions and movement behavior by (1) acoustically tagging sharks (in collaboration with Mote Marine Laboratory's Sharks and Rays Conservation Research Program) to better understand their movement and habitat use in the Sarasota area, (2) collecting diet information from sharks, dolphins and marine rays to better understand competition for shared food and habitat resource needs, and (3) examining how disturbance events (such as increasing water temperatures, red tides, hurricanes) may influence changes in species interactions and movements. For example, following a severe red tide in 2018 – killing many fish and stingrays in the area – we saw a spike in fresh shark bites on the Sarasota dolphin community which we hypothesize may have been driven by a lack of other food resources. I would like to extend my heartfelt appreciation to Mote Scientific Foundation for funding much of my post-doc research and their continued support for recent projects.



Taking photos during a SDRP dolphin survey.

Krystan as an intern with a spotted eagle ray pup.

I am now a staff scientist with CZS-SDRP and I couldn't be more grateful. I am so thankful for Randy's guidance and patience throughout my journey with SDRP and for the many mentors, collaborators and friends I have made while with this incredible program. I am honored to have the opportunity with CZS-SDRP to mentor students working with the program. The marine animals in Sarasota continue to inspire me and I value my time on the water with them. The work of the SDRP and its collaborators is essential for ensuring a future for this beautiful ecosystem, and I appreciate that I am able to contribute.

Getting ready to sample a sandbar shark.

Intern Program

During 2023, 18 full-time interns from the USA, Argentina, Brazil, Cambodia, Canada, Italy, Kenya, and Norway trained with the SDRP on field and lab techniques for monitoring dolphins and their prey via photographic-identification, purse-seining, and passive acoustics. These interns contributed more than 6,700 hours towards our research, learning with us via the CZS College Internships program, Eugenie Clark Field Research Skills and Leadership Program, and the Office of Naval Research-funded Internships Program for Diversity and Inclusion in Marine Mammal Science. We are especially grateful to Mote Scientific Foundation for funding support towards intern housing, travel, and living expenses, which allowed us to begin to provide $3,000 stipends to CZS interns this year. This support will be continued by the Charles and Margery Barancik Foundation for the next two years. Some international interns/trainees were also supported by Dolphin Quest and Dolphin Biology Research Institute.

Chicago Zoological Society's King Scholars visit the SDRP

Katie McHugh and Jason Allen, Chicago Zoological Society's Sarasota Dolphin Research Program

At the end of July, 2023, a group of high school students with the Chicago Zoological Society's King Conservation Science Scholars (KCSS) program had the opportunity to visit Sarasota for a week to assist with the SDRP's long-term dolphin conservation research. The trip was the culmination of Brookfield Zoo's 2022-2023 Marine Mammal Research Expedition, a six-month program that focused on bottlenose dolphins and cetacean field research topics and methods. The expedition was a collaboration between the SDRP and the KCSS program, which gives about 250 Chicago-area high school students opportunities to learn about animals and conservation, develop leadership skills, and make a difference in their communities — all while preparing for college and future careers.

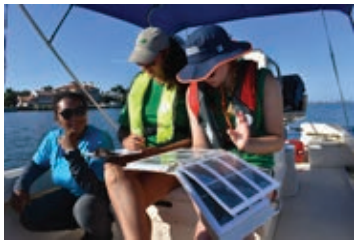
Marine Mammal Research Fellows with the CZS King Conservation Science Scholars program learn how to collect dolphin population monitoring survey data with SDRP lab manager Jason Allen.

During fall of 2022, eight King Scholars were selected to become Marine Mammal Research Fellows. Beginning in January 2023, they attended workshops at Brookfield Zoo and online that covered topics such as cetaceans and their ecosystems, bottlenose dolphin natural history, research methods, and study design. They received virtual and hands-on training with the Zoo's marine mammal care specialists who work with the dolphins at Seven Seas and had a virtual training with SDRP staff who prepared them for the field work they would be doing in Florida. Each teen also completed and presented an independent research project.

In late July, the Fellows flew to Florida to spend a week with the SDRP team. Their visit was coordinated by SDRP lab manager Jason Allen and KCSS manager Chris Connor, and included several days out in the field as well as time learning photographic-identification and data processing in the lab. Three days were spent on research vessels in Sarasota Bay scanning the water for dolphins and recording data on dolphin behaviors and location, as well as environmental conditions, and any adverse human interactions observed. Fellows learned basic photo-ID survey techniques and got to practice taking ID photos of the dolphins in the field. The students also spent two days in the lab, learning how the data they collected on the boat were organized in the SDRP's long-term databases, and using software to map the route their vessel took each day. They also got to practice identifying the dolphins they photographed by comparing dorsal fin nicks and notches against SDRP's dorsal fin identification catalog and learned more about monitoring dolphins using passive acoustics by visiting a listening station with our Sarasota Bay Listening Network manager, Katy Holmes. They also got to spend some time visiting Mote Marine Laboratory and Aquarium, where our SDRP offices are based.

The SDRP was happy to be able to provide this unique opportunity for Chicago-area high schoolers to obtain hands-on experience with field conservation research and hope our collaboration with KCSS continues in the future. The King Conservation Science Scholars program is made possible by the King Family Foundation; the United States Department of Education; BNSF Railway Foundation; CDW Corporation Charitable Gift Fund; Nalco, an Ecolab Company; Peoples Gas Community Fund at the Chicago Community Foundation; and Wintrust Financial Corporation.

Fellows practice identifying dolphins in our long-term photo-ID catalog.



High school students with CZS King Conservation Science Scholars work with CZS-SDRP college intern Ana Fernandes Costa to record photo-ID survey data.

Eugenie Clark Field Research Skills and Leadership Program

Krystan Wilkinson, Chicago Zoological Society's Sarasota Dolphin Research Program

In May 2023, we welcomed four participants for the second year of the 10-week Eugenie Clark Field Research Skills and Leadership Program. The goal of this fellowship program is to help early-career scientists from under-represented groups gain hands-on experience in shark, ray, and fish science. With support from Mote Scientific Foundation, Maxwell Foundation and the Manatee County Community Foundation, we provided a scholarship-based course designed to train participants in a variety of commonly used field research techniques. The Fellows learned first-hand how to safely catch-sample-and-release sharks and rays, participated in purse seine activities during dolphin prey fish sampling surveys, and helped service underwater acoustic receivers as part of the Sarasota Coast Acoustic Network (SCAN). They also developed and delivered shark, ray and ocean conservation-themed educational content to school groups and the public. For the first time we were also able to fund travel and registration costs for Fellows to attend the American Elasmobranch Society conference which was held in Norfolk, VA. This was a great opportunity for the Fellows to build their professional networks. SDRP staff scientist Krystan Wilkinson was one of the co-founding program mentors, along with Dr. Jayne Gardiner (New College of Florida), Jasmin Graham (Minorities in Shark Science), and Tonya Wiley (Havenworth Coastal Conservation).

Meet the 2023 Clark Fellows (from top to bottom of stairs on the R/V Eugenie Clark*): Aimee Mendoza, Heidy Martinez, McKenzie Zapata, and Maggie Rodriguez.*

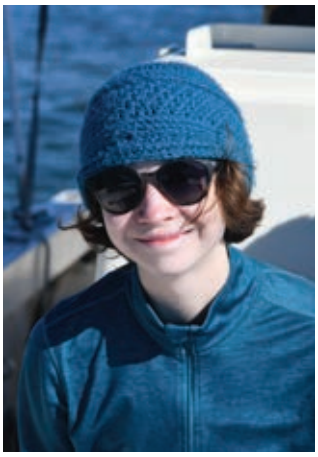
Intern Perspective

Vivian Cargille, New College of Florida

When my college career coach mentioned "students even get involved in dolphin research" as an example of an interesting program that some science students apply for, I decided to learn more about the SDRP and its work. A year later, during a one-month internship with the SDRP, I underwent a crash course in photo-ID, field work, and just how cold a 60 degree air temperature is when you're out on the water.

I was taken aback by the sheer scale of the SDRP's work. I got to see how the previous rescue of one female dolphin has now resulted in two subsequent generations of dolphins when I saw that dolphin's daughter with her own calves. The enormity of fifty years of data became evident when I was moving around health assessment files from dozens of binders and I was fascinated by not only the vast array of data the SDRP has collected, but how all the types of data overlap and interact to paint an in-depth and vital portrait of the Sarasota Bay ecosystem and what is required to keep it healthy and thriving.

Acoustics became my area of special interest after processing signature whistle classification through both my SDRP internship and a tutorial class. I was able to return to the SDRP for a full summer internship and collaborate for my undergraduate thesis on signature whistle detection/classification methods with Sarasota Bay Listening Network recordings.



Although the SDRP has learned an incredible amount about the resident dolphins, so much remains to be uncovered through their extensive research. I am and will always be grateful for the opportunity to learn from and work alongside the exceptional and dedicated scientists of the SDRP. I look forward to continuing and expanding this pursuit through my graduate studies and research.

Above: Vivian Cargille while out on a chilly January photo-ID survey.

Right: Vivian Cargille with SDRP interns and Clark Fellows during prey sampling in June 2023.

Intern Update – Where are they now?

Jess Ozog

My time as an intern with SDRP in 2019 was truly invaluable and gave me the necessary experience and tools to grow as a marine mammal scientist. The chance to be involved with so many different aspects of research, such as photo-ID, focal follows, biopsy sampling, and prey fish purse seining, was a fantastic learning opportunity. In addition to the regular research projects going on, the months I spent at SDRP were quite eventful. Within the first month of my internship, the interns had the opportunity to travel to the Everglades with the Mote Stranding Investigations team to assist with a necropsy of what is now known as the Rice's whale. I also participated in two disentanglement efforts of dolphins entangled in fishing line. These experiences really opened my eyes to the threats marine mammals face and the impact human behavior can have on them, which only strengthened my desire to continue working in this field.

Left to Right: Interns Suzanna Mickey, Jess Ozog, Jonathan Crossman, Ella Howell, Shannon O'Neill after a successful disentanglement in Stump Pass in 2019.

After my internship with SDRP ended, life got put on pause a few months later due to COVID. However, I was able to get a position as a Biological Science Technician with the National Park Service at Padre Island National Seashore in Texas working with nesting sea turtles. As much as I enjoyed the adrenaline rush of coming across a nesting sea turtle, I was eager to get back to studying marine mammals. Once the field season ended, I moved to start my Masters in Coastal Environmental Management at Duke University in August 2021.

While at Duke, I gained a better understanding of the intersection of science and policy and developed technical skills in data analytics and geospatial analysis. My master's project focused on the geospatial analysis of species density within marine mammal biologically important areas on the East Coast. In addition to my master's project, I worked with Jess Powell (SDRP graduate student alum) at NOAA Fisheries Southeast Regional Office on a project to model patterns of bottlenose dolphin depredation and scavenging in the

Jess Ozog taking photos during a pilot whale sighting at Norfolk Canyon.

Gulf of Mexico commercial reef fish fishery (manuscript in preparation!). My time at Duke connected me to professors, researchers, and students that all had ties back to SDRP, which just reinforced the influence SDRP has on the marine mammal research community.

After graduating from Duke in May 2023, I moved to Virginia Beach to start a new role as a Marine Scientist/ Technical Project Manager with HDR, Inc. in support of the Navy's Marine Species Monitoring Program. In addition to project management, I also assist with small boat tagging and survey efforts, aerial surveys, data processing and analysis, and drone research for humpback, sperm, and North Atlantic right whales. While all my previous marine mammal field experience has been with bottlenose dolphins, I am excited to expand my work to include large whales and contribute to their conservation and management efforts.

I am extremely grateful for my time spent in Sarasota and for the incredible foundation it has provided for me to grow as a scientist. The guidance and mentorship from SDRP staff are irreplaceable. I will always cherish the relationships I made with the staff and interns, and I am so thankful to have taken part in such an instrumental marine mammal research program.

Jess Ozog with a spotted eagle ray about to be released.

Community involvement in science

Citizen science and Sarasota Bay dolphins: Volunteers and research opportunities

The concept of "citizen science" is nothing new for the SDRP. Back in the 1970's, our tagging and tracking teams were filled out largely with local volunteers. Beginning in 1982 and continuing for the next 25 years, we worked with Earthwatch, an organization that matches interested members of the public with research projects requiring assistance. Some of our more than 1,000 Earthwatch volunteers continue working with us today, providing valuable services and expertise. We regularly involve members of a team of trained local volunteers in our photo-ID surveys, our health assessments, our seasonal fish surveys, and in dolphin rescues.

Sarasota Bay Listening Network opportunities for community involvement

Katy Holmes, Chicago Zoological Society's Sarasota Dolphin Research Program

As our Sarasota Bay Listening Network grows (see page 31), we encourage local coastal residents, educational, and public institutions to become involved! You can contribute by providing waterfront locations for deployment of passive acoustic listening stations (PALS) to add to our current array of 12 stations, and/or support opportunities to use data and sounds from these systems in educational and outreach programming. We are particularly seeking educational and public outreach partners where we can both grow our network and its impact together, while monitoring our shared coastal underwater environment.

Volunteer perspective

Mark Fishman

I was born under the sign of Aquarius. If you believe in astrology, you won't be surprised to learn that I love water. I am happiest when I am in, on, or around the water. Ever since watching Jacques Cousteau's television shows as a child, I became fascinated with undersea life, becoming a certified scuba diver at age 18, over 50 years ago, and have been diving ever since. At Mote Marine Laboratory & Aquarium, I dive in the exhibit tanks and clean the inside. My Bachelor's degree double majored in Biology and Psychology, and during my studies I developed a keen interest in animal behavior and animal communication, particularly marine mammals. I can thank Flipper, in large part, for that.

So, you can imagine my thrill, when while volunteering for Mote, I learned that I could slide over and devote some of my volunteer time to the renowned Sarasota Dolphin Research Program! I remember my first email to Aaron Barleycorn, introducing myself, explaining that I wanted to volunteer for the program. Like a kid who had applied to college, I awaited my "acceptance letter" from Aaron, and smiled from ear to ear when he sent the OK.

Left: Mark Fishman with a southern stingray caught and released during dolphin prey sampling. Right: Mark Fishman brings in the cork line.

Volunteering for SDRP since 2016 not only gets me on the water (my happy place), but also gives me the opportunity to observe these beautiful, intelligent creatures up close and personal. I look forward to my dolphin surveys each month with great anticipation. It always amazes me how well the SDRP staff participating in the population monitoring surveys knows the local dolphin community. They can not only visually identify individual dolphins by their unique dorsal fins, but they know their mother, their grandmother, their kids, and their friends. Amazing! That is the benefit of SDRP being the world's longest running dolphin research program lasting for 50 years and still going strong.

"Fishing" for SDRP is also extremely interesting, rewarding, and physically challenging to a degree. We deploy a large net in a specified area of Sarasota Bay, and collect all the creatures that were caught within it. Each is identified, counted, weighed, measured, and of course, released. Each set is an orchestration. The net has to be set up and stacked exactly right to be sure it deploys properly while the boat drives in a large circle as the net drops off the stern. Generally, we do three to four sets in a day and we know we have done a good day's work when its finished. Again, it's a full day on the water (happy place). The objective is to get a sense of the general health of the Sarasota Bay environment, but specifically, the food availability for the dolphin population. Beside the "bait fish" we hope to find, there are always surprises in what we collect, including stingrays, sharks, sea horses, crabs, and more! Great fun.

One of the many things that SDRP has taught me is that science is much more than the "eureka!" moments we read about. It is hours and hours of tireless data collection. Only when you have the data can you connect the dots, see trends, analyze what it means, and then, finally, learn something new that no one knew before.

Thank you, Sarasota Dolphin Research Program, for giving me the opportunity to participate in actually doing science. It gives me purpose in my retirement, and great satisfaction.

Products

Professional Activities Summary: October 2022 through September 2023

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 annual report, including the relevant work of our collaborators from partner institutions. Copies of specific papers are available through our website (sarasotadolphin.org) or they can be obtained upon request, as electronic pdf files.

Published Peer-Reviewed Journal Articles and Book Chapters

Barratclough, A., W. E. McFee, M. Stolen, A. Hohn, G. Lovewell, F. M. Gomez, C. R. Smith, D. García-Párraga, R. S. Wells, C. Parry, R. Daniels, S. Ridgway and L. Schwacke. 2023. How to estimate age of old bottlenose dolphins (*Tursiops truncatus*); by tooth or pectoral flipper? Frontiers in Marine Science, Marine Conservation and Sustainability, Special Topic: The dolphins of Sarasota Bay: Lessons from 50 years of research and conservation, 10:1135521. https://doi.org/10.3389/fmars.2023.1135521

Cahill, B. V., K. L. McCulloch, B. C. DeGroot, K. Bassos-Hull and M. J. Ajemian. 2023. Breaking bags and crunching clams: assessing whitespotted eagle ray interactions with hard clam aquaculture gear. Aquaculture Environment Interactions, 15, pp.59-71. https://doi.org/10.3354/aei00452

Cahill, B. V., R. J. Eckert, K. Bassos-Hull, T. J. Ostendorf, J. D. Voss, B. C. DeGroot and M. J. Ajemian. 2023. Diet and feeding ecology of the whitespotted eagle ray (*Aetobatus narinari*) from Florida coastal waters revealed via DNA barcoding. Fishes, 8(8), pp.388. https://doi.org/10.3390/fishes8080388

DiMaggio, K. M., M. A. Acevedo, K. A. McHugh, K. A. Wilkinson, J. B. Allen and R. S. Wells. 2023. The fitness consequences of human-wildlife interactions on foraging common bottlenose dolphins (*Tursiops truncatus*) in Sarasota Bay, Florida. Marine Mammal Science 39, 1161-1177. https://doi.org/10.1111/mms.13042

Duffield, D. A. and R. S. Wells. 2023. Paternity patterns in a long-term resident bottlenose dolphin community. Frontiers in Marine Science, Marine Conservation and Sustainability, Special Topic: The dolphins of Sarasota Bay: Lessons from 50 years of research and conservation. 10:1076715. https://doi.org/10.3389/fmars.2023.1076715

Fahlman, A., A. S. Allen, A. Blawas, J. Sweeney, R. Stone, R. Trainor, F. H. Jensen, K. A. McHugh, J. Allen, A. Barleycorn and R. S. Wells. 2023. Surface and diving metabolic rates, and dynamic aerobic dive limits (dADL) in near- and off-shore bottlenose dolphins, *Tursiops spp.*, indicate that deep diving is energetically cheap. Marine Mammal Science, 39(3), 976-993. https://doi.org/10.1111/mms.13023

Fahlman, A., R. B. Tyson Moore, R. Stone, J. Sweeney, R. Faulkner Trainor, A. Barleycorn, K. McHugh, J. Allen and R. S. Wells. 2023. Deep diving by offshore bottlenose dolphins (*Tursiops spp.*). Marine Mammal Science, 1–16. https://doi.org/10.1111/mms.13045

Hart, L. B., M. Dziobak, R. S. Wells, B. Ertel, and J. Weinstein. 2022. Microplastics in gastric samples from common bottlenose dolphins (*Tursiops truncatus*) residing in Sarasota Bay, FL (USA). Frontiers in Marine Science, section Marine Conservation and Sustainability. 9:947124. https://doi.org/10.3389/fmars.2022.947124

Kincaid, A. L., G. M. Lovewell, J. B. Allen, K. Bassos-Hull, J. L. Blackburn, R. A. Hazelkorn and R. S. Wells. 2022. Necrocoitus in common bottlenose dolphins (*Tursiops truncatus*) near Sarasota, Florida. Aquatic Mammals 48(6): 693-702. https://doi.org/10.1578/AM.48.6.2022.693

Longden, E. G., D. Gillespie, D. A. Mann, K. A. McHugh, A. M. Rycyk, R. S. Wells, and P. L. Tyack. 2022. Comparison of the marine soundscape before and during the COVID-19 pandemic in dolphin habitat in Sarasota Bay, FL. J. of the Acoustical Society of America. 152: 3170. https://doi.org/10.1121/10.0015366

Lettrich, M., M. J. Asaro, D. L. Borggaard, D. M. Dick, R. B. Griffis, J. A. Litz, C. D. Orphanides, D. L. Palka, M. S. Soldevilla, B. Balmer, S. Chavez, D. Cholewiak, D. Claridge, R. Y. Ewing, K. L. Fazioli, D. Fertl, E. M. Fougeres, D. Gannon, L. Garrison, J. Gilbert, A. Gorgone, A. Hohn, S. Horstman, B. Josephson, R. D. Kenney, J. J. Kiszka, K. Maze-Foley, W. McFee, K. D. Mullin, K. Murray, D. E. Pendleton, J. Robbins, J. J. Roberts, G. Rodriguez Ferrer, E. I. Ronje, P. E. Rosel, T. Speakman, J. E. Stanistreet, T. Stevens, M. Stolen, R. Tyson Moore, N. L. Vollmer, R. S. Wells, H. R. Whitehead, and A. Whitt. 2023. Vulnerability to climate change of United States marine mammal stocks in the western North Atlantic, Gulf of Mexico, and Caribbean. PLoS ONE, 18(9): e0290643. https://doi.org/10.1371/journal.pone.0290643

Patton, P. T., T. Cheeseman, K. Abe, T. Yamaguchi, W. Reade, K. Southerland, A. Howard, E. M. Oleson, J. B. Allen, E. Ashe, A. Athayde, R. W. Baird, C. Basran, E. Cabrera, J. Calambokidis, J. Cardoso, E. L. Carroll, A. Cesario, B. J. Cheney, E. Corsi, J. Currie, J. W. Durban, E. A. Falcone, H. Fearnbach, K. Flynn, T. Franklin, W. Franklin, B. Galletti Vernazzani, T. Genov, M. Hill, D. R. Johnston, E. L. Keene, S. D. Mahaffy, T. L. McGuire, L. McPherson, C. Meyer, R. Michaud, A. Miliou, D. N. Orbach, H. C. Pearson, M. H. Rasmussen, W. J. Rayment, C. Rinaldi, R. Rinaldi, S. Siciliano, S. Stack, B. Tintore, Leigh G. Torres, J. R. Towers, C. Trotter, R. Tyson Moore, C. R. Weir, R. Wellard, R. Wells, K. M. Yano, J. R. Zaeschmar and L. Bejder. 2023. A deep learning approach to photo-identification demonstrates high performance on two dozen cetacean species. Methods in Ecology and Evolution, Vol 14 (10), Pages 2611-2625. https://doi.org/10.1111/2041-210X.14167

Sayigh, L. S., N. El Haddad, P. L. Tyack, V. M. Janik, R. S. Wells and F. H. Jensen. 2023. Bottlenose dolphin mothers modify signature whistles in the presence of their own calves. PNAS, 120(27), e2300262120. https://doi.org/10.1073/pnas.2300262120

Schwacke, L. H., L. Thomas, R. S. Wells, T. Rowles, G. Bossart, F. Townsend, M. Mazzoil, J. Allen, B. Balmer, A. Barleycorn, A. Barratclough, L. Burt, S. DeGuise, D. Fauquier, F. Gomez, N. Kellar, J. Schwacke, T. Speakman, E. Stolen, B. Quigley, E. Zolman and C. Smith. 2023. An expert-based system to predict population survival rate from health data. Conservation Biology, e14073. https://doi.org/10.1111/cobi.14073

Taylor B. L., G. Abel, D. Bader, J. Barlow, G. Braulik, F. Cipriano, T. Collins, D. DeMaster, L. von Fersen, F. Gomez, Y. Hao, P. S. Miller, G. Minton, R. R. Reeves, L. Rojas-Bracho, E. R. Secchi, C. R. Smith, R. Suydam, D. Wang, R. S. Wells, and A. Zerbini. 2023. Integrated Conservation Planning for Cetaceans. The Zoological Garden, 91:101-112. doi:10.53188/zg0017

Trotter, C., N. Wright, A. Stephen McGough, M. Sharpe, B. Cheney, M. Arso Civil, R. Tyson Moore, J. Allen, and P. Berggren. 2022. Towards automatic cetacean photo-identification: A framework for fine-grain, few-shot learning in marine ecology, arXiv:2212.03646v1. https://doi.org/10.48550/arXiv.2212.03646

Vivier, F., R. S. Wells, M. C. Hill, K. M. Yano, A. L. Bradford, E. M. Leunissen, A. Pacini, C. G. Booth, J. Rocho-Levine, J. J. Curie and L. Bejder. 2023. Quantifying the age-structure of free-ranging delphinid populations: testing the accuracy of Unoccupied Aerial System-photogrammetry. Ecology and Evolution, 13, e10082. https://doi.org/10.1002/ece3.10082

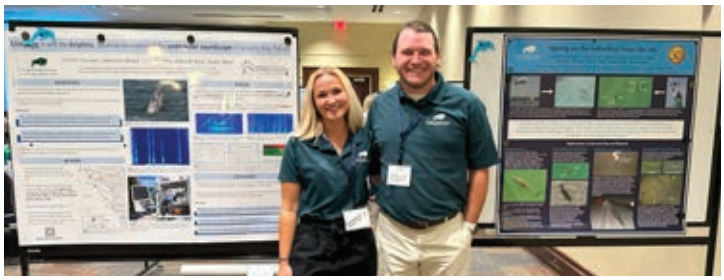
Manuscripts in Press or Accepted for Publication

Hart, L. B., M. Dziobak, R. S. Wells, E. Berens McCabe, E. Conger, T. Curtin, M. Knight and J. Weinstein. In Press. Plastic, it's what's for dinner. A preliminary comparison of ingested particles in bottlenose dolphins and their prey. Oceans, Special Issue: Marine Mammals in a Changing World, 2nd Edition.

Jensen, F., P. Wolters, L. Zeeland, E. Morrison, G. Ermi, S. Smith, P. Tyack, R. Wells, S. McKennoch, and L. Sayigh. In Press. Using a long-term database of bottlenose dolphin signature whistles to develop deep learning-based classification models. The Effects of Noise on Aquatic Life: Principles and Practical Considerations. Springer.

Wells, R. S., and A. Fahlman. Accepted. Human impacts on dolphins: Physiological effects and Conservation. In: The Physiology of Dolphins. A. Fahlman and S. Hooker, eds. Elsevier Press.

Presentations at Professional Meetings (n=21)
Public, University, School Lectures (n=28)



Cecilia Thompson and Jonathan Crossman presenting their posters on bioacoustics and drone work at the Southeast and Mid-Atlantic Marine Mammal Symposium in Mobile, Alabama.

Program Operations

As the lab turns...

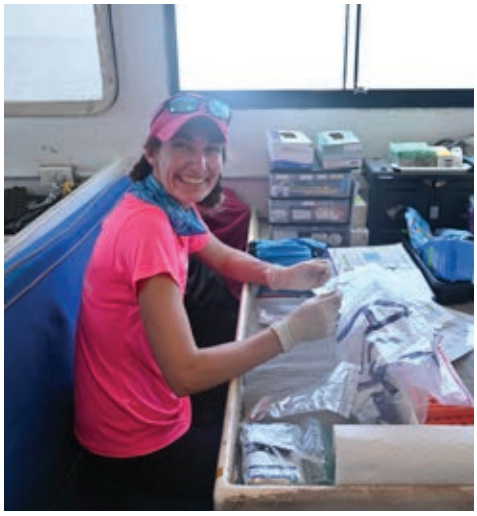
Krystan Wilkinson, Chicago Zoological Society's Sarasota Dolphin Research Program

We have had a few comings and goings this past year…

First, welcome to our newest staff members, Katy Holmes and Robyn Allen! Dr. Holmes earned her PhD in Animal Behavior and Communication from the University of Western Australia with Shark Bay Dolphin Research in 2022. She studied how juvenile male bottlenose dolphins develop social and vocal alliance behaviors that are important for their adult reproduction. And, Katy is an SDRP-alumna! She was an intern with the SDRP in 2012 – we are so happy to have her back serving in her new role as the Sarasota Bay Listening Network Manager.

Robyn Allen joined our staff as a part-time veterinary assistant. Robyn helps with all things related to sample preparation and processing for inshore and offshore dolphin health assessments.

Katy Holmes during offshore health assessments on the DTAG tracking boat.



Robyn Allen processing samples aboard the R/V Eugenie Clark.

Cecilia Thompson on her first day of class at the University of St Andrews.

Cecilia Thompson has officially moved to Scotland to start the next chapter of her career! She will be spending the next year at the University of St Andrews as a graduate student in the MSc Marine Mammal Science program run by the Sea Mammal Research Unit and Scottish Oceans Institute. Cecilia is looking forward to continuing to work with data collected by the Sarasota Bay Listening Network for her graduate research project. She will be working under the joint supervision of Dr. Vincent Janik and Dr. Peter Tyack of the University of St Andrews, as well as with the SDRP team. Cecilia said it was bittersweet to leave Sarasota, but she is enjoying her classes and exploring all that Scotland has to offer.

Christina Toms shared a bit of bittersweet news with us over the summer. "*It is with both sadness and excitement that I share my decision to embark on a new chapter in my career and return to academia. I will start a position as a Visiting Professor with the New College of Florida here in Sarasota during spring 2024. It has been a privilege to work alongside so many talented and brilliant colleagues these past six years. A huge thank you to all who have embraced this animal behaviorist and population ecologist in my novel role as the program's sample processing coordinator. I have learned so much from so many. Team Pink during health assessments will always hold a special place in my heart. This is certainly not a farewell--the SDRP has been an integral part of my career since I was an intern in 2006, and I look forward to continuing the collaborations developed over the years. More importantly, colleagues here have become a surrogate family, which I will always cherish.*" While we will certainly miss seeing Christina daily, we are excited to see her flourish as a professor and are thrilled she will be just across the Bay.

Good luck on your next adventure, Christina! Team Pink will not be the same without you!

Program Operations

Chicago Zoological Society Staff

Jason Allen, BS, Lab Mgr., Senior Researcher
Robyn Allen, BS, part-time Veterinary Assistant
Aaron Barleycorn, BS, Field Mgr., Senior Researcher
Elizabeth Berens McCabe, MSc, Senior Researcher
Jonathan Crossman, BA, Staff Researcher
Carolyn Cush, BS, Research Assistant
Kylee DiMaggio, MSc, Research Assistant
Katy Holmes, PhD, Sarasota Bay Listening Network Mgr.
Allison Honaker, MPS, Research Assistant
Katie McHugh, PhD, Senior Scientist, Deputy Program Dir.
Cecilia Thompson, BS, Contractor
Christina Toms, PhD, Staff Scientist
Randall Wells, PhD, Program Dir.
Krystan Wilkinson, PhD, Staff Scientist

Affiliated Mote Marine Laboratory Staff

Kim Bassos-Hull, MS, Research Associate

Dolphin Biology Research Institute Officers

Ralph Piland, President
Blair Irvine, PhD, Vice President
Michael Scott, PhD, Secretary
Randall Wells, PhD, Treasurer

Interns and Post-Graduate Trainees

Logan Batiste (ONR)
Susana Cardenas (Peru)
Vivian Cargille
Cecilia Costa (Brazil)
Hannah El Halabi (NCF ISP - rays)
Ana Beatriz Fernandes Costa (Brazil)
Chhayhy Heng (Cambodia)
Giulia Luerti (Italy)
Heidy Martinez (Clark)
Aimee Mendoza (Clark)
Ximena Merelle (Argentina)
Mandy Papke
Abby Parker
Stine O. Petersen (Norway)
Jaime Rae (Canada)
Cara Rankin
Maggie Rodriguez Ruiz (Clark)
Thalia Roveira (Kenya/USA)
McKenzie Zapata (Clark)

Local and Returning Volunteers

Dee Allen
Rene Byrskov
Sarah Dill
Mike Duranko
Kristi Fazioli
Mark Fishman
Ramsey Frangie
John Hamilton
Jeff Hollway
Pete Hull
Chuck Isselee
Renee Jones
Carol Joseph
Cathy Marine
Caryl Mason-Carr
Charlie Mericle
Kara Moore
Nigel Mould
Amy Shelton
Bryan Spaulding
Jeff Stover
James Thorson
Bill Tiffan
Martha Wells
Matt Winters
Larry Wolf

Randy Puckett sculptures available

The Sarasota Dolphin Research Program has received donations of several bronze whale and dolphin sculptures produced by renowned artist Randy Puckett: 1) **Encounter**, and 2) **Humpback and Dolphins**. These life-like sculptures are very accurate representations of these animals engaged in typical activities. As much as we appreciate their beauty, we lack space and opportunity to appropriately display these sculptures. We are considering offers from interested parties who could provide them with a good home. If you are interested, please contact Randy Wells at (941) 374-0449. Please see the following descriptions of the artwork from the Whales of Randy Puckett website: (https://www.randypuckett.com/gallery/?Category=Larger%20Groupings)

Title: Encounter
Year Released: 1997 **Edition:** 20 **Price:** $42,000.00
Dimensions: 32"H 60"W 24"D

ENCOUNTER shows a meeting between Bottlenose Dolphins and a Blue Whale mother and calf. It happens in Monterey Bay, and in a few other places on earth where deep waters close to shore create nutrient rich upwelling which cause the tremendous blooms of krill upon which the Blue Whales feed, and the near shore water is warm enough for the bottlenose. Juxtaposing the Bottlenose Dolphins, which are fairly large as dolphins go at 8-12 feet, gives some human perspective to the sheer size of the Blues.

Title: Humpback & Dolphins
Year Released: 1987 **Edition:** 95 **Closing Price:** $8,500.00
Dimensions: 23"H 20"W 18"D

Opportunities for You to Help Dolphin Research and Conservation

Show Your Support for the Chicago Zoological Society's Sarasota Dolphin Research Program

Each year, it costs more than $1 million to fund the Sarasota Dolphin Research Program's important work. The generous support from our partners ensures the continuation of the world's longest-running dolphin conservation research program, and provides our scientists the necessary resources 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.

Your support makes a critical difference for dolphins and their ecosystems. With your help, our team can continue the development of an unparalleled base of knowledge about wild dolphin populations and maintain the SDRP's position as a unique dolphin conservation resource worldwide. For more information on how you can help, or to make a contribution, contact Claire Broadhead, Major Gifts Officer, at (708) 688-8667 or Claire.Broadhead@CZS.org.

Special Thanks

The Chicago Zoological Society is honored to recognize the following donors and funding organizations for their generous contributions from October 1, 2022 – September 15, 2023 to its Sarasota Dolphin Research Program through donations, research grants, and/or contracts.

Research Grants / Contracts

Aarhus University
Charles and Margery Barancik Foundation
The Batchelor Foundation
Clearwater Marine Aquarium
Disney Conservation Fund
Dolphin Biology Research Institute
Dolphin Quest
Fundación Oceanogràfic
Harbor Branch Oceanographic Institute
Minorities in Shark Sciences
Mote Marine Laboratory, Inc.
Mote Scientific Foundation
National Marine Mammal Foundation
National Oceanic and Atmospheric Administration
New College of Florida
Office of Naval Research - Code 32
University of Southern Denmark

Donations

Anonymous
Denise L. Bartolotta
Jennifer Bellini and Scott Richardson
Debbie Caragiulo
Carson Davenport
Elizabeth Dinnin
Jennifer and Mark Duerinck
Claudia F. Fabela
Michelle and Brian Fagan
Geoff Hill
Jeannette Hunneybell
Diane Ledder
Linda Lamberton
Lauren and Chris Marshall
Marilee Menard
Mr. and Mrs. Ira Mirochnick
Ms. Edwina M. Nelon
Kelley C. Schueler
Mr. And Mrs. Jack Shaffer
Charles Siderski
Nancy C. Tameling
Dr. Randy and Martha Wells

SDRP welcomes equipment donations in addition to funds

Donations, including boats, computers, cameras, and vehicles, greatly help with our efforts, and can be made to Dolphin Biology Research Institute (dba Sarasota Dolphin Research Program). DBRI is a Sarasota-based 501{c}3 not-for-profit organization, incorporated in 1982, and is dedicated to continuing our research and conservation of dolphins and their habitat. For more information on how you can help, please contact Randall Wells at (941) 374-0449.

Dolphin Biology Research Institute would like to thank the following contributors for their cash or in-kind donations of $100 or more over the past year, from October 2022 through September 2023:

Anonymous
Jill Allread
Susi and Ralph Arden
Peter Bennett
Ed Blair, Jr.
Leslie Butterfield
Rene Byrskov
Victor Calderon
Boyd Carnal
Catherine and John Connolly
Sonila and David Cook
Jennifer Crooks
Cyber Grants
Kellie Dixon
Mark Fishman
Ramsey Frangie
Jennifer Turner and Rick Gans
Gulf Coast Community Foundation
Thomas Hallman
Don Hamilton
Maxine Handley
Carol Hawkins
Sue Hofmann
International Fund for Animal Welfare
Blair Irvine
Fran and Olvy Johnson
Barbara Jones
Linda Kahn
Kolmården Wildlife Park
Kim and Don Kosmacek
Jan and John Kucklick
Jan and Jerry Lazar
D'Arlene Llewellyn
Gail Lynch
Cathy Marine
Martin Family Trust
Ruth Mickelson and Bill Manning
Alan Mitchell
Elizabeth Moore
Jane and George Morgan
Fred Murphy
Network for Good
Mary Beth Norton
Dianne and Jim Ochiltree
Judie and Peter Ochsner
Jan and Ralph Piland
Howard Rhinehart
Michele and Roger Roark
Debbie and Jim Robinett
Marc Rudow
Anne Saunders
Martha and John Schoeppner
Michael Scott
Sea Grape Foundation
Rob Smallwood
Leonard Tavormina
Pat Terry
Josephine Theakos
Laura and Michael Thompson
James Thorson
Susan Tyler
Robert Van Buskirk
Kathryn Weinrichter
Martha and Randy Wells

People and Partners Make the Program

Dolphin Quest

Charles & Margery Barancik Foundation

NOAA National Oceanic and Atmospheric Administration U.S. Department of Commerce

Chicago Zoological Society
Inspiring Conservation Leadership

FIU Florida International University

Mote Scientific Foundation

National Marine Mammal Foundation

Elizabeth Moore

Mote Marine Laboratory

SERDP DOD • EPA • DOE

fahlo

New College of Florida

Fundación Oceanográfic Valencia

Disney Conservation Fund

University of Southern Denmark

University of St Andrews

State of Florida Institute of Oceanography FIO

Florida Wild 1

Gulf Coast Community Foundation

Clearwater Marine Aquarium

Sarasota Boat Rental by Suntex

The Batchelor Foundation, Inc.

Northern Trust

Community Foundation of Sarasota County

The Sarasota Dolphin Research Program

Chicago Zoological Society
Inspiring Conservation Leadership

Celebrating more than 50 years of dolphin research, conservation, and education