January 2025

Nicks‘n’Notches

Annual Summary of Activities of Brookfield Zoo Chicago’s Sarasota Dolphin Research Program









SARASOTA DOLPHIN RESEARCH PROGRAM

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Sarasota Dolphin Research Program 50 1970 2020 A program of the Chicago Zoological Society

The mission of

Brookfield Zoo Chicago

is to inspire conservation leadership by connecting people to wildlife and nature

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Sarasota Dolphin Research

Conservation Capacity Building by and within the Sarasota Dolphin Research Program

The Sarasota Dolphin Research Program is dedicated to making a positive difference for dolphins and their ecosystems. Our approach to this has a variety of facets. While we are perhaps best known for our research, we also engage extensively in education, outreach, and training, recognizing that it takes people to put our findings to best use for the animals. Whether it be training the next generation of conservation scientists or wildlife managers, or simply helping the general public to understand and care more about their finned neighbors and our shared ecosystem, we have a strong commitment to the people side of the conservation equation. It is also important to make sure that we develop and maintain depth in the bench of our diminutive SDRP team, to be able to continue and enhance all of our programs.

Over the decades, we have engaged more than 1,000 citizen scientists in our research and still maintain an active cadre of trained local volunteers. We have provided training opportunities to more than 200 scientists and students from 52 countries. We have mentored more than 500 undergraduate interns. As one of the strongest examples of our conservation capacity building, 104 graduate students have benefited from association with our program, through field research opportunities or access to data, samples, or guidance. We expect our involvement with local students to grow markedly with our increasing collaboration with New College of Florida, right across the bay from us, via its new Florida Institute of Marine Mammal Science and marine mammal science master's program.

It takes a great deal of work to maintain all of these efforts. Fortunately, we have a wonderful, committed staff, with 69% having worked with us for more than a decade, and nearly half for more than 20 years. From their extensive experience, they know what needs to be done and how to do it, and in many cases they helped to shape our current processes and protocols. In recognition of the tremendous talent, skill, and dedication of our team members, we have been making a concerted effort to encourage and mentor senior staff to take on increasing leadership responsibilities. Field Manager Aaron Barleycorn led catch-and-release efforts this year for health assessments and rescues, as well as coordinating most of our field activities. Lab Manager Jason Allen coordinated activities in the net corral during health assessments, and has taken on increasing database management and administrative responsibilities. Deputy Program Director and Senior Scientist Katie McHugh has become increasingly involved in the scientific direction of the program, as well as with educational programs and learning the complexities of program administration. I am pleased to say that these folks have stepped up and are providing our program with additional options, security, and fresh ideas for how to continue our efforts into the future (and I must admit, it makes my job a bit easier).

Many thanks for caring about the dolphins of Sarasota Bay and beyond, and the people who are trying to help them,

Randy Wells, PhD, Director, 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 2024.

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." This name links the efforts of several organizations and individuals that work together to ensure the continuity of the long-term dolphin research in Sarasota Bay. The SDRP has been operated by Brookfield Zoo Chicago (BZC) 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, including New College of Florida, University of California, Santa Cruz, and others.

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.

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

Randall Wells, Sarasota Dolphin Research Program, Brookfield Zoo Chicago

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 54+ years, staff, students, and collaborators have produced more than 370 peer-reviewed publications (many available at: https://sarasotadolphin.org/publications/), 4 books, and more than 120 technical reports, and we have made more than 935 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, 52 master's and 52 doctoral students have benefited from SDRP data collection opportunities, data, samples, or guidance. In addition, 514 interns have received multi-month training by the SDRP. Foreign participants in our training programs have come from more than 52 countries, and include 80 of the interns, 43 post-graduate scientists, and 138 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 34 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.

Team photo from Sarasota Bay health assessments in May 2024.

Sarasota Dolphin Research Program project summary

Randall Wells, Sarasota Dolphin Research Program, Brookfield Zoo Chicago

Staff were involved in conducting or developing 48 funded projects over the past year, covering a wide variety of research, education, or conservation topics, as can be seen in the list below. In addition, working with our many co-authors, we have submitted 23 different scientific manuscripts in 2024, including 11 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 below are either being led by Brookfield Zoo Chicago (BZC) researchers, or in some cases, these are subawards to the BZC's Sarasota Dolphin Research Program. The researchers responsible for overseeing the SDRP portions of the projects are listed as Principal Investigators. Funding for the projects is being administered primarily through BZC. More details about some of these projects are presented below and on the page that follows.

	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	2024-25 - Anonymous Sarasota Foundation - Sarasota Bay Listening Network: Wiring the bay for sound	Holmes, McHugh, Wells
5	2023-24 - Anonymous Sarasota Foundation - Kim Bassos-Hull Research	Bassos-Hull
6	2024-25 - Anonymous Sarasota Foundation - Kim Bassos-Hull Research	Bassos-Hull
7	2024-25 - NOAA Prescott - Small cetacean intervention and post-release monitoring services	Wells
8	2020-24 - NOAA Prescott - Continuation of a national service center for post-release monitoring of small cetaceans	Wells
9	2024 - Dolphin Quest - Bottlenose dolphin health assessments in Sarasota Bay: May 2024	Wells
10	2021-25 - NOAA RESTORE Act - 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
11	2018-24 - Disney Conservation Fund - Franciscana interactions with Argentinean fisheries	Wells
12	2020-24 - Disney Conservation Fund - Knowledge sharing for dolphin conservation	McHugh
13	2020-24 - Mote Scientific Foundation - Health assessment and biopsy darting of bottlenose dolphins	Wells
14	2022-24 - Disney Conservation Fund - Sarasota Bay Dolphin Listening Network	McHugh
15	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

	PROJECT: Dates, Funder, Title (ordered by size of award)	SDRP PIs
16	2024-25 - Mote Scientific Foundation - Health and movements of dolphins over the West Florida Shelf	Wells
17	2025 - Mote Scientific Foundation - Analysis of marine predator diets and microbiomes while advancing student research opportunities	Wilkinson
18	2025 - Mote Scientific Foundation - Bridging oceans: Collaborative research and capacity building for ray and cetacean conservation in the Galapagos	Wilkinson
19	2022-24 - Mote Scientific Foundation - A preliminary assessment of movement patterns of dolphin prey fish	McCabe/Wells
20	2021-24 - Mote Scientific Foundation - Human-animal conflict Stage 2: Shark behavior near commercial fishing activity	Wilkinson
21	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
22	2023-24 - Mote Scientific Foundation - Sarasota Bay Listening Network	McHugh, Wells
23	2024-26 - Mote Scientific Foundation - Movement patterns of dolphin prey fish - mullet tagging project	McCabe, Wilkinson
24	2024 - Dolphin Quest - Investigating the effects of human impacts on the critically endangered bottlenose dolphin subpopulation of the Gulf of Ambracia, Greece	Wells
25	2023-24 - Mote Scientific Foundation - Sarasota Coast Acoustic Network - Telemetry array servicing	Wilkinson
26	2024 - Batchelor Foundation - Sarasota Dolphin Research Program operations	Wells
27	2023-24 - Mote Scientific Foundation - Pole-mounted Tag Attachment Device (TADpole): Further development and application	Wells
28	2024-25 - Wells Fargo Community Giving for Sustainability Program - Sustainability for local dolphin research in Sarasota Bay	McHugh, Holmes Wilkinson, Bassos-Hull
29	2023 - Fahlo (through Florida International University) - Support for offshore tagging and tracking	Wells
30	2024-25 - NOAA (ProTech Fisheries/Abt) - Monitoring approaches for bottlenose dolphin restoration services	Wells
31	2024 - Save Our Seas Foundation - Keystone grant for continuing study of the endangered pygmy devil ray in the Gulf of Mexico, Caribbean and Atlantic	Bassos-Hull
32	2024-25 - Dolphin Quest - Using TADpole-deployed satellite tags to study diel movements of spinner dolphins in Hawaiian waters (only travel support for SDRP)	Wells
33	2023-24 - HBOI/FAU- Impacts of disturbance, disease and environmental degradation on estuarine and oceanic wild Florida dolphins	Wells
34	2024 - Dolphin Quest - Bermuda bottlenose dolphin photo-identification and tracking manuscript preparation	Allen, R.
35	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
36	2022-25 - ONR - VESOP II: Developing broadly applicable models to predict vital rates from remotely sampled health measures including epigenetics	Wells
37	2024-25 - BZC Women's Board - Dolphin adolescence and the importance of juvenile social connectivity	McHugh, Holmes
38	2024 - Dolphin Quest - Mekong River Irrawaddy Dolphin photo-analysis database project	Allen, J.
39	2024 - Dolphin Quest - Supplemental support for bottlenose dolphin health assessments in Sarasota Bay: May 2024	Wells
40	2023-24 - CZS Women's Board - Sarasota Dolphin Research Program conservation training	McHugh
41	2024 - Aarhus University (LMR) - DTAG deployment in Sarasota Bay	Wells
42	2023-24 - Mote Scientific Foundation - Eugenie Clark Field Research Skills and Leadership Program: Continuation	Wilkinson
43	2024-2029 - NSF - PACSP TOOLS: EPICS: Explainable AI Driven Individual Photo-Identification and Tracking for High-throughput Conservation Study	Wilkinson
44	2023-24 - Fundación Oceanogràfic - Dolphin health assessments	Wells
45	2024-25 South Carolina Sea Grant Consortium - Climate factor influences, spatiotemporal variability, and bottlenose dolphin health related to phthalate exposure measured over 30 years in Sarasota Bay, Florida (1993-2023)	Wilkinson
46	2024-25 - CBOT Endangered Species Fund - Wiring the Bay: Empowering marine wildlife conservation through underwater sound monitoring in Sarasota Bay	McHugh, Holmes, Wilkinson
47	2022-24 - CZS Women's Board - Sarasota Bay bottlenose dolphin abundance estimate for NOAA management	Wells, Wilkinson, Allen, J.
48	2024 - Cross College Alliance Environmental Discovery Awards Program - Summer 2024 Intern Support	McHugh

Sarasota Bay dolphin community status

Jason Allen and Kylee DiMaggio, Sarasota Dolphin Research Program, Brookfield Zoo Chicago

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, and to detect issues such as fishing line entanglements as early as possible. We are happy to report that we observed 13 new calves in 2024, 11 of whom appear to be doing very well as of this writing.

This year, FB05's (1963-2009) lineage birthed the most calves. Two of her granddaughters, 21-year-old Mabel and 20-year old F209, gave birth to their 6th and 5th calves, respectively. F209's 5th calf is the newest sibling of 2094, a calf we rescued from a fishing line entanglement in February 2023. Unfortunately, Mabel's calf's carcass was being supported by its mother when we first saw it. In addition, Mote Marine Laboratory's Stranding Investigations Program also recovered two premature fetuses; genetic tests by Debbie Duffield of Portland State University revealed no maternal matches among Sarasota Bay resident females.

We have lost community members since our last update, sadly some we have known for decades. Thirty-four-year-old Big Shout died in May, she was observed 459 times and gave birth to at least seven calves. The necropsy revealed she was very emaciated with recent shark bites and a necrotic fluke entanglement; while these injuries may have contributed to her death, a definitive cause of death was not determined. Additionally, well-known adult female FB54, who has been seen every year since 1975, but not since November 2023, is also presumed dead. During her 53 years, she was observed 1,551 times and gave birth to at least eight calves, two of which went on to give her a total of six grand-calves. This year we also lost 2-year-old C558 and 2151's newborn.

The Sarasota Bay estuary experienced an unusually high level of severe storm activity in 2024. The season began with more than a foot of rain from an unnamed storm in June, followed by Hurricanes Debby with severe flooding

Nineteen-year-old Swiss Cheese alongside her 5th calf. At less than a week old, you can still see its fetal folds.

Well-known community member 34-year-old Big Shout during our 459th and final sighting of her on 05 May 2024. She was seen with several fresh shark bites, and in poor body condition.

from rain in August, Helene with record-high storm surge flooding in September, and Milton, a Category 3 hurricane that hit Sarasota directly with strong winds and severe storm surge in October. SDRP staff went to great lengths to secure lab and field gear in preparation for the storms, as well as taking advantage of small weather windows to complete our monthly surveys and other field work. While we have not yet been able to survey the community after Hurricane Milton as of this writing, observations after the other storms this summer have shown the resident community of dolphins to have remained in the area. However, they may have shifted their use of the bay slightly and, in some cases, formed larger-than-normal groups. These short-term changes may reflect shifts in salinity, water quality, and/or prey fish availability.

Our long-term, monthly photo-ID surveys are one of the core efforts of our program, supporting all other projects. More than 59,600 dolphin group sightings since 1970 have yielded more than 182,000 identifications of more than 6,000 individually distinctive dolphins along the central west coast of Florida. 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 2,909 follows on 255 individual dolphins from 28 projects dating back to 1989. This database now also includes current and historic opportunistic respiration data taken on potentially compromised individuals. We are in the beginning stages of integrating our dolphin health database 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 undergraduate interns. Thanks to these efforts, this community remains one of the most thoroughly studied free-ranging dolphin populations in the world.

Conservation Research and Action

Human impacts on dolphins

Randall Wells, Sarasota Dolphin Research Program, Brookfield Zoo Chicago

Many of the articles in this annual report refer to the impacts of humans on dolphins. As conservation scientists, this is very much a focus of our program's efforts, trying to identify and characterize threats to dolphins to facilitate developing mitigation measures. Earlier this year, Andreas Fahlman and I published a book chapter summarizing anthropogenic threats (threats of human origin), with the twist of trying to explain these threats in terms of the physiology of the animals. While the ultimate outcomes of many threats from humans have been well-documented, less attention has been given to the physiological mechanisms underlying these impacts. We address these physiological mechanisms by using bottlenose dolphins as the basis of discussion, as much is known about this species, and it is an important apex predator that serves as a sentinel species for coastal ecosystem health. In some cases, information from bottlenose dolphins can be extrapolated as a model for predicting impacts to less-well-known cetacean species from threats such as entanglement in fishing gear, boat strikes and disturbance, pollution, and climate disruption, and understanding how these may affect health, survival, and reproductive success. Copies of the chapter are available upon request. (Wells, R. S., and A. Fahlman. 2024. Human impacts on dolphins: Physiological effects and Conservation. Pages 267-284 in: The Physiology of Dolphins. A. Fahlman and S. Hooker, eds. Elsevier. ISBN 978032390516)

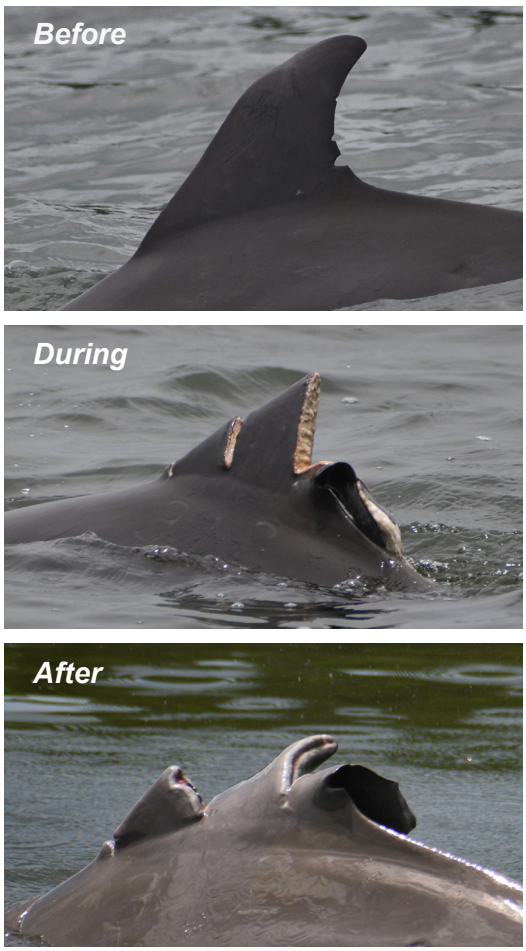
Human Interactions in Sarasota Bay

Katie McHugh, Sarasota Dolphin Research Program, Brookfield Zoo Chicago

Sarasota dolphins faced several human impacts in 2024, with three young animals affected by human-related injuries and similar human interaction (HI) rates observed as in the recent past. Two Sarasota dolphins became entangled in fishing gear this year. Juvenile male "Roy Kent" had fishing line embedded in and trailing from his fluke, while dependent calf 2615 had line attached to a fishing weight that cut through and wrapped around his dorsal fin. Thankfully, both animals were able to be disentangled during our May health assessment project (see pages 27-28). In addition, a well-known 8-year-old male, F312, suffered from a boat strike first observed after the 4th of July holiday near Cortez. This injury disfigured his dorsal fin, but he appeared to be healing and otherwise behaving normally during subsequent observations, so we are cautiously optimistic. Because of the ongoing nature of these interactions, we have continued expanding our community engagement and outreach activities, supported by the Disney Conservation Fund and in partnership with Mote Education. 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 entanglement and ingestion injuries via proper disposal of trash and fishing line, and reporting injured and sick animals to stranding network partners for potential early intervention.

A fisherman attempting to attract a dolphin by dangling a recently caught fish near a surfacing animal.

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. Sarasota Bay dolphins also face frequent behavioral disturbance and harassment by boaters of all types. Post-pandemic, our area saw an influx of people moving to and visiting this part of the Florida coast. Outreach to new boaters, boat rentals, and ecotours remains a high priority, and we would like to focus additional outreach efforts on these audiences in order to promote responsible viewing practices to reduce harassment.



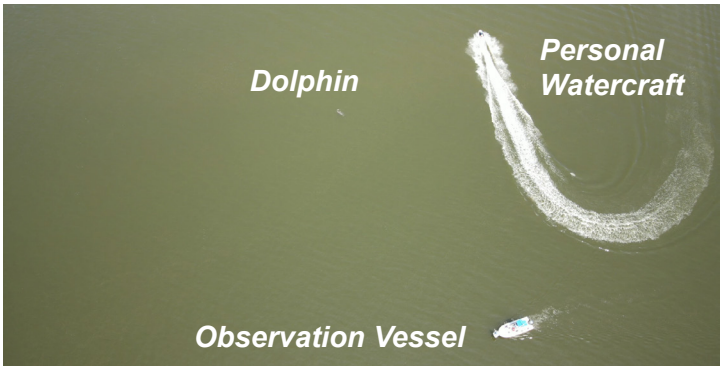
Juvenile male F312's dorsal fin prior to and immediately following a summer 2024 boat strike, which disfigured his dorsal fin. By one month later, the injury was healing well.

Are dolphins affected by the *Deepwater Horizon* oil spill less able to avoid vessel collisions?

Peter Tyack, Enrico Pirotta, Natasha Telschow, and Catriona Harris, University of St Andrews; Katie McHugh, Aaron Barleycorn, Sarasota Dolphin Research Program, Brookfield Zoo Chicago

Sarasota Dolphin Research Program (SDRP) staff assisted in the development and execution of an experiment to test whether bottlenose dolphins whose chronic health status was affected by the *Deepwater Horizon* oil spill were less effective than healthy dolphins in avoiding vessel approaches under controlled circumstances. This was a case study for a Strategic Environmental Research and Development Program (SERDP)-funded project to better understand how multiple stressors (here toxic chemicals and vessels) interact to produce adverse outcomes (here collisions). We refined our approach protocol with Sarasota Bay dolphins, then conducted the experiments with dolphins in Barataria Bay, LA, where many dolphins died after exposure to toxicants from the *Deepwater Horizon* spill. Even today, more than a decade later, many of the surviving dolphins have conditions such as lung disease or compromised adrenal function. For our study, the health of each dolphin was assessed hands-on by veterinarians before it was selected as a subject for the experiment, and we aimed for equal samples of dolphins that were healthy or had a lung condition or cortisol deficiency.

After identifying a dolphin subject, our observation team followed it from the SDRP research vessel *Nai'a*. Behavior of the subject was monitored by hydrophones, drone, DTAGs, and focal animal behavioral observations from Katie McHugh in the observation tower of *Nai'a*. After we established baseline behavior, we would radio our personal watercraft (PWC) operated by Aaron Barleycorn, who had been maintaining distance, to approach the dolphin following a systematic and repeatable pattern. Our analysis team at the University of St Andrews, led by Enrico Pirotta, used the visual observation data to estimate the probability of all 43 subjects of 46 controlled exposure experiments



Overview of the experimental set-up, with the observation vessel at the bottom of the frame, the personal watercraft underway to the right, and the dolphin near the center.

Barataria Bay dolphin with a DTAG on its back and a radio transmitter trailing from its dorsal fin.

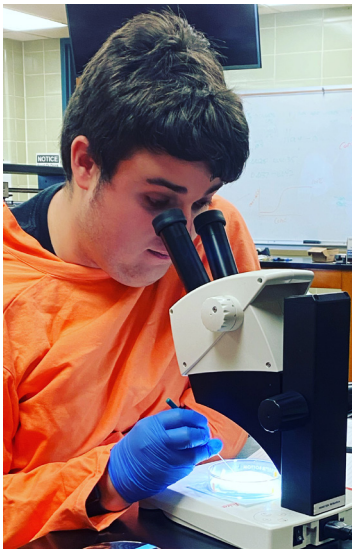
(CEEs) responding at each phase of vessel approach and found only weak effects of health condition on these dose-response patterns. A Master's student at the University of St Andrews, Natasha Telschow, analyzed more detailed response data from 9 dolphins which were DTAGed prior to the experiment. She estimated that half of the subjects responded at a received level of vessel noise of 113 dB re 1 µPa, a very low level of noise for disturbance effects. Dolphins are usually thought not to be so sensitive to the noise of vessels all around them, so this is an important result in its own right. Neither analysis of visual observations or DTAGs showed strong evidence that health condition affected these dose-response functions. One of the most important results of this study is an ongoing effort to define the level of certainty required for managers to assume that the effects of multiple stressors can be estimated independently, assuming no interaction between the stressors.

Evaluating Sarasota Bay dolphin exposure to plastic pollution

Leslie Hart, Miranda Dziobak, Eric Conger, Tita Curtin, Ayushi Gaur, Maggie Knight, and Stella Martin, The College of Charleston

The large-scale production, use, and durability of plastic have led to a serious pollution problem. Tiny pieces of plastic, called microplastics (smaller than 5 mm), are now found almost everywhere. Scientists have discovered microplastics in the water we drink, the food we eat, and even the air we breathe. Animals on land and in the oceans are also in danger, as microplastic pollution has been found on every continent, and trillions of particles are floating in our oceans. The extent of contamination and impacts on wildlife health is only beginning to be uncovered.

Since 2016, the College of Charleston's HOPE Research Lab has studied how bottlenose dolphins in Sarasota Bay are exposed to plastic and chemicals called phthalates, which are added to plastic. Because Sarasota Bay is near urban and agricultural centers, we suspect that the dolphins living there might be affected by these human-made pollutants. So far, we've discovered that approximately 75% of the dolphins we tested have been exposed to phthalates, and this exposure does not seem to depend on their age or sex. We have used urine and blubber samples



Eric Conger looking for microplastics in fish samples using a stereo microscope.

Maggie Knight (left) and Miranda Dziobak (right) collecting samples from a fish collected in Sarasota Bay, FL for microplastic and phthalate analyses.

from Sarasota dolphins to test for more than ten types of phthalates using state-of-the-art methods. These studies show that Sarasota Bay dolphins are often exposed to phthalates found in plastic, and some of their exposure levels are even higher than what has been seen in humans.

As part of a study funded by the National Institutes of Health's National Institute of Environmental Health Sciences (Award # R15ES034169), we are currently researching how dolphins in Sarasota Bay are being exposed to microplastics. We believe that plastic pollution in the environment is to blame, and based on human studies, the main ways dolphins are likely exposed are through ingestion and inhalation. Since 2019, we have been collecting stomach fluid and feces from dolphins during catch-and-release health assessments to measure and study their microplastic intake. So far, we found that 100% of the stomach fluid samples taken in 2019 (from 7 dolphins) contained microplastics. These results align with our research on dolphin prey fish, in which over 90% of the fish we tested had microplastics in them. Additionally, the most contaminated fish species, the pinfish, is also a main food source for Sarasota Bay dolphins. This research is still ongoing, but we are finding evidence that fish in Sarasota Bay could be a major source of plastic exposure for these dolphins.

To explore if dolphins are breathing in microplastics, we conducted a pilot study in 2023 in which we held petri dishes above the blowhole to collect exhalate (breath). All exhalate samples collected from Sarasota Bay dolphins had microplastics, and the most common types of particles were fibers and fragments. Additionally, we discovered that these particles were made of polyethylene terephthalate and polyester, which are polymers most commonly used in plastic food packaging and synthetic clothing. We do not yet know how this exposure affects the health of Sarasota Bay dolphins, but we plan to continue our research to learn more about implications for lung health.

We are deeply grateful to the Sarasota Dolphin Research Program for their longstanding partnership in this important research. Their collaboration allows us to explore the critical connections between ocean, human, and wildlife health. Together, we will continue to uncover new insights into the impacts of plastic pollution on Sarasota Bay dolphins and other marine life.

Expanding Sarasota Dolphin Research Program drone capabilities: North Atlantic Right Whale morphometrics and breath sampling

Jonathan Crossman, Sarasota Dolphin Research Program, Brookfield Zoo Chicago

In April of this year, I traveled to Woods Hole Oceanographic Institution in Massachusetts to learn and practice drone research techniques with Michael Moore, a longtime Sarasota Dolphin Research Program collaborator. Michael Moore has dedicated almost 30 years of his life to researching endangered North Atlantic Right Whales (NARW). These whales all too often fall victim to human activities such as vessel traffic and entanglement in fisheries reliant on traps with a line up to a float on the surface (crab and lobster). Drones have been increasingly used with this species to gain a better idea of the individual whale's condition. Morphometrics, the ability to obtain numerical values of shape and size of an animal, can be collected through high quality photos captured through a camera attached to a drone. After a week of bad weather, we were able to go out in Cape Cod Bay and implement skills I learned while on land in the days prior. During the research trip we were able to measure 15 different NARWs. I also learned how to collect breath samples from large whales, which involves much more precise flying close over the whale. Collaboration between researchers is vital in the continuation of working to protect at-risk species. The SDRP is incredibly grateful for the endless time and effort Michael Moore has provided as a collaborator over the decades.

A male North Atlantic Right Whale, 3191 Waldo, skim feeding in Cape Cod bay in April 2024. We sampled 4% of the estimated 327 remaining whales on this day. Taken under NOAA NMFS permit #27066.

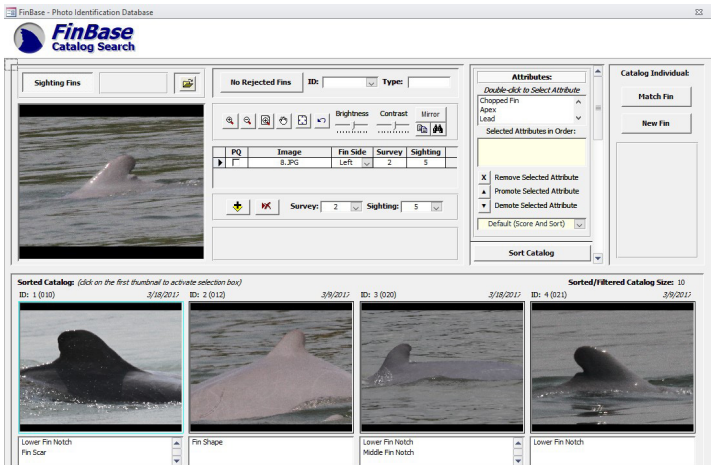
Critically endangered Mekong River dolphin research

Jason Allen, Sarasota Dolphin Research Program, Brookfield Zoo Chicago

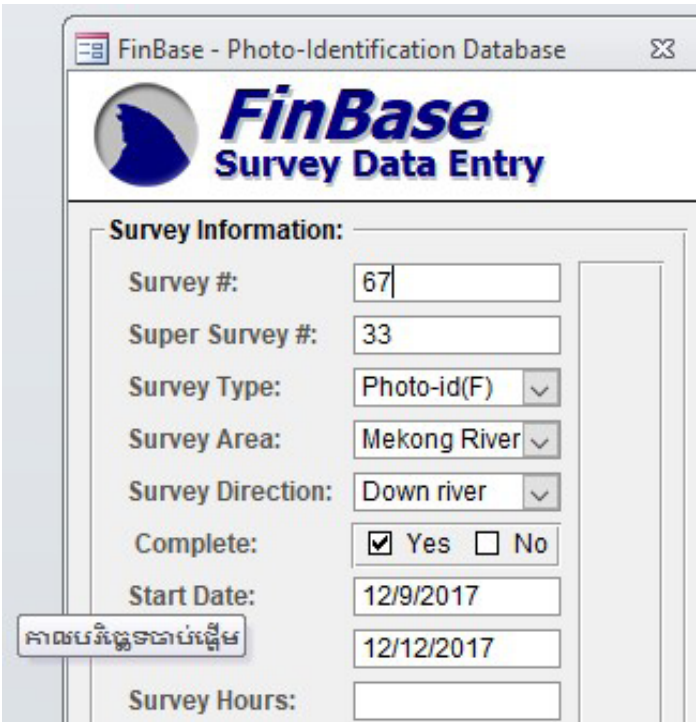
The Cambodian Mekong River Irrawaddy dolphin is critically endangered; fewer than 100 remain. These blunt-nosed cousins of bottlenose dolphins face threats from gill nets, longlines, electrofishing, dams, and overfishing. The Sarasota Dolphin Research Program has advised and assisted the Cambodian World Wildlife Fund (WWF) research team since 2012. We hosted four of their key staff for field and lab training in Sarasota in 2019 and, 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.

In May 2024, we received a Conservation and Research Award from Dolphin Quest to upload 2020-2023 sighting data, individual dolphin identifications, and supporting photographs to a version of our highly-functional database "FinBase" that has been modified and Khmer-translated in order to facilitate population monitoring and abundance estimation by the WWF team. Work is ongoing as of this writing and is expected to be completed by the end of 2024.

A Mekong River Irrawaddy dolphin identification photo taken in Kampi Pool during Jason Allen's January 2023 site visit.



Working closely with the WWF team in Cambodia and NOAA's Jeff Adams, we have developed a modified version of the FinBase database for use with Mekong River Irrawaddy dolphins.



One feature of the database is pop-up translations of the data fields into the Khmer language.

Investigating the effects of human impacts on the critically endangered bottlenose dolphin subpopulation of the Gulf of Ambracia, Greece

Joan Gonzalvo and Carmen Andrés, Tethys Research Institute's Ionian Dolphin Project

At the end of July, the Sarasota Dolphin Research Program (SDRP) assisted the Tethys Research Institute's Ionian Dolphin Project (IDP) with a two-week biopsy dart sampling session intended to obtain tissue samples from the critically endangered bottlenose dolphins inhabiting the Gulf of Ambracia, Greece. Unfortunately, shortly after their arrival to Greece, the SDRP researchers, Randall Wells and Aaron Barleycorn, came down with a flu that kept the team off the water for the first week. Once the work resumed, we managed to get on the water for five days, spending roughly 12 hours with different dolphin groups in mostly favorable weather conditions. Nevertheless, no samples were collected because the dolphins were being incredibly evasive, rarely allowing the boat to come within 50-100 m.

In early June 2023, we obtained seven biopsy samples (23 shots / 14 hits) in seven days on the water. Although poorly designed biopsy tips led to a low (50%) hit/sampling rate (new biopsy tips were used in 2024!), the higher number of biopsy sampling attempts (i.e., shots) in 2023, indicate that although elusive, the dolphins' behavior was less challenging than in 2024. The reason(s) for this dramatic change in behavior is unknown and it does not seem to be limited to our research boat.

Although no formal assessment of vessel impacts has yet been done, one notable change in recent years has

Dolphin-watching boats run through a group of dolphins in the Gulf of Ambracia, Greece.

been the initiation of unregulated dolphin-watching tours. Since 2019, IDP has repeatedly observed two vessels operated by a local company, working in tandem, running through and around the dolphins. The cumulative effect of these practices may be the main cause behind the progressive change in behavior observed in the dolphin population during the past three years, and especially evident in 2024. Future efforts will aim at characterizing the potential emerging threats from unregulated dolphin watching, which could provide important information when developing the portfolio of multiple and concurrent threats these animals are facing. We are very grateful to Dolphin Quest for funding this research.

Galapagos international training: Sharks and rays (and marine mammals!)

Kim Bassos-Hull and Krystan Wilkinson, Sarasota Dolphin Research Program, Brookfield Zoo Chicago

During 2024, we continued to build upon established collaborative research and conservation capacity training with colleagues internationally, and initiate new relationships. We currently work with researchers from Mexico, France, Ecuador, Belgium, England, and Brazil on various aspects of shark/ray research. With too many projects to showcase here we highlight our ongoing research and collaborations in the Galapagos with established colleagues (Dr. Diana Pazmiño of Universidad San Francisco de Quito (USFQ)/Galapagos Science Center (GSC), and Michel Guerrero of Proyecto Mantas Ecuador) and with new colleagues (Daniela Alarcón-Ruales of University of Sunshine Coast and Santiago Díaz-Pazmiño of University of Sydney).

Since 2020 we have been assisting Diana with research on rays in the Galapagos. With funding from Mote Scientific Foundation, we traveled to the Galapagos in March 2024 to conduct a variety of activities. The team successfully tagged and sampled 20 spotted eagle rays and 21 golden rays near San Cristobal Island. On Isabela Island, the team – which also included researchers from Georgia Aquarium, San Francisco State University, and the University of North Carolina – documented 178 sightings of oceanic manta rays and 61 genetic samples were collected via pole sampler for ongoing genetic studies. All ray sampling was conducted under the proper Galapagos National Park and Ecuadorian permitting agencies.

In addition to field activities, two workshops were hosted at the community center on Isabela Island to involve ecotourism stakeholders in ray research and conservation efforts, encouraging them to report ray sightings and submit photos for photo-ID analysis. Approximately 35 stakeholders participated with these workshops. Furthermore, a 2-day workshop was hosted at the Galapagos Science Center on San Cristobal Island for researchers presently engaged with, or interested in using, acoustic telemetry for their scientific research (17 participants across the 2-days). Kim and Krystan provided an overview of acoustic telemetry and a demonstration of the equipment and receiver maintenance on the first day. The second day of the workshop was focused on Galapagos-based researchers discussing how to proceed with a coordinated acoustic receiver network around the Galapagos Islands, similar in spirit to the Sarasota Coast Acoustic Network (SCAN) in Sarasota which Kim and Krystan co-manage. Kim and Krystan served as moderators during these discussions. The working group also discussed possible integration into the Central and South America regional Migramar network, a collaborative acoustic telemetry network similar to the regional FACT network along the U.S. Atlantic coast. As a result of this workshop, the group has begun establishing data sharing agreements to build trust among researcher partners and collaborating institutions. We received positive feedback from this workshop as well as a request for Kim and Krystan to host another workshop focusing on acoustic telemetry analytical techniques in the near future. Also, through these workshops we initiated a new collaborative relationship with Daniela and Santi, PhD students working on cetaceans in the Galapagos, to assist and train them with some of SDRP's long-established research protocols as they build a cetacean program in the Galapagos Islands. We very much look forward to continuing our partnerships and capacity building in this beautiful and unique area!

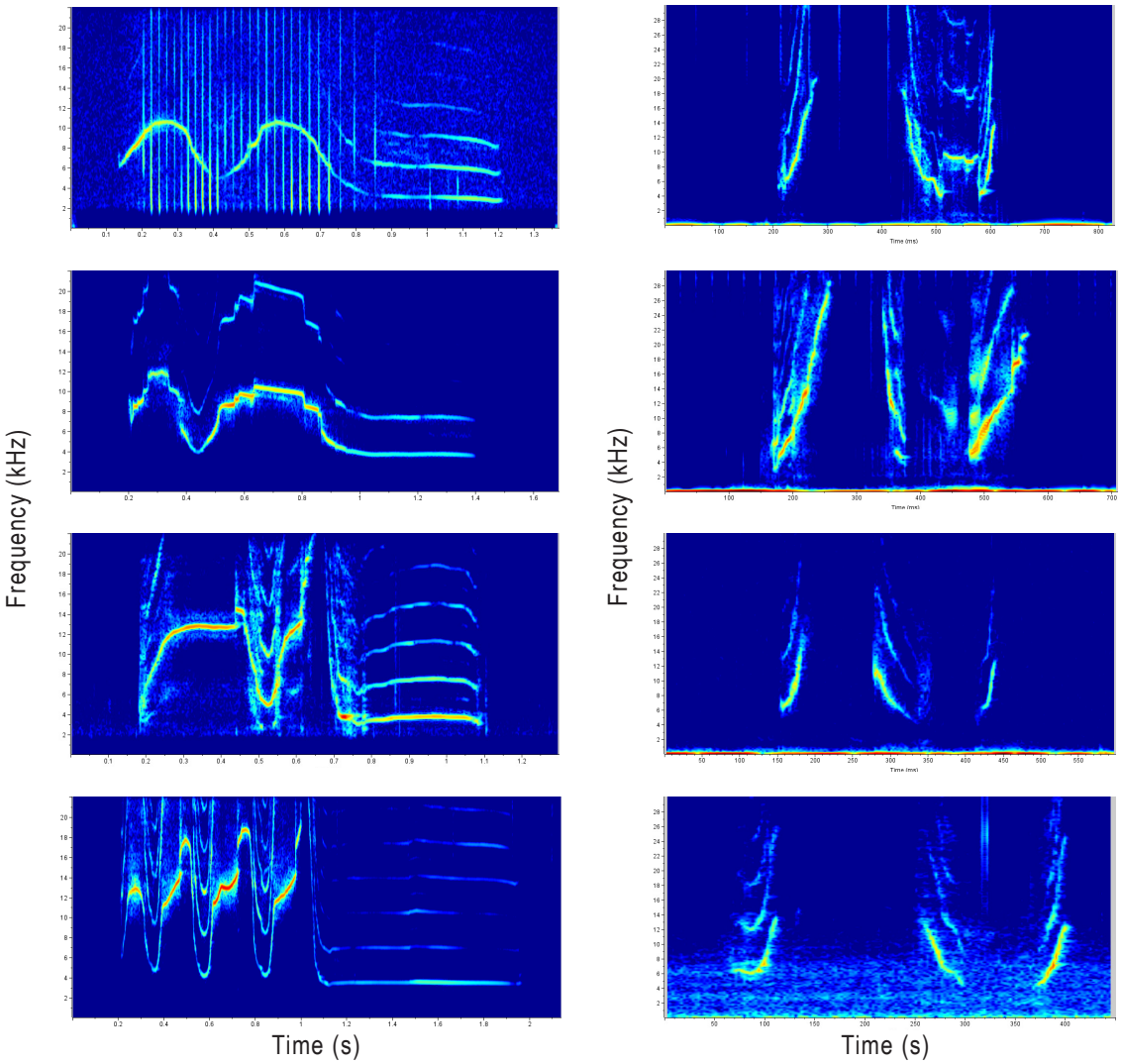
Participants of the 2-day acoustic telemetry workshop on San Cristobal Island at the Galapagos Science Center.

First evidence for widespread sharing of stereotyped non-signature whistle types by wild dolphins

Laela Sayigh, Woods Hole Oceanographic Institution; Vincent Janik and Peter Tyack, University of St Andrews; Frants Jensen, Aarhus University, Katie McHugh and Randall Wells, Sarasota Dolphin Research Program, Brookfield Zoo Chicago

Bottlenose dolphins (*Tursiops truncatus*) have long been known to produce name-like signals called signature whistles. Whistles other than the signature, known as "non-signature whistles" (NSW), have been historically difficult to study because it is difficult to distinguish them from signature whistles in recordings of free-swimming dolphins. In Sarasota Bay, we are uniquely positioned to study NSW, because the signature whistles (SW) of most animals in the community are known through our recordings during health assessments over the past 4 decades. Our catalog of individually distinctive SW of many animals in the Sarasota community has been described in prior issues of *Nicks'n'Notches*. We are now building a catalog of stereotyped NSWs that are shared by more than one individual, and have so far identified more than 20 of these shared NSW types, two of which were produced by at least 25 different individuals. These whistles were recorded both during health assessments and from free-swimming dolphins wearing non-invasive, suction-cup attached digital acoustic tags (DTAGs), which we deploy on dolphins prior to release. We have embarked on playback studies of the functions of both SW and shared NSW, in which we view movement responses with drones and record vocal responses with hydrophones and DTAGs. Control trials, in which we played the target dolphin's own SW, elicited an approach in 76% of trials in which we were able to observe the response. These data support the affiliative nature of SW copies, which appear to function as a way to initiate contact with another individual. Playbacks of a widely shared NSW, NSWA, consistently elicited avoidance responses, suggesting an alarm or warning type function. Another widely shared NSW, NSWB, has elicited varying responses, depending on the age and sex of the target dolphin. NSWB was also produced by the target dolphin in response to 2 playback trials. Our suggested function of NSWB is a "query"- type whistle, produced when something unexpected or unfamiliar is heard. In this case, we would expect different responses depending on age and sex class, for example with males likely being more interested in exploring unfamiliar stimuli than females with calves. We are planning additional playback trials with these and other NSW types to understand their functions.

This research presents the first evidence for shared, stereotyped, context-specific whistles in bottlenose dolphins, and suggests that NSWs play an important role in the dolphin communication system.



Four examples each of shared non-signature whistles NSWB (L) and NSWA (R), each produced by a different dolphin.

Sarasota dolphins help validate methods for identifying calls from tagged dolphins

Frants Havmand Jensen, Jeanne Shearer, Austin Allen, Department of Ecoscience, Aarhus University; Vincent Janik, University of St. Andrews

Digital acoustic tags (DTAGs) provide high-resolution data about the acoustics and movement behavior of common bottlenose dolphins in Sarasota Bay. This long-running project, now in its 13th year, has provided detailed information on dolphin foraging behavior, communication, and responses to human-caused disturbance. This year, we deployed a record-breaking 19 DTAGs on Sarasota Bay dolphins, bringing the total number of deployments up to 122. In addition to our regular data collection, DTAG deployments allowed us to provide follow-up information on the two dolphins which were disentangled during the health assessment. Both animals appeared to be swimming and diving normally following disentanglement, and F334 felt good enough to breach his tag off after 30 minutes!

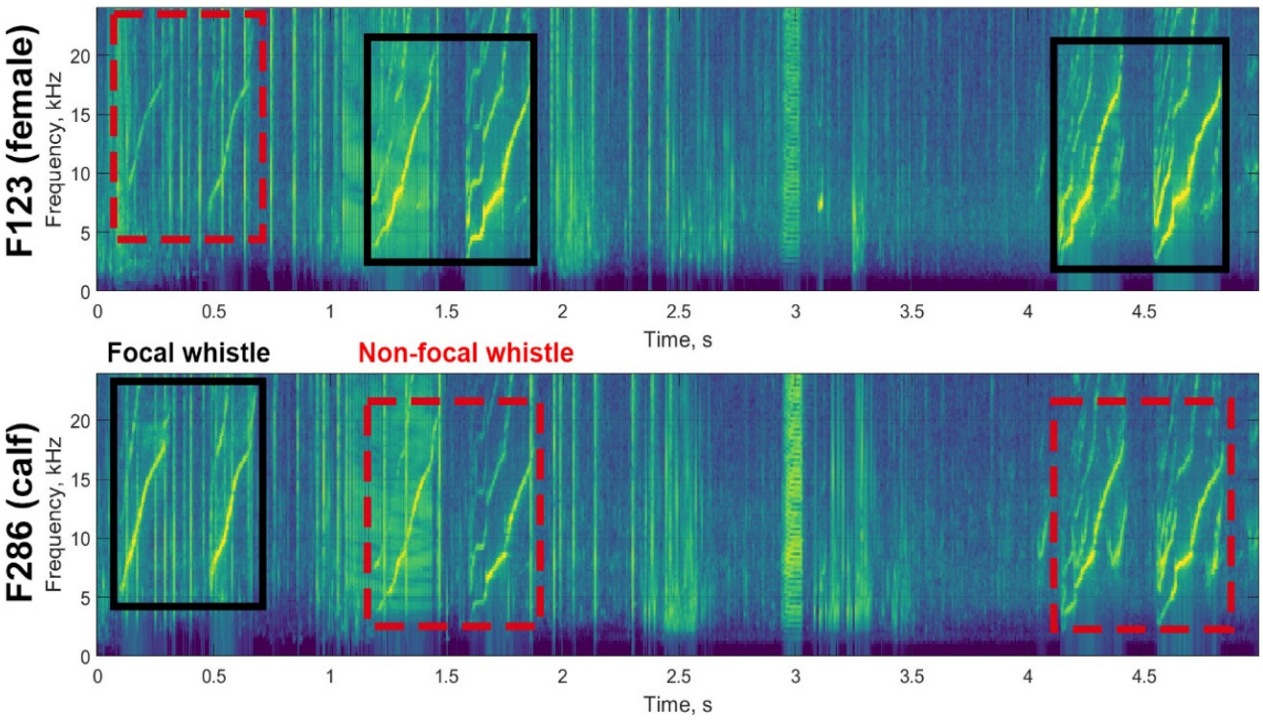
This growing DTAG database is being used to answer a variety of questions. This year, they are used as part of a Navy-funded effort to develop and validate methods for identifying calls from tagged animals. Since sound travels well underwater, acoustic recording tags record calls from both the tagged animal and from nearby dolphins, and identifying these sounds can be challenging. As part of the Cetacean Caller-ID project, we evaluate how a range of different measures can be used to separate out focal from nearby non-focal sounds, with Sarasota dolphins serving as a model for other species who use sounds in the same frequency range (mid-frequency).

Signature whistle captures of individual bottlenose dolphins at passive acoustic listening stations

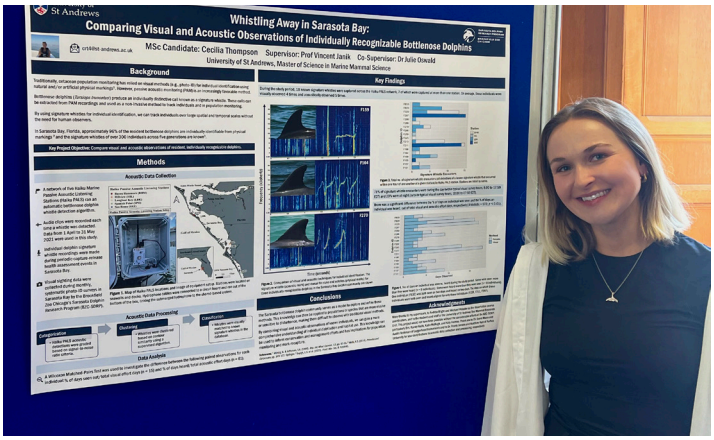
Cecilia Thompson, University of St Andrews and Sarasota Dolphin Research Program, Brookfield Zoo Chicago

For my graduate thesis (MSc Marine Mammal Science, University of St Andrews), I explored the use of bottlenose dolphin signature whistles (SW) captured at passive acoustic listening stations (PALS) in the Sarasota Bay Listening Network (SBLN) to monitor individuals in this community. To date, Sarasota Bay, through long-term Brookfield Zoo Chicago – Sarasota Dolphin Research Program (SDRP) research efforts, is the only place where free-ranging individuals are recognizable by both their distinctive SW and physical markings (e.g., dorsal fin nicks and notches). Visual (photo-ID) surveys are central to long-term SDRP research efforts, passive acoustic monitoring (PAM) is an increasingly favorable method for surveying and studying dolphins. PAM can occur continuously without the need for human observers and is not restricted to daylight hours or workable weather conditions.

I extracted SW captured by an automatic bottlenose dolphin whistle detection algorithm from SBLN PAM data. This detection algorithm was developed by SDRP collaborators at Loggerhead Instruments and ran at five Sarasota PALS. I then matched those SW to known individuals in the Sarasota Dolphin Whistle Database (SDWD), which contains SW recordings collected during SDRP health assessments for more than 300 known individuals across five generations. I used long-term



Time-frequency spectrograms of whistles recorded from a mother-calf pair when both animals were simultaneously instrumented with DTAGs. Signal brightness indicates loudness. Black boxes surround whistles from one dolphin, and red dashed boxes show the same call, only fainter, as received on the other's DTAG.



Cecilia Thompson presenting her thesis research at the University of St Andrews School of Biology MSc Poster Symposium in August 2024.

SDRP sighting data from photo-ID surveys that show an individual's range over time to validate the acoustic presence of an individual and compare visual and acoustic monitoring methods. During a two-month study period, 18 known SW in the SDWD were captured across five PALS, seven of which were captured at more than one station. Statistical testing revealed significant spatial variation in SW encounters across PALS locations, likely explained by variability in individual vocal behavior, habitat use, and ranging patterns throughout the study area. The comparison of visual and acoustic observations of those 18 individuals during the study period highlights how PAM can fill spatial and temporal gaps in data for a more comprehensive understanding of individual presence and habitat use. As Sarasota Bay is a highly urbanized coastal environment, this knowledge could be used to identify range shifts, evaluate exposure to localized threats such as wastewater spills and harmful algal blooms, and inform threat mitigation efforts. This is particularly important in communities like Sarasota Bay where individuals exhibit strong site fidelity to specific core areas. Although I have completed my MSc degree, I plan to prepare this work for publication and further investigate the use of SW extracted from SBLN PALS data in monitoring efforts.

Automated whistle extraction from Sarasota Bay Listening Network recordings

Vivian Cargille, New College of Florida

I recently completed my undergraduate thesis "New College Dolphins: Automated Whistle Extraction" with the help of the Sarasota Dolphin Research Program (SDRP), and specifically, the Sarasota Bay Listening Network (SBLN). I set out to build and test a method to find dolphin whistles in thousands of hours of passive recordings, both from the New College listening station and Palma Sola Bay listening station. Bottlenose dolphins use whistles in a variety of behaviors, and whistles are a common form of their social communication.

I'm interested in advancing how we can track dolphins through their whistles with the recording network, and this thesis was my first step. I spent hundreds of hours labeling sound clips as whistles/non-whistles to train the software, then testing on larger and larger datasets, all to see when dolphins were around the New College of Florida dock. I found more detected whistles in the winter/spring months, with a dip in the summer. These data provide some information about the movements of local dolphins, and raises questions about why these patterns exist.

As I presented and defended my undergraduate thesis at New College of Florida, to my friends, family, and faculty, it was clear that although this thesis was complete, many questions remain. My work on this thesis was a fantastic introduction to the research world, with wonderful support from SDRP staff. I look forward to continuing working with the SDRP as a student in the New College Masters in Marine Mammal Science program, as we all work to answer more of those questions.

Vivian Cargille defending their undergraduate thesis at New College of Florida in April 2024.

The influence of red tide on the foraging and social behavior of bottlenose dolphins

Kyra Bankhead, Oregon State University

As a highly social species, dolphins synchronize their behaviors with those of the group to maintain cohesion, which is necessary for foraging, mating, learning, and thus fitness. However, what happens when dolphins form subgroups around risky behaviors? My master's project is focused on investigating the coupled influence of red tides and human-centric foraging behavior on the social structure of the community of bottlenose dolphins in Sarasota Bay. In the past year, I successfully defended my master's thesis, revealing that human interaction significantly influences dolphins' grouping patterns, especially during red tide events.

While foraging on food provided by humans may require less immediate effort and energy from dolphins, interactions with humans can have profound negative consequences, including injury, health risks, and behavior changes that reduce fitness. I identified changes in the association between human-centric foragers with increased

Kyra Bankhead defending her master's thesis at Oregon State University in August 2024.

association during an intense red tide event. I also found that dolphins involved in human-centric tactics with direct human interactions (begging for food hand-outs) had lower qualities and quantities of social connections with other dolphins, while those using foraging tactics away from human presence (feeding around crab pots and other fishing gear left behind by humans) showed increased sociality.

The combined effect of human disturbances on the social structure and bonds of the bottlenose dolphins in Sarasota Bay could have profound implications for this community. Despite the ability of bottlenose dolphins to adjust their social dynamics according to their changing environment, ongoing human interactions and increased frequencies of red tide events could disrupt social cohesion, which is extremely important given that dolphins rely on each other for their survival and reproductive success. The capacity of bottlenose dolphins to learn foraging tactics from one another also suggests that this cohort could continue to experience long-term effects that persist even after prey availability recovers. I hope to continue my work with the SDRP to learn more about how these human-centric tactics spread throughout the bottlenose dolphin community as a part of my future PhD project.

Male dolphins who play more as juveniles sire more offspring as adults

Katy Holmes, Sarasota Dolphin Research Program, Brookfield Zoo Chicago

Play is a common juvenile mammal behavior with mysterious evolutionary origins. Scientists have hypothesized that it provides survival and reproductive benefits later in life, since it has no apparent immediate survival benefit. In a recent peer-reviewed publication (available at https://www.pnas.org/doi/10.1073/pnas.2305948121) based on work from my PhD at the University of Western Australia, my coauthors and I investigated the role of juvenile social play in the development of adult reproductive behavior in male Indo-Pacific bottlenose dolphins in Shark Bay, Australia. Here, adult male reproductive behavior involves intense competition, in which males are only successful if they work together to access estrus females. These alliances are characterized by strong, often life-long social bonds as well as functional behavior. Pairs or trios of allied males sequester a single female in events termed consortships that last for hours to weeks. Consorting males synchronize and coordinate their behavior in joint action to keep the female close and isolated from competing males. Social play among sexually immature juvenile dolphins resembles consortships, with individuals in same- or mixed-sex play groups taking turns in adult male and female roles. We therefore hypothesized that one function of social play is practice of adult male consortship behavior, which is crucial for males to sire offspring.

Using long-term association and genetic paternity data spanning 32 years along with detailed behavioral observations, we found evidence that social play provides practice of consortship behaviors (see: https://theconversation.com/playful-young-male-dolphins-grow-up-to-have-more-offspring-231491). Juvenile males were more likely to engage in joint action during social play if they had strong social bonds, suggesting that play provides likely future allies with practice of this important adult male skill, years before adulthood. Juvenile males were also more likely to produce an adult male consortship vocalization ('pops') when playing with females, but with an immature rhythm. Juvenile play appears to provide an adult-like context for males to practice the adult use and rhythm of pops, which they likely adjust based on hearing adult male pops. Notably, we show a rare direct link between juvenile play and evolutionary fitness by showing that males who spent more time playing as juveniles sire more offspring as adults. It therefore appears that juvenile social play is important for future reproduction, at least for male Shark Bay dolphins.

As in Shark Bay, bottlenose dolphins in Sarasota Bay spend several years as juveniles, in which males devote about one tenth of their time to playing with their peers. Adult males in Sarasota Bay form enduring alliances with their top juvenile associates, independent of relatedness, nearly always in pairs. In fact, Sarasota Bay is where adult male dolphin pair bonding was first discovered, back in the 1970s. However, unlike in Shark Bay, alliances are not a prerequisite for siring offspring in Sarasota Bay, although it is the preferred and more successful strategy, and inter-alliance competition is less intense. Research is needed to determine if the function of juvenile social play varies accordingly.

Male bottlenose dolphins engaged in social play in Sarasota Bay (left) and Shark Bay (right).

Sarasota Bay dolphin health assessment: May 2024

Randall Wells, Sarasota Dolphin Research Program, Brookfield Zoo Chicago

With the primary support of Dolphin Quest, we conducted our most successful dolphin health assessment project in years in Sarasota Bay, during May 13-24, 2024. We involved a team of 163 people, with 76-93 people working each day from 10-12 boats, collecting data and samples in support of 43 projects. In spite of bad weather for half of the first week, we set on 35 dolphins, and were able to sample 19 individuals. Eleven of these individuals were from our list of highest priorities - first-time samplings - including two life-threatening fishing gear disentanglement cases. We sampled 8 females and 11 males, ranging in age from 2 yrs to ~55 yrs. One female, Lizzie, was pregnant, and she successfully gave birth in June. Ten animals were 1-20 kg above expected mass; six were 1-9 kg below. DTAGs were deployed on each dolphin handled. Satellite-linked tags were deployed via TADpole on three dolphins to test tag attachments. This was a mentoring year for SDRP staff, testing new responsibilities with senior staff, and they performed very well, increasing their value to our program and to NOAA-NMFS for participating in dolphin rescues elsewhere in the southeast. In addition to Dolphin Quest and others, we are appreciative of the in-kind support provided by the Florida Fish and Wildlife Conservation Commission in the form of our dolphin catcher and boats, and many members of their research/stranding response staff from around the state. Our increased productivity this year came in large part from adding a second week and from FWC providing a new, faster, more maneuverable engine on their catch boat.

The photo below shows the team releasing the last dolphin of the session, on May 24th, 50 yards from where the Sarasota Dolphin Research Program's first dolphin catch occurred, in June of 1970. People are pointing toward the dolphin as it swims away, with the DTAG showing up as a white dot on the dolphin's back.

We thank Dolphin Quest, NOAA Prescott, NIEHS (College of Charleston), Harbor Branch Oceanographic Institution/ FAU, Aarhus University, Fundación Oceanogràfic, National Marine Mammal Foundation, Clearwater Marine Aquarium, Sarasota Police Department, SeaWorld Orlando, and several generous donors for their support of this project.

F340 (nicknamed Sake), circled, swims away during SDRP health assessments in May 2024.

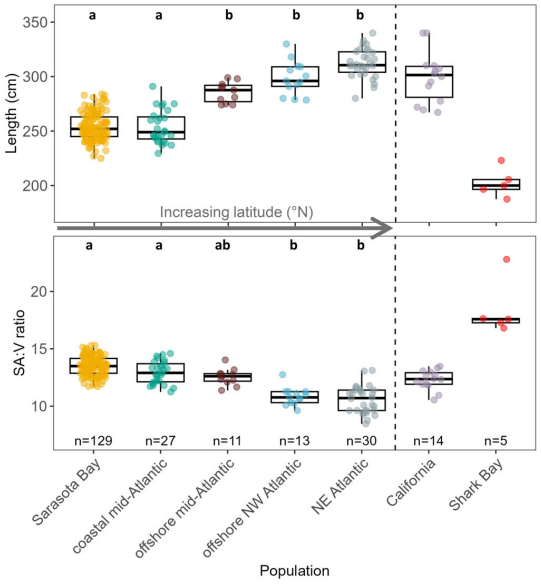
Bigger bodies like the cold—does this rule hold up for bottlenose dolphins?

Arina Favilla and Stephanie Adamczak, University of California, Santa Cruz

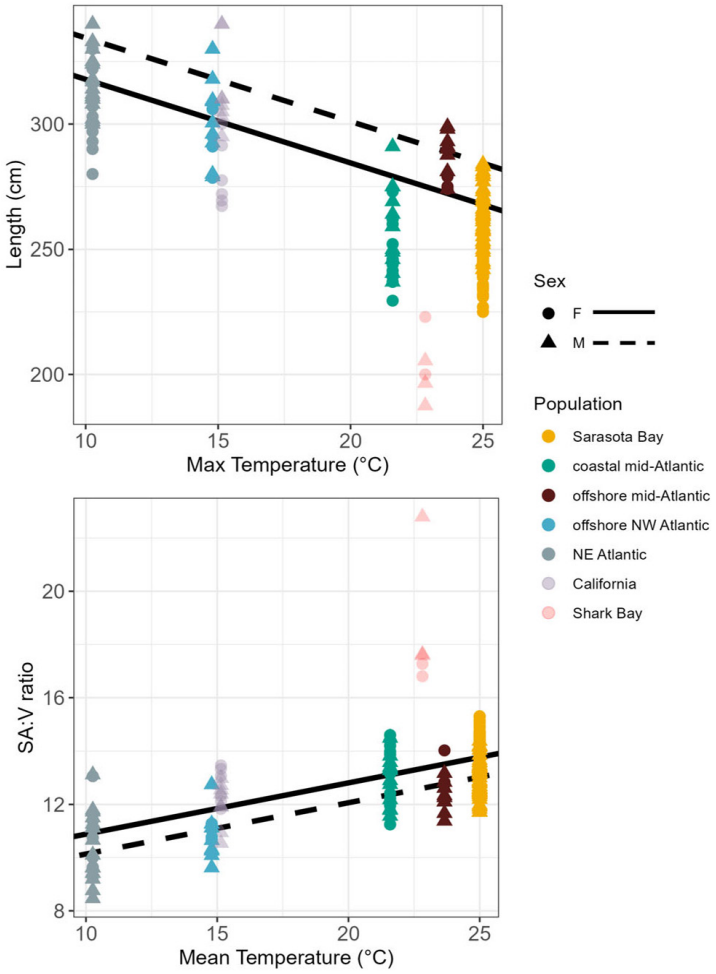
We found that bottlenose dolphins from seven different populations and two species across the world fit the expected body size relationship with temperature, where larger dolphins live in colder waters and smaller dolphins live in warmer waters, which is known as Bergmann's rule. Due to the warmer waters of Sarasota Bay, dolphins found here are shorter in length and have a higher surface area to volume ratio compared to other populations living in colder waters, like dolphins in the NE Atlantic Ocean and off of California's coast.

Bergmann's rule is an ecogeographic rule that was first proposed in 1847 to explain the prevalence of larger mammals in higher (colder) latitudes. Since then, scientists have put this rule to the test in both terrestrial and marine animals at the species level as well as across species. We decided to test Bergmann's rule in bottlenose dolphins since they are cosmopolitan, spanning the globe and inhabiting various thermal habitats. To do this, we collaborated with bottlenose dolphin researchers around the world to bring together morphometric data from seven different bottlenose dolphin populations of two species. The Sarasota Dolphin Research Program contributed a huge dataset for this project. Other datasets were primarily from stranding programs, highlighting the power of merging these difficult-to-collect datasets and encouraging standardization of morphometric data collection.

In this paper published in Marine Mammal Science, we compared two metrics of body size across the populations - body length and surface area to volume ratio, which is an important factor when considering how fast a mammal in water will lose body heat to its surrounding cooler environment. This ratio was calculated by using morphometric measurements common to all the datasets



Body length increases while surface area to volume ratio decreases across populations that live in higher latitudes in colder waters. Bottlenose dolphins in Shark Bay and off California's coast were not included in the statistical comparison but provide interesting case studies for comparison.



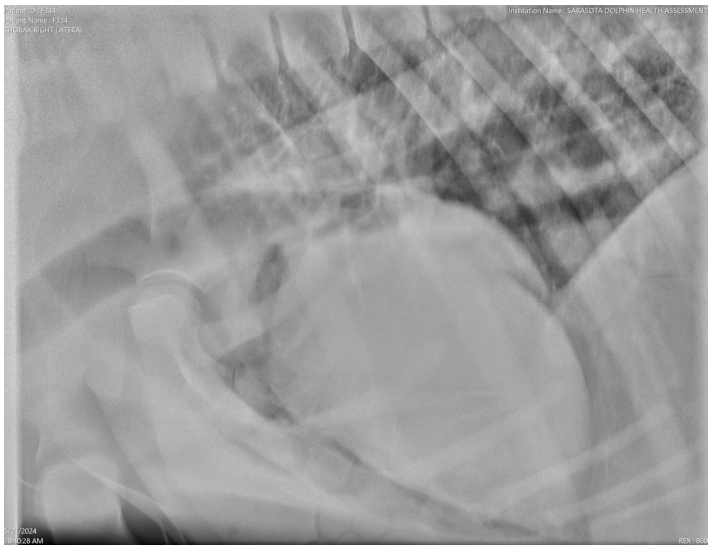
The relationship between body size and water temperature for each sex across populations. After testing several metrics of water temperature, maximum water temperature, and mean water temperature best explained the variation in body length and surface area to volume ratio, respectively.

to represent the dolphin's body as geometric shapes from which we can easily calculate surface area and volume. These body size comparisons were made in relation to average monthly water temperatures in each population's respective habitat. After accounting for differences in size between sexes, we found that body length had a strong relationship with maximum water temperature while the surface area to volume ratio was more correlated with mean water temperature. Sarasota Bay dolphins fall on the smaller end of the size spectrum but are still larger than the smallest dolphins, residing in Shark Bay, Australia. Offshore Atlantic dolphins were larger than Sarasota Bay dolphins and coastal Atlantic dolphins, but comparable in size to the hefty dolphins in the Northeast Atlantic around Scotland. While bottlenose dolphins seem to adhere to Bergmann's rule, there are many other factors that influence body size besides temperature, and we encourage further research into the ecological and bioenergetic factors that contribute to body size differences.

Advancing the diagnosis of wild dolphin lung disease with on-boat radiographs

Michael T. Walsh, College of Veterinary Medicine, University of Florida; Craig Pelton, OdySea Aquarium; Shelly Marquardt, Clearwater Marine Aquarium; Eric Hostnik, Department of Clinical Sciences Ohio State University and Brookfield Zoo Chicago; Jeff Woods, Vet Rocket LLC

To provide the best information and welfare for facility or wild dolphins it takes a number of medical techniques with each addressing a different part of the question of whether an animal is healthy. Animals under human care can have advantages as we can use some important tools with them that have been limited in their use in the field during health assessments. Dolphins in bays and along coastlines like Sarasota have natural illnesses, and other illnesses may be influenced by being exposed to human activities, such as from dust. The use of X-ray (radiograph) techniques to look internally for signs of illness has progressed to battery-operated wireless capability, making it portable and able to be used on a boat during health assessments.



Above: Radiograph of F334's chest area. This is a side view of the chest with the prominent oval heart in the center, the sternum to the left, spine above, the white aorta below the spine, curved diaphragm and liver to the right. Darker tissue is the lungs.

Left: Radiograph of the left flipper of dolphin F334. It shows the normal anatomy of the flipper with the same bones as in our hands. It also can be evaluated to determine the age of the animal from the project of Ashley Barratclough and others verifying age of dolphins through radiographs of growth areas in the bones.

With the support of the VetRocket company's portable, digital capability we have applied the use of radiographs to dolphins in Sarasota Bay for the past 6 years to gauge what changes are found in dolphin lungs. In individuals rechecked over time we can understand how they deal with lung disease, and perhaps see if there are population changes that occur due to environmental effects. Having the equipment on board also allows the project to support other investigators looking at determining the age of dolphins from radiographs of their flippers, investigating shark bite wounds, complementing ultrasound use to see deeper into lungs, or examining the effects of injury and bony changes found on physical exams. This project like others within the SDRP program illustrates the principle of you cannot find answers to important questions unless you are willing to look, and you will still be surprised.

Examination of wild dolphins for evidence of the involvement of viruses in oral and genital tumors

Michael T. Walsh, Andrew Allison, Robert Ossiboff, Megan Horowitz, University of Florida; Craig Pelton, OdySea Aquarium; Galaxia Cortes, Pontificia Universidad Católica de Chile

Tumors of the oral and genital area have been seen in both wild dolphins and those under human care. In some cases, the growths may become similar to invasive cancers of the oral cavity in people, which then spread to other parts of the body. Early work suggested there were two main viruses involved, and treatments for these lesions have been mixed in their success. To further understand what is involved as a possible cause we proposed the use of newer genetic detection techniques that might help to pinpoint the main virus in the disease. Comparing wild animals to those under human care would help to solve the puzzle of the virus involved and also lead to the development of better treatments and prevention with a vaccine. Biopsies are taken and divided in two sections, with one half examined microscopically by a pathologist (Dr. Ossiboff) for evidence of tissue changes typical of the tumor involvement seen previously in other dolphin cases. The other half of the sample is frozen at -80^{o} C, and the genetic material is subsequently examined for the presence of virus to correlate with the microscopic exam.

The genetic components of the project include areas of investigation not used in previous research of this disease. One is the application of Next Generation Sequencing (NGS) which is an expansion of looking for DNA and RNA fingerprints to identify the virus or viruses present. It is very rapid and much more efficient than earlier techniques and could result in finding other viruses that may be present. A second component is to take cotton tipped swabs and sample the oral and genital areas to see if the viruses are detected without biopsy. A master's student (Megan Horowitz) worked on the project with Dr. Andrew Allison, and they made great progress finding that a herpes virus was most common. Adding to that, the swabs detected the presence of the herpes virus without visual lesions. This leads to some other questions, but with the additional development of dolphin oral cell lines in Dr. Allison's lab the understanding of the virus, possible ability to isolate it and the improved understanding of the tumors is now more focused and encouraging. A parallel project is looking at possible treatments for the condition using Dr. Allison's cell cultures.

Epigenetics in Sarasota bottlenose dolphins

Ashley Barratclough, National Marine Mammal Foundation

"Epi" means upon or on top of, therefore the term "epigenetics" refers to the changes on top of those features determined by DNA. We are interested in how these changes occur over time. For example, the addition of new molecules that accumulate over time can be associated with aging. In humans, you may have seen this in the literature regarding "Epigenetic Aging Clocks" where we use epigenetics to determine "Biological Age" which is a proxy for the functional age of an individual, and could be less than their actual chronological age or higher (age acceleration). We all want our biological ages to be less than our actual age! Things such as a healthy lifestyle and diet can help us achieve this. Age acceleration, where the age of our DNA is older than our actual age, can be driven by environmental factors, stress, disease, etc.

In bottlenose dolphins in Sarasota Bay, we have been exploring epigenetics for a number of reasons. The primary reason is that thanks to the long-term SDRP photo-identification program, many of these dolphins are of known age. We could then use the Sarasota dolphins to create an epigenetic aging clock for dolphins that was really accurate – able to estimate age to within just 2 years across their full lifespan. The good news for the dolphins is that this means we no longer need to obtain and examine a tooth for growth layers to find out their age! We can do it by looking at their DNA from a simple skin biopsy or blood sample. We recently published a paper which included samples from 476 bottlenose dolphins with 112 of those from dolphins in Sarasota Bay. The second reason is that Sarasota Bay dolphins are a healthy control population compared to other wild dolphins. Our next steps are to explore what factors could be driving age acceleration in wild dolphins – do we see increases in their DNA age with environmental stress? Our preliminary findings comparing the epigenetics in the dolphins exposed to the *Deepwater Horizon* oil spill demonstrated that the exposed dolphins had higher ages predicted from their DNA than their observed ages. We think this could be due to the chronic disease conditions found in many of these dolphins after the spill.

You can read more about this work in the publication https://www.sciencedirect.com/science/article/pii/S0006320724001320.

Health and movements of Florida's Gulf dolphins

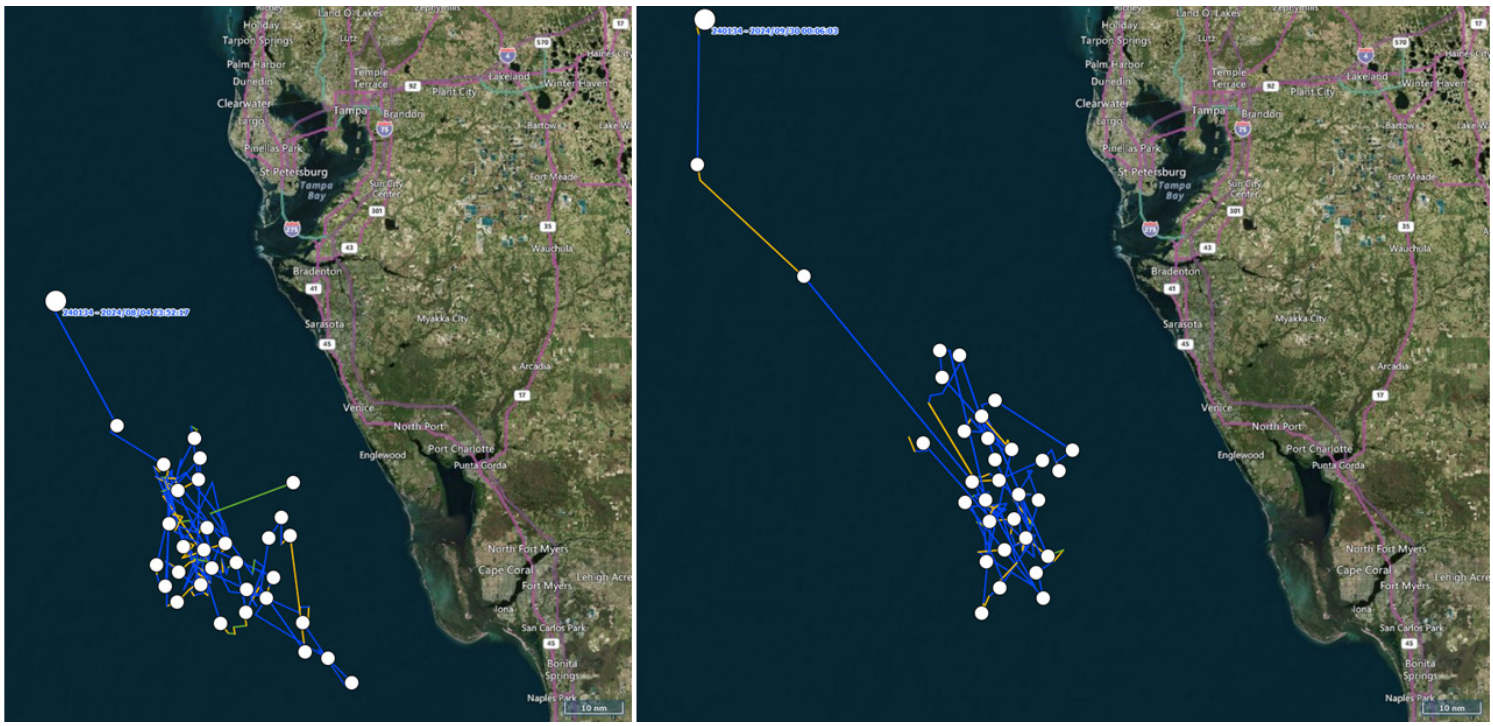
Randall Wells, Sarasota Dolphin Research Program, Brookfield Zoo Chicago

In May 2024, the SDRP completed fieldwork for a project involving a multi-institution team conducting dolphin health assessments 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 supplemental support from Florida International University and Fahlo. 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 for the offshore dolphins 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.

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, all but one of the dolphins also 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).

We conducted offshore catch-and-release sessions in June and September, 2022, May and September, 2023, and May 2024. Six Atlantic spotted dolphins, five bottlenose dolphins, and one rough-toothed dolphin were 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 our tagged dolphins have been concentrated off the west central coast of Florida. 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 of Tampa Bay to offshore of Sanibel Island.



Movements of Atlantic spotted dolphin Debbie relative to Tropical Storm Debby (left), showing high quality tag locations from tag deployment on May 31st, until just after passage of the storm on August 4th, and relative to major Hurricane Helene (right), showing locations from after the passage of TS Debby until just after passage of the hurricane, on September 30th. The white dots indicate high-quality locations, and the largest are the most recent locations relative to the storms' passage. In both cases, the dolphin's tracks move out of her established range, in directions consistent with the counter-clockwise-moving wind and waves from the storms passing to the north offshore of her.

Atlantic spotted dolphin nick-named "Debbie" upon release over the West Florida Shelf, on May 31, 2024. The dolphin has a satellite-linked tag on her dorsal fin, and a short-term digital acoustic archival tag (DTAG) attached by suction cups to her back.

Photo-identification analyses have provided additional evidence from 2019-2023 of repeated or long-term use of waters off the central west coast of Florida. We have resighted two previously tagged bottlenose dolphins. G002 was within 8 miles of his original 2022 tagging site, 237 days later, and G003 was within 13 miles of her original 2022 tagging site, 90 days later. Preliminary analyses resulted in 45 other bottlenose dolphin resightings, over periods as long as 6.5 years. We have resighted two previously tagged Atlantic spotted dolphins. SfG005 was within 11 miles of her original 2023 tagging site, 90 days later. A member of the public also documented SfG012 within 10 miles of his original 2023 tagging site, 65 days later. We have resighted 15 other Atlantic spotted dolphins, over periods as long as 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.

For the first time in the Gulf of Mexico, dolphins were tracked during passing tropical cyclones (Hurricanes Ian, Idalia, Helene, Tropical Storm Debby), and preliminary analyses suggest that in all 10 cases movements were generally consistent with moving with hurricane-driven wind and waves. Atlantic spotted dolphin "Debbie" showed similar responses to the passage of both Tropical Storm Debby and Hurricane Helene offshore of her locations (see maps on previous page).

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. The lead organizations on the project, Brookfield Zoo Chicago 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.

The status of fish populations in Sarasota Bay

Elizabeth Berens McCabe, Sarasota Dolphin Research Program, Brookfield Zoo Chicago

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, along with the bay's resilience. Since 2004, this project has also facilitated a variety of novel research and new collaborations; most recently, quantifying microplastic loads in dolphin prey fish, trophic transference, and the potential effects of phthalates in the diet of bottlenose dolphins (see page 9), and contributing to Mote Marine Laboratory's archived Herbarium collection (established in 1955 by Drs. Eugenie Clark and Sylvia Earle, further expanded by Susanna Dudley, and currently curated by Dr. Ernie Estevez). This year we are happy to report that *K. brevis* red tide concentrations remained at or below background levels, and this summer the dolphins had more food available to them than in most summer seasons!

Elizabeth Berens McCabe with a blue fish caught near Big Pass before being released back into the water.

Intern Ava Leaphart with a permit before releasing it back into the bay.

Intern Allie Shiers with a striped burrfish before releasing it back into the bay.

Our standardized multi-species fish survey consists of a winter and summer fishing season (10 sets of the net per month; Jan-Mar; Jun-Sept), during which we catch, measure, count, and release fish from the *R/V Flip* using a 183 m purse seine net in seagrass habitats. Based on our 2024 fish survey data, the Sarasota Bay fish community experienced greater than average seasonal variation in fish abundance and species diversity. Last winter we caught a total of 3,390 fish, 51% of which were dolphin prey fish, and averaged 113 fish caught per seine set. In total, 45 different species were caught this past winter. This summer yielded 51,681 individuals, 87% of which were dolphin prey fish, and an average of 1,292 fish caught per set. In total, 71 different species were caught this summer. To put these numbers into perspective, we caught our sixth lowest average winter fish abundance and our fourth highest average summer fish abundance since sampling began in 2004.

Low temperatures in January and February, and/or the high abundance of macroalgae present in Sarasota Bay seagrass meadows this past winter may account for these below average winter fish catches. Our abundant summer catches occurred despite large sewage discharges (nearly 43 million gallons of raw and partially treated sewage) into Sarasota Bay and the Manatee River during Tropical Storm Debby. Following Debby, dissolved oxygen levels were very low in some areas, resulting in fish kills in places such as Blackburn Bay. Throughout August and September fish surveys, water clarity in the estuary was greatly reduced by a combination of stormwater run-off (lower salinity, dark, tannin-stained waters) and incoming tides containing suspended sand from stirred-up Gulf waters. Sewage discharges are known to cause algal blooms which can smother or shade seagrass, and to create potential "dead zones" due to reduced oxygen levels in the water. They can also introduce bacteria, viruses, contaminants, microplastics, pharmaceuticals, and endocrine disruptors to fish and other marine life. The full repercussions of these sewage and nutrient inputs on seagrass beds, wildlife, and water quality are complex and will not be understood for some time.

While prey abundance is important; dolphins tend to consume prey within a certain size range. One of the most common and abundant dolphin prey species in Sarasota Bay is the pinfish. In 2024, pinfish accounted for 76% of the top ten common dolphin prey species caught. This year the proportion of pinfish within the size range that dolphins typically consume (≥96 mm) was 21% higher than in 2023. Following in order of abundance, scaled sardine and Atlantic threadfin herring had consumable proportions comparable to 2023, while the proportion of consumable pigfish, a soniferous or sound-producing prey species, was 54% lower. Ongoing efforts seek to examine the effects of ecological disturbances such as red tide and sewage discharges on fish, dolphins, rays, and sharks in Sarasota Bay.

We thank the many interns and dedicated volunteers who have worked on this project. 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 (23-09-RW2).

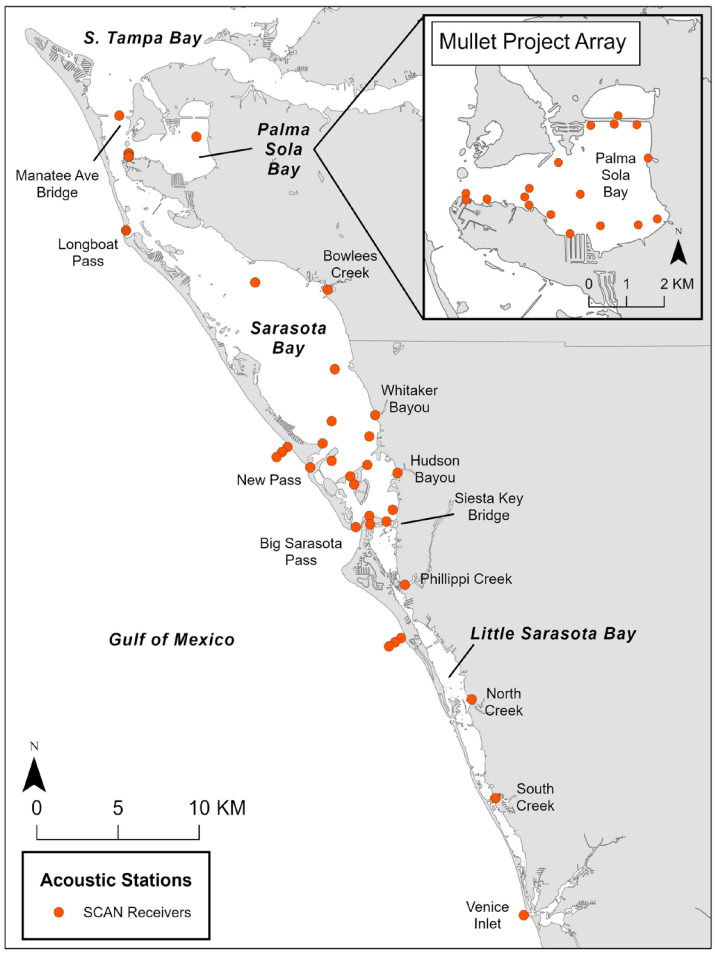
Volunteer Matt Winters with a vibrantly colored scrawled cowfish prior to releasing it back into Sarasota Bay.

Tagging and tracking dolphin prey fish in Sarasota Bay

Elizabeth Berens McCabe and Krystan Wilkinson, Sarasota Dolphin Research Program, Brookfield Zoo Chicago

The Sarasota Dolphin Research Program (SDRP) investigates the distribution of wild dolphins relative to their fish-based prey by collecting data on the movement of dolphin prey species. In addition to assessing the spatial ecology of dolphin-prey interactions in the Sarasota Bay area, these data can be used to monitor changes in prey movement and potential refuge areas associated with ecological disturbances, such as *Karenia brevis* red tides. Based on our preliminary movement data of mullet species in non-red tide conditions, individuals tagged locally move throughout the home range of the Sarasota dolphins!

The resident bottlenose dolphins of Sarasota Bay eat a variety of fish species associated with seagrass habitat, including mullet, pinfish, and ladyfish, and noise-making species such as spotted seatrout, Gulf toadfish, and pigfish. In the fall of 2023 and the spring of 2024, Krystan Wilkinson, Elizabeth Berens McCabe, and SDRP interns tagged 48 mullet (striped and white mullet) internally with



Distribution of SCAN underwater acoustic receivers in Palma Sola Bay and the Sarasota Bay area.

A recently caught mullet on the sampling board getting an acoustic tag.

Innovasea acoustic tags. Following tagging, movement data were collected using passive telemetry via the Sarasota Coast Acoustic Network (SCAN), which consists of 80+ passive acoustic receiver stations (see page 30). Briefly, these acoustic receivers are anchored on the bottom of the Bay in strategic locations and "listen" for tagged fish. When a tagged animal swims by an acoustic receiver, the time, date, and the individual's unique tag ID are recorded. Eighteen acoustic receivers are located in Palma Sola Bay to monitor mullet movements in this region as it is commonly used by dolphin moms with young calves and we see a lot of feeding activity in this area. Preliminary data downloaded this spring indicate that tagged mullet moved throughout the home range of the resident Sarasota Bay dolphins, with individual mullet tagged in Robinson Preserve (just north of Palma Sola Bay) exhibiting broad-scale movement out of Robinson Preserve, through Palma Sola Bay, and as far south as Siesta Key and Big Pass. Similarly, mullet tagged in New Pass were detected as far north as Palma Sola Bay.

Krystan Wilkinson (left) and Elizabeth Berens McCabe (right) prepare to release a tagged mullet into New Pass.

During October and November we have been able to tag 30 mullet. This will increase our sample size, as normal mortality rates due to predation are expected to be relatively high, and allow the collection of longer-term, broad-scale movement data throughout the area over an extended period (Oct 2023 – fall/winter 2025). In addition, we plan to use active acoustic telemetry (tracking the fish post-tagging, from a research vessel) to document the fine-scale movement patterns and habitat use of two tagged mullet over a 24-hour period.

We thank Pete Hull, Mote Marine Laboratory's Marine Operations Department, Mote Marine Laboratory's Fisheries Ecology & Enhancement group, and the SDRP interns who have worked on this project. The work would not be possible without you! Funding for this project was provided by Mote Scientific 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 (23-09-RW2).

Shark research in Sarasota Bay – An update

Krystan Wilkinson, Sarasota Dolphin Research Program, Brookfield Zoo Chicago

The Sarasota Dolphin Research Program (SDRP) not only studies dolphins, but also their predators and prey, to gain a deeper understanding of the ecosystem dynamics that shape the dolphin community. Through monthly dolphin photo-identification (photo-ID) surveys, we document shark bite wounds on local dolphins, providing evidence of unsuccessful predation attempts. These data are crucial for understanding seasonal and annual changes in predation pressure on the dolphin community. To date in 2024, the SDRP has documented at least nine Sarasota resident dolphins with fresh shark bites (see next column for example). Bull sharks and tiger sharks are the most frequent predators of the Sarasota Bay dolphin residents. Sydney Haas, a 2024 summer Brookfield Zoo Chicago (BZC)-SDRP intern and incoming Master's student at New College of Florida, will aim to identify the species of sharks responsible for the bite wounds documented during SDRP field projects for her thesis research (see Sydney's Intern Perspective article, page 41, and Heidi Harley's article about the new Master's program at New College, page 38).

Building on our observations of shark bite wounds, we began tagging coastal sharks in 2017, in collaboration with Mote Marine Laboratory's Shark and Ray Conservation Research Program, to gain a deeper understanding of shark-dolphin interactions in the area. Tagging efforts have largely been focused on bull sharks, the primary predator to the Sarasota dolphin community. In 2024, in collaboration with Georgia Aquarium, we tagged three bull sharks with acoustic transmitters to track their movement patterns and habitat overlap with the Sarasota Bay dolphin community (see SCAN article on page 30 for more information about

Montana State University students, Matt Honiker (left) and Savannah Angwin (right), collect water samples for a microbiome study in April 2024 while they were in Sarasota to gain hands-on field experience.

the technology). This brings our total to 53 bull sharks that are being monitored with 7-9-year acoustic transmitters. We also continue to monitor five tiger sharks, nine sandbar sharks, two dusky sharks and one scalloped hammerhead shark. While many of the bull sharks seem to move northward along the Florida Gulf coast during the warmer months and southward during cooler months, one bull shark recently broke this trend and explored the U.S. Atlantic coast. The 2.5 m female bull shark was tagged in April 2023 off of Sarasota. By late June 2023, she was detected off of South Carolina, and then off Virginia Beach in early July! We recently submitted all shark acoustic and satellite-linked tag detections, including data for this shark, to the National Marine Fisheries Service (NMFS) Highly Migratory Species (HMS) Management Division to support Amendment 17, which is aimed to update HMS Essential Fish Habitat (EFH) for tunas, swordfish, sharks and billfishes.

In addition to monitoring shark movement behavior, we are investigating bull shark microbiomes across life stages with research colleagues Dr. Jayne Gardiner (New College of Florida), Tonya Wiley (Havenworth Coastal Conservation) and Dr. Zoe Pratte (Montana State University). Animal microbiomes are closely aligned with their environment and lifestyle, thus examining the microbial communities of marine predators can offer valuable insights into how their behavior and diet change across life stage. Students have played key roles in this research from assisting with sample collection to sample processing. Matt Honiker and Savannah

Healing shark bite on Sarasota community member, 2255, in September 2024.

Angwin, students at Montana State University working under the guidance of Dr. Pratte, have made significant progress in analyzing collected microbiome samples. Preliminary results suggest high relative abundance of *Photobacterium damselae* in all life stages of bull sharks. While *P. damselae* is a common bacterium in elasmobranchs (sharks and rays), it hasn't been documented in early life stages before now. To enhance this study, we are collecting additional samples during fall 2024 and will perform metagenomic sequencing to determine if the same strain of *P. damselae* is present across all life stages. Thanks to a recent grant from Mote Scientific Foundation, providing a student stipend and sample processing costs, another student based at Montana State University will lead this follow-up analysis and sequencing in 2025.

Funding for this research has been provided by an anonymous donation to Brookfield Zoo Chicago and Mote Scientific Foundation. Tag donations were provided by Georgia Aquarium (n = 3 acoustic transmitters) and the Movement of Life at Smithsonian Institution (n = 4 satellite-linked tags). 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), as well as Dr. Jayne Gardiner and Tonya Wiley for their assistance with shark tagging and sampling. We thank Dr. Zoe Pratte, Matt Honiker and Savannah Angwin for leading microbiome sample processing.

New discoveries in ray research: Clues from innovative tag and ultrasound technologies

Kim Bassos-Hull, Krystan Wilkinson, Sarasota Dolphin Research Program, Brookfield Zoo Chicago; Atlantine Boggio-Pasqua, Aix-Marseille University, France

Since 2009, in collaboration with Mote Marine Laboratory's Sharks and Rays Conservation Research Program (SRCRP), we have been studying the life history, feeding ecology, and movement patterns of the whitespotted eagle ray (*Aetobatus narinari*) and the Atlantic pygmy devil ray (*Mobula hypostoma*), which are protected in Florida and globally classified as endangered. Using new and innovative tagging and ultrasound technologies we are starting to learn more about their fine- and large-scale movement patterns and reproductive strategies. These technologies are helping to inform critical habitats descriptions (including potential nursery areas) and providing life history data that are important for conservation and management of the species.

During April 2024, Research Associate Kim Bassos-Hull and Staff Scientist Krystan Wilkinson sampled and tagged 15 whitespotted eagle rays with Innovasea acoustic tags as part of an ongoing long-term study of these rays in Sarasota Bay. Three of these rays were tagged for the first time ever in Sarasota with CatsCam suction-cup-mounted tags which recorded audio, video, and three-dimensional movement patterns. All three tags were recovered after 24 hours and showed interesting oscillating movements in the water column, feeding behaviors and interactions with remoras and sharks. Additionally, a new field ultrasound (Butterfly) successfully detected pregnancy (4 pups) in a large ray. This provides clues about Sarasota Bay as a nursery area and the number of pups large eagle rays can carry.

In October 2024, in collaboration with FAU Harbor Branch and the Okaloosa County Coastal Resources Team, Kim and Aix-Marseille PhD student Atlantine Boggio-Pasqua conducted a third devil ray tagging season along Florida's Emerald Coast, as part of a dedicated multi-year project funded by Mote Scientific Foundation, Save Our Seas Foundation, Georgia Aquarium, and Nausicaá Aquarium. In three days, they caught, measured, and sampled 22 rays (juveniles and subadults), of which 16 were acoustically tagged and 7 were also equipped with a pop-up satellite-linked tag (Wildlife Computers). Both types of tags provide complementary information on the animals' movements. Internal acoustic tags are long-term (one year minimum) but only yield detections near underwater receivers, while satellite-linked tags are short-term (up to several months) but provide continuous vertical and horizontal movement data. The team also performed the world's first ultrasound exam on a wild Atlantic pygmy devil ray. Although no pregnancy was detected, examining female reproductive organs is critical to better understanding the species' sexual maturity and reproductive cycles.

Preliminary results from acoustic tags deployed last year suggest that juvenile and subadult pygmy devil rays spend several months along the Emerald Coast in the fall and early

Devil ray with satellite-linked tag: Researchers Matt Ajemian (Florida Atlantic University-Harbor Branch Oceanographic Institute) and Atlantine Boggio-Pasqua prepare to release a devil ray with a satellite-linked tag off Florida's Panhandle (October 2024). All research conducted under FWC-SAL-1140-SRP permit.

Left to Right: Krystan Wilkinson, Kim Bassos-Hull, Diana Pazmiño while working in the Galapagos in March 2024.

spring, with individuals coming closer to shore during the day and moving offshore at night. This is likely related to a peak abundance of one of their favorite prey, mysid shrimp (*Metamysidopsis swifti*), which can form dense patches along the beaches. The first satellite telemetry data ever recorded on the species showed “Blue”, a young adult, spending 4 days in the head of the DeSoto Canyon, diving down to 156 meters and showing diel vertical behavior: he was very active at night, probably feeding on zooplankton rising in the water column, and very passive during the day, probably resting. “Scout”, a subadult male tagged in October 2021 in Sarasota, was also detected along the Emerald Coast in November 2023 for the third consecutive year, after completing two yearly return migrations between the two areas.

With a total of 120 acoustic tags deployed on whitespotted eagle rays and 60 on Atlantic pygmy devil rays in the Gulf of Mexico, along with the CatsCam and satellite-linked tags, researchers hope to identify the most critical habitats for these endangered rays as well as the environmental drivers of their migrations.

Above: Researchers Ari Rojas and Ce Hampton from Florida Atlantic University-Harbor Branch Oceanographic Institute deploy the first-ever CatsCam suction-cup-mounted tag on a wild whitespotted eagle ray in Sarasota Bay (April 2024). All research conducted under FWC-SAL-1140-SRP permit.
Left: a drone view of a free swimming whitespotted eagle ray with a CatsCam tag in Sarasota Bay in April 2024.

Gulf of Mexico Dolphin Identification System: Using photo-identification to match dolphins that die as a result of human interaction

Carolyn Cush, Sarasota Dolphin Research Program, Brookfield Zoo Chicago

The Gulf of Mexico Dolphin Identification System (GoMDIS) is a collaborative effort involving photo-identification (photo-ID) researchers and stranding groups throughout the Gulf of Mexico, including Mexico and Cuba, to standardize, archive and curate bottlenose dolphin fin catalogs in one place. These are accessible online through the OBIS-SEAMAP photo-ID portal, thus allowing for ease of matching among 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/rehabilitated dolphins to the wild by identifying the most appropriate release sites. It also gives us further information about animals after they have died. Now, in its twelfth year, GoMDIS includes representative images from 45 catalogs with approximately 27,800 animals and more than 51,700 images. Gulf-wide, 2,433 matches between groups have been made to date, strengthening and stitching together data from individual research groups.

GW2024022 submitted by Gulf World Marine Institute was one of the deceased animals that was matched via photo-ID with OBIS-SEAMAP, and was found with fishing gear in her forestomach.

At the time of writing for 2024, we have received data and images for 86 deceased bottlenose dolphins from our collaborating stranding partners. Of these, 12 had the potential to be matched based on body condition and dorsal fin notches. These animals were searched for using the OBIS-SEAMAP portal and any potential matches were relayed to the contributors for confirmation. Seven were matched to animals in photo-ID catalogs from surrounding areas. Of the seven, four were documented with fisheries interactions, ranging from entanglements to swallowed fishing gear. Several of those animals were documented during photo-ID studies as opportunistic feeders around anglers, targeting both their bait and catches, which can lead to a slow, painful and unnecessary death. Help us keep them safe by spreading the word to reel in fishing lines when dolphins are nearby, and not reinforce their behavior of approaching anglers.

Dolphin Rescues, Releases, and Follow-up Monitoring

Sarasota Dolphin Research Program involvement in interventions and stranding response

Randall Wells and Aaron Barleycorn, Sarasota Dolphin Research Program, Brookfield Zoo Chicago

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 received new support from the NOAA John H. Prescott Marine Mammal Rescue Assistance Grants program 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) assist stranding network members with preparation of intervention and/or release plans, including selection of release sites and methodologies for follow-up monitoring, including maintaining the Gulf of Mexico Dolphin Identification System (GoMDIS) as a means for potentially determining the sites of origins of stranded dolphins, and therefore the most appropriate release sites, 3) train personnel for tag attachment and monitoring, 4) enhance safe dolphin handling capacity for the network by providing training/experience opportunities for potential dolphin catchers, veterinarians, stranding response personnel, law enforcement agents, and government personnel during bottlenose dolphin health assessment projects, and 5) assist 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. Recent tests of prototype darts provided important information for refinement of the system (see page 33).

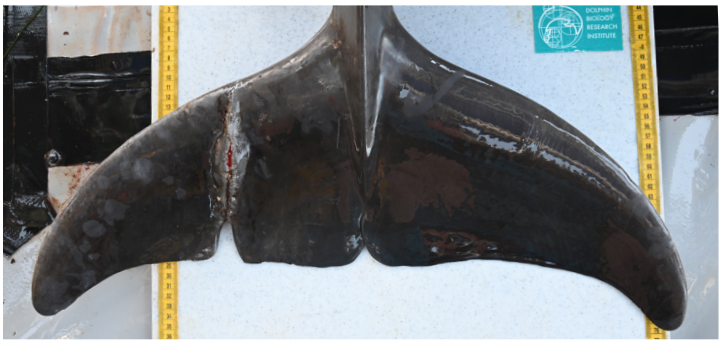
We consulted with NOAA on a number of potential interventions around the southeast this year, and led two rescues of bottlenose dolphin calves on Florida's west coast, as described below by Aaron Barleycorn:

C556 rescue (F334): On February 1st 2024, our survey boat found 8-year-old Sarasota resident C556 swimming with monofilament line and a bobber entangled around and trailing from his fluke. With permission from NMFS, we put together a remote disentanglement team to try to remove the gear. Between February and May, we made multiple attempts to find and disentangle C556, but he was not making it easy. Despite being reliably found during photo-ID surveys, we couldn't find him during some of our rescue attempts. When we did locate him, he would surface quickly, unpredictably, and often 100 yards or more from his previous location – very frustrating. He was still entangled as we approached our May dolphin health assessments. As he had never been handled before, he was already considered a high priority dolphin for assessments. With the entanglement, he moved to the top of the list.

Dr. Mike Walsh (left) and Dr. Jennifer Langan (right) work on cutting free the embedded fishing line from C556's fluke while Jonathan Crossman (center) holds it steady.

On May 13th, the first day of health assessments, we headed to Little Sarasota Bay to try to find C566. After 12 boats searched most of the day, we eventually did find him alone swimming back and forth across the bay. We made three different attempts to set around him, but he evaded capture every time. Eventually we had to head home unsuccessful as it was getting too late in the day.

On May 21st, we found him feeding near a sandbar and were finally able to get a net around him. As we completed the compass we encircled him and a few hundred mullet. He was happily feeding on his captive prey as we maneuvered the net over the shallows. We were finally able to get ahold of C556 and remove the gear. Because of his tendency to surface "here, there, every, everywhere," the team decided to name him Roy Kent from the TV show *Ted Lasso*. The attending veterinarians gave Roy a clean bill of health and he was let go, to hopefully frustrate our survey teams for years to come. He was most recently seen on September 6th 2024, being as evasive as ever.



C556's left fluke blade was severely injured by embedded fishing line.

Removing embedded fishing line from 2615.

2615 rescue (F332): On January 16th 2024, our survey boat found dolphin "Boot" and her 4-year-old calf (2615) in Palma Sola Bay. The calf had braided fishing line wrapped around and cutting through its dorsal fin. Braided line acts like a serrated blade when wrapped around a dolphin, cutting deeper and deeper as the dolphin moves. The line had already begun to severely disfigure his fin. We reported the entanglement to NMFS and the regional stranding agencies, and began to plan for a possible rescue, but Boot is usually north of our survey area in Tampa Bay so we do not have a great chance of seeing her regularly. As expected, we did not see them again for months. Luckily for 2615, they came back into our area, specifically Palma Sola Bay in April, right before our May health assessments. The fin was even more mangled, and the line had begun to collect algae, creating more drag, so we very much hoped they would remain in the area until May when we would have a team on the water able to do a rescue.

On May 17th, we found Boot and 2615, still in Palma Sola Bay, in very shallow water. We were able to set on them and do a full health work-up on both. We removed the line from 2615's fin, treated the still open wound, and gave him some antibiotics to treat any possible infections. Both mom and calf were seen together in July 2024. 2615 looked healthy, but he will have a severely disfigured dorsal fin for the rest of his life, and the disfigurement may catch more line – a stark reminder to us all to properly dispose of our fishing line, and to avoid fishing when dolphins are around, and to perhaps avoid using braided line completely.

2615's fin in 2023 prior to its entanglement.

Damage to 2615's dorsal fin from embedded braided fishing line.

Dolphin rescue updates

Aaron Barleycorn, Sarasota Dolphin Research Program, Brookfield Zoo Chicago

The Sarasota Dolphin Research Program applies its experienced, highly trained team and specialized gear to lead or participate in rescues of dolphins that have been injured, entangled, or stranded. When this occurs in the Sarasota area, we have the opportunity to monitor the animals post-release, in some cases for many years. This led to the important determination that each individual rescued dolphin leverages population-level conservation benefits. When we assist with rescues elsewhere, our colleagues are often able to provide us with updates. Below are updates on some of our rescued dolphins.

Merrily: In 1985, the SDRP performed its first dolphin rescue. Merrily, the 1-year-old calf of Granny (FB19), became entangled in a mullet net while SDRP personnel were performing a dolphin health assessment nearby. Without intervention she surely would have drowned. The team was able to remove her from the net, and she has been an important member of the Sarasota dolphin community ever since. Now 40 years old, Merrily has had 5 calves, and at least 4 grand-calves. She is seen regularly on our monthly surveys, most recently on October 3rd, 2024.

Merrily and her most recent calf, C115, born in 2016, in September 2024.

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 the insertions of his pectoral fins. On August 3rd 2006, Scrappy was temporarily captured, and the suit was removed. Now 24 years old, he and C835 have formed a male alliance. They have been seen together several times in 2024, most recently on October 1st.

Ginger: In December 2008, Ginger, a recently independent juvenile female dolphin, stranded on Siesta Beach. She was taken to Mote Marine Laboratory's dolphin hospital, treated for complications from the stranding, and released two months later. The SDRP

radio-tagged her and closely monitored her for two months post-release until the tag transmissions ceased. She has since been 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." She is often seen during surveys with her 1-year-old calf.

Nellie: In February 2010, the calf of resident dolphin FB25 was seen with plastic twine and a metal hook tightly wrapped around her head, embedding in the tissue. She was temporarily captured, disentangled and released 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.

Lizzie, disentangled in 2012, with her 9th calf, in June 2024.

Lizzie: One of our Sarasota residents, Lizzie, had an eventful 2013. She was given a temporary satellite-linked tag during our health assessments 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 had her 9th calf this year and was seen most recently on October 3rd.

F316: On April 1st, 2019, we rescued Sarasota resident F199's newly independent calf (now F316) who had fishing line around and cutting through his fluke, and who was incredibly emaciated. 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. Fortunately, F316 proved us wrong. We continue to see him regularly during surveys. At 7 years of age, F316 is indeed doing well and his fluke has healed. He was seen on September 6th 2024 socializing with several other juvenile dolphins, as we would expect from a healthy dolphin his age.

2094: On January 6th, 2023 a local tour boat reported a dolphin calf with monofilament fishing line wrapped around and trailing behind its fluke. SDRP staff were able to confirm the dolphin was the 2-year-old calf of resident dolphin F209 (since it was her 4th calf, it was given the code 2094). On January 11th, 2023, an SDRP boat was able to locate 2094 and used a long-handled cutting tool to remove 6 feet of trailing line from the free-swimming dolphin. This did not resolve the issue, but certainly reduced drag, providing some relief and buying time to organize a full intervention. On February 21st, SDRP led a multi-agency rescue of 2094 and we were able to temporarily catch, disentangle, and release her with her mom. Since that time, 2094 has been seen multiple times. This year F209 had another calf and 2094 entered the perilous life of an early juvenile dolphin. She has been seen regularly by herself in Roberts Bay, most recently on June 10th, 2024.

Dit: On August 9th, 2023, SDRP staff traveled to Cedar Key, Florida to attempt a remote disentanglement on a 5-month-old dolphin entangled in clam fishery netting. The dolphin, "Dit", had been seen multiple times since June 18th by the Cedar Key Dolphin Project (CKDP) with a life-threatening wrap of netting around its body and pecs. Working with CKDP and the University of Florida Marine Animal Rescue team, we were able to locate Dit with his mom, "Nail" and use a grapple attached to a long pole to remove the netting from the free-swimming calf. Soon after, major Hurricane Idalia devastated the area with 100+ mph winds and 7 feet of storm surge. Fortunately Nail and Dit survived the storm and were most recently seen together on July 8th, 2024.

Dit surfacing, entangled in clam fishery net, as a grappling hook attached to a pole is used to free it.

Progress with our pole-mounted Tag Attachment Device (TADpole)

Randall Wells, Aaron Barleycorn, Jason Allen, and Jonathan Crossman, Sarasota Dolphin Research Program, Brookfield Zoo Chicago

Building on our 2023 first successful deployment of a satellite-linked tag on a bow-riding Atlantic spotted dolphin with our pole-mounted Tag Attachment Device (affectionately known as the TADpole), we were able to tag two more Atlantic spotted dolphins on April 18th, 2024. These dolphins were tracked for 47 and 90 days.

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. Further modifications reduced the tagging time by crucial milliseconds. Parallel tests of the new aluminum attachment pin were performed with three bottlenose dolphins in Sarasota Bay to better understand the duration of attachment and ultimate tag shedding. A description of the tool and its development was recently published, and a copy of the paper can be found at: https://animalbiotelemetry.biomedcentral.com/articles/10.1186/s40317-024-00364-3

Atlantic spotted dolphin "Ping" with a satellite-linked tag attached via the TADpole, April 18th, 2024.

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 deployments to this point prove the engineering concept and utility of the system. Once fully developed, the TADpole has the potential to facilitate much-needed research on offshore dolphins around the world. As a first step, we have plans to take the tool to Hawaii to work with Robin Baird early in 2025. 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 Brookfield Zoo Chicago.

The Sarasota Coast Acoustic Network (SCAN)

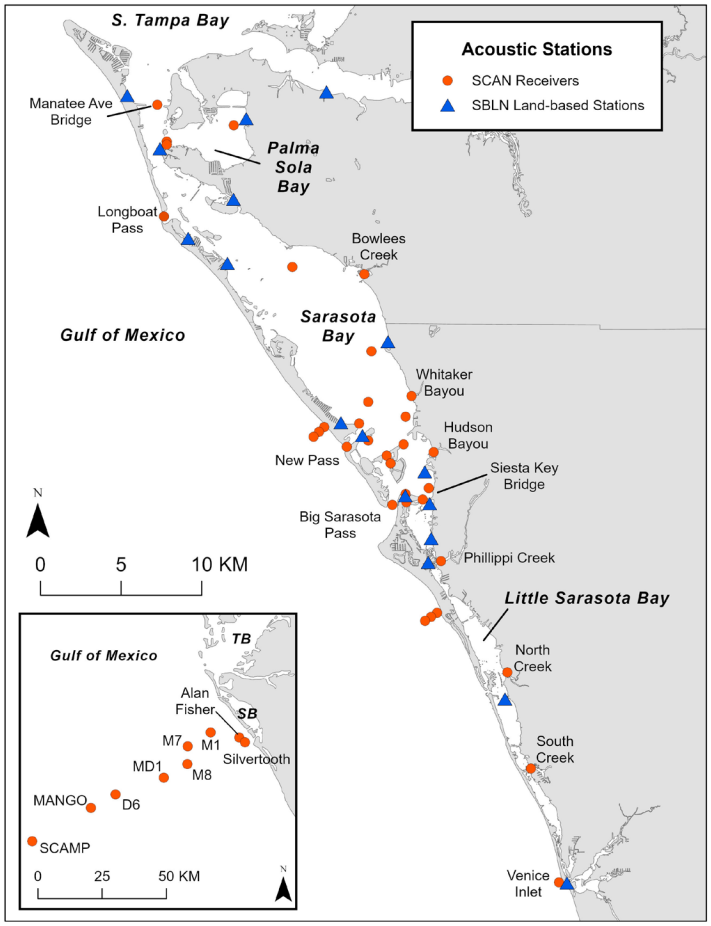
Krystan Wilkinson, Kim Bassos-Hull and Elizabeth Berens McCabe, Sarasota Dolphin Research Program, Brookfield Zoo Chicago

In recent years, researchers studying coastal and estuarine ecosystems have made great strides in learning about animal ranging patterns and habitat use by tagging fish and invertebrates with acoustic transmitters, tracked via networks of underwater receivers. How does this technology work? It begins with researchers attaching an acoustic transmitter (or tag) to an animal, such as a fish. The transmitter emits sound signals, or "pings," which are picked up by underwater acoustic receivers that are "listening" for these pings. As the animal swims by, the receiver records the date, time and identity of the transmitter. Each underwater receiver must be physically retrieved and downloaded in order to obtain the stored data, and batteries must be replaced annually. Maintaining a vast network of receivers allows researchers to address important scientific questions, such as residency within an area, migration patterns, and seasonal presence.

The Sarasota Coast Acoustic Network (SCAN) has deployed more than 80 underwater acoustic receivers in and near Sarasota Bay, Florida (see map on next page), including: (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 receiver network collects critical data which inform us about the movement patterns and habitat use of a variety of tagged animals – some of which are considered endangered or threatened – such as bull and tiger sharks (common predators of Sarasota Bay bottlenose dolphins), mullet (common prey of Sarasota Bay dolphins), as well as spotted eagle rays, lesser devil rays and lightning whelks. We do

not use these tags to study dolphin movement behavior as the tag pings are within the dolphin hearing range, but they are not in the hearing range of many shark, ray and fish species.

SCAN continues to emphasize collaborative research with partners from the Sarasota Dolphin Research Program, Mote Marine Laboratory, New College of Florida, Florida Atlantic University-Harbor Branch Oceanographic Institute and other Florida-based institutions. SCAN is part of two regional collaborative acoustic receiver array networks: (1) the Integrated Tracking of Aquatic Animals in the Gulf of Mexico (iTAG) network, and (2) the FACT Network along the eastern U.S. coast and The Bahamas, where SDRP staff scientist Krystan Wilkinson serves on the steering committee. These regional networks facilitate data sharing of tag detections across institutions allowing scientists to detect animal movements beyond their primary study area. One of our most important collaborations is with the Sarasota Bay Listening Network (SBLN; see the next article). This network monitors the soundscape of the Sarasota Bay estuary using passive acoustic listening stations wired to hydrophones, allowing SDRP to track sound-producing - but not acoustically tagged - animals, such as dolphins, manatees, and certain fish species, as well as noise produced by human activity, such as boats and marine construction (see infographic with SBLN article on the next page). Collectively, SCAN and SBLN are referred to as the Sarasota PALS Network (PALS stands for passive acoustic listening stations). These two types of PALS are complementary and facilitate a better understanding of animal movements, habitat use and residency in the estuary and its surrounding waters. We are in the process of increasing the area of overlap between SCAN and SBLN and, ultimately, the utility of these networks for studying species interactions and their relationship to the environment.



Distribution of SCAN underwater acoustic receivers and SBLN shore-based stations within the Sarasota study area. For simplicity, SCAN receiver locations represent general areas being monitored and are not representative of the number of receivers in each location.

Since SCAN's establishment in 2016, the network has contributed more than 2 million detections of 354 distinct tags representing 21 unique species to researchers via iTAG and FACT. SCAN has been able to support student projects by providing critical data for six undergraduate senior theses, two Master's theses, and two PhD dissertations which are currently in progress. SCAN collaborators have led or been co-authors on four peer-reviewed publications (with several others in progress) and two technical reports. Domestic and international interns and visiting research colleagues have also received technical training in servicing receivers and analysis of tag detection data.

Funding for the infrastructure and annual servicing needs of SCAN has been provided by Mote Scientific Foundation, an anonymous local foundation, an anonymous donation made through Brookfield Zoo Chicago, the Chicago Board of Trade Endangered Species Fund, and a Wells Fargo Community Giving for Sustainability Program grant. We hope SCAN can persist long into the future, and we sincerely thank our donors for their continued support of this impactful and productive array.

The Sarasota Bay Listening Network (SBLN)

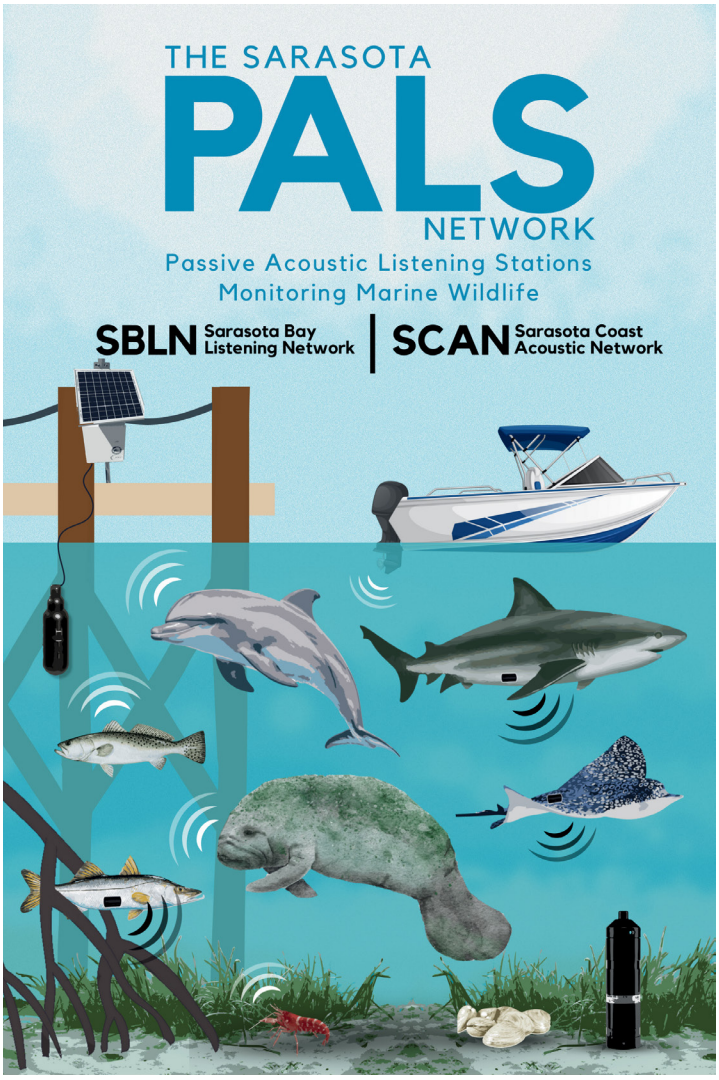
Katie McHugh, Katy Holmes, and Cecilia Thompson, Sarasota Dolphin Research Program, Brookfield Zoo Chicago

The Sarasota Bay Listening Network (SBLN) continuously records underwater sounds at land-based passive acoustic listening stations (PALS) wired to hydrophones (underwater microphones) around the Sarasota Bay estuary. These stations provide windows into local "soundscapes" of noise and vocalizations produced by human activities, animals and physical events, such as rain and waves. A goal of the SLBN and other passive acoustic monitoring networks is to understand the nature of marine soundscapes, including the contributions of different sources of sound, especially those of human origin, and how they influence animal behavior. By analyzing biological sounds, we also gain information about animal presence, biodiversity and behavior, which are useful indicators of ecosystem health.

The SDRP has a leading role in the management of the SBLN and its sister network, the Sarasota Coast Acoustic Network (SCAN), which are collectively known as

the Sarasota PALS (Passive Acoustic Listening Stations) Network. Whereas the SBLN records sounds produced by dolphins, manatees, fish and snapping shrimp, SCAN uses a different acoustic technology to detect sharks, rays and other fish tagged with acoustic transmitters (see infographic below). The two types of PALS are complementary, providing valuable data on the movements, responses to disturbance, and other behavior of an ecologically rich array of species, including some that are threatened or endangered. We are in the process of increasing the area of overlap and, ultimately, utility of these networks for studying species interactions and their relationship to the environment.

A generous grant from an anonymous local foundation has kickstarted exciting SBLN upgrades that will greatly increase its scientific value and accessibility to the public. With the expertise of collaborators at Loggerhead Instruments, Woods Hole Oceanographic Institution and University of Aarhus (Denmark), a second generation SBLN PALS station is in development. PALS2 will use sophisticated AI algorithms to automatically detect dolphin and manatee vocalizations and vessel noise and share summary data on a public website. AI-algorithms are also being developed to identify detections of specific dolphins from their individually distinct signature whistle "names", a feat that would not be possible without continued updates to the Sarasota Dolphin Whistle Database, which contains the most comprehensive collection of dolphin signature whistles for any population worldwide. Whistle detections will be transmitted to the cloud for comparison with known signature whistles of Sarasota Bay dolphins in near real-time, realizing a long-held goal of the project by allowing us to remotely track individual dolphins around the bay via acoustics.



The two components of the Sarasota PALS Network – stations for recording underwater sounds (SBLN), and receivers for collecting acoustic tag signals (SCAN).

Interns Alondra Velazquez, Allie Shiers, and Zoe Hosford help to maintain a SBLN station on Longboat Key.

During 2025, we plan to have 18 stations up and running, following repairs from hurricane damage and installation of new stations. We will also begin to upgrade the SBLN to PALS2 with the aid of the anonymous foundation's grant, beginning with six stations. Several SBLN stations are generously hosted by community partners, including New College of Florida, Eckerd College, Anna Maria Elementary School, and Marie Selby Botanical Gardens Historic Spanish Point campus, and we look forward to prioritizing these locations for PALS2 upgrades to increase the SBLN's public engagement. People will be able to listen to live audio and interesting sounds detected by PALS2 at the stations and via a public website, where they will eventually also be able to see where specific dolphins have recently been detected.

Ultimately, we are seeking to upgrade the entire SBLN to PALS2, which will greatly increase its efficiency and transform it into a model conservation-focused tool that can be replicated elsewhere.

How long does a bottlenose dolphin's blubber store its dietary history?

Theresa-Anne Tatom-Naecker, University of California, Santa Cruz

My PhD dissertation research focuses on a newer method to determine what dolphins eat (i.e., their diet) called quantitative fatty acid signature analysis (QFASA). When dolphins consume prey, certain fatty acids (chains of carbon, hydrogen, and oxygen atoms that are key to energy storage in mammals, including humans) are transferred from the prey into the dolphin's blubber, a layer of fatty tissue beneath its skin. The first part of my research confirmed that QFASA accurately estimates the average percentages of different prey species eaten by dolphins. Scientists can

QFASA should soon allow us to identify diets without having to wait for a dolphin to feed at the surface in front of us, as C250 is doing here with a mullet.

take a tiny piece of blubber and samples of possible prey fish, use chemical analyses to measure the amounts of different fatty acids in the samples, and apply statistical models to see what mixture of prey species most resembles the fatty acids found in the dolphin. However, we were not sure what time period of feeding the blubber recorded. In other words, how long were the fatty acids from the prey staying in a dolphin's blubber, and were the prey percentages estimated using QFASA an average of what the dolphin ate over a couple of days, weeks, or months? Understanding whether QFASA estimates a dolphin's diet over an extended period or provides a shorter snapshot influences the interpretation and application of the results. A shorter period may not represent the whole diet picture, while a longer-term estimate captures an animal's general diet patterns and can be used to study diet changes across different time periods, such as seasons or environmental conditions, or among different groups (e.g., sexes, ages, etc.).

I explored the feeding window using blubber and prey fish samples from three US Navy dolphins, generously donated by the National Marine Mammal Foundation. While we knew the percentages of fish the dolphins had eaten, the amounts varied over the six months (26 weeks) before sampling. One dolphin's diet consisted of 52-70% capelin and 29-48% herring over that period, the second consumed 50-53% capelin, 22-31% herring, 7-15% mullet, and 7-13% squid, and the third ate 7-8% Atlantic thread herring, 25-31% capelin, 0-5% croaker, 37-61% herring, 4-18% mullet, and 0.5-4% squid. Knowing this, we determined 15 known diets for each dolphin, corresponding with the average prey species percentages consumed between 0 and x weeks before sampling, with x = 1, 2, 3, 4, 6, 8, 10, 12…, 26. Then, we used QFASA to estimate each dolphin's diet and determined which known diet the estimates most resembled. Though the results varied somewhat depending on different parameters in the QFASA model, the diet estimates were closest to the dolphins' known diets averaged over at least the eight weeks before sampling and up to the entire 26 weeks before. This large range is not surprising. While the dolphins' known diets varied over the 26 weeks, they were more consistent between eight and 26 weeks, and especially between 14 and 26 weeks. These results confirm that QFASA provides long-term estimates of the percentages of prey species in a dolphin's diet, rather than a brief snapshot view, valuable for answering a range of research questions.

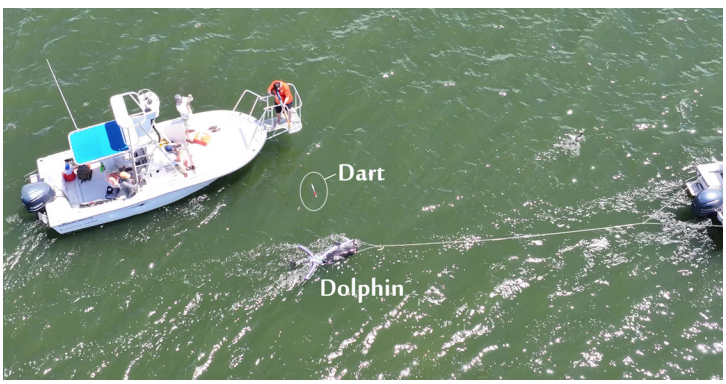
Developing a new tool to save dolphins – remote sedation

Gretchen Lovewell, Mote Marine Laboratory's Stranding Investigations Program, Michael T. Walsh, College of Veterinary Medicine, University of Florida, Randall Wells, Sarasota Dolphin Research Program, Brookfield Zoo Chicago

For years, entangled dolphins that live in water too deep for traditional rescue techniques have eluded and frustrated stranding network partners. In an effort to solve this problem, teams have been using with some success long-handled cutting tools modified from those used on large whales, but more options are needed to help these inaccessible animals. The next step in this endeavor is to develop a means to safely slow down but not immobilize a free-swimming, entangled dolphin, as they must stay conscious enough to come to the water's surface to breathe.

To tackle this problem, we convened the Cetacean Sedation Delegation, an international team primarily consisting of veterinarians with experience in the sedation of mammals. We are working to find a delivery system, establish testing protocols, and provide sedation guidelines for these free-swimming dolphins in need. DANiNJECT, a Danish company that has been developing and manufacturing remote immobilization equipment for zoo and wildlife animals since 1986, has been working to create the delivery system. The biggest challenge is to develop a dart that will stay in the dolphin long enough to deliver the full dose of the sedative, and float with or without the medication and be recovered, all while being mindful of animal safety and welfare. The resulting dart is an engineering marvel.

Two tests have been conducted on bottlenose dolphin carcasses collected by stranding network partners. The first test occurred on land in October 2022 to assess the effects various spring strengths had on dart retention. Unfortunately, the tissues were somewhat decomposed and did not reflect the full challenges involved. Without fresher tissues and water moving past the animal, it was impossible to truly test whether the dart would stay in long enough to deliver the full dose of the sedative at the proper depth and then come out of the animal as desired. The team reconvened in September 2024 with a much fresher



Testing of the prototype sedation dart with a towed dolphin carcass.

carcass, a revised dart, and a plan for in-water trials. Teams worked together for two days aboard two vessels. One team aboard the *R/V Fregata* towed a subadult dolphin carcass in a "cradle" to replicate swimming, and a second team aboard the *R/V Nai'a* served as the platform for shooting the delivery system. The in-water trials were eye-opening and demonstrated the importance of accuracy and the angle of penetration for delivering the sedative appropriately. In each trial, we made significant strides in developing a ready-to-go system to deliver sedatives safely. Still, the technology needs fine-tuning for delivery to be effective on quick-moving animals with small target sites, and we continue to explore options for future testing.

While the delivery system is being developed, the other key component of the project is what to fill the dart with. Creating the appropriate "cocktail" to slow down a conscious breather enough to restrain and handle them, but not so much that they stop swimming and sink, takes a lot of consideration and some of the most experienced minds out there. We have been surveying colleagues around the globe on their experiences of sedating animals in the wild and human care. It's clear from the initial responses that animals in a clinical setting are very different from animals in the wild. To further complicate things, the differences between species and individuals are vast. We are fortunate to have colleagues near and far willing to devote their time and energy to solving this problem. The initial efforts were primarily supported by Mote Marine Laboratory's NOAA Prescott Grant NA19NMF4390178: "Cetacean stranding response, and intervention training and tool development along Florida's central west coast." As we reflect on what we have learned and our next steps, we are actively seeking funding to fully develop and implement this tool for use in Sarasota Bay and beyond.

CetaSpiro, ultrasound-based portable technology for lung health evaluation in the field

Andreas Fahlman, Fundación Oceanogràfic; Jay Sweeney and Rae Stone, Dolphin Quest, Inc.; Blair Sterba-Boatwright, Texas A&M-Corpus Christi; Elmar Ottiger, g&o embedded systems GmbH; Christian Buess, ndd Medical Technologies, Zurich, Switzerland

Respiratory disease is a leading cause of sickness and death in small whales and dolphins, both in the wild and in human care. These animals often hide symptoms until the disease is severe, and while tests like X-rays and ultrasound can help diagnose respiratory issues, they are logistically difficult to perform in the wild and require expert training. Lung function testing, or spirometry, is a quicker, non-invasive method already used in humans to detect breathing problems (Fig. 1). In dolphins, we have shown that lung function testing can predict respiratory health with 88.3% accuracy and have developed an app where we can rapidly provide a diagnosis following the measurements (Fig. 2). This method could help diagnose respiratory issues in stranded dolphins, improving their chances of survival by allowing timely intervention.

However, as "breathing" champions, traditional diagnostic methods have been challenging in dolphins, so dolphin researchers teamed up with engineers building human spirometers to develop the non-invasive, ultrasound-based CetaSpiro. This is a portable spirometer that, unlike conventional spirometers, can accurately measure the high respiratory flows in dolphins, aiding early disease detection. The development of this conservation tool was made possible through collaboration with researchers, engineers, behaviorists, veterinarians and dolphins at public display facilities, and wild dolphins will now benefit from this work. The CetaSpiro will be provided to stranding networks and used during dolphin health assessments to provide supplementary diagnostic information about lung health.

Left: Figure 1. Sarasota Bay dolphin undergoing lung function testing using the portable CetaSpiro.

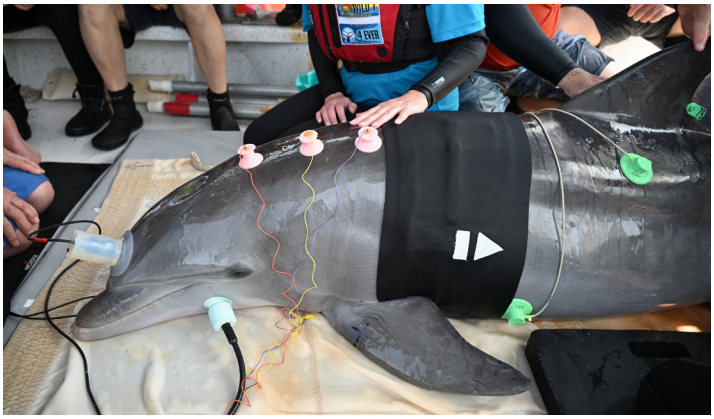
Below: Figure 2. Dolphin-lung-health app, where the user can take 4 variables provided by the lung function testing to get a reliable score about whether a dolphin is free from respiratory disease. This model predits this animal is HEALTHY. Its score is lower (healthier) than 70% of all healthy animals in currently available data. This plot shows the position of this animal relative to others in the dataset.

Electrical Impedance Tomography: How to non-invasively image the lungs of dolphins in the wild

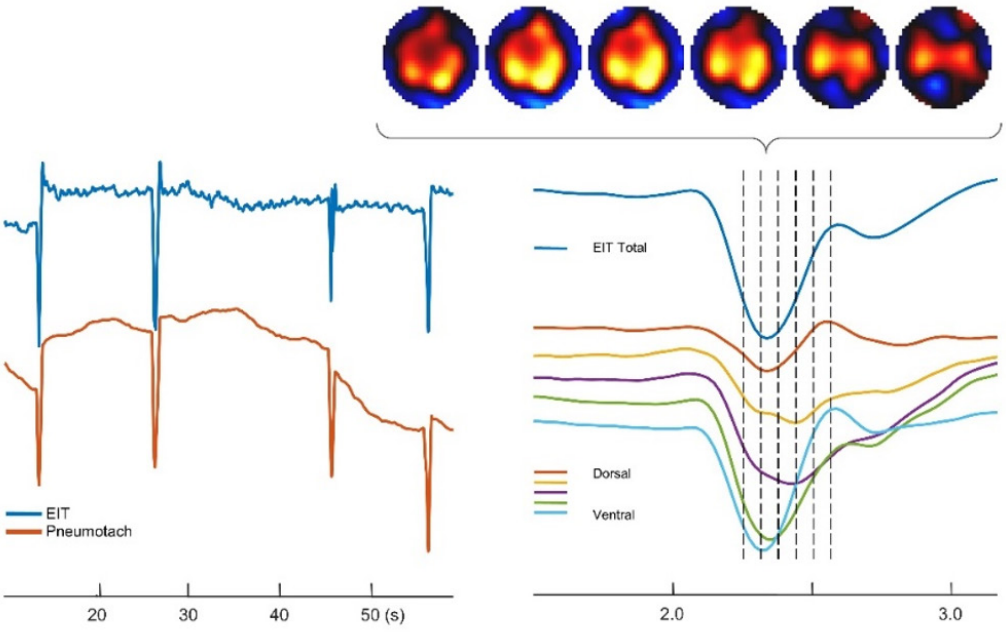
Andreas Fahlman, Fundación Oceanogràfic; Tarek Harake, TNH Biosystems; Andy Adler, Carleton University

For dolphins, as for all air-breathing mammals, the lungs are vital to bring in oxygen for metabolism and to remove carbon dioxide. As dolphins hold their breath while diving with a limited supply of oxygen, and they need efficient gas exchange at the surface to rapidly exchange and renew the oxygen, understanding how the lungs work is important to understand how dolphins have adapted to maximize their diving efficiency, i.e. time underwater. In the last decade, research on how the lungs work in dolphins has been done using conventional spirometry. Although these studies have provided an understanding about the lung capacity, we still do not understand how dolphins can generate the "explosive" exhalations, and how pressure affects the lungs. To do this, we wanted to develop methods to perform Electrical Impedance Tomography in dolphins, which is a non-invasive method used in human medicine to "visualize" the regional filling of air in the lungs (Figure below).

Electrical Impedance Tomography measures the resistance of the electrical signal across the chest, which varies with how air-filled the lungs are (Figure below). By placing a belt loosely around the chest of the dolphins resting on a mat on the boat while the veterinarians are performing the health assessment (image to the right), we can then measure how air is flowing inside the lungs. During each breath, we can see how air is leaving and entering and look at the distribution. As the weight of the dolphin in-air possibly alters their respiratory capacity as compared with when they are in water, we can compare how being "beached" is affecting their ability to breathe. This not only helps improve the safety for the dolphin, but also provides useful information during dolphin strandings, and we can provide information how to best place dolphins to minimize the effects of being beached. In future studies, we will perform measurements in water, which will provide knowledge of how the lungs are working and define their capacity to dive. This, in turn, will allow us to better understand how climate change affects their capacity to dive and make a living.



A dolphin undergoing an Electrical Impedance Tomography (EIT) measurement. A belt is placed around the chest of the dolphin which allows the impedance (variation in the ease of an electrical current to flow from one electrode to the other) to be measured around the chest. When the animal is exhaling, the impedance changes as less air is present, which is measured and the relative amount of air in the lung can be determined. Similarly, as the dolphin inhales the impedance again changes. The air volumes can be compared with results from measuring the air exhaled and inhaled, using a custom-made spirometer which is placed over the blow-hole.



On the left, the blue line is the signal from the EIT and the red is from conventional spirometry, where the air flow is measured. These data show that both methods provide similar results. On the right, circles at the top show the volume of air in the lung. Black regions have no change in air content. Air volume decreases as colors become yellow and red. The top blue line below shows the air of the lung through a rapid reduction in volume during exhalation with the signal going down and then going up as the dolphin inhales. The colored lines below are the changes in air volume at different levels of the lung, with red being dorsal (back) and blue being ventral (stomach). These lines show that the lung first begins to empty ventrally and then dorsally, showing that emptying happens at different times at the bottom and top of the lung. The six vertical dashed lines represent the time points of the six circles at the top depicting the relative lung volume.

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 Brookfield Zoo Chicago 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/sources-of-information/videos/

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/sources-of-information/videos/

We are 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 Selby Gardens' Historic Spanish Point. More information is available at: http://watershedtour.org/

If you have not visited our website recently, you should take a look (and listen). Links to our publications are 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.

International Training Opportunities

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. During the past year, we were joined by colleagues and students from Cambodia, Canada, Cuba, Denmark, Germany, Italy, Spain, and Brazil.

International trainee perspective

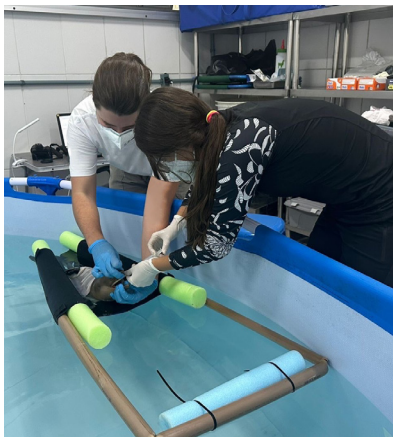
Aricia Duarte Benvenuto, Laboratory of Wildlife Comparative Pathology, University of São Paulo

For the second consecutive year, I had the opportunity to participate in the Sarasota Bay Dolphin Health Assessments in collaboration with the National Marine Mammal Foundation (NMMF) and Dolphin Quest. This experience was essential to increase my experience as a veterinarian with wild cetacean handling and medicine for future application in Brazil. I was able to accompany the veterinary team, participating in collection of samples and assisting Dr. Kyle Ross (NMMF) with ultrasound procedures. Additionally, I was able to work with and learn from very experienced professionals of the Sarasota Dolphin Research Program team and multiple institutions, including biologists, veterinarians and scientists.

I am a veterinarian from Brazil currently doing my post-doctoral research on Franciscana dolphins (*Pontoporia blainvillei*), a small dolphin endemic to the coastal waters of Brazil, Uruguay and Argentina. This species is considered the most endangered dolphin in the southwestern Atlantic Ocean. Bycatch is currently considered the main threat to Franciscana survival; however, increasing numbers of live and dead stranded orphaned calves are of paramount concern. Unfortunately, all attempts to rehabilitate these

calves have been unsuccessful, indicating a need to improve veterinary care and efforts. In our current project, we have developed partnerships with multiple rehabilitation facilities in Brazil in order to assist in live-stranding events by providing veterinary support. Thus, the knowledge gained during the health assessments will be important to amplify the capacity building on free-ranging cetacean medicine that could assist in Franciscana survival outcomes. This project is funded by the Dolphin Quest Conservation Fund and Wildlife Health Fund by American Association of Zoo Veterinarians, and in collaboration with NMMF, Yaqu Pacha and the Alliance for Franciscana dolphin Research, Rescue and Rehabilitation.

Aricia Benvenuto obtaining a blood sample from a bottlenose dolphin under the guidance of veterinarian Jay Sweeney.



Attempting to rehabilitate a stranded Franciscana calf.

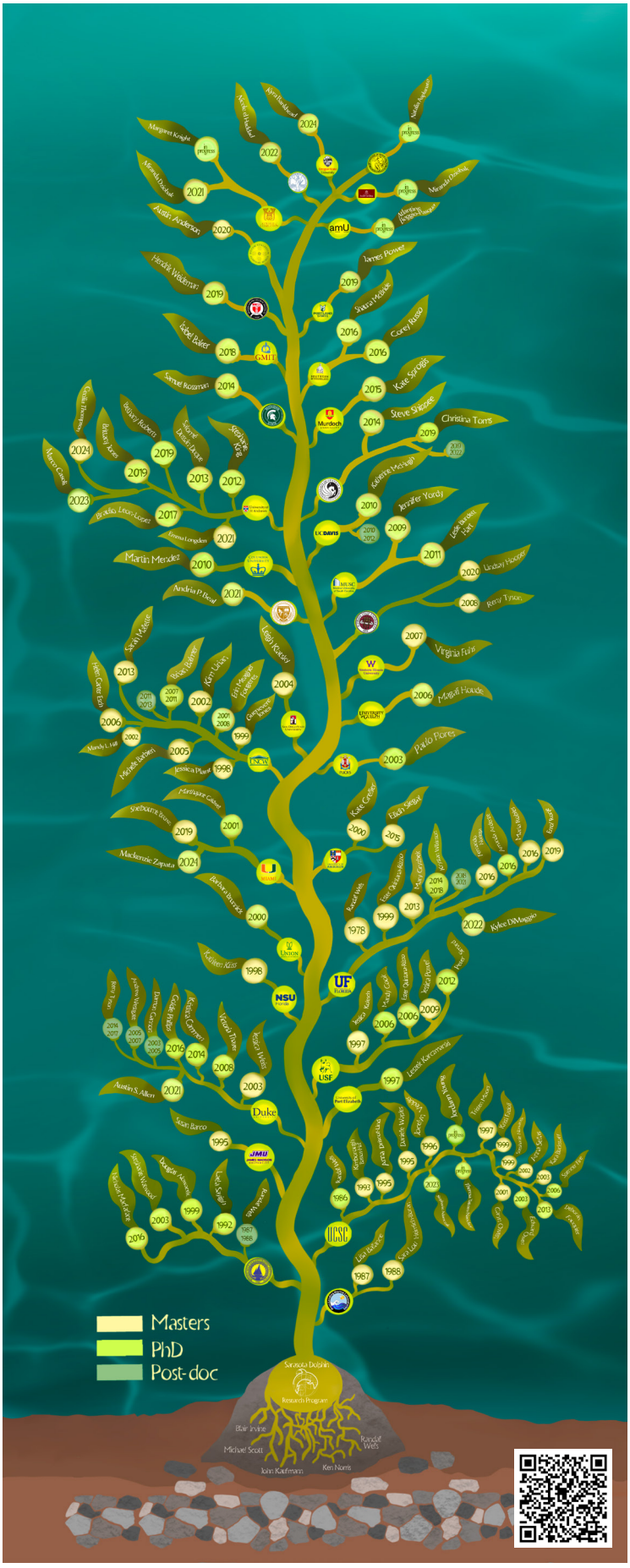
The "Academic Kelp"

An "Academic Tree," tracing the lineages of students back to an original common mentor or influence is a tradition in academia. At the Sarasota Dolphin Research Program, we've developed this "Academic Kelp" as our marine science version.

Each leaf depicts a graduate student or post-doctoral fellow whose research efforts benefited from association with our program, through field research opportunities or access to data, samples, or guidance, along with the year they completed their program. Each branch depicts a college, university, or other academic institution that served as the student's academic home. Each degree is depicted by a different color: beige-yellow for Masters, bright green-yellow for doctoral, and darker green for post-doc. Scan the QR code for a high resolution color version or visit https://sarasotadolphin.org/sdrp-academic-kelp/

The branches come off a common stem that is rooted in the Sarasota Dolphin Research Program, showing the founders — Blair Irvine, Michael Scott, and Randall Wells — and the major advisors for Wells' Masters and Ph.D. programs as individual roots (John Kaufmann and Ken Norris, respectively).

We are grateful to former intern Kaelyn Shirley and long-time volunteer René Bryskov for developing this beautiful image showing our roots and growth over five-plus decades and helping us keep it updated with our newest graduates.



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, 52 doctoral dissertation and 52 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 six doctoral students and seven Master's students have been making use of resources provided by the SDRP:

Doctoral Dissertations – Complete

Vivier, Fabien. 2024. Implementing a novel approach to quantify the age-structure of free-ranging delphinid populations using Unoccupied Aerial System photogrammetry. Doctoral dissertation. University of Hawai'i at Manoa.

Doctoral Dissertations – Underway

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*). Aix-Marseille University, France.

Dziobak, Miranda. In progress. Bisphenol A (BPA) in free-ranging bottlenose dolphins (*Tursiops truncatus*): exploring exposure routes, health risks, and insights into information dissemination. 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.

Master's Theses – Completed

Bankhead, Kyra. 2024. Human influenced environmental changes can impact foraging and social behavior of wild dolphins. Master's thesis. Oregon State University.

Cusick, Kelly. 2024. Urine Protein Composition of Common Bottlenose Dolphins (*Tursiops truncatus*) in the Gulf of Mexico, USA. Master's thesis. College of Charleston.

Thompson, Cecilia. 2024. Signature whistle captures of individually recognizable bottlenose dolphins (*Tursiops truncatus*) at passive acoustic listening stations in Sarasota, Florida. Master's thesis. University of St Andrews.

Zapata, Mackenzie. 2024. Assessing community structure of a dolphin prey fish assemblage in Sarasota Bay, FL. MPS Internship Report. University of Miami.

Master's Theses – Underway

Haas, Sydney. In progress. Determining shark species responsible for bite wounds observed on free ranging bottlenose dolphins in Sarasota Bay, Florida. Master's thesis, New College of Florida.

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

Warden, Kylie. In progress. Climate factor influences, spatiotemporal variability, and bottlenose dolphin health related to plasticizer exposure measured over 30 years in Sarasota Bay, Florida (1993-2023). Master's thesis. College of Charleston.

New College of Florida's Master's in Marine Mammal Science opens its doors on Sarasota Bay

Heidi E. Harley, New College of Florida

A new marine mammal society formed on the shores of SDRP's natural laboratory, Sarasota Bay, in August 2024. That's the month that New College of Florida, the state of Florida's public honors college, welcomed our first class of 11 graduate students to our Master's in Marine Mammal Science program housed in Caples Hall, by New College's dock. Some may wonder, "Why marine mammal science on Sarasota Bay?", but if you're reading *Nicks'n'Notches*, you don't have to ask!

In this collaborative venture, SDRP researchers are joining New College faculty to mentor our students across disciplinary lines (behavior, cognition, neuroscience,

The first entering class of New College of Florida's MS in Marine Mammal Science program in front of Caples Hall. From the left: Top row: Pete Gremore, Prof Athena Rycyk, Prof Peter Cook; Middle row: Dr Amber Whittle, Lisa Carbary, Sydney Haas, Helena Wood-Barron, Jenny Lee, Tyler Fortune; First row: Prof Heidi Harley, Elizabeth Fry, Coordinator Nicole Vanderberg, Vivian Cargille, Lydia Wassink, Carson Hood. Not pictured: Sophie Flem.

acoustics, ecology, conservation, and more), thereby continuing SDRP's focus on partnering with experts with different strengths to serve dolphins both in and ex situ. This issue of *Nicks'n'Notches* highlights our long on-going relationship via New College/SDRP's Vivian Cargille's thesis summary and New College/SDRP's Sydney Haas's intern perspective. Both of these students are now graduate students in the Master's program, and Sydney's already begun working on her thesis topic around shark bites on dolphins with mentor Dr. Krystan Wilkinson, yet another marine mammal researcher who began as an intern with SDRP. In addition, previous SDRP intern and researcher Dr. Christina Toms is now a Visiting Assistant Professor at New College, and SDRP/NCF alumna Prof Athena Rycyk is on our faculty. New College is grateful to be part of the generations of dolphins and marine mammal researchers SDRP nurtures. Please join us! It's amazing what more than a half-century of learning about a resident society of dolphins can teach us about creating marine mammal societies on land and sea.

Grad Student Update – Where are they now?

Christina Toms, New College of Florida

I joined SDRP as a college graduate and intern in 2006. I was intent on graduate school, but wanted to spend some time gaining practical experience before launching back into academia. Little did I know then just how influential this experience would be in shaping and supporting my career in the years and decades to come. At the time, I was particularly interested in socially complex mammals and on topics related to animal behavior and cognition. Then PhD candidate Katie McHugh's research on the social development of juvenile bottlenose dolphins was a natural fit. I planned on being in Sarasota for a few months as a summer intern, but ended up staying as a volunteer for two years. In that time, I not only learned about bottlenose dolphin social systems but also about what was involved in running an exceptionally rigorous research program. I learned to value the critical importance of quality control in data collection and management, proper maintenance and calibration of equipment, attention to painstaking details, and above all, safety first! The lessons learned laid the foundation and gave me the skills and confidence required to later develop my own field research program in graduate school. Perhaps even more importantly, that internship resulted in mentorship and support for years to come from an outstanding team of scientists whom I still have the honor of calling colleagues and friends.

I left in 2008 to pursue a master's degree in Experimental Psychology at the University of Southern Mississippi. While my thesis turned away from marine mammals to address questions related to animal behavior and personality using a model organism (the zebrafish), I remained engaged in marine mammal research. I quickly discovered that the high-quality experience and training offered by the SDRP carried substantial weight in the marine mammal community. It helped me land a bottlenose dolphin research field technician position with the National Marine Fisheries Service when I was a master's student and afforded me credibility when establishing new relationships in the field.

In addition to the many practical skills learned, my time with the SDRP taught me much about conservation and management of wild populations. As a young and naïve aspiring researcher, I shied away at the prospect of working directly on conservation and management questions—working with the government and on policy issues were of little interest to me. I wanted to work with animals, not people! But witnessing the power that long-term research on one little population of bottlenose dolphins in the Northern Gulf of Mexico has had on informing and fueling conservation efforts around the globe was eye-opening for me. That recognition combined with witnessing the devastating effects of the *Deepwater Horizon* oil spill (which occurred in the middle of my master's program) solidified my resolve to do more in my career than ask interesting science questions.

I shifted gears for my PhD and joined the Conservation Biology program at the University of Central Florida to develop a baseline understanding of how bottlenose dolphin communities were doing in Pensacola Bay, Florida—a population that was impacted by the *Deepwater Horizon* oil spill but for which there were few data available for assessing impacts. Dr. Randy Wells served as an advisor on my graduate committee and with continued training and support from the SDRP, I built a field research program during my dissertation modeling the standards, protocols, and practices established by the SDRP. I distinctly remember the groans of some of my students as I nitpicked data formatting details in Excel and their specific use of red vs. blue pens to distinguish between data entered in the field and lab, respectively—responses not unlike my own when I was an intern.

Nearly 12 years after my summer-internship-turned-two-year-residency, I found myself buying a house in Sarasota following an offer to return to the program in a full-time position. That was almost 7 years ago. Since then, I finished my PhD, completed a post doc, have learned far more about veterinary science than I ever would have if I'd not been the sample processing coordinator, and have had the privilege to work alongside of, and learn from, so many incredibly brilliant and talented scientists through many collaborative projects over the years. It's also given me the opportunity to return to my animal personality roots.

Christina Toms (left) as a 2006 SDRP intern.

I have long been interested in the role that an individual's personality plays in ecological and evolutionary processes. "Who" an individual is will impact how they handle challenges, react to stressors, select mates, and ultimately how successful they are in reproduction and survival. With life history data accumulated over more than 50 years, SDRP holds the only dataset of its kind in the world where individual dolphins have been consistently tracked and monitored over such a time span, and where corresponding health data are also available for many individuals. We are using historic data combined with ongoing sampling efforts to pair behavioral responses to stressful events and novel sounds with endocrine response (e.g., cortisol) via blood sampling to catalogue and define traits indicative of proactive and reactive behavioral types.

In January 2024, I returned to academia as a Visiting Professor of Biopsychology at the New College of Florida (NCF) where I get to merge my seemingly disparate degrees in conservation biology and psychology towards developing an interdisciplinary academic research program of my own. NCF is conveniently located just across the bay from the SDRP, which means that I get to introduce my students to some of the best-studied dolphins in the world, and the program responsible for it, just outside their classroom windows. The SDRP and Brookfield Zoo Chicago (BZC) have already been highlighted in my classroom through class projects and a guest lecture by Dr. Katie McHugh, and my conservation psychology students learned about the role of BZC in pioneering the field of conservation psychology. When I returned to the SDRP 6.5 years ago, it felt then as if my career had gloriously come full circle. But getting the chance to connect my network and 18 years' worth of research to the next generation of potential scientists feels like a whole new level of "coming full circle." I am so thankful to the program's unwavering support over the years and for the many collaborators, friends, and the surrogate family I have made through this incredible program. The SDRP has been influential in my career in more ways than I can count—I look forward to the next 18 years!

Christina Toms (on the right) helping hold blood tubes while Dr. Mike Walsh (on the left) obtains blood samples from a spotted dolphin during offshore health assessments in May 2023.

Brookfield Zoo Chicago King Scholars Marine Mammal Research Expedition students visit the Sarasota Dolphin Research Program

For the second summer in a row, a group of high school students with Brookfield Zoo Chicago's (BZC) 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 Chicago's 2023-2024 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 Chicago-area high school students opportunities to learn about animals and conservation, develop leadership skills, and make a difference in their communities.

Last fall, eight King Scholars were selected to become Marine Mammal Research Fellows. These students attended workshops at the Zoo and online that covered topics such as cetaceans and their ecosystem, bottlenose dolphin natural history, research methods, and study design. The students also attended a virtual workshop focused on the long-term work of the SDRP with Program Director Dr. Randy Wells, and an in-person training at BZC led by several SDRP staff who prepared them for the field work they would be doing in Florida and introduced the basics of dolphin photo-identification.

The Fellows then flew to Florida alongside several BZC staff to spend a week with the SDRP team in July 2024, which included several days on the water as well as some time processing data in the lab and visiting Mote Aquarium (where SDRP's offices are based). Field days were spent on research vessels in Sarasota Bay scanning the water for dolphins and recording data on dolphin behaviors and

Fellows learning how to identify dolphins in our long-term photo-ID catalog from SDRP Lab Manager Jason Allen and Field Manager Aaron Barleycorn during their in-person training at Brookfield Zoo in April 2024.

location, as well as environmental conditions, and any adverse human interactions observed. Fellows learned basic photographic identification survey techniques and got to practice taking ID photos of the dolphins in the field. The students also spent some time in the lab, learning how the data they collected on the boat were organized in the SDRP's long-term databases, using GIS software to map their survey routes, discussing career pathways with SDRP researchers, and learning more about monitoring dolphins and other species using passive acoustics. The SDRP is proud to collaborate on this unique opportunity for Chicago-area high schoolers to obtain hands-on experience with field conservation research and looks forward to continuing the program in future years!

Marine Mammal Research Expedition fieldwork included several days on the water as part of our dolphin population monitoring survey team.

Intern Program

During 2024, 13 full-time interns 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 5,600 hours towards our research, learning with us via the Brookfield Zoo Chicago College Internships program, Cross College Alliance Environmental Discovery Awards Program, and the Office of Naval Research-funded Internships Program for Diversity and Inclusion in Marine Mammal Science. We are especially grateful to the Charles and Margery Barancik Foundation for funding support towards intern housing, travel, and living expenses, which allowed us to provide stipends to BZC-SDRP interns.

Interns and Post-Graduate Trainees

Sydney Haas
Lexi Hollick (NCF ISP)
Zoe Hosford
Cameron Larmer
Ava Leaphart
Jake Lighthall
Isabel Palacios
Emily Rodriguez
Faith Shaver
Allie Shiers
Alexys Siagel
Lizzy Singh
Alondra Velazquez

Intern Perspective

Sydney Haas, New College of Florida

I chose to attend the New College of Florida because of its proximity to Sarasota Bay and the possible research opportunities that exist with the marine mammals that live there. The Sarasota Dolphin Research Program made my dream of doing research with dolphins a reality. My first day with SDRP was spent offshore. Experts from all over the world came to Sarasota to collaborate with SDRP on various research projects with the dolphins that live here. I was able to observe the complete workup of an Atlantic spotted dolphin: bloodwork, ultrasound exam, lung capacity and morphology measurements, and the deployment of an acoustic tag. This one day alone showed me the community that SDRP provides in marine mammal biology. Throughout the summer, I was able to explore many different aspects of SDRP, such as taking part in their population monitoring study with photographic identification boat surveys, learning about the prey in the Sarasota Bay through purse seine net fishing, and deploying acoustic field stations. I also took part in lab work, learning about how dolphins are identified through the markings on their dorsal fins. I discovered my passion for exploring the predator-prey relationships that exist between the dolphins and sharks in the Sarasota Bay by analyzing photos of shark bitten dolphins.

This experience has led to me continuing to work with SDRP through the Marine Mammal Master's program at the New College of Florida. In this program, I will be working with Krystan Wilkinson on identifying the species of sharks that are biting the dolphins in Sarasota Bay through photos of dolphins that exhibit shark bites. This project will hopefully contribute to what is known about the shark-dolphin relationships that exist in the Sarasota Bay, extending the work that gave birth to the SDRP back in 1970.

Intern Sydney Haas on a photo-ID survey on a toasty summer day.

Intern update – Where are they now?

Michelle Greenfield-Feig, Indianapolis Zoo

My relationship with the Sarasota Dolphin Research Program (SDRP) started as an internship in 2017. Right from the start, I was welcomed into the family and have continued to stay involved through research and health assessments ever since. As an intern, I learned the basics of conducting fieldwork and developing a novel research project. I was fortunate to work under the mentorship of Dr. Randy Wells and Dr. Katie McHugh for my undergraduate thesis evaluating how anthropogenic injuries affect the social relationships of the dolphins in Sarasota Bay. This support was critical in helping me cultivate the skills necessary to present my work at several scientific conferences and publish a manuscript in the journal Marine Mammal Science.

Documenting dolphin locations and behaviors as an SDRP intern in 2017.

After finishing my internship and graduating from Princeton University, I stayed connected to SDRP through a subsequent publication and then started my veterinary degree at Cornell University. While in school, I further developed the tools necessary to become a researcher and marine mammal veterinarian with externships at Hubbs SeaWorld Research Institute, Clearwater Marine Aquarium, The National Marine Mammal Foundation, Brookfield Zoo Chicago, and Georgia Aquarium. I also started producing Aquadocs Podcast, which has become the #1 podcast about aquatic veterinary medicine. In each episode, I interview people who have careers centered on aquatic animal health (check out Dr. Wells on Episode 24). Having worked with various organizations and interviewed people from around the world on Aquadocs, it comes as no surprise to learn just how many people are SDRP collaborators or connected in another way.

Most recently, I have been fortunate to join the vet team for the past few years during health assessments. The collaborative, high-energy, and impactful environment that defines health assessments makes this the best week of the year. It is truly incredible what we accomplish together – more than 40 research projects, international friendships, training opportunities. There is nothing quite like it. I love learning from the experts how to interpret dolphin ECGs or take blood samples. The quality of research and field medicine that occurs during health assessments is unparalleled. And it is always rewarding to return home and share what I have learned with others.

Currently, I am the Harlan Family Veterinary Intern at the Indianapolis Zoo. I provide routine preventative and emergent care for more than 1,400 animals, including 10 bottlenose dolphins. I am so grateful for my experience as an intern with SDRP and the continued relationship I have maintained since. I look forward to many more years of collaboration as I continue my journey as a zoological and aquatic veterinarian.

Assisting with blood-sampling during a Sarasota Bay health assessment in 2024.

Completing an ultrasound exam on a bottlenose dolphin. (Greenfield-Feig, M. R., Tarpley, R. J., Traversi, J. P., Meegan, J. M., & Jensen, E. D. (2024). Pre-anal gland abscess in a male Atlantic bottlenose dolphin (Tursiops truncatus). Journal of the American Veterinary Medical Association, 262(2), 1-4.)

Volunteer perspective

Jon Thaxton

It's so unusual to find someone native to the retirement and vacation destination of Sarasota, Florida, that the most common introductory line when you meet someone is *"Where are you from?"* This inquiry presumes one is from somewhere else, so when I respond, *"I'm from Sarasota,"* this often prompts an unnecessary clarifying question, *"No, I mean where did you live before you moved to Sarasota?"* Sometimes I just give up and say, *"I'm from Cleveland!"*

In reality, I'm the fifth generation of my family to marvel at the wonders and richness of Sarasota Bay. I grew up in Osprey, a small fishing village in central-coastal Sarasota County. All my friends' fathers worked on commercial fishing boats, and I would often join them in pursuit of mullet, pompano, and mackerel. When not on commercial fishing boats I would be exploring, fishing, camping, anything, just to be on the water. Like the four generations before me, Sarasota Bay is at the core of my family's heritage.

I have been a public policy advocate focusing on conserving Sarasota County's natural resources for over 45 years. For twelve years I was fortunate to advance this advocacy as a Sarasota County Commissioner. Many of my efforts were related to bay water quality and protecting threatened and endangered species.

I have always lived near bottlenose dolphins. Sometimes, especially while fishing, I considered them pests as we competed for the same seafood dinner, especially snook. As a young boy vacationing on Grassy Key, I hitched a ride on Mitzi, the dolphin who played "*Flipper*" in the 1960's television show. As a teen I swam with two dolphins that had been relocated from the roadside tourist attraction Floridaland, into the nearby Holiday Inn swimming pool, to avoid exposure to a particularly intensive red tide bloom.

Jon Thaxton during Sarasota Bay health assessments in May 2024.

This is to say that I have a life-long experience of frequent dolphin encounters and interactions and am not easily impressed. But my threshold for notable dolphin experiences was elevated into the stratosphere the first time I volunteered for the Sarasota Bay Dolphin Health Assessment project.

I was impressed with the program before we even left the dock on the first day. The precision and coordination among the scientists of diverse disciplines and from all regions of the planet was simply extraordinary. The care and passion that every member of every team, especially the veterinarians, showed for the animals could restore the faith in humankind in even the most determined pessimist.

As a 6'5" physically capable man, one of my volunteer duties is managing the deep end of the catch net. Another not so glamorous task is retrieving and cleaning red-drift macro algae from the net. Being able to see the lead line in 6' of water and removing the copious amounts of algae offers me an opportunity to discuss with the team the harmful impacts that anthropogenic nutrients have on the health of the bay and our beloved dolphins.

But no experience can match the euphoric feeling of holding a dolphin. They are truly magnificent animals. Their titanic strength and their inescapable intellect are like characteristics of a different world. But they're not from a different world, they are very much from this world. Participating in science that stewards their protection is my greatest reward for volunteering for the Sarasota Dolphin Research Program.

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, Sarasota Dolphin Research Program, Brookfield Zoo Chicago

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 or funds for deployment of passive acoustic listening stations to add to our network, 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.

Products

Professional Activities Summary: October 2023 through September 2024

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

Araújo, P. R. V., B. D. Postaire, K. A. Feldheim, K. Bassos-Hull, R. Lessa and M. J. Ajemian. 2024. Population Structure of *Aetobatus narinari* (Myliobatiformes) Caught by the Artisanal Fishery in Northeast Brazil. Diversity 2024, 16, 377. https://doi.org/10.3390/d16070377

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Conger, E., M. Dziobak, E. J. Berens McCabe, T. Curtin, A. Gaur, R. S. Wells, J. E. Weinstein and L. B. Hart. 2024. An analysis of microparticles in the muscle and gastrointestinal tissues of fish from Sarasota Bay, FL: exposure and implications for apex predators and seafood consumers. Environments, 11, 185. https://doi.org/10.3390/environments11090185

Dziobak, M. K., A. Fahlman, R. S. Wells, R. Takeshita, C. R. Smith, A. Gray, J. Weinstein and L. B. Hart. 2024. First evidence of microplastic inhalation among free-ranging small cetaceans. PLoS ONE. 19(10): e0309377. https://doi.org/10.1371/journal.pone.0309377

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Hart, L. B., M. Dziobak, R. S. Wells, E. Berens McCabe, E. Conger, T. Curtin, M. Knight and J. Weinstein. 2023. Plastic, it's what's for dinner: A preliminary comparison of ingested particles in bottlenose dolphins (*Tursiops truncatus*) and their prey. Oceans. 4, 409–422. https://doi.org/10.3390/oceans4040028

Jensen, F. H., P. Wolters, L. van Zeeland, E. Morrison, G. Ermi, S. Smith, P. L. Tyack, R. S. Wells, S. McKennoch, V. M. Janik and L. S. Sayigh. 2023. Automatic deep-learning-based classification of bottlenose dolphin signature whistles. Pp. 1-12 in: A. N. Popper et al., eds., The Effects of Noise on Aquatic Life: Principles and Practical Considerations. Springer. https://doi.org/10.1007/978-3-031-10417-6_143-1

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Manuscripts in Press or Accepted for Publication

VanCompernolle, M.,….R.S. Wells…et al. (>300 authors). Accepted. Vulnerability of marine megafauna to global at-sea anthropogenic threats. Conservation Biology.

Wells, R. S. and M. D. Scott. (In press). Common and Tamanend's Bottlenose Dolphins *Tursiops truncatus* Montagu, 1821 and *Tursiops erebennus* Cope, 1865. In "Handbook of Marine Mammals: Volume 1, Coastal Dolphins and Porpoises" (Eds. T. A. Jefferson and S. H. Ridgway). Academic Press.

Presentations at Professional Meetings (n=22)
Public, University, School Lectures (n=50)

For the first time in more than 40 years, an SDRP vessel passed through Midnight Pass. The pass was closed by homeowners in 1983 as it migrated north toward their homes, and their efforts to re-open it further south failed. Hurricane Helene briefly opened the pass in September, and Hurricane Milton did a better job in October. It is very narrow, and surrounded by shallows, with a deeper (11 ft) hole in the center, and is navigable for small boats (and presumably dolphins and manatees) from the Gulf to the Intracoastal Waterway.

Katie McHugh and Laela Sayigh watch on as Alex Bocconcelli lowers a hydrophone array during the filming of MacGillivray Freeman's Call of the Dolphins slated to release to IMAX® and theaters February 2025.

Program Operations

Brookfield Zoo Chicago Staff

Jason Allen, BS, Senior Researcher, Lab Manager
Robyn Allen, BS, Staff Researcher, Sample Coordinator
Aaron Barleycorn, BS, Senior Researcher, Field Mgr.
Elizabeth Berens McCabe, MS, Senior Researcher
Jonathan Crossman, BA, Staff Researcher
Carolyn Cush, BS, GoMDIS Curator
Kylee DiMaggio, MS, Staff Researcher
Katy Holmes, PhD, Staff Scientist, Listening Network Mgr.
Allison Honaker, MPS, Research Assistant
Katie McHugh, PhD, Deputy Program Dir., Senior Scientist
Cecilia Thompson, MS, Staff Researcher
Randall Wells, PhD, Program Director
Krystan Wilkinson, PhD, Staff Scientist

Affiliated Mote Marine Laboratory Staff

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Martha Wells
Matt Winters

As the lab turns...

Sarasota Dolphin Research Program Staff

Staff members Robyn and Jason Allen welcomed a new baby girl into their family this summer. Mom and baby are both healthy and doing well.

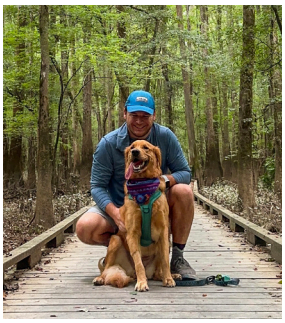
Warmest congratulations go to BZC-SDRP staff researcher Kylee DiMaggio, who married her high school sweetheart and long-time partner, Vincent Iannaco, in March, alongside the Manatee River with friends, family, and the dolphins.

Congratulations are in order for former SDRP intern and new BZC-SDRP staff member Cecilia Thompson, for successfully completing her MSc in Marine Mammal Science at the University of St Andrews (UStA) in Scotland. Cecilia took courses such as Advanced Bioacoustics, Biologging, and Statistical Modeling. She also conducted a graduate research project using Sarasota Bay Listening Network data under the supervision of long-time SDRP collaborator Dr. Vincent Janik and Dr. Julie Oswald of the UStA and the guidance of the SDRP team. For further details on her thesis, see her article entitled “Signature whistle captures of individual bottlenose dolphins at passive acoustic listening stations” on page 14.

Congratulations Robyn and Jason Allen!

Congratulations Kylee DiMaggio and Vincent Iannaco!

Cecilia aboard the Hebridean Whale and Dolphin Trust R/V Silurian, while conducting marine mammal surveys on the west coast of Scotland.



Whidbey joins the SDRP “fur”mily!

Left: A butterfly ray visiting Kim Basso-Hull’s house following Hurricane Milton.

Look what the storm surge brought in! Research Associate Kim Bassos-Hull’s home and pool on Siesta Key were flooded by seawater during both Hurricanes Helene and Milton in September and October 2024. Much to her husband Pete’s surprise when he first returned to their home following Hurricane Milton he found a butterfly ray swimming in their new “saltwater” pool. The ray was safely captured and returned to the canal behind their home.

Finally, we had a new member join the SDRP ‘fur’mily. Whidbey joined Jonathan Crossman’s home and has been loving life on the Florida coast! Her favorite activities are playing on the beach and chewing sticks!

Opportunities for You to Help Dolphin Research and Conservation

Show Your Support for Brookfield Zoo Chicago's Sarasota Dolphin Research Program

Each year, it costs approximately $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 study of a wild dolphin population 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@BrookfieldZoo.org.

Special Thanks

Brookfield Zoo Chicago is honored to recognize the following donors and funding organizations for their generous contributions from October 1, 2023 – September 15, 2024 to its Sarasota Dolphin Research Program through donations, research grants, and/or contracts.

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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 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 2023 through September 2024:

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