FATHOMING 50

CZS' WORLD-RENOWNED
SARASOTA DOLPHIN RESEARCH PROGRAM
CELEBRATES 50 YEARS OF PIONEERING
RESEARCH AND CONSERVATION BREAKTHROUGHS.

If someone had told 16-year-old Randy Wells that his volunteer gig with a Mote Marine Laboratory scientist would help launch his career as director of a program conducting the world's longest-running study of a wild dolphin population, he would have scoffed at the idea. In 1970, Wells, who had grown up in Illinois, had recently moved to Siesta Key, Florida, and was more interested in sharks than dolphins.

The Mote scientist was Blair Irvine who was studying the behavioral interactions of sharks and dolphins. In his spare time, he studied wild bottlenose dolphins on Florida's central-west coast. In 1970, very little was known about the lives of wild dolphins. Irvine and Wells set out to do the first study of wild dolphin ranging patterns to find out if the dolphins roamed widely in the Gulf of Mexico or stayed close to home—home being the coastal area of Sarasota Bay. Little did Irvine and Wells know that their small study, and the work that followed, would make Sarasota Bay the site of one of the most acclaimed dolphin conservation research programs in the world.

A half-century later, the Sarasota Dolphin Research Program (SDRP), as it came to be called, is operated by the Chicago Zoological Society with Dr. Randall Wells at the helm. It's been 50 years since Wells first encountered Sarasota Bay's wild dolphins, and now he is celebrating a rarely achieved milestone in the world of animal research—the SDRP's 50th anniversary.

Currently, Sarasota Bay's "cast of characters," numbers about 170 individuals spanning as many as five concurrent generations. SDRP researchers have known many of the dolphins since birth. In some cases, they also know their parents, grandmothers, great-grandmothers, and great-great-grandmothers. The SDRP has gathered data on the health and physiology, behavior, social patterns, and reproductive success of many of the Bay's residents.

"This information can only come from long-term research and monitoring the same animals over time," said Wells. They found that Sarasota dolphins are long-lived, with females living for as long as 67 years, and males up to 52 years. Furthermore, dolphins, like other marine mammals, are facing an increasing number of disturbances and threats from humans.

"Our main question has been: What does it take for this population to survive and thrive?" said Wells. As you'll see, Wells and his team of researchers have contributed much to our understanding of what it takes—and they continue to do so. A few of their ground-breaking discoveries and conservation success stories are plotted on the timeline that follows.

1970-2020 HISTORIC TIMELINE

1970

Wells and Irvine conducted the **first tagging study of coastal bottlenose dolphins**. They attached plastic identification tags to dolphins' dorsal fins to track their movement patterns. As time and opportunity allowed, they searched for the tagged dolphins and found them—often not far from where they were initially tagged. Spotting the same dolphins multiple times in Sarasota Bay led Irvine and Wells to suspect the dolphins resided there year-round.

SDRP founder, Blair Irvine (left), and Robert Corbin with the first dolphin tagged in Sarasota Bay in 1970.

1972

The **Marine Mammal Protection Act** became law, making it illegal to harass, feed, hunt, capture, import, and kill or attempt to kill marine mammals in U.S. waters. The Act created the U.S. Marine Mammal Commission to provide oversight of actions affecting bottlenose dolphins and other marine mammals, and their ecosystems, to ensure their conservation and long-term survival.

Data from tracking and surveys conducted in 1975 and 1976 found that 92 percent of the dolphins Wells and Irvine tagged in 1970 and 1971 had remained in the area. This provided evidence that the dolphins resided for multiple years in Sarasota Bay and surrounding waters. The finding of **long-term residency** was a breakthrough, said Wells. "Once we discovered residency and knew we could find individual dolphins on a predictable basis, the doors were opened to all kinds of research." For example, they would be able to study dolphins within the contexts of their social groups and environment. With further research, the SDRP confirmed that multiple generations of the dolphins lived within the same community home range.

1975-76

Blair Irvine and associates, Randy Wells and Michael Scott, encountered a tagged dolphin "Genie" in 1976. In 1982, Genie gave birth to her first calf, demonstrating three-generation residency to the Sarasota Bay area for the first time.

1974

SDRP researchers were awarded their first grant from the **U.S. Marine Mammal Commission** to fund more dolphin tagging and tracking. The SDRP's data on wild dolphins were considered to have great potential for creating policies to protect and conserve the animals. Michael Scott joined the research team.

The SDRP helped to revolutionize tagging—the use of visual tags, radio tags, and satellite-linked tags—to monitor and study dolphins. (Above): A dolphin with a satellite-linked tag. (Right): A dolphin wears a suction-cup-mounted digital archival tag, or Dtag, with on-board hydrophones, sensors, and computers. Dtags enable scientists to collect immense quantities and varieties of data with minimal impact on dolphins.

1977-79

Opportunistic resighting efforts—using photographic identification of dolphins' distinctive markings—were conducted to monitor the dolphins studied from 1970 to 1976. Wells completed his University of Florida master's thesis: "Home range characteristics and group composition of Atlantic bottlenose dolphins, *Tursiops truncatus*, on the west coast of Florida."

SDRP researchers have continually developed, field tested, and/or refined new gear and techniques, which would eventually be adopted by scientists elsewhere. The most basic work of the SDRP involves recognizing individual animals by a unique set of markings, scars, and nicks and notches on their dorsal fin. The SDRP was among the first groups to implement systematic **photo-identification surveys**. Wells and Scott conducted these surveys in Sarasota on a seasonal basis, and subsequently expanded them into the nearby waters of Tampa Bay and Charlotte Harbor.

1980

A rescue team, including SDRP personnel, stabilized a stranded dolphin in 2008. Ginger, a 3½-year-old resident female, has been known by the SDRP since her birth. She was rehabilitated at Mote Marine Lab for two months and released. The SDRP continues to observe her, as well as her calves, including one born in 2020.

1982

The **Dolphin Biology Research Institute (DBRI)** was organized by the SDRP as a 501(c)(3) not-for-profit corporation to support its research. DBRI provides logistical support, including a small fleet of research vessels, vehicles, computers, cameras, and other field equipment. Funding from Earthwatch, Inc. was used to involve citizen scientists in the SDRP's research. Earthwatch continued to support the SDRP with funding and volunteers for 25 years; some of the volunteers continue working with the program today.

1984

SDRP researchers began conducting **life history studies** of the Sarasota dolphins using brief capture-release. Small groups of dolphins are encircled with a net in shallow water. With assistance from veterinarians, researchers measure the animals; determine their sex; obtain samples for genetic, age, and hormone analyses; and mark them for future identification. They also collect recordings of the whistles produced by each dolphin in support of communication research by Woods Hole Oceanographic Institution scientists.

1985

Building on Mote's early record of stranding response and rehabilitation of marine mammals, initiated by Irvine and Wells in the 1970s, Mote Marine Laboratory formally established a **dolphin-stranding-response program.** Mote partnered with the SDRP to rescue injured, diseased, and stranded animals. SDRP staff, who had led and participated in many marine mammal rescues, were highly skilled in evaluating an animal's condition and situation to determine the appropriate intervention. "A rescue may involve getting the animal off the beach, or out of entangling gear, and back into the wild," said Wells. Or the rescue team may decide an animal needs rehabilitation and follow-up monitoring after the rescue. Many rescued dolphins have injuries involving entanglements and other problems related to interactions with humans.

The SDRP incorporated **health assessments** into their safe and effective capture-release efforts, to monitor the health of individual dolphins and the population as a whole. Over the decades, data collected during health assessments have been used by more than 40 research projects. During the periodic assessments, dolphins are gently lifted aboard a veterinary vessel and thoroughly examined by SDRP scientists, biologists, and veterinarians. Today's assessments include ultrasound examinations to detect the condition of organs, pregnancies, and the progress of pregnancies. The animals are then photographed, sometimes marked or tagged, and released on site about an hour later.

Dr. Wells and his team take measurements of a dolphin during a capture-release health assessment.

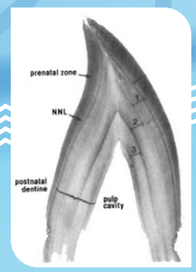
"We've learned about the animals' biology, health, body condition, and age; which dolphins they're related to; environmental contaminants they're carrying; and how they communicate with one another," said Wells. Using long-term health assessment data, researchers can also detect changes within a population of dolphins, such as fluctuations in the rate of successful pregnancies. These data, coupled with long-term photo-ID data, enable SDRP scientists to determine survivorship—or how many dolphins survive from year to year. These kinds of data define the species' normal biology, said Wells. Researchers can use Sarasota Bay dolphins as a reference population when doing comparisons with populations of at-risk dolphins and dolphins in managed-care facilities.

1986-87

Wells completed his doctoral dissertation at the University of California, Santa Cruz, entitled "Structural aspects of dolphin societies," and was awarded a postdoctoral fellowship at Woods Hole Oceanographic Institution to continue work with the Sarasota dolphins.

SDRP scientists began using the **focal animal behavioral observation** approach. From a distance, they located, observed, and recorded a dolphin's behavior—including respirations, or how often it surfaced to breathe; its nearest neighbor(s); the size of its group; and habitat use. The dolphin's behavior was recorded at specified (usually three-minute) intervals. Over time, repeated observations enabled researchers to understand how an animal's behavior changed with life stage, varying circumstances, and health.

1988



1989

The **Chicago Zoological Society** hired Wells to continue to direct the operations of the SDRP. The arrangement with CZS has provided the program with operational support and critical staff, and helped kick off a new round of long-term research.

Scientists from the government and other institutions have used the SDRP's long-term data and the natural laboratory of Sarasota Bay to conduct their own studies. For example, a National Marine Fisheries Service (NMFS) scientist developed a method of **precise age determination** in dolphins. With the SDRP's assistance, she tested and confirmed a method of age determination using the number of layers found in a dolphin's teeth. A known age is critical because it enables scientists to interpret an animal's health data and determine the viability and social structure of a population. The SDRP is now working with researchers to use less-invasive methods to determine age. Collaborating with scientists at the National Marine Mammal Foundation, they are helping to refine techniques to estimate age by looking at the degree of bone fusion in X-rays of flippers. They are also working with Florida International University scientists to estimate a dolphin's age from rates of change in the DNA in a skin sample.

SDRP by the Numbers

The SDRP has played a crucial role in educating and training researchers and future conservation leaders around the world. In 50 years of operation, the SDRP has yielded

- 44 doctoral dissertations and 41 master's theses that benefited from research opportunities, samples, data, or guidance provided by the SDRP
- More than 430 undergraduate interns who received training by the SDRP
- More than 100 researchers and students from 43 countries who benefited from the SDRP's training opportunities
- More than 270 peer-reviewed journal articles and book chapters that were written or co-authored by SDRP staff members; more than 100 technical reports that involved SDRP staff as senior authors or co-authors
- More than 439 scientific presentations and more than 278 public and university lectures that were presented or co-authored by SDRP staff members

For more information about the SDRP, go to SarasotaDolphin.org

1990

SDRP scientists and colleagues continue to learn more detail about dolphins' social lives within discrete, adjacent resident communities along the west coast of Florida. By observing individual animals over time, and incorporating genetic studies, they identified three **basic types of dolphin groups.** The nursery group consists of adult females with their most-recent offspring. Juvenile groups are made up of both males and females that have left their mothers, but are not yet sexually or socially mature. The third kind of group involves pairs of sexually mature males, often of a similar age. Male pairs move among female groups and do not take part in rearing calves. Females often use different males to sire subsequent calves.

The SDRP was the first group to find that adult male bottlenose dolphins establish long-term pair bonds that often last until one of them dies. Paired males, like "Racing Stripe" and "Otter" shown above, are often synchronous in their surfacing patterns.

1992

The SDRP developed an increasingly active field program that included graduate students. Wells returned to Sarasota full time and established a base of operations at **Mote Marine Laboratory**. Mote provides office, lab, storage, and dock space, as well as access to boat-launching ramps. In exchange, the SDRP has helped Mote develop marine mammal research and stranding response capabilities.

1993

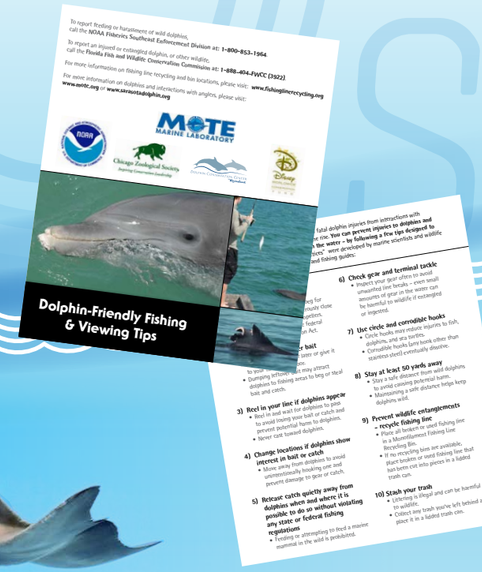
With a full-time presence in Sarasota, the SDRP ramped up its **photo-identification monitoring surveys** of the local dolphins. Since 1993, the surveys have been conducted monthly instead of seasonally and generate much more detailed information.

1994

The SDRP is a leader in the study of the **cumulative impacts of human activities** on coastal bottlenose dolphin populations. Impacts include commercial and recreational fishing that injure and kill dolphins that ingest, are hooked by, or become entangled in fishing gear. Boaters sometimes collide with dolphins. Vessels, and construction and demolition activities, create noise disturbances. Pollutants and trash in the ocean poison and entangle marine animals. Climate change has been a growing threat.

Public education and outreach are important parts of the SDRP's mission. Staff members frequently speak to audiences of all kinds about threats to dolphins. While continuing to support stakeholders' interests, the SDRP educates them about how they can help reduce or eliminate the threats. Over the years, they've created books, an annual report called *Nicks 'n' Notches,* dolphin-friendly-viewing and fishing-tip cards, PSAs, and videos. The SDRP has established an active presence on social media and online at **SarasotaDolphin.org**, where much of this information is available.

[Left]: Feeding or approaching within 50 yards of wild dolphins is prohibited by law. [Above]: This male dolphin, known to the SDRP as "Riptorn," was apparently struck by a boat propeller in 1983. He was one of the few lucky survivors of boat strikes and lived for another 32 years.

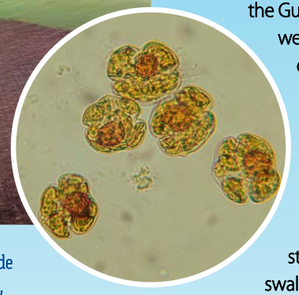


1999

Zoos and aquariums with resident bottlenose dolphins have benefited from the SDRP's research on what wild dolphins eat, what they should weigh, what blood-value ranges should be considered normal, how they behave, the composition of their social groups, and breeding outcomes. For example, a **consortium of researchers at managed-care facilities**, including Brookfield Zoo, has used the SDRP's research findings on the types of dolphin social groupings to make decisions about which dolphins in their facilities will be kept together or kept separate. For example, a pair of bonded males may be kept together. In turn, research on dolphins in managed-care settings has raised questions—about dolphin communication, for example—that led to further studies by the SDRP.

The SDRP established a **long-term, seasonal, fish-monitoring program** to track changes in the abundance and diversity of the primary fish the dolphins eat. "I want to be able to learn about the dolphins from an ecological perspective—what drives them to do the things they do," said Wells. "I need to understand what they are responding to in their environment, and prey availability is one of the main items." During prey fish surveys, researchers use a purse seine net to briefly capture fish in Sarasota Bay to determine fish population diversity, abundance, and condition. The fish are released after they are briefly examined and measured. The surveys occur during three months of winter and four months of summer. The SDRP received federal funding to purchase the needed boat and net and to hire staff.

2004

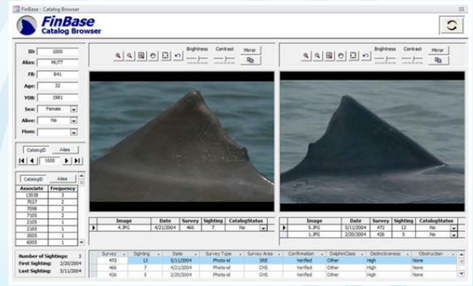


An aerial view of a red tide off the coast of Sarasota, Florida (above), and a microscopic closeup of the *Karenia brevis* organism that causes these toxic blooms.

2005-06

The SDRP was the first group to quantitatively document changes to a fish community from a severe **red tide harmful algal bloom**, which produces toxins that kill fish and wildlife. Although red tides are not uncommon off the Gulf Coast of Florida, the red tides of 2005 and 2006 were unusually severe, long lasting, and ecologically damaging. Using data collected from fish surveys, SDRP scientists documented a 75 percent decline in fish populations; the dolphins' primary food source was nearly wiped out and it took two years for the fish populations to recover. In response, the Sarasota Bay dolphins altered their ranging and social patterns. They moved closer to humans, stealing bait at the end of fishing lines and swallowing food illegally thrown to them by boaters. Unfortunately, some dolphins died after swallowing, being hooked by, or becoming entangled in fishing gear.

Since the SDRP first began its dolphin monitoring surveys, they recorded data from 57,000 dolphin group sightings and amassed more than 855,000 photographs during photo-identification surveys. More than 161,000 individual animals have been identified. To access the massive amounts of data, the SDRP worked with Jeff Adams of NMFS to adapt his **FinBase**, a database designed specifically for storing and managing data and images of individual dolphins. Recently, the SDRP has been involved in developing and testing several programs to automate the matching up of dolphin fins, which can greatly speed up dolphin identification.



2006

Help Fund This Important Research Program

CZS, which operates the Sarasota Dolphin Research Program, lost revenue during the months Brookfield Zoo was closed to the public. Your financial support is critical at this time to support the SDRP and our other programs.

If you can help, please go to **CZS.org/Donate.**

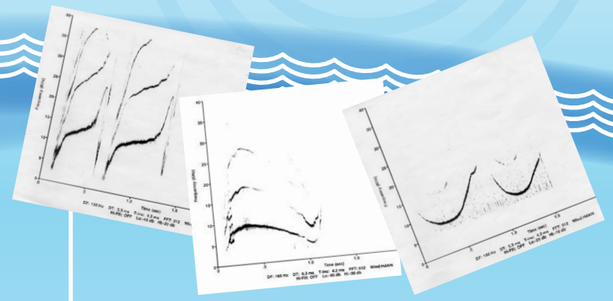
Significant support for the SDRP, in 2019 and 2020, came from Charles & Margery Barancik Foundation; Anonymous (3); The Batchelor Foundation; Mr. and Mrs. Stephen P. Bent; Mr. and Mrs. Edward McCormick Blair, Jr.; James and Elizabeth Bramsen; Dolphin Quest; Allison and Rick Elfman; Florida Restore Act Centers of Excellence Program; Fundación Oceanogràfic; Mr. and Mrs. John P. Grube; Gulf of Mexico Research Initiative; Hamill Family Foundation; Nancy and Jonathan C. Hamill; Harbor Branch Oceanographic Institution; Mrs. Loretta N. Julian; Linda R. Kahn; Ms. Diane A. Ledder; McComb Family Foundation; Mr. and Mrs. Michael A. Mason; Mr. and Mrs. Ira Mirochnick; Mr. and Mrs. Scott F. Moller; Mr. and Mrs. Michael D. Moorman; Mote Scientific Foundation; National Fish and Wildlife Foundation; National Marine Mammal Foundation; National Oceanic and Atmospheric Administration; Mr. and Mrs. James R. Nelon; JoAnnGrace Tameling Schaeffer; Kelley C. Schueler; Mr. and Mrs. Jack Shaffer; Mr. and Mrs. Robert E. Shaw; Melissa and Stuart Strahl; Joan M. Tameling; Nancy C. Tameling; Mr. and Mrs. John W. Taylor III; Mr. and Mrs. Thomas A. Tisbo; University of Central Florida; and the Women's Board of the Chicago Zoological Society.

2010

BP's ***Deepwater Horizon* oil spill** killed large numbers of marine animals and fouled 1,300 miles of Gulf of Mexico shoreline. The National Oceanic and Atmospheric Administration (NOAA) led a team of investigators, including the SDRP, in studies to determine the potential impact of the ecological disaster on dolphins. Since pollutants from the spill did not reach Sarasota Bay, the unaffected Sarasota Bay dolphin community was used as a reference population with which to compare the dolphin communities in heavily oiled areas, such as Barataria Bay in Louisiana. Barataria Bay health assessments results were compared with those of resident dolphins in Sarasota. Researchers found a greater incidence and severity of lung disease in Barataria Bay, and only about 20 percent of the pregnancies led to observed calves, in contrast to 83 percent in Sarasota. The SDRP found a year-to-year survivorship rate of 96 percent for the Sarasota dolphins, compared with an unsustainable 87 percent in Barataria Bay. These findings revealed the devastating impact of the oil spill on dolphins and contributed to British Petroleum settling the case and accepting responsibility for the ecological disaster. Sarasota Bay dolphins have also served as a reference population in the study of the impacts of biotoxins in the Florida Panhandle and PCB concentrations along the East Coast.

2012

The *Deepwater Horizon* oil spill revealed that government regulators lacked important data to effectively manage and protect bottlenose dolphins in the Gulf of Mexico. With funding assistance from the NMFS, Disney Conservation Fund, and Harbor Branch Oceanographic Institute, the SDRP developed and continues to manage the **Gulf of Mexico Dolphin Identification System (GoMDIS)**. This online repository holds and integrates bottlenose dolphin identification catalogs from more than 20 collaborating organizations around the Gulf of Mexico, including Mexico and Cuba. This allows researchers to track the movements of dolphin individuals over a very wide range, determine where stranded dolphins originated, investigate population structure, and detect range shifts resulting from environmental disasters like the *Deepwater Horizon* oil spill.



Above are spectrograms (time along the horizontal axis, frequency on the vertical axis) showing the distinctive shapes of the whistles of different dolphins.

2013

For decades, the SDRP has worked with scientists from Woods Hole Oceanographic Institution and the University of St Andrews, Scotland, who were studying dolphin communication. Of particular interest to the researchers was the role in communication of individually distinctive whistles called **"signature whistles."** Scientists conducted experiments using recordings of dolphins obtained by researchers during SDRP health assessments, and from dolphins at Brookfield Zoo's SEVEN SEAS and Walt Disney World's The Seas. They found that dolphins learned the signature whistles of other dolphins, and used the whistles to call out to them. This work has highlighted fascinating questions about how signature whistles might be comparable to names—a rare concept in the animal kingdom.

A mere 62 years after it was first described by scientists, the vaquita is in imminent danger of extinction. [Left]: The young vaquita was caught as part of the VaquitaCPR project in 2017. It was soon released because it did not adapt to sanctuary facilities. (Photo credit: VaquitaCPR)

2016-17

Wells was asked to co-manage the **Vaquita-CPR program**, a large-scale, international collaboration to try to rescue remaining vaquitas from the threats they face from illegal fishing gear. The vaquita—the most endangered cetacean in the world—is a very small porpoise found only in the Gulf of California, along the northwestern coast of Mexico. Fewer than 30 were thought to remain in the world. They are killed in nets set illegally for endangered totoaba fish, to obtain fish swim bladders for black markets in China.

The SDRP has consulted and collaborated with scientists and agencies all over the world that are working to conserve dolphins and other marine mammals. They include franciscana dolphins in Argentina and Brazil, the baiji dolphin and finless porpoises in the Yangtze River, Chinese white dolphins of the Pearl River Estuary, Mekong River dolphins, and Indo-Pacific bottlenose dolphins in the Solomon Islands.

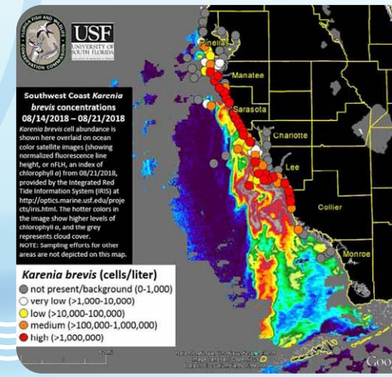
2017

Passive Acoustic Listening Stations (PALS) were installed in 10 locations around Sarasota Bay. Each station has a hydrophone, or underwater microphone, that enables researchers to monitor the sounds made by dolphins, fish, and boat traffic around the clock. In a collaborative effort by the SDRP, New College of Florida, and Loggerhead Instruments, researchers collected huge amounts of acoustic data. A New College graduate student developed a method to sort through the data and pull out signature whistles. Each whistle can then be compared to a catalog of signature whistles with the goal of finding a matching whistle. This will allow scientists to identify and track individual dolphins as they move around the bay.

A young Sarasota Bay dolphin leaps in front of the first PALS on Longboat Key, Florida. The network of PALS will allow scientists to measure the ecological soundscape of the dolphins and track individuals via their signature whistles.

2018-19

Another severe **red tide harmful algal bloom** in Sarasota Bay lasted from the summer of 2018 into January of 2019. Using data from their fish surveys, SDRP scientists again documented a catastrophic decline in the number of dolphin prey fish. They proactively alerted the public about a possible increase in their interactions with dolphins and how these interactions could be avoided. The SDRP's quick action may have prevented dolphin deaths from gear ingestion. Unfortunately, at least four Sarasota dolphins died from red tide toxins. Surprisingly, the fish population bounced back much quicker than it did in 2005 and 2006—showing that the ecological impact of a red tide depends on various factors. In another ecological surprise, Sarasota dolphins experienced a record number of shark attacks in 2019, perhaps in response to the post-red-tide absence of rays, one of the primary prey fish of sharks.



2020

Today, the SDRP's staff members advise and participate in research projects all over the world that involve a variety of marine animals, including whales, porpoises, turtles, sharks, and rays. "The more research we do in Sarasota Bay, the more questions we have and the more refined the questions are," said Wells. The questions are also more complex. "We are now working with colleagues to understand how dolphins respond to multiple concurrent threats. The work we do has become even more necessary over time. Given that there is no better-known cast of characters of dolphins in the world than those in Sarasota Bay, we hope to be able to continue to work with them for many years to come—to help their brethren in Sarasota Bay and elsewhere." ■

Photos taken by the Chicago Zoological Society's Sarasota Dolphin Research Program under a series of National Marine Fisheries Service Scientific Research Permits. Research has been conducted under a series of NMFS Scientific Research Permits, and Mote Marine Laboratory Institutional Animal Care and Use Committee approvals.