

EARTH IS BLUE™



Volume 3, June 2018

**FARAWAY
OCEAN**

**STORIES
FROM THE
BLUE**

DIVING WITH
A PURPOSE

THE
NEXT **INSPIRING
GENERATION**

MAGAZINE OF THE

NATIONAL MARINE SANCTUARIES



NATIONAL
MARINE
SANCTUARY
FOUNDATION



An underwater photograph showing a large kelp plant with several bright yellow, bulbous floats. A small, silver fish is swimming near the kelp. The background is a deep blue-green color.

WHEN THE OCEAN IS HEALTHY, WE ALL BENEFIT.

Americans are proud of our national marine sanctuaries—our blue parks. They are living proof that the sustainable use of our ocean goes hand in hand with robust coastal economies, valuable fisheries and thriving marine habitats.

National marine sanctuaries were created with bipartisan support, extensive scientific input and broad community participation.

Protecting marine sanctuaries means a healthier future—not only for ocean animals, but for all of us, including our children and grandchildren. Now more than ever, we need to stand up for our national marine sanctuaries.

Learn more at
MontereyBayAquarium.org/Conservation



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and **NMSF's** stewardship of marine sanctuaries—invaluable resources
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Cover photo: A fisherman holds a bonefish in Florida Keys National Marine Sanctuary. Photo: Bonefish & Tarpon Trust.

Above: A photographer takes in the view at Olympic Coast National Marine Sanctuary. Photo: Matt McIntosh/NOAA

The articles within this magazine are the views of the authors within and do not necessarily reflect the views of NOAA's Office of National Marine Sanctuaries or the National Marine Sanctuary Foundation.



Printed on recycled paper with environmentally-friendly ink.

OUR BLUE HERITAGE

Through partnerships with communities and individuals, sanctuaries help keep the heritage of our ocean and Great Lakes alive.

GET INTO THE BLUE

The ocean and Great Lakes are our planet's greatest playground – and national marine sanctuaries protect some of the best, most iconic places to play.

STORIES FROM THE BLUE

Behind every success of the National Marine Sanctuary System is a group of dedicated people: scientists, volunteers, educators, community members, and more.

GET INTO YOUR SANCTUARY

SPECIAL FOLDOUT — From surfing to fishing, recreational opportunities abound in your national marine sanctuaries.

FARAWAY OCEAN

Take a trip to some of the lesser-known and lesser-visited sites of your National Marine Sanctuary System

LIFE IN THE BLUE

Throughout the National Marine Sanctuary System, you'll find an astounding array of marine life, all relying on the indispensable resources of the ocean and Great Lakes.

EXPLORE THE BLUE

The National Marine Sanctuary System collaborates with scientists to obtain new knowledge on species diversity, ecosystem health, and more.

THE BLUE AND YOU

People all across the country support their national marine sanctuaries through volunteering and education – and you can do the same.

YOUR EARTH IS BLUE

Through photography, sanctuary visitors show the world the special places of the National Marine Sanctuary System through their eyes.



A MESSAGE FROM THE NATIONAL MARINE SANCTUARY FOUNDATION



Photo courtesy of the National Marine Sanctuary Foundation

Ten years ago I was a new staff member of the Senate Commerce, Science, and Transportation Committee, which has oversight of NOAA. The first piece of legislation that I worked on was a bill to expand the boundaries of Gulf of the Farallones and Cordell Bank national marine sanctuaries. It was a “Wow!” moment for me – the first time I heard of the National Marine Sanctuary System.

Up to that point, I had had no idea that Congress passed legislation in 1972 to create a system of underwater parks to permanently protect nationally significant areas in the marine and Great Lakes environment. And then in 2008, 36 years after the creation of that act, I was working on legislation to expand two of them for the American people.

To prepare for the hearing in which the committee would decide whether to move the bill to the full Senate for passage, I researched the importance of these two sanctuaries. I spoke with the California congressional offices, local and state stakeholders, and NOAA. What was the national significance of these areas? Why was expansion important? Who would expansion impact?

What I learned was that sanctuaries are special places where people come together with another type of community: that of the natural world within our ocean, Great Lakes, and their watersheds. The two sanctuaries that were being considered for expansion are nationally significant because they are the breeding waters for numerous marine mammals, fish, and seabirds, and countless marine species either call them home or migrate through their waters. They also lie within one of only four coastal upwelling ecosystems on Earth, and the only such area within the United States. Expanding these sanctuaries was important to people because it meant protecting waters that support rich biological diversity important

for a healthy ocean, providing clean and accessible waters to residents for recreation, and supporting businesses – from whale watching to commercial fisheries – that rely on marine resources for their livelihoods.

Fast forward to today, and I am privileged to be able to visit sanctuaries across the United States and meet with the people and communities who are their stewards. Each of the sites, stretching from American Samoa to the Pacific Northwest to the Florida Keys and up to Alpena, in my home state of Michigan, are unique because of their animals and plants, and the cultural resources and maritime heritage that they preserve. Yet they all share something in common. Each sanctuary is a treasured place that gives communities the opportunity to connect with the natural world.

This year, the National Marine Sanctuary Foundation is honoring BBC with its Conservation Innovation Award for its groundbreaking documentary *Blue Planet II*, which shows with breathtaking imagery the beauty of the ocean, its unique marine life, and its incomparable seascapes. *Blue Planet II* is a clarion call to action for all of us to work individually and collectively to reduce human impacts on our ocean.

One place to start is connecting with our national marine sanctuaries and supporting their work. Community support for sanctuaries ensures these natural places, the species that call them home, the history they preserve, and the people that rely on them, are protected generation after generation. Citizens are sanctuaries’ stewards and their voices.

Kris Sarri, President & CEO
National Marine Sanctuary Foundation





Photo: Kate Thompson/NOAA



Photo: Matt McIntosh/NOAA

A MESSAGE FROM THE OFFICE OF NATIONAL MARINE SANCTUARIES

When I was in my early twenties, I worked in the Florida Keys, leading teenagers on snorkeling trips throughout the islands. Most of the students were from landlocked states, and many had never seen the ocean before. My favorite thing in those days was the first moment a kid surfaced, awe and excitement lighting up their eyes and a thrilled grin stretching across their face. For many of the kids,

these trips opened up their world. By exploring the Keys, they had the opportunity to see how they were connected to the ocean, and to our blue planet.

In those days, I didn't know that the Florida Keys were protected by a national marine sanctuary – in fact, I didn't find out until my last evening on the job, overhearing the lecture a coral biologist was giving to my students. But even before that moment, I knew that this place was something special, something worth protecting.

National marine sanctuaries are truly places of sanctuary – not just for animals and ecosystems, but for us, too. They are where we go to take time off from busy lives, to explore and play, to snorkel, paddle, fish, and more. Walking on the shores of our national marine sanctuaries and swimming within their waters, we can recharge. In our ever-more-digital world, finding these moments to connect to the natural world has never been more important.

But our digital world can also *help* us connect to the ocean and Great Lakes. Our national marine sanctuaries give us opportunities to develop and test new technology to better protect and conserve marine ecosystems. Sanctuaries like Channel Islands are testing new systems to help track vessel movements and reduce ship strikes, while others like Gray's Reef are working with partners to design new remotely operated vehicles

and to explore the seafloor. Satellite tags and hydrophones are helping us understand how organisms like fish, sharks, whales, and other mobile species are using the areas protected by national marine sanctuaries. In the near future, wave gliders and other autonomous vehicles show real promise in helping us put “eyes and ears” in remote parts of marine protected areas to better understand how human use these special places, too.

Technology is also helping those far away from sanctuaries get acquainted with them: through virtual reality and 360-degree images, we've brought these special places to the public, who can experience them without getting wet. Working with partners like NOAA's Office of Ocean Exploration and Research, as well as Ocean Exploration Trust, to livestream our research expeditions through telepresence has helped scientists access sanctuaries from shore and diversify the expertise on each expedition. The future of technology is accessibility – more people able to witness, experience, and appreciate our national marine sanctuaries.

And that's really what national marine sanctuaries are about: we protect these jewels of the ocean and Great Lakes so that the American public can enjoy them today, tomorrow, and generations into the future. I want to see a National Marine Sanctuary System where everyone, no matter their background or their resources, can go to find their personal sanctuary. With your help and the help of our partners, we're on our way to that future.



John Armor, Director




OUR BLUE HE

Look beneath the surface of the sites of your National Marine Sanctuary System and you'll find a living museum, a repository of the stories and cultures that have been passed down through generations: ***Our Blue Heritage***. In this section, you'll find stories of partnerships that have helped us keep the heritage of our Great Lakes and ocean parks alive.

Discover how intertidal monitoring in Papahānaumokuākea Marine National Monument helps connect Native Hawaiians to a delicacy that has been treasured for generations, and how expeditions to these remote Hawaiian islands are helping integrate cultural knowledge into scientific observation.

Then, learn how a group of African-American divers are fostering appreciation for marine environments within their community and helping investigate the rich maritime history of the Florida Keys. Travel north to Thunder Bay National Marine Sanctuary to understand how the rediscovery of two lost shipwrecks has connected Michigan residents to their past.

Finally, journey to the waters of National Marine Sanctuary of American Samoa to learn how the ocean is home, and how residents around the sanctuary celebrate this resource every year.

An underwater photograph showing a sandy seabed. On the right side, there is a large, brown, woven mesh trap. A striped goatfish is positioned near the trap, appearing to be interacting with it. The water is clear and blue, and the lighting is bright, suggesting a shallow depth.

The ocean is integral to Samoan culture. In National Marine Sanctuary of American Samoa, traditional fishers catch goatfish using small hand-woven traps called 'enu.

Photo: Matt McIntosh/NOAA

RITAGE



PROTECTING THE 'OPIHI

'*Opihi*, a species of limpet, are a delicacy in Hawai'i. Three species are endemic to the Hawaiian Islands, found nowhere else in the world. Overharvesting in the main Hawaiian Islands has put 'opihi at risk – but in the uninhabited Northwestern Hawaiian Islands, in Papahānaumokuākea Marine National Monument, 'opihi abound. For nine years, researchers have been traveling to the monument to monitor 'opihi populations and other rocky intertidal organisms. The monitoring expeditions integrate Native Hawaiian cultural knowledge and practices with Western science to assess and better understand the shorelines and shallow waters of high islands within the monument. This research is led by members of the 'Opihi Partnership, a public-private collaborative consortium that provides information to improve management of harvesting intertidal species in the main Hawaiian Islands.





Members of a collaborative monitoring expedition to Papahānaumokuākea Marine National Monument assess 'opihi populations.

Photos (clockwise, from right): NOAA; NOAA; Hoku Johnson/NOAA

DIVING WITH A PURPOSE

— By JAY V. HAIGLER



Photo courtesy of Jay Haigler

As I check my mask and regulator one last time and slip beneath the waves, a whole new world unfolds before my eyes. Here in Florida Keys National Marine Sanctuary, colorful fish dart this way and that amid coral reef colonies.

But I'm not here to enjoy the scenery. I'm part of a team of scientific divers working with the sanctuary to unlock the mystery of an early 20th century shipwreck that lies broken in sanctuary waters off Key Largo, Florida. Months after our field survey mission at Elbow Reef, the identity of the mysterious shipwreck is confirmed to be *Hannah M. Bell*, which sank in April 1911. I am thrilled that this century-long mystery has been solved and grateful to have had a role in the outcome. I always look forward to my next adventure in a national marine sanctuary.

During the survey of *Hannah M. Bell*, I was working with divers from Diving With a Purpose. Diving With a Purpose started in 2005 as a volunteer archaeology program under partnership with members from the National Association of Black Scuba Divers Foundation (NABS) and the National Park Service. The program has evolved into a community-focused non-profit organization dedicated to the stewardship of our ocean and Great Lakes resources through education, archaeology, science, and underwater exploration. We provide education, training, certification, and field experience to adults and youth in the fields of maritime archaeology and ocean conservation. A special interest of ours is the protection, documentation, and interpretation of African slave trade shipwrecks, and the maritime history and culture of African-Americans.

Thanks to a strong collaboration with NOAA's Office of National Marine Sanctuaries, our members have received nautical archaeology training, and now use their skills to help NOAA survey and document historically-significant shipwrecks and maritime heritage sites across the National Marine Sanctuary System. In addition to the survey of *Hannah M. Bell*, we have also worked with sanctuaries to document a Tuskegee Airmen crash site in Lake Huron.

Our partnership with national marine sanctuaries helps support and develop the next generation of marine conservation leaders. Gray's Reef and Flower Garden Banks national marine sanctuaries have been host sites for Youth Education Summits sponsored by NABS. These summits bring together youth with an interest in marine science at national marine sanctuaries. The summits provide these young people with educational experiences that enhance their knowledge of and respect for marine life, while promoting safe and skilled exploration of the ocean through snorkeling and scuba diving.

Last year, I was proud to be among a group of members representing Diving With a Purpose and the National Association of Black Scuba Divers who spoke publicly in support of the proposed Mallows Bay – Potomac River National Marine Sanctuary. Why? Mallows Bay contains an extraordinary collection of shipwrecks from the Revolutionary War to the present, and is also an important ecological habitat. Also, I believe that sanctuary would provide opportunities for underserved youth in the Washington, DC, area to get on the water and experience the great outdoors.

When I first became a scuba diver more than 13 years ago, I enjoyed simply being underwater and seeing the amazing diversity of marine life. However, over time, I wanted something more meaningful from the sport. Diving With a Purpose and working with national marine sanctuaries has afforded me opportunities to take my scuba diving passion to another level, learn about the rich maritime cultural heritage of our great nation, and share this information with others.

Jay Haigler is the diving safety officer for the National Association of Black Scuba Divers and a director and instructor with Diving With a Purpose.





Haigler surveys a shipwreck in Florida Keys National Marine Sanctuary.

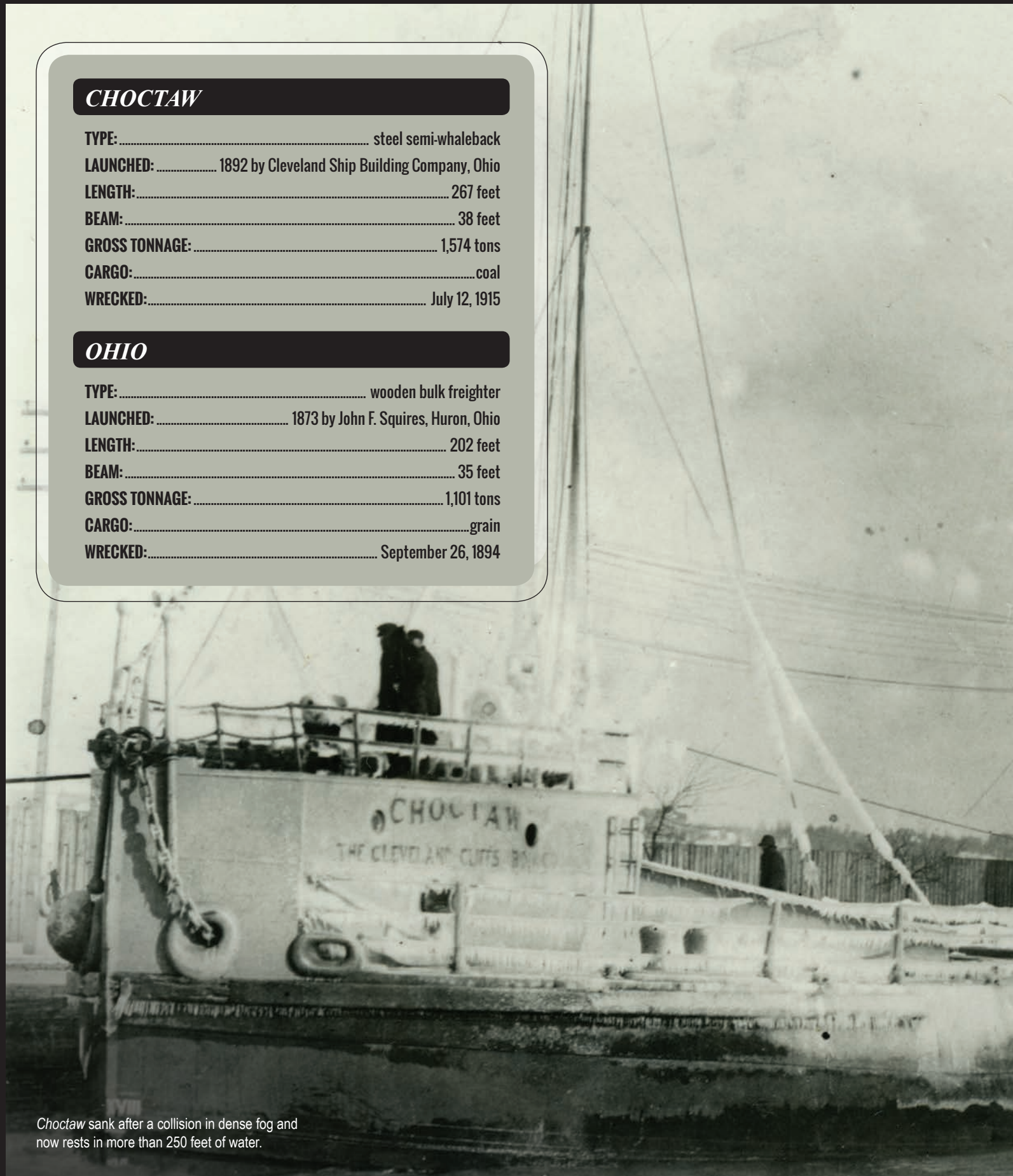
Photo: Matt Lawrence/NOAA

CHOCTAW

TYPE:..... steel semi-whaleback
LAUNCHED:..... 1892 by Cleveland Ship Building Company, Ohio
LENGTH:..... 267 feet
BEAM:..... 38 feet
GROSS TONNAGE:..... 1,574 tons
CARGO:..... coal
WRECKED:..... July 12, 1915

OHIO

TYPE:..... wooden bulk freighter
LAUNCHED:..... 1873 by John F. Squires, Huron, Ohio
LENGTH:..... 202 feet
BEAM:..... 35 feet
GROSS TONNAGE:..... 1,101 tons
CARGO:..... grain
WRECKED:..... September 26, 1894



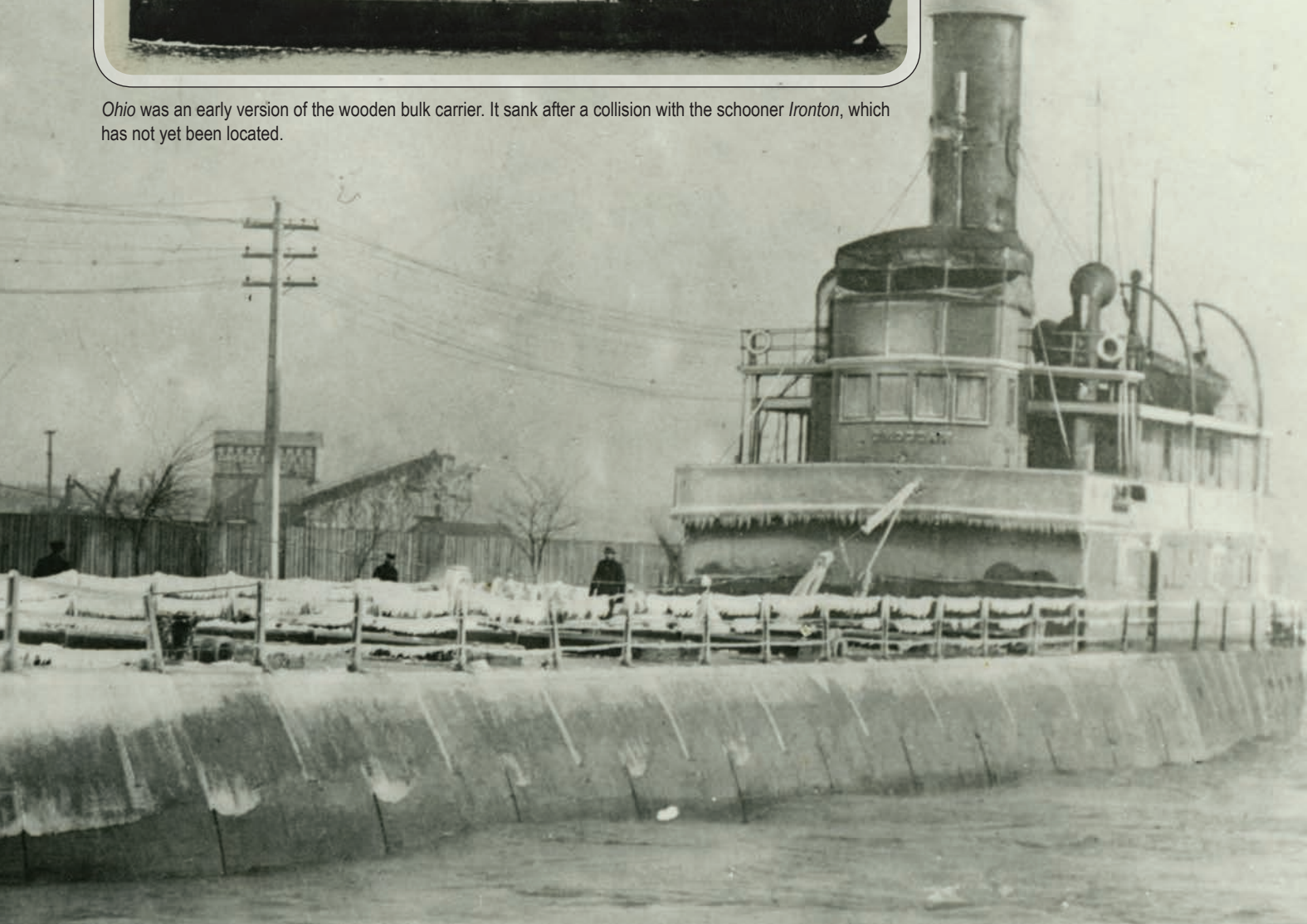
Choctaw sank after a collision in dense fog and now rests in more than 250 feet of water.

FINDING HISTORY

Beneath the waves of Thunder Bay National Marine Sanctuary lies an underwater museum. In this section of Lake Huron, nestled up against the shores of northeastern Michigan, are nearly 100 known shipwrecks. Perhaps another hundred are still lost in “Shipwreck Alley,” and in summer 2017, researchers found two of them. Working with NOAA’s Office of Ocean Exploration and Research to test new archaeological tools like unmanned aircraft systems and autonomous underwater vehicles and seek lost vessels, researchers located the wrecks of *Choctaw* and *Ohio*. Both vessels had been lost for more than a century.



Ohio was an early version of the wooden bulk carrier. It sank after a collision with the schooner *Ironton*, which has not yet been located.



FAUTASI: THE RACE FOR FLAG DAY

Samoa culture and *Fa'a Samoa* – the Samoan way of life – are at the heart of National Marine Sanctuary of American Samoa. For the people of American Samoa, the ocean is home, it is a source of sustenance, and it is a site for recreation and community. Each year on Flag Day, young men from coastal communities compete in the fautasi race, proving their courage and leadership.





Fautasi races occur each year on Flag Day, the anniversary of the day American Samoa became a United States territory.

Photo: NOAA

GET INTO THE

To many, the ocean and Great Lakes are our planet's greatest playground – and national marine sanctuaries protect some of the best, most iconic places to play. In sanctuaries, you can dive in technicolor coral reefs; explore historic shipwrecks; paddle around lush kelp forests; watch a humpback whale's majestic breach; explore a shoreside tidepool; and more. There's no end to the adventure in sanctuaries!

In *Get Into the Blue*, hear from Monterey Bay Aquarium executive director Julie Packard about how these ocean parks provide important opportunities for recreation, education, and science. To Packard, sanctuaries are “test beds for new approaches,” whether it's determining the best way to protect against human impacts or to inspire the next generation of ocean stewards.

Looking to try out new ways to play in your national marine sanctuaries? Get your inspiration here! Learn how recreational fishing can help support healthy ecosystems, and get a glimpse into the rapidly-growing world of stand up paddling. Prefer to keep your feet on solid ground? Lighthouses offer an opportunity to see your sanctuaries in a whole new light – check out how on page 20.



Florida Keys National Marine Sanctuary is a popular location for fishing and other recreational activities.

Photo: Matt McIntosh/NOAA

BLUE



GET INTO THE BLUE

The Monterey Bay Aquarium overlooks the waters of Monterey Bay National Marine Sanctuary.

Photo: Kate Thompson/NOAA



GATEWAY To The Ocean

— By JULIE PACKARD



Photo: Corey Arnold

I grew up surrounded by the beauty of California's amazing nature — our scenic coastlines, abundant ocean, and underwater forests. What a privilege.

Every child should have the opportunity to run on a sparkling windy beach or squeal in delight seeing a whale surface for air. Sadly, this is not the case for a growing number of kids and families. Our national marine sanctuaries are part of the solution, providing extra protection to special ocean places for the many benefits they provide.

The most obvious benefit of sanctuaries is to secure areas where we can minimize human impacts, in turn promoting ecosystem health and resilience. But the benefits go far beyond that. Our sanctuaries are test beds for new approaches to understand ocean health and the rapid changes now underway across the global marine environment. They're centers for ocean research and education. And, they can drive a thriving tourism economy, as we've seen in Monterey Bay.

At the Monterey Bay Aquarium, where I serve as executive director, our mission is to inspire

conservation of the ocean. The fact that we're on the shores of a vast national marine sanctuary is central to the narrative our visitors take home with them: The Monterey Bay is an amazing, vibrant natural wonder where you can see ocean animals in the wild — all because people took action to protect it.

At the broader level, California's Central Coast is a remarkable example of protected nature generally, in a state of 39 million people. We have a long history of coastal protection, and I'm proud to have helped advance those measures. The Big Sur Coast, where both land and sea are protected, remains one of my favorite places to be refreshed and inspired. It's a haven for animals that once were on the road to extinction. Sea otters, California condors, and brown pelicans now all call it home after decades of depletion. It's a stunning reminder of what we can accomplish if we put our minds to it.

My life's journey that led to the Monterey Bay Aquarium began when I was a college student studying tide pool life on the shores of Monterey Bay. It was not yet a sanctuary and I'm grateful every day that its living resources will be here for future generations to benefit from and enjoy. The opportunities our sanctuaries provide for research and education are essential now more than ever. This is where our next ocean scientists will be inspired and trained, and it's where we can do the research to understand the complex ecosystems that sustain us, in turn to inform a more sustainable path for humanity.

This century must be the one in which we begin to reverse the negative environmental trends underway. Our lives depend on it. When I see the knowledge and passion of young people who have grown up in a world that includes national marine sanctuaries, I'm convinced we can do it.

Julie Packard is the executive director of the Monterey Bay Aquarium.

FISHING HAPPENS HERE

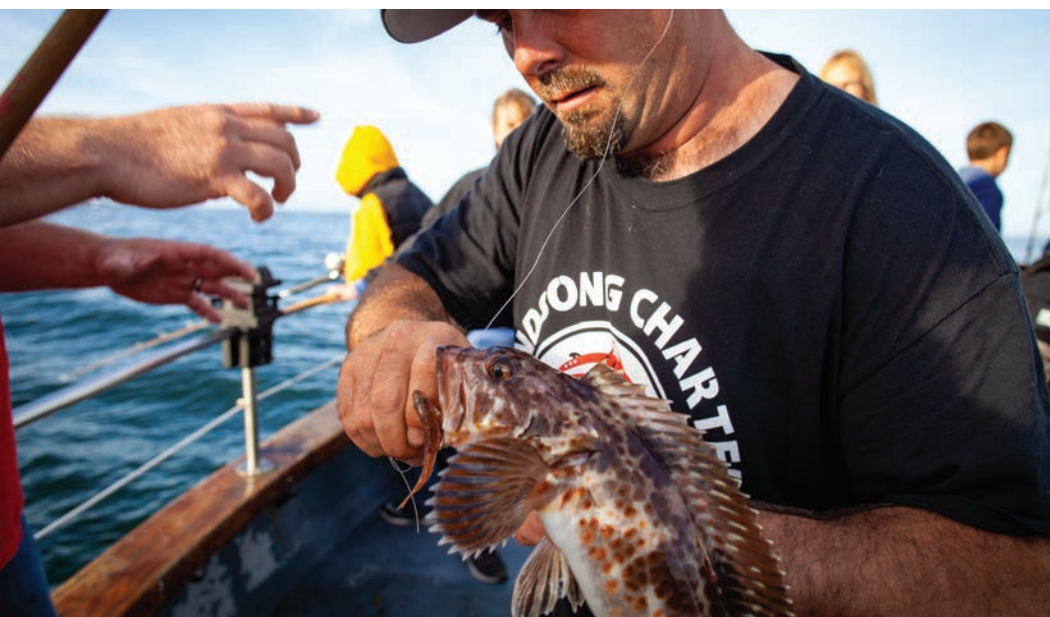
What better way to experience your national marine sanctuaries than on the water? Fishing provides opportunities for people of all ages to get to know the ocean and Great Lakes, gives families time to connect, and helps young people better understand underwater life. In national marine sanctuaries, recreational anglers give back and support strong marine environments by practicing sustainable fishing and boating techniques, advocating for fisheries data and science, and improving fish habitats.

Fishing gives young people the opportunity to get out on the water and connect with their national marine sanctuaries.

Photo: Sanctuary Classic



With everything from fly fishing in Florida Keys National Marine Sanctuary to sport fishing for king mackerel in Gray's Reef National Marine Sanctuary, and lake trout or walleye fishing in the Great Lakes within Thunder Bay National Marine Sanctuary, national marine sanctuaries have something for every kind of angler!



Clockwise (from top, right): fishing rod and reel, Florida Keys NMS; fishing guide holding mangrove snapper, Florida Keys NMS; fisherman holding lingcod, Olympic Coast NMS; fly fishing, Florida Keys NMS

Photos: Nick Zachar/NOAA; Matt McIntosh/NOAA; Matt McIntosh/NOAA; Will Benson

STAND UP FOR SANCTUARIES

Stand up paddling is among the fastest growing water sports, and many “SUPers” are coming to national marine sanctuaries to enjoy this unique way to improve their balance and get a full-body workout. In Thunder Bay National Marine Sanctuary, a stand up paddleboard can transport you to the past while you investigate the shipwrecks just beneath the surface, while in Olympic Coast your board can take you on an extreme adventure through the surf. Paddleboards can also be the perfect ticket to wildlife watching in places like Monterey Bay National Marine Sanctuary – just make sure to give animals plenty of space!





A paddleboarder explores the shipwrecks of
Thunder Bay National Marine Sanctuary.

Photo: David J. Ruck/NOAA

SENTINELS OF THE SANCTUARIES

For centuries, lighthouses have served as beacons, guiding mariners away from danger and marking the way to safe harbor. From the Point Arena Lighthouse overlooking Greater Farallones National Marine Sanctuary to the lighthouses of the Outer Banks Maritime Heritage trail near Monitor National Marine Sanctuary, lighthouses all across the nation tell the story of our seafaring nation.





Point Arena Lighthouse, Greater Farallones NMS; Thunder Bay Island Lighthouse, Thunder Bay NMS; Point Sur Lighthouse, Monterey Bay NMS; Cape Hatteras Lighthouse, North Carolina, Monitor NMS; Sombrero Key Lighthouse, Florida Keys NMS

Photos: Matt McIntosh/NOAA; David J. Ruck/NOAA; Robert Schwemmer/NOAA; Captain Albert E. Theberge/NOAA; Brenda Altmeier/NOAA



STORIES FROM

Behind every successful sanctuary is a group of dedicated scientists, community members, volunteers, educators, and more. In this section, you'll meet some of the inspiring people who help support the National Marine Sanctuary System through their *Stories from the Blue*.

First, meet Jacqueline Laverdure, education and outreach coordinator for Olympic Coast National Marine Sanctuary. Laverdure has devoted herself to sanctuaries for over a decade. Next, hear from Florida Keys National Marine Sanctuary Advisory Council member Mimi Stafford, who has lived in the Florida Keys since the 1970s.

Then, hear the stories of two researchers who have contributed to the National Marine Sanctuary System. A Dr. Nancy Foster Scholar, Dr. Cori Kane studies deep reef communities in the Hawaiian Islands in and around Papahānaumokuākea Marine National Monument. Stellwagen Bank National Marine Sanctuary volunteer Kevin Powers has used his time in the sanctuary to continue his scientific investigations even after retirement.

Let these personal stories of families, friends, and individuals coming together to enjoy and learn from national marine sanctuaries ignite your passion to protect our ocean and Great Lakes.



Film festivals like the annual Thunder Bay International Film Festival give audiences a glimpse into national marine sanctuaries.

Photo: Kate Thompson/NOAA

THE BLUE

THUNDER BAY
INTERNATIONAL FILM FESTIVAL
IN PARTNERSHIP WITH
INTERNATIONAL OCEAN FILM FESTIVAL
GREAT LAKES, GREAT FILMS
THE FRIENDS OF THUNDER BAY NATIONAL MARINE SANCTUARY PRESENT A LINKUP FESTIVAL
SHOWCASING OCEAN AND GREAT LAKES FILMS FROM AROUND THE WORLD
ROGERS CITY | ALPENA | HARRISVILLE
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DIVE IN - JANUARY 24-28, 2018
MADE POSSIBLE BY
CHEMICAL BANK
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Jacqueline Laverdure has worked for Olympic Coast National Marine Sanctuary for more than 10 years.

Photo: Matt McIntosh/NOAA



Photo courtesy of Jacqueline Laverdure

A Passion for the Sea: Jacqueline Laverdure

For Jacqueline Laverdure, sanctuaries are both work and home. She formerly worked as a vessel captain in the protected waters of Florida Keys National Marine Sanctuary and then was one of the Team OCEAN coordinators for that sanctuary. Today, she serves as the education and outreach coordinator for Olympic Coast National Marine Sanctuary. This is her Story from the Blue.

For ten years, I lived on a boat in Florida Keys National Marine Sanctuary. I lived and I worked and I played there, found my food – dove for lobster and crab – and slept there. The Florida Keys were my life. Waking up on a boat was amazing. Sometimes dolphins and even sea turtles would hang around the boat, making my morning an amazing time.



“ Sanctuaries are everything to me. They’re where I play, where I’ve lived, where I get my food, where I’m inspired.”

We also have corals in Olympic Coast but you’d need to have a submersible to get to them.

The culture is very different, also: in the Florida Keys it’s very much a tourist destination, with over a million people from all over the world visiting. When we protected the resources it was usually against tourist activities, people who were unaware of proper use of the resources.

Here in the Olympic Coast, it’s much quieter, and although it is a destination, there are fewer tourists. There is also a really rich native culture in the Pacific Northwest, including the four coastal treaty tribes that live adjacent to the sanctuary. These tribes who have relied on the resources for over ten thousand years are being impacted by global issues, issues they didn’t create. Ocean acidification and marine debris are impacting their resources and the food they rely on. This is their home – they’re going to pass this place and the resources on to future generations. They’re protecting it not for tomorrow but for the next several hundreds and thousands of years.

People typically divide up cultural resources and natural resources. But what I find out here in Olympic Coast National Marine Sanctuary is that all natural resources are cultural resources. They’re the same.

While I lived in the Keys, I worked on charter boats as a boat captain. I worked together with other charter boat captains and the sanctuary to create a program that is now called Dolphin SMART. We developed the program to encourage proper and safe viewing of dolphins in the wild. In 2006, I got an incredible opportunity to join the sanctuary’s staff as their coordinator of Lower Keys Team OCEAN, the Ocean Conservation Education Action Network. We talked to tourists, and taught them how to enjoy the reef properly and how to tie their boats to moorings instead of setting their anchors on the fragile corals. That’s how my long career with sanctuaries started.

I worked for Florida Keys National Marine Sanctuary with Team OCEAN for two years before I applied to work at Olympic Coast National Marine Sanctuary in Washington state. My husband is from the Netherlands, and when he first moved to the United States he fell in love with the Olympic Peninsula. When I saw the position, I asked him, “Is this the place that you told me is the most beautiful place in the world?” I applied for the job, and when I came out here I fell in love with this place as well.

There are so many differences between the two sanctuaries. The diversity of life is so different: you have coral reefs in the Florida Keys and out here in the Olympic Coast you have tide pools.

“ We all need to be
part of the solution.”



A longtime resident of the Florida Keys, today Mimi Stafford serves on the sanctuary's advisory council.

Photo: David J. Ruck/NOAA

A Life Devoted to the Keys: Mimi Stafford

Mimi Stafford spent her teenage years in central Florida before leaving to study marine biology. After college, she and her husband visited the Florida Keys and dove the reefs, deciding then and there that they could never leave. For years, Mimi has worked as a commercial diver and fisher in the lobster, sponge, and stone crab fisheries. She also participated in the tourist industry as a charter and ecotour operator. Today, Mimi supports Florida Keys National Marine Sanctuary by serving as a member of the Sanctuary Advisory Council. This is her Story from the Blue.

The Keys were a magical place when I was little. There weren't many people. My father and I would launch a little skiff not far from where I live now and head to the reef for adventure. We wouldn't see anyone all day long. It was amazing, it was so quiet. Today, there's a significant change.

By the time I returned to the Keys as a young woman in the early 1970s, something was happening with the conchs and they were declining. In the 1980s, my husband and I witnessed a massive die-off of the queen conchs, Bahama sea stars, and *Diadema* sea urchins. There are many theories about the cause of the declines, but I do not think we have ever fully identified the underlying problems.

In the 1990s we witnessed the precipitous decline of the corals, especially staghorn and elkhorn and the more delicate species that are so important to the structures of our outer reefs. Sponge populations have also declined. The loss of these corals and sponges changes the entire ecosystem and further exacerbates the overall decline of the reef system.

People are talking about temperature changes and rainfall changes and climate changes, serious issues that we need to focus on. I was on an ecosystem protection working group with the sanctuary for a couple of years and now I



Photo: David J. Ruck/NOAA

represent the general public of the Lower Keys on the Sanctuary Advisory Council. We are going through the preliminary stages of coming up with a new management plan, and when the draft comes out, we will go back and have public meetings again. I really encourage people to come and be a part of it. It's the best way to find a solution that works for everyone.

I think people need to know when they come down here to the Keys that they are really coming to a special spot. Anything they do, even small things like throwing cigarette butts on the ground, contributes to the degradation of our water quality. Think about a better, less impacting, way to explore and experience the Keys and to appreciate what is special. Choose kayaking instead of jet skis. You can jet ski anywhere. Why come down here and jet ski? You miss it all. You scared it all away.

I feel like my children were lucky enough to see the Keys when the marine environment was still healthy. I am so fortunate to have been here through these years and I feel a responsibility to be a part of the recovery. As a child, I couldn't wait to get out there and get underwater because it was so magical. I would love for my grandchildren to see that.

Making Connections: Dr. Cori Kane



Photo: Randy Kosaki/NOAA

Dr. Nancy Foster Scholar Dr. Cori Kane first got acquainted with Papahānaumokuākea Marine National Monument when working as a researcher for the state of Hawai'i. Intrigued by the lush coral reefs of the Northwestern Hawaiian Islands, she undertook a Ph.D. at Washington State University under the mentorship of Dr. Randy Kosaki, monument deputy superintendent. Today, with support from NOAA's Office of National Marine Sanctuaries, she researches deep reefs in Papahānaumokuākea and in the main Hawaiian Islands. This is her Story from the Blue.

Diving in Papahānaumokuākea Marine National Monument is like the Wild West. In the main Hawaiian Islands, fish avoid people, but in the Northwestern Hawaiian Islands that behavior doesn't

exist. When you drop in and you make noise, everything is actually attracted to you. It's a huge role reversal from every situation I've ever been in.

When you go to protected places like Papahānaumokuākea, which have not had massive disturbance, it's an entirely different world. Organisms there are much bigger than they are in the main Hawaiian Islands and the fish diversity and biomass is greater. We'd be in some areas where every single fish we saw in a transect was native to Hawai'i and found nowhere else. Hawai'i has some of the highest numbers of native fishes in the world – but usually you'd only see 20 to 25 percent native fishes.

My favorite thing out there is seeing the large schools of *ulua*. They're these big, four- or five-foot fish that come in, and then everything else disappears – they're on the top of the food chain. They'll check you out and swim right next to you. They're naturally curious. Usually in the water you feel like you're the top dog, but in the monument, you're being investigated. When I'm out there, I feel like I'm being researched as much as I'm researching the environment.

While exploring Papahānaumokuākea, I found that fish that I'd see really commonly at 20 and 30 feet were somehow down in 150 and 200 feet, a completely different environment. My research now is looking at how deep and shallow reef fish are related. Some of my work has been looking



Kane surveys a deep reef in Papahānaumokuākea Marine National Monument.

Photo: Greg McFall/NOAA



Photo: Greg McFall/NOAA

at one specific group, parrotfishes, which are an important food source in Hawai'i. There have been reports that there are parrotfish in the deep reefs, but we've actually found that that's entirely opposite – they are pretty much absent once you get below 40 meters. The idea of this universal refuge area that's inherently protected because no one goes there doesn't work, at least for this major food fish in Hawai'i. More and more we're finding that the deep reefs are important as safe houses for maintaining biodiversity, but not necessarily for repopulating food fish that are in shallow areas.



Besides the research, I've talked a lot to neighborhood and community associations, done volunteer fair days, spoken with fishermen. Working with Native Hawaiian communities has been some of the most rewarding work, too. Usually traditional and Western knowledge are considered separately, and we've been collaborating to break down some of the barriers. Western science builds on the knowledge Hawaiian ancestors already knew.

Obviously I'm biased, but I think I have the best job in the world. It's important to find something you're passionate about. The biggest thing I tell undergraduate students is just to get outside. It doesn't matter if you're near an ocean or not. I'm not near an ocean ten months out of the year, but getting outside and looking at nature if you want to be an ecologist is integral. I can ask similar questions in the forests of Washington and Oregon as in the ocean in Hawai'i. It's all about the questions and having an interest.

“ When you go to protected places like Papahānaumokuākea, it's an entirely different world.”

Seabirds Count: Kevin Powers



Photo: Tasia Blough/NOAA

Kevin Powers is a seabird biologist whose scientific research played a role in the designation of Stellwagen Bank National Marine Sanctuary. In 2016, he was recognized by the National Marine Sanctuary Foundation as the Volunteer of the Year for his many hours of research and exploration at the sanctuary. Powers has been happily dedicating his life to continuing marine conservation work since his retirement in 2012. This is his Story from the Blue.

While I worked as a seabird biologist at the Manomet Bird Observatory in Plymouth, Massachusetts, in the late 70s, a request came from the office of Congressman Gerry Studds. At the time, the observatory's program was the only systematic survey of birds or mammals in the Gulf of Maine. The congressman requested information on whale and seabird sightings, and our data were used in the designation of Stellwagen Bank National Marine Sanctuary.

In 1983, after the research project was completed, I left marine science for a job in the tech industry working as a software engineer. But after 35 years, I retired and got re-involved with marine conservation. I was introduced to Anne-Marie Runfola, volunteer coordinator at Stellwagen Bank, who told me about the sanc-

tuary's seabird survey program that needed qualified volunteers. It was perfect for me – so I became a regular volunteer and seabird observer. The research coordinator at Stellwagen Bank, David Wiley, also needed someone to analyze data from a satellite-tagging program on shearwaters, and honestly, I couldn't have asked for anything better to do in retirement. I loved that I was able to put my time and passion into marine conservation work that would benefit Stellwagen Bank.

I've even learned more about what I studied in my career as a volunteer. We have been able to track patterns of bird movements to learn how Stellwagen Bank has become an important feeding area for marine creatures.

One of the most rewarding parts of volunteer work is meeting people with similar interests to mine, as well as academics in marine ecology. All the other sanctuary volunteers share the same passion for marine conservation, and Stellwagen Bank National Marine Sanctuary offers us a great opportunity to help preserve a diverse part of our ocean while studying its species. From young to old, working with these amazing volunteers has really reinvigorated me to study seabirds and to help preserve the marine environment.

It's because of my work and the other volunteers I've met that I've been able to have so many great memories at Stellwagen. I can think of countless clear, sunny days where we have been out on our research vessel with the water teeming with marine life. Volunteering has allowed me to enjoy these experiences to the fullest and even share them with my loved ones. My son, who is now a professional biologist, remembers a time that I took him out on a boat when he was young and he saw his first humpback whale. The whale was named Olympia, and she breached very close to the boat we were on. What's so great about these memories are that anyone can have an experience like this.

A long-tailed jaeger flies above the waves in Stellwagen Bank National Marine Sanctuary.

Photo: Peter Flood

“ I loved that I was able to put my time and passion into marine conservation work that would benefit Stellwagen Bank.”





Get INTO YOUR Sanctuary




Planning an adventure or dreaming of your next vacation? Look no further than your national marine sanctuaries! These jewels of the ocean and Great Lakes hold possibilities for everyone. Discover the ocean and Great Lakes, and yourself, in national marine sanctuaries.

*open
to learn more about
surfing in your National
Marine Sanctuary
System!*



WILDLIFE VIEWING

Where else can you encounter the majestic animals of the ocean in their natural habitats? In your national marine sanctuaries, you can see whales and dolphins, seals and sea lions, birds, sea otters, and more.



PADDLE SPORTS

All throughout the National Marine Sanctuary System, you'll find opportunities to kayak, stand-up paddleboard, canoe, and more! Experience natural habitats and historical resources from a whole new perspective.



SURFING

From beginner waves to expert tubes, national marine sanctuaries provide opportunities for surfers of all skill levels. In these protected areas, you'll find some of the most famous surf spots in the world.





 **VISITOR CENTERS**

At sanctuary visitor centers and partner exhibits, you can learn more about the natural and cultural treasures protected by your national marine sanctuaries, explore hands-on exhibits, and attend engaging educational programs – all without getting your feet wet.



 **FISHING**

Recreational fishing is one of the most popular pastimes in the United States – and 98 percent of sanctuary waters are open to recreational anglers. National marine sanctuaries provide excellent opportunities for sustainable recreational fishing and boating!



 **DIVING**

Some of the best diving in the world can be found in your national marine sanctuaries! From coral reefs to shipwrecks, you'll find opportunities for divers and snorkelers of all experience levels.



Photos, from top to bottom, left to right, both pages: Kate Thompson/NOAA; Matt McIntosh/NOAA; David J. Ruck/NOAA; Dayna Rignanes/NOAA; Matt McIntosh/NOAA; David J. Ruck/NOAA

FARAWAY OCEAN: A JOURNEY INTO DISTANT SANCTUARIES

— By ELIZABETH WEINBERG

A diver places a specimen in a collection bag in Cordell Bank National Marine Sanctuary

Photo: Joe Hoyt/NOAA





From top to bottom: seaweed blenny, Gray's Reef NMS; octopus, Cordell Bank NMS; blue whales, Channel Islands NMS

Photos: Greg McFall/NOAA; OET/NOAA; Jess Morten/NOAA



What is a sanctuary? Is it a safe haven for the vulnerable? A tranquil place to find calm? A view inspiring awe and beauty? A jumping-off point for adventures?

The sites of the National Marine Sanctuary System are all of these things. In the calm waters of Hawaiian Islands Humpback Whale National Marine Sanctuary you'll find humpback whales peacefully raising their young, while in the waves of Monterey Bay National Marine Sanctuary you'll find surfers testing their limits. Sanctuaries are places where you can experience the serenity of an ocean sunset and the heart-pounding excitement of seeing a giant sea bass pop out from behind a curtain of kelp.

Some of these ocean and Great Lakes treasures are easier to get to than others. To witness the kaleidoscope of color of Cordell Bank National Marine Sanctuary, for example, you have to get offshore and have the skill as a technical diver to make it to the sanctuary's deep-water pinnacles. To fish at Gray's Reef National Marine Sanctuary, you need the means and the time to get 19 miles off the coast of Georgia. But these sanctuaries belong to everyone, and protecting





A sea lion dives through the kelp forest at Santa Barbara Island in Channel Islands National Marine Sanctuary.

Photo: Curtis Wee

them means keeping them near and dear to the hearts of people all over the country and the world.

With that in mind, we turned to the people who know them best so you, too, can experience these jewels.

A WHOLE NEW SANCTUARY

Even if you've visited sanctuaries a hundred or a thousand times, everything's a little bit different with each encounter. Todd Recicar, research vessel captain for Gray's Reef National Marine Sanctuary, describes diving in the sanctuary this way: "Sometimes the excitement of diving in the sanctuary is not knowing when you jump in the water what the visibility is going to be like on the bottom." A diver might get an expansive

view of live-bottom reef, or instead be inspired to focus on the small details just in front of them.

Greg McFall, manager of the NOAA Diving Program, echoes this sense of variability. "What you might see when you go out to the sanctuary in February will be completely different – different organisms, different abundances – in the summer," he says. In the winter, cold waters and storm-driven waves scour the reef, and a tubeworm called sea frost carpets the sanctuary. But in the summer, the water warms to subtropical temperatures, bringing in sponges, sea stars, and more that thrive and cover the rocky ledges in this area off the coast of Georgia. Thanks to McFall, too, you don't have to be a diver to experience this transformation: his pho-

tographs have brought this offshore sanctuary to life for people all over the world.

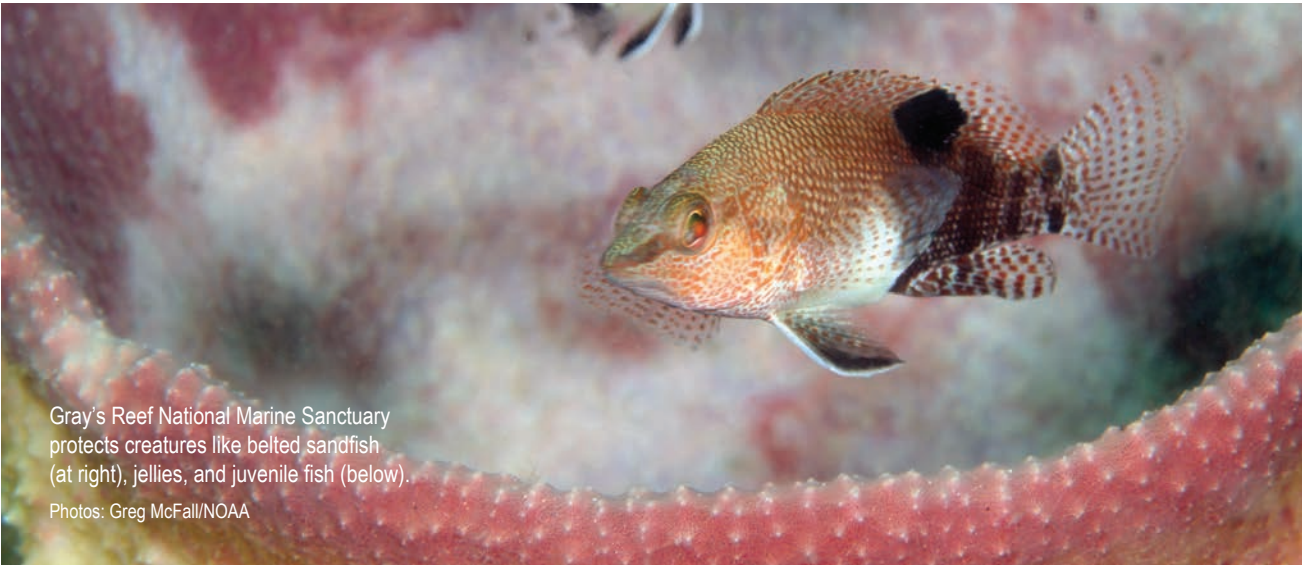
In some places within the National Marine Sanctuary System, the mystery is even deeper and darker. The borders of Cordell Bank National Marine Sanctuary begin six miles offshore, and while the sanctuary's rich waters support an astonishing array of life, it's challenging to get to. The closest port is Bodega Bay, which sanctuary education and outreach coordinator Jennifer Stock explains is often referred to as "Blow-dega" for its unpredictable winds. And Cordell Bank itself, a rocky underwater feature, is far beneath the surface.

Cordell Bank rises from the continental shelf, with small pinnacles reaching to within 115 feet of the



Divers prepare to enter the water at Gray's Reef National Marine Sanctuary.

Photo: Jody Patterson/NOAA



Gray's Reef National Marine Sanctuary protects creatures like belted sandfish (at right), jellies, and juvenile fish (below).

Photos: Greg McFall/NOAA

ocean surface. When you're diving, explains maritime archaeologist Joe Hoyt, you have to position yourself carefully so you don't miss the bank. Hoyt is one of the few people to have dived down to the bank, and he describes it as having a "shocking palate of color. It's confusing, because it looks almost tropical because it's so bright, but it's cold, and you're in Northern California. It's disorienting." Here, in the nourishing waters of the California Current, invertebrates like hydrocorals and strawberry anemones abound, giving Cordell Bank a technicolor glow. The area also serves as a rockfish nursery. McFall explains there are so many rockfish that "if your dive buddy is more than four feet away from you, you can't see them."

New technologies are enabling scientists to investigate never-before-seen parts of national marine sanctuaries, too. In Channel Islands National Marine Sanctuary, a 2016 research expedition on board the E/V *Nautilus* discovered evidence of past sea levels and shorelines. These discoveries have changed the narrative around



FARAWAY OCEAN

the natural history of California's Channel Islands and informed future expeditions, explains sanctuary education and outreach team lead Julie Bursek. And in Cordell Bank, *Nautilus's* deep-sea expeditions investigated areas too deep for divers to go. Researchers saw species they'd never seen before, or never seen in that region. Now, explains Stock, it's as if "we have a whole new sanctuary to be talking about and describing to people."

AN UNEXPECTED TREAT

Whether you live in a landlocked state or wake up each morning along the coastline, sanctuaries have something for you. Visiting their shores or adventuring on the water, or even just jumping in through virtual reality and social media, you can find true connection – with family, with friends, and most of all, with wildlife.

While it's important to give animals in and outside of sanctuaries plenty of space to live healthy lives, sometimes marine creatures are curious and bold enough to forge connections with divers and other visitors. While on a science expedition to Gray's Reef National Marine Sanctuary, the sun suddenly was blocked out above Greg McFall. It was a manta ray, he says, "literally on top of my head." After puzzling over its behavior for a moment, he realized the manta seemed to want him to scare off a remora that was clinging to it. "So I reached up and scared the remora away and the manta ray just took off like a shot," he says, and the remora zoomed off after it. "It came back and did that five more times," with the remora reattached each time, "so we played that game for a while."

In Channel Islands National Marine Sanctuary, Julie Bursek had a similar experience while surveying giant sea bass habitat off Anacapa Island. "All the sudden out of the murk a large sea bass appeared, and then another, and then another, and another," she describes. "Before I knew it I was surrounded by nine giant sea bass, just circling around me." Sanctuaries are sites for curiosity and connection – for animals as much as for humans.

To Bursek, visiting Channel Islands National Marine Sanctuary "is a spiritual journey as well as an emotional journey." The trip offshore to these Southern California islands takes visitors alongside bowriding dolphins and spouting blue whales, and the kelp forests are like a whole new world. Being above the waves in sanctuaries can be as magical as the world beneath the surface.





Clockwise, from right: live-bottom reef in Gray's Reef NMS; marine debris in Olympic Coast NMS; marine debris in Papahānaumokuākea MNM; coral and fish in NMS of American Samoa

Photos: Greg McFall/NOAA; Karlyn Langjahr/NOAA; James Watt/NOAA; Greg McFall/NOAA

Joe Hoyt encountered the beauty of sanctuaries above the surface after a technical dive in Cordell Bank National Marine Sanctuary. “Normally when you get out of the water after a technical dive, the quickest thing you want to do is sit down and take the gear off,” he says. But after one dive, a blue whale was feeding right off the starboard side of the research vessel. “Everybody was still in their heavy gear and they ran to the rail like little kids – a bunch of dudes having the time of their lives. It was an unexpected treat.”

PEACE AND HARMONY

Places like National Marine Sanctuary of American Samoa are “surreal,” with “nature and culture in harmony with one another,” says acting sanctuary superintendent Atuatasi-Lelei Peau. It “really is heaven, with peace and harmony.”

Still, these ocean jewels are at risk. Jennifer Stock was on the *EV Nautilus* when researchers explored the deep waters of Cordell Bank in 2017. During the remotely operated vehicle (ROV) descent, “I was kind of squirming, I was so excited,” she says. But when the ROV reached the seafloor, “the very first thing we saw was a plastic water bottle. My heart sank. We can’t get away from this plastic intrusion on our planet.”

For Joe Hoyt, preserving the value of sanctuaries all comes down to protection. These ecosystems are fragile and we have to care for them, he says, “while also understanding that these places have value for people.” Those two things don’t have to be in conflict. For example, because Cordell Bank National Marine Sanctuary “is protected and managed and considered special, you have this place where juvenile rockfish grow, then move off and support a fishing industry elsewhere.”

The National Marine Sanctuary System belongs to all of us. The word “sanctuary” connotes different things to different people, but universally, it brings to mind protection. Sanctuaries protect our natural and cultural resources – and it behooves us to protect them in turn.

A common dolphin splashes at the surface in Channel Islands National Marine Sanctuary.

Photo: John Burke





LIFE IN THE B

National marine sanctuaries are so much more than what we see above the surface – they are also vital resources for producing food, oxygen, habitats, and water for all life on Earth. In these marine protected areas, you'll find diverse *Life in the Blue*: seabirds, humpback whales, tiny invertebrates, and more, all relying on the indispensable resources of the ocean and Great Lakes.

First, experience Monterey Bay National Marine Sanctuary through the eyes of wildlife photographer Douglas Croft. To Croft, Monterey Bay “is a monument to what can happen when we decide to protect instead of destroy.”

Then, get two different glimpses into marine ecosystems. Dive beneath the waves and make the acquaintance of the tiny invertebrates that form the backbones of ocean food webs. Then, soar above the blue and learn how seabirds help scientists track changing ocean conditions.

Finally, check out how the National Marine Sanctuary System provides safe harbor for juvenile animals, from baby sea turtles to tiny squid.

A white tern chick practices flight skills in Papahānaumokuākea Marine National Monument.

Photo: Dan Clark/USFWS

LUE



THROUGH THE LENS OF A SANCTUARY ADVOCATE

Douglas Croft has been photographing wildlife since 2010. A San Jose, California, resident, one of his favorite locations to photograph is Monterey Bay National Marine Sanctuary. “There’s nowhere in the U.S. that has the kind of ecosystem that we have here,” he says. To Croft, the sanctuary is “a monument to what can happen if we decide to protect instead of destroy.” He also helps support the sanctuary ecosystem and community, assisting local nonprofit Monterey Bay Marine Life Studies with educational whale watches for students, whale disentanglement efforts, and more.



A Risso's dolphin leaps from the water in Monterey Bay National Marine Sanctuary.

Photo: Douglas Croft



In addition to showcasing the beauty of the sanctuary, Croft uses his photography to raise awareness of threats to wildlife, like marine debris.

Photo: Douglas Croft



Left to right, from top: white ibis, Florida Keys NMS; common murrelets, Greater Farallones NMS; California brown pelicans, Monterey Bay NMS; great shearwater, Stellwagen Bank NMS

Photos: Matt McIntosh/NOAA; NOAA; Peter Pearsall/USFWS; Peter Flood



The islands of Papahānaumokuākea Marine National Monument are remote, but huge quantities of marine debris wash up on their shores each year, putting birds like Laysan albatross at risk.

Photo: NOAA

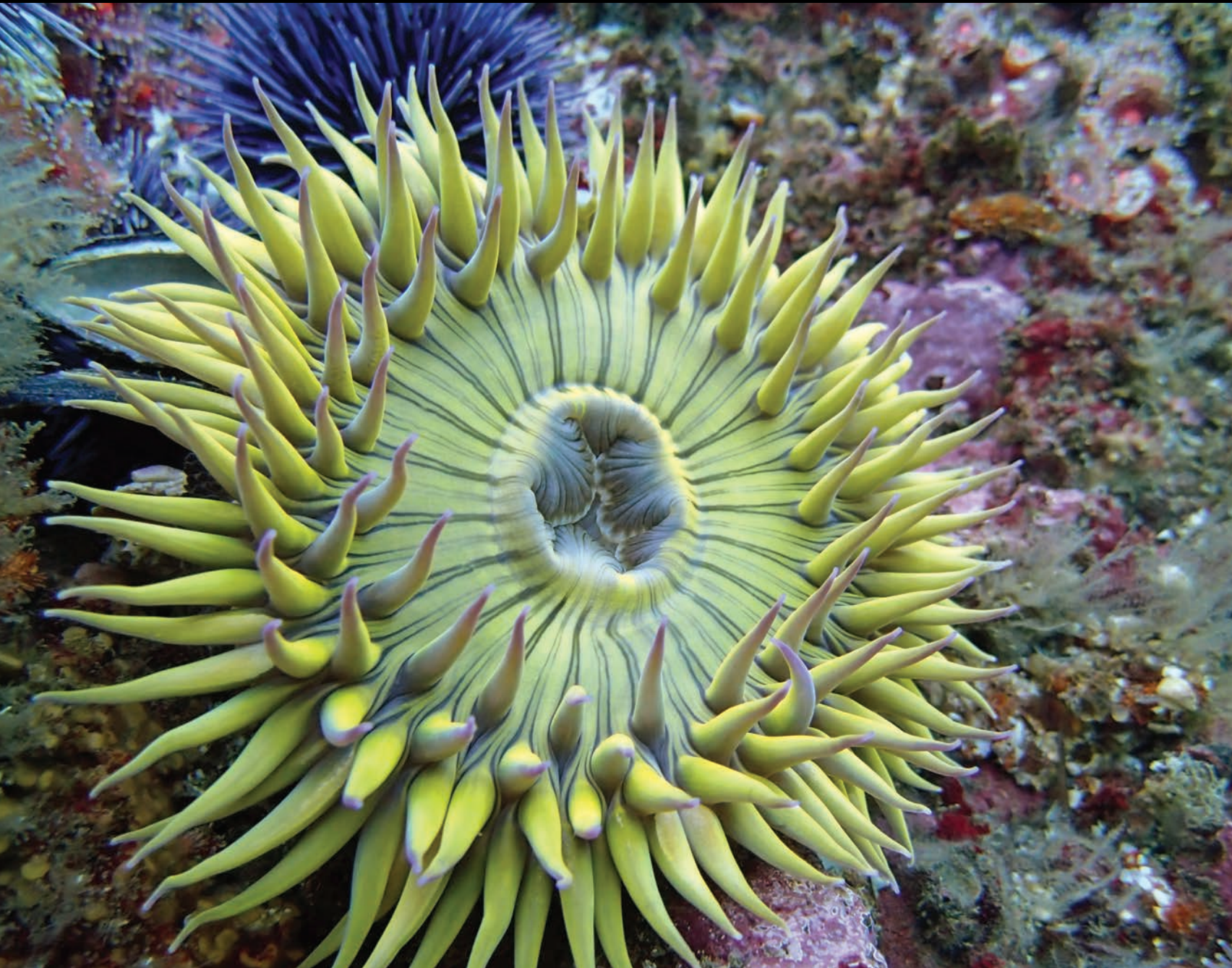
FLYING THROUGH SANCTUARIES

The biological communities of national marine sanctuaries are complex, and often hidden beneath the waves. But one group of animals plays a special role in helping scientists track sanctuary conditions: birds. Whether birds are resting during their long migrations, looking for their next meal, or caring for their hatchlings, the National Marine Sanctuary System provides important habitats. Where birds are found, what they eat, and how they behave helps scientists understand the health of ocean ecosystems. Plus, thanks to the variety of birds – from songbirds to seabirds! – that depend on national marine sanctuaries, sanctuaries are prime spots for birdwatching.



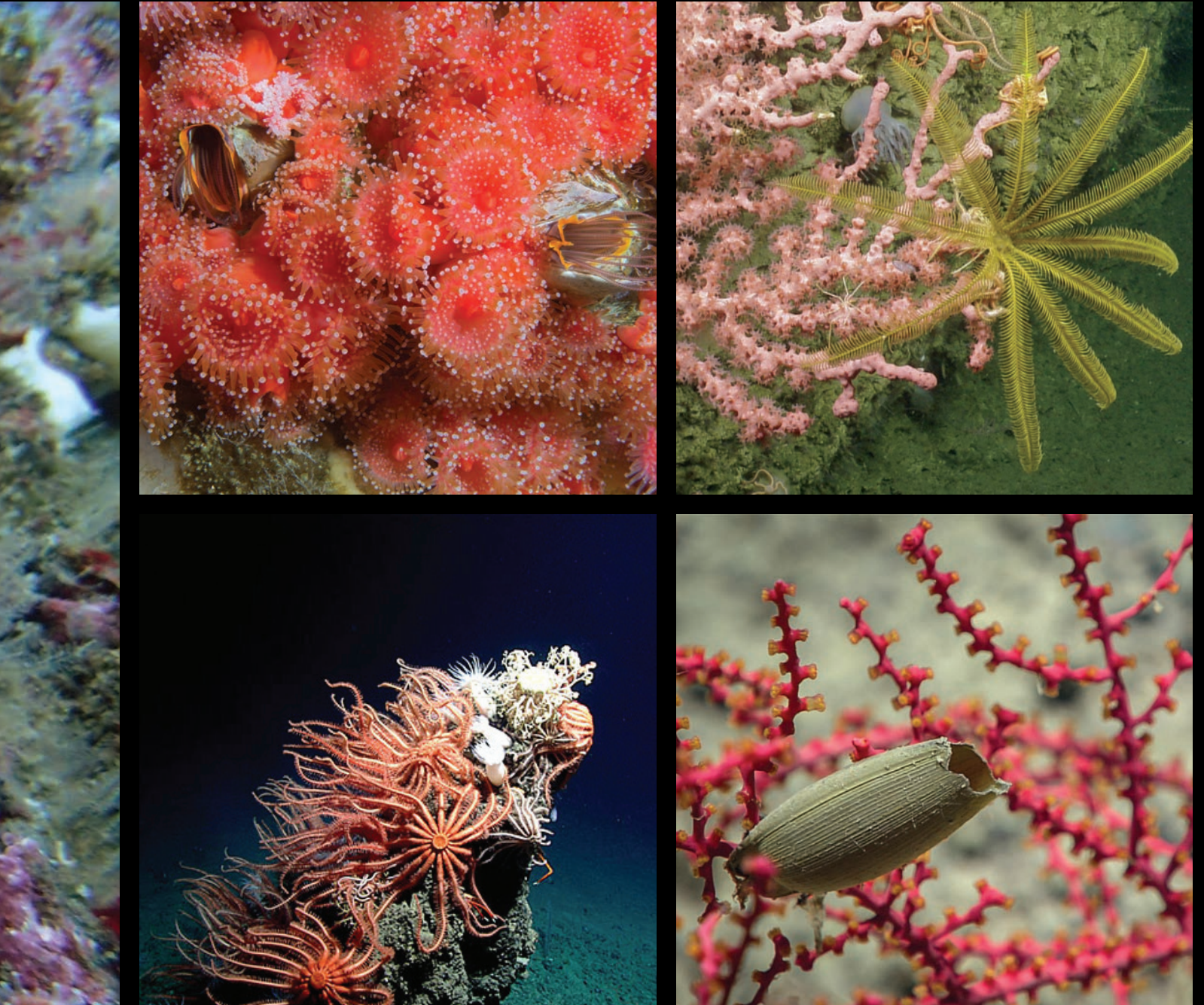
Florida Keys National Marine Sanctuary is a birder's paradise.
Green herons are one commonly-sighted bird here.

Photo: Matt McIntosh/NOAA



INVERTEBRATES: BACKBONE OF THE OCEAN

Invertebrates may lack a spine, but they form the backbone of ocean communities. These bizarre creatures form the base of food webs, break down organic matter, and filter seawater. Close to the ocean's surface, tiny invertebrates like krill feed enormous creatures like baleen whales. Miles down on the seafloor, scientists are still discovering new invertebrates, with novel species of corals and sponges being identified each year.



Though many invertebrates look like plants, these sea creatures are actually animals. From left to right: starburst anemone, Channel Islands NMS; strawberry anemones and barnacles, Cordell Bank NMS; crinoid, Cordell Bank NMS; brisingid sea stars and basket star, Gulf of Mexico; skate, ray, or shark egg case on octocoral, Gulf of Mexico.

Photos: Evan Barba; Matt Vieta/BAUE; OET/NOAA; NOAA; NOAA

UNDERWATER NURSERIES

Swim through a kelp forest, over a seagrass bed, among mangroves, or along a reef, and you'll find all sorts of tiny creatures. These areas act as nurseries, providing safe harbor for young animals. By protecting the areas where fish, sea turtles, invertebrates, and more begin their lives, national marine sanctuaries ensure the continued vitality of ecosystems within and beyond sanctuaries.



Baby green sea turtles, or *honu* in Hawaiian, swim through the waves in Papahānaumokuākea Marine National Monument.

Photo: Koa Matsuoka



Left to right, from top: orca, Monterey Bay NMS; Laysan albatross, Papahānaumokuākea MNM; blue angelfish, Gray's Reef NMS; green heron, Florida Keys NMS; northern elephant seal, Monterey Bay NMS; humpback whale, Hawaiian Islands Humpback Whale NMS; kelp bass, Channel Islands NMS; vampire squid, Monterey Bay NMS; squid, Greater Farallones NMS; rockfish, Channel Islands NMS; goldentail moray eel, Flower Garden Banks NMS; cubbyu, Gray's Reef NMS; Laysan ducks, Papahānaumokuākea MNM; cocoa damselfish, Gray's Reef NMS; giant Pacific octopus, Monterey Bay NMS; lobster eggs, Stellwagen Bank NMS; pinto abalone, Monterey Bay NMS; wolf eel, Monterey Bay NMS; North Atlantic right whale, Gray's Reef NMS; Hawaiian monk seal, Papahānaumokuākea MNM

Photos (above): Douglas Croft; Naomi Blinick/USFWS; Greg McFall/NOAA; Matt McIntosh/NOAA; Douglas Croft; J. Moore/NOAA, under NOAA Permit #15240; Stuart Halewood; NOAA/MBARI; NOAA/PointBlue/ACCESS; Stuart Halewood; Steve Miller; Greg McFall/NOAA; Naomi Worcester/Hawai'i DLNR; Greg McFall/NOAA; Taylor Eddy; NOAA; Steve Lonhart/NOAA; Michelle Manson; Georgia DNR; Mark Sullivan/NOAA


EXPLORE THE

Much of what we know about our national marine sanctuaries started with teams of scientists, sailors, and explorers who were adventurous enough to dive into the dark depths of the ocean and learn everything they could. A vast majority of the world's waters are unexplored, and today sanctuaries represent bright hubs for science and investigation. The National Marine Sanctuary System collaborates with scientists to obtain new knowledge on ocean and Great Lakes health, species diversity, ecosystem durability, and more.

In this section, *Explore the Blue* with Dr. Leila Hatch, a scientist working to understand and document changing conditions in Stellwagen Bank National Marine Sanctuary. Then, discover some of partnerships that are made possible by sanctuaries and the vessels that ply their waters.

Then, learn how sanctuaries promote resilient coastal communities. Whether it's through protecting barrier reefs that break up storm surge or by leading the way in post-disaster recovery, national marine sanctuaries ensure that these special places, and the communities who call them home, can thrive for the future.

Finally, learn how sanctuaries and our partners are protecting highly endangered North Atlantic right whales from threats like ship strikes and entanglement.



Dr. Nancy Foster Scholar Andrea Kealoha examines a water sample from the Gulf of Mexico after Hurricane Harvey.

Photo courtesy of Andrea Kealoha

BLUE



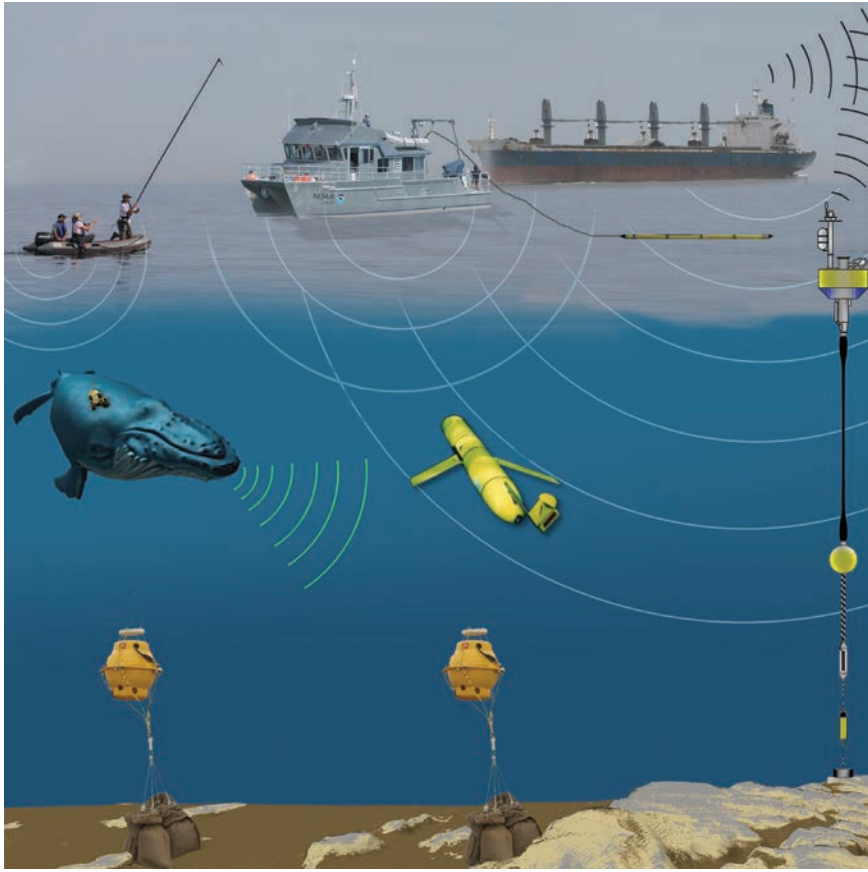
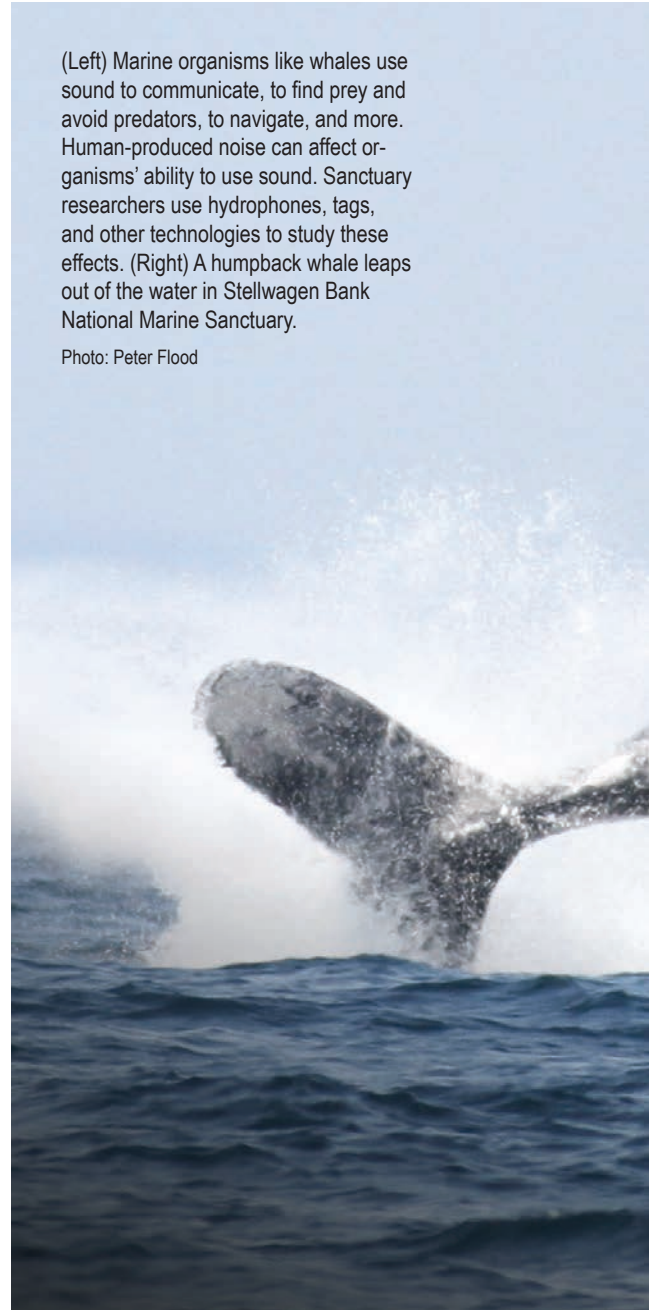


Image: NOAA

(Left) Marine organisms like whales use sound to communicate, to find prey and avoid predators, to navigate, and more. Human-produced noise can affect organisms' ability to use sound. Sanctuary researchers use hydrophones, tags, and other technologies to study these effects. (Right) A humpback whale leaps out of the water in Stellwagen Bank National Marine Sanctuary.

Photo: Peter Flood



SCIENCE AND SANCTUARIES IN SYNC



Photo: Anne Smircina/NOAA

— By DR. LEILA HATCH

I grew up on a farm, and spent the summers on the Massachusetts shore with my grandparents. Music and social activism were both big parts of my upbringing, as was being in nature. In high school, a researcher moved in next door who studied whale song, a subject that combined many of the things I loved and showed me a path towards a career in science. But I didn't just want to understand how ocean animals use sound underwater; I wanted to conduct science that mattered to the people who make decisions about our environment.

With that in mind, after I finished my Ph.D., I looked for a way to get into the action. I went to Capitol Hill as a Knauss Fellow with the U.S. House of Representatives' Resource Committee. Here, I was up close to the decisions that were being made. I supported work on the reauthorization of the Marine Mammal Protection Act and the Magnuson-Stevens Fisheries Conservation and Management Act. I staffed hearings on the Energy Policy Act, legislation that, among many things, incentivized the development of offshore liquified natural gas facilities. But at the end of my fellowship, I still wasn't sure that I'd found the right path in DC. I wanted more space to develop expertise on the issues that mattered to me.



“ Sanctuaries and science are both built on models of evolving consensus, and the two can nurture one another.”

So back to science I went. I was hired by Stellwagen Bank National Marine Sanctuary as a postdoctoral fellow to support a growing acoustics program, and spent the first month on the job setting up and deploying hydrophones – underwater microphones – to listen in on the sounds produced by marine life and human activities.

Then, a month into the job, my worlds collided.

Two of the only liquified natural gas facilities set to move forward under the Energy Policy Act – the very policy I had watched pass while on the Hill – were to be within just a few nautical miles of the sanctuary’s boundaries. And the major concerns with these facilities were risks to whales, both through collisions with ships, and through hearing loss due to noise. The research that I had spent a month setting up would have a direct

bearing on the policies I’d been working on over the previous year. Using our data, we collaborated with NOAA colleagues, the natural gas companies, state and federal licensing agencies, and academic partners to find the best ways to reduce impacts to whales.

Sanctuaries and science are both built on models of evolving consensus, and the two can nurture one another. Sanctuaries challenge scientists to innovate and communicate with policymakers and the public, and in turn, scientists challenge sanctuaries to look at natural and cultural resources from new perspectives. Together, we grow, expanding our communal understanding of the ocean.

Dr. Leila Hatch is a marine ecologist at Stellwagen Bank National Marine Sanctuary and the co-leader of NOAA’s Ocean Noise Strategy effort.



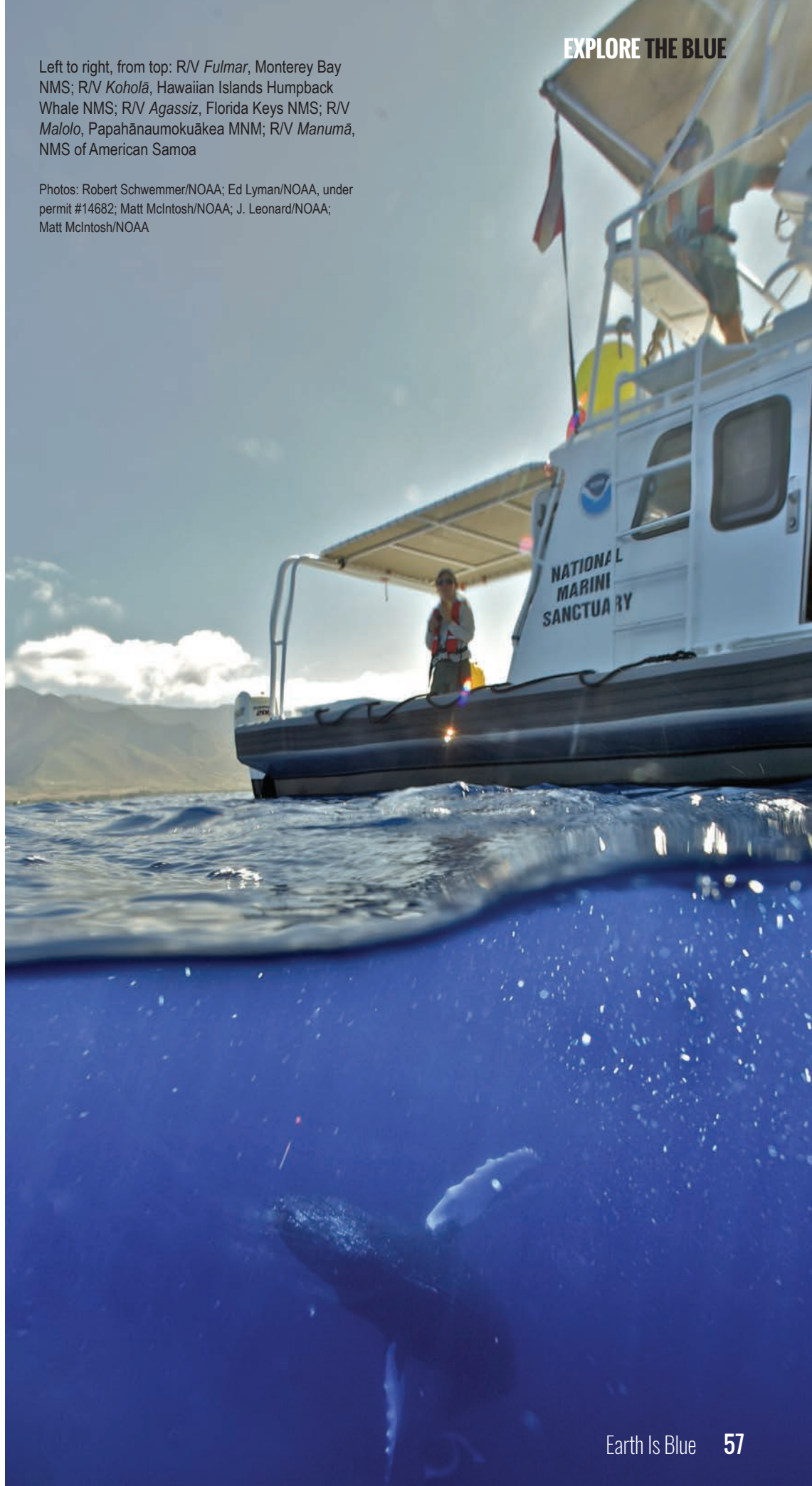
PLATFORMS FOR COLLABORATION

To understand the conditions within the National Marine Sanctuary System, researchers have to get on the water. That's where the Office of National Marine Sanctuaries' Small Boat Program comes in. More than 45 vessels support marine archaeology, seafloor mapping, oceanographic sampling, damage assessment, education and outreach, and other activities. These boats get sanctuary staff into the field and ensure that partners can conduct research in sanctuaries, too – more than 100 universities, non-profit organizations, and government agencies rely on the boats of the National Marine Sanctuary System.



Left to right, from top: R/V *Fulmar*, Monterey Bay NMS; R/V *Koholā*, Hawaiian Islands Humpback Whale NMS; R/V *Agassiz*, Florida Keys NMS; R/V *Malolo*, Papahānaumokuākea MNM; R/V *Manumā*, NMS of American Samoa

Photos: Robert Schwemmer/NOAA; Ed Lyman/NOAA, under permit #14682; Matt McIntosh/NOAA; J. Leonard/NOAA; Matt McIntosh/NOAA



BUFFERING THE STORMS

When a hurricane hits the coast, it can spark tragedy, leaving flooding and destruction in its wake. But national marine sanctuaries help ensure our coasts are resilient. During storms, healthy coral reefs can help buffer the coastline from storm surge, minimizing damage. And after a storm, sanctuaries and our partners help assess damage to natural resources and assist coastal communities in recovery efforts.



After Hurricane Irma hit in September 2017, Florida Keys National Marine Sanctuary worked with partners to rapidly assess which areas of the reef were most impacted.

Photo: Steve Gittings/NOAA



In the Florida Keys, hundreds of vessels sank during Hurricane Irma. Sanctuaries help advise cleanup efforts after natural disasters.

Photo: Eric Raslich/NOAA



Researchers from Texas A&M University worked to assess water quality in and around Flower Garden Banks National Marine Sanctuary after Hurricane Harvey in August 2017.

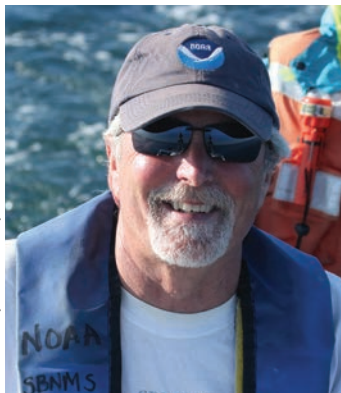
Photo courtesy of Andrea Kealoha



North Atlantic right whales visit Stellwagen Bank National Marine Sanctuary each year to feed, and calve in the warm waters near Gray's Reef National Marine Sanctuary.

Photo: Christin Khan/NOAA, under MMPA permit #775-1875

Photo courtesy of David Wiley



FINDING SANCTUARY FOR RIGHT WHALES

For years, North Atlantic right whales were hunted for their oil and baleen, which devastated the population. Despite current protection under the Endangered Species Act, this critically-endangered whale is in crisis, with only about 450 remaining. There is some good news, though: NOAA scientists, resource managers, and partners are working to galvanize efforts to save the North Atlantic right whale. Stellwagen Bank National Marine Sanctuary research coordinator Dr. David Wiley is one such scientist.

HOW DO NORTH ATLANTIC RIGHT WHALES USE STELLWAGEN BANK NATIONAL MARINE SANCTUARY?

DR. WILEY: Stellwagen Bank is located off the coast of Massachusetts, and is an incredibly rich feeding ground for whales like right whales. We see them feeding on dense concentrations of zooplankton. In the sanctuary, they also engage in surface active groups, where numerous whales get together to roll around, rub against each other, and socialize.

WHAT ARE YOU TRYING TO LEARN ABOUT RIGHT WHALES' ROLE IN THE SANCTUARY?

The main problem these whales face is injury or mortality caused by entanglement in fishing gear and collisions with large ships. We map how the whales use the sanctuary, so we can try to separate them from danger.

Noise from shipping is also making it harder and harder for right whales to communicate with each other, so we have been using passive acoustics to map the soundscape of the sanctuary. Dr. Leila Hatch, the sanctuary's marine ecologist, and her team have calculated that noise from shipping has diminished right whale communication space in the sanctuary by almost 70 percent.

We try to learn as much as we can about the human activities that interact with right whales. Since we cannot change right whale behavior, our only hope is to modify the human activities that harm them.

HOW ARE STELLWAGEN BANK NATIONAL MARINE SANCTUARY AND YOUR PARTNERS ADDRESSING THE NORTH ATLANTIC RIGHT WHALE CRISIS?

We have a bunch of projects focused on right whales. We led the creation of the Whale Alert mobile app, which is a free app that allows mariners and the general public to see all right whale management requirements displayed on nautical charts. People can also use Whale Alert to report right whale and other whale sightings, and to notify the proper authorities if they see a right whale or any other marine life in distress. We also led the development of the world's

first near real-time acoustic detection system for right whales, which help warn mariners and other boaters when there is a right whale in the shipping lanes. The buoys also help us track how frequently right whales are in the sanctuary – we're finding they're here for the majority of days of most months of the year.

We've also found it crucial to collaborate with commercial industries to encourage right whale protection. We've worked with the Massachusetts Port Authority, the Coast Guard, and the International Fund for Animal Welfare (IFAW) to create the Right Whale Corporate Responsibility Project, which provides deserving companies with positive attention for their efforts to protect the whales. We've also worked with the Massachusetts Lobstermen's Association to reduce entanglement risk.

WHY DO YOU CARE ABOUT RIGHT WHALES?

In terms of large whales, North Atlantic right whales are the conservation challenge of our time. Saving them will require working collaboratively with diverse partners and stakeholders. At Stellwagen Bank National Marine Sanctuary, we have a history of working productively with stakeholders, and we hope to continue and improve upon those efforts.

Please note that it is illegal to intentionally approach within 500 yards of a North Atlantic right whale. If you find your vessel within this buffer zone, depart immediately at a safe, slow speed. As a whale watcher, you can support companies that commit to using best practices and protecting the ocean through programs like Whale SENSE (whalesense.org). If you see an injured or entangled whale, please call the 24-hour NOAA hotline at 1-888-256-9840.

THE BLUE AND

The sites of the National Marine Sanctuary System are different things to different people: places to play, to explore, to give back to their communities. In this section, learn how people all across the country are supporting their national marine sanctuaries – and how you can do the same.

First, check out the Sanctuary Ocean Count, an annual volunteer event in Hawaiian Islands Humpback Whale National Marine Sanctuary. Across the Hawaiian Islands, members of the public team up to help the sanctuary understand just how many humpback whales use the warm Hawaiian waters.

Then, hear from Hannah MacDonald, a longtime volunteer with national marine sanctuaries. For MacDonald, sanctuaries are home: she began volunteering with Thunder Bay National Marine Sanctuary as a high school student, and today she continues to work closely with sanctuaries.

Next, learn about how virtual reality is helping people get into their sanctuaries from all different parts of the world. Finally, discover how an exhibit at the Virginia Museum of Contemporary Art helps bring the century-old story of the USS *Monitor* to life.



Students with the Ocean Guardian School Program practice research and monitoring techniques on Hendry's Beach in Southern California.

Photo: Claire Fackler/NOAA

YOU



SANCTUARY OCEAN COUNT

Every year since 1996, Hawaiian Islands Humpback Whale National Marine Sanctuary has conducted the Sanctuary Ocean Count. Volunteers throughout the islands of Hawai'i conduct yearly shore-based counts during the peak breeding season for humpback whales. Their observations help the sanctuary monitor humpback whales and promote public awareness and shore-based whale watching opportunities. To date, the Sanctuary Ocean Count has over 60 designated sites across three islands, with more than 2,000 volunteers participating in this citizen science opportunity.



A volunteer observes whales in Hawaiian Islands Humpback Whale National Marine Sanctuary during the annual Sanctuary Ocean Count.

Photo: Bruce Parsil



INSPIRING THE NEXT GENERATION



MacDonald stands on the shore of Thunder Bay National Marine Sanctuary.

Photo: Nick Zachar/NOAA

— *By* HANNAH MACDONALD



Photo: NOAA

Michigan is several hundred miles away from the nearest salty shore. Fortunately for me, it is hugged by 3,288 miles of freshwater coastline. Standing on the edge of the Great Lakes feels like standing on the shore of a mighty ocean. Once you dive underwater, you glimpse a world of freshwater fish inhabiting rocky reefs and historic shipwrecks as their own sanctuaries.

Throughout my life, I have spent my time diving, sailing, and exploring in Lake Huron. Alpena, Michigan, my hometown, sits beside the lake. Growing up, Thunder Bay National Marine Sanctuary was essentially in my backyard.

Each time I dove underwater, I traveled back in time and saw pristinely preserved maritime heritage and marine life. Thunder Bay instilled a sense of wonder in me. In high school, I became a volunteer at the sanctuary. I taught

visitors about invasive species and Great Lakes health, and supported Alpena Shipwreck Tours by narrating maritime history tours on a glass bottom boat. I engaged with visitors, educating them on the importance of protecting the Great Lakes.

Not only a marine sanctuary, Thunder Bay was my teacher, a haven for my growth as an individual, and a place to foster my passions. I marveled at the larger network of sanctuaries across the country that protected a variety of ecosystems, and how my sanctuary was a part of that system.

Still, it wasn't until I ventured across the country to Channel Islands National Marine Sanctuary for NOAA's Ocean for Life science and cultural exchange program that I truly connected to the

(Below) MacDonald is interviewed after the Thunder Bay Film Festival highlights a film she is part of, *Big Five Dive*. (Right) In 2013, MacDonald participated in the Ocean for Life program, an international ocean science and cultural exchange program that took place in national marine sanctuaries.

Photos: Kate Thompson/NOAA and Claire Fackler/NOAA



“Thunder Bay has been my teacher, a haven for my growth as an individual, and a place to foster my passions.”



ocean and its rich ecosystems for the first time. While watching marine mammals thrive in the protected area and exploring a towering kelp forest, I felt a special relationship with this place. That connection would ultimately drive my motivation for ocean advocacy and my link to national marine sanctuaries.

I was motivated to spread that awareness of the human connection to the ocean. I had been shocked to learn how much damage marine debris does to marine ecosystems, so I created a plastic pollution awareness group in my hometown called Plastics FLOAT (For the Love Of Alpena Today). The National Marine Sanctuary System became my resource center as a youth committed to making a wave of change.

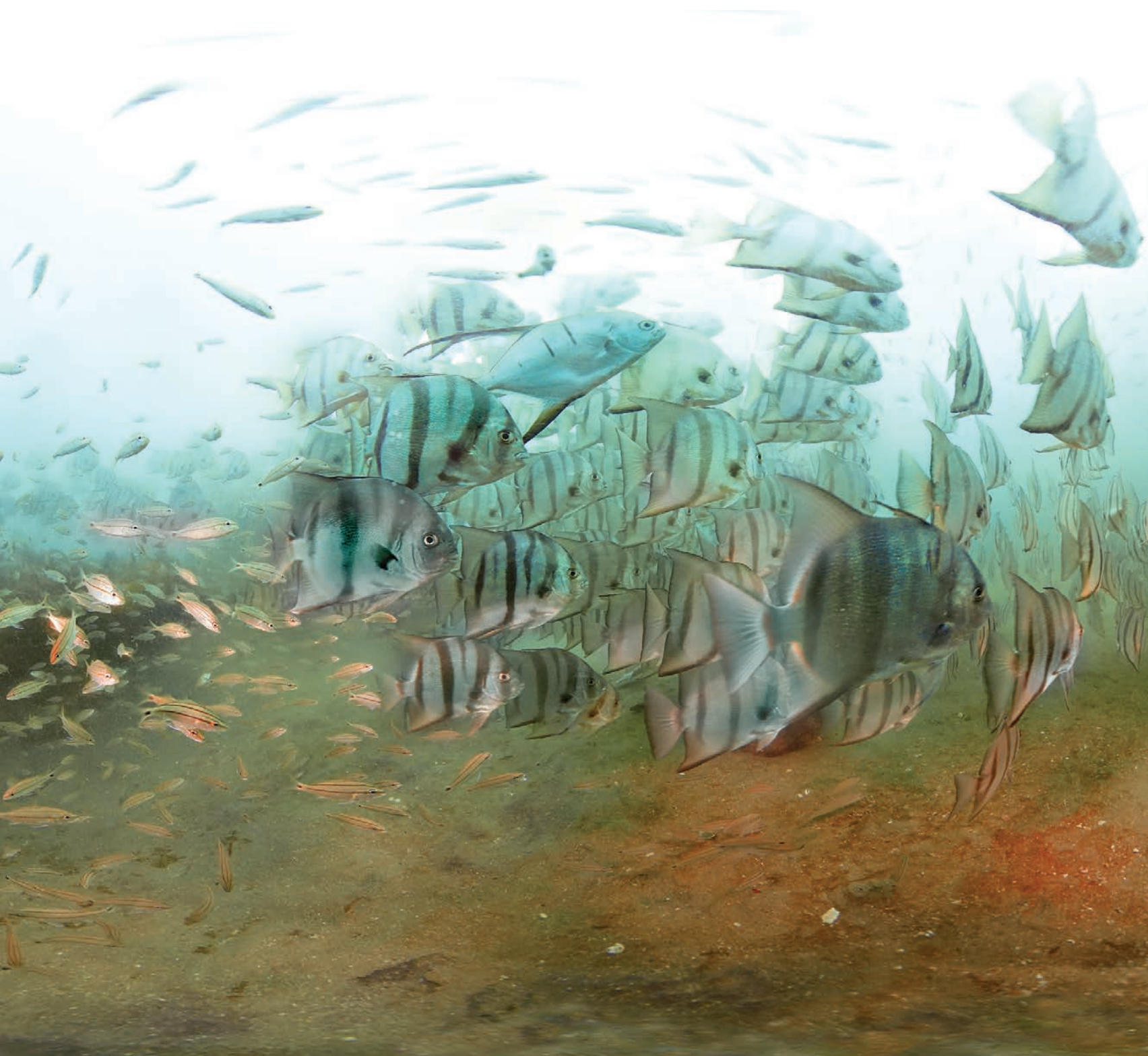
Thunder Bay National Marine Sanctuary opened the door to ocean conservation for me, and now, as a college student at Michigan State University, I still work hand-in-hand with sanctuaries. In the summer of 2017, as a NOAA Hollings Scholar, I served as the Junior Oceanographer programmer at Olympic Coast National Marine Sanctuary. I wanted to inspire students just like Ocean for Life and Thunder Bay had inspired me. I developed summer programs that focused on marine ecosystems of the Olympic Coast, marine technology, and ocean literacy. I am continuously learning about the ocean, conservation, and stewardship, and gaining skills in leadership and communication through my experiences with sanctuaries.

For me, sanctuaries are much more than protected underwater parks. They are a place to further education, encourage adventure, strengthen coastal communities, and drive change to safeguard the health of our blue planet. I am continually moved by the deep connection, sense of place, and endless learning opportunities that the sanctuary system provides me. My experiences at Thunder Bay, Channel Islands, and Olympic Coast national marine sanctuaries have ignited my passion, advanced my career path, and created endless opportunities for me to become a lifelong advocate for this big, blue, ocean planet.

Hannah MacDonald is a recent graduate of Michigan State University and a long-time participant in National Marine Sanctuary System programs.

A TRIP BENEATH THE WAVES

Immerse yourself in your national marine sanctuaries without getting wet! New 360-degree images take you on a virtual reality voyage to underwater marvels. Visit sanctuaries.noaa.gov/vr to experience images that highlight the amazing habitats, animals, and shipwrecks you can find in national marine sanctuaries.



Divers visiting Gray's Reef National Marine Sanctuary are often surrounded by schooling fish, like Atlantic spadefish and tomate.

Photo: Bill Goodwin/NOAA in collaboration with The Ocean Agency



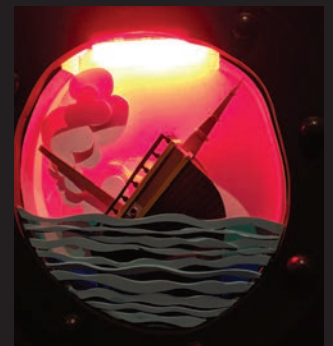
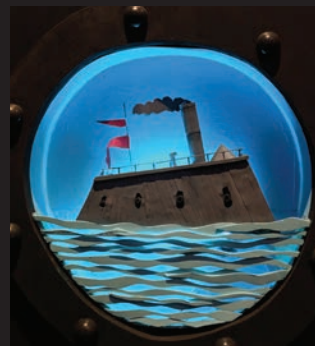


THE MONITORIUM

Partner exhibits bring offshore and distant sanctuaries to life. In 2017 and 2018, Monitor National Marine Sanctuary partnered with the Virginia Museum of Contemporary Art and artist Wayne White to create a mixed media exhibit. The *Monitorium* depicted the people of the historic USS *Monitor*, a Civil War era ironclad that changed naval warfare forever.



The *Monitorium* exhibit opens with art depicting *Monitor's* Confederate foe, the CSS *Virginia* (left), and the Union ship USS *Congress* (right) during the Battle of Hampton Roads.





Visitors to the *Monitorium* experienced props and puppets depicting the story of *Monitor* and its crew. The exhibit brought viewers to Lincoln's Navy secretary, Gideon Wells, nicknamed "Neptune," as well as Captain John Worden and many of *Monitor*'s crew members. At the exhibit's end, visitors watched *Monitor* sink during a storm in 1862. Survivors of *Monitor*'s demise described its red lantern as the last thing they saw of the sinking vessel.

Photos: Kate Thompson/NOAA and Dayna Rignanes/NOAA



earth is blue

Each year, in honor of the annual Get Into Your Sanctuary celebration, the NOAA Office of National Marine Sanctuaries holds a photo contest. Please join us in congratulating the winners of the 2017 contest, pictured here! Through photography, these sanctuary visitors show the world our special ocean and Great Lakes treasures through their eyes.

Compete in the Get Into Your Sanctuary photo contest for a chance to see your photos in next year's Earth Is Blue Magazine. Visit sanctuaries.noaa.gov/mag/submissions to learn how you can submit your photos.

Can't get enough of Earth Is Blue? Follow NOAA's Office of National Marine Sanctuaries on Facebook, Twitter, Instagram, Tumblr, and Flickr for more incredible images of your National Marine Sanctuary System.

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Flickr: flickr.com/photos/onms

Facebook: facebook.com/NOAAOfficeofNationalMarineSanctuaries

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YOUR #EARTHISBLUE



VOLUME 3



Winner of the "Sanctuary Views" category:
The Point Arena Lighthouse overlooks Greater
Farallones National Marine Sanctuary.

Photo: Michael Beattie



Winner of the "Sanctuary Portraits"
category: A surfer contemplates the
swell at Lighthouse Point in Monterey
Bay National Marine Sanctuary.

Photo: Douglas Croft



Winner of the "Sanctuary Life"
category: A bloom of sea nettles
drifts through Monterey Bay
National Marine Sanctuary.

Photo: Curtis Wee

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NATIONAL MARINE SANCTUARY

VOLUNTEER OF THE YEAR



Florida Keys fishing guide Capt. Will Benson is the National Marine Sanctuary Foundation's 2018 Volunteer of the Year. A member of the Florida Keys National Marine Sanctuary Advisory Council, he led the creation of the Blue Star Fishing Guides program. This new program recognizes charter operators who are committed to conservation and education.

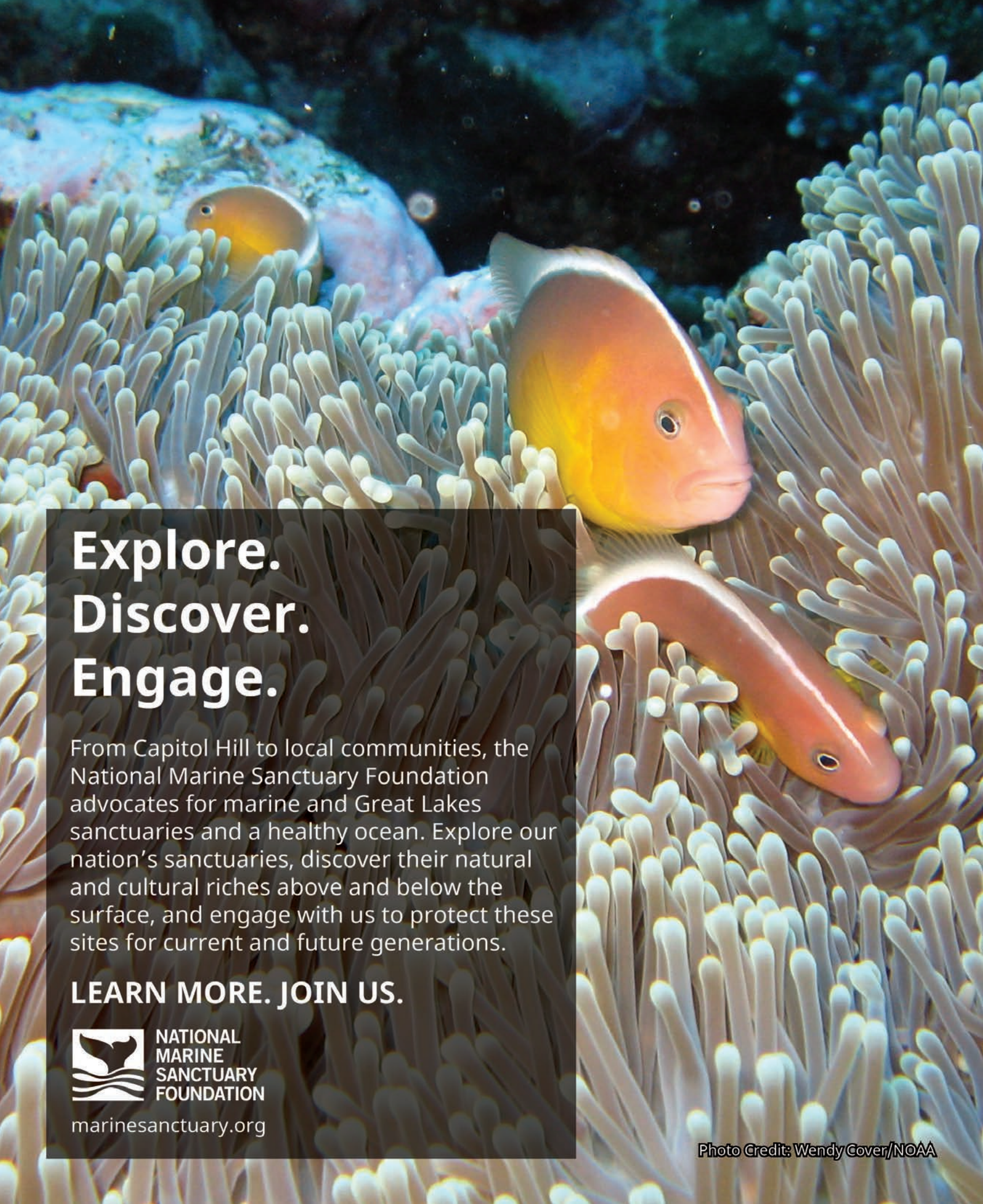
Benson is the owner of World Angling and was born and raised in the Florida Keys. He uses his platform as a well-known fishing guide to further the public's understanding of conservation. His work in the community includes countless hours advocating for the sanctuary, writing letters of support for grants and projects, and bringing together those who treasure the Florida Keys, including resource managers and their constituents. A father of two, Benson believes in the value of protecting our natural resources and is always looking for ways to instill that appreciation in the next generation.





We believe conservation solutions that make **economic sense** are the ones that **stand the test of time.**

We work to achieve lasting change by creating new and unexpected partnerships among conservation, business and community interests to build durable solutions to important problems.

A vibrant underwater scene featuring several clownfish swimming among the tentacles of a sea anemone. The clownfish have bright orange and yellow bodies with white stripes. The anemone's tentacles are a pale, translucent color. The background is dark blue, suggesting a deep-sea environment.

Explore. Discover. Engage.

From Capitol Hill to local communities, the National Marine Sanctuary Foundation advocates for marine and Great Lakes sanctuaries and a healthy ocean. Explore our nation's sanctuaries, discover their natural and cultural riches above and below the surface, and engage with us to protect these sites for current and future generations.

LEARN MORE. JOIN US.



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Photo Credit: Wendy Cover/NOAA