

USHERING IN A NEW ERA **OF SANCTUARIES**

WHALE FALL IN THE DEEP SEA





Cover: Stellwagen Bank National Marine Sanctuary volunteer watches a humpback whale surfacing and breaching in the sanctuary. Photo: Nick Zachar/NOAA Below: Fish swim in the coral reef at French Frigate Shoals, located in Papahānaumokuākea Marine National Monument. Photo: Greg McFall/NOAA At right: John Armor fishes in Flower Garden Banks National Marine Sanctuary at the Vet Into Your Sanctuary event. Photo: Sepp Haukebo

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.

Printed on recycled paper with environmentally-friendly ink.









FROM THE DIRECTOR

navigate this difficult time, NOAA's Office of National Marine Sanctuaries is confronting these challenges head-on by putting our people first and examining ways that we can be part of the solution in our communities as we further our mission. We are focused on having "all hands on deck" to meet the challenges of today and tomorrow.

To be part of the solution, we must make national marine sanctuaries, marine national monuments, and other marine protected areas more accessible and relevant to all Americans. We need to accept that for far too long the ocean conservation community has not been as strong as it could be because it's not as inclusive as it should be. If we are to be part of the solution in communities, we must reflect the diversity of the communities we serve.

The challenges of 2020 have sharpened our resolve to examine our approach to managing the nation's system of underwater parks. In addition to expanding opportunities for all members of our communities to contribute to our success, we are working hard to make them more accessible. Enhanced distance learning programs and stunning 360 degree virtual reality experiences allow us to bring national marine sanctuaries into your home.

As we look ahead to our 50th anniversary in 2022, the coming year is shaping up to be equally momentous. We have sanctuaries nominated in the Great Lakes that are moving steadily toward fruition, while several existing national marine sanctuaries are looking to expand.

These new and expanded sanctuaries will help us respond to growing threats to our ocean and Great Lakes. With climate change and other human impacts - the spread of invasive species, increasing runoff, pollutants, and marine

2020 has been a remarkable and challenging year. Our nation is simultaneously trying to cure a global pandemic, confront institutional racisms and injustices, stabilize our economy, and respond to natural disasters. As we

debris – our marine world is transforming before our eyes. As we respond, we need to be nimble and think differently. Our National Marine Sanctuary System is a key proving ground for trying out new techniques that will help us build a more resilient and sustainable world.

Throughout our system, we're developing new approaches to restore ecosystems impacted by changing ocean conditions. This past winter, Florida Keys National Marine Sanctuary and NOAA's Office of Habitat Conservation worked with many partners to launch Mission: Iconic Reefs, one of the largest investments in reef restoration anywhere in the world. By using innovative methods like growing healthy corals in tanks and outplanting them on reefs, the sanctuary, Mote Marine Laboratory, Coral Restoration Foundation™, and others are taking bold action to restore the sanctuary's coral reefs. On the West Coast, Greater Farallones National Marine Sanctuary and the Greater Farallones Association are implementing a community-based project to restore bull kelp ecosystems and ensure the continued health of these biodiverse habitats.

Our capacity to manage these special places relies on our ability to invest in infrastructure. We are constantly working to maintain and update our small boat fleet, which provides a platform for research, restoration, and resource protection throughout the system. Plus, we're always thinking creatively and testing out new technologies. With the support of NOAA's new Unoccupied Systems Strategy, we're using small unoccupied aircraft systems to help disentangle whales in Hawaiian Islands Humpback Whale National Marine Sanctuary, while autonomous underwater vehicles, or gliders, are helping us monitor ecosystems from New England to American Samoa.

2020 marks a new decade, one that will undoubtedly unleash new challenges, but also new opportunities. The National Marine Sanctuary System is ready for both - and I hope you'll join us in protecting this blue planet for generations to come.

John Armor, Director

EARTH IS BLUE

OUR BLUE HERITAGE

- Protecting the Ghost Fleet 7
- **9** An Ocean of Discovery
- **11** Searching for Shipwrecks and Sinkholes
- **12** Stellwagen Shipwreck Sleuths
- **13** Proposed Lake Ontario National Marine Sanctuary



GET INTO THE BLUE

- **17** An Ocean Way of Life
- **19** Make a Splash
- **21** Get Into Your Sanctuary
- **23** Pride in the Ocean
- **25** Into the Depths and Back in Time

TREASURES **OF THE BLUE**

- **31** Osprey in Mallows Bay-Potomac River
- **35** Manta Ray in Flower Garden Banks
- **39** Northern Elephant Seal in Monterey Bay
- **41** Humpback Whale in Hawaiian Islands
- **43** *Porites* Coral in American Samoa



LIFE IN THE BLUE

| 53 | The Hawaiian Archipelago is a Genealogy | 65 |
|----|--|----------|
| 55 | Whale Fall in the Deep Sea | 67 |
| 57 | Lending a Kelping Hand | 69 71 |
| 59 | Destruction in Pristine Habitats | 73 |
| 61 | A Day at the Turtle Spa | /3 |

POSTER Special Fold Out Section: Learn about a whale fall and the life it supports.

USHERING IN A NEW ERA OF SANCTUARIES: 45 in 2019, NOAA designated the first new national marine sanctuary in two decades: Mallows Bay-Potomac River National Marine Sanctuary.

EARTH IS **BLUE**





EXPLORE THE BLUE

- **5** Saving the Right Whales
- 7 We're Gonna Need a Bigger Boat
- **9** Mysteries of the Deep
- Mission: Iconic Reefs
- **3** Remembering Greg McFall

THE BLUE AND YOU

- **77** Teaching a Neighborhood to Fish
- **79** Restoration Blueprint
- 81 Ocean Cultura
- **83** Dive into Sanctuaries Without Getting Wet
- **85** Making a Splash Against Trash
- **87** Your Earth Is Blue

OUR BLUE HERITAGE

rom the iconic Civil War-era ironclad warship USS *Monitor* to the commercial vessels of the Great Lakes, your National Marine Sanctuary System works diligently to protect our nation's maritime heritage. With a new national marine sanctuary protecting the Ghost Fleet of Mallows Bay and expeditions to historic shipwrecks, we're finding new ways to tell the stories of the people of our ocean, our Great Lakes, and *Our Blue Heritage*.

Divers survey the wreck of the whaling ship, *Pearl*, at Pearl and Hermes Atoll in Papahānaumokuākea Marine National Monument. Photo: Greg McFall/NOAA

In 10 years I want to look back and see how many more vessels we've found, how many more stories we can tell."

PROTECTING THE GHOST FLEET

Mallows Bay-Potomac River National Marine Sanctuary protects the remains of the Ghost Fleet and other shipwrecks. Photo: Matt McIntosh/NOAA



STORIES FROM THE BLUE: Susan Langley

In 2019, NOAA designated Mallows Bay-Potomac River National Marine Sanctuary, the first new national marine sanctuary in almost 20 years. Susan Langley, the Maryland state underwater archaeologist, formerly served on the Monitor National Marine Sanctuary Advisory Council and was instrumental in this new site designation.

I first came to Mallows Bay in 1995 with Don Shomette, a well-known maritime author who wrote The Ghost Fleet of Mallows Bay. I was just besotted from the beginning. I wanted to see this place become a park or a sanctuary.

Mallows Bay is a fantastic site – we have the largest homogeneous collection of ship remains in the Western Hemisphere. In 1917, the

government planned to build a thousand vessels in 18 months for the World War I war effort. They weren't military vessels; they were to carry food and troop supplies across the Atlantic for the Allies.

The fact that they planned to build a thousand of them meant suddenly we had to have merchant mariners, not naval sailors – enough to crew a thousand vessels. We've always had American merchant mariners. but this was the formalization of the American Merchant Marine.

OUR BLUE HERITAGE



Although nearly 300 ships were built, the war ended before the fleet was complete. Some of them carried cargo to Hawai'i and elsewhere, but none made it to the theater of war. After the war, some did cross to Europe, a few of them were sold to private owners, and most were sold for salvage. Western Marine and Salvage bought most of the ships and kept them in the Potomac River near Mallows Bay. They would take a few at a time to Alexandria to break them down for scrap metal. Those remaining in the Potomac

would occasionally catch fire, break loose, and become hazards to navigation, so the company was ordered to corral them and they burnt a large number of them to the waterline before floating them into Mallows Bay.

Western Marine and Salvage Company went bankrupt during the Depression era, which opened the door for local communities on both sides of the river to salvage the ship remains and derive needed income. At the start of World War II, Baltimore's Bethlehem Steel initiated the third and final shipbreaking period, lasting only two years. Since then, natural events have shaped the number and integrity of ships remaining in Mallows Bay. There are still about 100 in the sanctuary. They are now an integral part of the environment: they act as artificial reefs and serve as nurseries for fish stock. Birds nest here, and the history is just absolutely amazing.

In addition to the Ghost Fleet, we have a former Sea Scout boat. We may well have a Revolutionary War era vessel, and there's a Civil War encampment in the area. The history just keeps coming. As a sanctuary, we can devote more time to surveying. In 10 years, I want to look back and see how many more vessels we've found, how many more stories we can tell.

I take my students and everybody who comes to visit me to Mallows Bay. The more people who see it, the more excited they become. It's the perfect place to paddle and kayak and every season there's something different to see. Sometimes in the mornings in the spring, mist comes off the water, and the sunrise outlines the ships' silhouettes.

AN OCEAN OF DISCOVERY

The ocean connects us all – and that's especially true in the islands of Hawai'i. Kaua'i Ocean Discovery is a new learning facility located in Līhu'e, Kaua'i, that shares the traditions and knowledge of our ocean connections and inspires stewardship of its guests. Visit an underwater world through videos, displays, and hands-on activities, and learn about humpback whales, Hawaiian monk seals, sea turtles, albatrosses, and more. Guests to Kaua'i Ocean Discovery get an immersive experience in Hawaiian Islands Humpback Whale National Marine Sanctuary and Papahānaumokuākea Marine National Monument.

Kaua'i Ocean Discovery is free and appeals to all ages. Online resources and ocean programming are also available. Photos: Left page: Nick Zachar/NOAA. Right page (clockwise from top): Matt McIntosh/ NOAA, Matt McIntosh/NOAA, Dayna McLaughlin/NOAA, Matt McIntosh/NOAA







KAUA'I OCEAN DISCOVERY

HUM KOHOLĀ KUAPI

I as endangened under the Endangened Species Act, the Hawa'i' humpback whale population has recomment in as koholik in Hawaiian, the scientific name is Megaptera novaeangliae, which means "big-winged New Enen anno "humback" from the distinct hump that appears when they arch their back into a dive. The humtion anno "humback" from the distinct hump that appears when they arch their back into a dive.

Numbers transfer record uses it from the loss that an impact for a dmode. Attractives varies togs the at-long the banks as the tites at least a rate from the 2-banks, which as it are to an itemas study enhange one Euroses of the at-perlimited, many the togs such role attractive from the set.

Using an autonomous surface vessel, researchers created highresolution bathymetric maps of the Lake Huron lakebed. Photo: OET/UNH-CCOM elow: (left) researchers operate the autonomous surface vehicle from afar; (right) the autonomous surface vehicle is lifted over the water. Photos: OET/NOAA

SEARCHING FOR SHIPWRECKS AND SINKHOLES

In spring 2019, researchers came together in Thunder Bay National Marine Sanctuary to seek lost shipwrecks and discover natural features such as sinkholes and fish habitats. Using an autonomous surface vehicle, researchers from the sanctuary, NOAA Great Lakes Environmental Research Lab, Ocean Exploration Trust, and University of New Hampshire's Center for Coastal and Ocean Mapping used sonar to create high-resolution maps of deep areas within the sanctuary.

STELLWAGEN SHIPWRECK SLEUTHS

Stellwagen Bank National Marine Sanctuary is known for magnificent whale watching - but it is also home to a host of historic shipwrecks. The sanctuary teamed up with Woods Hole Oceanographic Institution (WHOI) and Marine Imagine Technologies to document the archaeological and biological conditions of several shipwrecks, including Portland, Frank A. Palmer, and Louise B. Crary.



Above: WHOI archaeologist Dr. Calvin Mires (left) and WHOI marine biologist Dr. Kirstin Meyer-Kaiser (right) examine images broadcast topside by the ROV Pixel. Photo: Elizabeth Weinberg/NO/

Sea anemones and other invertebrates grow on the shipwreck of the passenger steamship Portland in Stellwagen Bank National Marine Sanctuary. Photo: NOAA

OUR BLUE HERITAGE

PROPOSED LAKE ONTARIO NATIONAL MARINE SANCTUARY

In April 2019, NOAA proposed the designation of a national marine sanctuary in eastern Lake Ontario. Eastern Lake Ontario represents a diverse array of important events in our nation's history, including military conflicts, maritime innovation, and American expansion to the west. The eastern corridor is one of the most historically significant regions in the Great Lakes and the country. The proposed sanctuary would protect and interpret the area's maritime heritage, including a nationally-significant collection of historic shipwrecks. In February 2020, NOAA established a local Sanctuary Advisory Council to provide input to NOAA on the designation.

OUR BLUE HERITAGE

Divers explore the wreck of *St. Peter* in the proposed Lake Ontario sanctuary. Photos: Phil Hartmeyer/NOAA (background); Nick Zachar/NOAA (below)

GET INTO THE BLUE

our national marine sanctuaries are ready and waiting for your next adventure. In these iconic places, you can paddle, dive, and more. National marine sanctuaries provide doorways to new experiences and pathways to discover our nation's cultural diversity. They're open to everyone, so what are you waiting for: *Get into the Blue*! A diver swims over a sponge and the live-bottom reef of Gray's Reef National Marine Sanctuary. Photo: Greg McFall/NOAA

STORIES FROM THE BLUE: Paula Stevenson McDonald



For centuries, the people of Samoa have lived with a very close connection to the ocean. Through outrigger canoes paddling, fautasi (traditional longboats), and now coastal rowing, Paula Stevenson McDonald is working alongside National Marine Sanctuary of American Samoa to keep this relationship alive for future generations. This is her Story from the Blue.

I was born and raised in American Samoa. Here, the ocean is a critical part of our culture, our home, and our way of life.

For five years now, I have been the owner of South Pacific Watersports and president of our outrigger canoe club, Le Vasa. As a member of this community, it is important to me that we promote our role as stewards of our ocean and everything in it, especially with our youth. One way we've managed to do this is via our summer camp program.

Through our summer camp program, we are helping to educate our youth about health and fitness, on-the-water safety, and conservation. We work closely with National Marine Sanctuary of American Samoa, to bring the kids to the Tauese P.F. Sunia Ocean Center, the sanctuary's visitor center. The kids get to talk directly with sanctuary staff and learn more about the sanctuary. We also go out on field trips into the sanctuary so the kids can learn hands-on about why it's so important to take care of it.

There are many reasons to be concerned about our ocean – marine debris, sea level rise, and coral bleaching. My concern is that our people are not doing enough to take care of our ocean. To accomplish this, we need to get the word out. It will take everyone's help. I'm doing my best with help from the sanctuary.

In American Samoa, we have the canoe, we have our fautasis, and I hope that through these activities, we can reconnect our people to the ocean in a more impactful way. We continue to reach out to the community and our youth to spread the word that we must do more. I just hope when they do come out here on the canoe, on the fautasi, to experience our ocean, they feel the connection with the ocean; that they think about our ancestors, about our culture, and our way of life, and then take action.



GET INTO THE **BLUE**

AN OCEAN WAY OF LIFE

The ocean is a critical part of our culture, our home, and our way of life."

The fautasi longboat derives from the blending of Samoan watercraft and western whaleboat traditions. Today, the sport of fautasi racing is the main event during Flag Day celebrations in American Samoa.

Photo: Matt McIntosh/NOAA

GET INTO THE BLUE

MAKE A SPLASH

Not a diver but still want to explore your national marine sanctuary? Grab a paddle and hop aboard a kayak, canoe, or stand up paddleboard! Paddling is a perfect way to see wildlife, explore a kelp forest, cast a fishing line, and more. Always make sure to keep a respectful distance from animals, and never get between mothers and their offspring.



Kelp forests offer exciting opportunities for exploration in Channel Islands National Marine Sanctuary. Photos: (left) Sienna Streamfellow/Channel Islands Adventure Company; (right) Nathan Coy



GET INTO YOUR SANCTUARY

As a travel destination, few places on the planet can compete with the diversity of the National Marine Sanctuary System. The majority of national marine sanctuaries' waters are open for sustainable recreation. During the first weekend in August, NOAA's Office of National Marine Sanctuaries annually hosts "Get Into Your Sanctuary" celebrations to raise awareness about the value of our national marine sanctuaries as iconic destinations for responsible recreation. Whether you're already an avid outdoors person looking for a new adventure or you've never been kayaking, fishing, or taken advantage of our amazing underwater parks, Get Into Your Sanctuary is for YOU!









GET INTO THE BLUE

Left page: Channel Islands NMS. Right page (clockwise from top right): Mokupāpapa Discovery Center, Hawai'i; Greater Farallones NMS; Hawaiian Islands Humpback Whale NMS; Channel Islands NMS; Olympic Coast NMS; Florida Keys NMS

Photos: (left page) Robert Schwemmer/NOAA; (right page, clockwise from top right) Nick Zachar/NOAA; Sara Heintzelman/NOAA; Matt McIntosh/ NOAA; Robert Schwemmer/NOAA; NOAA; NOAA

PRIDE IN THE OCEAN

Our ocean is for everyone! During the month of June, the National Marine Sanctuary System celebrates Ocean Month and LGBTQ Pride Month through #PrideInTheOcean. In collaboration with Pride Outside, this social media campaign asks LGBTQ community members to share an image of themselves with a caption of why and how they take pride in the ocean. Here are a few of the participants.

66 Our community is out there taking pride in our ocean." – Patagonia Seattle

A double rainbow stretches over Stellwagen Bank National Marine Sanctuary. Photo: Laura Lilly



Running barefoot long the shore is my second avorite beach activity. Being fabulous queer on a fabulous each is my first." <u>Julian Kos</u>anovic (they/them

I hope that I can inspire others – whoever they

- Elizabeth Bradfield (she/her)

are and wherever they come from – to care for our ocean.

My hope is that I will inspire others to be the change that will preserve the ocean while also making the next generation of scientists feel comfortable however they self-identify."

PRIDE OUTSIDE

- Nicolas Vanderzyl (he/him)

INTO THE DEPTHS & BACK IN TIME

By Keith Flood

eith C. Flood is a photographer and diver who has explored multiple national marine sanctuaries, including Monterey Bay, Greater Farallones, and Channel Islands. Most recently, he dove on several shipwrecks in Thunder Bay National Marine Sanctuary.

Stepping off the stern of the 28-foot dive boat, we begin our descent into Lake Huron's Thunder Bay National Marine Sanctuary. Our destination on this first dive of a five-day trip is the shipwreck *Typo*.

My eyes strain to catch my first glimpse of the wreck as I descend face down like a free-falling sky diver. At 100 feet I make out a blurry brown object coming up at me surrounded by ink-blue water. I soon realize this is the still upright main mast. My descent continues until an enormous dark shadow stands out in the water and begins to reveal itself. I feel goosebumps all over, not from the icy cold 38-degree Lake Huron water but from the 137-foot long wreck of *Typo* as it comes into full view!

Typo sank after a collision with another ship on October 14, 1899. Four crew members were lost, and the ship now rests at a depth of 195 feet. It's a challenging depth to dive, and we only have 17 minutes of precious bottom time. My dive buddies and I explore the length of the wreck, being careful not to come into contact with its fragile 100-plus-year-old water-logged wooden hull. The ascent back to the surface takes another 40 minutes including decompression stops, time which we each spend reliving our step back into history.

Over the next several days, we made two dives a day to *Typo*, *Kyle Spanger*, *Florida*, *Norman*, and *Cornelia B. Windiate*. All were in the 170-foot to 210-foot depth range and represent just a handful of the thousands of wrecks in the Great Lakes. These crown jewels of Thunder Bay National Marine Sanctuary all date back to the late 1800s. They are in especially pristine condition due to the icy cold-water depths and through the efforts of Thunder Bay National Marine Sanctuary to protect these nationally significant shipwrecks.



Background: Wrecked in 1897, *Florida* rests at a depth of 206 feet in Thunder Bay National Marine Sanctuary. Above: Divers explore the remains of the shipwreck *Florida*. Photos: Keith Flood

TREASURES OF THE BLUE

ow much does a blue whale weigh? How did the shearwater get its name? Is a strawberry anemone as delicious as it sounds? Just how common are common murres? Take a tour of the *Treasures of the Blue* to find answers to these questions and more.













Olympic Coast Thunder Bay Lake Ontario Wisconsin-Greater Farallones Lake Michigan Cordell Bank Monterey Bay Papahānaumokuākea Monitor **Channel Islands** Gray's Reef Flower Garden Banks Wetter (1) Florida Keys Hawaiian Islands Humpback Whale American Samoa (U.S.) Rose Atoll

Fauth la Dlua

Photos (clockwise from bottom left): Matt McIntosh/NOAA; Chuck Graham; Daryl Duda; Sophie Webb/NOAA;

Wendy Cover/NOAA; G.P. Schmahl/NOAA; Peter Flood; Matt Vieta/BAUE; Ed Lyman/NOAA, under permit #14682

Stellwagen Bank Mallows Bay-Potomac River



 1000
 2000
 3000
 4000
 5000
 6000
 7000

 Bathymetric Tints (Depths are in corrected meters below mean sea level)
 Image reproduced from the GEBCO world map, http://www.gebco.net/ Customized by NOAA's Office of National Marine Sanctuaries

Lake Trout

Stealthy divers exploring the shipwrecks of Thunder Bay National Marine Sanctuary may encounter fish like the lake trout. The diversity of fish species in the Great Lakes spans a spectrum from warmer water species in shallow nearshore areas to cold-water species like lake trout found in deeper, open waters.

SCIENTIFIC NAME: Salvelinus namaycush

DIET: Other fish; some crustaceans and insects

WEIGHT: Average 9 to 10 pounds

LIFE SPAN: 25+ years

AGE AT MATURITY: 6-7 years

THREATS: Habitat degradation, invasive species

STATUS: Varies throughout the U.S.

FUN FACT: This freshwater fish is popular with recreational anglers in and around the sanctuary.

Photo: NOAA



Great Shearwater

Seabirds like the great shearwater travel to Stellwagen Bank National Marine Sanctuary to feed on fish. Because they spend most of their time above water, seabirds are easier to track than other marine animals. Researchers use satellite technology to track great shearwaters and learn more about them and the health of the sanctuary ecosystem.

SCIENTIFIC NAME: Ardenna gravis

DIET: Fish and squid

WINGSPAN: Average 3 feet

CLUTCH SIZE: 1 egg

AGE AT MATURITY: 6 or 7 years

THREATS: Bycatch, ingesting plastic, pollution, climate change

STATUS: Protected under the Migratory Bird Treaty Act

FUN FACT: Each fall, great shearwaters migrate more than 10,000 miles from the North Atlantic to the South Atlantic.

Photo: Peter Flood

TREASURES OF THE BLUE

 $\mathbf{\Omega}$



CREATURE FEATURE

Osprey

Marine Sanctuary provide prime nesting locations for many different bird species, including the iconic osprey. These Chesapeake Bay watershed, and are talented fishers, often spotted plunging feet-first into the water to catch fish.

SCIENTIFIC NAME: Pandion haliaetus

DIET: Fish

WINGSPAN: Up to 6 feet

OLDEST KNOWN OSPREY: 25 years

CLUTCH SIZE: 2 to 4 eggs

THREATS: Marine debris, habitat degradation

STATUS: Protected under the Migratory Bird Treaty Act

FUN FACT: Ospreys were once nearly eradicated in the Chesapeake region due to widespread pesticide use, but today, thanks to pesticide bans, there are more than 2,000 nesting pairs in the region.

Photo: Matt McIntosh/NOAA

Sand Tiger Shark

Sand tiger sharks guard many of the shipwrecks in the Graveyard of the Atlantic, patrolling these artificial reefs in search of fish and invertebrates to eat. Don't be fooled by their rows of jagged teeth – these large sharks are generally quite docile, and typically swim calmly around divers.

SCIENTIFIC NAME: Carcharias taurus

DIET: Fish, rays, crabs, lobsters, and squid

LENGTH: Average 7 to 9 feet

WEIGHT: 200-350 pounds

LIFE SPAN: Estimated 10-15 years

THREATS: Overfishing

STATUS: Protected in commercial fisheries under the Atlantic Fishery Management Plan

FUN FACT: Sand tiger sharks are unique among sharks in that they often come to the ocean surface to gulp air. They retain this air in their stomach to help them to hover above the ocean floor.

Photo: Bruce Sudweeks

CREATURE FEATURE

REE

S

Loggerhead Sea Turtle

Loggerheads are the most abundant sea turtle species found in U.S. Atlantic coastal waters. In Gray's Reef National Marine Sanctuary, they're often spotted resting and foraging. They get their name for their large, muscular heads, which help them feed on hard-shelled prey like whelks. Lucky for them, invertebrates are in abundance at Gray's Reef!

SCIENTIFIC NAME: Caretta caretta

DIET: Invertebrates like crabs, sea urchins, and jellyfish

LENGTH: Average 3 feet

WEIGHT: Average 250 pounds

LIFE SPAN: Unknown, possibly 50+ years

THREATS: Bycatch in fishing gear, nesting habitat degradation, vessel strikes, entanglement in marine debris

STATUS: Threatened

FUN FACT: Loggerheads are the largest hard-shelled turtle in the world. Photo: Greg McFall/NOAA

Staghorn Coral

The Florida Keys are built on layers of old corals and new growth. Among the most iconic coral species throughout the Caribbean, staghorn corals grow quickly and form dense thickets. Through a new plan called Mission: Iconic Reefs, the sanctuary and its partners are working to restore staghorn reefs throughout the Keys.

SCIENTIFIC NAME: Acropora cervicornis

DIET: Plankton; sugars produced by symbiotic a

COLONY HEIGHT: 4 feet

THREATS: Ocean warming, ocean acidification overfishing, disease, pollution

STATUS: Endangered

FUN FACT: Like other stony corals, staghorn corals live in partnership with a symbiotic algae called zooxanthellae. The zooxanthellae are photosynthetic and produce energy from the sun, which they share with the corals in exchange for shelter.

Photo: Greg McFall/NOAA

TREASURES OF THE BLUE

Manta Ray

Manta rays are popular visitors to Flower Garden Banks National Marine Sanctuary. Manta rays can reach 22 feet from fin-tip to fin-tip, but the manta rays that visit this region tend to be much smaller. Recent research suggests that these manta rays may be juveniles using the sanctuary's waters as part of a nursery range.

SCIENTIFIC NAME: *Manta birostris*

DIET: Zooplankton

SIZE: Average 23 feet

WEIGHT: Average 5,300 pounds

LIFE SPAN: About 40 years



THREATS: Commercial fishing, especially bycatch

STATUS: Threatened

FUN FACT: Unique markings on the undersides of manta rays are like our own fingerprints, and help researchers identify individuals.

Photo: G.P. Schmahl/NOAA

Tufted Puffin

Among the many seabirds of Olympic Coast National Marine Sanctuary is the tufted puffin. Tufted puffins are known for their distinctive appearance, with a bold white "face-mask" and golden head plumes in the breeding season. They are graceful hunters underwater, and can hold multiple fish crosswise in their bill to carry back to their chicks.

SCIENTIFIC NAME: Fratercula cirrhata

DIET: Mostly fish, some small squid and zooplankton

WINGSPAN: Average 30 inches

LIFE SPAN: Possibly 20+ years

CLUTCH SIZE: 1 egg

THREATS: Oil spills, fishing bycatch, prey scarcity, pesticides, habitat destruction

STATUS: Protected under the Migratory Bird Treaty Act

FUN FACT: Tufted puffins nest in burrows on slopes or cliffs.

Photo: Mary Sue Brancato/NOAA

0

L Y M \square \sim

CREATURE

Common Murre

Hundreds of thousands of birds flock to Greater Farallones National Marine Sanctuary to feed in the sanctuary's rich waters and nest in the rocky Farallon Islands. Among them is the common murre, the most abundant breeding seabird in northern and central California. These penguin-like birds nest close together on slopes and cliffs.

SCIENTIFIC NAME: Uria aalge

DIET: Primarily small fish and krill; also squid and marine worms

WINGSPAN: Average 26 inches

CLUTCH SIZE: 1 egg



THREATS: Oil spills, fishing bycatch, human disturbance

STATUS: Abundant

FUN FACT: Greater Farallones National Marine Sanctuary Seabird Protection Network helps boaters, hikers, paddlers, and aviators keep seabirds safe.

Photo: Douglas Croft

Strawberry Anemone

Cordell Bank shines bright pink thanks to the many strawberry anemones clinging to the rock. Strawberry anemones are not true sea anemones, but rather are more closely related to corals. These small invertebrates sometimes reproduce by cloning themselves, and are often found in genetically-identical clusters that cover a square meter or more.

SCIENTIFIC NAME: Corynactis californica

- DIET: Small invertebrates and fish larvae
- SIZE: Average 1 inch tall and in diameter
- **COLOR:** Often pink, but can be purple, brown, or orange

FUN FACT: Though their name sounds delicious, we don't recommend eating strawberry anemones. They use their tentacles to catch prey, and they pack a punch!

Photo: Matt Vieta/BAUE



BA

LL)

N

LL)

Northern Elephant Seal

In the 1800s, northern elephant seals were hunted almost to extinction, with a few hundred surviving in Mexico. With protection, the population has increased into the tens of thousands. During mating, pupping, and molting seasons, elephant seals can often be spotted hauled out on the beaches along Monterey Bay National Marine Sanctuary.

SCIENTIFIC NAME: Mirounga angustirostris

DIET: Squid, fishes, rays, and sharks

WEIGHT: 4,400 pounds (males); 1,300 pounds (females)

LIFE SPAN: 13-19 years

THREATS: Entanglement in fishing gear, vessel strikes, marine debris



STATUS: Protected under the Marine Mammal Protection Act

FUN FACT: Male elephant seals have a large nose, or proboscis, which overhangs their lower lip by about eight inches.

Photo: Nick Zachar/NOAA

Blue Whale

Blue whales are the largest animals ever to live on our planet, yet eat tiny prey called krill. They can eat up to six tons of it each day! Like many whales, blue whales are at risk of being hit by large ships, which can injure or kill them. Channel Islands National Marine Sanctuary is working to reduce ship strikes through voluntary speed reduction programs.

SCIENTIFIC NAME: Balaenoptera musculus DIET: Krill LENGTH: Up to 100 feet WEIGHT: Up to 330,000 pounds LIFE SPAN: Unknown, but likely 70+ years

TREASURES OF THE BLUE



THREATS: Ship strikes, entanglement in fishing gear, ocean noise

STATUS: Endangered

FUN FACT: Blue whales are the largest animal to have ever lived on Earth – they are larger even than the dinosaurs were!

Photo: NOAA

CREATURE FEA

Humpback Whale

Each winter, thousands of humpback whales make the long journey to Hawai'i from their feeding grounds that are primarily in Alaska. In the warm, shallow waters of Hawaiian Islands Humpback Whale National Marine Sanctuary, they mate, give birth, and nurse their young. Known as koholā in Hawaiian, the humpback whale is the state marine mammal of Hawai'i.

SCIENTIFIC NAME: *Megaptera novaeangliae* DIET: Krill and small fish LENGTH: Up to 60 feet WEIGHT: Up to 80,000 pounds LIFE SPAN: 80-90 years Photo: Ed Lyman/NOAA, under NOAA Permit #14682-38079



THREATS: Entanglement in fishing gear, ship strikes, human encroachment, and harassment

STATUS: North Pacific population delisted as endangered in 2016. Protected under the Marine Mammal Protection Act

FUN FACT: The genus name for humpback whales, *Megaptera*, means "big winged." It refers to their long pectoral fins, which can be up to a third of their body length.

<u>Ulua/Giant Trevally</u>

Ulua, or giant trevally, are found throughout the Hawaiian Islands, particularly in Papahānaumokuākea Marine National Monument. Ulua are apex predators, and are known for cooperative feeding habits with Hawaiian monk seals. During ancient times in Hawai'i, the ulua was used as a sacrifice in religious ceremonies, sometimes replacing humans.

SCIENTIFIC NAME: Caranx ignobilis **DIET:** Crustaceans and fish **LENGTH**: Up to 5+ feet **WEIGHT**: 100+ pounds LIFE SPAN: 20 years THREATS: Overfishing



TREASURES OF THE BLUE

FUN FACT: The ulua is mentioned in various Hawaiian songs, chants, and proverbs, generally likening the fish to a strong warrior or a handsome man.

'A'ohe ia e loa'a aku, he ulua kāpapa no ka moana.

He cannot be caught for he is an ulua fish of the deep ocean.

Photo: John Burns/NOAA



 \sim

Massive *Porites* Coral

National Marine Sanctuary of American Samoa is known for its stunning array of corals - the quarter-square-mile Fagatele Bay alone contains some 200 different species. Among the most iconic corals are the massive species in the Porites genus, which include Fale Bommie (Big Momma), one of the largest coral heads in the world.

SCIENTIFIC NAME: Porites lutea, P. lobata, P. austaliensis, and P. solida

DIET: Nutrients from symbiotic algae, small plankton

FALE BOMMIE HEIGHT: 20 feet

FALE BOMMIE CIRCUMFERENCE: 135 feet

THREATS: Ocean warming, coral bleaching, ocean acidification, land-based pollution

FUN FACT: Each year, massive *Porites* corals generate new growth, and scientists can read cores from the coral structure just like rings from a tree. In this way, scientists can track changing oceanographic conditions over the last five centuries.

Photo: Wendy Cover/NOAA



Above: A kayaker explores the Ghost Fleet of Mallows Bay-Potomac River National Marine Sanctuary. Inset: NOAA staff and partners gather at the sanctuary's designation ceremony. Photos: Matt McIntosh/NOAA

USHERING IN A NEW ERA OF NATIONAL MARINE SANCTUARIES

- By ELIZABETH WEINBERG

For nearly 20 years, Thunder Bay National Marine Sanctuary in Lake Huron has been the youngest national marine sanctuary in the United States. In 2019, that changed, as NOAA designated the first new national marine sanctuary in two decades: Mallows Bay-Potomac River National Marine Sanctuary.

The new sanctuary is located about 40 miles south of Washington, D.C., in the tidal Potomac River, a tributary of the Chesapeake Bay. It protects the remnants of more than 100 World War I-era wooden steamships, as well as other historically-significant maritime heritage resources. The sanctuary will be co-managed with the state of Mary-land and Charles County, Maryland.

"This is a historic moment for the National Marine Sanctuary System," says John Armor, director of NOAA's Office of National Marine Sanctuaries. "Mallows Bay-Potomac River National Marine Sanctuary will allow us to preserve and interpret an important moment in our nation's history, and also support the communities to which this special place means so much, socially and economically."

The Mallows Bay-Potomac River National Marine Sanctuary designation is the first in a wave of new sanctuaries proposed under the revamped Sanctuary Nomination Process. Two proposed sanctuaries are currently in the designation process, Wisconsin-Lake Michigan and Lake Ontario, and sites in Alaska, Lake Erie, and California have also been nominated.

SANCTUARIES FOR THE PEOPLE

In 2014, NOAA launched a brand new Sanctuary Nomination Process. The process starts with communities: each nomination is created by a group of people who care passionately about protecting an area of our nation's marine or Great Lakes waters. State and local agencies, Indigenous tribes, conservation nonprofits, educators, scientists, and more may collaborate to propose their local waterway for protection as a national marine sanctuary. NOAA then reviews the nomination to see if establishing a sanctuary would help protect significant natural and cultural resources. If so, the nomination is considered for potential designation.

Mallows Bay-Potomac River was one of the very first areas to be put forward. Just months after NOAA announced the Sanctuary Nomination Process, former Maryland governor Martin O'Malley submitted

DESIGNATION OF THE BLUE

a nomination for a 14-square-mile area in the tidal Potomac River to be considered as a national marine sanctuary. The nomination was supported by a coalition of nearly 100 business, education, Native American, conservation, historical, research, and recreational organizations. The Maryland congressional delegation also was supportive.

Over five years, the proposal underwent significant public input, including two rounds of public meetings with local communities and comment periods on the proposed designation documents.

In addition to protecting historically-significant artifacts and sites,

Mallows Bay-Potomac River National Marine Sanctuary will serve as an important site for education and research. It will also provide opportunities for tourism and economic development. The area is popular with recreational kayakers and anglers. Natural resources will continue to be managed by the Maryland Department of Natural Resources and the Potomac River Fisheries Commission.

"Designating this section of the Potomac River as a national marine 'shipwreck' sanctuary offers exciting opportunities for citizens in the local community, our region, and far beyond – citizens from all walks of life who joined together to support

this sanctuary," says Charlie Stek, the community lead for the sanctuary nomination. "It will enhance recreational fishing, boating, and tourism in Maryland and Virginia. It will help to educate the public about our nation's rich cultural and maritime history. And it will promote conservation and research in our continuing efforts to restore the health of the Chesapeake Bay and Potomac River."

TIDES OF HISTORY

Many of the new sanctuary nominations are for areas containing significant maritime heritage resources like shipwrecks. "These places offer us opportunities to reflect on the

past in the context of the present,' says Joe Hoyt, National Maritime Heritage Program coordinator for NOAA's Office of National Marine Sanctuaries. "Maritime heritage sites are not only places of learning, but also special places to honor the past, recognize achievements, and remember sacrifices. These places connect us to people and our waterways in ways that are profound and lasting."

Mallows Bay-Potomac River National Marine Sanctuary, for example, protects nearly all of the remains of the "Ghost Fleet," hundreds of World War I-era wooden steamships. During World War I, a thousand wooden steamships were



In addition to the Ghost Fleet, the sanctuary protects archaeological and cultural resources spanning centuries. Evidence of Native American habitation of the area dates back 12,000 years; Mallows Bay and the surrounding area is in the territory of the Piscataway Conoy Confederacy, Piscataway Indian Nation, and Patawomeck Indian Tribe. The area also contains artifacts from the Revolutionary,



commissioned to support the U.S. war effort. However, the war ended before the ships could be used and hundreds of them were scuttled in the Potomac River. Many of them remain, now protected by the national marine sanctuary.

Civil, and both World Wars, as well as successive regimes of Potomac fishing industries.

"Designating the Ghost Fleet in Mallows Bay – the Chesapeake Bay's first national marine sanctuary – is a fitting tribute to a unique cultural and natural resource that provides a tangible link to important chapters in U.S. history," says Katherine Malone-France, interim chief preservation officer at the National Trust for Historic Preservation. "We commend NOAA for taking this action to promote a historic place that conveys the rise of American industrialism, ingenuity, and a citizen war effort that heralded the emergence of our country as a world power.

DESIGNATION OF THE BLUE

This designation will ensure that more Americans are able to experience this special place."

COMMUNITY HUBS

National marine sanctuaries proposed under the Sanctuary Nomination Process start with people, and once they're designated, they continue to play a key role for communities.

Mallows Bay-Potomac River National Marine Sanctuary provides hands-on education experiences: since 2014, the National Marine Sanctuary Foundation awarded Ocean Guardian funds to two public schools in Charles County, Maryland. These grants have enabled in-school and outdoor education and stewardship for hundreds of students. People of all ages have also gotten to know Mallows Bay through NOAA-led trash cleanup events.

The sanctuary nomination has also catalyzed efforts to help the public better understand the importance of Mallows Bay. In 2018, with National Marine Sanctuary Foundation funding, the Chesapeake Conservancy, state of Maryland, and Charles County developed water trail markers and laminated maps, and an audio tour of the Ghost Fleet vessels is forthcoming.

Mallows Bay has also served as a hub for research efforts. In 2017, Duke Marine Robotics Lab and Remote Sensing Facility led an interdisciplinary team from three universities and a private company of drone operators to provide the first-ever high-definition imagery and positioning location of the Ghost Fleet. The following year, the National Marine Sanctuary Foundation provided funds to the



Maryland Department of Natural Resources to deploy a new water quality buoy in the Potomac River adjacent to Mallows Bay that provides real-time water conditions for recreational and commercial users of the river.

"Mallows Bay is just a short drive from our nation's capital. It is one of the most amazing places to explore - full of history, wildlife, and cultural interests, but so few people have heard about it," says Susan Shingledecker, vice president and director

of programs at Chesapeake Conservancy. "This is the first national marine sanctuary in the Chesapeake Bay, and it brings national and international attention to our efforts to restore the health of the Chesapeake, one of the world's most collaborative estuary restorations."

The designation of new national marine sanctuaries puts them on the map for communities near and far. We at NOAA are excited to help protect these important areas for today and future generations.





DESIGNATION OF THE BLUE

LIFE IN THE BLUE

ur ocean is in constant flux. The National Marine Sanctuary System works to help sensitive habitats respond to human-made threats like climate change and pollution, and safeguards habitats you'll find in surprising places. It's all part of protecting *Life in the Blue*.

Young rockfish school over the rocky reef of Cordell Bank National Marine Sanctuary. Photo: Greg McFall/NOAA

STORIES FROM THE BLUE: Kalani Quiocho



Kalani Quiocho grew up in Hilo, Hawai'i, raised by his large family and great grandparents who were traditional medicinal healers. The islands of Hawai'i have been his home and his wellspring. He currently serves as the Native Hawaiian program specialist for Papahānaumokuākea Marine National Monument, which protects the waters surrounding the Northwestern Hawaiian Islands. This is his Story from the Blue.

The ocean was my first origin space. I lived right across the street. I grew up in Keaukaha, a Hawaiian homestead, and the ocean there is a childhood friend, a first crush, my whole family, and my wedding partner. When it rains in Hilo, it can pour hard, and as a young boy one of my most favorite things to do on rainy days was to go to the ocean and dive underwater. It was a silent escape that brought me joy. It was my sanctuary. One day, during one of these escapes, I encountered a tiger shark. His presence salted my soul and my senses are preserved in this moment. That is how I learned reverence. That tiger shark

helped me to see my connections with other things and this has been one of the ways I know who I am.

I used to work as a fisheries observer. The first time I experienced a shark being gutted was traumatic, very different from my encounter with that first tiger shark from home. This other shark's blood poured hard and I couldn't escape. I couldn't dive underwater. That shark will always be the sacrifice that transformed me. He made me see that I have impact, that I am part of this larger system and I have agency

in my choices and how I exist.

I'm committed to ensuring that traditional knowledge and Indigenous environmental ethics are represented in parity with conventional science and conservation. Our culture is the method by which we do our science and commune with nature. We have homeland perspectives and place-based knowledge that are generationally-informed through ancestral experiences. They can contribute to global existence.

The entire Hawaiian archipelago is a genealogy. Hawai'i emerges in the east where the sun rises and the islands are volcanically birthed from the oceanic womb. Extending westward, the sunsets and the islands return to their source. The oldest islands, almost 30 million years old at the west end, are the elder islands. Papahānaumokuākea is our origin space, the place where our oral traditions derive from. It's a place where spirits exist and where ancestors return to. Papahānaumokuākea is our origin space, the place where our oral traditions derive from. It's a place where spirits exist and where ancestors return to."

THE HAWAIIAN ARCHIPELAGO IS A GENEALOGY



The name of Papahānaumokuākea acknowledges two prominent ancestors: Papahānaumoku, the broad expansive earth who gives birth to islands through the oceanic womb, and Wākea, sky father, the broad expanse that allows us to access time and space. Naming the monument for Papahānaumoku and Wākea is an acknowledgment of the ancestral connections of people and place. These islands are familial, we're related to them through the bones of our ancestors.

We must remember the most basic truths about our relationships with our environment and each other. Protected areas like Papahānaumokuākea preserve these ancestral memories and perpetuate our existence. And as we envision our future, let's think about what kind of ancestors we want to be. LIFE IN THE BLUE

More than 80 cultural sites are known on Nihoa in Papahānaumokuākea Marine National Monument, including habitation terraces and bluff shelters, religious places, agricultural terraces, and burial caves.

> Photos: (above) Wayne Levin; (below) Nick Zachar/NOAA



WHALE FALL IN THE DEEP SEA

When a whale dies at sea, its body sinks to the seafloor and becomes what is known as a whale fall. There, it becomes an oasis for all kinds of marine life, providing food for sharks, octopuses, fish, worms, crabs, and more. In October 2019, researchers aboard the E/V Nautilus were exploring Davidson Seamount in Monterey Bay National Marine Sanctuary when they came across a whale skeleton at a depth of 10,623 feet. The whale skeleton was lying on its back and was an estimated 13 to 16 feet long. *Muusoctopus* octopuses, fishes, and more fed on the carcass. Scientists are working to identify the species of whale.

At left: Octopuses and fish feed on the decomposing whale, while Osedax worms burrow into the bone, giving it a red fuzzy appearance. Above: The ROV Hercules shines its lights on the whale fall. Photos: OET/NOAA



A diver swims through a kelp forest in Monterey Bay National Marine Sanctuary Photo: Steve Lonhart/NOAA

LENDING A KELPING HAND

Kelp forests harbor incredible biodiversity, serving as shelter and providing food for a wide array of animals from fish to sea otters. However, in recent years kelp forests along the West Coast suffered a dramatic decline. Even in protected ocean spaces, such as Greater Farallones and Monterey Bay national marine sanctuaries, kelp forest ecosystems transitioned from algal-dominated to urchin-dominated. This shift was accompanied by a steep decline in the variety of species living in this habitat and a collapse of some recreational and commercial fisheries. In an effort to support rapid kelp recovery, the Greater Farallones Association developed the Sonoma-Mendocino Bull Kelp Recovery Plan, which outlines strategies for restoration site selection, monitoring, research, and community engagement.

Purple sea urchins consume kelp holdfasts – essentially the kelp's root system and can send kelp fronds spinning off into the current. If there are too many sea urchins, as there are in many areas along the West Coast, the kelp forest can vanish. Researchers are working to understand how to better manage purple urchin populations and support kelp forest restoration and recovery. Photos: (top) Nick Zachar/NOAA; (bottom) Cynthia Catton/CDFW

DESTRUCTION IN PRISTINE HABITATS

Papahānaumokuākea Marine National Monument protects lush coral reefs in the Northwestern Hawaiian Islands. But when researchers surveyed the reefs in summer 2019, they were faced with tragedy: Hurricane Walaka had flattened a reef at French Frigate Shoals, while a newly named species of algae with invasive characteristics was overgrowing native corals and other algae at Pearl and Hermes Atoll. Monument staff are now working to understand and respond to these impacts.









The before and after photos at left show the impacts of Hurricane Walaka, which passed through the Northwestern Hawaiian Islands at French Frigate Shoals as a Category 3 hurricane. The hurricane caused major damage to the islands of this atoll and left rubble at Rapture Reef. Above, before and after images show the impacts of outbreaklevel overgrowths of a newly named red alga, Chondria tumulosa, witnessed at Pearl and Hermes Atoll. Many of these mats were as large as multiple football fields. Underneath the mats were dead native corals. Photos: Left: (top) James Watt/NOAA, (bottom) Kailey Pascoe/NOAA; Right: (top) James Watt/NOAA, (bottom) Taylor Williams/NOAA



A DAY AT THE TURTLE SPA

Over time, sea turtles and other marine animals accumulate algae and small parasites. But without hands to pick them off, what's a sea turtle to do? Call in the fish! In Hawaiian Islands Humpback Whale National Marine Sanctuary, green sea turtles (Chelonia mydas) – or honu - regularly visit "turtle cleaning stations." The sea turtle gets a relaxing day at the spa, while convict tangs (Acanthurus triostegus) and other fish get to chow down on the parasites. This relationship is just one example of a type of symbiosis in the ocean, called mutualism, in which animals of different species form relationships that benefit them both.

LIFE IN THE BLUE

Green sea turtles regularly visit "turtle cleaning stations," like this rocky area, throughout Hawaiian Islands Humpback Whale National Marine Sanctuary. Photos: (left page) Matt McIntosh/NOAA; (right page) Nick Zachar/NOAA

EXPLORE THE BLUE

ach day, researchers in the National Marine Sanctuary System work diligently to uncover new information about our ocean and Great Lakes. They track enormous sharks and disentangle whales. They collaborate to protect coral reefs that are being loved to death. They use new technology to investigate some of the deepest areas of the ocean, and more. Jump in with them and *Explore the Blue*. Researchers Christian Clark, James Anderson, and Yannis Papastamatiou tag an ulua (giant trevally) at Pearl and Hermes Atoll in Papahānaumokuākea Marine National Monument. Photo: Greg McFall/NOAA

EXPLORE THE BLUE

In the early days of the Center for Coastal Studies, we realized that Stellwagen was an area of particular richness for marine mammals.³

Left: A right whale breaches in National Marine Sanctuary Right: Trained responders work to

enter for Coastal Studies. unde

SAVING THE RIGHT WHALES



STORIES FROM THE BLUE: Stormy Mayo

- By CHARLES MAYO

Charles "Stormy" Mayo is one of the founders of the Center for Coastal Studies, and was instrumental in the designation of Stellwagen Bank National Marine Sanctuary. Together with Dave Mattila and others at the Center, Mayo developed the techniques used by NOAA and other organizations to disentangle whales. This is his Story from the Blue.

My family came to Boston in 1637 and then to Cape Cod. They were mostly mackerel fishermen all the way until my father, who was a tuna fisherman. In my family's early days they would carry harpoons on all their mackerel boats and if they had a chance at a swordfish or a whale, they'd take a shot. Most of the time they weren't successful in taking whales but once in a while they would be and it was a whole year's worth of living made in one throw.

For whalers, right whales were the "right" whale to catch. The animal is very robust, slow swimming, and easy to get near, especially when

they're feeding, as is common in the Stellwagen Bank area. So right whales were relatively easy to harpoon, though usually very difficult to subdue, and they floated at the surface when killed. They have huge racks of baleen and plenty of oil, which were worth a lot.

Today, I think it's reasonable to say that there may be around 400 North Atlantic right whales. With that low population size and it being in a fairly steep decline, the situation right now is grim. So the future of the right whale in the North Atlantic is very much in doubt - we don't know for sure where the story is

EXPLORE THE BLUE



going, but we do know that in 2017 and 2018 we saw more than 20 mortalities and only five births. So the arithmetic is bad. We know now, although we didn't years ago, that entanglement in fishing gear is a big issue. For right whales it, along with low calving, may be the greatest threat to the future of the species.

The first real organized disentanglement effort was one that my colleague Dave Mattila and I, along with a group of volunteers, undertook on Thanksgiving Day, 1984. We were confronted by a whale we knew, an animal that had spent a lot of its life on Stellwagen, a young whale that I named "Ibis" and whose mother, "Pegasus," I knew well. So in a sense Ibis was a friend who was lethally entangled.

We were kind of scratching our heads about how to free her. My father was the captain of our research vessel and he said to me, "keg her." He was one of the last people to take a whale in Provincetown, and he had used beer kegs to act as floats. Whalers have historically used kegs to drag and tire whales and slow them down. We didn't have kegs, but we had big orange floats. Dave came up with the idea of using our boat's anchor as a grapple to throw into the trailing gear. The whale dragged the floats, but she was very weak - she'd been tangled and tortured

for probably a whole summer. After several hours Ibis had tired and she stopped, motionless, on the surface and we were able to free her.

We now have a full-on disentanglement program, and Dave Mattila is now working with the International Whaling Commission, bringing the disentanglement methods to fishermen and rescuers around the world.

In the early days of the Center for Coastal Studies, we had dedicated folks collecting data from whale watch boats. We realized that Stellwagen Bank was an area of particular richness for marine mammals. Working together with a group in Washington, I used our data, most collected from whale watching boats, to substantiate the value of the place and to submit a nomination to make Stellwagen a national marine sanctuary. The bank was eventually designated and of course named Stellwagen Bank National Marine Sanctuary.

The sanctuary program fosters an important vision of the bank's complex and interdependent elements, including the human and animal "users" that depend on its rich complexity. To assure the future productivity of the Stellwagen ecosystem, the sanctuary's vision identifies the need for the protection of all of its components in order to make the system work.

WE'RE GONNA NEED A BIGGER BOAT

Basking sharks are the second largest shark species in the world. Measuring up to 30 feet as adults, these enormous sharks are about as long as a school bus – but as filter feeders, they eat tiny crustaceans about the size of a grain of rice. Though basking sharks are huge, little is known about these skittish sharks, particularly about their migration patterns and how changing ocean conditions may impact their behavior. Fortunately, researchers at Channel Islands National Marine Sanctuary recently deployed some of the first basking shark satellite tags.

Above: A basking shark feeds in the Santa Barbara Channel near Channel Islands National Marine Sanctuary. Right: Sanctuary researcher Dr. Ryan Freedman affixes a satellite tag to a basking shark. Photos: (above) Kristin Campbell/Newport Coastal Adventure; (right) Pike Spector/NOAA

MYSTERIES OF THE DEEP

Though our planet is mostly ocean, we still know little about what lies far beneath the surface. Approximately 95% of the ocean remains unexplored, much of it in the deep sea. Even your national marine sanctuaries contain areas that have still not been seen by humans. NOAA's Office of National Marine Sanctuaries works with our partners to expand our understanding of sanctuaries through deep-water exploration and research. In 2019, we explored deep areas of Flower Garden Banks, Stellwagen Bank, Greater Farallones, Cordell Bank, American Samoa, and Monterey Bay national marine sanctuaries – and streamed it live to viewers at home. Check out the expeditions at sanctuaries.noaa.gov/live.









EXPLORE THE **BLUE**



MISSION: ICONIC REEFS

The coral reefs of Florida Keys National Marine Sanctuary are legendary, making up a barrier reef that spans more than 260 continuous miles. But these coral reefs, like coral reefs across the globe, are in serious trouble. In recent decades, they have been damaged by hurricanes, bleaching, disease, pollution, and heavy human use. The sanctuary and its partners are working diligently to protect the reefs, but our efforts have not been able to keep up with the decline. In response, NOAA and our partners have launched Restoring Seven Iconic Reefs: A Mission to Recover the Coral Reefs of the Florida Keys, one of the largest commitments in reef restoration anywhere in the world. By restoring corals at seven iconic reef sites in Florida Keys National Marine Sanctuary, we can change the trajectory of an entire ecosystem and help save one of the world's most unique areas for future generations.



Left page (clockwise from top left): "Trees" used to grow staghorn corals; mustard hill coral replanted at Carysfort Reef; outplanted corals on a restored coral bed in Looe Key; a diver attaches staghorn coral to the seabed; Cheeca Rocks is one area of reef being restored. Right page: Florida Keys National Marine Sanctuary is a popular recreation destination. Photos: (left page, clockwise from top left) Nick Zachar/NOAA; NOAA; Greg McFall/NOAA; Nick Zachar/NOAA; XL Catlin Seaview Survey (The Ocean Agency); (right page): Shawn Verne



EXPLORE THE BLUE









Top to bottom, left to right: rockfish, Cordell Bank NMS; sea cucumber, NMS of American Samoa; feather duster worm, Gray's Reef NMS; sponge, Florida Keys NMS; jelly, Papahānaumokuākea MNM; Greg McFall; sea urchin, Papahānaumokuākea MNM

Photos: Greg McFall/NOAA; inset: Jennifer Stock/NOAA



REMEMBERING GREG MCFALL

In early 2020, the National Marine Sanctuary System lost one of the treasured members of our family, Greg McFall. The director of the NOAA Diving Program, Greg had also served as research coordinator and superintendent of Gray's Reef National Marine Sanctuary and supported many other national marine sanctuaries. His passing is a huge loss to us and to the larger sanctuaries community. An accomplished diver and gifted photographer, Greg provided an unparalleled view of the underwater world from the Florida Keys to American Samoa. Here on these pages and throughout this year's Earth Is Blue Magazine, we celebrate Greg's legacy and his appreciation for the magnificence of the ocean.



THE BLUE AND YOU

ho's the key to protecting the ocean and Great Lakes? You are! Volunteers, visitors, and partners make the National Marine Sanctuary System a success. You help us improve access to these special ocean and Great Lakes places, remove debris and keep the ocean healthy, and more. Plus, through virtual reality we're bringing national marine sanctuaries to more people than ever before. It's all part of *The Blue and You*.

1

NOAA divers Greg McFall and Sarah Fangman pause for a selfie in Florida Keys National Marine Sanctuary. Photo: Greg McFall/NOAA

6

TEACHING A NEIGHBORHOOD TO FISH

Brannon casts off the dock in Port Hueneme, California. Inset: Brannon's son and daughter often volunteer with the Reel Guppy Program. Photos: Nick Zachar/NOAA



Some of these kids might want to be marine biologists, and where's a greater place to study than their own backyard?"

STORIES FROM THE BLUE: Kevin Brannon



Kevin Brannon is the founder of the Reel Guppy Outdoor Fishing Program in Port Hueneme, California, which teaches local kids to fish and takes them on excursions to the nearby Channel Islands National Marine Sanctuary. This is Kevin's Story from the Blue.

The Reel Guppy Program is a program I started here locally in Port Hueneme, knowing that our neighborhood needed something positive and free for kids to do. It's a way to show kids the outdoors and introduce them to fishing, which they might not otherwise get an opportunity to do. Most of these kids don't even go to the beach, and it's right in their backyard. We supply the resources – fishing poles, bait, gear – so it's no cost to them, and teach them about the environment and about stewardship for the ocean.

I grew up in the system – singleparent home, foster care – and now I want to give back to those kids. I've loved fishing my whole life. We used to fish in the creek for crawdad and carp, and I started fishing out on the Port Hueneme pier when I was about seven years old. I used a drop line with a hook I found on the floor, and a little piece of bait out of the fillet sink. It just kind of escalated from there.

Through the Reel Guppy Outdoor Program, so far we've taken over 3,000 kids out fishing. That's 3,000 kids catching a memory that will last them a lifetime, and it's starting new adventures for families. If they catch something they can eat, we process it for them and show them how, and they take it home. A lot of them come back and tell a story about how they cooked it.

One of the coolest things we do is taking kids out to Channel Islands National Marine Sanctuary, which is just nine miles away. People come from around the world to enjoy the sanctuary, but our kids don't really get exposed to it. When we bring them there, they can see what a healthy ecosystem looks like. They catch the memories of seeing healthy seagrass or dolphins swim by. To hear them jumping up and down on the boat excited to see this, it makes even our volunteers get teary-eyed. Some of these kids might want to be marine biologists, and where's a greater place to study than their own backyard?

The Reel Guppy Outdoor Program all started with family. It started with my kids – they've been in it since the beginning. I can see them now getting older, leading by example and helping out more. Our job here on Earth is to help and give back.

Basically, I live my dream every day with my family, teaching people about fishing and Channel Islands National Marine Sanctuary. I get to share that with my kids, and then they'll share it with their kids, and that's what fishing's all about.

THE BLUE AND YOU

Restoration nint Bluephint FLORIDA KEYS NATIONAL MARINE SANCTUARY

fishing and diving

Florida Keys National Marine Sanctuary protects seagrass beds, coral reef colonies, mangrovefringed islands, and thousands of marine species. But these fragile habitats are increasingly under threat. In an effort to address these threats, the sanctuary has proposed a Restoration Blueprint based on 30 years of cutting-edge science, technical experience, and local community involvement. Meeting the challenges of the future will take dedication from all of us. Learn more about the Restoration Blueprint at floridakeys.noaa.gov/blueprint.



Barracudas swim near the Alligator Reef Lighthouse. Photo: Mike Johnson









Clockwise from top right: A bluehead wrasse swims over an Orbicella coral; anglers cast into sanctuary waters; grunts and snappers aggregate at Snapper Ledge; a goliath grouper swims through the sanctuary; a diver surveys corals. Photos: Olivia Williamson; Matt McIntosh/NOAA; Daryl Duda; Nick Zachar/NOAA; Greg McFall/NOAA





Ocean **CULTURA**

- By ROBERT FANGER, HISPANIC ACCESS FOUNDATION Located off the coast of Massachusetts, Stellwagen Bank National Marine Sanctuary provides refuge for humpback whales that feed in the national marine sanctuary from April through December and migrate to lower latitudes in the Caribbean Sea, including the Dominican Republic, during the winter to mate and calve. To celebrate this geographic connection, Hispanic Access Foundation and Lawrence, Massachusetts-based Iglesia de Dios Pentecostal participated in a whale watching trip in the sanctuary during the 6th annual Latino Conservation Week last summer.

The whale watching event drew 84 church members and students from Lawrence Public Schools who learned about humpback whales and marine life, environmental career opportunities, and the protection and responsible use of marine resources.

"We want our youth and families to have meaningful educational experiences in the outdoors, and seeing the natural world in such a powerful, up-close way certainly qualifies," says Pastor Victor Jarvis. "Not only does it change perspectives on the power and importance

of nature, it encourages us all to embrace our moral obligation to preserve these treasures for those who will come after them."

In advance of the whale watch trip, students learned about whale migration, the intricate web of marine life in Cape Cod and Massachusetts bays, and the cultural and social connections between marine sanctuaries in the Eastern U.S. and the Caribbean. During the whale watch tour, students were asked to keep a sharp lookout for marine life, including whales, birds, bask-



ing sharks, ocean sunfish, jellyfish, sand lance, and sea turtles.

"Latinos are passionate about enjoying the outdoors and their stewardship of places like Stellwagen Bank National Marine Sanctuary is essential to protecting it for future generations," says Maite Arce, president and CEO of Hispanic Access Foundation. "It's vital to introduce Latinos to new opportunities, new locations, and new ways to translate their passion for the outdoors into making a difference for our nation's treasured natural resources."



It was only natural that the event took place during Latino Conservation Week, a nationwide initiative launched by Hispanic Access Foundation in 2014 that helps create opportunities for Latinos across the country to demonstrate their passion for enjoying the outdoors and to cultivate their role as environmental stewards. More than 220 organizations, parks, and agencies celebrated Latino Conservation Week with more than 160 events across the country in 2019.

"We are pleased to collaborate with Hispanic Access to increase the engagement of the local Latino community in learning about whales and other marine life, to encourage students to think about potential environmental careers, and to support stewardship programs focused on protecting our treasured natural and cultural marine resources," says Anne Smrcina, Stellwagen Bank National Marine Sanctuary's education and outreach coordinator.

Several of the participants on the whale watch were of Dominican Republic descent and many could recall seeing the whales off the coast of the Caribbean island when they were children. Even though they now call Lawrence their home, for these attendees the humpback whales are a distinct connection to their past, families, and way of life.

"The ocean is deeply tied to many Latino families' community and cultura, that we can't imagine a world without healthy oceans," says Arce. "The sea was interconnected with our communities; we recreated in it, we ate the food it provided, and our livelihoods depended on it. The ocean is a part of who we are and an inseparable part of our cultura. And it's critical that we help to protect it."

THE BLUE AND YOU

A videographer films a sea turtle in Hawaiian Islands Humpback Whale National Marine Sanctuary using a 360-degree video camera. Photo: Matt McIntosh/NOAA

DIVE INTO SANCTUARIES WITHOUT GETTING WET

National marine sanctuaries belong to everyone – but it can be hard for many people to access these underwater treasures. Virtual reality is changing that. New 360-degree images and videos take viewers on a voyage to see amazing marine habitats, animals, shipwrecks, and more. Take your own virtual reality tour at sanctuaries.noaa.gov/vr.

NATIONAL MARINE SANCTUARIES



THE BLUE AND YOU





MAKING A SPLASH AGAINST TRASH

Olympic Coast National Marine Sanctuary protects the beautiful, biodiverse outer coastline of the state of Washington. But even in this remote part of the ocean, plastic trash and other debris regularly wash up on shore, threatening marine life. The sanctuary has teamed up with Washington CoastSavers and the Million Waves Project to clean up trash from the sanctuary's beaches, convert the plastic into filament for 3D printers, and then use that filament to print prosthetic limbs for people who need them.

Clockwise from top: Million Waves Project participant Abbey McPherren tests a 3D-printed prosthetic for fit and functionality; the sun sets along the Olympic Coast; McPherren holds up trash she has collected as part of a Million Waves Project/Washington CoastSavers cleanup. Photos: (clockwise from top) James Andrew/Silver Fir Media; Kate Thompson/NOAA; James Andrew/Silver Fir Media



Winner of the "Sanctuary Life" category: Bruce Sudweeks (background photo). Schools of fish swirl around the wreck of a tugboat off Cape Lookout, North Carolina, near Monitor National Marine Sanctuary.

Winner of the "Sanctuary Views" category: Tiffany Duong (top right). Sun shines on Molasses Reef in Florida Keys National Marine Sanctuary.

Winner of the "Sanctuary Recreation" category: Olivia Williamson (bottom right): A scuba diver swims alongside a green sea turtle in Florida Keys National Marine Sanctuary.







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 2019 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.

Magazine of the National Marine Sanctuaries

VOLUME 5

MANAGING EDITORS......Kate Thompson Dayna McLaughlin Elizabeth Weinberg DESIGN/LAYOUTShannon Shikles WRITERElizabeth Weinberg ART/ILLUSTRATION Matt McIntosh CONTRIBUTORS. John Armor Kevin Brannon Ellie Cherryhomes Robert Fanger Keith Flood Marissa Garcia Susan Langley Sarah Marquis Charles "Stormy" Mayo Kalani Quiocho Vernon Smith Pike Spector Paula Stevenson McDonald PHOTOGRAPHERSKeith Flood

Peter Flood Greg McFall Matt McIntosh G.P. Schmahl Nick Zachar

GET INTO YOUR SANCTUARY PHOTO CONTEST ENTRIES

Jane Fay Baker Nathan Coy Douglas Croft Daryl Duda Tiffany Duong Chuck Graham Sepp Haukebo Mike Johnson Laura Lilly Sienna Streamfellow Bruce Sudweeks Olivia Williamson

YOUR #EARTHISBLUE 🔰 🛈 t 🚥 f

Facebook: @NOAAOfficeof NationalMarineSanctuaries Twitter: @sanctuaries Instagram: @noaasanctuaries Tumblr: @noaasanctuaries Flickr: flickr.com/photos/onms





























COMMUNITY. CONSERVATION. COLLABORATION.

From humpback whale feeding grounds off Cape Cod to coral reefs in American Samoa, NOAA's Office of National Marine Sanctuaries protects treasured places in the ocean and Great Lakes. The communities of the National Marine Sanctuary System work together to leave these ocean treasures better than we left them, for people and the planet.

LEARN MORE. JOIN US.

sanctuaries.noaa.gov



National Marine Sanctuaries









Photos: Greg McFall/NOAA