



New England  
Aquarium

# blue

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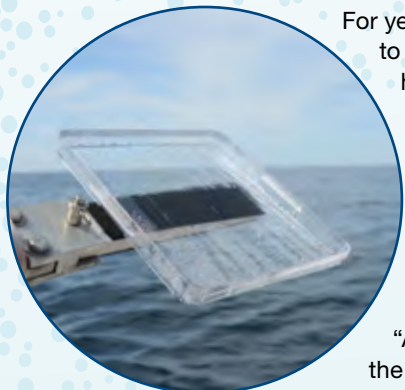
*Meet Our New President,  
Vikki Spruill*



—Emily Greenhalgh

## Blown Away: Measuring Hormones from Whale Blow at Sea

When doctors try to paint a picture of a person's health, they gather as much information as possible. The same is true for the scientists at the Anderson Cabot Center for Ocean Life at the New England Aquarium and their 50-ton patients—North Atlantic right whales.



For years, doctors have been able to measure concentrations of hormones and other compounds from human breath. Now, drawing on those same ideas, scientists at the Anderson Cabot Center have found a way to measure hormones in blow (breath) from large whales at sea.

“A marine mammal is tied to the surface in order to breathe,” said Dr. Elizabeth Burgess, lead

author on a recent paper published this summer in *Scientific Reports* and associate scientist at the Anderson Cabot Center's Marine Stress and Ocean Health program. “That's our opportunity as humans to take samples and understand these animals.”

Interpreting blow samples is difficult because samples are diluted by an uncontrolled and unknown amount of water (including seawater). The Anderson Cabot Center scientists helped solve this problem by using urea, an organic compound found in low variation in the blood. The researchers found they

could detect urea concentration within the samples of blow and use this information to correct hormone values for any water contamination. A diluted blow sample would have a lower urea concentration and vice versa. This allowed them to accurately quantify hormone concentrations and meaningfully compare levels between individual whales.

Thanks to the New England Aquarium's Right Whale Identification Catalog, which is curated by researchers at the Anderson Cabot Center, the scientists were able to positively photo-identify all 46 right whales they sampled during this study. The most pivotal whale in the study was Harmonia (Catalog #3101 in the Right Whale Catalog), a pregnant female. The team collected two blow samples and one fecal sample, which meant the scientists could compare the expected hormone patterns from their tried and tested fecal work to the blow results. Both types of samples had high progesterone levels characteristic of pregnancy.

“This project was a really classic example of extending into new, innovative technologies by leveraging decades of work done at the Aquarium,” said Elizabeth.

The scientists collected and analyzed 100 blow samples from 46 different North Atlantic right whales during this study—that's nearly 10 percent of the total population! It's the first time anyone has successfully quantified hormone levels from whale blow from large whales at sea. The research also marks the first time scientists have been able to noninvasively access near real-time hormone information. Knowing how humans are affecting right whale populations is a key part to protecting them into the future.

### Learn More

*In the months ahead, Anderson Cabot Center researchers will share more exciting science-based solutions to problems facing our oceans. Please visit [accol.org](http://accol.org) to learn more about our work or to make a donation.*

 Anderson Cabot Center for Ocean Life  
at the New England Aquarium

Senior Scientist Dr. Rosalind Rolland collects a blow sample in the field.

—Emily Greenhalgh

# Coral Reefs

## Incredibly Diverse, Gravely Threatened

Imagine a vibrant ocean environment. You'll probably picture a coral reef with its kaleidoscope of colors and spectacular biodiversity. Even cousins to our own Myrtle the green sea turtle call coral reefs home. It's easy to see why these environments have long captured the imagination of ocean lovers.

But corals aren't simply a backdrop for colorful fish and invertebrates. As anyone who has visited our Living Corals exhibit knows, corals are alive! They may resemble funny rocks, but these living animals are relatives of sea jellies and anemones. There are more than 800 known species of reef-building coral around the world and hundreds of different species of soft and deep-sea corals.

Although they're often associated with tropical paradises, corals also exist outside tropical waters. Deep-sea corals are found in all oceans, including the icy waters off Antarctica. There are even corals in the waters off the northeast coast of the United States. The Northeast Canyons and Seamounts Marine National Monument, a blue park about 150 miles southeast of Cape Cod, features a stunning array of deep-sea, cold-water corals.

Like their warm-water cousins, cold-water corals provide nursery grounds, food, and protection for a staggering number of fish and invertebrate species. Some species of deep-sea corals have been dated to more than 4,000 years old—twice the age of California's redwood trees.

Scientists estimate that coral reefs act as nurseries for about a quarter of the oceans' fish. In addition to their unique ecological importance, reefs act as a natural shield around our coasts, protecting valuable coastal infrastructure and wetlands from storms. They also bring in billions of dollars a year in tourism. According to the National Oceanic and Atmospheric Administration (NOAA), 500 million people around the world depend on coral reefs for their food and livelihoods.

Although they cover less than 1 percent of the planet's surface, coral reefs are some of the most biodiverse ecosystems in the world. They're also among the most threatened.

Warming waters from climate change, unsustainable fishing practices, invasive species, and global pollution all threaten these vital environments. Deep-sea corals and sponges are extremely vulnerable to human activities that could damage the seafloor. Dredging, seismic activity, and bottom-trawl fisheries all damage the seafloor environment, affecting corals that could take centuries to recover—if they are able to recover at all.

The New England Aquarium is dedicated to studying these ecosystems and educating the public to help the world's reefs survive and thrive. Our crown jewel, the 200,000-gallon Giant Ocean Tank, lets you experience firsthand the beauty of a Caribbean coral reef. The four-story tank features hundreds of Caribbean reef animals, including sea turtles, stingrays, eels, and fishes. Head to the top of the GOT to explore the Yawkey Coral Reef Center for an intimate view of coral reef inhabitants. Want to see live corals? Check out the Living Corals exhibit on Level 1 and sway along with the pulsing xenia or sea anemones.

Of the 800 known coral species, the majority are found in the Indian and Pacific oceans in an area known as the Indo-Pacific region. The Aquarium is in the process of creating a new exhibit to highlight this amazing area. Our new Indo-Pacific Coral Reef Exhibit will open in 2019. The 9,000-gallon, floor-to-ceiling tank will feature more than 70 different kinds of tropical reef fishes. Artificial coral expertly designed and painted by Aquarium artists will make you feel as if you're actually swimming among the colorful tangs, wrasses, and sharks.

As always, our Aquarium educators will be around to help inspire and instruct. We know corals have the best chance to adapt if humans slow climate change and reduce other human-caused stresses. How can you help? Learn all you can about these habitats and what's harming them, and then share that knowledge. Together, can we protect the blue planet.

