THE WHALE SAVERS

A DECADES-LONG QUEST TO SAVE THE NORTH ATLANTIC RIGHT WHALE IS HELPING REVIVE A SPECIES THAT IS A BELLWETHER OF THE HEALTH OF THE OCEANS.

BY DOUG STRUCK

A NORTH ATLANTIC RIGHT WHALE FEEDS OFF CAPE COD. BILL GREENE/THE BOSTON GLOBE/GETTY IMAGES

NEW ENGLAND AQUARIUM/AP/FILE

NEW ENGLAND AQUARIUM

From left: A North Atlantic right whale and her calf nuzzle in waters off the coast of northern Florida.

Researchers from the New England Aquarium in Boston track and take pictures of right whales in the Bay of Fundy.

BAY OF FUNDY, NOVA SCOTIA AND NEW BRUNSWICK

Whale No. 4091 rolled to the surface, emptied its lungs in twin steeples of steam, and raised its tail to the sky to dive again in search of food. It was quick, but Amy Knowlton fired off 21 photos from her perch on the bow of the Nereid.

Later, poring over the pictures, Ms. Knowlton meticulously compared the patterns of white calloused skin, sea lice, and small propeller cuts and identified the whale as a young acquaintance. 4091, a whale born to its mother, Echo, in 2010 off the coast of Georgia and seen in this northern bay nearly every year since, was still alive.

Knowlton could have done it with any of the 509 North Atlantic right whales still thought to exist. She and other researchers know each animal in the endangered population through a voluminous catalog of photos, histories, and biological samples.

The effort to understand – and save – the struggling northern right whale has produced one of the most exhaustive profiles of a marine species ever compiled. It includes a name-by-name history of each whale, which some compare to Jane Goodall's intimate description of Tanzanian chimpanzees. But the subject of this research lives hidden underwater.

'[THE NORTH ATLANTIC RIGHT WHALE] IS PROBABLY THE BEST UNDERSTOOD WHALE IN THE WORLD.'

– **Scott Kraus,** scientist at the New England Aquarium in Boston

And – though the researchers are reluctant to say it – their efforts are slowly working. Decimated by whalers, the northern right whale was thought to be extinct – or nearly so – in the 1950s. In 2007, their numbers were estimated at 350. Today, partly because of ship traffic changes pushed by the researchers, there are more than 500.

Not enough, says Scott Kraus, head of the most prominent clutch of researchers based at the New England Aquarium in Boston. "One good disease could wipe them out," he says. And, for reasons the researchers still guess at, the whales are reproducing at only about 2 percent per year – one-third the rate of the rebounding southern right whale and other protected species.

This majestic animal, once grimly hunted by man, is now an ironic gauge of both humanity's conscience and of the health of the oceans. While volunteers work to save it on moral grounds, scientists see the difficulties in restoring the right whale as a warning of the decline of the world's seas and a signal of the possible fate of other species.

The story of the struggling North Atlantic right whale also is a portrait of the decades-long perseverance of scientists and volunteers determined to learn more about the elusive giants. Their unparalleled accumulation of data on the species has led to knowledge – though still with gaps – that provides hope for the survival of the graceful mammal.

The Atlantic once teemed with what were thought to be thousands or tens of thousands of right whales. The huge animals often stayed near the coast and lingered at the surface, making them easy prey for Basque hunters from Spain and France more than 500 years ago.

With blubber as much as two feet thick that could be simmered into oil, and a huge grate of baleen that was used for corsets, umbrellas, and buggy whips, they were the "right" whale for hunters, which is one theory for the derivation of their name. Whale ships launched from New England and British ports pursued them voraciously from the 1600s into the 1900s.

Whaling was banned by the League of Nations in 1935. But by then, the North Atlantic right whale was nearly extinct. It was a campaign of slaughter, cruelly echoed on land by hunters of the Great Plains buffalo. Some of the remaining few whales may have been shot during World War II by nervous patrols mistaking them for enemy submarines off the coast of the United States.

Most researchers thought the population was gone. But in 1959, two researchers from the Woods Hole Oceanographic Institution in Massachusetts, Bill Schevill and Bill Watkins, were doing acoustic recordings of other whales off Cape Cod when they noticed right whales. By 1979, a survey commissioned by the federal government to consider oil exploration permits found 200 right whales.

Researchers were intrigued and began to search for more. They flew over areas long noted in whaling records and found a group in the Bay of Fundy. It was equivalent, Mr. Kraus later noted, "to finding a brontosaurus in the backyard."

▶ NEXT PAGE

With monitoring help from Delta Airlines pilots and ship captains, more congregations were found off Nova Scotia and in the calving grounds off Florida and Georgia. In 1980, the New England Aquarium began research that has created a right whale catalog based on nearly a half-million photographic images from 65,000 sightings.

The whales are now watched from their winter calving grounds as they swim up the East Coast, linger at Cape Cod in the spring, and summer in the Bay of Fundy or farther north.

Other whale species, such as the humpback and the southern right whale, have rebounded steadily. In another huge victory for cetaceans, researchers just last month hailed the rebounding of the California blue whale population to near historic levels. Earth's largest animal had been hunted to near extinction. But the North Atlantic right whale has perplexed researchers trying to understand why the increase in its numbers has been slow.

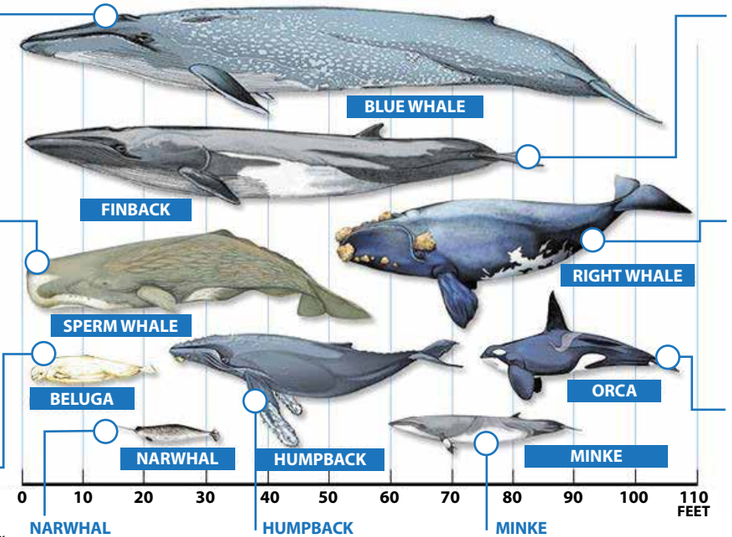
The gap in knowledge isn't for lack of trying. Researchers spend months every year cruising the waters or flying in planes looking for the whales. They have used dogs on boats to help in the effort. They have scooped whale poop for analysis, listened in on the whales' watery conversations, and fired crossbows at the animals to get a plug of skin.

They have mapped the mammals' genes, reached with long poles to capture whale breath, helped untangle the animals from fishing lines, stuck suction cups on them to record their dives, and taken hundreds of thousands of photos.

They also have spent countless hours in meetings with governmental agencies and shipping companies to reduce the aquatic roadkill of whales from ship traffic.

▶ NEXT PAGE

SIZING UP WHALES



BLUE WHALE
Population: 10,000 to 25,000
Size (weight/length): Up to 200 tons, 80 to 100 ft.
Fact: Largest animal on the planet, the size of 33 elephants.

FINBACK
Pop.: 50,000 to 90,000
Size: 80 tons, 65 to 80 ft.
Fact: Nicknamed "razorback" because of the distinct ridge on its back.

SPERM WHALE
Pop.: 200,000 to 1.5 million
Size: 35 to 45 tons, 45 to 60 ft.
Fact: Largest brain of any creature on Earth. Holds its breath for up to 90 minutes. Moby Dick was a sperm whale.

NORTH ATLANTIC RIGHT WHALE
Pop.: More than 500
Size: Up to 70 tons, 45 to 55 ft.
Fact: Marked by white calluses on its head.

BELUGA
Pop.: More than 150,000
Size: 1,500 to 3,500 lbs., 9 to 22 ft.
Fact: Social animal that migrates in pods.

ORCA
Pop.: At least 50,000
Size: Up to 6 tons, 23 to 32 ft.
Fact: Known as the killer whale. It is one of the world's most powerful predators.

NARWHAL
Pop.: More than 80,000
Size: Up to 4,200 lbs, 17 ft.
Fact: Has a long spiraled tusk that makes it look like a marine unicorn.

HUMPBACK
Pop.: More than 56,000
Size: 40 tons, 48 to 62 ft.
Fact: Known for its magical sounds, which travel great distances.

MINKE
Pop.: More than 1 million
Size: Up to 15 tons, 35 ft.
Fact: Fast, elusive, and friendly: It often approaches boats and surprises passengers.

SOURCES: Smithsonian Institution, National Oceanic and Atmospheric Administration, New England Aquarium, World Wildlife Fund, American Cetacean Society

RICH CLABAUGH/STAFF

▶ FROM PREVIOUS PAGE

"This is probably the best understood whale in the world," Kraus says. He estimates 20 to 30 scientific teams have studied right whales, and more than a dozen are currently involved in the effort. Volunteer observers, including the crews of commercial "whale watch" tour boats and ferry captains, regularly contribute photos.

The effort has brought cooperation from an unusually wide group. Canada and the US, the National Marine Fisheries Service, the National Oceanic and Atmospheric Administration, and state agencies in Florida and Georgia share information. Research outfits such as the Woods Hole Oceanographic Institution combine with others ranging from the US Navy to universities such as Syracuse, Cornell, Duke, Rhode Island, and North Carolina Wilmington.

'IT'S PRETTY GRUESOME. WE HAVE SEEN QUITE A NUMBER OF ANIMALS WITH COMPLEX [FISHING GEAR] ENTANGLEMENTS THAT END UP DYING OR DISAPPEARING.'

– **Amy Knowlton,** whale researcher

Their combined knowledge of right whales will be tested by what many researchers say is a new threat. The federal government, carrying out a 2010 promise by President Obama to open up the Atlantic East Coast to oil exploration, has taken steps to permit drilling companies to use seismic cannons to probe for undersea deposits from Delaware to Cape Canaveral, Fla. – the precise yearly route of the right whales.

The cannons would blast a shock wave of sound underwater every 10 to 15 seconds for many days during testing. Some scientists say adding the explosions to the environment of mammals that are extremely sensitive to underwater sounds may block communication and feeding. "This could really affect the population in terms of being able to find each other," says Douglas Nowacek, an associate professor of conservation technology at the Duke University Marine Lab in Beaufort, N.C. "These sounds can travel tens of hundreds of kilometers – you can't see that far," says Sofie Van Parijs, who studies whale acoustics at the Northeast Fisheries Science Center in Woods Hole, Mass. "Having this extra level of noise added to the ocean is going to add to the loud cacophony of man-made noise out there."

Federal regulators say they are sensitive to the impact on whales. They will impose restrictions on when the seismic testing can be done, and require the testing to stop when whales are seen or heard in the area.

"These [seismic] surveys are being conducted and have been conducted for a long time without adverse impacts to animals" in the Gulf of Mexico, argues William Brown, chief environmental officer of the federal Bureau of Ocean Energy Management. "There hasn't been any example of a marine mammal being killed by the sound of an air gun."

The dispute illustrates the difficulty of studying creatures that are elusive, mostly unapproachable, and uncommunicative (with humans). The aquarium's Rosalind Rolland, a veterinarian by training, pioneered the use of dogs on boats to sniff out whale feces, and now, with three other researchers, is analyzing hormones from the "blow" of whales.

"These animals weigh 50 tons and are 60 feet long," she says. "I can't use the usual approaches [scientists use in studying] the physiology of dogs or cats." But by capturing their exhaled breath, she says, "you can get the same information that you could with a blood test."

It is hard work to spot the whales and get close enough to collect samples before they disappear, she acknowledges. "People who get discouraged usually don't go into this work."

Dr. Rolland and Susan Parks, an assistant professor of biology at Syracuse University in New York, provided a clue now widely cited by researchers to illustrate the effects of man-made noise on whales. Ms. Parks was studying acoustics and Rolland was measuring stress levels of whales in hormone samples on Sept. 11, 2001.

Shipping abruptly halted for about a week in the aftermath of the attacks on New York and Washington, D.C.

"It made this huge experiment," Parks says. "Both noise levels and the stress levels showed a dramatic drop that we haven't seen in any other year."

Many of the conclusions of researchers come from sweating

▶ NEXT PAGE

YAN GUILBAULT/NEW ENGLAND AQUARIUM

A right whale flashes its fluke as a ship passes nearby. Regulatory changes to shipping lanes by both the United States and Canada have dramatically reduced the number of whales that have been hit by commercial vessels.

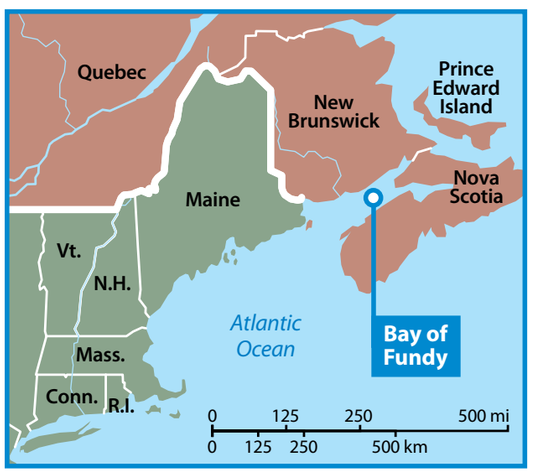
over data that is subtle and less obvious. The long research records being compiled by the scientists only gradually reveal patterns and behavior. But the extensive catalog compiled by the aquarium is now the go-to repository for identifying right whales, and the in-depth information on the individual whales is consulted worldwide.

"The power is that you know the animals that were successful, those that weren't, those that died, that were entangled.... You know their age, their sex, their health," Kraus says. "These individuals collectively make up the population, and it's really powerful."

"We are really trying to understand the right whale story," Knowlton adds. "That's the value: You know the individual and what's happening with it. I do think we are making a difference."

The extensive data can even be used to solve cold cases. A 1935 New York Herald Tribune reporter watched Florida sport fishermen who had come across a right whale and her calf. Deciding to kill the one-ton calf, the men speared it repeatedly over six hours and shot

▶ NEXT PAGE



RICH CLABAUGH/STAFF

▶ FROM PREVIOUS PAGE

more than 100 rounds from a rifle to drive the mother away. Decades later, Knowlton examined the photos in the newspaper and identified the mother. She had survived, and had been photographed in 1980 and again in 1995 – but never again with a calf.

Knowlton, like many others tracking the right whale, started out as a volunteer. She grew up near boats on Buzzards Bay on the southern Massachusetts coast, and eventually earned a master's degree in marine policy and a captain's license. She has been tracking the whales for 32 years.

She and as many as 20 other researchers spend each August and September at a rambling house in Lubec, Maine, a down-at-the-heels fishing village at the easternmost point of the US. This summer, they worked in four teams to survey the whales, identify the animals for the catalog, monitor acoustics, and sample respiration of the whales.

Knowlton explained her work as the Nereid, a 30-foot powerboat owned by the aquarium, bounced through the ragged waves of the Bay of Fundy on a whale survey in August. Buoys tethered to a thicket of lobster traps lined their route to open waters, where earlier this summer the researchers spotted more than 30 separate whales each day for nearly a week, a bonanza of research. "We were elated," said Knowlton.

Water sprayed over the bow in the choppy water. Monica Zani, an assistant scientist at the aquarium, was at the helm and peered through windshield wipers. Bundled against the spray and the cold, volunteer Bill McWeeny and research assistant Orla O'Brien scoured the water for activity. On the bow, spotters used hand signals to indicate what they were seeing: fin whale, minke whale, sperm whale, humpback whale, harbor porpoise. Marilyn Marx watched their signals and entered the data in a computer shielded from the spray. Sleek shearwaters and stubby Atlantic puffins whipped past the boat a few feet above the surface.

Ms. Zani came to the mammal work from being captain of a whale-watch boat. She took school groups on tours in Boston Harbor, and in 2000 joined the aerial surveys over the right whale calving grounds off the southeastern US. That year the group was alarmed to find only one calf. The next year, there were 30.

On this day, Zani is the official "whale watcher," responsible for quickly drawing diagrams of the skin patterns observed as the mammals surface to supplement the photos. In off moments, she flips through a thick notebook with vinyl-coated pages on each whale.

Volunteer Mr. McWeeny teaches science at a middle school in Castine, Maine. He spent his first summer in 1983 helping spot what he calls "the beautiful creatures." He takes his summer experiences back to the classroom. His students are organized into research groups, named the "Calvineers" after one of their favorite whales, and they study whale problems. They are rewarded with a whale-watch trip. Like the others, he has agonized through the lean years of sightings, afraid the whale population had suddenly plunged or moved elsewhere.

The erratic results of their sightings show many mysteries still exist about right whales, despite how much they are scrutinized. Only in 2013 did Tim Cole, a researcher with the Northeast Fisheries Science Center at Woods Hole, answer a longstanding question of where courting whales gather in the winter to mate (a spot in the middle of the Gulf of Maine, he found). Calf birthings and whale sightings can vary widely from year to year, often perplexing the observers. Last summer, the aquarium survey teams saw only five whales all summer in the Bay of Fundy.

"We had our fingers crossed this year," said McWeeny, from under his trademark leather hat aboard the Nereid. "The first day out, we got about 35 whales." At the end of the afternoon, they turned off the motor and sat quietly on the water to listen. The bursts of breath and swish of fluting whales washed over them. "All around us were the right whales."

Scientists have been successful at removing some of the threats facing right whales, but others persist. Once the harpoons were stilled, the biggest immediate danger to the whales was being hit by ships or gouged by propellers. David Laist from the Marine Mammal Commission in Bethesda, Md., worked with Knowlton and aquarium scientist Dan Pendleton to show that an average of three whales were killed every four years from ship strikes.

▶ NEXT PAGE

'THESE ANIMALS WEIGH 50 TONS AND ARE 60 FEET LONG. I CAN'T USE THE USUAL APPROACHES [SCIENTISTS USE IN STUDYING] THE PHYSIOLOGY OF DOGS OR CATS.'

– Rosalind Rolland, a researcher studying hormones from the 'blow' of whales

BRIAN SKERRY/NATIONAL GEOGRAPHIC

Researchers brandish cameras on the 30-foot boat Nereid as a group of right whales breaches, as if on cue, for a photo op.

'EVERY TIME WE WENT TO A DEAD WHALE ON THE BEACH IT WAS SOMEBODY WE KNEW.'

– Scott Kraus, whale scientist

With only 115 adult females remaining, the loss of even one – which could potentially give birth to a calf every three years over a life span of 70 years or longer – can be a blow to recovery.

Combing through 58 reported strikes of large whales, the researchers concluded a ship cruising at 14 knots would usually kill a whale it hit. The risk of serious injury dropped at speeds below 10 knots. The scientists persuaded shippers and the federal government to honor a 10-knot speed limit within 20 nautical miles of shore during whale seasons.

It took them 11 years to do it.

Meanwhile, Moira Brown, a senior scientist at the aquarium, spearheaded an effort working with Canadian authorities to move shipping lanes away from documented whale hangouts in 2003 and declare other Canadian whale spots "areas to be avoided" by commercial ships. In 2007, David Wiley, a researcher at the Stellwagen Bank National Marine Sanctuary in Scituate, Mass., persuaded US officials to seasonally shift Boston shipping lanes to avoid clusters of whales.

Those efforts showed dramatic results. The researchers have found no whale carcasses floating up near the managed shipping lanes since the limits were imposed. Last year, the National Marine Fisheries made the lower speed limits permanent, based on the researchers' findings.

"It's an example of something you can do if you are really, really persistent," Ms. Brown said. "An unprecedented success."

The challenge now is fishing gear. One section of the notebook researchers keep on each whale contains silhouettes of the leviathans dragging lines, ropes, buoys, and other gear. "It's pretty depressing to know these [entangled whales] are out there," says Zani. There is a "quick response team" that can race from shore in Zodiac vessels to try to cut ropes from entangled whales, but it is often not successful.

Knowlton and other aquarium scientists combed through the whale sightings and concluded that 83 percent of the whales have injuries from becoming entangled. A favorite of the researchers, an animal named Admiral, showed up in successive years with deep, festering rope wounds that seemed infected. The animal disappeared after 2007.

"It's pretty gruesome," Knowlton says. "We have seen quite a number of animals with complex entanglements that end up dying or disappearing." She is looking to see if there is a statistical link between stronger fishing ropes developed in the 1990s and whale entanglement wounds. "I think the ropes are too strong, maybe even stronger than the fishermen need," she says.

Climate change poses another threat. Some fret that the rising temperature of the seas from global warming will propel the whales away from their traditional congregating areas. Scientists worldwide are documenting the shifts in movements for a range of species, from sharks and sea turtles to crabs and tropical fish.

Surprisingly, these largest of animals feed on some of the smallest creatures. They filter vast quantities of water through their mouths, straining it through baleen plates to capture copepods, tiny zooplankton the size of rice. Some evidence suggests the zooplankton are moving north as the Atlantic warms, and the whales are likely to follow. Another team, headed by Brown, found many whales in Roseway Basin, 35 miles south of Nova Scotia, this summer. Other right whales have been spotted in the Gulf of St. Lawrence.

Kraus, who dubbed the right whale the "urban whale" in a 2007 book edited with Rolland, believes the whales are struggling to survive in an "industrialized ocean." They are buffeted by pollutants carried into the sea by North America's eastern rivers and assaulted by an acoustic din of ships, underwater drilling, seismic testing, and even naval explosive testing.

"It could be their food. It could be cumulative – being in the tailpipe of the East Coast with pharmaceutical pollution, oil runoff, pesticides in the water, and this accumulating noise," he says of the whales' woes. "You won't see the end results of this kind of activity until many years after they have just faded away."

Sitting in the communal kitchen of the researchers' Lubec house, under a large portrait of Admiral painted on the wall, Kraus insists he is not sentimental about the animals.

"You are not, like Jane Goodall, sitting with the chimps in the forest for days on end," he says. "You don't have personal interaction with them. They live in a world that is alien to us."

But he says some researchers have stopped helping with the necropsy that is done on washed-up dead whales to determine the cause of death. "Every time we went to a dead whale on the beach it was somebody we knew," Kraus says.

He sees the right whale as a valuable indicator of the vitality of oceans and a good "poster whale" for the environment.

"People love whales. We can use charismatic megafauna to get people to understand that you don't just save the animals, you save the home of the animal," he says. "If you don't save the home, there won't be any animals." ■