

Stellwagen Bank National Marine Sanctuary

Designated in 1992 under the Marine Mammal Sanctuaries Act, Stellwagen Bank National Marine Sanctuary (SBNMS) is one of 14 sites in the USA National Marine Sanctuary System. The sanctuary encompasses 638 nm² (2180 k²) of open ocean across the mouth of the Gulf of Maine, with a mission to protect the natural environment while maintaining a balance with the commercial and recreational uses of the area. Some 17 species of marine mammals have been seen in SBNMS at one time or another, but there are several species that are regular visitors including humpback whale, fin whale, minke whale, northern right whale, Atlantic white-sided dolphin, harbor porpoise, pilot whale, and harbor seal.

The Gulf of Maine/SBNMS humpback whales are the most studied population of baleen whales in the world with a data set going back 35+ years. The North Atlantic Humpback Whale Catalog, which represents the five North Atlantic feeding stocks as well as the West Indies breeding population, contains more than 9,000 fluke photographs. The catalog, maintained by Allied Whale at the College of the Atlantic in Bar Harbor, Maine, allows scientists and naturalists to identify and monitor individual animals, and gather valuable information about population sizes, migration, health, sexual maturity and behavior patterns.



SBNMS map, border outlined in red.

Stellwagen Bank itself was formed when retreating ice age glaciers left an underwater plateau that is shallower than the surrounding deep seas. As a result deep, cold water "bumps up" against the bank and rises toward the surface, initiating a process called upwelling, which starts a rich food chain supporting large numbers of fish, seabirds, and large whales.

The North Atlantic Humpback Whale Sister Sanctuary Program (NAHW-SSP)

The NAHW-SSP was initiated in 2006 by Stellwagen Bank National Marine Sanctuary (SBNMS) to facilitate the effective management of a *shared* population of about 1,000 endangered humpback whales (*Megaptera novaeangliae*) across jurisdictional boundaries throughout its migratory range, from feeding and nursery grounds in the Gulf of Maine to breeding and calving areas in the Caribbean.

To date, the North Atlantic Humpback Whale-Sister Sanctuary Program (NAHW-SSP) includes 5 member nations — Dominican Republic, Bermuda, the French Antilles, the Caribbean Netherlands and the United States — and is a pioneering program in support of the United Nations Environment Programme's Specially Protected Areas and Wildlife's Marine Mammal Action Plan for the Wider Caribbean Region (UNEP/SPAW-MMAP). The initiative has forged the marine mammal protected areas network (MaMPAN), the first such international partnership in the world protecting one of the ocean's most iconic species throughout its North Atlantic migratory range.

The multi-sanctuary, science-based program has increased the area of protection for North Atlantic humpback whales from 638 nm² (2180 km²) in SBNMS to 194,936 nm² (699,429 km²) total area of sanctuaries combined over the past ten years, making it one of the largest networks of coordinated marine conservation areas in the world. As additional sites join, this chain of sister sanctuaries will help to ensure a safer future for the North Atlantic's endangered humpback whales.

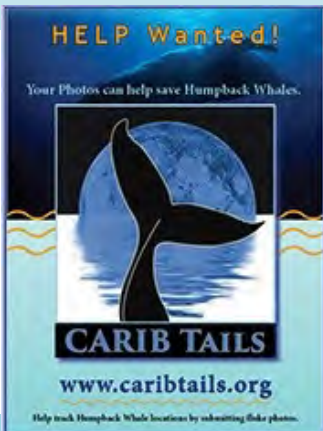
Sanctuary Research and Benefits

Stellwagen Bank National Marine Sanctuary (SBNMS) supports research and outreach activities focused on environmental and resource protection, and has relationships with many other academic and non-governmental research organizations located in the area. Activities include:

Whale Watching: SBNMS has been identified by the World Wildlife Fund as one of the top ten whale watching spots in the world, and has recently been voted the #1 Best Place to See Aquatic Life in USA Today's latest reader's choice contest. Dozens of whale watching companies operate in the region and attract more than a million tourists a year to the sanctuary area. Whale watching has become a significant aspect of the tourism economy, providing critical economic support to local communities. Most whale watching companies offer trained naturalists on board who provide commentary during the trips, collect data and fluke photographs for ongoing cetacean research programs, and serve an important role as professional observers of the local whale population.



Whale watching is an important local industry.



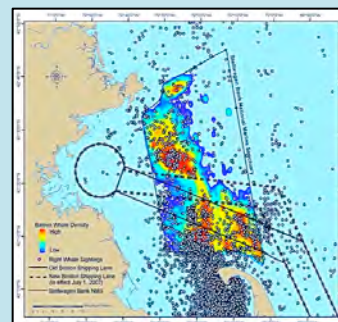
CARIB Tails: In 2014 the Sister Sanctuary Program established an ongoing internet-based project to enlist recreational sailors and cruisers as citizen scientists to take a special role in research by photographing the distinct patterns on the tails of humpback whales and helping to track the movements of humpback whales between their Gulf of Maine/SBNMS feeding grounds and their breeding grounds in the Caribbean. Contributions of tail fluke photographs, especially from the Eastern Caribbean region, are critical for understanding migratory routes and specific breeding areas, and for advancing conservation efforts. The project is an international research collaboration between Stellwagen Bank National Marine Sanctuary (SBNMS) and its Sister Sanctuary Program partners, together with UNEP's Caribbean Environment Programme. For more information: www.caribtails.org

Humpback Underwater Behavior: Research data on the underwater behavior of humpback whales is collected by temporary non-invasive digital recording tags used with data visualization software, or video recordings from similar "critter-cams". An important use of this information is to understand the relationship between feeding behavior and entanglement in fishing gear in order to help develop safer fishing equipment and methods.



Placing a digital recording tag on a humpback whale. The D-tag records depth and body orientation (pitch, roll, heading).

All images: SBNMS



Map shows the realignment of the shipping lanes into the Port of Boston to reduce the risk of ship strikes to baleen whales in SBNMS.

Shipping Lanes Change: Based on 25 years of recorded whale sightings correlated with current ship traffic data, in 2006 the International Maritime Organization approved a proposal to narrow and move the Boston area shipping lanes that cross SBNMS and from the Port of Boston. The Traffic Separation System (shipping lanes) were moved 12 degrees to the north, which greatly reduced the risk of vessels striking whales—by up to 81% for all whales (humpback, fin, minke, northern right) and by up to 58% for the critically endangered right whale—while minimally impacting shipping interests.

International Programs

Sister Sanctuary Agreement Established with Bermuda

In 2012, NOAA's Stellwagen Bank National Marine Sanctuary (SBNMS) and the Bermuda Government signed a Sister Sanctuary Agreement with pledged cooperation on scientific and educational programs to better protect the endangered North Atlantic humpback whale population.

This sister sanctuary partnership was developed under the auspices of the Sargasso Sea Alliance – an international effort led by the Government of Bermuda to protect the unique ecosystem of the Sargasso Sea and its iconic species. Humpback whales are long-distance migrants but highly faithful to specific feeding and breeding areas. Long-term research shows that they spend the summer and fall in the rich feeding grounds of Stellwagen Bank National Marine Sanctuary, and then in late fall migrate some 1,500 miles south to the warmer waters of the Caribbean to mate and give birth to their young. Bermuda, a critical migration corridor, is located about 650 miles east of the North Carolina coast.

Bermuda's marine mammal sanctuary encompasses its entire Exclusive Economic Zone (EEZ), roughly a 450,000 square kilometer circle of jurisdictional ocean. The sister sanctuary relationship is a significant contribution to the awareness and protection of this shared population of humpback by providing new avenues for collaborative education, scientific research and resource management, including joint monitoring of protected species and development of outreach programs.

Bermuda's Marine Mammal Sanctuary was created consistent with the objectives of the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean (the Cartagena Convention) and its Protocol on Specially Protected Areas for Wildlife (SPAW), and the Bermuda Protected Species Act of 2011, which recognizes the importance of, and provides the tools for, protecting critical humpback whale habitats and their migratory corridors.



SBNMS and Bermuda's marine mammal sanctuaries work together in the following areas:

- Exchange of whale fluke (tail) photos for humpback whale population studies and related citizen science programs;
- Exchange of technical information, scientific data and practical experiences in managing marine mammal protected areas, including staff exchanges and site visits;
- Development and assessment of methodologies for natural resource protection within marine mammal protected areas; and
- Development, coordination and evaluation of research and monitoring programs, outreach and education programs, and community engagement strategies

The North Atlantic Humpback Whale Sister Sanctuary Program helps improve knowledge about humpbacks in the North Atlantic and the threats they face from both natural and man-made changes to their environment. The relationship is crucial to the long-term conservation of the North Atlantic humpback whale population, as well as to the development of future cooperative agreements with other countries.

International Programs

Sister Sanctuary Agreement Established in French Antilles

In 2011, NOAA's Office of National Marine Sanctuaries and France's Marine Protected Areas Agency signed a Sister Sanctuary agreement to protect endangered humpback whales that migrate annually between NOAA's Stellwagen Bank National Marine Sanctuary and the Agoa Marine Mammal Sanctuary in the French Antilles. This area includes the islands of Guadeloupe, Martinique, St. Martin and St. Barthelemy at the Caribbean's eastern edge. The agreement has since been renewed through 2020.

Both sanctuaries provide critical support for the North Atlantic population of humpback whales, which spend spring and summer at Stellwagen Bank sanctuary and other northern feeding grounds before heading south to the warmer waters of the Caribbean Sea in late fall to mate and give birth to their young.

The Agoa Marine Mammal Sanctuary was declared in September 2010, in recognition of the vast diversity of marine mammal species present in the French Antilles and the Caribbean in general, and of the potential threats facing these marine mammals and their habitats. Agoa's entire 143,256 square-kilometer French Exclusive Economic Zone (EEZ) is currently defined as a critical habitat for marine mammals. In all, 25 of the 28 cetacean species that can be found in the Caribbean Sea, including baleen whales and toothed whales, have been documented in the French Antilles.

Agoa was created consistent with the objectives of the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean (the Cartagena Convention) and its Protocol on Specially Protected Areas for Wildlife (SPAW), and SPAW's Marine Mammal Action Plan for the Wider Caribbean. The Agoa MPA was listed as a special SPAW area in 2012.



The sanctuary's name, Agoa, refers to the goddess of the sea in Amerindian mythology.

The objective of the sanctuary is to ensure the conservation of marine mammals, within the framework of a harmonious co-existence with human activities. Today hunting is no longer practiced in French waters, but other threats include an increase in maritime traffic, noise pollution, pollution and degradation of marine environment habitats, and an increase in whale watching, which may contribute to behavioral disturbance. Within Agoa, provisions are being made to remove or reduce the negative effects of the activities having an impact on the well being of marine mammals or the integrity of their population.

Under the auspices of UNEP's SPAW Protocol, the sister sanctuary agreement helps improve humpback whale recovery in the North Atlantic by providing new avenues for collaborative education, scientific and management efforts, including joint research and monitoring programs.

Region, which recognizes the importance of protecting critical humpback whale habitats and migratory corridors.

The North Atlantic Humpback Whale Sister Sanctuary Program (NAHW-SSP) helps improve knowledge about humpbacks in the Atlantic and the threats they face from both natural and man-made changes to their environment. The NAHW-SSP is crucial to the long-term conservation of the endangered North Atlantic humpback whale population, as well as to the development of future cooperative agreements with other countries.

Footprints



*"Footprints" photographed in US/ SBNMS in 2008.
Credit: Center for Coastal Studies*

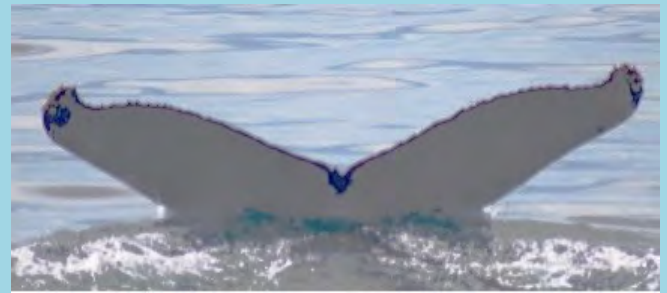
When a humpback whale named "Footprints" was photographed in 2008 in the Gulf of Maine's northern feeding ground, and in 2011 in the southern breeding/calving ground off Guadeloupe, it was the first photo match confirming the migration exchange between Agoa and Stellwagen Bank National Marine Sanctuary.

After decades observing whales in the Gulf of Maine, the northwestern Atlantic and the Caribbean, scientists have been able to identify a number of individual humpback whales as they migrate north and south. But whales visiting the eastern Caribbean remain somewhat of a mystery.

The photo match for "Footprints" was the first successful pairing of images under a new international citizen science humpback whale tracking and identification project called CARIB Tails, launched by Stellwagen Bank National Marine Sanctuary and its sister sanctuary partners. Sailors and yachters are the key contributors, especially in the remote and under-surveyed areas of the Eastern Caribbean.

In coordination with the United Nations' Caribbean Environment Programme's SPAW Protocol and its Regional Activity Centre (Guadeloupe), the North Atlantic Humpback Whale Sister Sanctuary Program and its network of marine mammal sanctuaries (MaMPAN), supports the protection of the North Atlantic population of humpback whales in the U.S., the French Antilles, Bermuda, the Dominican Republic and the Caribbean Netherlands.

For more information: www.caribtails.org



*Footprints re-sighted in Agoa, Guadeloupe in 2011.
Credit: Association Evasion Tropicale.*

Photo-Identification

Humpback whales have patterns of black and white pigmentation and scars on the underside of their tails that are unique to each whale, just as fingerprints are to humans.

For scientific purposes, humpback whales sighted in the North Atlantic are assigned a catalog number in the North Atlantic Humpback Whale Catalog (NAHWC) maintained by the College of the Atlantic in Bar Harbor, Maine U.S.A. The NAHWC is one of the longest and most detailed data sets for baleen whales in the world.

Photographs in the catalog (n=9,000), including date and location, allow scientists and naturalists to identify and monitor individual animals and gather valuable information about migration patterns, population sizes, health, sexual maturity and behavior patterns.

International Programs

World's First Sister Sanctuary Agreement Links US Stellwagen Bank National Marine Sanctuary and the Dominican Republic's Silver Bank and Navidad Bank Sanctuary

In 2006, the United States' National Oceanic and Atmospheric Administration (NOAA) and the Dominican Republic's Ministry of Environment and Natural Resources established the world's *first* Sister Sanctuary agreement to protect the endangered humpback whale between NOAA's Stellwagen Bank National Marine Sanctuary (SBNMS) and the Santuario de Mamíferos Marinos de la República Dominicana (SMMRD). The agreement has since been renewed through 2016.

Humpback whales are long-distance migrants but highly faithful to specific feeding and breeding areas. Long-term research shows that individuals spend the summer and fall in the rich feeding grounds of Stellwagen Bank National Marine Sanctuary in the Gulf of Maine and then in late fall migrate some 1,500 miles south to the warmer waters of the Caribbean to mate and give birth to their young.

The Dominican Republic was the first Caribbean nation to establish a marine mammal sanctuary. The Silver Bank and Navidad Bank Humpback Whale Sanctuary was created in 1986 and expanded in 1996 and 2004 to include Navidad Bank and part of Samana Bay, covering the three main humpback breeding grounds in Dominican waters.



Map of Santuario de Mamíferos Marinos de la República Dominicana

Today the Dominican Republic's sanctuary protects all marine mammals within its 32,879-square kilometer area. The area attracts the largest breeding aggregation of humpback whales in the North Atlantic, with more than 3,000 individuals sighted within a season.



Salt's Flukes

Photo: Provincetown Center for Coastal Studies

The first documented sighting of a whale from Stellwagen Bank on Silver Bank off the Dominican Republic was "Salt" in 1975. Her sighting confirmed the north-south migration route of humpback whales. Since then, researchers have found that a significant number of mother-calf pairs from Dominican waters make the trip to Stellwagen Bank, where the young learn to feed and mothers regain weight after their winter-long fast and nursing period.

El Santuario de Mamíferos Marinos de la República Dominicana was created consistent with the objectives of the United Nations Convention for the Protection and Development of the Marine Environment of the Wider Caribbean (the Cartagena Convention) and its Protocol on Specially Protected Areas for Wildlife (SPAW), and its Marine Mammal Action Plan, which recognizes the importance of protecting critical humpback whale habitats as well as their migratory corridors.

The sister sanctuary agreement between NOAA's Stellwagen Bank sanctuary and El Santuario de Mamíferos Marinos de la República Dominicana helps improve humpback whale recovery in the North Atlantic by increasing public awareness and support for marine mammal conservation through joint research, monitoring, education and capacity building programs, and helps improve knowledge about humpbacks and the threats they face from both natural and man-made changes to their environment.

The sister sanctuary relationship is crucial to the long-term conservation of the North Atlantic humpback whale population, as well as to the development of future cooperative agreements with other countries.

<http://stellwagen.noaa.gov>

SALT: The Grand Dame

A humpback whale named "Salt" makes a 3,000-mile round-trip journey each year—swimming from the colder waters of the North Atlantic to the warm waters of the Caribbean Sea.

Salt is one of the most famous humpback whales in the world. She is known as the "Grand Dame of Stellwagen Bank" because she has been seen on Stellwagen Bank sanctuary in the Gulf of Maine in all but one summer since 1976. She is also the first Gulf of Maine humpback whale to have been seen by researchers in 1979 on Silver Bank off the Dominican Republic.

Her sighting confirmed the north-south migration route of humpback whales. Since then, researchers have found that a significant number of mother-calf pairs from Caribbean waters make the trip to Stellwagen Bank NMS, where the young learn to feed and mothers regain weight after their winter-long fast and nursing period.



These days, humpbacks are given names based on the unique pattern on the underside of their tails.

Salt's tail flukes.



However, Salt's name was inspired by the thick white scarring on her dorsal fin that made it look like it was encrusted with salt.

Salt is a great-grandmother. Since 1976 she has escorted 13 of her calves from the mating and calving grounds in the Caribbean back to New England's feeding grounds. She currently has 11 grandchildren, and one great-grandchild, representing the fourth generation of humpbacks in her family group.



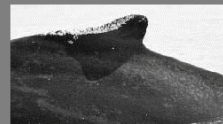
Map showing humpback whale migration range between Stellwagen Bank National Marine Sanctuary and Sister Sanctuaries in the Caribbean.

Salt's Family Tree

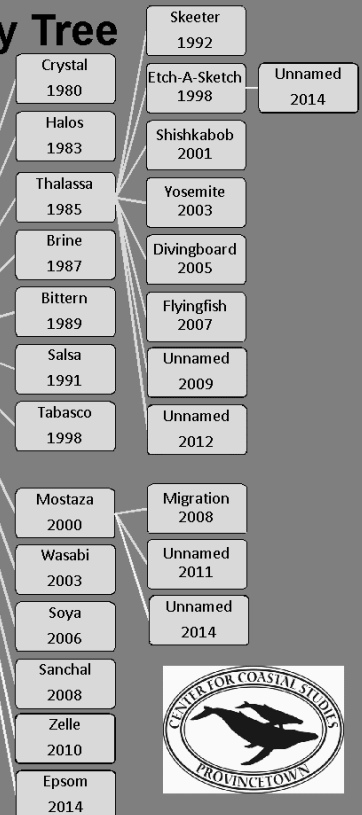
Salt is one of the most well-known humpback whales in the world. She has been studied by CCS since the mid-1970s.



Whales like Salt are not only well-loved by whale watchers but also key to our understanding of humpback whale biology, ecology and threats.



Salt was named for the white scarring on her dorsal fin



Salt's Family Tree

International Programs

Caribbean Netherlands Joining Sister Sanctuary Program

In September 2015, the Caribbean Netherlands established the Yarari Marine Mammal Sanctuary, encompassing the territorial waters as well as the Exclusive Economic Zone surrounding the islands of Saba and Bonaire. Stellwagen Bank National Marine Sanctuary (SBNMS) and the Caribbean Netherlands have worked under a sister sanctuary Letter of Agreement since 2011, and formal plans for a Sister Sanctuary Memorandum of Agreement (MOA) are expected in 2016.

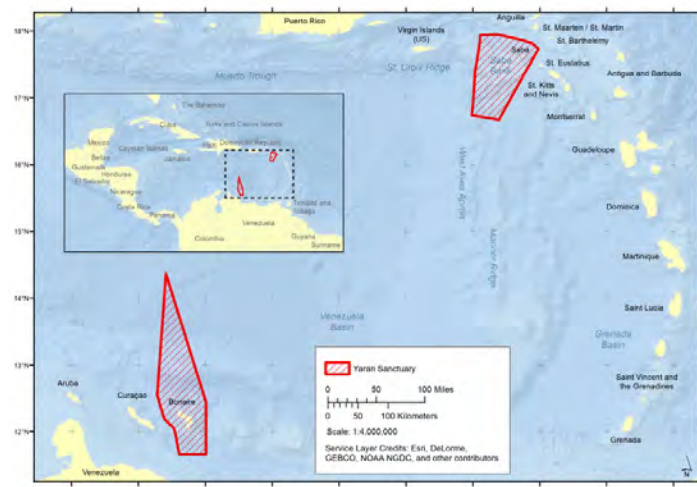
The Caribbean Netherlands is the fifth nation member of UNEP's Caribbean Environment Programme to become part of the Marine Mammal Protected Areas Network (MaMPAN). With the addition of Yarari, the multi-sanctuary, science-based North Atlantic Humpback Whale Sister Sanctuary Program (NAHW-SSP) has increased protection for humpbacks from 2,180 sq. km to 699,456 km² total area of sanctuaries combined over the past ten years.

Tail fluke photos from Saba, gathered through SBNMS's CARIB Tails citizen science project are analyzed and matched within the North Atlantic Humpback Whale Catalog, which is maintained by Allied Whale at the College of the Atlantic, Maine USA. These contributions already offer new perspectives about the timing and movement patterns of humpback whales from the southeastern Caribbean.



Yarari is a Taíno Indian word meaning 'a fine place.' The Yarari sanctuary, containing critical habitat for marine mammals, is of particular importance for the conservation of marine mammals and provides support for humpback whale breeding, calving, feeding, resting, and migration behaviors.

The objective of Yarari is to provide a refuge for the protection and conservation of marine mammals and sharks and their habitats from negative impacts of human activities, whether direct or indirect, actual or potential.



Map showing the Yarari Marine Mammal and Shark Sanctuary, in the waters surrounding the islands of Saba and Bonaire.

Yarari was created consistent with the objectives of the United Nations' Convention for the Protection and Development of the Marine Environment of the Wider Caribbean (the Cartagena Convention) and its Protocol on Specially Protected Areas for Wildlife (SPAW), and its Marine Mammal Action Plan (MMAP) for the Caribbean region, which recognizes the importance of protecting critical humpback whale habitats and migratory corridors.

The North Atlantic Humpback Whale SSP will help improve knowledge about humpbacks in the Atlantic and the threats they face from both natural and man-made changes to their environment. NOAA anticipates the relationship will be crucial to the long-term conservation of the endangered humpback whale population, as well as to the development of future cooperative agreements with other countries.

Multiple Sightings

The first humpback whale identified from Yarari MMS (Saba Bank) in 2014 via the Sister Sanctuary Program's CARIB Tails citizen science project.



Photographer: Jimmy Van Rijn (Saba Marine Park)

The most recent Yarari MMS (Saba Bank) fluke submitted. This individual was first seen on Silver Bank (off the Dominican Republic) in 1980 and again on Silver Bank in 2004. The individual is at least 36 years old.



Photographer: Leslie Ravel (Yarari MMS)

Making Matches

After decades observing whales in the Gulf of Maine, the northwestern Atlantic and the Caribbean, scientists have been able to identify a number of individual humpback whales as they migrate north and south. But whales visiting the eastern Caribbean remain somewhat of a mystery.

Yarari has contributed three fluke photographs under a new international citizen science humpback whale tracking and identification project called CARIB Tails, launched by Stellwagen Bank National Marine Sanctuary and its sister sanctuary partners. Sailors and yachters are the key contributors, especially in the remote and under-surveyed areas of the Eastern Caribbean.

In coordination with the United Nations' Caribbean Environment Programme and SPAW's Regional Activity Center, CARIB Tails is a collaboration between the North Atlantic Humpback Whale Sister Sanctuary Program (NAHW-SSP) partners — a network of marine mammal sanctuaries (MaMPAN) that protects the North Atlantic population of humpback whales in the U.S., the French Antilles, Bermuda, the Dominican Republic and the Caribbean Netherlands.

For more information: www.caribtails.org

Photo-Identification

Humpback whales have patterns of black and white pigmentation and scars on the underside of their tails that are unique to each whale, just as fingerprints are to humans.

For scientific purposes, humpback whales sighted in the North Atlantic are assigned a catalog number in the North Atlantic Humpback Whale Catalog (NAHWC) maintained by the College of the Atlantic in Bar Harbor, Maine U.S.A. The NAHWC is one of the longest and most detailed data sets for baleen whales in the world.

Photographs in the catalog (n=9,000), including date and location, allow scientists and naturalists to identify and monitor individual animals and gather valuable information about migration patterns, population sizes, health, sexual maturity and behavior patterns.

North Atlantic Humpback Whale Sister Sanctuary Program

Sister Sanctuaries Work to Protect Endangered Whales

North Atlantic Humpbacks Find Havens Throughout Migratory Range

For the first time, a group of nations have joined forces to protect an endangered migratory marine mammal on both ends of its range—the endangered humpback whale.

[NOAA's Stellwagen Bank National Marine Sanctuary \(SBNMS\)](#)

was designated by Congress in 1992, and in 2006 signed an international sister sanctuary agreement to work together with the Santuario de Mamíferos Marinos de la República Dominicana (Marine Mammal Sanctuary of the Dominican Republic) to protect this charismatic species. In 2011, Stellwagen Bank NMS signed a similar sister sanctuary agreement with the French Antilles Agoa Marine Mammal Sanctuary, and in 2012 signed a sister sanctuary agreement with the government of Bermuda to help protect the humpback whales along their migration corridors. A sister sanctuary agreement with Yarari, the Caribbean Netherlands NMS is anticipated in 2016. *These agreements have helped create the first international marine mammal protected area network (MaMPAN) to protect humpback whales in the world.*

"SALT" —The Grande Dame of the North Atlantic Humpback Whale Sister Sanctuary Program (NAHW-SSP)

When a humpback named "Salt" was photographed in the Stellwagen Bank National Marine Sanctuary in 1976, and also photographed on Silver Bank off the Dominican Republic in 1979, it confirmed a migration path between SBNMS and the Caribbean.



Salt's Flukes (Source: CCS)

International scientific studies in 1992 and 2004 confirmed that humpback whales throughout the North Atlantic are generally loyal to their northern feeding grounds, and return each winter to mix with other groups in warm Caribbean waters to breed and calve. Long term research has shown that a population of approximately 1,000 individuals make the 3,000 mile round trip between SBNMS and the Caribbean each year.



Map shows nations that have joined together to protect endangered humpback whales. Sister sanctuary agreements help increase public awareness and encourage cooperative research and conservation programs.

Protection Beyond Borders

The North Atlantic Humpback Whale Sister Sanctuary Program (NAHW-SSP) is working toward increasing public awareness and support for marine mammal conservation through joint research, monitoring, education and capacity-building programs designed to enhance coordination and help improve endangered humpback whale recovery in the North Atlantic.

The sister sanctuary model promotes a strategy that defines emerging problems beyond Exclusive Economic Zones, kindles commitment to critical habitats, and manifests the true spirit of regional cooperation, which is a key element to ensure effective management for biodiversity protection and the conservation of migratory, marine mammal species.

The sister sanctuary concept is part of a larger international global vision of Marine Mammal Protected Areas worldwide. The United Nations Environment Programme has cited the sister sanctuary agreement as an important mechanism to maintain connections between marine protected areas and to protect migratory endangered species that cross international boundaries.

CARIB Tails: Research and Monitoring

Identifying Individual Humpback Whales

Who's Who?

Two techniques, photo-identification and genetics, are used to identify and catalog individual humpback whales and link them to specific breeding and feeding areas.

Photo-Identification

Humpback whales have patterns of black and white pigmentation and scars on the underside of their tails that are unique to each whale, just as fingerprints are to humans. Researchers document the marks on the right and left lobes of the tail, or flukes, and rate the percentage of dark versus light skin pigmentation from 100 percent white to 100 percent black.

For scientific purposes, each humpback whale sighted in the North Atlantic is assigned a catalog number. Information collected for humpbacks in the Stellwagen Bank National Marine Sanctuary (U.S. Gulf of Maine) constitutes one of the longest and most detailed data sets for baleen whales in the world. Photographs in the Gulf of Maine Humpback Whale Catalog (maintained by the Provincetown Center for Coastal Studies) and the North Atlantic Humpback Whale Catalog (maintained by the College of the Atlantic in Bar Harbor, Maine) allow scientists and naturalists to identify and monitor individual animals, and gather valuable information about population sizes, migration, health, sexual maturity and behavior patterns.

Photographing individual whales and their calves each year helps to identify family relationships. Four generations of humpback whales have been documented in certain maternal lines, or "matrilines."

The unique scarring and patterns provide the inspiration for common names. For Gulf of Maine humpbacks, researchers and naturalists work together each year to name new adult whales and young animals sighted in a second year. New calves are not named because their coloring and scarring often change dramatically during that first year.

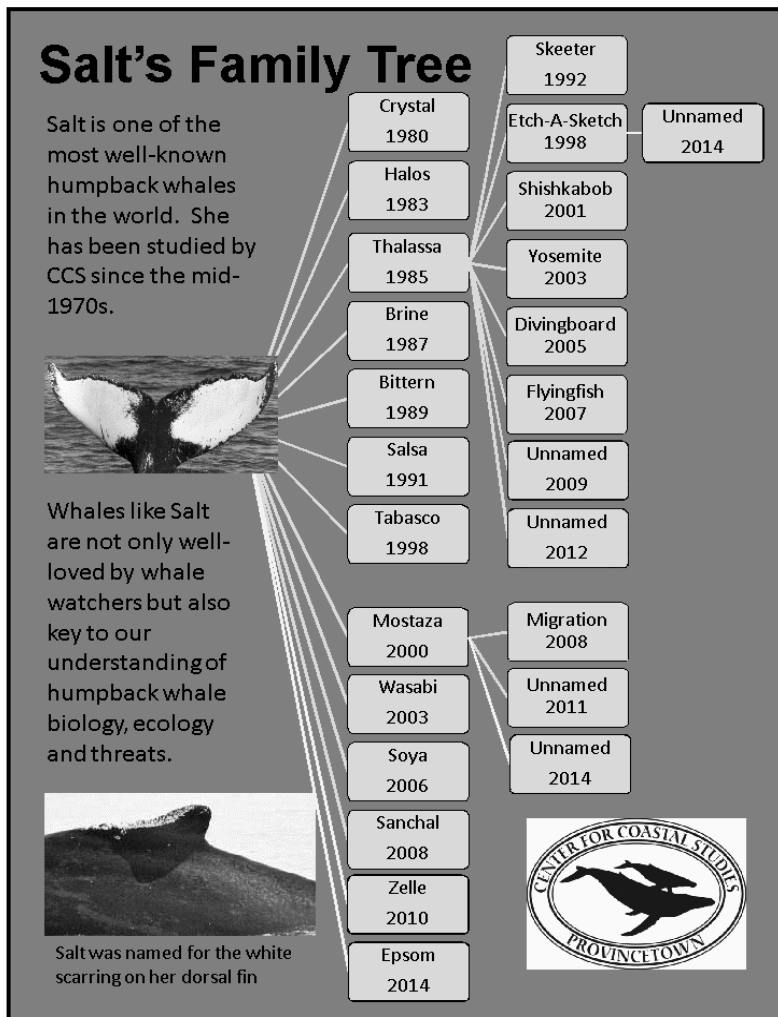


Pigmentation and scarring patterns on the tail flukes provide ways of identifying individual humpback whales. The top image shows Echo (note marks on left fluke) and the bottom whale was named Nile for the mark resembling a river delta (also on her left fluke).

The most famous Stellwagen Bank sanctuary whale is "Salt," the first humpback whale to be given a name along with another female named Pepper. She is known as the matriarch of the sanctuary and the "Grand Dame of Stellwagen Bank" because she has been seen here in all but one summer since 1976. She was also the first humpback whale to be identified by researchers on Silver Bank off the Dominican Republic. Those photos helped scientists confirm the migratory route that links northern feeding grounds with southern breeding grounds.

Genetics

Another way to identify individual whales and confirm family relationships is through DNA analysis. Genetic data are generally obtained from skin samples. Pieces of naturally sloughed skin can sometimes be collected from the water after a whale has been active at the surface. More commonly, researchers shoot a small dart from a special crossbow at the whale's back. The biopsy dart takes a small plug of skin and blubber before bouncing off into the water. Back in the laboratory, DNA extracted from the sample can provide answers to questions about the sex of the individual whale, population structure, evolutionary history, paternity of offspring and social relationships.



Salt's Family Tree

The Truth From Tails

Salt is a great-grandmother. Since 1976 she has escorted 13 of her calves from the mating and calving grounds in the Caribbean back to New England's feeding grounds. She currently has 11 grandchildren, and one great-grandchild, representing the fourth generation of humpbacks in her family group. By recognizing and studying Salt and her family, we can begin to understand the lives of humpback whales and answer important questions.



Scientists follow a tagged whale until the tag detaches.

Follow That Whale

The ability to identify individual whales can be critically important during research projects. When attaching a data-recording device, scientists like to know as much about the tagged animal as possible. By knowing who the animal is, scientists may be able to find out about its age, sex and past associations with other whales. The whale can be recognized, even when in a group, and followed until the tag detaches. In some cases, whales have been tagged multiple times, giving scientists the opportunity to study the animal in different years, times of the day, and locations.

2009 Tagged Humpbacks

- Draco
- Entropy
- Fern
- Fern's calf
- Glo-Stick
- Jabiru
- Lavalier
- Lavalier's calf
- Milkyway
- Samovar
- Solas
- Tripod
- Upsilon
- Valley



Draco



Glo-Stick

What is the age of the animal?

Salt was first seen in 1976 and she was an adult at that time, so she was at least 4-6 years old. In 2016, she would be at least 40.

When is a humpback whale sexually mature?

We know that Thalassa was born in 1985 and she had her first calf (at least the first that we know of) in 1992. Gestation is about one year. Other mothers in our population have had calves at even younger ages. Our conclusion is that humpback whales probably reach sexual maturity within the span of ages four to six.

What is the calving interval for humpbacks (how many years between births)?

In looking at Salt and Thalassa, we see a general calving interval of two or three years.

Whale photos taken under NOAA Fisheries Permits #605-1904 and #775-1875 or under NOAA Northeast Regional Whale Watching Guidelines.

CARIB Tails

Humpback Whale Migrations

Stellwagen Bank and Silver Bank — Endpoints in a 3,000-Mile Annual Round Trip

In 1976, during the first year of commercial whale watching on Stellwagen Bank, a large, easily identifiable humpback with a scarred dorsal fin was sighted and named. The individual was Salt, and she has become an annual summer visitor to the area. Whale watchers keep an eye out for this massive creature, and she doesn't disappoint, reappearing regularly, often with a calf in tow (13 that we know of as of 2016). A few years after that first sighting, when whale researchers began a photo identification program at Silver Bank in the waters off the Dominican Republic, they saw a familiar sight. It was Salt. She offered the first proof-positive of the migratory path of this 45-foot, 40-ton global commuter.

This link between northern feeding grounds and breeding/calving grounds in the Caribbean Sea was again confirmed in 1992 and 1993 when scientists from seven countries worked together to conduct a unique study of North Atlantic humpback whales across their entire ocean range. The project was called the Years of the North Atlantic Humpbacks (YoNAH). Using photo-identification and biopsy sampling, YoNAH provided a detailed picture of the abundance, population structure and migratory movements of the endangered North Atlantic humpback whale.

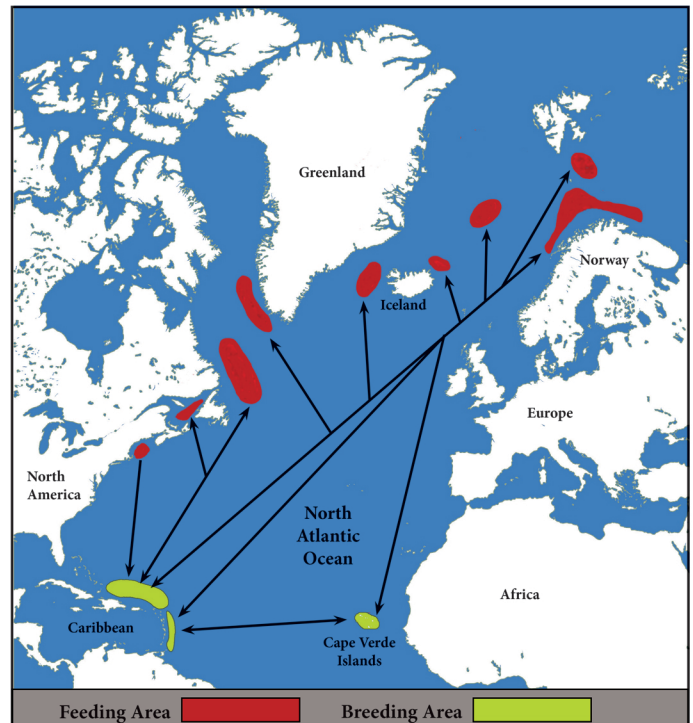
The study delineated five distinct feeding aggregations: Gulf of Maine, eastern Canada (Gulf of St. Lawrence, Labrador and Newfoundland), western Greenland, Iceland and Norway.

In 2004 and 2005, another international study called More North Atlantic Humpbacks (MoNAH) focused on photographing and sampling humpback whales in the Gulf of Maine and on Silver Bank off the Dominican Republic to provide updated information on this population. Scientists are able to conclude that humpbacks are generally loyal to their northern feeding grounds, yet mix with other groups of humpback whales on their tropical breeding grounds. Mixing genes from different populations is believed, among other things, to contribute to the resilience of humpback whales.

At the end of the mating and calving season, humpbacks return to their respective feeding grounds with the newborns following their mothers.



Calves learn the route to their mothers' feeding ground on the spring northbound migration and undertake the same 1,500-mile trip back every winter. Stellwagen Bank National Marine Sanctuary may be an especially favored stopping-off place for new mothers who stock up on quantities of fat-rich sand lance. These small, pencil-thin, schooling fish also offer a relatively easy target for the just-weaned calves.





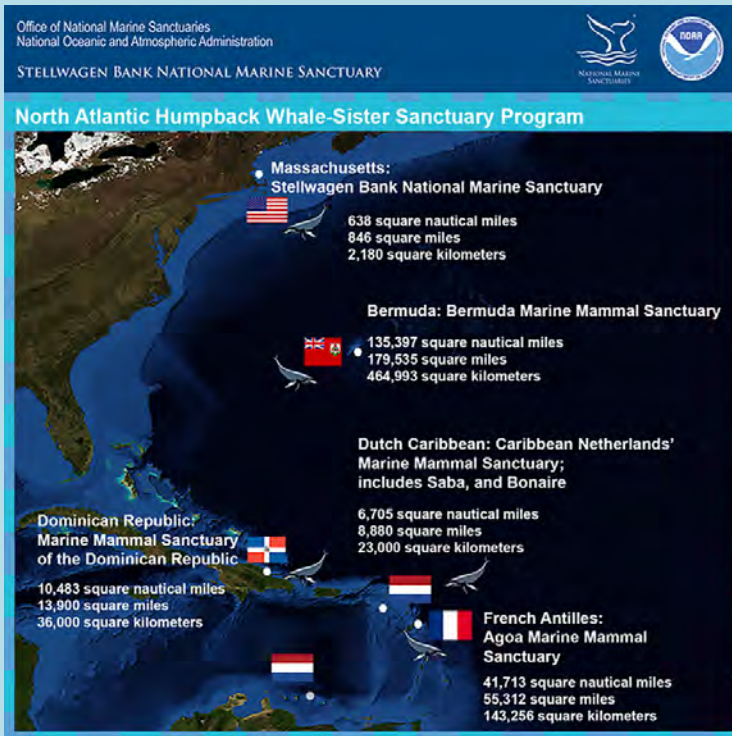
A humpback mother and her calf swim in the clear waters of the Caribbean Sea.

Photo courtesy of Deborah Glockner-Ferrai

Studies indicate that humpbacks' most populous breeding and calving area is along the north coast of the Dominican Republic (Greater Antilles). However, their range extends throughout the Lesser Antilles chain as far as Trinidad and Tobago, and Venezuela. The Stellwagen Bank sanctuary is working with its counterparts throughout the Wider Caribbean Region to coordinate education, outreach and research programs, and is establishing similar sister sanctuary relationships with other Caribbean nations where humpback whales spend their winters.

Migration is not always without incident. There is a natural hazard of orca attacks, primarily on humpback calves. Not all attacks are lethal. Almost 15 percent of the humpback whales from the Stellwagen Bank National Marine Sanctuary have orca tooth marks on their tail flukes.

Migrating from the tropics to colder waters, humpback whales pass a gauntlet of threats, especially in the western Atlantic Ocean. Major ports line the coastline, with heavy ship traffic passing in an east-west direction over the north-south whale path. The Caribbean and western Atlantic are also heavily fished. Fixed gear, nets and traps anchored or placed on the seafloor become an ever-present danger to a feeding or migrating whale.



Map of western North Atlantic humpback whale migratory range.

A humpback's flippers frame the distant shipwreck of the freighter, *Polyxani*, on Silver Bank in the Marine Mammal Sanctuary of the Dominican Republic.



Photo courtesy of Jooke Robbins, CCS.



SB-EDAC-002-2007

WHALE NAMES

These humpback whales have been seen in the Stellwagen Bank National Marine Sanctuary.

Try to match each whale pictured at the right to one of the names listed below:

- ANCHOR
- APEX
- PUTTER
- RAPIER
- SHARK
- TRIDENT
- VENOM
- WYOMING

Photos courtesy of the Provincetown Center for Coastal Studies



GERRY E. STUDDS
STELLWAGEN BANK
 NATIONAL MARINE SANCTUARY



Match the Humpback with its Name

Humpback whales have distinctive patterns on the undersides of their tail flukes – a form of whale “fingerprint.” By naming the whales, based on these patterns, naturalists and scientists find it is easier to identify the animals in the wild. Using a name, rather than a catalog number, also simplifies communication between researchers. Try to match these whales with their names.



#1 _____



#2 _____



#3 _____



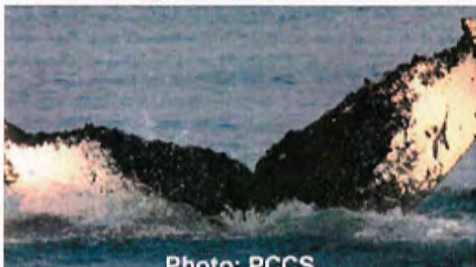
#4 _____



#5 _____



#6 _____



#7 _____



#8 _____



SB-EDAC-002-2007

WHALE NAMES

These humpback whales have been seen in the Stellwagen Bank National Marine Sanctuary.

Try to match each whale pictured at the right to one of the names listed below:

ANCHOR
APEX
PUTTER
RAPIER
SHARK
TRIDENT
VENOM
WYOMING

Photos courtesy of the Provincetown Center for Coastal Studies



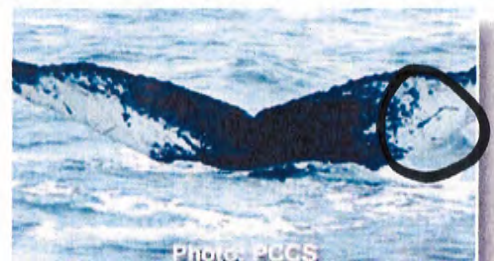
GERRY E. STUDDS
STELLWAGEN BANK
NATIONAL MARINE SANCTUARY

Match the Humpback with its Name

Humpback whales have distinctive patterns on the undersides of their tail flukes – a form of whale “fingerprint.” By naming the whales, based on these patterns, naturalists and scientists find it is easier to identify the animals in the wild. Using a name, rather than a catalog number, also simplifies communication between researchers. Try to match these whales, commonly seen in the sanctuary, with their names.



#1 TRIDENT



#2 APEX



#3 SHARK



#4 PUTTER



#5 RAPIER



#6 VENOM



#7 WYOMING



#8 ANCHOR



SB-EDAC-002A-2007

GERRY E. STUDDS

STELLWAGEN BANK

NATIONAL MARINE SANCTUARY



Match the Humpback with its Name ANSWER SHEET

- #1 -- TRIDENT
- #2 -- APEX
- #3 -- SHARK
- #4 -- PUTTER
- #5 -- RAPIER
- #6 -- VENOM
- #7 -- WYOMING
- #8 -- ANCHOR

1

