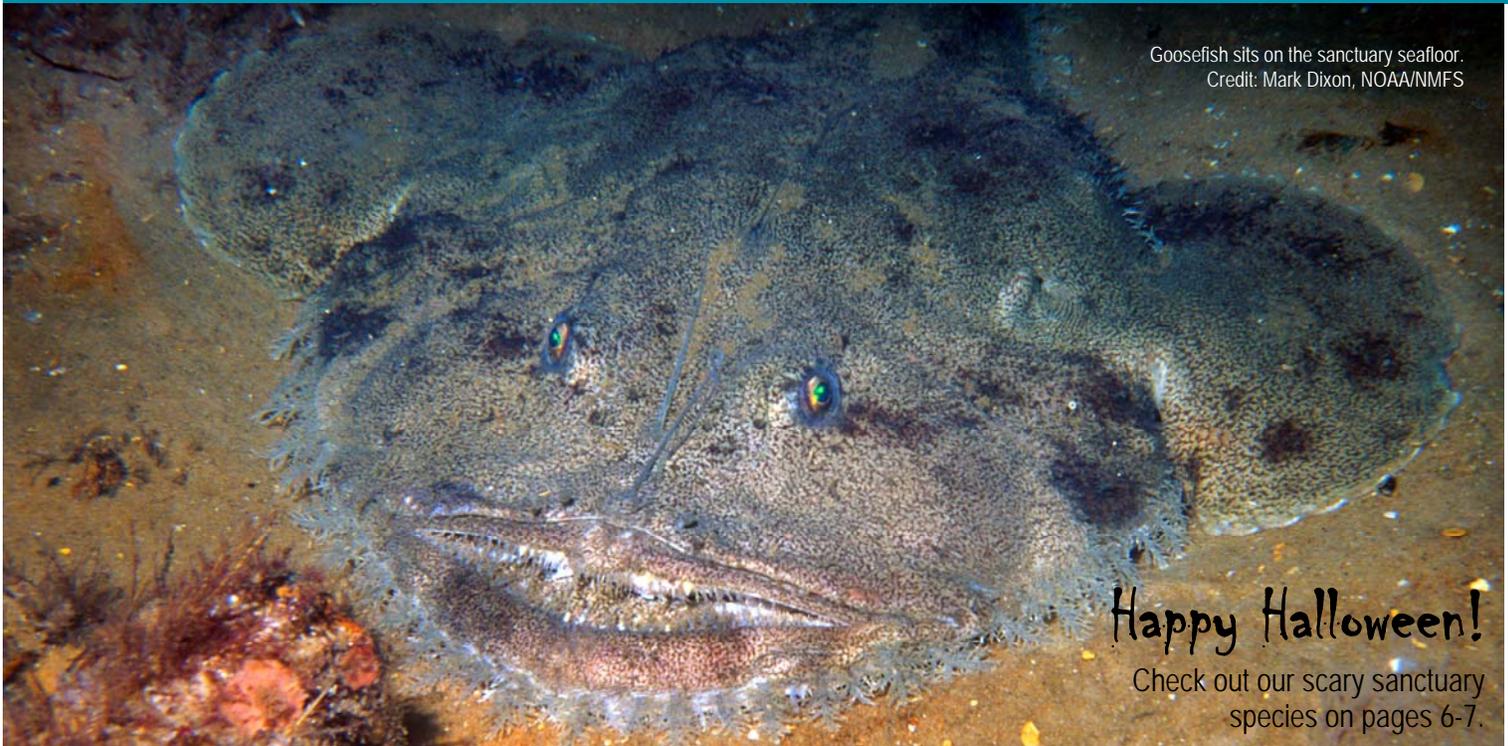


STELLWAGEN BANK E-NOTES: *sanctuary news & events*

October 2014



Goosefish sits on the sanctuary seafloor.
Credit: Mark Dixon, NOAA/NMFS

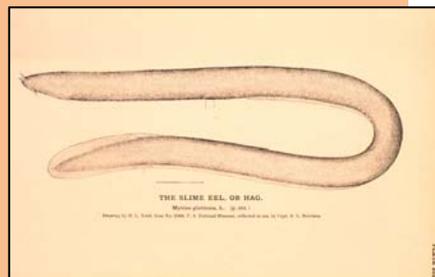
Happy Halloween!

Check out our scary sanctuary
species on pages 6-7.

Our Top 10 list of scary creatures and Halloween-related topics in Stellwagen Bank National Marine Sanctuary

1. Hagfish
2. Goosefish
3. Great White Shark
4. Witch Flounder
5. *Didemnum vexillum*
6. Skeleton Shrimp
7. Blood Star
8. Whale Lice
9. Sea Raven
10. Spider Crab

plus a ghostly extra – see pages 6-7



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Changes in forage fish abundance alter Atlantic cod distribution, affect success of the fishery

A shift in the prey available to Atlantic cod in the Gulf of Maine that began nearly a decade ago contributed to the controversy that surrounded the 2011 assessment for this stock. A study released earlier this year of how this occurred may help fishery managers, scientists, and the industry understand and resolve apparent conflicts between assessment results and the experiences of the fishing industry.

When the dominant prey species of Atlantic cod changed from Atlantic herring to sand lance beginning in 2006, cod began to concentrate in a small area on Stellwagen Bank where they were easily caught by fishermen. The fishermen perceived the Gulf of Maine cod stock to be abundant in subsequent years as they reported increased ease in catching cod, yet the 2011 stock assessment concluded that the Gulf of Maine cod stock had not increased as expected and that fishing rates had been too high even though catches had not exceeded the quotas. Fishermen were skeptical, and the 2011 assessment conclusions were questioned and criticized.

Writing in the *Canadian Journal of Fisheries and Aquatic Sciences*, researchers from NOAA Fisheries' Northeast Fisheries Science Center (NEFSC) show how the fishermen's observations and the assessment results could both be accurate. Their findings reveal why fishermen targeting these cod would conclude the fish were abundant, and also illustrate how commercial catch-per-unit of effort can be a misleading indicator of stock abundance.

The fisheries science center has been routinely monitoring the diet and distribution of cod and many other species since 1973 in an ecosystem survey of waters from Maine to North Carolina and eastward into Canadian waters. By collecting, analyzing, and documenting stomach contents of cod taken in the Gulf of Maine during this survey, researchers can see what cod eat both seasonally and over time.

"Atlantic herring and sand lance are dominant prey for Atlantic cod in the Gulf of Maine. This long, standardized time series of data has been invaluable to our ability to both show and understand where and when predators and prey are distributed across the region," said David Richardson, an oceanographer at the NEFSC's Narragansett Laboratory in Rhode Island and lead author of the study. "When sand lance are abundant, they account for a high proportion of the diet of cod. Also, cod tend to be more aggregated when they are feeding on sand lance than when they are feeding on other prey."

An assessment is an examination of fishery stock conditions used to develop catch limits and other management measures. The 2011 assessment results were also controversial because the 2008 assessment had suggested an uptick in young fish that would grow the stock. Ultimately this growth in the

population did not materialize, and the catch limits set based on the 2008 assessment were found to be too high.

"The sand lance-induced cod aggregations led to a number of challenges in evaluating population trends in Gulf of Maine cod," Richardson said. "During the 2007 and 2008 spring bottom trawl surveys, extremely high catches of cod were recorded at individual stations on Stellwagen Bank, while the remainder of the stock area had low catch rates. At the same time, the fishing industry was experiencing high catch rates of cod in the same small area on Stellwagen Bank. One of the main conclusions of this study is that the trends in cod abundance in this small region were not truly reflective of the overall resource at the time."

Atlantic herring and sand lance have very different habitat and life history requirements that affect their distribution. Atlantic herring are migratory, shifting distribution in response to changing oceanographic conditions like temperature. Sand lance are burrowers, and have a nightly need to burrow into shallow sandy bottom, such as that found on Stellwagen Bank, an underwater plateau covering about 156 square miles located in the southwestern portion of the cod stock area.

"Data from the Northeast Fisheries Science Center survey and from the fishery both indicate that an increase in sand lance abundance resulted in cod aggregating in a small and predictable area on Stellwagen Bank where they were easily caught by fishermen," Richardson said. "The cod were fished in a very small area, approximately 100 square miles, while the entire cod stock area on which the assessment was based is 20,255 square miles."

"Data indicate that an increase in sand lance abundance resulted in cod aggregating in a small and predictable area on Stellwagen Bank where they were easily caught by fishermen."

Michael Palmer, an assessment scientist in the NEFSC's Population Dynamics Branch at the Woods Hole Laboratory and a co-author of the study, said the concentration of cod and of the fishing fleet was significant. "Between 1994 and 2010 the number of fishing trips occurring in this small area increased by 191 percent, and the number of trips occurring outside this area declined by 46 percent."

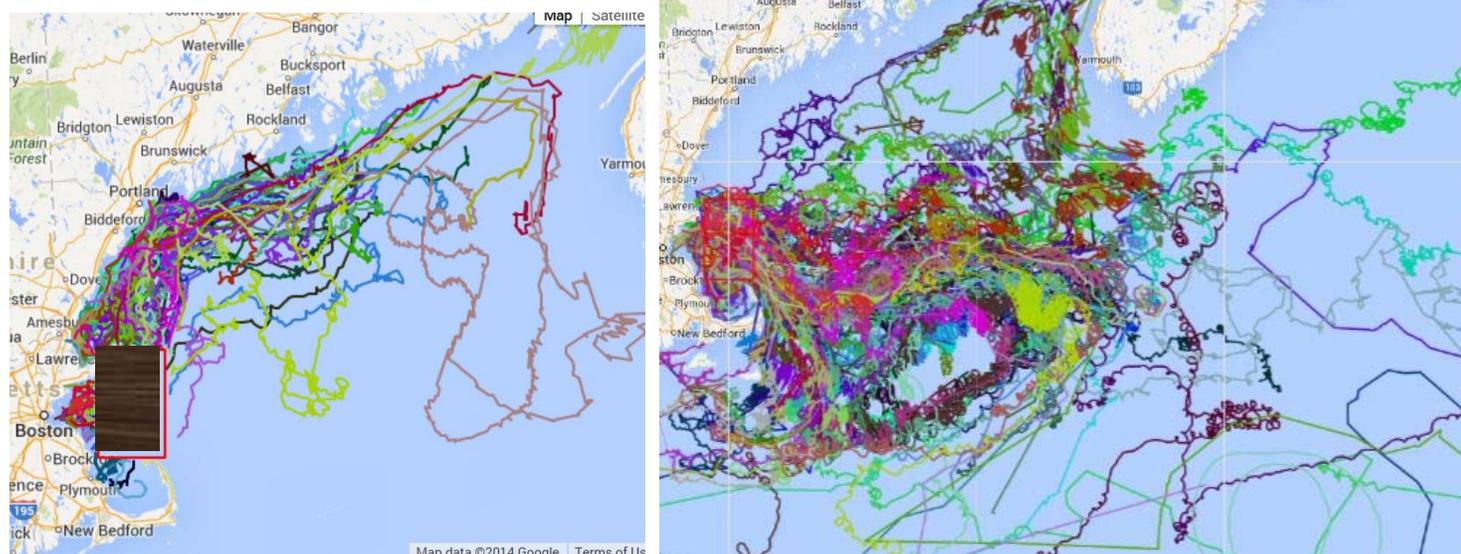
"This shift in the fishery distribution indicates a large influx of fishing effort into this small area during the same time period that sand lance was abundantly available to feeding cod," said Palmer. By 2010, 45 percent of all Gulf of Maine cod landings came from this area, compared with 12 percent prior to 2005.

This dynamic is important not only for cod but also for other species, including whales that have been reported feeding on sand lance in the same area. "The change in the composition of the forage fish community in the Gulf of Maine may have driven distribution shifts, not only for Atlantic cod, but also for other predators feeding on the same set of prey species," said Richardson.

This article is reprinted from:

http://nefsc.noaa.gov/press_release/pr2014/scispot/ss1406/

Drifter buoys display current connections between sanctuary and the region



Drifters deployed in the Gulf of Maine are showing that Stellwagen Bank National Marine Sanctuary sits in a busy location, with waters that connect to a much wider world. The equipment – primarily inexpensive “homemade” buoys, each with a satellite transmitter “tag” – floats at the sea surface, pushed by prevailing currents. By recording the tracks, researchers are developing a better understanding of water movements. The image on the left shows drifter tracks for units that made their way to the sanctuary from release points outside its boundaries (movements once in the sanctuary are not included). The image on the right displays the tracks of drifters that have been released within sanctuary boundaries. These tracks indicate that most coastal drifters released north of the sanctuary move southward along the coast into the sanctuary region (Maine Coastal Current); once there, prevailing currents tend to move the drifters out of the Gulf of Maine via the Great South Channel or around Georges Bank (the oval area southeast of Cape Cod). Some drifters find their way off the Continental Shelf into deeper waters of the North Atlantic while occasionally drifters circle within the Gulf of Maine. These results indicate that the sanctuary area is a probable source or larval recruits to much of the Great South Channel and Georges Bank.

Data from these types of buoys can be used for studies of lobster and fish larvae transport, harmful algal bloom movements, invasive species dispersal, transient eddy formations, oil spill tracking, power plant effluent dispersal and tidal power assessments. The information in this article has been provided by Dr. Jim Manning, an oceanographer with NOAA’s Northeast Fisheries Science Center, who has instituted a drifter-building program with a numerous schools in the New England region (and beyond). In many cases student-built buoys have been deployed by local fishermen. During this summer’s 38th voyage of the whaleship *Charles W. Morgan*, several buoys were deployed in or near the sanctuary from both the whaleship and the sanctuary’s research vessel *Auk*.

COLUMBUS DAY TRIVIA

Did you know ...

- that Christopher Columbus named the area west of Trinidad “Golfo de la Ballena” (Gulf of the Whale). The area is now known as the Gulf of Paria. In the late 15th century whales were abundant in that area, but intense hunting reduced the population and few are now seen there....
- that during Columbus’s four round trips between Spain and the New World, he traveled extensively throughout humpback whale breeding grounds, including the waters around what we now call the Dominican Republic, Cuba, Puerto Rico, and the French and Dutch Antilles. Several of these countries have marine mammal protected areas that are Sister Sanctuaries to Stellwagen Bank National Marine Sanctuary....
- that the sanctuary is participating in a project called *CARIB Tails* with the United Nations Environmental Programme. Yachters and sailors in Caribbean waters are asked to photograph the tail markings of humpback whales. Researchers are matching these images with photos of known whales in the North Atlantic catalog (including Gulf of Maine/Stellwagen Bank) to determine migratory routes and add new individuals not previously photographed. (For more information, go to <http://www.caribtails.org>)



David Wiley, sanctuary research coordinator, prepares to release a tagged bird.

Tracking the Flights of the Shearwaters

The project was intended to track the movements of Great Shearwaters in the sanctuary and Gulf of Maine relative to prey abundance, prey distribution and environmental variables. What

To view the tracks of the 11 tagged shearwaters, go to:
http://www.seaturtle.org/tracking/index.shtml?project_id=891



has transpired provides a much more wide-ranging result. Using satellite tags, researchers are receiving data that not only show local hot spots in the Gulf of Maine but give proof of the long-distance migration of this species. In fact, as of Oct. 21 (press deadline date for this issue), eight of the 11 tags were still functional. Two of the birds appear to have arrived in the South Atlantic (Brazilian/Uruguayan/Argentinian coastal waters) via the eastern Atlantic near the African coast. One of those birds was tracked to Tristan da Cunha (remote islands in the middle of the southern South Atlantic Ocean Basin). This is truly a bird of perpetual summer—migrating from northern summer waters to the austral (southern) summer.

Brewster, Quincy, Wareham and the other birds that have not yet made the major commute are probably juveniles, staying longer in the feeding grounds to put on weight and mature. The long-distance travelers are likely to be adults, heading back for mating, nesting and chick-rearing on those remote South Atlantic islands.

The shearwater tagging project is a joint effort of Stellwagen Bank National Marine Sanctuary, the U.S. Fish and Wildlife Service and the University of Massachusetts/Amherst, and has been funded by the Volgenau Foundation.



Small, light satellite transmitters are attached to the skin of the bird's breast. All photos this page, credit: NOAA/SBNMS

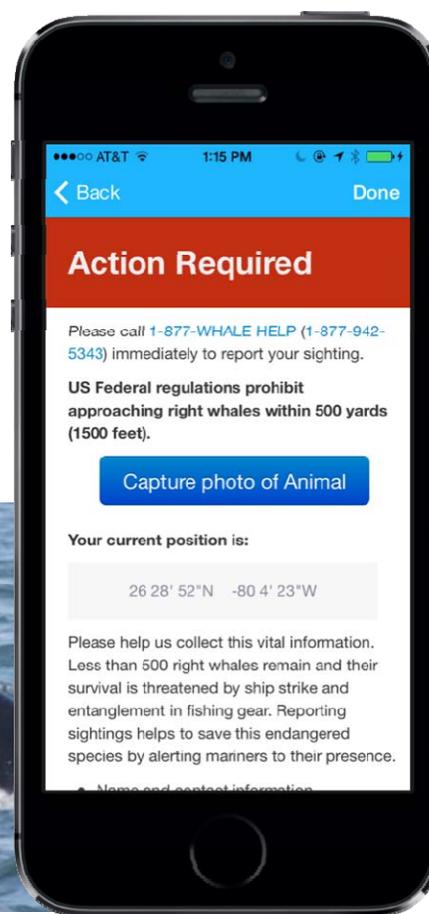
A paper on the tagging project will appear in the December issue of *Bird Observer* magazine.

Whale Alert app now includes interactive features and expands to West Coast

A new version of the Whale Alert iPad/iPhone app was released in September with enhanced features and expanded coverage areas that extend along the U.S. West Coast and up into Atlantic Canada. An exciting interactive feature allows the public to report whale sightings and upload photos. The sightings data are especially important for assessing cases of dead, entangled or stranded animals.



Humpback tail. Credit: A. Smrcina, SBNMS

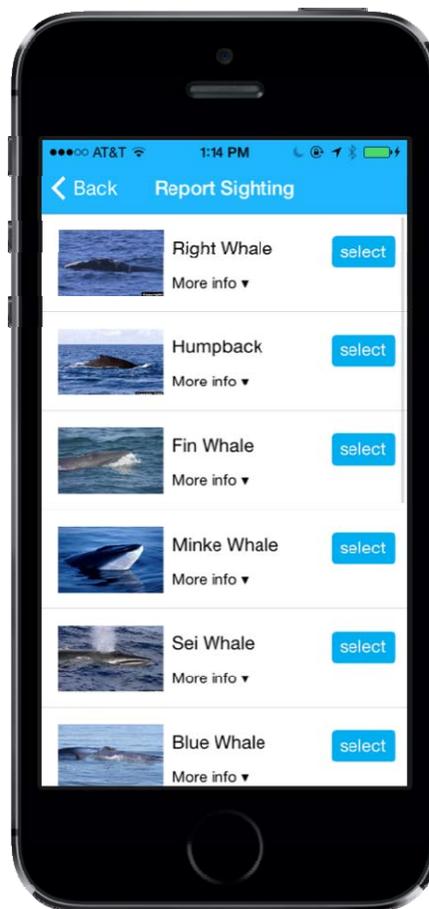


Whale Alert uses GPS, Automatic Identification System, Internet and NOAA nautical charts to provide mariners with a single source of information about whale locations and conservation measures that are active in their immediate vicinity. New features include information about California Marine Protected Areas, PORTS® -- Physical Oceanographic Real-Time System, tide and weather data and the ability for the public to report whale sightings to databases that NOAA and whale biologists use to map whale habitats and migration patterns.

Whale Alert has been developed by a collaboration of government agencies, academic institutions, non-profit conservation groups and private sector industries, led by NOAA's Office of National Marine Sanctuaries. Collaborating organizations include Bioacoustics Research Program at Cornell University, Canadian Hydrographic Service, Canadian Whale Institute, Cape Cod National Seashore, Center for Coastal and Ocean Mapping at the University of New Hampshire, Conserve I.O., Excelerate Energy, EOM Offshore, International Fund for Animal Welfare, Massachusetts Port Authority, NOAA Fisheries, National Park Service, Pacific Marine Shipping Association, Point Blue Conservation Science, U.S. Coast Guard and the Woods Hole Oceanographic Institution, as well as other shipping industry representatives.

Whale Alert can be downloaded free of charge from Apple's App Store, at <https://itunes.apple.com/us/app/whale-alert-reducing-ship/id911035973?ls=1&mt=8>

More information on Whale Alert and the groups responsible for its development can be found at <http://www.whalealert.org>



Prepared to be scared! Our Top 10 Halloween-related species... plus an extra topic of concern

#1 – Hagfish



“I got slimed.” That’s probably what anyone would say if and when they handle a hagfish. Any fish that attempts to take a bite out of one of these slime factories will find its mouth filled with goo – so much of the yucky stuff that it may clog up the gills and possibly suffocate the attacking animal. The hagfish can then easily slip away from the choking predator. If a hagfish is put in a bucket in no time at all it will fill the space with gelatinous ooze. No wonder the fish is nicknamed “slime eel.”

The hagfish is one of the strangest (and most primitive) fish in the sanctuary. It is a cartilaginous fish (like sharks) and has a jawless mouth with a ring of teeth. Hagfish eat worms, but usually scavenge on dead fish and whales – they bore into the carcasses (including animals caught on longlines or in gill nets), eating the intestines and internal organs and then the muscles. When a fishermen comes to retrieve the catch, it may end up being only a scaly bag of skin and bones.



Photo credits: (clockwise from top left): *Hagfish slime* by A. Zommers, Univ. of Guelph; *Researchers hold hagfish from deep Atlantic cruise/Scientist displays slime sample* by NOAA Ocean Explorer.

The hagfish, relatively unknown and unloved, has attracted some attention lately. There’s a SpongeBob cartoon character – Madame Hagfish – and a small commercial industry (hagfish skin has been used as a form of leather). Researchers at the University of Guelph in Canada have been studying the slime (a mixture of mucous and extra strong, extra long protein threads that is almost as strong as spider threads). They see possible commercial uses for synthetic versions of this interesting ooze.

Ghost Gear – Lost nets, lines and traps



Ghost gear – also known as derelict gear -- may continue fishing long after it has been lost. Credit: Doug Costa, SBNMS

If fishing gear breaks away from its anchor or otherwise ends up in the ocean unattended, it is considered marine debris or derelict gear. Another term – somewhat fitting for Halloween – is ghost gear. These lines, nets and traps continue to fish, and the “catch” lures other unfortunate prey. The debris also presents a safety threat to fishermen, when gear (or vessels) becomes entangled in those items.

The National Oceanic and Atmospheric Administration (NOAA) offers a marine debris dedicated program and website (with grant programs – depending on funding). The sanctuary has benefited from this program with several marine debris removal efforts over the past few years.

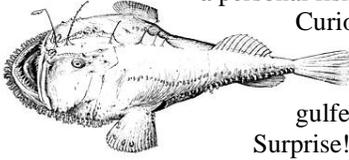
To learn more about the topic, visit:
<http://marinedebris.noaa.gov>



Top 10 Halloween Species (continued from page 6)

2. Goosefish (aka Monkfish)

Like Jaba the Hut, this fish sits back and waits for its meal to appear. Half buried in the sand, the fish waves its first spine – a personal fishing pole with a lure at the tip. Curious fish investigating possible food soon become the goosefish's dinner, engulfed within its enormous mouth. Surprise! This is definitely a quick bite.



3. Great White Shark

Swimmers and surfers off Cape Cod have to think twice when getting in the water – great white sharks are now making regular appearances. Luckily, humans are not their preferred prey – it's more likely that gray seals are their targets -- but, a shark taste test on a wet-suited body could be a fatal mistake. Large white sharks have been seen in or near the sanctuary and several have been tagged.



4. Witch Flounder

This fish was selected due primary to its name – it's not really scary in looks or behavior -- it resembles other flatfish. The witch flounder's alternate common name is "gray sole" -- also appropriate for the season. What's sort of spooky about flounders, in general, is that they start life as a larval fish with a normal vertical orientation in the water column, but as they grow and settle to the sea floor, they turn to their sides, their bodies flatten, and one of the eyes moves from the downward facing side to the top. That's why their faces look so unbalanced and Picasso-ish.



5. *Didemnum vexillum*

This carpet sea squirt has been called "marine vomit" and "rock snot." It's an invasive tunicate that spreads over structures and rock/gravel seafloor, covering and suffocating organisms that grow attached to the bottom. It's been slowly infiltrating locations around the world – Washington, Alaska, New England, New Zealand, United Kingdom, Netherlands. It may have started its global campaign in Japan – just like Godzilla.



6. Skeleton Shrimp

There are shrimp and then there are caprellids (aka skeleton shrimp) – not truly a shrimp but an amphipod. Looking more like a praying mantis insect than the main ingredient of your seafood cocktail, this skinny, long-legged crustacean is adapted for climbing – on hydroids, on sea weeds, on sea stars and even on spider crabs



7. Blood Star

Both planktivore and carnivore, this sea star feeds upon sponges, tunicates, detritus on the sea floor and plankton and it can absorb dissolved organic matter through its skin.



Like other sea stars, it can send its first (of two) stomachs out of its mouth to envelope prey and start digesting its food before pulling the organ back into its body.



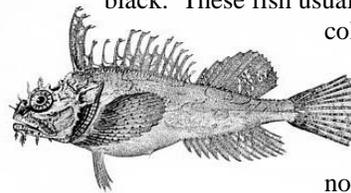
8. Whale Lice



"Head lice" – those are words that strike fear in the minds of mothers with schoolkids. But for whales, their own species specific creepy, crawly crustaceans might not be so bad. Right whale callosities, those rough skin patches on their heads in places where humans have hair (on top of the head, over the eyes, under the mouth), are filled with whale lice (cyamid amphipods). Callosities take on the color of the whale lice – and the whole patch undulates with the movement of these small crab-like creatures. When a right whale dies, the whale lice crawl away from the callosity on a search for a new home.

9. Sea Raven

Unlike Edgar Allen Poe's avian raven, the sea raven is not black. These fish usually appear muddy brown in color, with occasional appearances in bright red, reddish-purple and yellow. Some are uniformly shaded, others are mottled. There's nothing sleek about these fleshy, spiny creatures. Voracious predators, sea ravens eat almost anything that they can fit in their mouths, including similarly sized fishes and lobsters.



10. Spider Crab

It's not one of the crabs you regularly see on a dinner plate – and hearing the name certainly does not start anybody salivating – but it serves as a link in the sanctuary food web. The long, jointed legs of this crab suggest the fear-inducing shape of its web-building land-side namesake.



Images: Goosefish, witch flounder and sea raven art courtesy of NOAA/NMFS; *Didemnum* (top) by NOAA, (bottom) from Wikipedia Commons; skeleton shrimp adapted from Wikimedia Commons; whale lice and spider crab photos by A. Smrcina, SBNMS; right whale art by Will Hon; blood star from Wikipedia Commons; great white shark art by Coleman Barnes, 2014 MME Marine Art Contest.



Credit: Deborah Marx, SBNMS

Animals without Passports extends its stay at the Museum of Science, Boston

The sanctuary's *Animals without Passports* traveling exhibit moved internally within the Museum of Science, Boston to a higher visibility location on the main exhibit floor (blue wing lower level across from the dinosaurs exhibit). It will be on display through January 2015, and possibly longer. This is the third venue to host the exhibit that follows the humpback whale's migration between North Atlantic feeding grounds in the Stellwagen Bank National Marine Sanctuary and Caribbean breeding grounds. It showcases information on the Sister Sanctuaries program and describes the various hazards humpback whales face as they follow long-distance migrations. Exhibit funding was provided by the Office of National Marine Sanctuaries and National Marine Sanctuary Foundation.

Boston's Museum of Science (<http://www.mos.org>) is one of the world's largest science centers and the city's most attended cultural institution. It introduces about 1.5 million visitors a year to topics in science, technology, engineering and math via dynamic programs and hundreds of interactive exhibits.

October is National Seafood Month

October is *National Seafood Month*, a time to highlight smart seafood choices, sustainable fisheries, and the health benefits of eating a diet rich in seafood. It's also an opportunity to illustrate U.S. fisheries challenges as managers and the industry move to end overfishing and rebuild fish stocks.

NOAA Fisheries offers a website (www.fishwatch.gov) that can help people make informed decisions about seafood selection by providing the most accurate and up-to-date information available in the United States about the complex science, laws, and management processes actively sustaining our seafood supply.



NATIONAL MARINE SANCTUARY SYSTEM



Scale varies in this perspective. Adapted from National Geographic Maps.

National Oceanic and Atmospheric Administration
National Ocean Service
Office of National Marine Sanctuaries
Gerry E. Studds Stellwagen Bank National Marine Sanctuary



<http://stellwagen.noaa.gov/>