# OCEAN COMMOTION 2015



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The **horseshoe crab** and the **red knot** each have amazing, yet inseparable stories. They are an example of the interdependence of two creatures and their importance in the environment. Both are losing habitat and both populations are declining. The decline of the red knot was noticed first, which led to the discovery that the horseshoe crab was declining, too.

#### **Horseshoe Crab**

The horseshoe crab is often called a "living fossil" because it has remained unchanged for 450 million years. Today, four species of horseshoe crab roam coastal waters of the globe. The species commonly found in North



America is the Atlantic horseshoe crab (*Limulus polyphemus*). The Atlantic horseshoe crab can be found along the North American coast from the Yucatan peninsula to Maine.

The horseshoe crab is not a crab at all. They are more closely related to spiders, ticks and scorpions, which are all arachnids. Horseshoe crabs are invertebrates with hard, protective exoskeletons on the outside of their bodies. Horseshoe crabs have five pairs of feet that have spiny bristles near the base. These bristles are used to chew food, like clams and marine worms, by moving their legs. They have a spike-shaped tail, called a telson, that they use to flip themselves over if they get stuck on their backs. As they grow, horseshoe crabs must shed, or molt their exoskeleton. Horseshoe crabs have multiple pairs of eyes on the top and underside of their bodies. Unlike ours, horseshoe crab blood is blue. This blue coloration is caused by the copper in their blood, which they use as an oxygen-carrying molecule.

During spring and summer, horseshoe crabs swarm the Atlantic beaches, especially in Delaware Bay, to lay eggs. This usually occurs at high tide before or after a full or new moon. Females bury their eggs in the sand, while attached or surrounding males fertilize the eggs as they are buried. After a few weeks, tiny horseshoe crabs emerge from the sand and scurry toward the ocean floor. They spend about 10 years growing to maturity there before they return to the beach to nest.

Horseshoe crabs face a number of threats. Human development and disturbance of their habitat and nesting grounds reduce the resources horseshoe crabs need to survive. Horseshoe crabs are also sensitive to poor water quality, and they have been over-harvested for fishing bait. Horseshoe crabs are also harvested to collect their blue blood for bio-medical testing. This process is generally non-lethal, and afterward they are returned to their habitat. However, a small percentage of horseshoe crabs die as a result.

As horseshoe crabs are threatened, so are the services they provide to people and ecosystems. The blood harvested from horseshoe crabs is used to test medical equipment and new drugs for contamination. Their eggs are important food for several species of migrating shorebirds, like the threatened red knot. Both the eggs and larvae are important components of the food chain, providing food for fish and eel as well. Older horseshoe crabs provide habitat for smaller organisms that attach to their shells, such as barnacles, sponges and fungi.



#### Red Knot

The red knot (*Calidris canutus*) is a migratory shorebird in the sandpiper family, a group of birds that inhabit coastal zones. The red knot achieves an amazing feat each year, traveling over 9,300 miles from Tierra del Fuego in South America to its breeding grounds in the Arctic.

The red knot is not always red. Like many birds, it molts its feathers from drab winter browns and greys to a more colorful rustyred in the spring. This color arrives just in time for the red knot's long journey north.

During migration, red knots stop in Delaware Bay and surrounding areas to feed on horseshoe crab eggs before continuing onto the Arctic. Once arriving, males use songs and flight displays to attract females. They nest on the ground in coastal tundra areas. They dig a small hole, which is filled with dried leaves and grass. Females lay 3-4 eggs, which are incubated by both parents for 21-22 days. Both parents care for the young for a short while, but leave before the hatchlings are able to fly. The hatchlings search for food on their own, and are able to fly after 18-20 days.

They forage for insects, bivalves, snails and crustaceans in their coastal habitats. Horseshoe crab eggs are an extremely important food source for migrating red knots. Unfortunately, as horseshoe crabs and their habitat declines, so does the availability of their eggs. In addition, a changing climate is impacting food availability throughout the bird's range. With less food available, researchers have found fewer red knots are completing their journey to the Arctic tundra breeding grounds. It is estimated that their populations have plummeted by nearly 75 percent. Other threats from climate change, including sea level rise, changes in weather patterns, and timing of migration, may also impact them in the future.

On December 9, 2014, the U.S. Fish and Wildlife Service designated the red knot subspecies found in North America a threatened species under the Endangered Species Act. The Endangered Species Act protects habitat, prohibits hunting or killing red knots and provides a framework for monitoring and managing the species. Federal, state and non-profit organizations have been working together on behalf of the red knot.

Conservation efforts will need to go beyond red knots for their populations to rebound. Continued efforts on behalf of the horseshoe crab are critical for the multiple organisms, including the red knot, which depend on them. Addressing habitat loss and threats from climate change is also important for both species' survival. Preserving these special relationships benefits both humans and the environment. The horseshoe crab and red knot are just one of many examples of interdependence in our ecosystems how and why our environment is so important.

## Teacher Resources, Lesson Plans and Media

#### **Resources:**

U.S. Fish and Wildlife Service. The Horseshoe Crab: *Limulus polyphemus*, A living Fossil. <u>http://www.fws.gov/northeast/pdf/horseshoe.fs.pdf</u>

U.S. Fish and Wildlife Service. Service Protects Red Knot as Threatened Under the Endangered Species Act. <u>http://www.fws.gov/news/ShowNews.cfm?ID=306702E2-C4DB-EDF8-28653BB2E2D600F5</u>

National Audubon Society. Guide to North American Birds: Red Knot. <u>https://www.audubon.org/field-guide/bird/red-knot</u>

Cornell Lab of Ornithology. All About Birds. Red Knot. <u>http://www.allaboutbirds.org/guide/red\_knot/id</u>

University of Rhode Island. Environmental Data Center. Atlantic Horseshoe Crab. <u>http://www.edc.uri.edu/restoration/html/gallery/invert/shoe.htm</u>

Florida Fish and Wildlife Conservation Commission. Facts about Horseshoe Crabs. <u>http://myfwc.com/research/saltwater/crustaceans/horseshoe-crabs/facts/</u>

National Wildlife Federation. Horseshoe Crab. <u>https://www.nwf.org/Wildlife/Wildlife-Library/Invertebrates/Horseshoe-Crab.aspx</u>

Delaware Sea Grant. Paper Model of a Horseshoe Crab. <u>http://www.deseagrant.org/products/horseshoe-crab-model</u>

#### **Lesson Plans:**

Public Broadcasting Service . Endangered Relationships . Grades 5-8. <u>http://www.pbslearningmedia.org/resource/bf10.sci.lv.ls.lpendang/endangered-relationships/</u>

U.S. Fish and Wildlife Service. Horseshoe Crabs and the Shorebird Connection. <u>http://www.fws.gov/uploadedFiles/Region\_5/NWRS/South\_Zone/Coastal\_Delaware\_Complex/Bombay</u> <u>Hook/HorseshoeCrabShorebirdStudy.pdf</u>

NOAA Ocean Service Education. What do you know about Horseshoe Crabs?. Grades 9-12<sup>th</sup>. <u>http://oceanservice.noaa.gov/education/lessons/horseshoe\_crabs\_lesson.html</u>

Sea Grant New Jersey. Build-a-horseshoe crab. Grades K-6<sup>th</sup>. <u>http://njseagrant.org/wp-content/uploads/2014/03/build\_a\_horseshoe\_crab.pdf</u>

National Estuarine Research Reserve System. Hooray for Horseshoe Crabs. <u>http://estuaries.noaa.gov/teachers/horseshoe-crabs.aspx</u>

University of South Florida, Project Oceanography. Coast-Horseshoe Crabs. http://www.marine.usf.edu/pjocean/packets/f01/f01u5p3.pdf

#### Media:

National Audubon Society. General Bird Migration Computer Game. <u>http://www.audubon.org/mission-migration-game</u>

National Fish and Wildlife Foundation. Ready for Red Knots. http://www.nfwf.org/whoweare/mediacenter/video/Pages/red-knots-video.aspx#.VgBpat9VhBc

New York Times. A Bird, a Crab and a Shared Fight to Survive. <u>http://www.nytimes.com/2012/06/06/nyregion/red-knots-horseshoe-crabs-and-fight-to-survive-in-delaware-bay.html? r=0</u>

Public Broadcasting Service. Documentary (50min). Crash: A Tale of Two Species. <u>http://www.pbs.org/wnet/nature/crash-a-tale-of-two-species-video-full-episode/4772/</u>

U.S. Geological Survey. Red Knots and Horseshoe Crabs Knotted Together. http://www.usgs.gov/newsroom/article.asp?ID=2843#.VgBood9VhBc

U.S. Fish and Wildlife Service. Red Knots Horseshoe Crabs and Climate Change. <u>http://www.fws.gov/northeast/climatechange/stories/redknot.html</u>

### Booklist

#### Children

Extraordinary Horseshoe Crabs by Julie Dunlap

Horseshoe Crabs and Shorebirds: The Story of a Food Web by Victoria Crenson

High Tide for Horseshoe Crabs by Lisa Kahn Schnell

*Horseshoe Crabs: Living Fossils* by Annie Wendt Hemstock

Crab Moon by Ruth Horowitz

Red Knot: A Shorebird's Incredible Journey by Nancy Carol Willis

#### Adults

Moonbird : A Year on the Wind with the Great Survivor B95 by Phillip Hoose

The Narrow Edge: A Tiny Bird, an Ancient Crab, and an Epic Journey by Deborah Cramer

The Flight of the Red Knot: A Natural History Account of a Small Bird's Annual Migration from the Arctic Circle to the Tip of South America and Back by Brian Harrington

Horseshoe Crab: Biography of a Survivor by Anthony D. Fredericks and Glenn Gauvry