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Photo: James Clayton

Living Fossils

Conserving and protecting horseshoe crabs

By Amy Dries

A group of volunteers wanders a stretch of a Long Island beach at 2 a.m. The volunteers wear headlamps and hold flashlights that shine on the dark water. They carry data sheets, a measuring device, a drill and assorted surveying tools. No matter the weather, they hike along the shoreline, sloshing through the crashing waves and wet sand. If they are not careful, the waves pour over the sides of their rain boots, which makes walking difficult.

In the glimmer of the lights, they see two brown shadows in the distance, through the

ripples of water. The volunteers pray that their tired minds and strained eyes have not been fooled by a mass of seaweed or some rocks. Fortunately, they are not disappointed. As the group approaches, the shadows take shapes and reveal a pair of spawning horseshoe crabs. The female's body digs deep into the sand with the hope of safely creating a new generation.

Breathing Relics

Horseshoe crabs have wandered our earth for 450 million years. They are 200 million years older than dinosaurs. There are four horseshoe crab species (one of which is native to the United States) that have survived several mass extinction events. Yet they are currently facing their largest challenge yet: humans.

Outfitting horseshoe crabs with tags with tracking numbers helps ensure scientists can collect more data on this important species. (photo: U.S. Fish and Wildlife Service / Robert Pos

These marine arthropods have experienced few evolutionary changes since their first occurrence in the Devonian period. Surprisingly, they are more closely related to spiders and scorpions than they are to lobsters or crabs. Though formidable looking, horseshoe crabs are actually quite harmless. They could never bite a human due to lack of teeth, and they do not use their tail as a defense mechanism. This sharply pointed appendage is used if they get flipped upside down, and as a rudder during swimming. Their diet consists of small clams, algae, worms and crustaceans, which they gather with seven pairs of leg-like appendages. These "legs," and pincers near their mouths, also help them eat by ushering in food.

Ecological Importance

Horseshoe crabs are important to many ecosystems. Their eggs are an essential food source to many migrating shorebirds. Shorebirds, like the red knot, feed on horseshoe crab eggs and larvae. When horseshoe crab numbers are low, shorebird populations are also negatively affected. In fact, as of December 11th 2014, the red knot was listed as

threatened under the Endangered Species Act. (See "To the Moon! (and partway back)" in our April 2015 issue for more about the red knot.)

Studying shorebirds is how Dr. Matthew Sclafani, leader of the New York Horseshoe Crab Monitoring Network, first became involved with horseshoe crabs. He started a research project at the Delaware Bay because there was a large decline in migratory seabirds. "We wanted to see if there was a correlation between the seabirds and horseshoe crab populations," said Sclafani.

Unbeknownst to many, horseshoe crabs are an important aspect of our medical and pharmaceutical industry. Their blue blood contains cells called Limulus amebocyte lysate (LAL) that, when used properly, can detect bacteria. LAL is used to test certain drugs, vaccines, and medical equipment for bacterial contamination. If done carefully, harvesting this species for their blood can be a relatively safe process for the crabs. Many organizations, however, are trying to encourage alternative medical practices to lessen the number of horseshoe crab lives taken by pharmaceutical companies.

Survival Concerns

One major concern for the horseshoe crab is habitat loss. "Horseshoe crabs spawn on beaches, most of which have houses developed on them. This means they spawn in people's backyards," said Glenn Gauvry, president of the Ecological Research and Development Group (ERDG), a non-profit conservation organization focusing on protecting the four horseshoe crab species.

Fortunately, there are programs that are preventing future destruction of horseshoe crab habitat and spawning sites. In the Delaware Bay, the ERDG has created a "Backyard Stewardship Program" and a "Community Sanctuary Program." The Backyard Stewardship Program has protected 15 miles of horseshoe crab spawning habitat, whereas the Community Sanctuary Program has Delaware Bay property owners commit to protecting horseshoe crabs on their own land. Community participation and understanding is of the utmost importance for their conservation.

Overharvesting is another concern for this species. Horseshoe crabs are used as bait to

catch eels and whelks or conchs. The crabs are put into plastic mesh bait bags that are attached to the conch pots by bungee cords. The ERDG has made bait bags that use 50% less horseshoe crabs, but it may not be enough. In Delaware, there is a 30-day harvest that occurs directly after the peak of horseshoe crab spawning and it is only permitted at one location along the Delaware Bay. During this time, 164,000 males are allowed to be taken. "This year it only took 10 days to close down the harvest," said Gauvry. In New York, there is a recreational limit of five horseshoe crabs per day, and they must be for the harvester's own personal use. New York also has a voluntarily reduced commercial quota of 150,000 crabs per day. The quota can only be harvested by licensed commercial anglers and DEC closely monitors the harvest.

This recovered horseshoe crab was discovered during one of Missy Weiss's surveys. The tracking number can be used in future migration research. (photo: Amy Dries)

Dr. Sclafani believes that there may be a need for more regulation. "The problem is that it takes about eight years to see the effect of a regulation, because it takes about eight years for a horseshoe crab to be sexually mature," he said. "It depends on the area that you are looking at. There are specific regions where management plans need to be put in place."

Conservation Action

Horseshoe crab populations in some areas have steadily declined over the past decades. With this knowledge, many conservation organizations joined together and with their efforts, numbers have stabilized or even increased. However, there are still many places where horseshoe crab populations are on the decline.

Several organizations are trying to improve the world's knowledge of horseshoe crabs. The ERDG's main focus is horseshoe crab conservation. Gauvry first began to care about these animals when he was assigned to look at the potential effects an oil spill would have if it occurred in the Delaware Bay. "In order to learn how to mitigate or deter a critter from oil, you need to understand the critter. In this situation, it was horseshoe

crabs," said Gauvry. "Back in the late 1980s, there was little concern for them and no organizations were focusing on their conservation. In 1995, we started ERDG to become the voice for horseshoe crabs," he concluded.

Missy Weiss, the Environmental Educator and Program Manager at Downs Farm Preserve on Long Island, New York, knew she wanted to become involved with horseshoe crabs after attending a Long Island Natural History conference in 2013. She quickly learned about a program in need: The New York Horseshoe Crab Monitoring Network. This organization recruits volunteers to participate in a citizen science project. They have assigned beaches where people come together to count and tag horseshoe crabs during the spawning season. People go out at all times of the night carrying scientific measuring tools-and a sense of purpose.

A group of volunteers (including the author, left) carry supplies needed to monitor horseshoe crabs (photo: Andrew L'HommeDieu

Volunteers conduct spawning surveys along select beaches. The group first walks the beach and counts the crabs they encounter, then they go back and measure each crab's width, determine its sex, and record the location where it was found. Then they drill a small hole into its exoskeleton and clip a tag with a specific tracking number in place. When someone rediscovers the individual, they can access a database to find out where it was originally tagged, or where it was last found. The goal is to collect more data on this species, and to find out where horseshoe crabs go in the off-season. Weiss was intrigued by these creatures and became a monitoring site supervisor on the North Fork of Long Island.

"As of 2014, I have coordinated two monitoring seasons and this was the first time that I've worked intensively with this species," said Weiss. The best find was during the 2014 season when Weiss's group came across a barnacle covered tag on a horseshoe crab. After taking its number and looking at the database, they found it had traveled to Long Island from Rhode Island. They identified the horseshoe crab as being tagged in 2009. This is an important piece of information that will be applied to future horseshoe crab

migration research.

Horseshoe crabs don't tend to cross our minds as animals that need our attention. They are not cuddly or cute, but the underlying uses and importance of these ancient creatures should give us enough reasons to care. They are an essential component of natural ecosystems and our medical world. Overharvesting and habitat loss are just two threats that have contributed to decreased numbers of horseshoe crabs. If more people realized the importance of this ancient species, perhaps they will be better able to survive their biggest challenge to date: human interference.

Amy Dries is studying Conservation Biology at SUNY College of Environmental Science and Forestry. She has monitored horseshoe crabs for two spawning seasons at various beaches in Suffolk County.