

GIANTS

at our feet



—New York's horseshoe crabs

By Lee Roscoe and Eileen Stegemann

They bumble up from the muck of the subtidal zone, swimming on their backs. Using their hinged body and long, spear-like tail, they flip over and float or walk to the high tide line. They are somewhat ungainly in their movements and look like cobblestones, polished smooth and shiny with salt water. They are horseshoe crabs: secretive bottom-dwelling creatures that have been around for more than 240 million years.

It's June and they're here to mate. The universal scent of algae and salt, of bubbling ruffled ocean mixing with sand, abounds. The smaller males find the females both by scenting their pheromones and by sighting them with one or more of their ten eyes. Females deposit their eggs into holes they dig about a hand's length down into the sand, while the males fertilize them. Migrating shorebirds, including red knots, dunlins and sandpipers, take advantage of the bounty, eating as many horseshoe crab eggs as they can find, while numerous fish species take their share as well. As such, though an individual female horseshoe crab may lay 80,000 or more eggs in a season, fewer than a dozen will live long enough to mate and lay eggs again.

The horseshoe crab's large size (females average 12-15" wide), hard shell and sword-like tail give it a formidable appearance. While there are four species worldwide, only one, *Limulus polyphemus*, is found in North American waters—from Nova Scotia in Canada to the Yucatan Peninsula in Mexico. In New York, horseshoe crabs occur

year-round in Long Island Sound, the Atlantic Ocean, and in other areas along the coast. During the spawning season (May and June), thousands can be seen along the shorelines of the bays of Long Island, with peak numbers occurring at night around the times of the new and full moons.

Milling around the spawning creatures are biologists and volunteers, marking out transects to conduct a census of the population. Working in teams of two to three, they mark down the time, place, weather, approximate wave height, cloud cover and temperature, and then count the crabs. They note the genders, how many are mating, and how many are solitary. For some individuals, the width of the carapace (top of the shell) may be measured.

Some crabs have plastic recapture tags affixed to their shells. The teams checking the crabs record the data on the tag, which is then forwarded to the U.S. Fish and Wildlife Service. The crews also outfit some new crabs with tags—up to 20 new crabs of each sex.

Biologists hope that the information they collect will give them a fuller understanding of the biology, health and migration patterns of horseshoe crabs. Do they migrate far or stay local? So far it would appear that these slow and oddly endearing beings don't go very far, but are tied to their natal spots. However, a few crabs have traveled as far as Cape Cod Bay and Delaware Bay after being tagged on Long Island.

Although they have a hard shell and claws, the word "crab" is a misnomer as horseshoe crabs are not true crabs but are

in a class of their own (Merostomata), and are more closely related to spiders and scorpions. Horseshoe crabs have seven pairs of leg-like appendages under their shells which are used for gathering and eating food, as well as for moving. Reminiscent of spiders, the two small appendages with pincers that are located near their mouth help usher in food.

Horseshoe crabs eat while walking right-side up on the sand, both below the ocean waters or on the beach. Their

males and females, respectively), they may have gone through 15 to 17 molts. While no one knows for sure, it is believed that these unique creatures may live for 20 years or more.

Horseshoe crab numbers have steadily declined during the past few decades, particularly in Delaware Bay. This is due in part to the fact that horseshoe crabs do not move far from their birth place and so are vulnerable to disturbances. Building wharves, dredging beaches, and dragging

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legs have spines at the base, which help to grind up food. They eat a variety of marine worms, mollusks, and other small marine animals.

While they are growing, horseshoe crabs must shed (molt) their shells. New shells grow under the old shells and when exposed, remain soft for up to several days. During that time, horseshoe crabs are more vulnerable to predation. By the time horseshoe crabs reach maturity, at about 8 to 10 years of age (for

the sea bottom all disturb breeding. Pollutants and stormy weather also negatively affect them. In many areas around Long Island, development has replaced the open shoreline where horseshoe crabs once frequented, and they are a rare sight in New York Harbor. But despite this, they hang on in the waters of Connecticut, New Jersey and New York, around Sandy Hook and Raritan Bay, the New Jersey Estuary, and in Long Island Sound. They come ashore at

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With a hard shell and spear-like tail, the horseshoe crab is a formidable-looking creature that has been around for more than 240 million years.

Staten Island's Great Kills, and Midland Beach at Wolfe's Pond Park, and around Long Island at sites from Montauk to Sag Harbor, and from Jones Beach to Jamaica Bay.

Horseshoe crab numbers have also been affected by humans harvesting them. The Lenape made bowls, bails, hoes and spear tips out of horseshoe crab parts. Colonists, and those who followed, ground up the crabs to make fertilizer (when eels ran short) and for use as fowl feed. Since the 1920s, scientists have been capturing horseshoe crabs to examine their eyes (two lateral compound eyes on either

contains the clotting factor LAL (limulus amoebocyte lysate), which clots when toxins are encountered. This is very useful in alerting medical personnel to possible dangerous reactions to blood transfusions, vaccines and medicines.

Horseshoe crabs are also used as bait to capture whelks and eels, largely for the Asian market. To this end, millions of crabs were harvested in the past two decades.

Recently, however—prodded in part by concerned citizens beset with nostalgia for the creatures they saw during their youth and now only occasionally encounter—people

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side of their shell with a smaller eye behind each one; one central “endoparietal” eye on the shell surrounded by two small ones, as well as two eyes located on the underside near the mouth; and multiple photoreceptors on the tail which combine to form the last “eye”). This led to insights into how light hits the optic nerve and then is transmitted to the brain.

Since the 1990s, horseshoe crabs have been captured to use their blood for medical testing. Horseshoe crabs' blue blood

have changed their attitudes, and scientists are looking closely at the state of horseshoe crab populations. In 1998, the Atlantic States Marine Fisheries Commission developed a coastwide plan that instituted state-by-state commercial harvest quotas. In New York, the recreational harvest of horseshoe crabs is restricted to five per day. Additionally, New York harvesters must have state permits, and some areas are closed to harvest. Fire Island National Seashore, for instance, is off limits to any harvest as per the U.S.



USFWS/Robert Pos

Children are fascinated by this armor-plated crustacean.

National Park Service's protection of "national seashores." Other restrictions regarding open seasons, permits and harvest regulations can be obtained by contacting DEC's Bureau of Marine Resources.

There are a number of groups that have made it their mission to watch over horseshoe crab populations. The New York Horseshoe Crab Monitoring Network is a cooperative effort between Cornell Cooperative Extension and DEC. Each May-July, they organize the event described at the beginning of this article, whereby participants visit specific identified beaches throughout New York's Marine District and assist with the collection of scientific data. To find out more about this event, visit the network's website at www.nyhorseshoecrab.org.

There are several other efforts that also benefit the state's horseshoe crab populations, including: New York Audubon's IWASH (Improving Wetland Accessibility for Shorebirds and Horseshoe Crabs), which looks at the effect of litter on birds and crabs; the Long Island Horseshoe Crab Network run by a professor at Dowling College, which monitors 64 sites in Queens, Long Island and Brooklyn; and Friends of the Bay at Oyster Bay, Friends of Flax Pond in Stony Brook, and Friends of Little Neck Bay, which all keep tabs on horseshoe crabs. In addition, New York Harbor School's Marine Science and Technology Center currently being built on Governor's Island has plans to reintroduce local marine ecosystem animals long gone, such as *Limulus*, to New York Harbor.

To me, horseshoe crabs represent my youth. Late spring and early summer were defined by this creature scabbling into the near surf. My friends and I spent hours watching and playing with them, fascinated by their armor-plated looks and lumbering movements. They held such a sense of wonder. Today, the sight of a shed shell washed up on the beach still thrills me, and I will often stop and collect them. The fragile molts of the youngest make nifty gilded objects for crafters, and their "Darth Vader helmets" and "swords" are great playthings for children. I have faith that these icons of beach lovers will continue for generations to come, and look forward to sharing their discovery with others.

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Conservationist Assistant Editor **Eileen Stegemann** grew up watching horseshoe crabs on the Jersey shore and Cape Cod.

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Stevie Thorsen/American Littoral Society



(top and center) During the spawning season (May and June), thousands of horseshoe crabs can be seen along the bays of Long Island's shoreline.
(bottom) Biologists affix plastic tags to some horseshoe crabs' shells as part of a mark-recapture study.



James Clayton

WHAT IS IT?

If you guessed the photo on the Table of Contents was a close-up of the underside of a horseshoe crab, then you were right! As you can see from the photo, parts of the underside bear a resemblance to a spider—specifically the small appendages with pincers that help push food into the mouth.

Horseshoe Crab Facts:

The horseshoe crab (*Limulus polyphemus*) is often referred to as a living fossil, and is thought to have evolved more than 240 million years ago!

Its name refers to the horseshoe shape of the largest part of its shell.

Despite its name, it is not a true crab but is more closely related to spiders, ticks and scorpions.

The horseshoe crab has seven pairs of leg-like appendages: five pairs of walking legs; one pair of legs with leaf-like structures and spines that aid in moving sediment and crushing food; and one pair of small appendages used to guide food into their mouths.

Horseshoe crabs have 10 eyes—two main eyes and 8 others that are used to link images together.

These prehistoric creatures can grow to about 18 inches in width, and are thought to live as long as 20 years.

They can swim upside down.

Contrary to popular belief, a horseshoe crab's tail (telson) is not used as a weapon or stinger. Instead, the tail is used as a rudder during swimming, and to right itself if it gets flipped over. (Note: Never lift a horseshoe crab by its tail, you might injure it. Instead, lift it by the large part of its shell.)

Horseshoe crabs eat while moving, feeding on a variety of marine worms, mollusks, and other small marine animals.

Their eggs are an essential food source for many migrating shorebirds, including red knots, semipalmated sandpipers, sanderlings and dowitchers; and their eggs and larvae are consumed by many fish, such as American eel, killifish, weakfish, silversides, summer flounder and winter flounder.

The horseshoe crab's blood is blue (caused by the presence of hemocyanin; human blood is red because of the presence of hemoglobin), and it has unique bacteria-fighting abilities. It is used by pharmaceutical and biomedical industries for important medical research and testing.