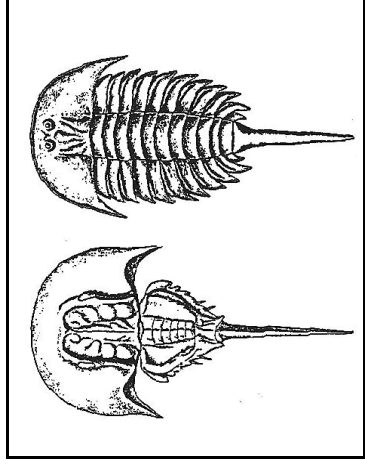


that lends its red color). In the 1950's, it was discovered that the horseshoe crab's copper-blue blood contains a clotting agent called *lysat*e. What makes their blood so unique is that it gels in the presence of endotoxins. This chemical helps to bind the harmful bacteria and keeps it from spreading. For humans, the use of this clotting factor serves as a lifesaver in the field of medicine. Horseshoe crab blood reacts quickly with human serums to detect any toxic contamination. Research using their blood has also led to a better understanding of human immune deficiency diseases.

You and the Horseshoe Crab – Its Future

The history of the horseshoe crab has been a long one. The earth has seen many mass extinctions over millions of years. Today, horseshoe crabs face population losses due to harvesting by the bait industry. A decline in the number of horseshoe crabs will impact other species, particularly migrating shorebirds that feed on eggs, and sea turtles that sometimes feed on the adult horseshoe crabs. Some coastal states have enacted laws to restrict their catch numbers. You can help. When you are finished examining that horseshoe crab you picked up, gently place it back into or close to the water. Now that you know that it is not harmful or dangerous, you may want to introduce this strange and wonderful creature to a friend. In fact, we hope you do. This way they will also know how to aid a horseshoe crab stranded on the beach.



Horseshoe crabs are closely related to ancient trilobites

Horseshoe Crab A Living Fossil

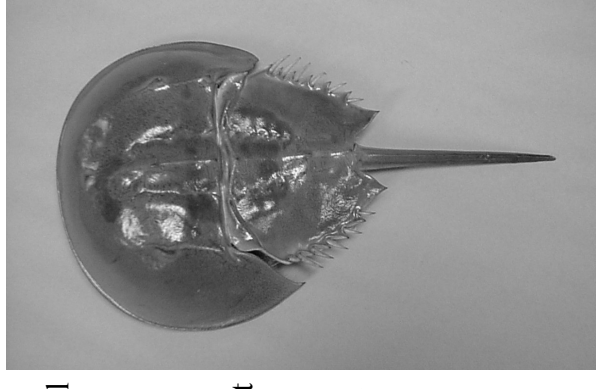
Sandy Hook
Gateway National Recreation Area
National Park Service
U.S. Department of the Interior

*Horseshoe crabs are one of nature's most fascinating creatures. With their big size and intimidating appearance, they certainly appear to be anything but friendly. Actually, the horseshoe crab is not a crab at all and is classified with Arachnida along with spiders, scorpions and ticks. It is one of the Earth's oldest creatures, having appeared 100 million years before the dinosaurs. Today there are four species of this animal in the world with three found in the Far East from Japan through India. Our species (*Limulus polyphemus*) is distributed from the coasts of northeastern Maine to Mexico. In the months of May, June, and July these primitive arthropods known as "living fossils" (a surviving ancestry of over 350 million years!) may be found on Sandy Hook's beaches.*

Getting to Know the Atlantic Horseshoe Crab

You may be walking along a beach and find a horseshoe crab over on its back. While turned over, you will notice there are six pairs of legs. The first and smallest front pincers called *cheliceræ* (pronounced ki-lis'-er-ee) are used to probe the soft mud bottom for food like small clams and worms. The next five pairs of legs have special bristles on the large upper joints that crush the food.

Since horseshoe crabs have no jaws or teeth, the bristles help move food from bottom mud to its mouth located in the center. Interestingly, it is around the mouth that the horseshoe crab's brain forms a collar. The last and largest pair of legs have flaps that open up. These act like the disc on a ski pole, pushing the horseshoe crab along to prevent its getting stuck in sand. Six pairs of gills located below the legs look like folded pages, and are known as book gills. When swimming upside down in water, a horseshoe crab moves the gills to help propel its body. While up on a dry beach the horseshoe crab is careful to keep its gills wet for breathing.



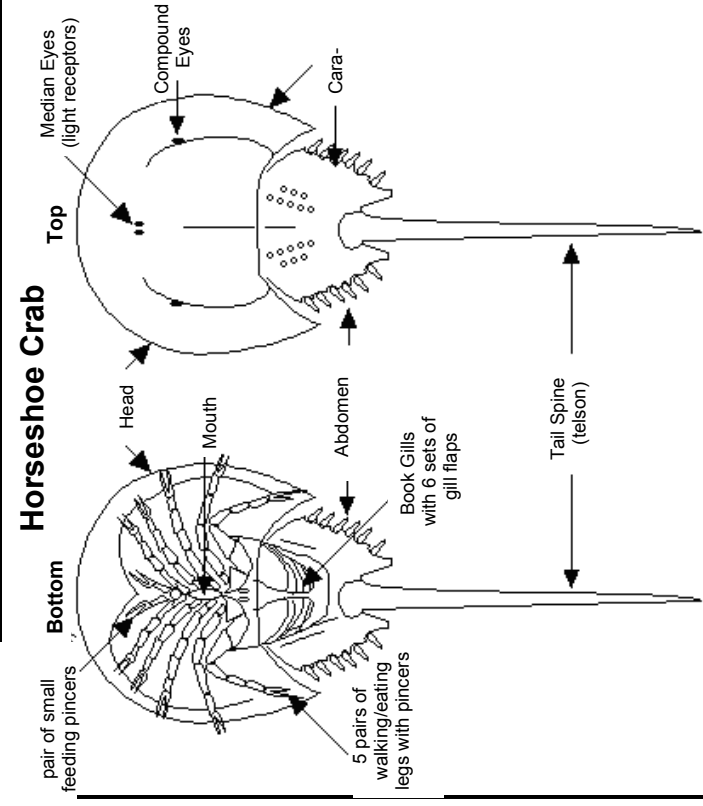
For further information write: Sandy Hook, Gateway
National Recreation Area, PO Box 530, Fort Hancock, NJ 07732
or phone: 732- 872-5970. Web address: www.nps.gov/gate

Text by

Conrad Wisniewski



Some people fear the spike-like tail will hurt them, but this is not true. The tail or *telson* is actually used by the horseshoe crab as a rudder underwater. It also helps a stranded and vulnerable horseshoe crab right itself when overturned by a wave onto the beach. First, the animal bends its hind part forward. Then it thrusts the telson's point downward into the sand. Kicking its legs starts a rocking motion which eventually allows it to roll back over to its underside. Sometimes horseshoe crabs are not able to turn over quickly enough before they are eaten-out by birds, particularly the gulls. If you find a horseshoe crab on its back, you can assist in a rescue. The best way to do this is to gently grasp the edge of its shell to turn it over. You should never pick it up by its tail as this will damage the ball and socket joint, which is very similar to a human hip joint.



Spring Fever

During the May to July mating season, male and female horseshoe crabs come up to the waterline at high tides (especially during the full moon). While females can be as large as 2 feet long and weigh up to 10 pounds, males only reach a third of this size. Males, however, possess a pair of powerful claspers on their forward legs called club claws that they use to hold onto the backs of the females. Males sit out roughly 10 to 20 feet from the shore and latch onto the passing female as she makes her way to shore. Because the female is so large, sometimes as many as 15 males may be riding along. Only the first male gets to fertilize the eggs. Females will dig a nest about a foot down into the sand to lay about 4,000 soft, sticky, lime green eggs or up to 88,000 a season. While the eggs remain on the beach, many are eaten by thousands of shorebirds that use them for energy during migration. Horseshoe crab eggs are an important part of our coastal habitat food chain. For any remaining eggs, the next high tide disrupts the bed and carries the survivors out to shallow water. After two weeks the eggs hatch and a month later the young begin to swim for a week before their first molt. Finally, after several molts, they develop a tail.

Molting and Life Span

Like all crabs and many insects, the horseshoe crab has to molt, that is, shed its outer shell in order to grow larger. Baby horseshoe crabs lack a hard shell and spike tail. People have noted that in this stage of development, the horseshoe crab resembles trilobites; ancient organisms that have been extinct for millions of years. Their outer shell is made of *chiton* that hardens out of their skin. They will molt 16 to 17 times until they reach sexual maturity at age 10. Horseshoe crabs can live for up to 40 years but most only make it to age 20. Those that haven't molted in a few years can easily be distinguished by a dark, almost black coloration on a worn outer shell. Many will have slipper shells or barnacles growing on them.

A Real Blue Blood

When this animal is injured its blue blood seals the infected area with a clot. The blood turns blue when it comes in contact with the air. This is due to a copper containing respiratory pigment called *hemocyanin* (human blood has hemoglobin, an iron containing pigment



Spawning Horseshoe crabs provide eggs that fuel many shorebirds during their annual migration.

The Eyes Have It

Now that you have safely placed the horseshoe crab back onto its feet, look at the top surface of the shell (the *carapace*) where you may examine its thirteen sight sensors. There are two large compound eyes can be seen on the upper sides of their shell, two much smaller ones on the front, eight tiny ones on the lower front lip of their shell, and one on the underside of the telson. The four on top detect shape and especially motion, although they can only see in black and white. The others are simple light receptors used to detect daylight. When molting, the creature grows a new set of lenses every time. No other marine animal does this! In deep water they swim upside down using the bottom eyes to find food or other horseshoe crabs. They also switch on internal chemicals at night allowing them to see many times better. Scientists have learned much about the human eye by studying the horseshoe crab's optic nerve.