ATLANTIC HORSESHOE CRAB (Limulus Polyphemus)

Grades: Recommended for Grades 6-12

Objectives:
1. Students will identify the Atlantic Horseshoe Crab and label anatomy.
2. Students will learn and explain the term "Living Fossil".
3. Students will discover the importance of the Atlantic Horseshoe Crab as it relates to our ecosystem.
4. Students will develop an appreciation for the role of the Atlantic Horseshoe Crab as it relates to the field of medicine.
5. Students will understand and practice conservation efforts as they apply to the Horseshoe Crab and our local ecosystem.

Vocabulary: Define these words as you read through the following information:

Arthropods / amebocytes /carapace / chelicerae / book gills / telson / molt

Limulus Amebocyte Lysate

Description:
The Atlantic Horseshoe Crab, a marine animal related to spiders, ticks and scorpions can be found along the east coast of North America from Maine to Mexico. These harmless arthropods, animals having an exoskeleton, a segmented body and paired walking legs, have roamed the earth for well over 400 million years with very little change over that span of time. For this reason they have been called "living fossils". Horseshoe crab ancestors can be traced back to around 445 million years ago, 200 million years before dinosaurs.

The Atlantic Horseshoe crab is easily recognized by its large brown helmet called a **carapace**. This horseshoe shaped covering protects their underside where they have five pairs of walking legs and two additional appendages, the **chelicerae**, used for feeding. Toward the tail are **book gills** used for breathing

as well as propulsion when swimming. Males and females can be distinguished by the first pair of walking legs, where males have what appear to be boxing gloves. Males are also smaller in size than their female counterparts. Female horseshoe crabs can grow up to 18-19 inches from head to tail, males are approximately 14-15 inches.

A total of ten eyes allow the Atlantic Horseshoe crab to detect light and dark, shadows and motion. The two compound eyes are easily seen on each side of the animal's shell and are used for finding mates. The other eyes are light receptors which can be found on top of the shell, on the tail and near the mouth. These eyes are used for determining movement and changes in moonlight. The purpose of the **telson,** or tail, is to assist in righting itself should it be knocked over by a wave, and acts as a rudder as they plow along the bottom. As dangerous as the telson may look, it is neither venomous nor is it used as a weapon. Lifting a horseshoe crab by its telson will cause harm, when picking up a horseshoe crab carefully hold each side of its helmet.

Atlantic horseshoe crabs grow larger by **molting,** shedding the old shell and replacing it with a larger, soft shell from underneath that hardens in a few days. The shell left behind may wash up on the beach and be mistaken for a dead crab. Older horseshoe crabs molt less frequently than juveniles and often become covered in algae and mollusks. The crabs mature at 9 to 11 years with some living more than 30 years.

Ecosystem

Atlantic Horseshoe Crabs feed on small clams and other bivalves, crustaceans, worms, detritus, algae and other invertebrates.

The Atlantic Horseshoe crab plays an important ecological role in regard to the food web. Several species of shorebirds as well as fish depend on horseshoe crab eggs as a source of food. Sea turtles are known to eat adult horseshoe crabs.

Each spring during the high tides of the new and full moons thousands of horseshoe crabs gather along the beaches. The female pauses every few feet to dig a hole and deposit as many as 20,000 pearly green, birdshot-sized eggs. The male then fertilizes the eggs as he is pulled over the nest. After the spawning is complete, the crabs leave and the waves wash sand over the nest.

LIMULUS AMEBOCYTE LYSATE / LAL

The survival of the Atlantic Horseshoe Crab has been credited to their unique copper laden blue blood which contains remarkable antibacterial properties and is highly sensitive to toxins from bacteria.

Limulus Amebocyte Lysate is a liquid extract of amebocytes, which are blood cells, that form a gel bubble around the bacteria. This gel bubble effectively isolates the contamination thus saving the animal from further harm. This reaction can take as little as 45 minutes and has saved many humans from life threatening infections.

Every year hundreds of thousands of Atlantic Horseshoe Crabs are bled to obtain the LAL used in the field of medicine. The animal is captured and brought to a laboratory where 30% of their blood is bottled. A quart of Atlantic Horseshoe crab blood is estimated to cost $15,000. Pharmaceutical companies are now banding together to replace the practice of bleeding Atlantic Horseshoe Crabs with a synthetic alternative.

CONSERVATION:

The Atlantic Horseshoe Crab is not considered to be endangered at this time however their population has been declining in some areas. Several factors are being considered as threats to their numbers; these include using them as bait in fisheries, harvesting them for their blood to be used in the medical industry, shoreline development, habitat loss and pollution.

It is well known that the Atlantic Horseshoe Crab's reproductive cycle depends on sandy shorelines. Erosion of these landforms due to beachfront development has caused their primary breeding ground to shrink. Adult Atlantic Horseshoe Crabs are used by commercial fisherman to be used as bait. This practice takes the lives of increasing numbers of adults meaning fewer return to spawning areas to lay their eggs.

Long Island Aquarium Experience

At the Long Island Aquarium, you will have the opportunity to observe the Atlantic Horseshoe Crab in our Ray Bay, Touch Tank, and various exhibits. During your visit answer the following questions:

How do Atlantic Horseshoe Crabs grow?

How does the Atlantic Horseshoe crab benefit the ecosystem?

What color is the Atlantic Horseshoe Crabs blood? Why?

What contributions have the Atlantic Horseshoe Crabs made to medicine?

What is being done to help increase the number of Atlantic Horseshoe Crabs?

What can you do to contribute to the conservation and restoration of the Atlantic Horseshoe Crab?