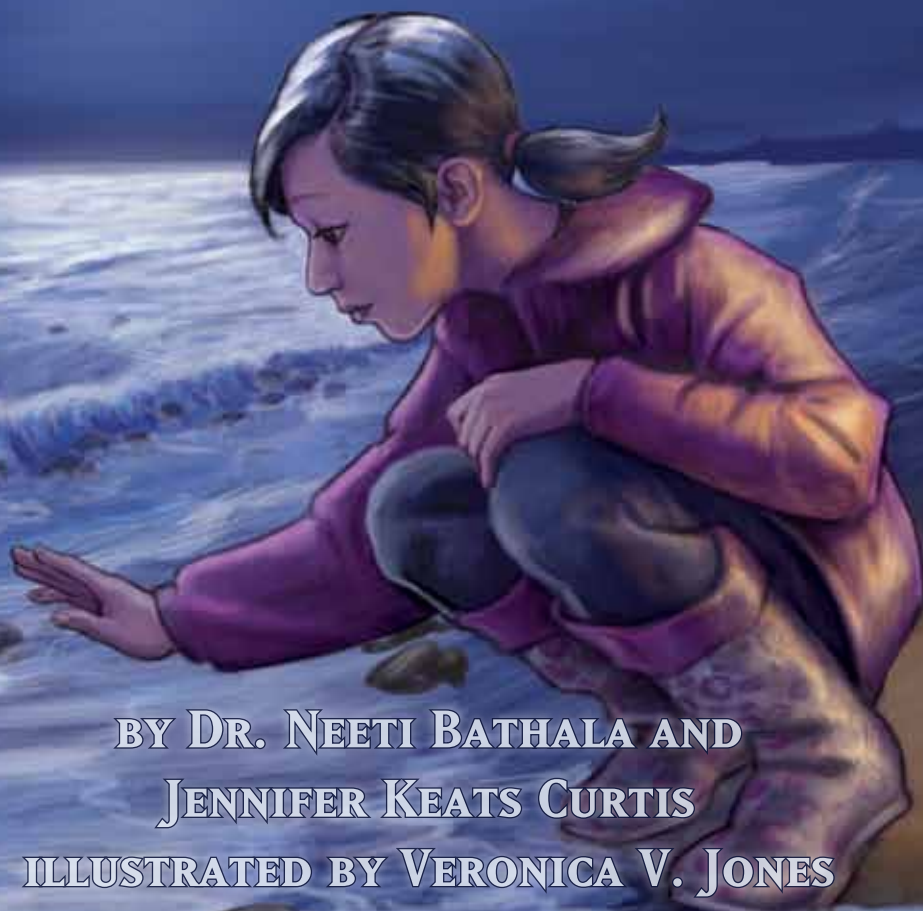


MOONLIGHT CRAB COUNT



BY DR. NEETI BATHALA AND
JENNIFER KEATS CURTIS
ILLUSTRATED BY VERONICA V. JONES

MOONLIGHT CRAB COUNT

Even kids can get involved in science! Ecologist Dr. Neeti Bathala and Jennifer Keats Curtis collaborate to bring us the story of two adventurous citizen scientists. Leena and her mom volunteer each summer to count the horseshoe crabs that visit their beach. With their dog Bobie at their sides, the duo spends a night on the shore surveying horseshoe crabs who have come to mate and lay eggs. Readers will learn valuable facts about these ancient animals and how they can get involved in the effort to conserve horseshoe crabs.



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Thanks to Sheila Eyler, Mid-Atlantic Fish and Wildlife Conservation Office of the U.S. Fish and Wildlife Service; Steve Doctor, Natural Resources Biologist at the Maryland Department of Natural Resources; and Andrew McGowan, Environmental Scientist with the Delaware Center for the Inland Bays, for verifying the accuracy of the information in this book.

The *For Creative Minds* includes

- Horseshoe Crabs
- Meeting in the Bay
- Dr. Neeti Bathala, Ecologist
- Citizen Science

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Dr. Neeti Bathala is an Associate Professor of Ecology and Environmental Sciences at the University of the Arts in Philadelphia. Her research has brought her across the world, studying everything from bottlenose dolphins in Greece to sea turtles in Costa Rica. Neeti's academic efforts involve research and teaching to make science accessible and enjoyable to all. *Moonlight Crab Count* is her debut picture book. Neeti lives in New Jersey and is an avid gardener, creating diverse ecosystems with native plantings. She spends her summers at the Jersey Shore where she is active in local conservation efforts of horseshoe crabs and other marine animals.

Award-winning nature author **Jennifer Keats Curtis** is often found among students and teachers, talking about literacy and conservation. She is the author of more than a dozen books about wildlife rescue, animal care in captivity, and citizen science. Some of her recent titles include *Kali's Story* (Children's Choice Book Award 2015), *Primate School*, and *After a While Crocodile: Alexa's Diary*. Jennifer lives in Maryland with her family and a wide variety of pets. Visit her website at www.jenniferkeatscurtis.com.

Veronica V. Jones is a freelance and children's illustrator from the Northern Virginia area. After graduating from the Catholic University of America with a degree in engineering, she decided to follow her first love, art; and started her career as a freelance illustrator. Veronica began drawing for children in 2010 and has created many covers and interiors since then. *Moonlight Crab Count* is her debut picture book. Visit her website at www.vvjones.com.

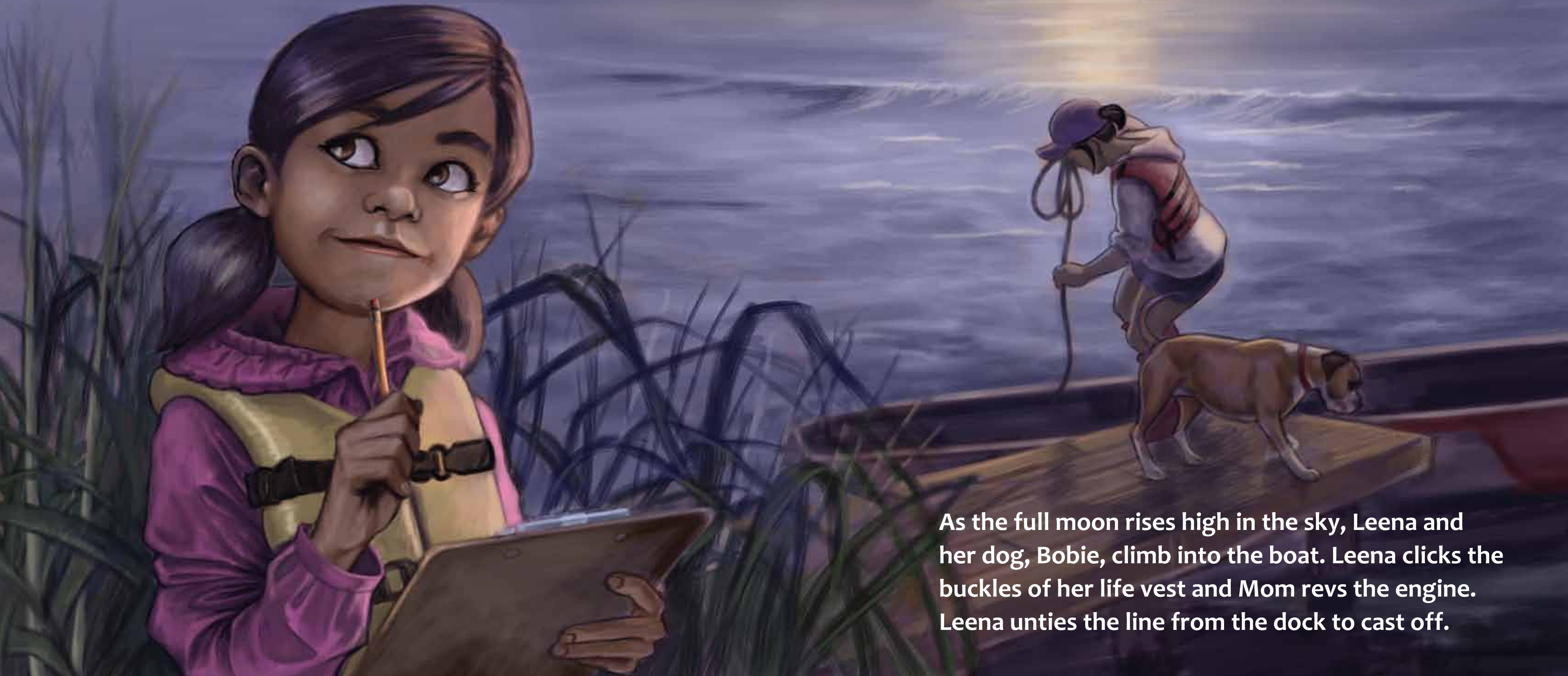


Dr. Neeti Bathala, Jennifer Keats Curtis, and
Veronica V. Jones

MOONLIGHT CRAB COUNT

BY DR. NEETI BATHALA AND JENNIFER
KEATS CURTIS
ILLUSTRATED BY VERONICA V. JONES

Full moon. Check.
High tide. Check.
Flashlight. Check.
Clipboard. Check.
Thermometer. Check.
Dog biscuit. Woof!



As the full moon rises high in the sky, Leena and her dog, Bobie, climb into the boat. Leena clicks the buckles of her life vest and Mom revs the engine. Leena unties the line from the dock to cast off.

The trio skims the small waves and heads out into the bay. In the moonlight, Leena can just make out the island ahead.



Dropping the thermometer into the water by its string, Leena checks the temperature and records important data on her clipboard:

Date: June 18

Time: 9:29 p.m.

Water temperature: 23.2 degrees Celsius

Wind speed: 6 mph





Mom beaches the boat right onto the sand. Leena and Bobie hop off. As Mom secures the anchor, Bobie bounds along the shore, barking as water wets her paws. With Mom behind her, Leena walks across the sand.

As she stoops to pick up a pretty, scalloped shell, Leena sees something strange. Bobie spies it too. She hurries to investigate, woofing at the creature that looks like half a brown basketball with bumpy eyes, sharp spines, and a pointy sword.



For Creative Minds

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Horseshoe Crabs

Horseshoe crabs are weird. They are not true crabs (crustaceans). They are more like spiders and scorpions. We call horseshoe crabs “living fossils” because they look just like their dinosaur ancestors. They have hardly changed in millions of years.

Horseshoe crabs have ten eyes. They even have eyes on their tails that can detect light.

Once she is ten years old, a female horseshoe crab can lay 70,000 to 100,000 green eggs every year.

Horseshoe crabs have six pairs of legs. They use five pairs of legs for walking.

The sixth pair of legs brings food (like baby clams and sea worms), to the horseshoe crab’s mouth.

Long tails help the horseshoe crabs steer or right themselves when they get flipped over.

Horseshoe crabs’ blood is bright blue, not red like humans’.

Horseshoe crabs have a shell (exoskeleton) to protect them from predators.

Tiny hairs all over the horseshoe crabs’ bodies help them feel and smell.



Meeting in the Bay

The Atlantic horseshoe crab (*Limulus polyphemus*) lives in coastal waters in the Gulf of Mexico and along the east coast of the United States. There are four species of horseshoe crabs in the world. The Atlantic horseshoe crab is the only one in the Americas. The other three live in East and Southeast Asia.

In the spring, Atlantic horseshoe crabs travel (migrate) from the bays and ocean to beaches along the Eastern Seaboard. They meet on the shore under the full and new moons in May and June. In some areas, they meet as early as February or as late as August.

Female horseshoe crabs crawl up the beach to the high tide line. Male horseshoe crabs hang onto her back. The female horseshoe crab digs holes in the sand. She lays up to 20,000 green eggs in each hole. The male horseshoe crab fertilizes the eggs in the hole. This process is called **spawning**. After the horseshoe crabs leave, sand covers the nest.

The Delaware Bay is the largest spawning area for Atlantic horseshoe crabs. Over one month each year, tens of thousands of horseshoe crabs fill the beaches of the Delaware Bay. While horseshoe crabs lay their eggs on the beach, other animals come to eat the tasty green eggs. Eleven types of shorebirds, including the red knot, come to the Delaware Bay to eat the eggs. Red knots are a threatened species. This means that if humans do not protect red knots, they could become endangered or even go extinct. When an animal is extinct, there are no more of that animal left anywhere in the world.

Every year, red knots migrate from their winter homes in South America to their summer nesting grounds in the Arctic. About halfway through their journey, red knots reach the Delaware Bay. After so much flying, they are hungry! The birds fly onto the beaches to slurp down as many horseshoe crab eggs as they can.



Dr. Neeti Bathala, Ecologist

As long as I can remember, I have loved nature. As a child, animals and plants fascinated me. How did the sun make plants grow? Why did some species live in water and others on land? I was lucky to work in my father's garden where I could see something grow from a seed into a plant that fed the caterpillars that became butterflies. I especially wanted to know more about water, which seemed magical because it fed plants and made homes for animals. I knew I wanted to protect the earth because this is the secret to keeping all species safe.

As I grew up, I loved my biology classes. I learned to measure and to observe organisms, from the smallest bacteria to the largest whale. Having numbers showed me how things changed. I could see how populations got bigger when they had more area to expand. I learned that changing a factor like light could affect how big an organism became.

I grew my own plants and kept aquariums of fresh and saltwater animals. I learned why each species needs the best environment to thrive. I became an ecologist—a scientist who studies nature—so that I could go into the field and see how changes in the environment affect living things.

I have a special appreciation for species that have been around for a long time and have survived change. The horseshoe crab is such a creature. Its survival affects many other species, including our own.

Ecologists lead very exciting lives! We study plants, animals, and environments on the land and in the water so we can get jobs with the goal of conserving species. I have monitored bald eagle chicks, tagged butterflies, protected sea turtles nesting on the beaches, tracked dolphins, and looked for seahorses in mangroves. I study plants from the desert to the dunes to the tropical rain forests. I even dive in the ocean to observe fish and corals.

To become an ecologist, it is important to study science and math so you can learn to count species and understand individuals and groups in small areas and on the whole planet. Especially as our climate changes, studying nature is an important job. Starting now, you can even help in your own backyard or schoolyard, by gardening and planting flowers to help species thrive.

Every day is an adventure!

—Neeti Bathala



Citizen Science

Many scientists study horseshoe crabs, but they can't be everywhere to count them all. They often rely on **citizen scientists**, like Leena and her mom, to help. There are many different projects, all around the world and online, where citizen scientists can help with research. Would you like to be a citizen scientist?

Put the following steps in order to discover what is involved with being a citizen scientist. The answer will spell a body part found on horseshoe crabs. Which step are Leena and her mom doing in this story?

L Citizen scientists send their results to the professional scientists.

S Professional scientists analyze and learn from data collected by citizen scientists.

T Professional scientists design a project and ask for volunteers.

I Citizen scientists make observations and collect data.

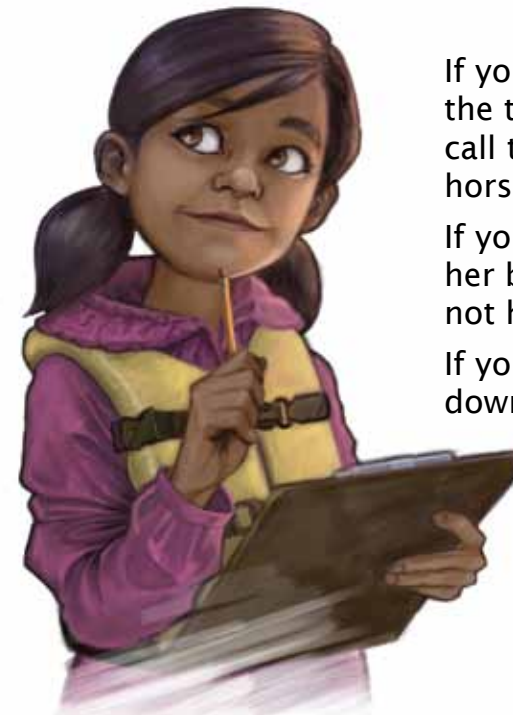
A Volunteer citizen scientists are trained to collect and report data.

How can you help horseshoe crabs?

If you find a horseshoe crab with a tag on her shell, write down the tag number, where you found her, and how she is doing. Then call the phone number on the tag. This helps scientists track the horseshoe crabs.

If you find a horseshoe crab that has been flipped over by waves, flip her back over! She is not dangerous and may just be stranded. Do not hold the animal by her tail because this can hurt her.

If you live along the Eastern Seaboard (the East Coast from Maine down to Florida) and want to count—or survey—horseshoe crabs, call your local nature center, Conservancy Center, or Department of Natural Resources to learn more about volunteering.



To all that have inspired me, human and other species great and small.—NB

For my husband and favorite captain, Jim; and to my daughter, Max, who helped me count the horseshoe crabs and took some great photos.—JKC

To my family, who even though they didn't do the drawing and painting, still helped me so I could. I love you so much.—VVJ

Thanks to Dr. Sheila Eyster, Mid-Atlantic Fish and Wildlife Conservation Office of the U.S. Fish and Wildlife Service; Steve Doctor, Natural Resources Biologist at the Maryland Department of Natural Resources; and Andrew McGowan, Environmental Scientist with the Delaware Center for the Inland Bays, for verifying the accuracy of the information in this book.

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