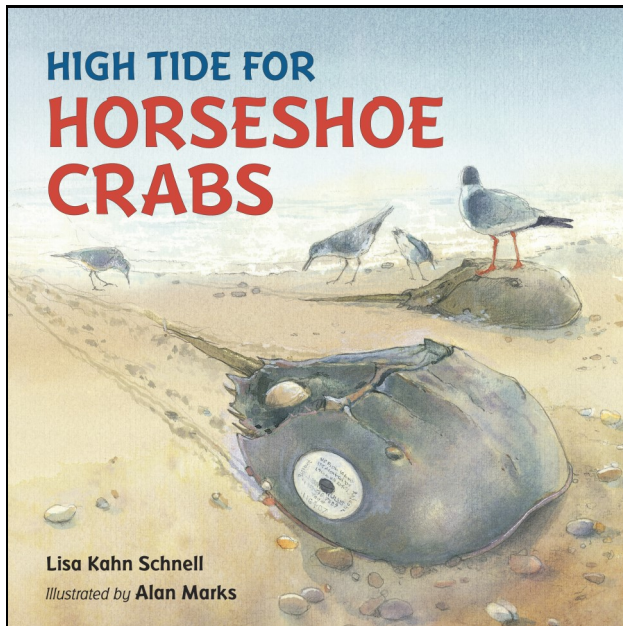


HIGH TIDE FOR HORSESHOE CRABS



Lisa Kahn Schnell • Illustrated by Alan Marks

Activity & Discussion Guide Developed by Charlesbridge

Every spring millions of horseshoe crabs crawl to the beaches of Delaware Bay to lay their eggs. There are so many crabs crowding the beach that their shells clack together. But they aren't the only ones crowding the beaches for two weeks in spring.

Flocks of shorebirds migrating north from South America stop to feed on the horseshoe crab eggs. People also flock to the shore. Scientists and tourists turn out to see the spectacle and learn more about the animals that call this place home for a few weeks.

Beautiful illustrations from Alan Marks put the reader right on the shoreline to observe this exciting annual event that interconnects species.

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E-book editions also available

Ages 3–7 • 9 x 9 • 40 pages

Pre-Reading Discussion Questions

Ask students to look at the front cover . . .

- What animals do they see on the cover?
- How are the animals interacting?
- In what direction do they think the crabs are traveling? How can they tell?
- Have them look closely at the horseshoe crab in the foreground. What do they see on its shell (called a **prosoma**)?
- Ask students to describe what a high tide is. Why do they think it might be important to the horseshoe crabs?
- Have students ever seen a horseshoe crab in real life? What was it like?
- Do they think the cover image will wrap around to the back of the book?

Ask students to look at the back cover . . .

- What do they see on the back cover?
- Thinking about the front and back covers, what do they think the story will be about and how will the people on the back cover fit into the story?

Post-Reading Discussion Questions

- Ask students to describe what the book was about, and what characters were involved.
- For how long have horseshoe crabs been taking part in this cycle?
- Have students explain how the high tide helps the horseshoe crabs.
- Ask students to explain how the shorebirds fit into the story. What journey are they embarking on and how do they interact with the horseshoe crabs in Delaware Bay?
- Have students recall what brings scientists and “citizen scientists” to Delaware Bay. What do they do there? Scientists tag the horseshoe crabs each spring—ask students if they remember seeing evidence of this during the pre-reading discussion.
- Have students discuss how the shorebirds get access to the tiny horseshoe crab eggs. How many will they eat? Will there be any eggs left to survive? How do the shorebirds know when to move on, and where do they go next?
- Ask students how much time passes before the young horseshoe crabs burst from their eggs. How big are they when they leave the egg, and what do they do next?





Make a Paper Mâché Horseshoe Crab

Items needed: Large bowls to hold paste mixture, white glue or flour, water, a balloon for each child, paintbrushes, strips of newspaper, construction paper

1. Cover the work surface in newspaper or a washable table cloth. Provide each child with a smock or apron to protect clothing.
2. Give each student a pile of newspaper and have them tear into long strips about an inch wide. Tearing the strips is preferable over cutting them, as the uneven edges help the paper to contour better around the balloon. Students will need a good amount of strips, as they'll cover the balloon in multiple layers for strength.
3. **Prepare the paste.** Pour 2 parts white glue and 1 part water into a mixing bowl. If you'd rather, flour can be used instead of white glue. If using flour, combine 1 part flour with 1 part water. Blend the mixture using a paintbrush, spoon, or popsicle stick. If the mixture appears too thin, add more glue/flour—too thick, add more water.
4. Assist students in blowing up their balloons and tying a knot. Balloons can be painted with cooking oil before covering with the newspaper strips. This ensures easy removal of the balloon once the paper mâché has dried.
5. **Begin the paper mâché!** Have students dip a strip of newspaper into the paste mixture. They'll then remove the strip from the bowl, wiping off the excess paste by lightly pinching the strip between two fingers and running them down the length of the paper.
6. Students will lay the newspaper strip over the balloon. Smooth it out, using fingers or a paintbrush. Be sure to get as many of the creases and bumps out as you can. Repeat this until the balloon is covered in three layers of newspaper strips. Alternate the direction of strips for each layer (horizontal, vertical, horizontal). Leave the bottom of the balloon exposed (where the knot is). Once the paper mâché is dry, you will pop the balloon from the bottom and remove. The hardened structure will then be cut in half to mimic the shape of a horseshoe crab.
7. Designate a space in the classroom for students to set their paper mâché to dry overnight. Test the balloons the next day to make sure they are completely dry before popping the balloon, cutting in half, and painting.
8. The bottom of the balloon will be the back of the horseshoe crab, to which students can attach its "tail" (called a **telson**). To create this tail, have students cut construction paper into a long, thin triangle and fold it lengthwise to create strength and height. Glue or tape the telson to the inside of the paper mâché form, making it stick out the back.
9. Once the paint has dried on the horseshoe crabs, have students use the end sheet diagrams from the book to label the parts of their own horseshoe crabs.

Further Post-Reading Activities

Journal Entry

Ask students to imagine that they are part of the action that takes place in this book. Have them each write a journal entry from three different perspectives: as a horseshoe crab, as a shorebird, and as a vacationer or “citizen scientist.” They will write about their experience during the spring in Delaware Bay. What brought them to the area, and have they been there before? Are they nervous or excited leading up to their experience? How do they feel once they’ve arrived on the shore? When are they ready to leave, and do they plan to come back next year?

Research Project

The horseshoe crabs in this book are of the species *Limulus polyphemus*. Have students pick a different species of horseshoe crab to research further. Using the websites listed in the end matter of the book, students will prepare a two-minute presentation to give in small groups. Instruct them to highlight any ways in which their researched species of horseshoe crab differs from the species discussed in the book.

Nature Comparisons

Shorebirds coming from South America rely on the horseshoe crabs in Delaware Bay to produce eggs that will sustain the birds as they continue on to the Arctic. The horseshoe crabs rely on the tides to bring them far onto shore, where the eggs will develop best. As a class, discuss other types of codependent relationships that exist in nature.



Fill in the Blank

The following diagrams show a horseshoe crab from the top, and from the bottom. Fill in the blank with the appropriate word from the list below. Use the end papers of the book to study, but try filling in the blanks without opening the book!

Median eyes
lateral eyes
Telson
Pedipalps
Mouth

Book gills
chelicerae
Male pedipalp
Opisthosoma
Operculum covers

pusher legs
Legs
Blood
Prosoma

_____ sense
light from the visible to the
ultraviolet ranges. Other eyes
are located underneath the
body and on the tail.

The hard, dome-like _____
protects soft body parts and
discourages predators.

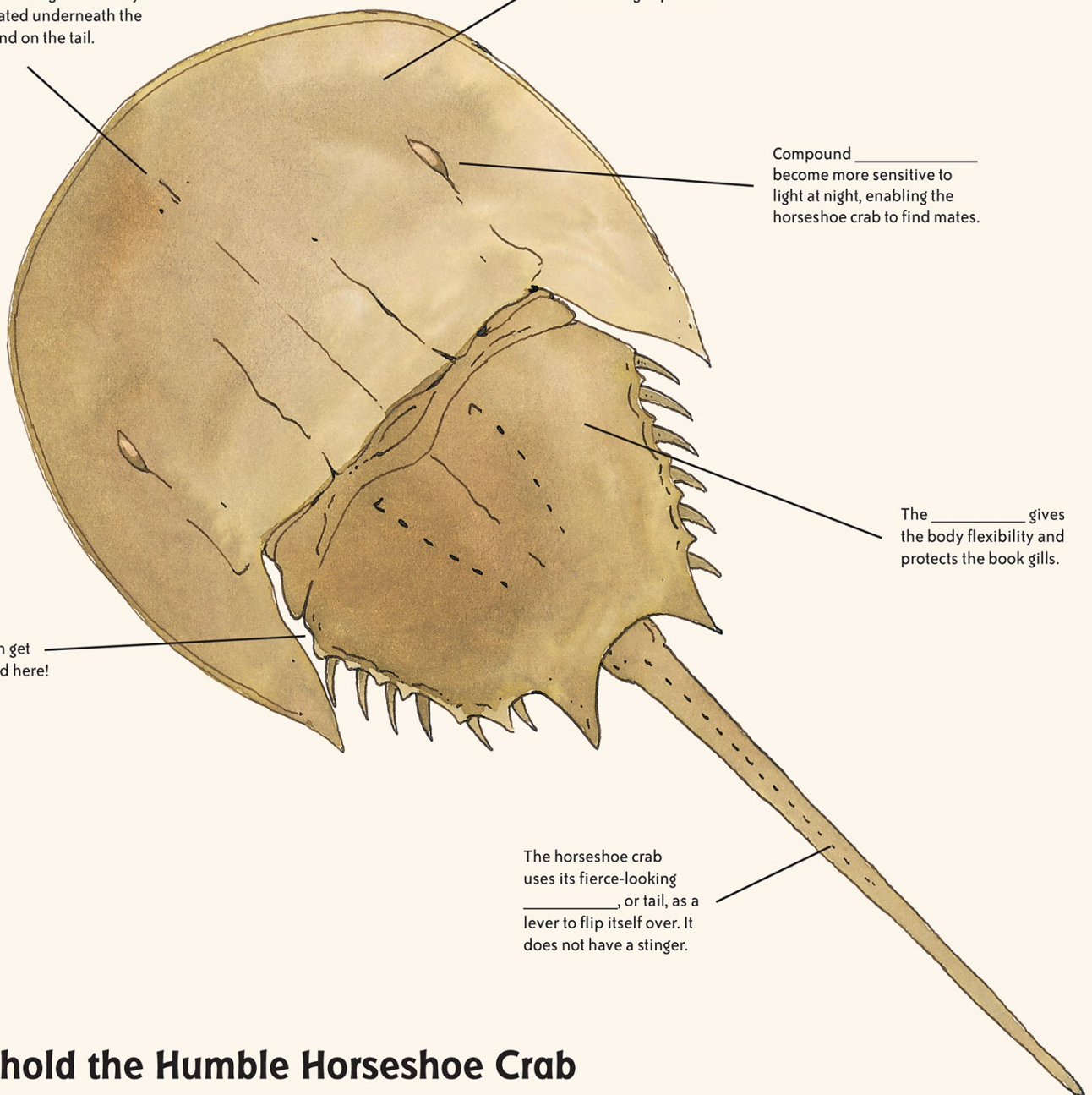
Compound _____
become more sensitive to
light at night, enabling the
horseshoe crab to find mates.

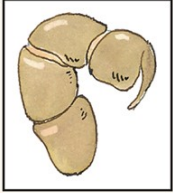
The _____ gives
the body flexibility and
protects the book gills.

Ouch!
You can get
pinched here!

The horseshoe crab
uses its fierce-looking
_____, or tail, as a
lever to flip itself over. It
does not have a stinger.

Behold the Humble Horseshoe Crab





Both females (shown here) and males have _____. In mature males they look like boxing gloves and help hold on to the female's shell while mating.

The _____ look like little legs, but they are actually feeding claws.

A horseshoe crab cannot bite. It doesn't even have jaws or teeth! Bristles at the base of the legs knead and push food into the _____.

_____ thin sheets of tissue held together like the pages of a book, help the horseshoe crab breathe and swim.

Five pairs of _____ help the horseshoe crab walk, eat, and dig.

The _____ covers the book gills. Eggs and sperm are released from this area.

The _____ help dig into the sand, push off when swimming, and mold eggs into clusters.

Horseshoe crabs have blue _____!
Copper causes their blood to turn blue when it contacts air; iron turns our blood red.

