



ADVENTURES
OF BINI THE
HORSESHOE CRAB



Published in Singapore by
National Parks Board
Singapore Botanic Gardens
1 Cluny Road
Singapore 259659

Authors:
Adi Haliq Bin Zaini,
Ameryn Dahnia Binte Mohamad Zaili,
Bentley Boo Cheng Kang

Illustrators:
Ahmad Iqbal Bin Othman,
Hafizah Binte Mohamad Pauzi

Advisors:
Ang Hui Ping,
Jayasri,
Sabrina Tang,
Dr Laura Yap

Printed by
Oxford Graphic Printers Pte Ltd

©National Parks Board, 2020

All rights reserved. No parts of this publication may be reproduced, stored in any retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise without the prior permission of the copyright owner.

One morning, Bini the horseshoe crab awakens from her moult.
She lets out a huge yawn, stretches all her 12 legs, and shakes off the mud.

Multiple Legs!

Horseshoe crabs have six pairs of legs. Five pairs are used for walking and the last pair is used for eating.



“Yay, I have finished moulting! I have grown bigger too! I’ve got to tell my parents!” Bini says in excitement.

Bini starts to look around the mangrove forest, but she cannot find her parents.

“Oh no, where have they gone?” Bini wonders worriedly.

Growing Up!

As horseshoe crabs grow bigger, their hard shells (exoskeletons) become too small for them. Moulting allows them to shed their old shells to form bigger ones. Horseshoe crabs moult up to six times in their first year, and up to 18 times before they become adults.



Bini ventures out into the mangrove forest to look for her parents.

“Oh, what is that green object flipping around?”

As Bini goes closer, she sees that it is a small pufferfish caught in algae.

“Hello there! Do you need any help?” Bini asks.

“Yes please! I was swimming around when I suddenly got stuck in a mat of algae,” yelps the pufferfish.

Backstroke Swimmers!

Horseshoe crabs rarely swim, but when they do, they either swim like Bini or even upside down. Swimming upside down is a habit from when they were developing inside their eggs.

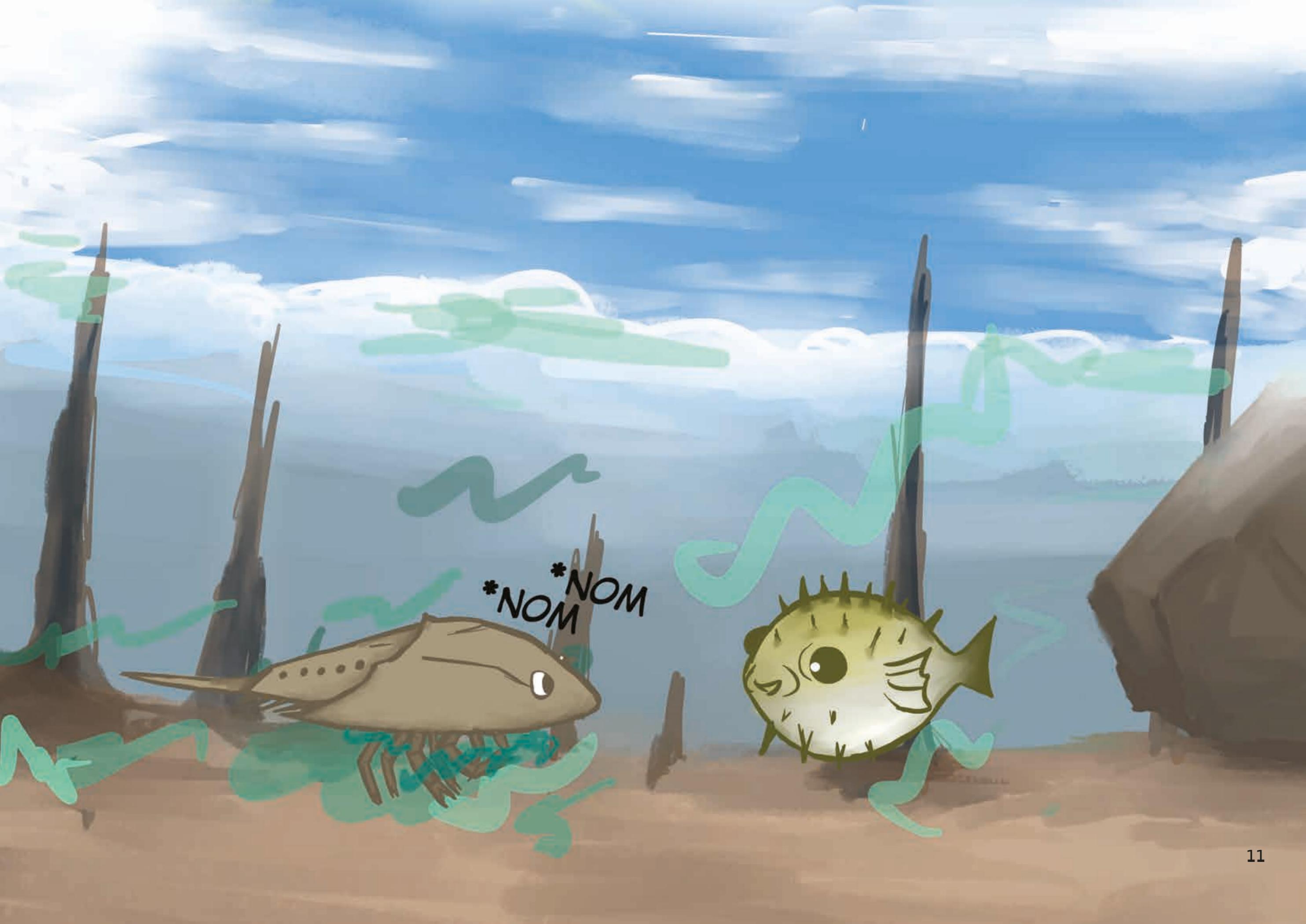


“Oh, let me help you with that!” says Bini.

Bini starts to nibble on the algae to help free the pufferfish!

Daily Diet!

Horseshoe crabs are scavengers. This means that horseshoe crabs eat almost anything like small clams, worms, and algae.



*NOM *NOM *NOM

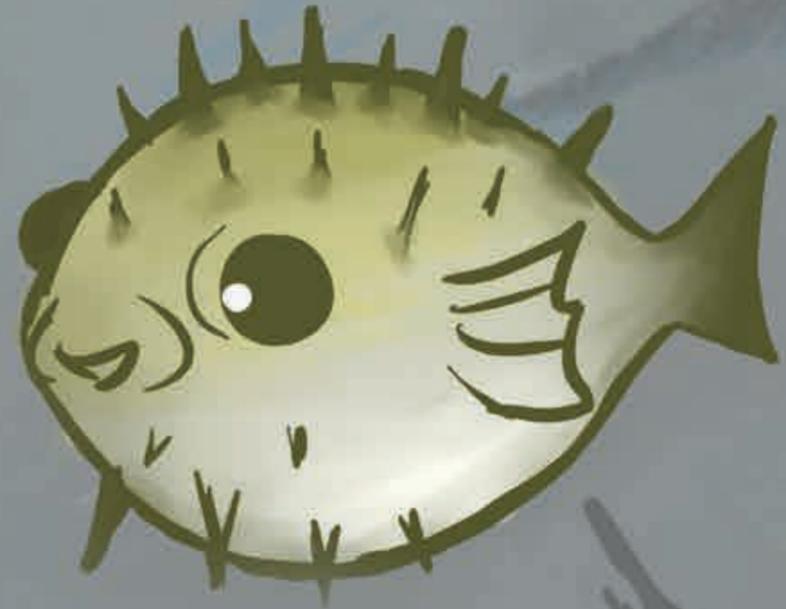
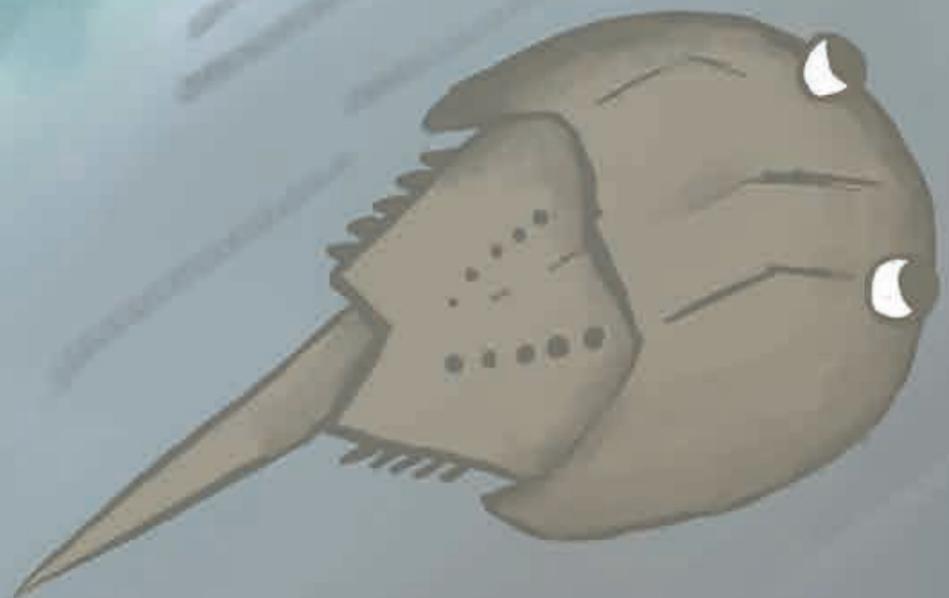
“Thank you so much! I thought that I would be stuck here forever!” the pufferfish says happily.

“Is there anything that I can help you with?” asks the pufferfish, eager to return the favour.

“I am looking for my parents. Have you seen them?” says Bini, full of hope.

Male or Female?

Female horseshoe crabs tend to be bigger than males. The first pair of walking legs in male horseshoe crabs are shaped like hooks to latch onto female horseshoe crabs for mating.



The pufferfish shakes his head.

“However, I saw a trail similar to yours going in that direction.”

The pufferfish points towards a trail that looks exactly like Bini’s.

Follow the Trail!

Ever stumbled upon a trail that looks like two clear lines with little markings along them? Chances are that it was from a horseshoe crab!



As Bini follows the trail, she bumps into a mud crab.

“Hello there, I am looking for my parents. Have you seen them around?”

Mud Crabs and Horseshoe Crabs!

Mud crabs are often seen in mangroves just like horseshoe crabs. However, mud crabs are true crabs while horseshoe crabs are more closely related to spiders.



Snip snip

“I saw two horseshoe crabs go past a while back,” replies the mud crab.

“Oh really? I’d better go catch up with them. Thank you, Mr Mud Crab!” says Bini, as she waves goodbye to Mr Mud Crab.

“No worries, but be careful, there are plenty of dangers up ahead,” the mud crab cautions.



*SNIP
*SNIP



**BEWARE
DANGER**



As Bini continues her quest to find her parents, she notices bits and pieces of unfamiliar objects.

“What are those things in the mud?”

“Ouch, that hurts!” Bini cuts one of her legs as she crawls over the mud filled with rubbish. A little bit of her blue blood starts to flow out.

“I’d better get out of this place quickly!” exclaims Bini in fear.

Blue Blood?

Unlike humans, horseshoe crabs have blue blood. While human blood contains iron, horseshoe crabs’ blood contains copper – another type of metal that helps to transport oxygen in the body. That gives their blood its blue colour!



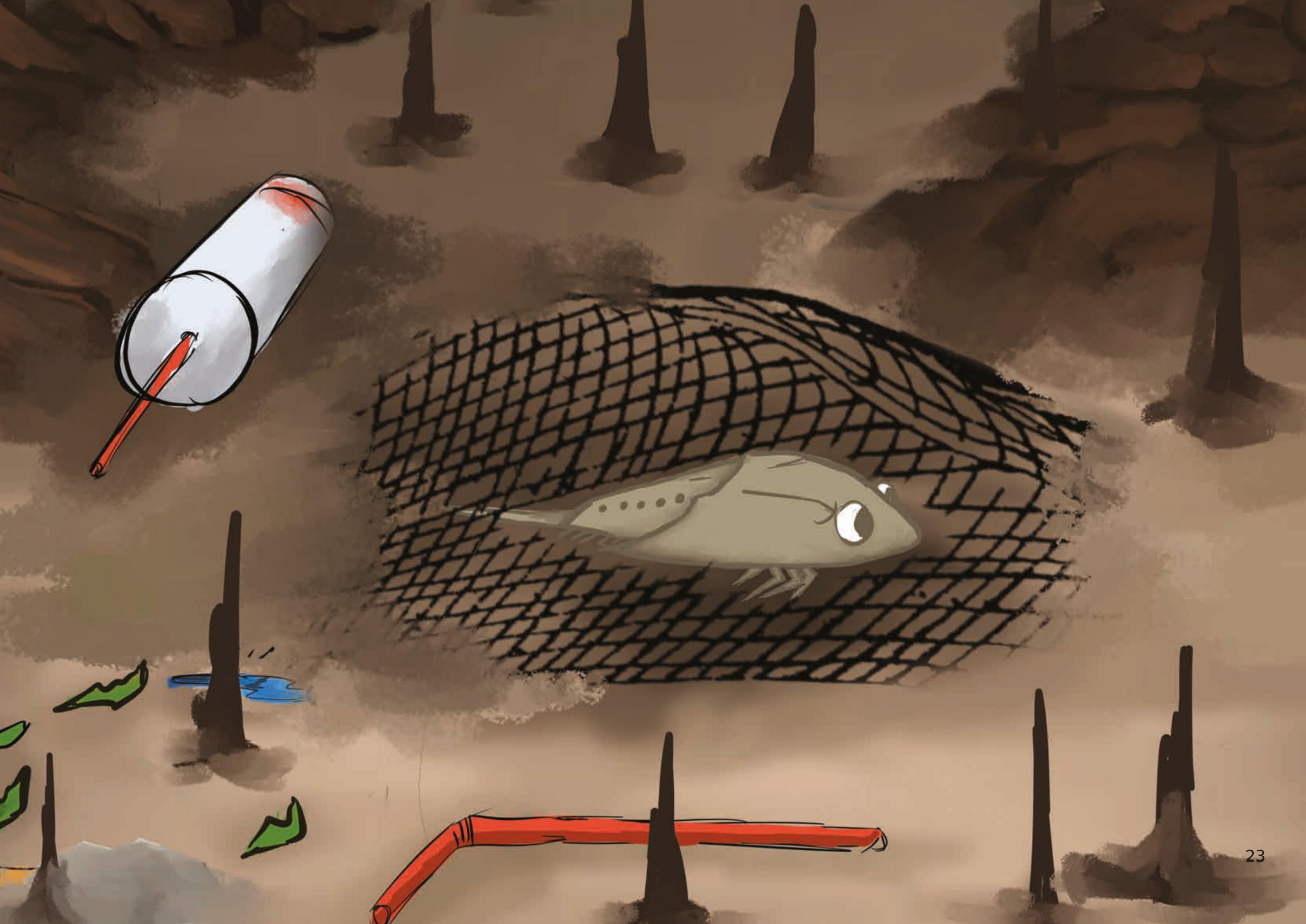
“Oh no!”

Bini finds herself entangled in something.....

It is a large fishing net!

Killer litter!

Horseshoe crabs and many other animals are often found trapped in abandoned fishing nets. This can cause serious injuries to them. The nets are usually thrown away or forgotten by people. They drift across the sea, trapping animals along the way. Hence, they are called drift nets or ghost nets.

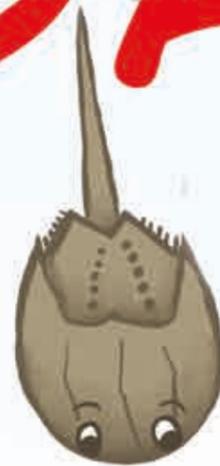


Bini tries her best to crawl out, but the harder she tries, the more entangled she becomes.

“Help me! I’m stuck!” wails poor Bini.

After some time, Bini grows tired. Feeling frightened and helpless, she starts to cry as she remembers the good times she had with her parents.

FLASHBACK



Snip snip

“Don’t worry, I am here to save the day!”

It is Mr Mud Crab from earlier!

“You are caught in a fishing net. Fret not, I will use my pincers to cut you free.”

Snip snip

After freeing Bini from the net, Mr Mud Crab and Bini continue the journey in search of her parents.



They come across a huge patch of charru mussels.

“Oh! What are these?” cries Bini. “There are hundreds of them!”

Snip snip

“These are charru mussels,” replies Mr Mud Crab.

“They do not belong in this mangrove. They can cause harm to our environment! Look, there are more of them over there.” Mr Mud Crab points his pincers towards more charru mussels.

Invasive Species!

Animals that do not belong or originate from another area are called non-native species. When non-native species spread and cause harm to the environment and its native animals, they become invasive species. An example of an invasive species in Singapore is the charru mussel.



“Oh, I have seen my parents feeding on them. I miss my mom and dad so much,” Bini mumbles sadly.

Keystone Species!

Horseshoe crabs are keystone species. This means that the ecosystem depends on them and that their environment will change if they are absent. For example, horseshoe crabs help to eat and remove invasive species like the charru mussel, preventing them from taking over the mangrove.



*NOM *NOM

MUSSELS!



Snip snip

“Bini, look! There are two horseshoe crabs up ahead! Could they be your parents?” Mr Mud Crab points towards some mangrove trees.

Hurrying ahead, they finally find Bini’s parents amongst the roots of the mangrove trees.



*SNIP
*SNIP

A relieved Bini is so happy to be reunited with her parents.

“Mom! Dad! What are you doing here?” asks Bini.

“Oh hello Bini! We are preparing a nest for your mother to lay her next batch of eggs in,” answers Bini’s father.

“We’re sorry for leaving you for a while. You were moulting and we didn’t want to disturb you,” Bini’s mom apologises.

Moulting Time!

During the moulting process, horseshoe crabs’ bodies become fragile and soft. Thus, horseshoe crabs tend to have little to no movement at all so as to not disturb the process and to ensure that they moult successfully.



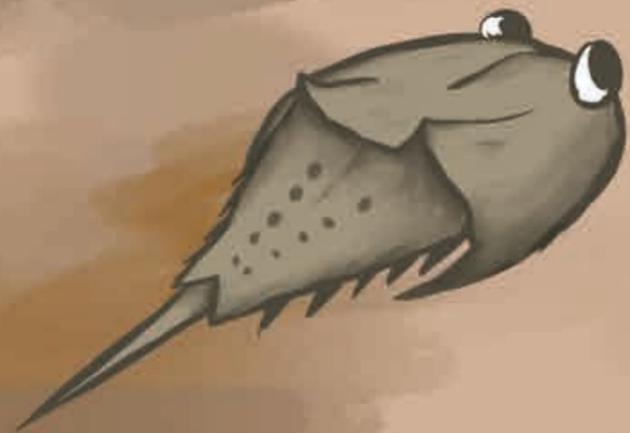
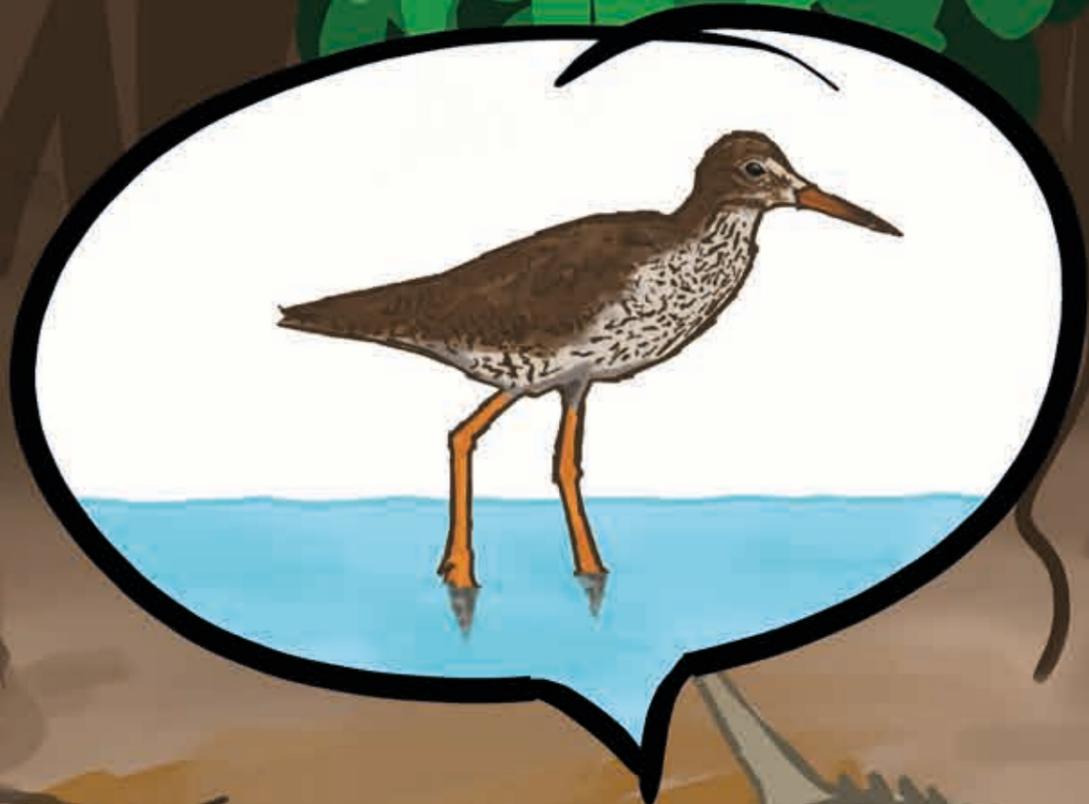
“I finished moulting, and I have grown bigger!” says Bini with pride. Bini’s parents are as proud as Bini.

“But why do you have to come all the way here to build a nest?” Bini asks in confusion.

“Well, we are trying to find a safe spot for the eggs to prevent any shorebirds from eating them,” explains Bini’s father.

Protect the Eggs!

Horseshoe crab eggs are a food source for shorebirds like common redshanks and marsh sandpipers. To protect their eggs from the birds, horseshoe crabs tend to dig and lay their eggs in burrows in the sand or mud.



Once Bini's parents have finished digging the burrow, Bini's mom lays a cluster of eggs.

Big Family!

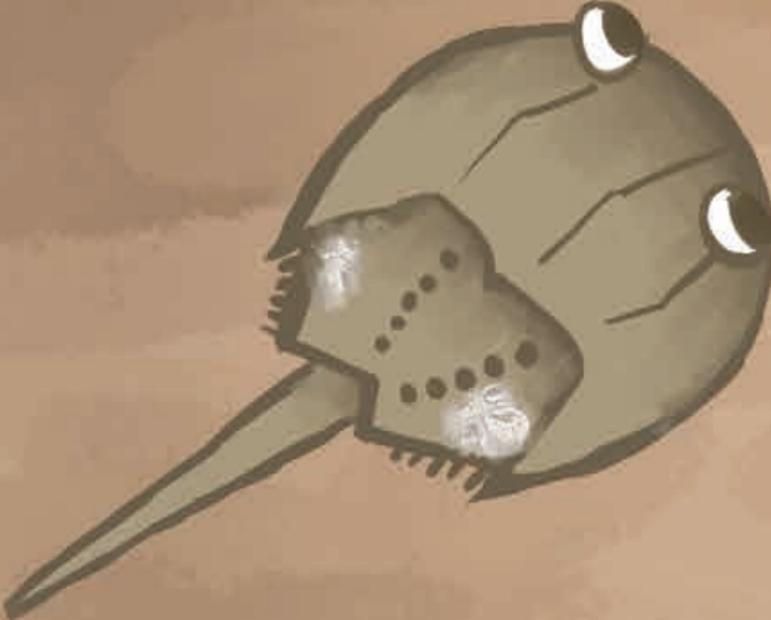
Female horseshoe crabs lay their eggs in big batches and may even lay around 100,000 eggs over their entire lives.

The eggs can be seen in clusters and are usually green or orange.

*DIGS



*DIGS



*DIGS



One month later, Bini becomes a big sister to a hundred little horseshoe crabs!

1 MONTH LATER

BINI



More about Bini the Horseshoe Crab!

- Did you know that horseshoe crabs are ancient creatures, and have been around even before dinosaurs? These harmless creatures are important scavengers. They feed on carcasses (dead animals) and help to recycle nutrients in the ecosystem. In turn, their eggs and larvae are a source of food for many other animals.
- Horseshoe crabs have special blue blood that is sensitive to bacteria. Their blood is used to test medicine to make sure that it is safe for humans. However, this has caused many horseshoe crabs to be taken from the wild for their blood, driving them close to extinction.
- Singapore is home to two species of horseshoe crabs, out of the four species found globally.
- In our story, Bini is a mangrove horseshoe crab (*Carcinoscorpius rotundicauda*), the smallest species of horseshoe crab. The other species found in Singapore is the coastal horseshoe crab (*Tachypleus gigas*).



Photo credit: Adi Haliq

Coastal horseshoe crabs have longer spikes on their bodies and serrated tails.

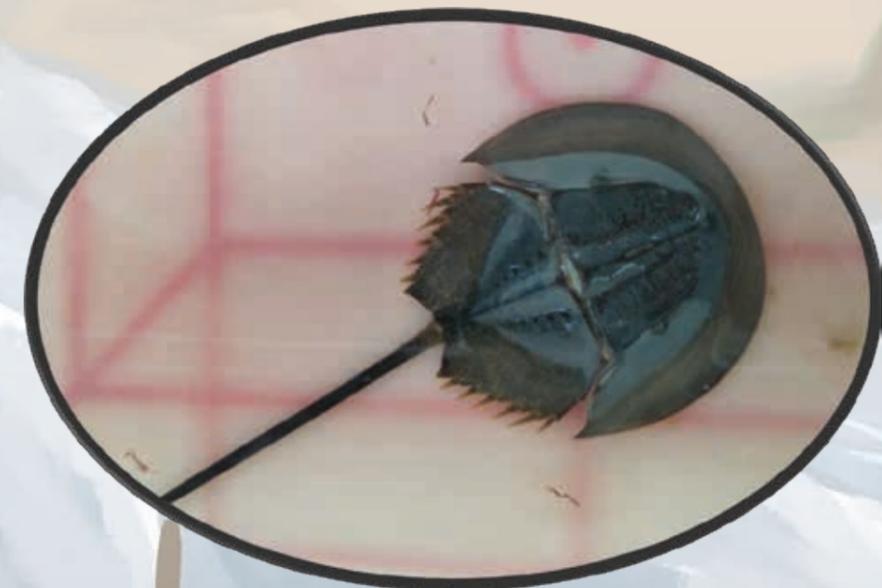


Photo credit: Ameryn Dahnia

Mangrove horseshoe crabs have shorter spikes on their bodies and rounded tails.

Crabby Consequences

- Around the world, horseshoe crabs have been affected by human activities.
- They get trapped in fishing nets thrown away into the sea. Unable to escape the net by themselves, many die as a result. Horseshoe crabs may also get injured when walking through litter such as broken glass, like poor little Bini in this story.
- Unlike the litterbugs in Bini's story, you can make a positive difference to the environment. Be considerate and mindful. Throw away your rubbish properly into rubbish bins.



Photo credit: Adi Haliq

A horseshoe crab tangled with a fishing net.

Bini is a young horseshoe crab living in a huge mangrove forest in Singapore. One day, she awakens from moulting, and realises that her parents are missing! Where might they have gone? It is up to Bini to look for them!

Follow Bini on her amazing adventure through the mangrove in search of her parents, and learn more about the wonderful biodiversity that lives in our City in Nature!

An NParks Community in Nature project with:

Scan to learn more about City in Nature:



**REPUBLIC
POLYTECHNIC**

DISCOVER. TRANSFORM. ACHIEVE

