

Over
70
flaps

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SMALL WORLDS WATER

Explore small habitats
in nature

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SMALL WORLDS

Have you ever peered into rock pools to watch creatures moving in the water? Have you explored the wild wetlands and their reedy ponds, or wondered what life might be like in a freshwater cave?

Nature is full of small worlds. In these magical environments plants and animals work together in wonderful ways in order to survive. And although these worlds may be small, they are complex habitats which are, quite literally, swimming with life. Look closely and you'll find crabs in a pool high above the tree tops, fishes in the tangled roots of a mangrove and ghostly creatures at the bottom of the ocean.

In this book you will find eight very different small and watery worlds, from desert waterholes to coral reefs and hydrothermal vents.

Are you ready? Take a deep breath and dive in.

What will you discover?

Look out for:

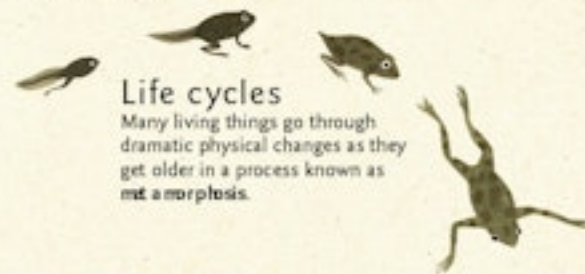
Predators

These creatures prey on other animals for food.



Life cycles

Many living things go through dramatic physical changes as they get older in a process known as **metamorphosis**.



Decomposers

A plant, fungus or bug that breaks down organic material like dead plants and animals



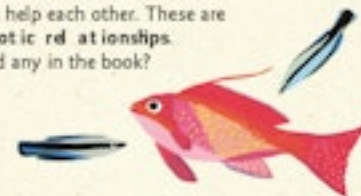
Animal homes

Animals find many ways to shelter from predators and raise their babies.



Relationships

Sometimes different life forms behave in ways that help each other. These are called **symbiotic relationships**. Can you find any in the book?



ROCK POOL

As the tide goes out, it leaves behind pools of sea water trapped in gaps between the rocks. Each rock pool has its own unique treasure trove of plants and animals.

A rock pool may look safe, but it's a harsh world – battered by waves and heated by the sun.

Barnacles stick to the surface of rocks. Their strong shells protect them from predators.

Most of these small fishes will stay in the same rock pool all their lives.

This sea star is on the hunt for tiny prey.

This is sea lettuce, a type of seaweed. Its ruffled fronds look just like lettuce leaves.

Seaweed is vital for the web of life in a rock pool. Many creatures depend on it for food and shelter.

Sea anemones are sometimes called 'flowers of the sea' but they are animals, closely related to jellyfish and corals.

By day, the brown shrimp lies buried under the sand.

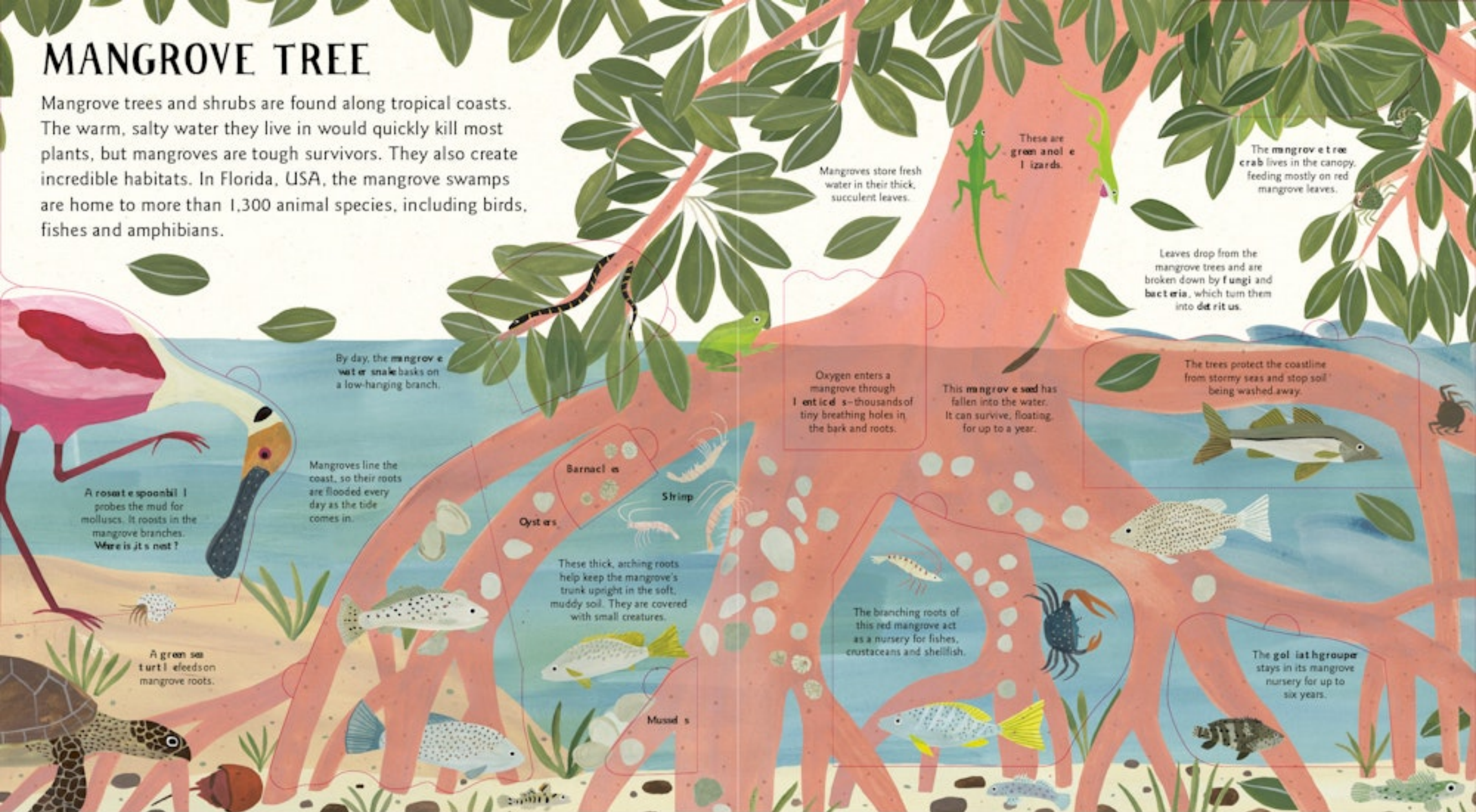
Hermit crabs have soft body parts. They use the empty shells of other sea creatures for protection.

A candy-striped flatworm creeps across the rock pool using thousands of tiny hairs on its underside.



MANGROVE TREE

Mangrove trees and shrubs are found along tropical coasts. The warm, salty water they live in would quickly kill most plants, but mangroves are tough survivors. They also create incredible habitats. In Florida, USA, the mangrove swamps are home to more than 1,300 animal species, including birds, fishes and amphibians.



By day, the mangrove water snake basks on a low-hanging branch.

A roseate spoonbill probes the mud for molluscs. It roosts in the mangrove branches. Where is its nest?

A green sea turtle feeds on mangrove roots.

Mangroves line the coast, so their roots are flooded every day as the tide comes in.

Barnacles

Shrimp

Oysters

These thick, arching roots help keep the mangrove's trunk upright in the soft, muddy soil. They are covered with small creatures.

Mussels

Oxygen enters a mangrove through **lenticels**—thousands of tiny breathing holes in the bark and roots.

This mangrove seed has fallen into the water. It can survive, floating, for up to a year.

The branching roots of this red mangrove act as a nursery for fishes, crustaceans and shellfish.

These are green anole lizards.

The mangrove tree crab lives in the canopy, feeding mostly on red mangrove leaves.

Leaves drop from the mangrove trees and are broken down by fungi and bacteria, which turn them into **detritus**.

The trees protect the coastline from stormy seas and stop soil being washed away.

The goliat grouper stays in its mangrove nursery for up to six years.

WATERHOLE

In the centre of Australia, lies a vast desert. But along an ancient, dried-out riverbed in the Finke Gorge are small spring-fed pools; home to amazing desert fishes and frogs. And when the rare rains come the valley floods, bringing an explosion of life.

A yd low-faced whip snake
hunts for frogs at the
water's edge.

A praying mantis
hunts for insects
among the reeds.

A kingfisher
waits beside
the pool.

A snowy-white
great egret
stands
at the water's edge.

The goanna
spends most of its
time on land...

These dragonflies are mating.
The blue male grips the
female's neck, while the female
bends her body forwards.

The hardy bony bream can survive
in water that's nearly as salty as the
ocean, and temperatures that range
from 9–38° Celsius.

A desert rainbowfish
is looking for mosquito
larvae to eat.

A crayfish lurks in the algae.
It will eat anything, from small
invertebrates (creatures with no back
bone, like insects) to underwater plants.

Finke gobies
spend their days
hiding in mud.

When the rains fall, huge
numbers of Main's frogs
emerge to lay their eggs
in the water. How many
can you see?

The Hurler's catfish feeds in the
muddy bottom of the pool. The
females lay their eggs when the rains
come and water levels begin to rise.

These strange-looking
creatures are shield shrimp.

During long droughts, the river
and most of the waterholes
dry up. Thousands of fishes
die, but those that survive will
repopulate the river when
the rains return.

LEAF POOL

In the rainforest canopy, a bromeliad plant collects rainwater in its tightly interlocking leaves. This pool of water creates a miniature aquarium, high among the treetops.

Bromeliads are a family of tropical plants that includes the pineapple.

Scientists have found more than 250 different animal species in water-filled bromeliads. Fungi, algae, insects, spiders, frogs, mites, worms and even crabs can live in them.

This bromeliad is an **epiphyte**, which means it grows on the surface of other plants.

Mosquitoes come to the bromeliad to lay their eggs in the water.

Falling leaves are often trapped in spiky bromeliad plants.

These **poison-dart frogs** have carried their tadpoles from the forest floor, in order to leave their young in the safety of the leaf pool. **How many frogs can you find?**

A **hummingbird** is collecting pollen from the bromeliad. Its droppings fall into the plant.

This **snake** has come to the bromeliad to drink. It is also searching for its frog prey.



HYDROTHERMAL VENT

Deep at the bottom of the Pacific Ocean, superheated water spews out of a strange, chimney-like structure on the sea floor. This is a hydrothermal vent. There is no sunlight here, just heat, pressure and toxic minerals. And yet, life doesn't just exist here – it thrives.

Several crab species live around hydrothermal vents.

This spiky ball is a sea urchin. Each 'petal' is an individual, jellyfish-like organism.

Shrimp live in clumps around the tube worms and mussels.

At a little distance from the vent, where the water temperature drops to less than 15° Celsius, the sea floor is covered in mussels. Bacteria, which live in their gills, provide them with food. Can you find a predator looking for mussels to eat?

Hydrothermal vents, and the creatures that live on them, were only discovered in 1977. Until then, scientists believed that all living things needed sunlight to survive. The vents have changed the way scientists think about life on Earth.

These are tube worms. They have a tough outer layer made from chitin – the same substance that makes up the shells of crabs.

Tube worms can grow up to 2.4 metres long. They have no mouths and no digestive systems.

Hydrothermal vents that have dark plumes are known as black smokers. The black colour comes from particles of iron, which the water has absorbed from the surrounding rocks.

This deep sea slug has come to the vent to lay her eggs.

Bacteria around the vents multiply to form thick mats.

The beautiful colour here comes from blue ciliates – microscopic creatures that feed on bacteria.

Hydrothermal vents are found in areas where there is lots of volcanic activity.

IRISH PEAT BOG

On the Irish moors are wetlands, known as bogs. They are made of a dark, damp soil called peat, formed over thousands of years. Dotted with rainwater pools, the bogs teem with life.



Otters hide and shelter in **hills**, underground homes that they dig out of riverbanks, although sometimes they steal the homes of other mammals.

At dawn, an otter comes out to hunt, using its sensitive whiskers to feel for vibrations in the water.

Peat is a dense, dark, earthy substance made of partially decomposed plants.

Peat bogs are excellent at preserving animal remains, and have taught us a lot about the plants and animals of the past.

This common frog will lay her eggs in the water. Each frog produces 1,000-4,000 eggs.

Sphagnum moss is one of the most common plants in the bog.

A hare hides in the grass, listening for predators.

Dragonflies and damselflies hunt for midges and mosquitoes to eat.

A curlew dips its long, elegant beak into the water, searching for invertebrates.

A raft spider waits motionless at the water's edge.

These small creatures are **dragonfly larvae**. They will spend a year in the water, hunting other insect larvae, worms and tadpoles.

A damselfly has landed on the sticky red tentacles of an appealing **sundew** plant.

UNDERWATER CAVE

Along the coast of Mexico, on the Yucatán Peninsula, is a vast underwater cave system. It is fed by fresh water from falling rain and salt water that flows through underground caverns from the sea. Inside these caves you will find unique creatures, many of which are completely blind.

Less is known about underwater caves than the ocean floor. The caves along the Yucatán Peninsula were first explored in the 1980s, and many of them have yet to be studied by scientists. One thing we do know is that a chemical called **methane** is vital to life in these caves.

As water drips through cracks in the limestone, it leaves behind minerals. These build up slowly over time to form icicle-like **stalactites**.

These water-filled caves are known as **cenotes**.

The **Mexican blind cave fish** is a scavenger feeding on almost anything it can find.

Blind **swamp eels** swim through the darkness in the depths of the cave, searching for cave shrimps.

In some caves, divers have found fossils of extinct animals. This is the skull of an extinct type of **short-faced bear**. Can you find another fossil in the cave wall?

This **cave shrimp** is a highly aggressive hunter.

Yucatán tetras swim into the cave in search of blind crustaceans and other fish to prey on.

These small, eyeless creatures are **isopods**, a type of crustacean.

A **remitipede** is a centipede-like crustacean. It is the only crustacean in the world known to have venom.

The **tubed nauplius** is a tiny, blind, shrimp-like crustacean, which grows up to 3 millimetres long.

CORAL REEF CLEANING STATION

Each morning, at an eye-catching spot on a reef in the Red Sea, special cleaner fishes and shrimp gather at a place known as a cleaning station. Their customers come from all over the reef, and range from fishes and eels to turtles and rays.

Most cleaner fishes are only small, growing to around 5 centimetres long, but they often have bright stripes, which attract other fishes so they can clean them.

The top part of a coral reef is covered in tiny, soft bodied animals called coral polyps.

This cleaner blenny is performing a short dance to attract other sea creatures for cleaning.

Many creatures come to coral reefs to lay their eggs. The reefs are also nurseries for young fishes.

Cleaner fishes get their food by eating bacteria, harmful parasites and dead skin from other creatures. This keeps the other creatures clean and healthy.

Every day, a single cleaner fish inspects over two thousand creatures.

A fish allows a cleaner blenny to approach it, but...

The thresher shark lives in deeper waters, but comes to the reef to feed and visit the cleaning stations.

A green sea turtle has just arrived at the cleaning station from its breeding ground - a beach over 800km away.

A cleaner shrimp waves its long antennae to show it is ready to clean other sea creatures.

A surgeonfish swims up to a cleaner shrimp.

These batfish are queuing to have their teeth cleaned. They feed on small fishes, algae, and invertebrates.

This grouper would normally eat a creature the size of a cleaner fish...

There are many different types of coral. This is a hard coral called **Acropora**. Coral reefs help the planet, as they recycle carbon dioxide, a gas that leads to global warming. But coral reefs are in danger.