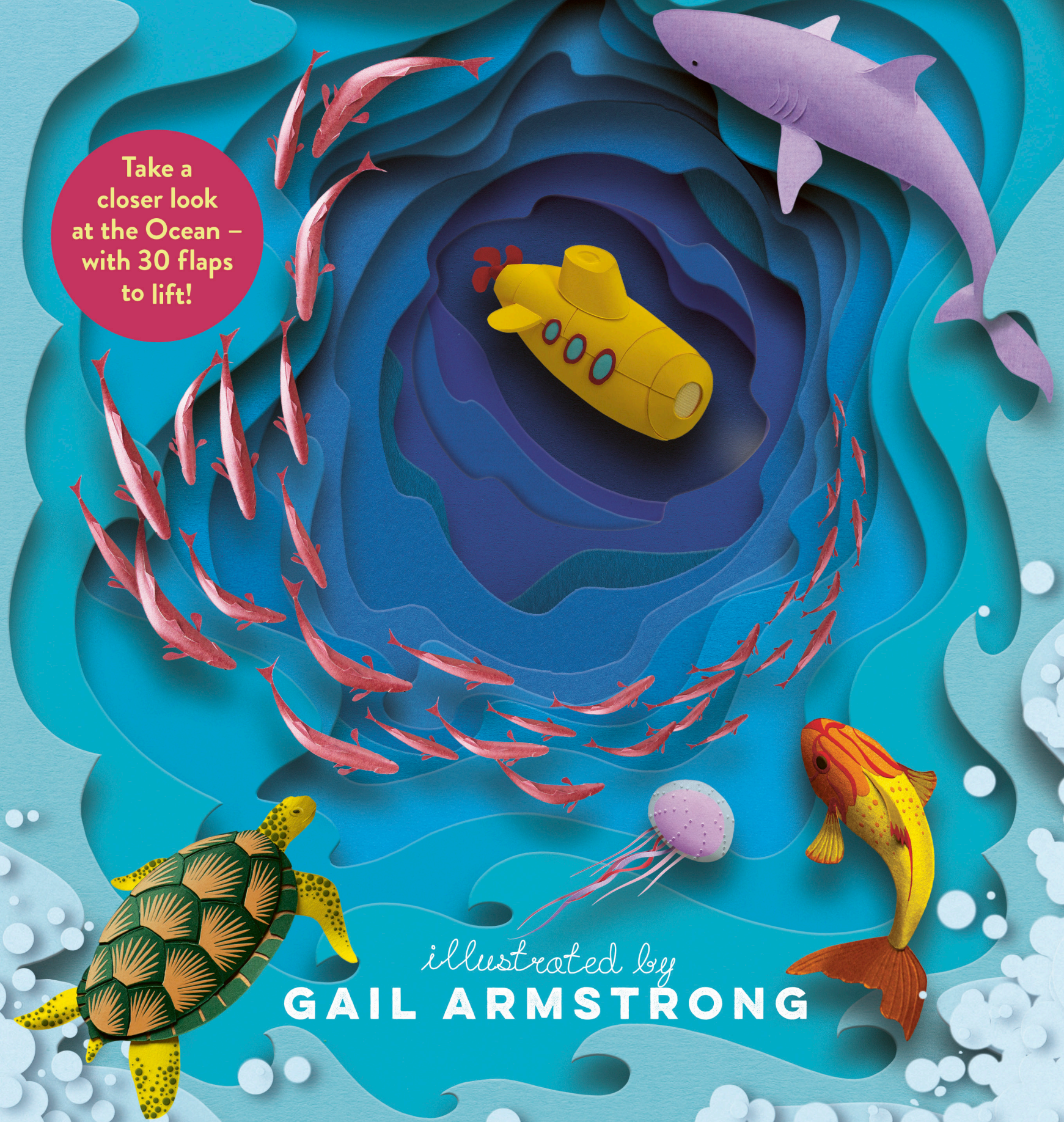


PAPER WORLD

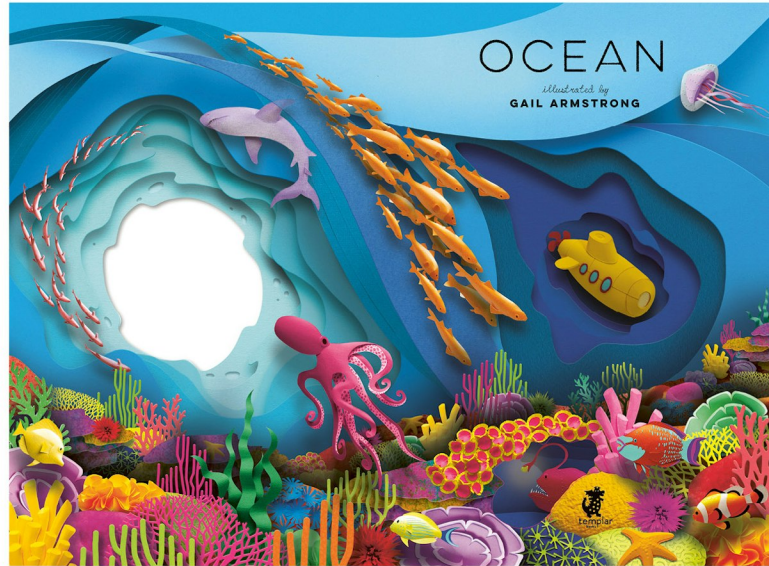
# OCEAN

Take a  
closer look  
at the Ocean –  
with 30 flaps  
to lift!



*illustrated by*  
**GAIL ARMSTRONG**





# WATER WORLD

Viewed from space, Earth shimmers blue-green thanks to the vast oceans that cover two-thirds of its surface. Our 'blue planet' is the only place in the Solar System where life is known to exist. And water is the basis of all life as we know it.

Most water on Earth is found in the oceans, but it also occurs in lakes and rivers, as well as frozen in great blocks of ice at the planet's poles. Wherever it flows, water brings life – plants and animals cannot live long without it – and the oceans themselves form the largest habitat on Earth, a staggering 99 per cent of living space on the planet! Only a fraction of the oceans have been explored by humans. In fact, scientists estimate around 1.5 million marine species are still to be discovered.

**Atmosphere**  
The atmosphere is the blanket of gases surrounding Earth. The Sun warms the oceans; ocean currents spread warmth around the globe, and the warmth transfers into the atmosphere. Without the oceans and atmosphere working together, Earth's temperatures would be very extreme!

precipitation

condensation

Going up

The Sun warms water, making it evaporate and turn into moisture in the air. As it rises in the air, it cools and condenses to form rain or snow clouds.

Coming down

Water falling on land collects in rivers and lakes, or soaks through rock into underground rivers. If it flows back into the ocean where it can evaporate again.

**Water cycle**  
The water cycle is the constant movement of water around the Earth.

**Ocean life**

Scientists think about 95 per cent of animals in the ocean are invertebrates – animals without a back bone, such as jellyfish.

**Ocean explorers**

Humans have always lived close to the oceans, using them for food and for transport. Evidence shows that the first boats were used up to 6,000 years ago.

**Origin of life**

Most scientists agree that life on Earth began in the oceans at least 3.7 billion years ago. Initially just single cells, only later did life evolve into large creatures.

**Life only in water**

395 million years ago

**Life moving onto land**

340 million years ago

**Life on land**

The first creatures left the water to walk on land around 400 million years ago.  
315 million years ago

**Studying the oceans**

Scientists who study the oceans are called oceanographers. If they study the plants and animals that live there, they are called marine biologists. Being a marine biologist often involves getting into the sea to study it up-close!

click here

#### Seaweed

A line of seaweed sometimes marks the high tide line, showing where the waves have dropped them.

## THE SHORE

Where the land meets the sea, we find the coasts of the world. These habitats come in many forms: from soft, sandy beaches, to mud flats, craggy rocks, or sheer cliffs rising out of the water. Pounded by waves, conditions change by the hour as the tides sweep in and out. For the creatures that live here, each moment brings new challenges.

Low tide reveals an array of wonders. Tiny creatures that live in the sand must burrow deep to escape the snapping beaks of seabirds, or hide themselves among fronds of seaweed. The retreating waters also expose colourful rockpools: a perfect miniature habitat where animals can shelter until the sea covers them over again.

#### Rockpool

When the tide goes out on rocky shorelines, it can leave pools of water trapped in hollows. Rockpools provide shelter for many animals until the next high tide.

#### Starfish

Starfish move using hundreds of tube feet on their underside.

#### Rubbish dump

Human objects are often washed up on shorelines, alongside lots of wood called driftwood. Some objects, such as glass and brick, are worn smooth by the action of the waves. But many plastics pose a danger to the wildlife in coastal habitats.

#### Hermit crab

Hermit crabs live inside shells that have been abandoned by sea snails. As they grow, they change shells, a bit like moving house.

#### Limpet

At high tide, limpets move about looking for seaweed to eat. But at low tide, they clamp themselves to the rocks to protect their soft bodies from predators or from drying out in the sun.

#### Sea anemone

Anemones tuck their tentacles inside their bodies at low tide. This stops them from drying out.

#### Blenny

These clever fish can survive out of water if they get caught out at low tide. They use their fins to wiggle and hop back to the nearest rock pool.

#### Tides

Tides are the rise and fall of the ocean, which occurs twice a day. They are caused by the Sun and Moon's gravitational pull on the Earth's water. We can find out more about how the tides work later in this book.

click here

#### Seal

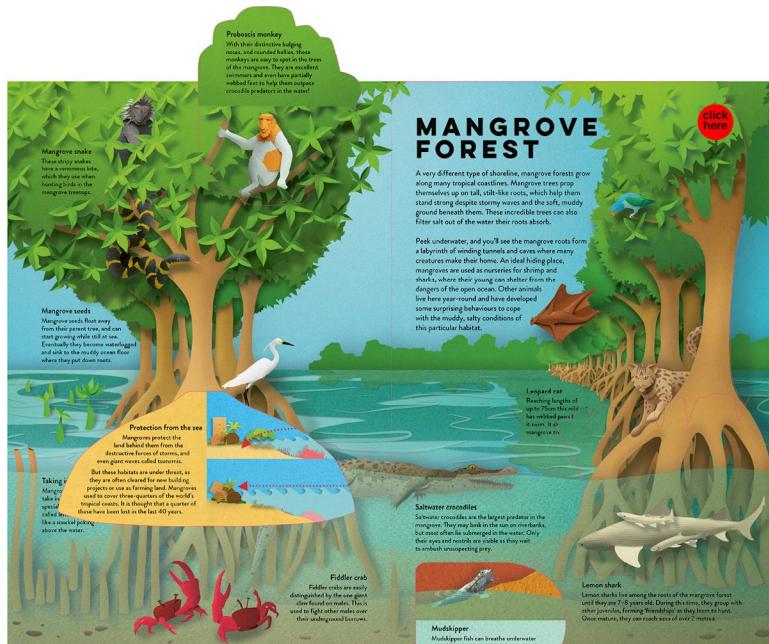
Some larger animals can be found on the coast, too. Seals come ashore to birth their young, called pups. Newborn pups are covered in white, fluffy fur, and drink their mother's milk until they are big enough to take to the sea and learn to fish.

#### High water mark

Creatures such as slugs, worms and tiny sea crabs bury themselves in the sand to stay out of sight of predators. However, many animals use their long thin heads to probe into the sand and catch their prey.

#### Sea birds

Beaches are an important source of food for many birds. Cliffs also provide an excellent nesting site for seabirds, not of much of predators such as rats and foxes. However, some species, such as the noddie, only come to land to breed and spend the rest of their life on the open water.



**Proboscis monkey**  
With their distinctive bulging noses, and rounded bodies, these monkeys are easy to spot in the trees of the mangroves. They are excellent swimmers and even have partially webbed feet to help them outpace crocodile predators in the water!

**Mangrove snake**  
These striped snakes have a venomous bite, which they use when hunting birds in the mangrove trees.

**Mangrove seeds**  
Mangrove seeds float away from their parent tree, and can start growing while still at sea. Eventually they become waterlogged and sink to the muddy river floor where they put down roots.

**Protection from the sea**  
Mangroves protect the land behind them from the destructive forces of storms, and even giant waves called tsunamis. But these habitats are under threat, as they are often cleared for new building projects or use as farming land. Mangroves used to cover three-quarters of the world's tropical coasts. It is thought that a quarter of these have been lost in the last 40 years.

**Taking**  
Mangroves take up  
these have been lost in the last 40 years.  
like a snorkel poking  
above the water.



**Fiddler crab**  
Fiddler crabs are easily distinguished by the one giant claw found on males. This is used to fight other males over their underground burrows.

## MANGROVE FOREST

click here

A very different type of shoreline, mangrove forests grow along many tropical coastlines. Mangrove trees prop themselves up on tall, stilt-like roots, which help them stand strong despite stormy waves and the soft, muddy ground beneath them. These incredible trees can also filter salt out of the water their roots absorb.

Peek underwater, and you'll see the mangrove roots form a labyrinth of winding tunnels and caves where many creatures make their home. An ideal hiding place, mangroves are used as nurseries for shrimp and sharks, where their young can shelter from the dangers of the open ocean. Other animals live here year-round and have developed some surprising behaviours to cope with the muddy, salty conditions of this particular habitat.

**Longhorn beetle**  
Reaching lengths of up to 75cm this odd insect has reddish panels on its back, and is a common sight in mangrove trees.

### Saltwater crocodiles

Saltwater crocodiles are the largest predator in the mangroves. They may bask in the sun on mudbanks, but most often lie submerged in the water. Only their eyes and nostrils are visible as they wait to ambush unsuspecting prey.



### Mudskipper

Mudskippers fish can breathe underwater or in the open air, thanks to some unique adaptations. They also use their fins to shuffle or 'skip' across muddy surfaces.

### Lemon shark

Lemon sharks live among the roots of the mangrove forest until they are 7-8 years old. During this time, they group with other juveniles, forming 'friendships' as they learn to hunt. Once mature, they can reach sizes of over 2 metres.

