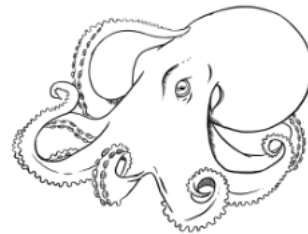


MZANSEA

Revealing South Africa's Marine Ecosystems



STORY AND ACTIVITY BOOK



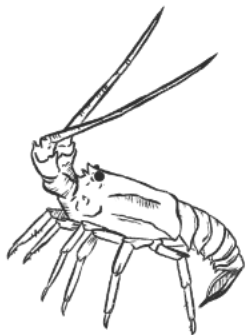
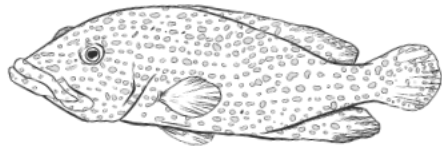
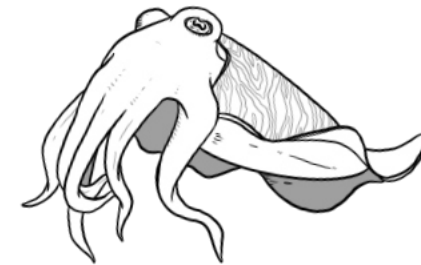
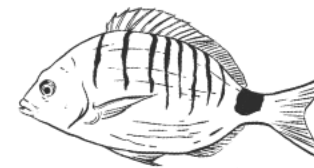
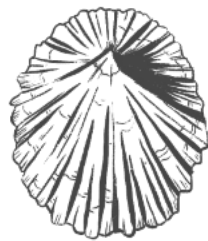
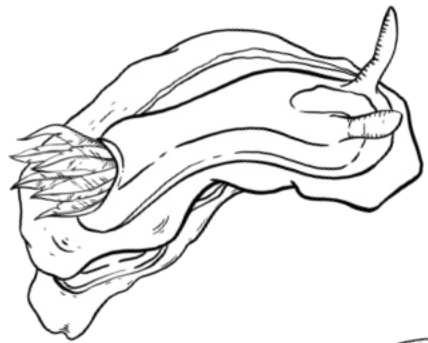
UK Research
and Innovation



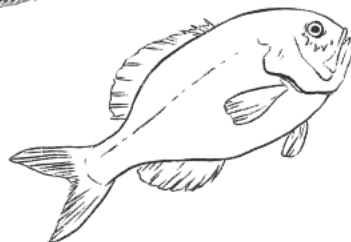
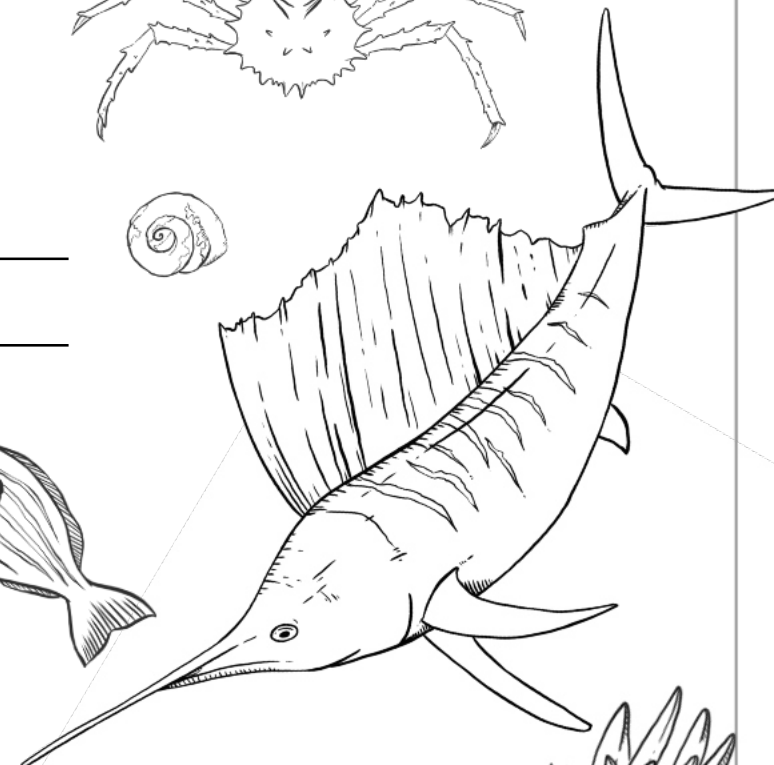
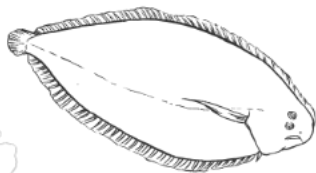
SAEON

South African Environmental
Observation Network

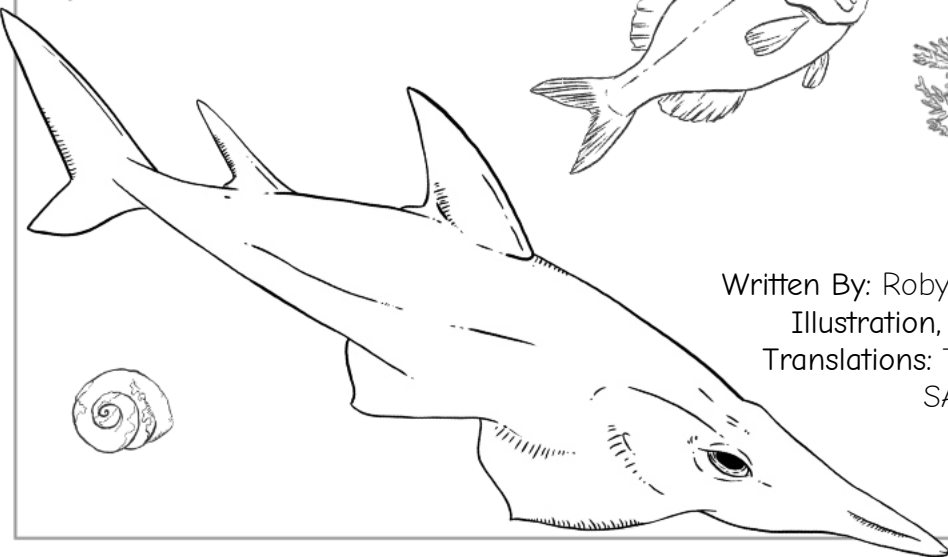
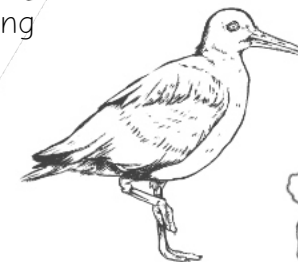




THIS BOOK BELONGS TO



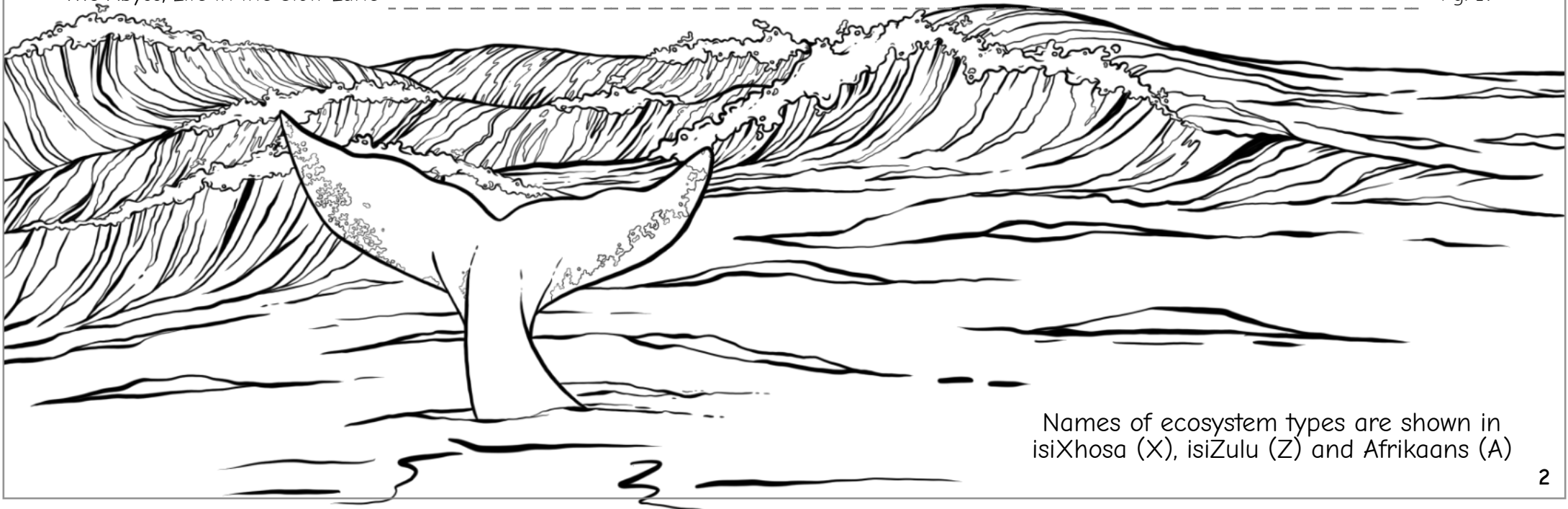
Written By: Robyn Adams, Kerry Sink, Judy Mann-Lang
Illustration, Design and Layout: Robyn Adams
Translations: Thomas Mtontsi, Mari-Lise Franken,
SAAMBR Education Team



The ocean is like a blue blanket that covers magical places and mysterious creatures. Just as there are forests, grasslands, fynbos and deserts on land, the ocean has many types of ecosystems. In this book we will explore some of them.

In this book we will explore:

Rocky Shores, <i>Windows to the Sea</i>	Pg. 3
Sandy Shores, <i>Playgrounds with Purpose</i>	Pg. 4
Islands, <i>Pockets of Safety</i>	Pg. 5
Kelp Forests, <i>Undersea Jungles</i>	Pg. 6
Coral Reefs, <i>Cities in the Sea</i>	Pg. 8
Shallow Rocky Reefs, <i>Sunlit Gardens</i>	Pg. 9
Sandy Shelves, <i>Hidden Life</i>	Pg. 10
Muddy Shelves, <i>Richness from Rivers</i>	Pg. 11
Rocky Reefs, <i>Twilight Forests</i>	Pg. 12
The Open Ocean, <i>Liquid Highways</i>	Pg. 13
Seamounts and Ridges, <i>Mountains Under the Sea</i>	Pg. 15
Canyons, <i>Ocean Valleys</i>	Pg. 16
Slopes, <i>Midnight Margins</i>	Pg. 18
The Abyss, <i>Life in the Slow Lane</i>	Pg. 19



Names of ecosystem types are shown in isiXhosa (X), isiZulu (Z) and Afrikaans (A)

ROCKY SHORES, UNXWEME OLUNAMATYE (X), USEBE OLUNAMADWALA (Z), ROTSAGTIGE KUSTE (A)

"WINDOWS TO THE SEA"

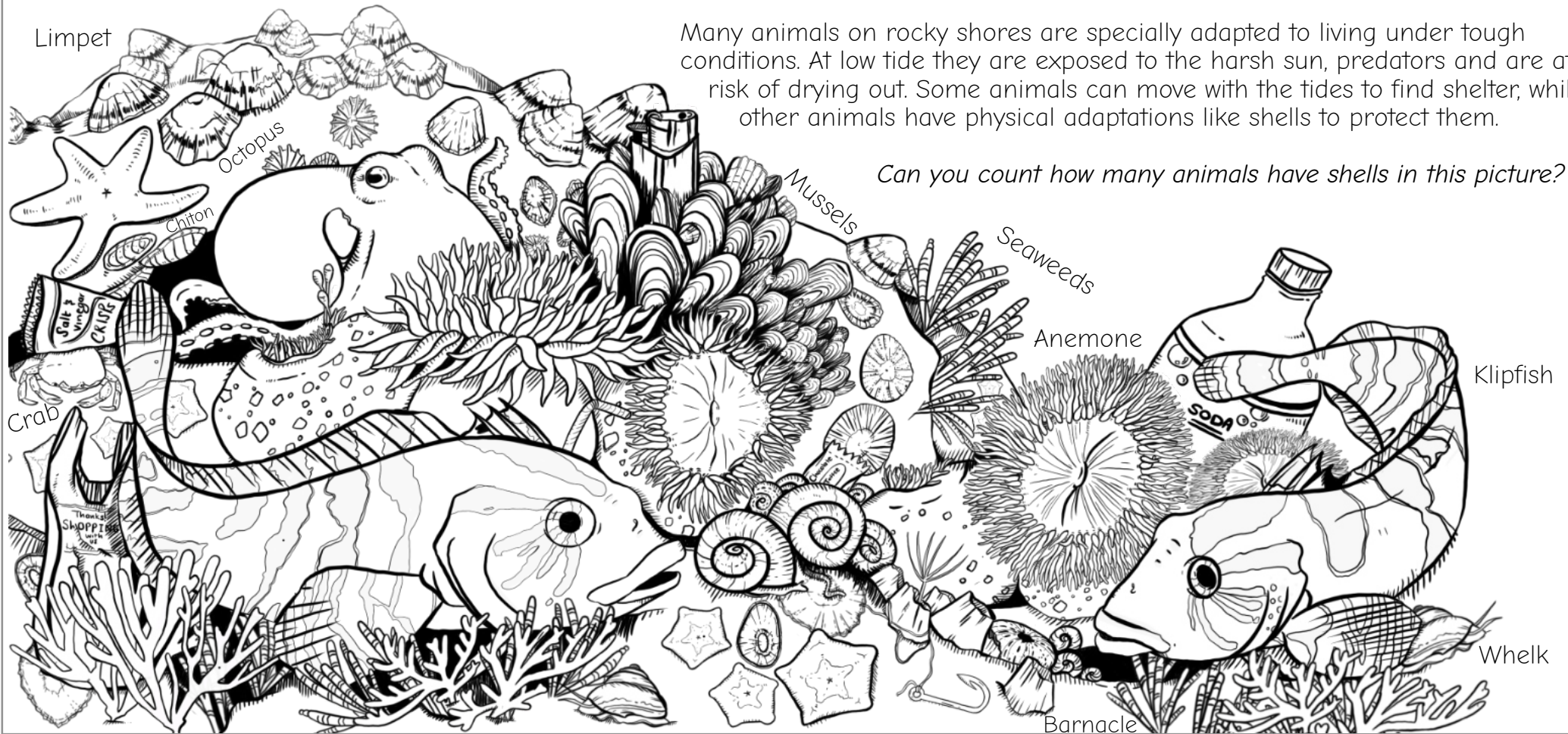
These interesting rocks and pools change from land to sea. They provide us with food and places to meet many different sea creatures. By looking into rock pools, we can see clues to the kind of life that lives far beneath the ocean waves - like brightly coloured animals that hide between and under rocks or in the dense seaweeds.

Rocky shores are special places where we can see and learn about seaweeds and animals, while only getting our feet wet. Sometimes, people leave things behind that do not belong on rocky shores. We can stop waste from entering our oceans by reducing our plastic use, re-using as much as possible and recycling what we can.

Can you find all seven items in the rock pool that are not supposed to be there?

Many animals on rocky shores are specially adapted to living under tough conditions. At low tide they are exposed to the harsh sun, predators and are at risk of drying out. Some animals can move with the tides to find shelter, while other animals have physical adaptations like shells to protect them.

Can you count how many animals have shells in this picture?



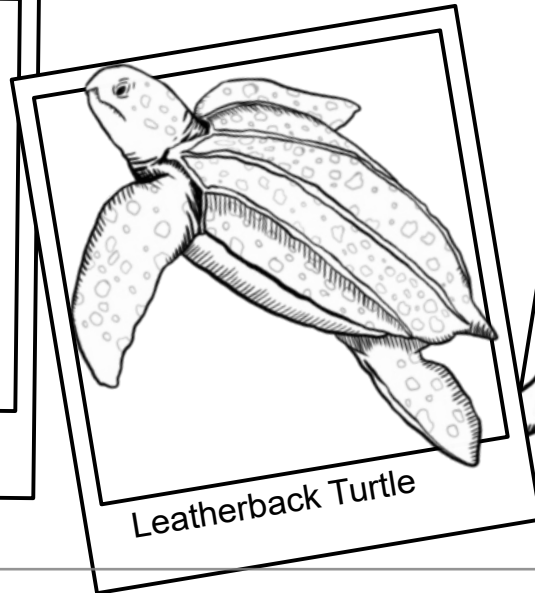
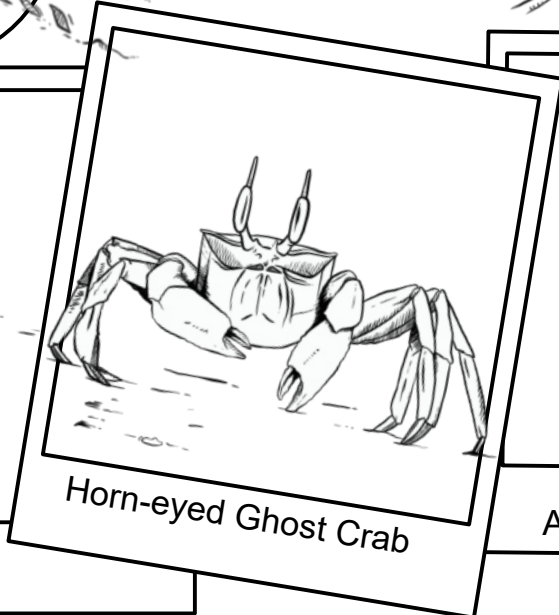
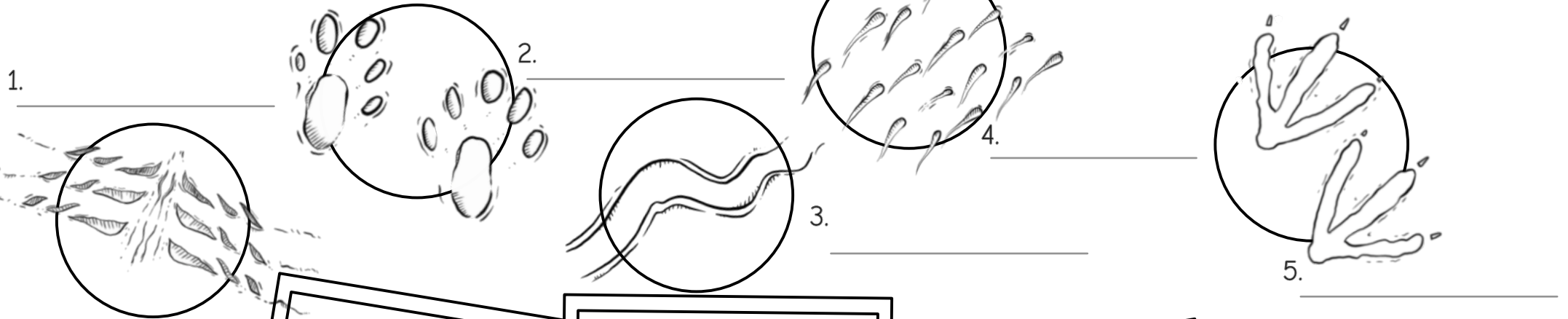
SANDY SHORES, UNXWEME OLUNENTLABATHI (X), EBISHI (Z), STRANDE (A)

"PLAYGROUNDS WITH PURPOSE"

Sandy shores are special places where we like to play! Sandy beaches and the dunes that sometimes lie next to them provide homes to many animals that live on the shifting sand or bury themselves under the sand. Next time you visit the beach see if you can find the holes, tracks and burrows of animals that live there. Healthy sand dunes and beaches protect people and their houses from high waves during storms!

Animals on sandy shores often leave tracks in the sand, giving us clues about their movements and their behaviour.

Can you match the sandy shore animal with their 'footprint'?



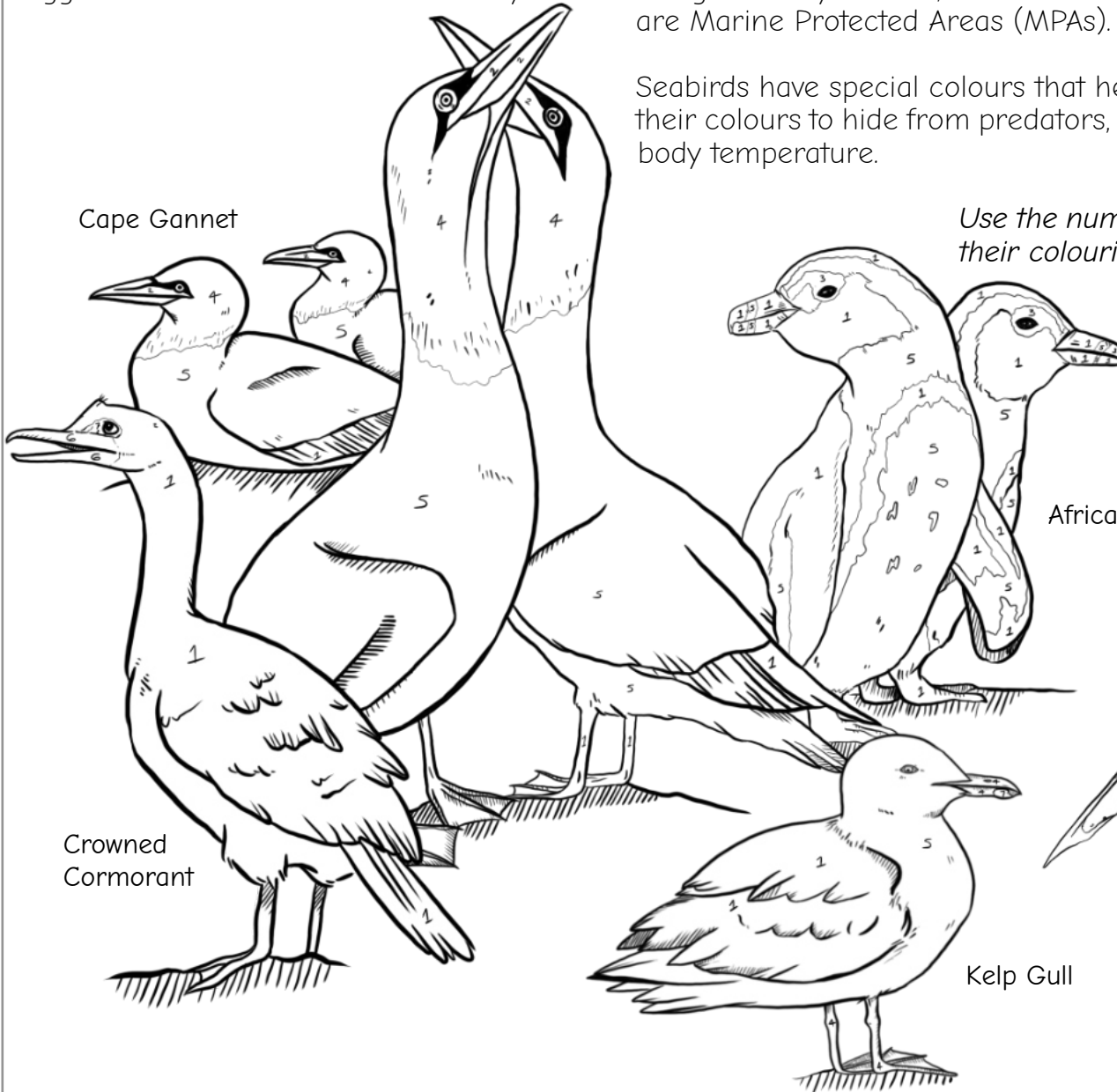
ISLANDS, IZIQITHI (X), IZIQHINGA (Z), EILANDE (A) "POCKETS OF SAFETY"

Seabird islands are safe places where our special South African seabirds like African Penguins, gannets, cormorants and terns can lay their eggs and rear their little chicks safely without being eaten by caracal, foxes and cats. These islands lie off the coast of South Africa and many are Marine Protected Areas (MPAs).

Seabirds have special colours that help them adapt to their surroundings. African Penguins use their colours to hide from predators, while the pink patches near their eyes help to regulate their body temperature.

Use the numbers and the key to colour in the seabirds. Think about how their colouring may help them avoid predators.

Cape Gannet

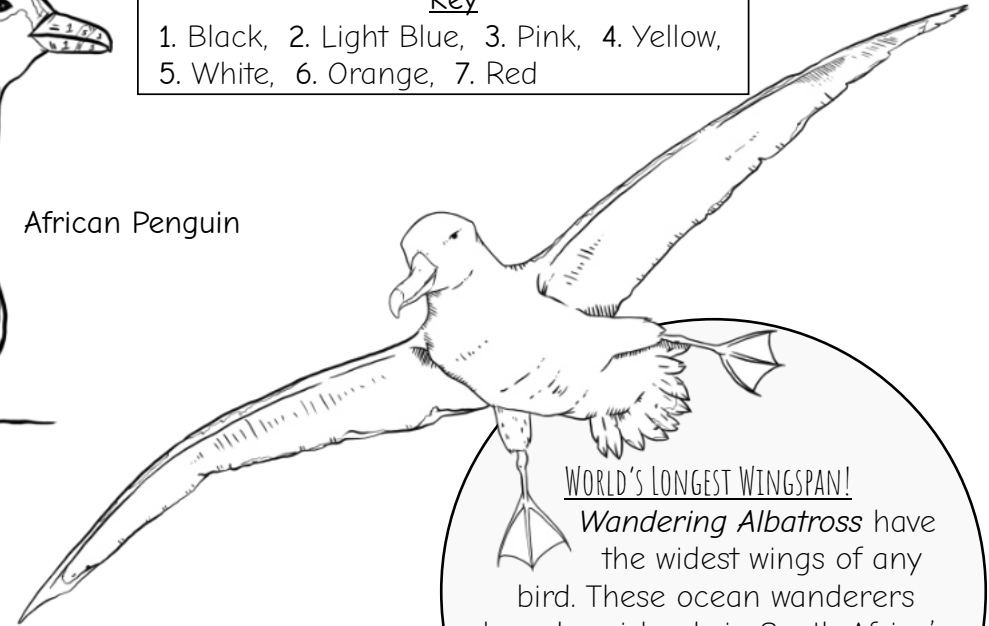


Key	
1.	Black
2.	Light Blue
3.	Pink
4.	Yellow
5.	White
6.	Orange
7.	Red

African Penguin

Crowned Cormorant

Kelp Gull



WORLD'S LONGEST WINGSPAN!
Wandering Albatross have the widest wings of any bird. These ocean wanderers breed on islands in South Africa's sub-Antarctic territory and have wingspans of up to 3.5m! Twice the length of a human!

KELP FORESTS, AMAHLATHI EKELP (X, Z), BAMBOES WOUDE (A) "UNDERSEA JUNGLES"

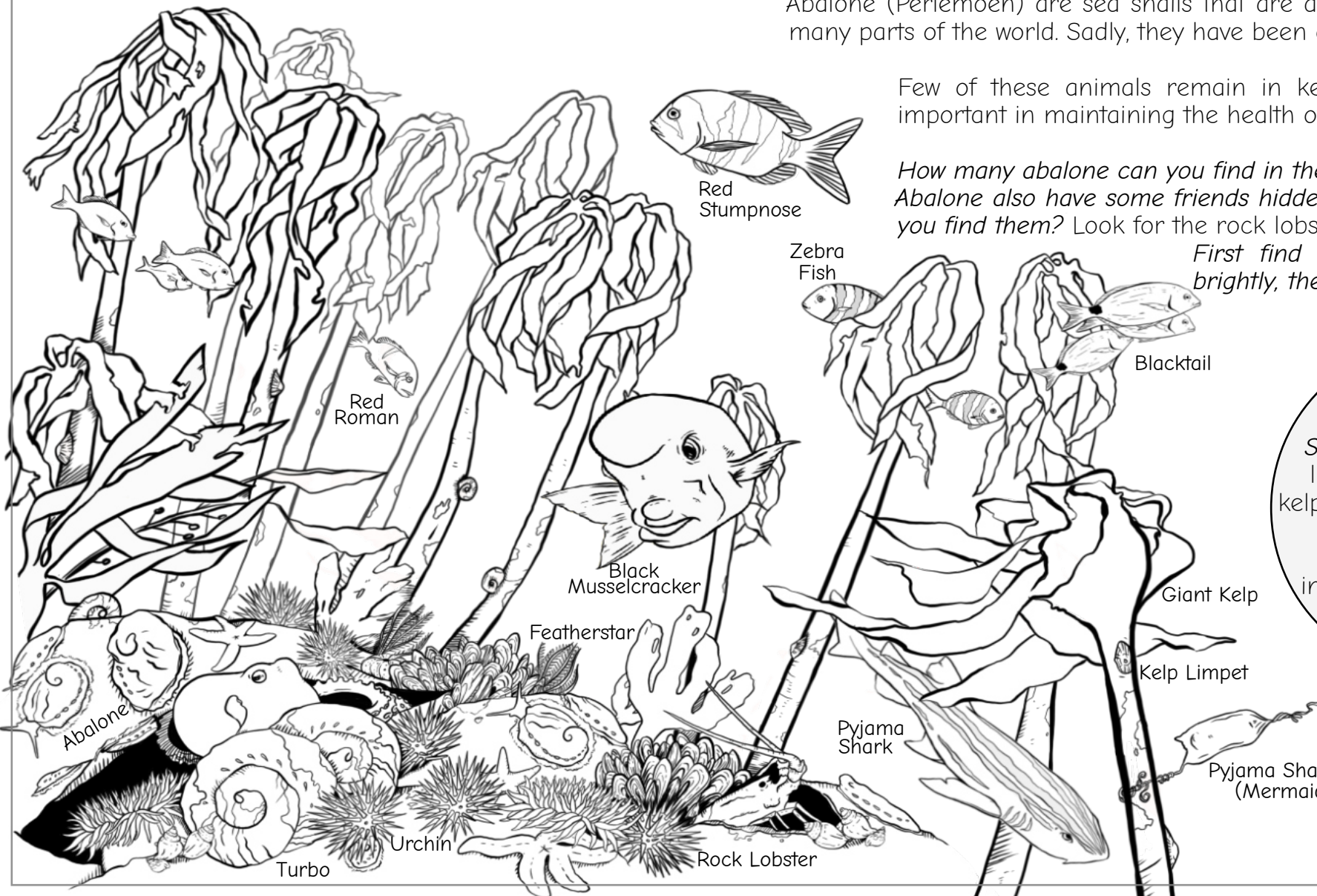
In the shallow water of the coldest part of South Africa's coast, is a magical seaweed forest that is like an undersea jungle that helps provide the air we breathe and the food we eat. Tall kelps protect schools of fish, octopuses, small sharks and a multi-coloured forest floor of seaweed gardens, anemones, urchins, rock lobsters and other animals.

Abalone (Perlemoen) are sea snails that are a popular seafood dish in many parts of the world. Sadly, they have been overharvested.

Few of these animals remain in kelp forests, but they are important in maintaining the health of kelp forests.

How many abalone can you find in the picture? Abalone also have some friends hidden in the kelp forests, can you find them? Look for the rock lobster and the urchin.

First find these and colour them brightly, then colour in the kelp.



FUN FACT!
Kelp forests are **SUPER** ecosystems. Just like rainforests on land, kelps help provide the air we breathe by removing carbon dioxide and increasing the oxygen in the water

KELP FORESTS, AMAHLATHI EKELP (X, Z), BAMBOES WOUDE (A) "UNDERSEA JUNGLES"

In kelp forests, animals use crevices (holes) in the rocky floor, seaweeds and kelp to hide from predators. The names of some common kelp forest species are hidden in the word search and in the picture.

Can you find the hidden animals in the word search?

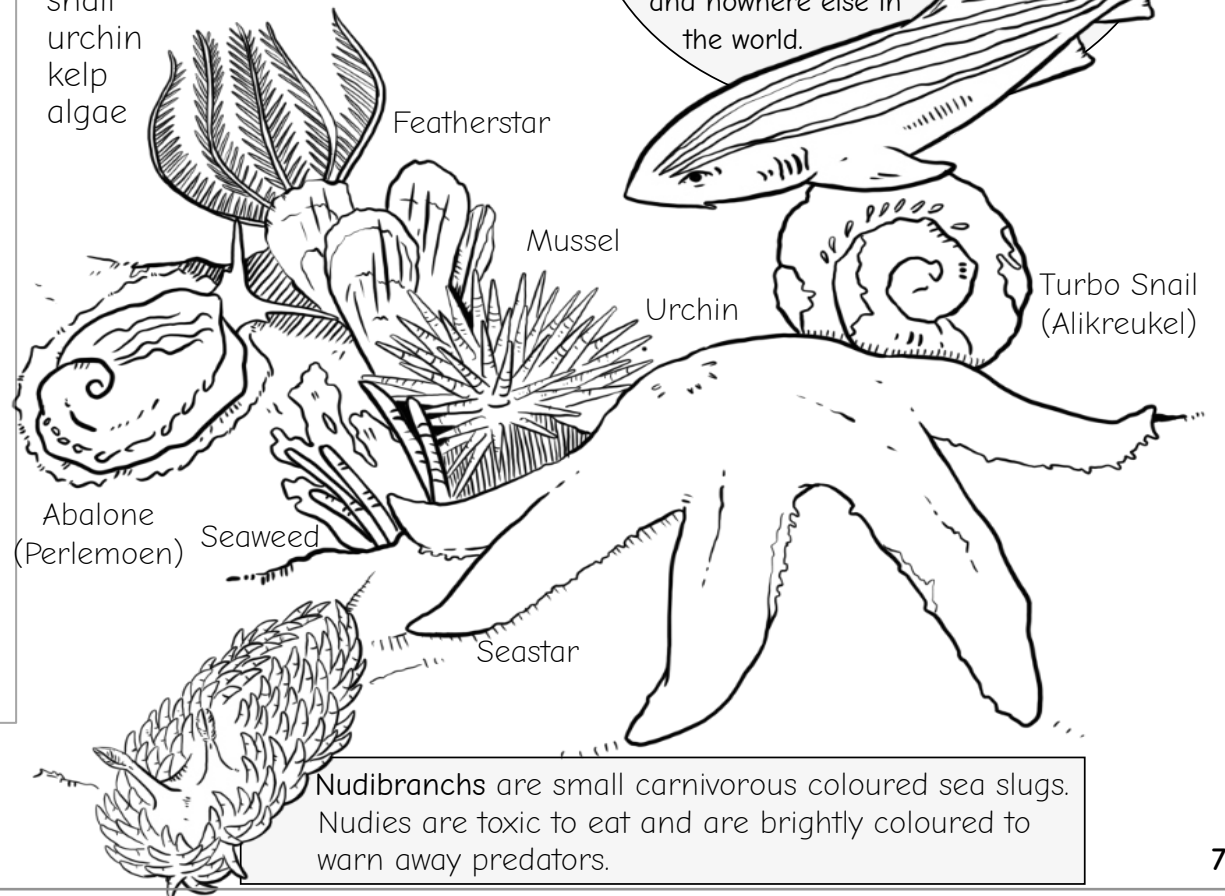
E F I R O C K L O B S T E R
V E O C T O P U S H R Y M O
E A M H M U S S E L U K L T
R T T A L G A E A W U H U T
G H P Y J A M A S H A R K E
Y E E T T B H A T E A H E R
E R B N Y A T R A L E R L E
T S N A I L R T R K U E P C
H T U B R O N Z E B R E A M
P A O R U N L E A N C H I L
O R P R K E Y A R D H E M I
N U D I B R A N C H I R E F
Y R K S T R E P I E N O D E

featherstar
octopus
mussel
sea star
whelk
pyjama shark
abalone
snail
urchin
kelp
algae

strepie
nudibranch
rock lobster
otter
bronze bream

PYJAMA SHARKS

These small sharks are small but mighty. While they only grow to 1 m, they are capable predators and feed on octopus and other small animals. These sharks are endemic to South Africa. - meaning that they live here and nowhere else in the world.



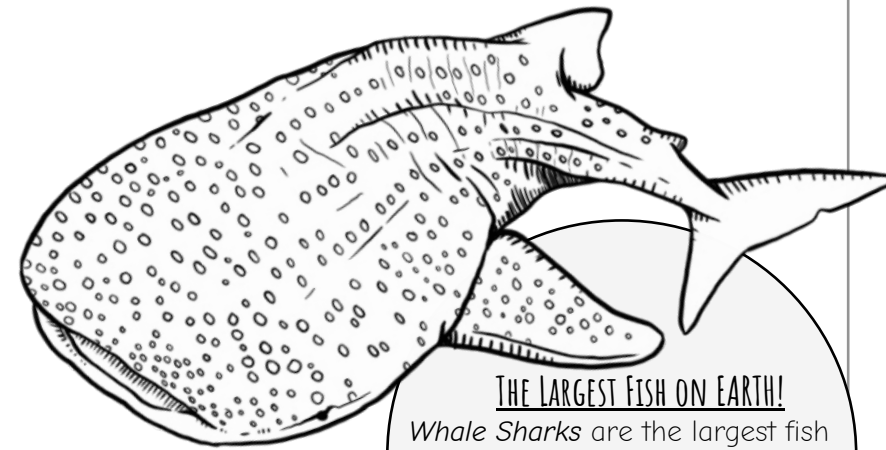
Nudibranchs are small carnivorous coloured sea slugs. Nudies are toxic to eat and are brightly coloured to warn away predators.

CORAL REEFS, IINGQAQA ZEKORALE (X), IZIXHOBO ZAMAKHORALI (Z), KORAALRIWWE (A) "CITIES IN THE SEA"

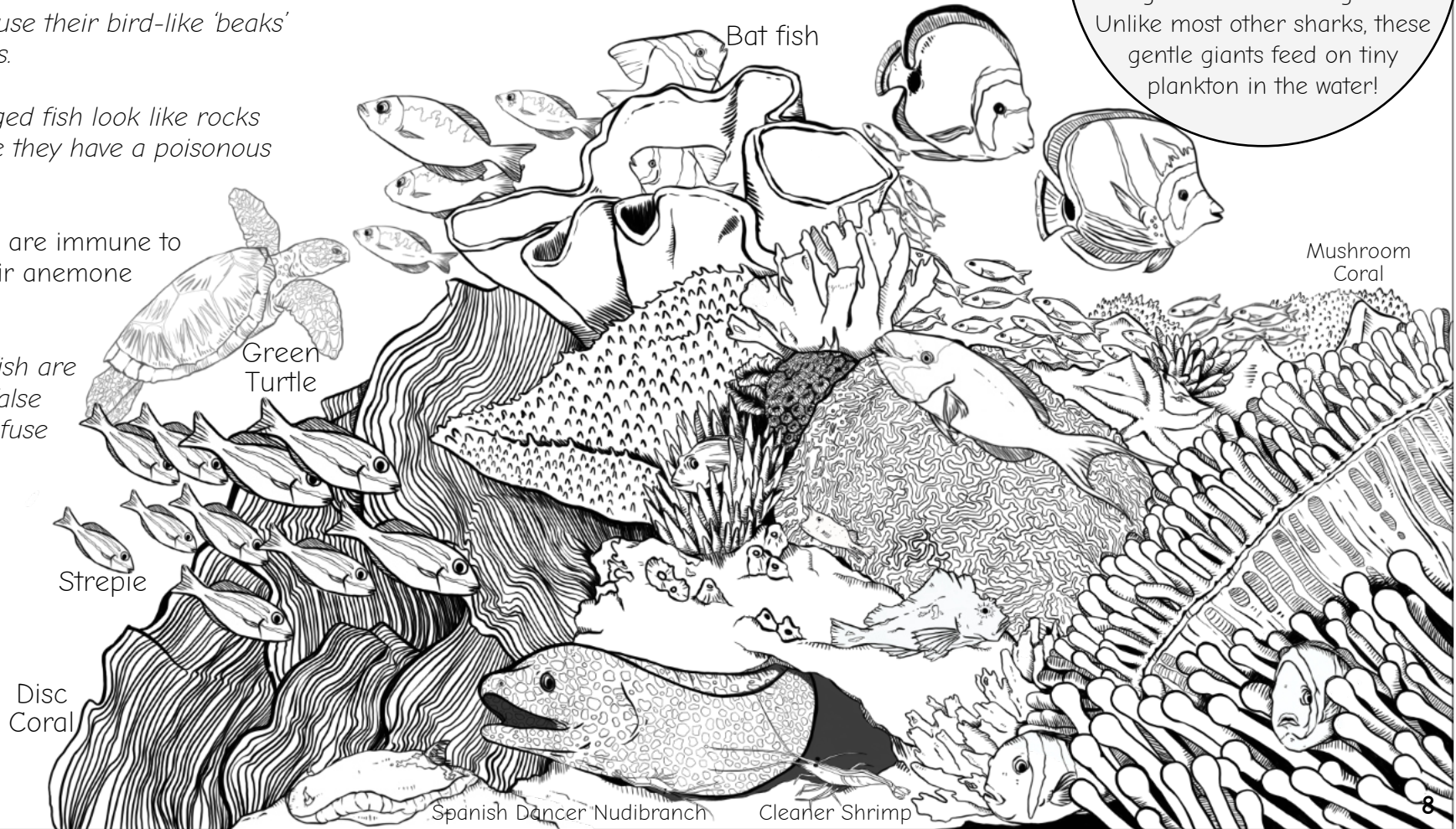
In the warm shallow waters of Northern KwaZulu-Natal are coral reefs. Corals are animals that make living connected homes where many other colourful creatures live. The animals that live on coral reefs often like to hide away.

Can you find and colour the animals described below?

1. Honeycomb moray eel - Snakelike fish that hide in caves.
2. Parrotfish - Bright fish that use their bird-like 'beaks' to scrape seaweed off corals.
3. Stonefish - These camouflaged fish look like rocks and are dangerous because they have a poisonous spine.
4. Clownfish - These funny fish are immune to the stinging tentacles of their anemone homes.
5. Butterflyfish - These pretty fish are rounded and often have a false eyespot on their tails to confuse predators.



THE LARGEST FISH ON EARTH!
Whale Sharks are the largest fish in the ocean, growing to 18m long, longer than the average bus! Unlike most other sharks, these gentle giants feed on tiny plankton in the water!



SHALLOW ROCKY REEFS, INGXONDORHA EZINCINANE EZINAMATYE (X), AMADWALA ANGAJULILE (Z), VLAK ROTSAGTIGE RIWWE (A) "SUNLIT GARDENS"

In sunlit shallow waters beneath the waves (usually less than 50 m deep) are gardens of beautiful green, red and brown seaweeds that capture the energy of the sun.

These rocky reefs are home to many animals, each important and connected to one another. Seaweeds and tiny plant plankton make their own food from sunlight and are the start of the food web. These seaweeds are eaten by grazers like topshells, limpets and urchins. Predators then eat these grazers.

Can you draw arrows to show who eats who?



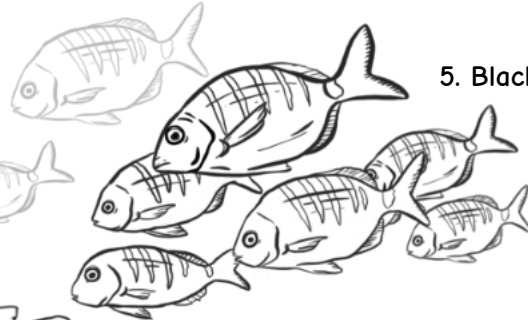
8. Ragged-Tooth Sharks
are top predators and
eat fish

**7. Predators like
Scotsman** eat grazers

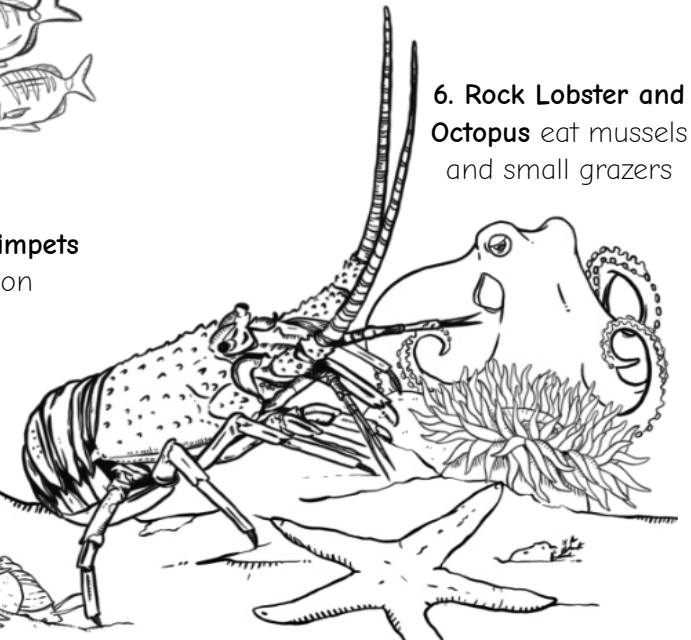
2. Convict surgeonfish graze
on seaweeds



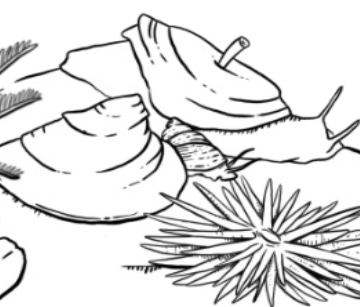
5. Blacktail eat seaweeds and
small grazers.



**6. Rock Lobster and
Octopus** eat mussels
and small grazers



**4. TopShells, Slipper Limpets
and Urchins** graze on
seaweeds



1. Seaweeds make
their own food from
sunlight



3. Mussels

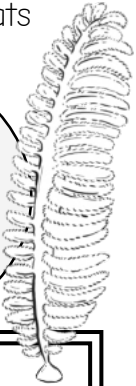
SANDY SHELVES, ISHELUFA EZINESANTI (X), IMIGEDE YENHLABATHI (Z), SANDBANKE (A) "HIDDEN LIFE"

The shelf is the flatter area under the sea from beyond the shore to the slope where the underwater continent drops more steeply into the deep ocean. Below the waves are sandy plains where most animals live under the sandy surface. Just like beaches – but under the water, the animals that live on these sandy shelves leave us clues to their existence – tracks here and a little hole there. These habitats are also homes for important food like hake and interesting animals like seapens.

Sandy shelves are ecosystems with very few places to hide from predators. Animals living on sandy shelves can disappear under the sand by burrowing or quickly move away.

Can you spot the 7 differences between the two images and figure out which animals are not in the picture or may have hidden away from predators?

Sea pens are a type of soft coral that are adapted to live on sand



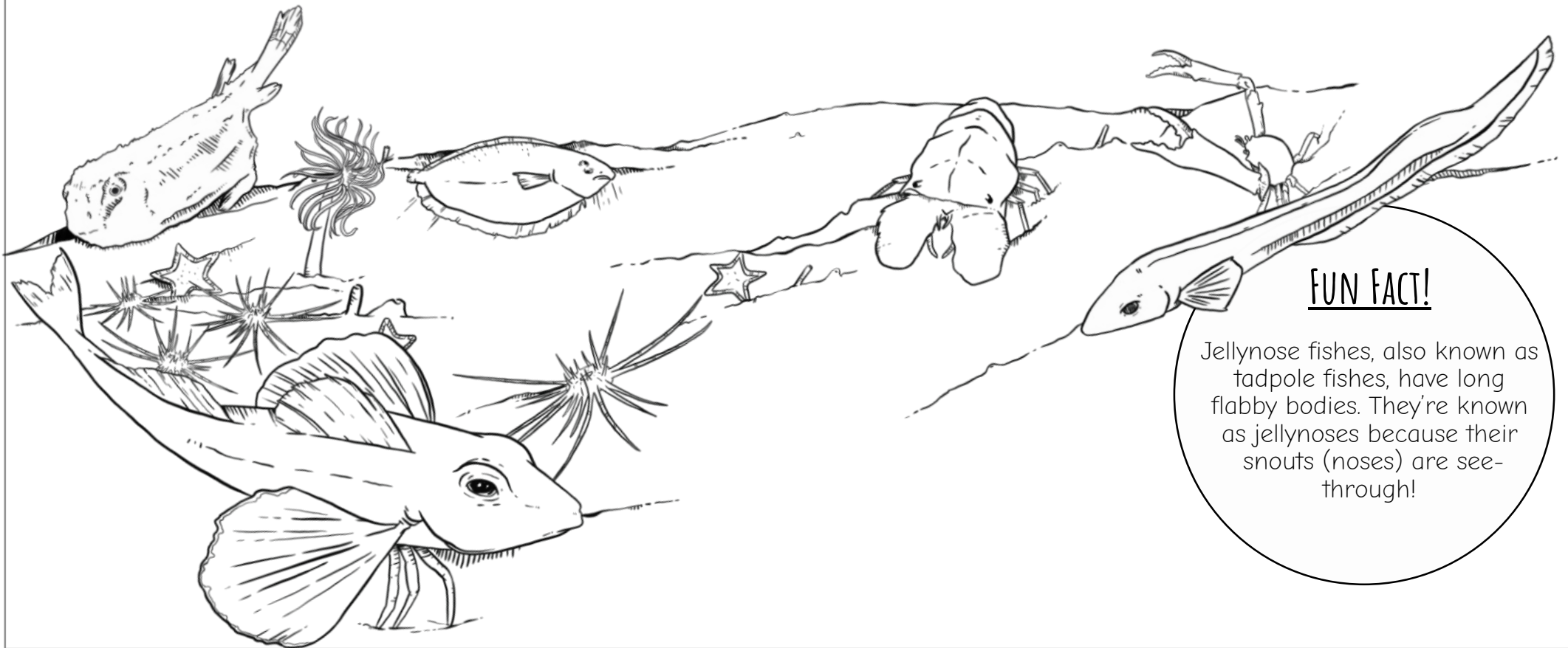
MUDDY SHELVES, ISHELUFA ZODAKA (X), IMIGEDE YODAKA (Z), MODDERBANKE (A)

"RICHNESS FROM RIVERS"

Muddy shelves are amazing places – imagine a massive field of mud stretching for kilometres underwater. The mud comes from land but travels to the sea through our rivers. This shows that everything on earth is connected and we should do our best to keep our land, rivers and ocean clean and healthy.

Living in the mud are many strange creatures like a) prickly crabs, b) winged orange gurnard fish, c) spiky sea urchins, d) hidden flat fish, e) fish that walk on the seabed and f) shovelling lobsters.

Can you find or label the animal in the picture using the description above? For example, use the letter f to label the lobster.



FUN FACT!

Jellynose fishes, also known as tadpole fishes, have long flabby bodies. They're known as jellynoses because their snouts (noses) are see-through!

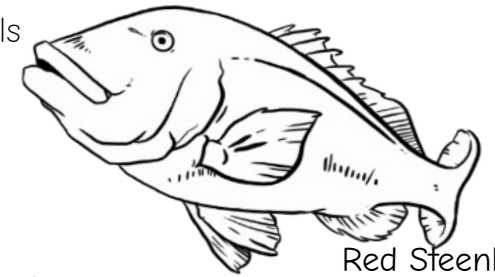
DEEP ROCKY SHELVES, ISHELUFA EZINAMATYE (X), IMIGEDE ESAMATSHE (Z), DIEP ROTSBANKE (A) "TWILIGHT FORESTS"

Deep below the ocean surface, in the dim twilight (usually deeper than 50 m) are bright animal forests. Seafans, sea whips and spiral wire corals grow among fragile soft corals, brittle lace corals, sponges and ancient black coral trees. These delicate animals are home to many species and grow very slowly. They are sensitive to damage by human activities.

In these reefs, habitat-building animals provide homes and food for many smaller animals. These animals are connected and depend on each other.

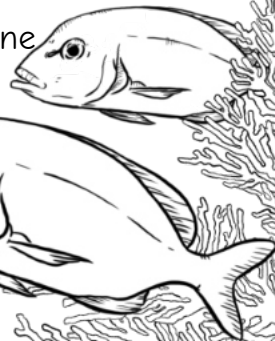
Can you unscramble the letters below to name the animals that provide homes for other animals?
Now, draw a circle around the animal that is hiding among the habitat-building animals.

1. esanfa _____
2. aes phwi _____
3. opgnes _____
4. alce olarc _____



Red Steenbras

Dane



Sea Whip

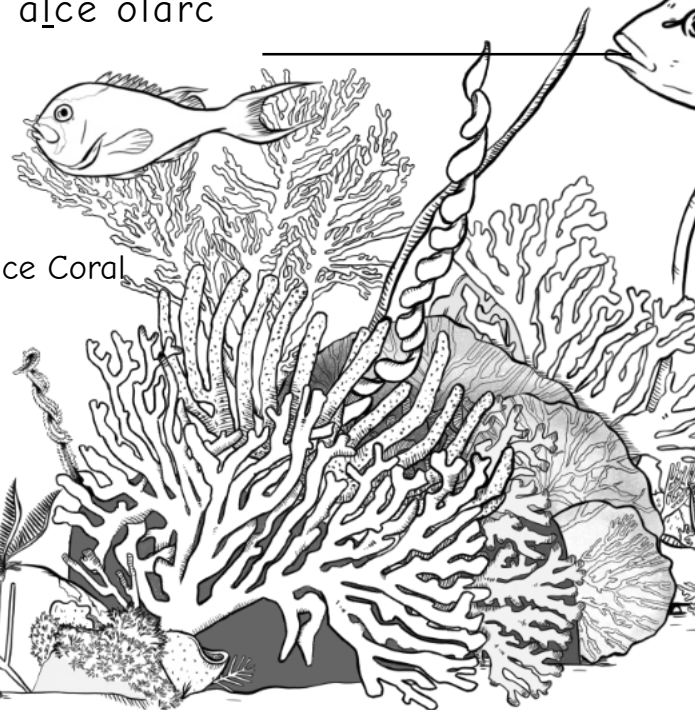


Spiral-wire Coral



Seventy-four Seabream

Lace Coral



Seafan



Sponge



OPEN OCEAN, ULWANDLE OLUVULEKILEYO (X), ULWANDLE OLUVULELEKILE (Z), OOP SEE (A)

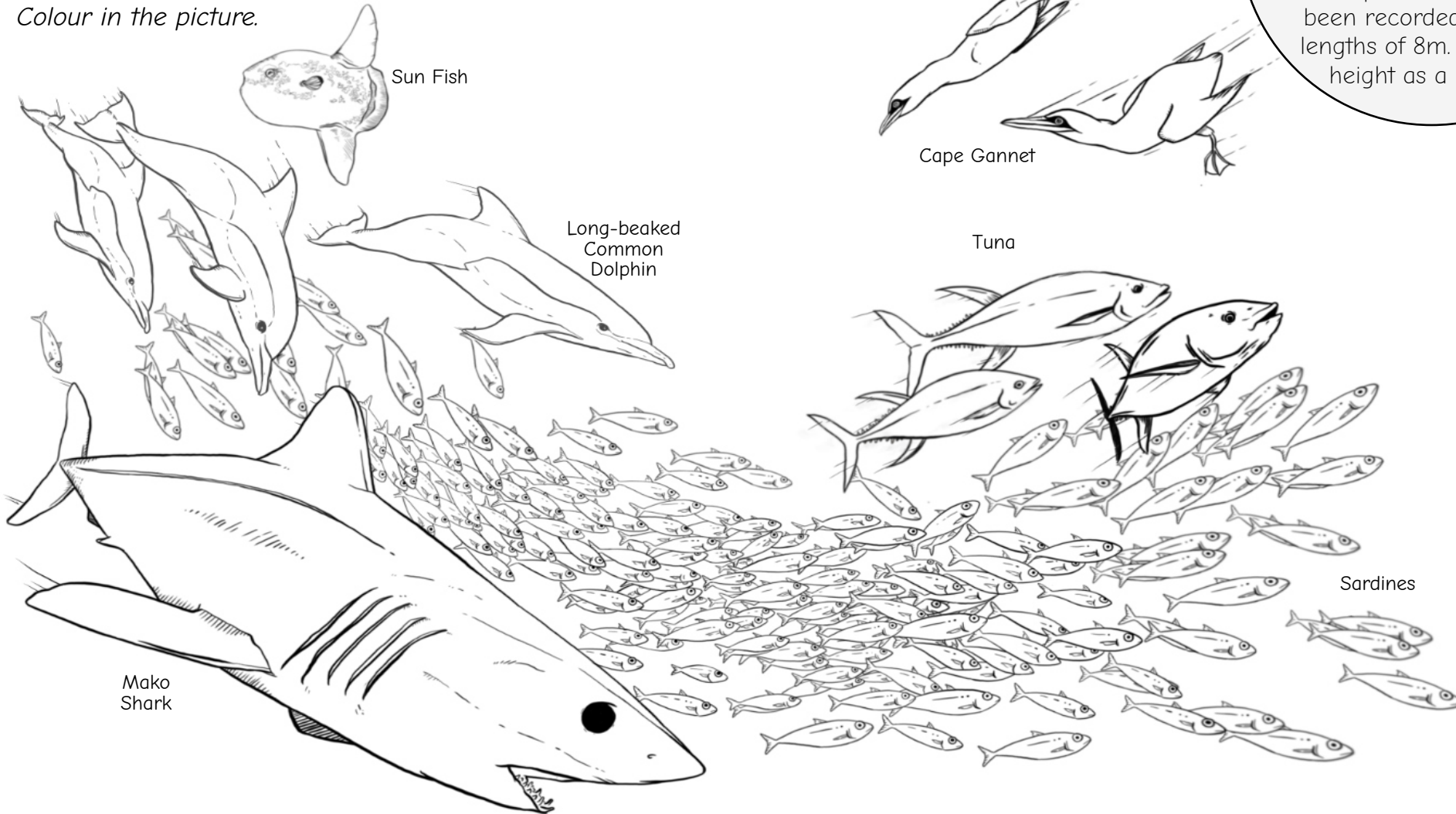
"LIQUID HIGHWAYS"

The open ocean connects countries, people and animals. Long-distance wanderers travel across the seas – sea turtles and tunas, albatross and marlins.

In some places they are joined by large schools of fish, dolphins, gliding sharks and diving seabirds.

These animals, not limited by fences or country borders, journey all around the world.

Colour in the picture.



WORLD RECORD HOLDER

The world record for the Longest *Bony Fish* goes to the Giant Oarfish! These ribbonlike fish live in the Open Ocean and have been recorded to reach lengths of 8m. The same height as a Giraffe!

THE WHALE HAS A HEADACHE...

Umkhomo had a headache...

The ocean was far too loud and Umkhomo's head was pounding from all the noise.

The songs of the other whales were being drowned by all the traffic...fishing boats, trawling along the seabed and trying to find the best spot to tow their nets. Blasting their horns to signal to one another, 'I'M OVER HERE!'

Big cruise ships, touring between the ports, ferrying people and all their stuff. The rumbling of their massive engines roaring in the ocean currents.

Container ships, rushing from one end of the ocean to the other. Making noise as they carry the world's cargo.

Vessels searching for oil - using massive air blasts to create thundering booms that echo across the otherwise quiet sea.

"Why can't these humans just keep quiet?" thought Umkhomo in frustration.

Luckily, there are special protected places in the ocean where animals can hear each other...where the noisy vessels do not go.

Where Umkhomo can hear the dolphins chattering to each other while they chase schools of silvery fish.

Where he can hear the seabirds, squawking above the surface, fighting over pieces of baitfish.

Where he can hear the reef crackle and the fish drumming.

Where he can hear the other whales, their songs telling stories of the long journeys they have travelled.

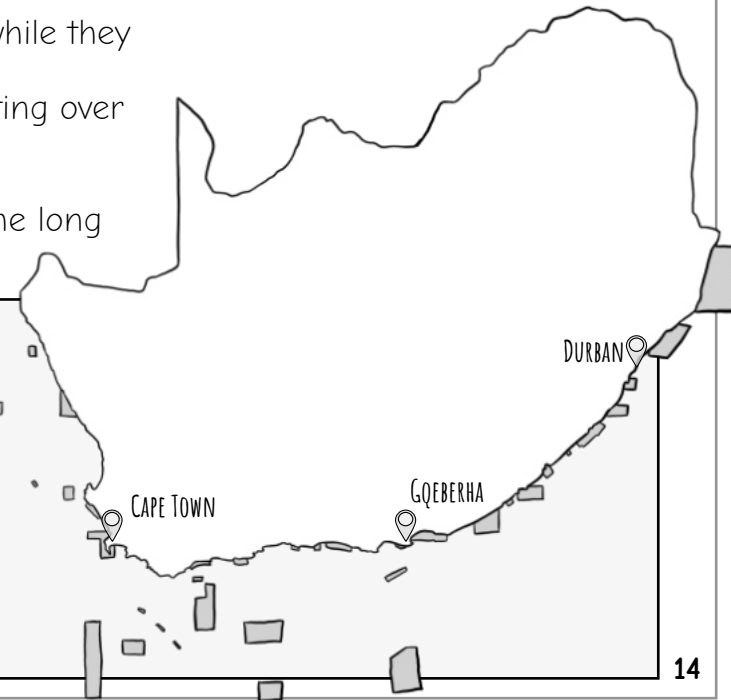
Southern Right Whale

MARINE PROTECTED AREAS

South Africa has 41 Marine Protected Areas (MPAs) covering 5% of the ocean under our care. These areas protect ecosystems and animals from harmful human activities.

Parts of these MPAs are safe places called no-take areas, where no fishing is allowed and fish can grow and reproduce. More fish can then move into other areas where people can fish. Some of the offshore MPAs still allow surface fishing in some areas but protect the sensitive corals and sponges on the seabed.

You can visit www.marineprotectedareas.org.za to learn more about these special places.

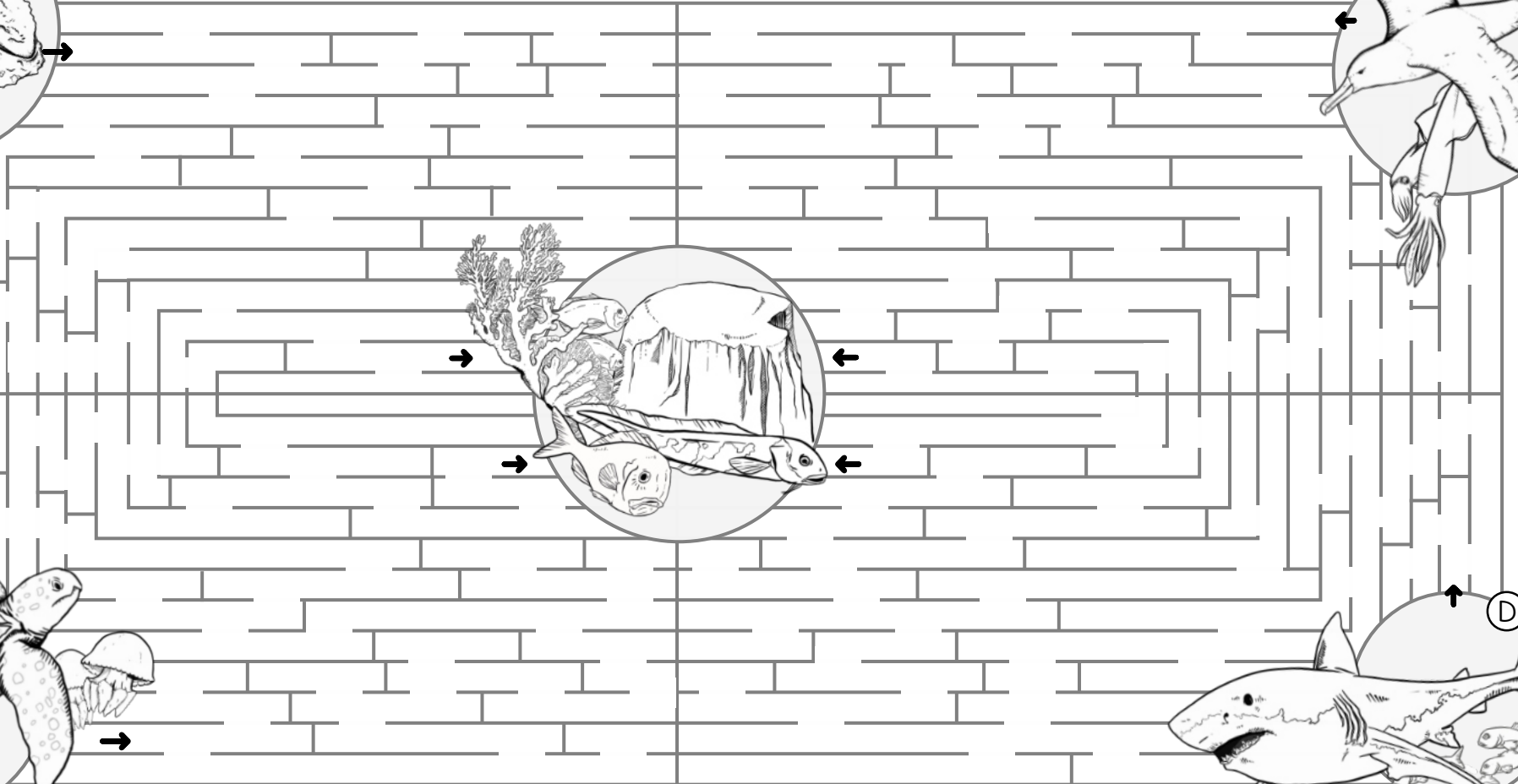
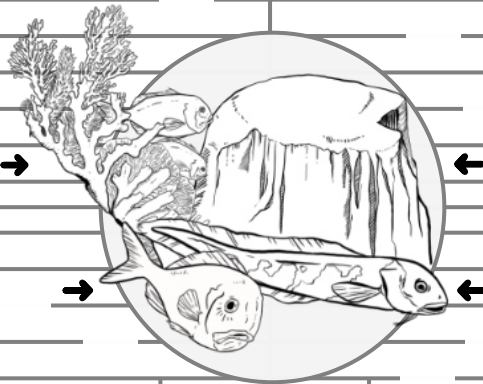
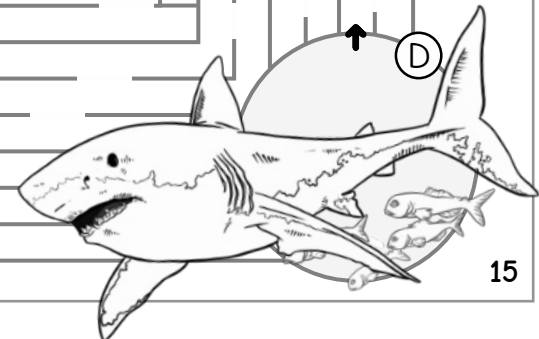
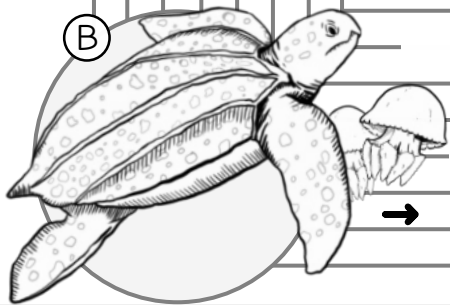
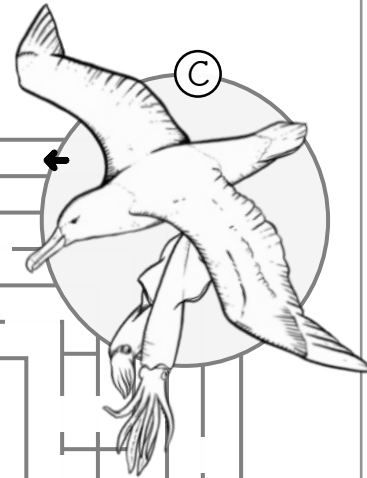
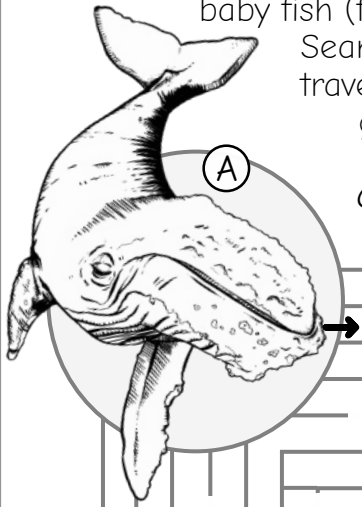


SEAMOUNTS AND RIDGES, IINTABA EZIPHANTSI KOLWANDLE (X), IZINTABA NAMAGQUMA ANGAPHANSI KOLWANDLE (Z), SEEBERGE EN HEUWELS (A) "MOUNTAINS UNDER THE SEA"

The highest mountain range in South Africa is the Drakensberg. Just imagine, under the ocean, we have mountain ranges too. These undersea mountains support many different marine animals living on the mountain slopes and providing shelter and safe places for baby fish (fish nurseries).

Seamounts are rest and snack stops for long-distance ocean wanderers. A) Humpback Whales and B) Leatherback Turtles travel to their breeding grounds near the coast while C) Albatrosses and D) White Sharks journey in search of feeding grounds.

Can you find the path that the whale, turtle, albatross and shark take to their seamount feeding grounds?

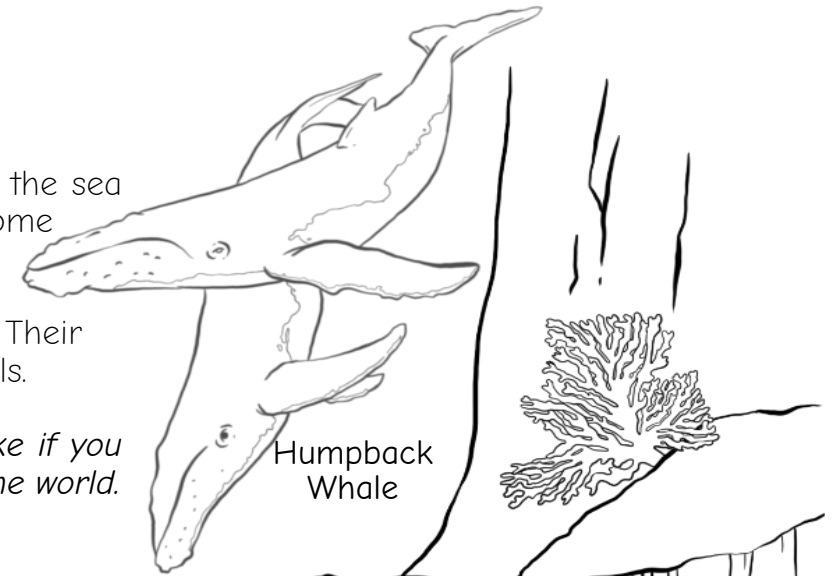


CANYONS, IMIWONYO (X), IMIHUME (Z), SEE VALLEIE (A) "OCEAN VALLEYS"

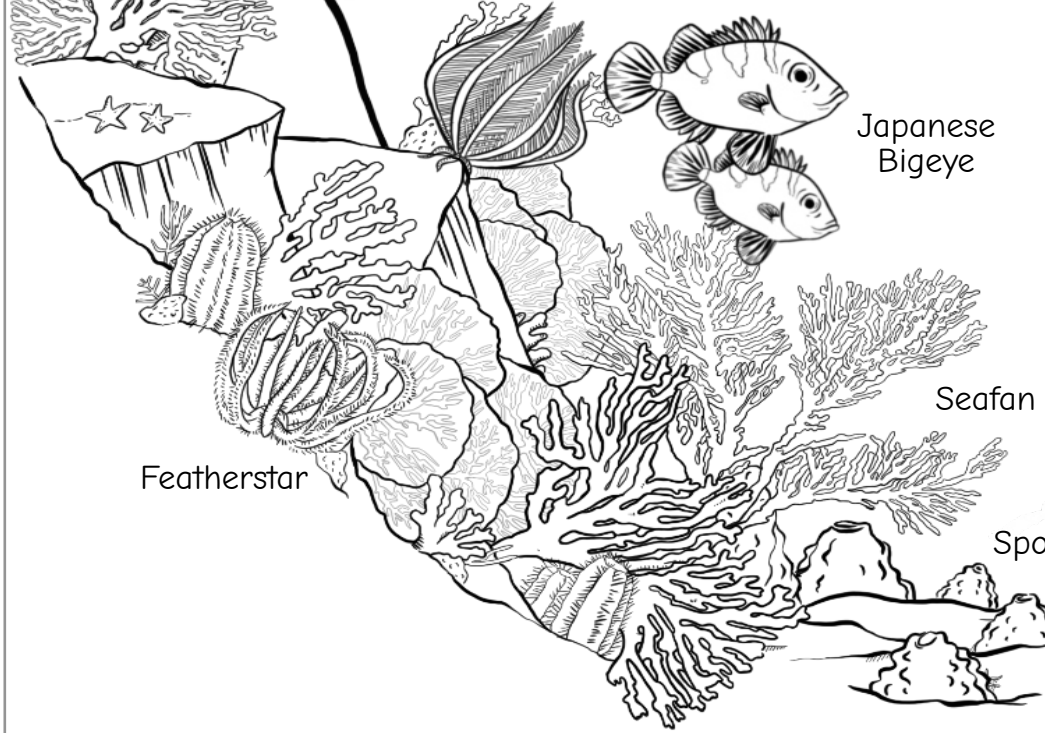
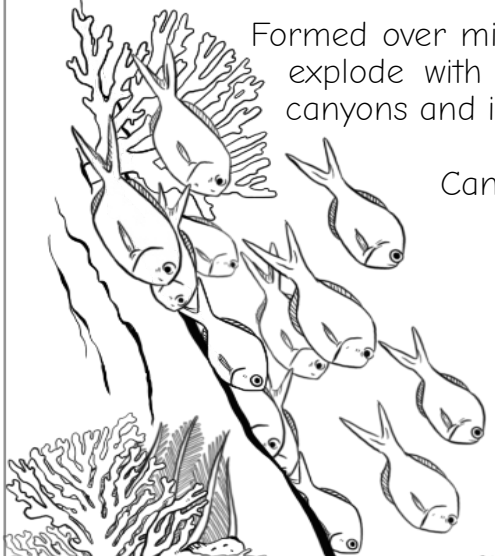
Formed over millions of years by currents, deep dark valleys beneath the sea explode with life. Vibrant corals line the steep rocky sides of some canyons and in others, ancient coelacanths gather in dark caves.

Canyons act as a path for nutrients to reach the deep sea. Their productive waters are rest-stops for migrating animals.

Use the next page to imagine what it would be like if you were able to use the ocean to travel anywhere in the world. Where would you go? Which sea creatures would you wish to see?



Humpback Whale

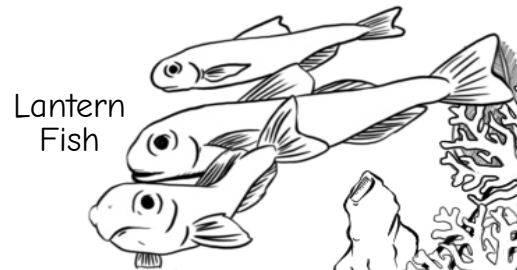


Japanese Bigeye

Seafan

Featherstar

Sponge



Lantern Fish



Pineapple Fish

Tube Anemone

Lace Coral

Brittlestars

ANCESTOR FISH

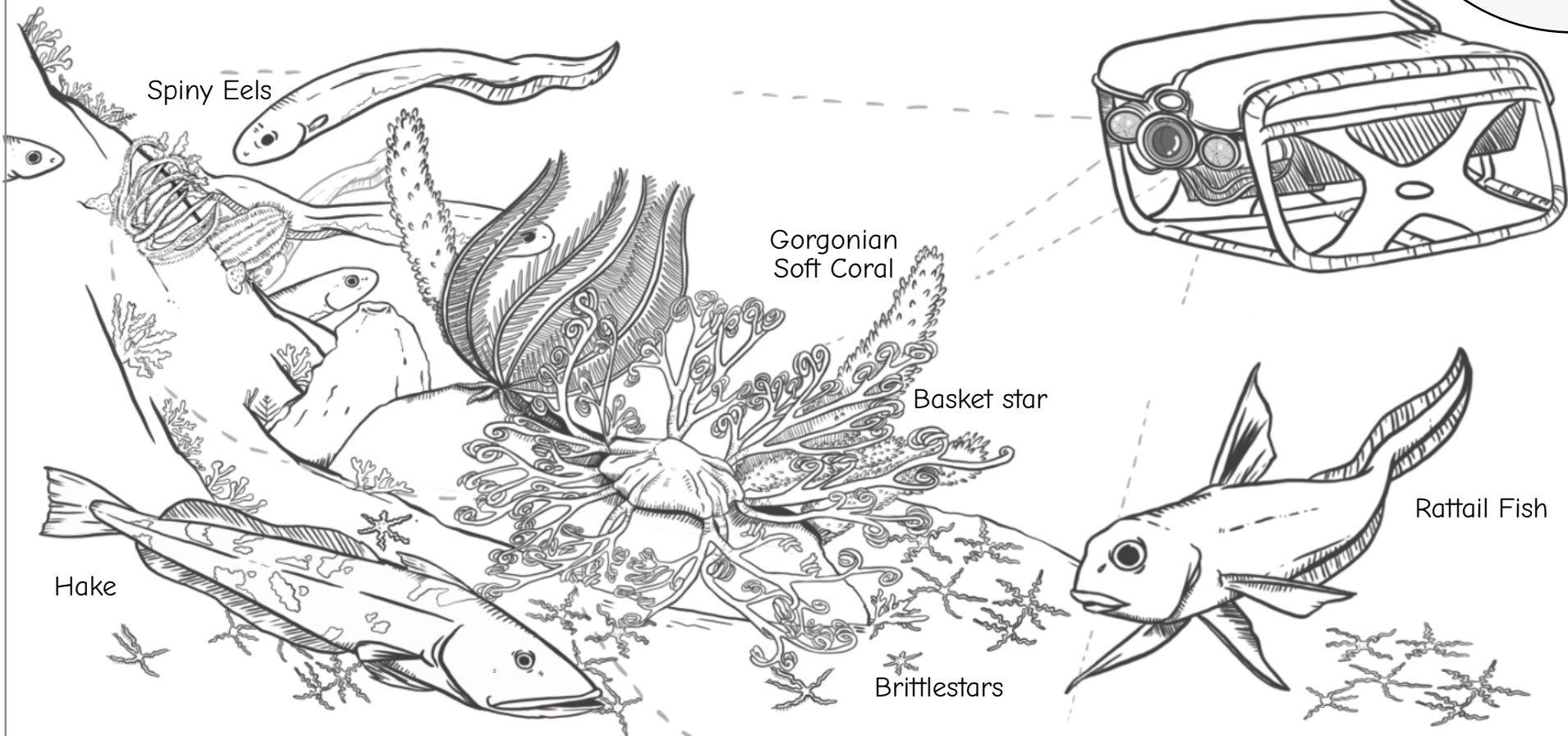
Once thought to be extinct, these ancient fish live in deep canyons in the iSimangaliso Wetland Park in northern KwaZulu-Natal. New research has found that coelacanths live to be 100 years old and reach maturity at 55. It is also thought that they can be pregnant for 5 years! Longer than any other animal.

SLOPES, AMATHAMBEKA (X), IMITHANGALA YASOLWANDLE (Z), SKUINSTES (A) "MIDNIGHT MARGINS"

Imagine going under the water – deeper and deeper – to where there is no light. This part of the ocean is the drop off where the shallow continental shelf descends from around 200 m into the deep sea. Scientists are just beginning to learn about the animals that live here. The lights of our underwater submersibles reveal surprising patches of deep corals and amazing sponges and glowing animals that use lights to send messages (communicate), catch prey and attract mates.

Exploring these deep slopes needs special equipment that does not buckle under the water pressure at these depths and can travel long distances below the surface. Scientists can use remotely operated vehicles (ROVs) which are like underwater drones to help them study the seafloor.

Colour in the picture.



Lantern Shark

GLOWING SHARKS

Using Special underwater technology, like Remotely Operated Vehicles (ROVs) scientists make new discoveries into the deep sea - like new species of sharks that GLOW! This process, called *Bioluminescence*, is used to send messages in a dark world.

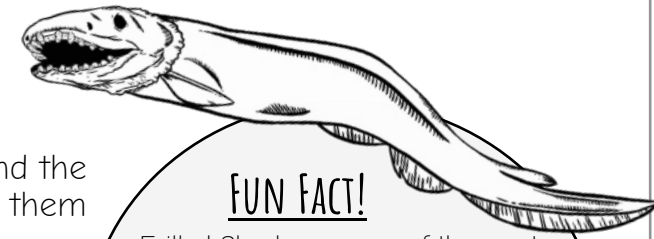
THE ABYSS, INZONZOBILA (X), EMATHAFENI OLWANDLE (Z), DIE AFGROND (A)

"LIFE IN THE SLOW LANE"

Down, down, down we go. At depths between 3 500 and 6 000 m (3.5 -6 km!) under the water, we find the deepest part of South Africa's ocean. Many mysterious creatures live in this dark world – most of them have never been seen by humans. Imagine that – a whole world for us still to explore.

The abyss is not an easy place to live. There is no light, so it is very cold and completely dark and creatures must feel their way around. The abyss is under extreme pressure – with all that water above it and animals must cope with more than 600 times the pressure at the surface.

Can you design and draw your own abyssal creatures? Remember that your creature must be able to survive in the dark, with little food and extreme water pressure. What adaptations would your creature have to survive in the abyss?



FUN FACT!

Frilled Sharks are one of the most interesting animals that live in the abyss. Since they live in such deep water, very few have ever been seen in their natural habitat. These animals keep their eggs for up to 3.5 years and give birth to live young.

THE OCEAN ZONES

A. *The Sunlit Zone (0-200 m)* is the topmost zone of the ocean and receives the most light. Living here are tiny seaweeds that make food from sunlight and half of the world's oxygen. They are the foundation of many ocean food webs. This zone is home to animals relying on their eyes to hunt.

B. *The Twilight Zone (200 -1000 m)* is home to fewer animals than the sunlit zone. It receives just enough light that daytime and night-time are different, but not enough to make food from sunlight so animals here rely on food sinking from above. Many animals hide in the twilight zone during the day but come up to feed in the sunlit zone at night. This is the largest daily migration on earth!

C. *The Midnight Zone (1000 -4000 m)* has very few animals living in it. It is dark, has very high pressure, low temperatures and little oxygen and food. Animals living in this zone must be adapted to living in these extremes.

D. *The Abyssopelagic zone (4000 -6000 m)* is the water column just above the abyss. Like the midnight zone, it has no light, extremely high water pressure and low temperatures, oxygen and food. This zone is home to a range of interesting animals adapted to living in a dark, cold world.

Cut out the template on the next page and follow the instructions to make a flexagon to see which Ocean Zone the Manta ray, Jellyfish, Lanternfish and Dumbo Octopus live in.

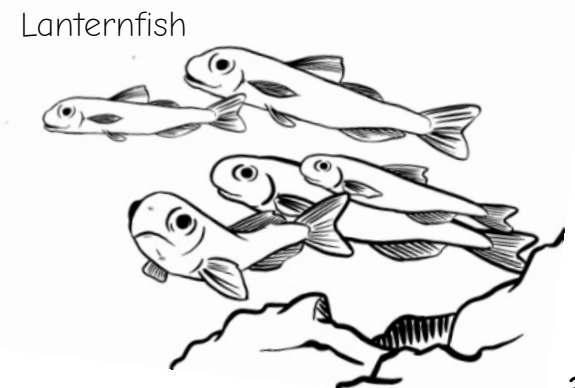
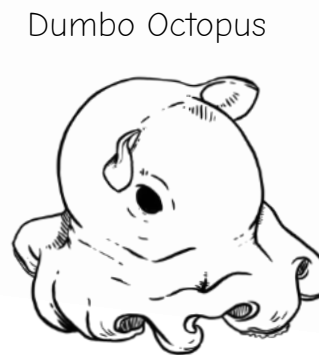
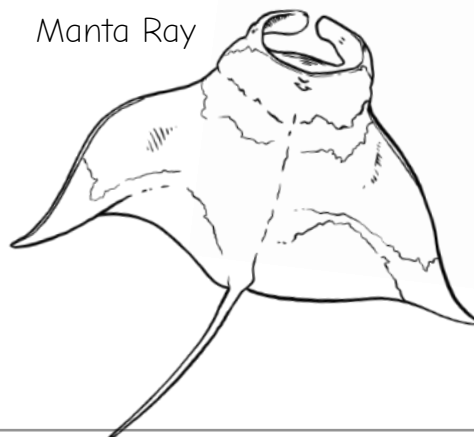
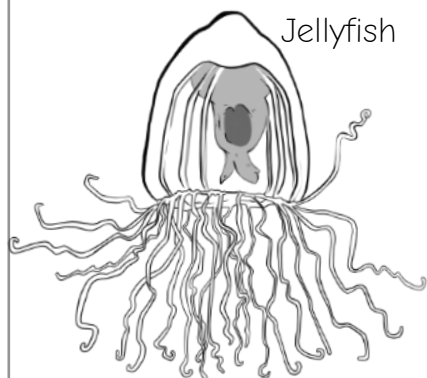
Once you have made your flexagon, you can work out which zone each of the animals live in (A, B, C or D). Now, match the letters and zones, shown below to the animals that live in each zone. Draw a line from each zone to its animal.

(A) Sunlit Zone

(B) The Twilight Zone

(C) The Midnight Zone

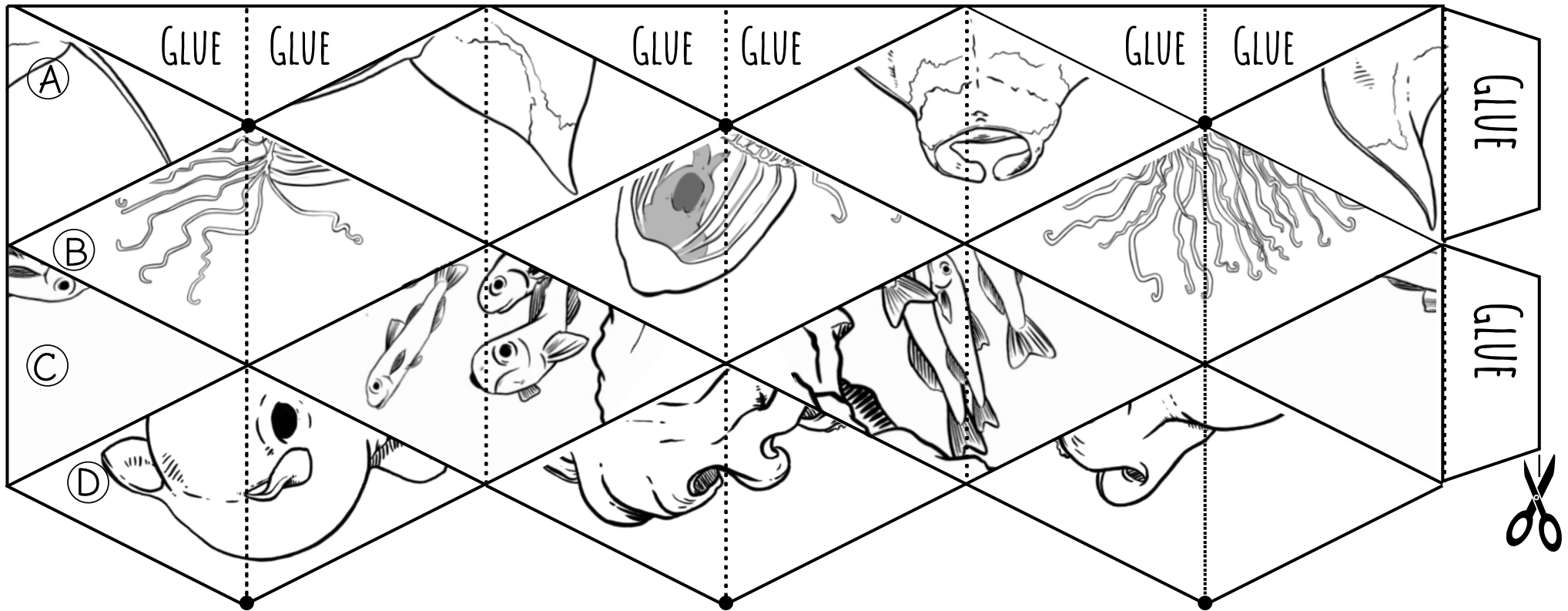
(D) The Abyssopelagic zone

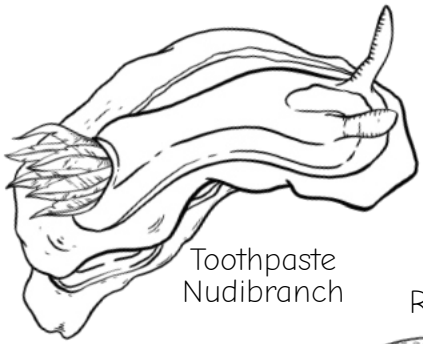


THE OCEAN ZONES: FLEXAGON

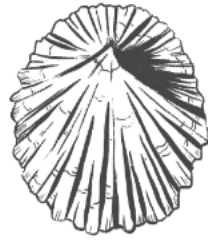
1. Cut out the template below.
2. Fold each dashed line (print side to print side), then unfold
3. Fold each solid line (diagonal lines) back to back so that the sides without print face each other. Then unfold
4. Gently fold paper to match each dot so that you form a tube. Make sure that the printed side is on the outside of the tube.

5. Add glue to the triangles marked 'glue' and press the tube together.
6. Add Glue to the "glue tabs" and tuck into the end of the tube. Press to seal.



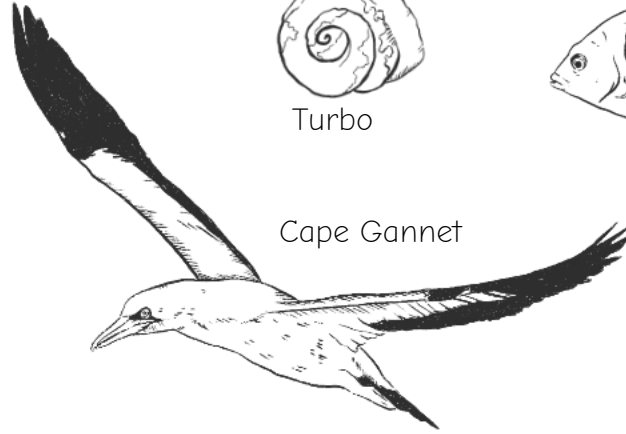


Toothpaste Nudibranch



Rock Cod

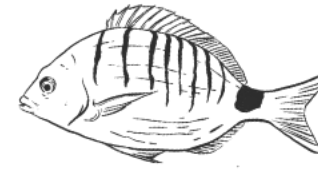
Limpet



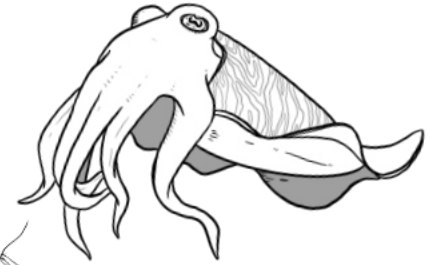
Cape Gannet



Turbo



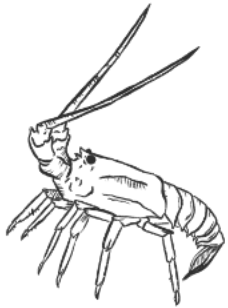
Blacktail



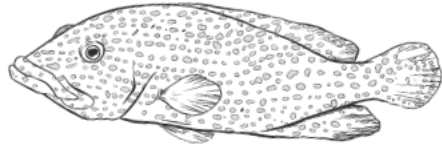
Cuttlefish



Crab



Lobster



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We would like to thank the teams at SAAMBR, SANBI and SAEON, and the many educators, scientists and children who provided invaluable assistance, advice, reviews and recommendations.

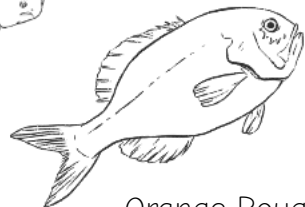
We hope that you enjoy this book as much as we enjoyed making it.



Prawn



Sole



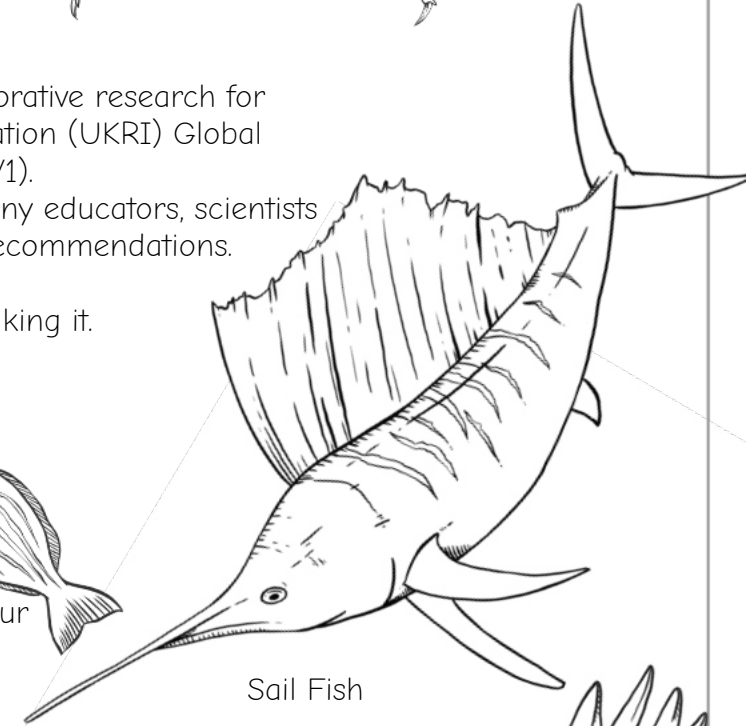
Orange Roughy



Seafan



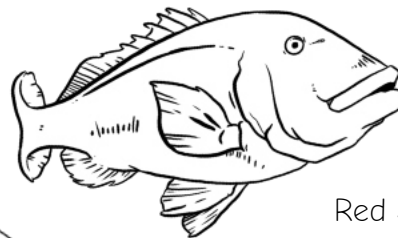
Seventy-four



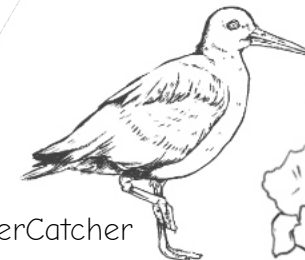
Sail Fish



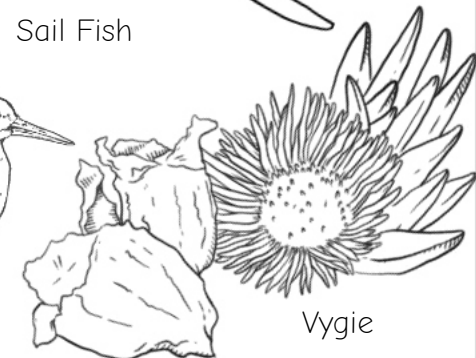
Guitar Shark



Red Steenbras

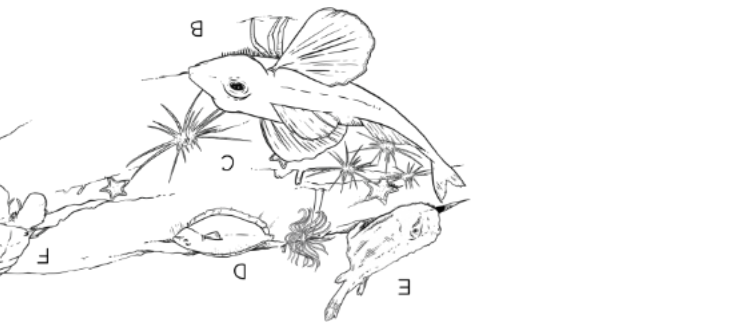


Oystercatcher



Vygie

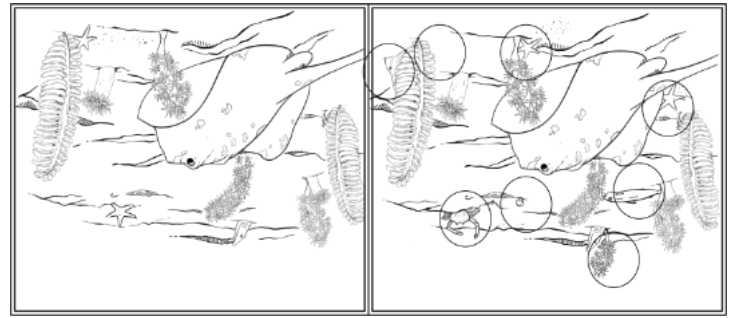
Answers



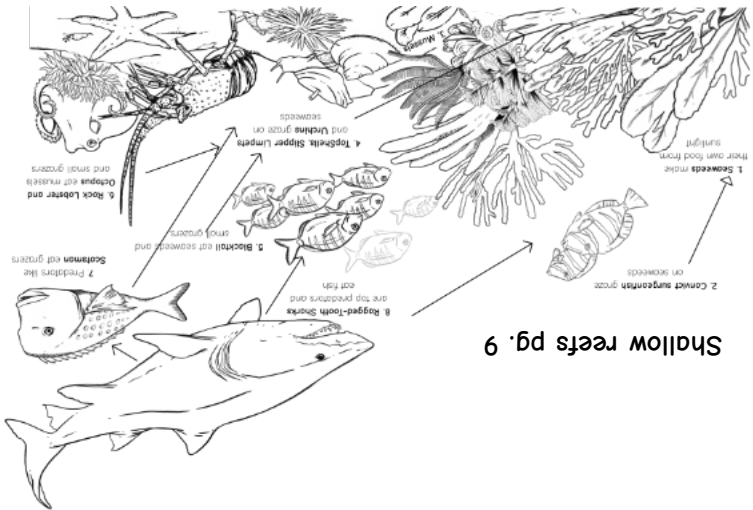
Muddy Shelves pg. 11

- Rocky Shelves pg. 12
1. Seatan
 2. Sea whip
 3. Sponge
 4. Lace coral

- The Ocean zones pg 22
- A- Manta Ray
 - B- Jellyfish
 - C. Lanternfish
 - D Dumbo Octopu



Sandy Shelves pg. 10



Shallow reefs pg. 9



Rocky Shore pg. 3

- Sandy Shore pg. 4
1. Leatherback Turtle
 2. Cape Clawless otter
 3. Plough snail
 4. Ghost Crab
 5. Penguin

Undersa Jungles pg7

E	F	I	R	O	C	K	L	O	B	S	T	E	R
V	E	O	C	T	O	P	U	S	H	R	Y	M	O
E	A	M	H	M	U	S	S	E	L	U	K	L	T
R	T	A	L	G	A	E	A	W	U	H	U	T	
G	H	P	Y	J	A	M	A	S	H	A	R	K	E
Y	E	E	T	T	B	H	A	T	E	A	H	E	R
E	R	B	N	Y	A	T	R	A	L	E	R	L	E
T	S	N	A	I	L	R	T	R	K	U	E	P	C
H	T	U	B	R	O	N	Z	E	B	R	E	A	M
P	A	O	R	U	N	L	E	A	N	C	H	I	L
O	R	P	R	K	E	Y	A	R	D	H	E	M	I
N	U	D	I	B	R	A	N	C	H	I	R	E	F
Y	R	K	S	T	R	E	P	I	E	N	O	D	E

- Coral Reefs pg. 8
1. E
 2. A
 3. D
 4. C
 5. B