



SSC DIVE IN!

DEEP SEA





WELCOME!

Hello, and welcome to “SSC Dive In!”. Packs of resources providing some marine learning directly into family homes and classrooms.

This pack’s theme: **Deep Sea**

The deep seas around Scotland are those waters deeper than 200 metres. The deepest parts of our seas are the most difficult to access and therefore less is understood about the habitats and species found here.

Dive into this pack to discover more about the rich diversity of life found in the deep.

Inside this pack:

- **Overview: What is the Deep Sea?**
- **Spotlight on Habitats**
- **Discovery sheets: Species information**
- **Deep sea art**
- **Blog: Exploration**
- **Craft: Angler Fish Pop Out Card**
- **Wordsearch**
- **Glossary**

We’d love to hear from you! If you’ve had fun having a go at activities, experiments and crafts, let us know. Any comments or pictures can be sent to marineengagement@seabird.org. More resources are available on our [website](#).

Enjoy using our packs and want to see more? The Scottish Seabird Centre is an environmental conservation and education charity. Every penny we raise helps us deliver our important education and conservation work. If you enjoy using our resources and would like to support our work, please consider making a donation to our [JustGiving page](#). Thank you.

We hope you enjoy diving in to the pack!

Scottish Seabird Centre Learning Team



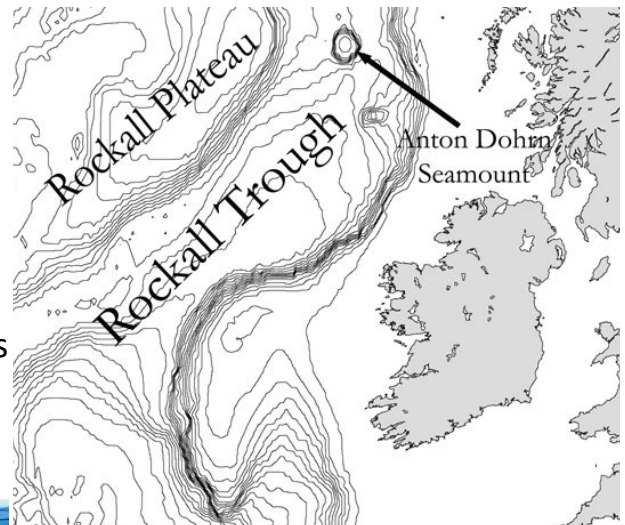


OVERVIEW

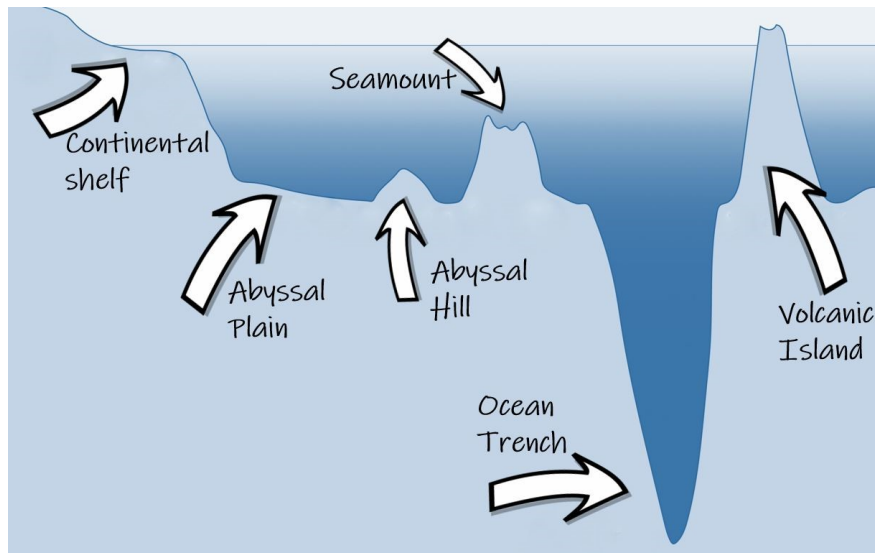
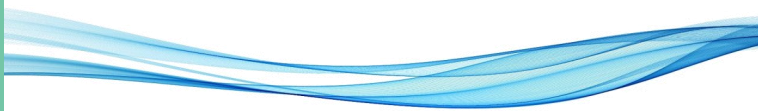
WHAT IS THE DEEP SEA?

HOW DEEP IS DEEP?

Some parts of the world's oceans are over 10,000 metres deep. In Scotland, the deepest point lies within the Rockall Trough and this is 2,500 metres deep. For comparison, the highest mountain in Scotland, Ben Nevis, is 1,345 metres above sea level. All sea deeper than 200 metres is considered to be deep ocean.

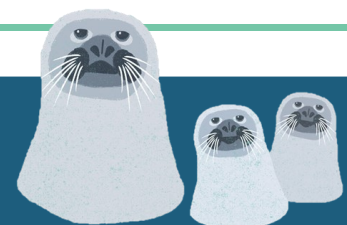


https://upload.wikimedia.org/wikipedia/commons/1/1c/Rockall_Trough.jpg



The seafloor is not uniform. It has hills and valleys just like the land above water. Lots of interesting features are hidden below the waves. The diagram below shows some examples of the features found on the seafloor.

Lying around 200 kilometres to the west of the Outer Hebrides, Anton Dohrn Seamount is 1,800 metres tall (that is the height of 6 Eiffel Towers stacked one on top of the other) but it does not reach the surface of the water. The **ecosystem** around it is diverse and includes cold-water coral reefs and sponge communities. Learn more about seamounts on page 11.





OVERVIEW

WHAT IS THE DEEP SEA?

WHAT IS IT LIKE IN THE DEEP SEA?

Firstly, let's think about the light...

Deep water is darker than shallow water because sunlight is unable to reach the depths. Below 200m, it is so dark that **photosynthesis** cannot occur, which leads to there being very few plants in the deep sea. Below 1000m, all sunlight is missing and this zone is often referred to as being the 'midnight zone' because it's so dark.

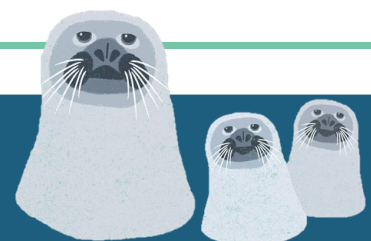
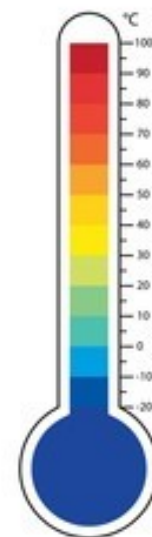
Light Adaptations: Some animals have extremely sensitive eyes which allow them to see light at low levels, on the other hand, some animals have lost their sight all together. This allows them to adapt to spend more energy on other senses instead. Interestingly, 70% of sea creatures create their own light, this is called **bioluminescence**. For example, the anglerfish uses a bioluminescent lure to attract **prey**.

Next let's consider the temperature...

The sea gets colder with depth because cold water sinks below the less dense warmer water at the surface, which has been warmed by the sun. The temperatures in the Scottish deep seas range from 4°C to -1°C. Despite this, great species diversity still exists in the deep. *Click this [link](#) to view a video showcasing the biodiversity among the cold water coral at Rockall Bank.*



Some species of comb jelly, like the one pictured above create their own light. *Click this [link](#) to watch a video about bioluminescence.*





OVERVIEW

WHAT IS THE DEEP SEA?

WHAT IS IT LIKE IN THE DEEP SEA?

Now let's consider pressure...

Pressure increases with depth because the weight of the water above pushes down on any object or animal below. Every 10 metres below the surface, an additional 6.47kg is added, therefore by sea depths of 200m, 129.4kg would be pushing down on you. This is the same as 259 kittens or over 129 pineapples.

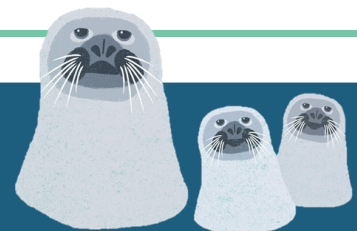
129 X



Pressure Adaptations: Animals which live in the deep oceans are less likely to have a bony structure because bones do not cope well with pressure. Deep sea creatures also usually lack lungs or any other area filled with gas in their bodies. Having adapted structures avoids the crushing of bones and **compression** of bodies. However, the sperm whale is one of the species with a special lung **adaptation**. Before diving to the depths of the ocean, sperm whales (pictured below) collapse their lungs by moving the oxygen in them to their muscles and blood vessels.



Public Domain: Gabriel Barathieu





OVERVIEW

WHAT IS THE DEEP SEA?

WHAT IS IT LIKE IN THE DEEP SEA?

What about food supply?

Since there is no light for **photosynthesis**, oxygen levels are low in the deep sea. This in turn makes the availability of food very sparse.

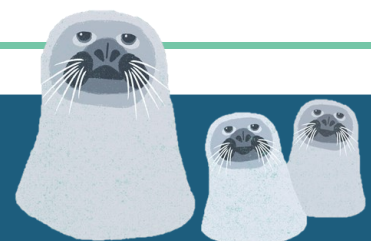
Food Adaptations: Reactions in the bodies of deep sea species tend to be slower, this is the **metabolism**. This allows deep sea creatures to grow slowly and last without food for long periods. **Diel vertical migration** is a behavioural adaptation which allows animals to deal with the lack of food. Animals move to the surface of the water under the protection of darkness at night. This allows them to feed off food in the shallower depths and remain hidden from predators. They then migrate back down to the ocean depths, to hide during the day.



The word 'diel' comes from Latin and relates to a 24-hour period that usually includes a day and the adjoining night .

So, what have we learnt about life in the deep sea?

In summary, deep-sea animals have to live in quite an extreme environment in terms of temperature, pressure and food availability. Yet, the deep sea still has great **biodiversity** because species have adapted over time to these conditions. Just like the species that live closer to the surface of the sea, deep sea creatures are under threat from **climate change** and rising sea temperatures. Already sparse food supplies near the seafloor could reduce considerably as temperature, acidity and oxygen levels change.





ART

DRAW DEEP SEA SPECIES

You can create bold and eye-catching art by using light or bright chalks and pastels on very dark paper or card. This combination is ideal for creating deep sea scenes, where strange-looking creatures move around in the shady waters.

WHAT DO I NEED?

Black or dark blue paper

Bright or light coloured
chalks or pastels

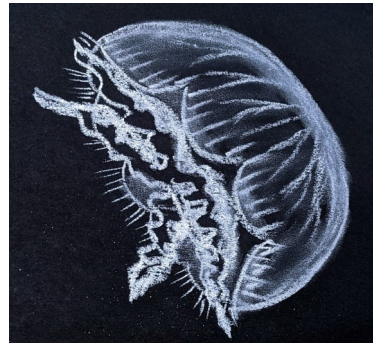
Reference images from a book
or on-line

1



Find some images of deep sea creatures for inspiration—either in books or on-line.

2



Draw your chosen creature onto the dark paper using a light or bright chalk, crayon or pastel. You can use your finger to smudge the lines a bit to add a watery feel if you like.

3



Try drawing a range of species of different shapes and sizes.

4

You can also use colour if you like. Why not invent your own imaginary species or create a whole habitat of yet to be discovered deep sea creatures?





BLOG

EXPLORATION

The deep sea has long hidden its secrets from humans but due to technology advances we are able to explore much more than previous generations were able to. However, there is so much left to investigate, that it could take several more generations to reach the point where we understand as much about the deep sea as we do about the land. We have only investigated around 1% of the ocean floor (in fact we know more about the moon).



© Sebastian Hennige (cold water coral reef from inside JAGO submersible)



Scientists measure pressure in units called 'bars'. One bar is added for every 10 metres increase in depth, representing the weight of the overlying water. The increasing pressure as you descend deeper into the water is a huge challenge to human deep sea exploration. To be able to inflate human lungs in deep water, special pressurised air or other gas mixtures have to be breathed. Even with this, there is a limit to depths divers can reach.

The deepest SCUBA dive was completed by Ahmed Gabr in 2014. He went **332.35 metres** deep.





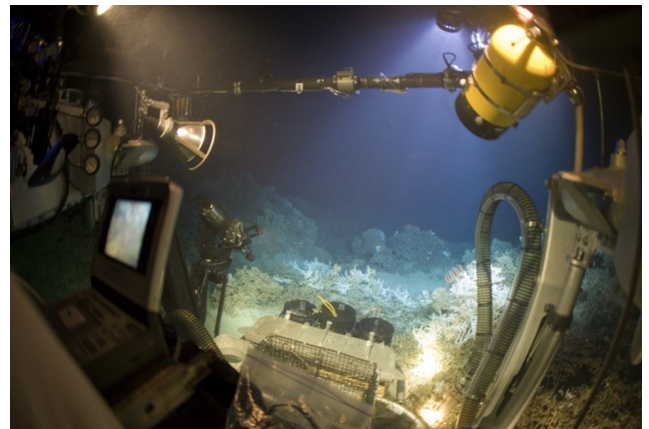
BLOG

EXPLORATION

Although there is still so much to explore when it comes to our deep seas, ocean exploration has been a field of interest for centuries. 2022 it is the 150th anniversary of the *HMS Challenger* expedition. This voyage set sail in 1872 and investigated the world's ocean depths for four years. The trip was led by a Scotsman, Charles Wyville Thomson. How we research the ocean today is still influenced by the work carried out on this pioneering trip. To find out more about this expedition, take a look at these links from [Dynamic Earth](#) and the [University of Edinburgh](#). To explore a more modern research vessel and some of the techniques used today, try this link to the [Royal Research Ship James Cook virtual tour](#).



Painting of HMS Challenger—William Frederick Mitchell, Public domain, via Wikimedia Commons



Deep sea **submersibles** are now used for human exploration of the deep seas. Some **submersibles** do not carry humans but instead are controlled from a boat on the surface. However, other examples are human occupied vehicles (HOVs), which enable people to go deep down into the sea. Recently, Alan Jamieson became the deepest diving Scotsman by using an HOV when he reached a depth of **10,714 metres**.

The first submarine was invented by Cornelius Drebbel in 1623.

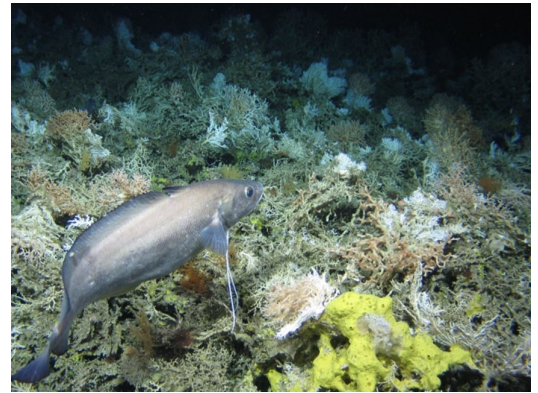




HABITAT

COLD WATER CORAL REEFS

Features such as seamounts provide the perfect surface for cold water corals to form. The only reef-forming coral in Britain is the *Lophelia pertusa* which can be found in waters over 2000 metres deep. This species of coral uses its tentacles to sting and trap small **crustaceans** since they cannot use sunlight for energy living so far down in the depths of the sea. Cold-water coral reefs can reach thousands of metres long and provide a key habitat for many species, including the Atlantic wolf fish and squat lobsters.



© Changing Oceans Group



Lophelia pertusa specimen



Squat lobster © naturescot

Coral reefs are used for shelter, food and as a nursery for **juveniles**. Skates such as the common (blue) skates often lay their egg cases in coral. Common (blue) skate are categorised as a Critically Endangered species by the IUCN, therefore protecting this habitat for them is essential. Unfortunately, cold-water coral is particularly vulnerable to human impacts e.g. pollution and certain fishing activities.

The cold-water coral reefs in the west of Scotland are around **4,000 years old**.

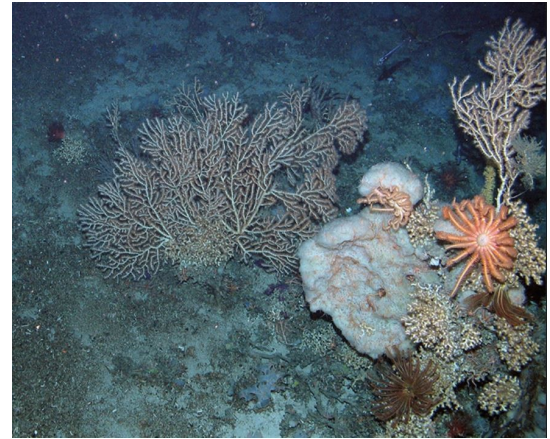




HABITAT

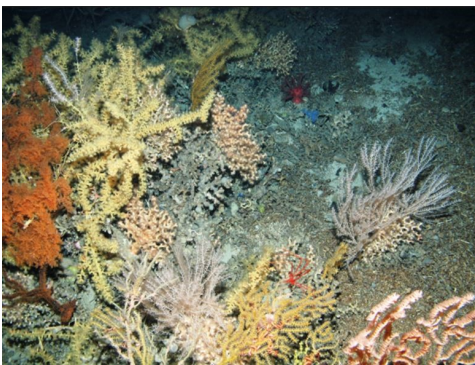
SEAMOUNT COMMUNITIES

Seamounts are underwater mountains and are considered to be places of high **biodiversity**. Most seamounts were once active volcanoes but are now extinct and are submerged underwater. To be considered a seamount the feature must rise above the seafloor by at least 1000 metres and not break the surface of the water.

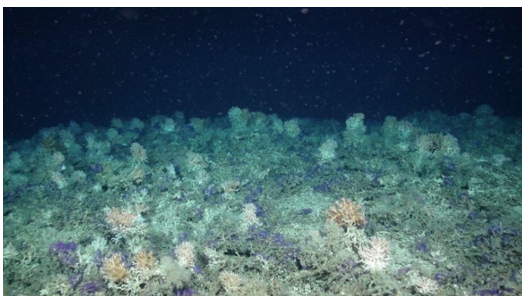


Anton Dohrn Seamount © Marine Scotland

Scotland's seamounts are found off the west coast of Scotland in the Rockall Trough. The seamounts are called Anton Dohrn, Rosemary Bank and Hebrides Terrace. Each is located within one of Scotland's offshore marine protected areas (MPAs). To learn more, you can view a [video](#) about Anton Dohrn Seamount and link to information about the [West of Scotland MPA](#).



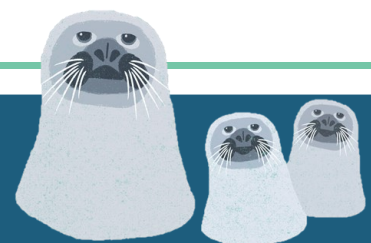
Anton Dohrn coral garden © Marine Scotland



Rosemary Bank Seamount © naturescot

The giant mountainous structure of a seamount within deep water creates waves. This wave action can bring deeper waters higher up the water column and along with it food and **plankton** for filter feeders and fish. In turn, bigger predators, including sharks, dolphins and seabirds are attracted to these areas for feeding.

Seamounts also provide the perfect surface for corals and sponges to attach and grow.





HABITAT

SEA LOCHS

There are many sea lochs around Scotland's coasts, with a huge number along the west coast. Sea lochs are tidal inlets of the sea which can vary greatly in size. Sea lochs are shallower than the deep seas and are more sheltered, so a diverse range of life can flourish here, including many deep sea species.



Loch Creran in Argyll © naturescot

Watch a quick dive into Loch Creran by naturescot [here](#). Loch Creran receives protection by virtue of being designated a Special Area of Conservation. Read more about Marine Protection on our [website](#).



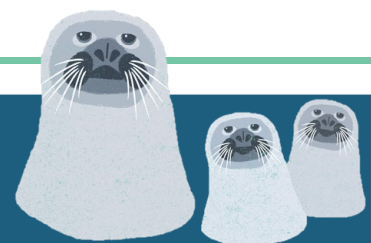
Tall sea pens in Loch Duich © Dr Keith Hiscock

Sea lochs were created by **glaciers** which scoured deep basins, usually over 30 metres deep. A layer of freshwater floats above the seawater in the sea lochs, creating a 'blanket', which helps the temperature and salt content in the water below remain stable. The lack of waves and stability of the environment mimic the deep sea, which is why deep-water creatures can also be found in sea lochs.

This [link](#) shows Darwin 200 diving in a sea loch but also a narrow and the Bass Rock.



Diver surveying Loch Sween © naturescot





WORDSEARCH

DEEP SEA

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

Can you find the words below in the word search?

SEAMOUNT

ANTON DOHRN

DEEP

SUBMERSIBLE

CORAL

SEA LOCH

ANGLERFISH

DARK

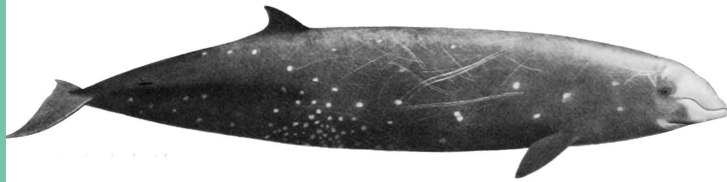
PRESSURE

DIVER



DISCOVER

DEEP SEA SPECIES



NOAA United States. National Marine Fisheries Service,
Public domain, via Wikimedia Commons

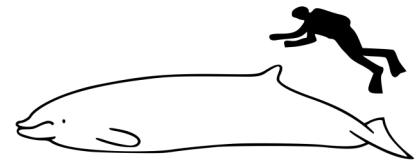
Cuvier's beaked whale

ZIPHIUS CAVIROSTRIS

SIZE: Length up to 7.5 metres

LOCATION: Shetlands and the Outer Hebrides

DEPTH: Over 900 metres



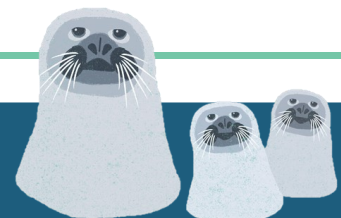
By Chris huh, CC BY-SA 3.0, <https://commons.wikimedia.org/w/index.php?curid=2130176>

WHAT DOES IT LOOK LIKE?

Cuvier's beaked whales have slim bodies and a flat head. This flat head with their beak shaped mouth makes their faces a cone shape. They are grey in colour but can sometimes look brown due to algae which can grow on their bodies. Their head is white with a white marking that covers the upper back down to the dorsal fin and they have dark rings around their eyes. The males' teeth can sometimes be seen pointing from their lower jaws—looking like tusks.

FACTS:

- ◆ The Cuvier's beaked whale is the deepest diving mammal in the world. It has been recorded to dive to a depth of 2,992 metres.
- ◆ Some can be covered in scars due to shark attacks and male to male fighting over females.
- ◆ They have special flipper pockets which let them hold in their flippers so they do not stick out. This makes them **streamlined**, passing through the water easily.





DISCOVER

DEEP SEA SPECIES



Image: Canva

Portuguese dogfish

CENTROSCYMNUS COELOLEPIS

SIZE: Length up to 1.2 metres

LOCATION: West and north coasts, around the Shetland Islands

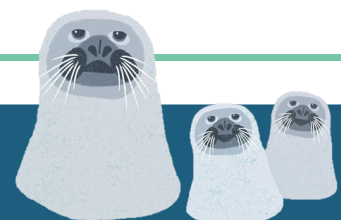
DEPTH: Can be found in waters deeper than 3000 metres

WHAT DOES IT LOOK LIKE?

The Portuguese dogfish is dark brown and has yellow-green eyes. They are able to see and detect bioluminescence. The snout is rounded and short but is thinner than the mouth. The body also has a flattened stomach and two dorsal fins with a spine on each. Despite being a shark this creature has scales which more closely resembles those of a fish.

FACTS:

- ◆ The Portuguese dogfish is the deepest living shark in the world. They have been recorded at a depth of 3,700 metres.
- ◆ They can live for up to 60 years.
- ◆ This shark is a species of “Sleeper shark”, which is a group of sharks that do not usually show aggressive behaviour and instead exhibit behaviours which can be described as slow and sleepy.
- ◆ The Portuguese dogfish is an active hunter and eats sea life such as squid and octopi.





DISCOVER

DEEP SEA SPECIES



© naturescot

Blue ling

MOLVA DYPTELYGIA

SIZE: Up to 1.5 metres in length

LOCATION: North coast, Faroe-Shetland Channel

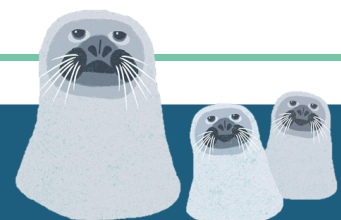
DEPTH: Up to 1500 metres

WHAT DOES IT LOOK LIKE?

This fish looks very similar to an eel. The whole body has a blue hint which gives the fish its name. The back and sides of the body are dark brown in a stripey or spotty pattern with a blue stomach. Living in the deep sea, the blue ling benefits from having very large eyes. They also have a chin barbel which makes them look like they have a “beard”. Blue lings also have two long fins which stretch along their bodies.

FACTS:

- ◆ The blue ling is related to the cod.
- ◆ This species is classed as ‘Vulnerable’ by the IUCN, due mainly to fishing pressures.
- ◆ The biggest blue ling recorded was over 18kg.





DISCOVER

DEEP SEA SPECIES



© Dr Keith Hiscock

Tall sea pen

FUNICULINA QUADRANGULARIS

SIZE: Can grow higher than 2 metres

LOCATION: North and west coast of Scotland. Deep waters and sea lochs.

DEPTH: 25—2000 metres

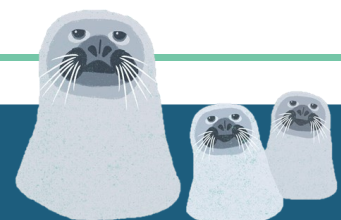
WHAT DOES IT LOOK LIKE?

A tall and narrow species of sea pen, which is usually white or light pink in colour. The stalk is square shaped and the polyps grow outwards from it, giving a feathery appearance. The sea pen curves towards the top of its stalk. Sea pens often live in groups, creating a forest-like habitat.

FACTS:

- ♦ Sea pens are related to corals and sea anemones.
- ♦ The deep-sea brittlestar is a common resident of tall sea pens. They hang from the stalks and catch food which passes in the water.
- ♦ Sea pens are named after old writing quills, due to their resemblance to a feather.
- ♦ Sea pens are **sessile** but can move to new locations if they need to.
- ♦ Burrowed mud in sheltered deep sea or sea lochs is the key habitat where sea pens are found.

Click this link to see a [video](#) showing a dive to see all three British sea pens.





DISCOVER

DEEP SEA SPECIES



Image: Canva

Black scabbardfish

APHANOPUS CARBO

SIZE: 1.1 metres long

LOCATION: West coast

DEPTH: Over 1500 metres

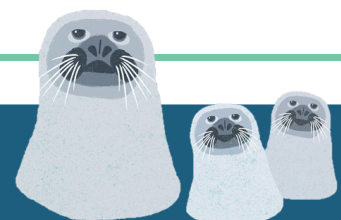
WHAT DOES IT LOOK LIKE?

The black scabbardfish is a long metallic black coloured fish. The dorsal fin is lined with spines and the anal fin also has 2 spines. The tail fin is small and forked. They have large eyes and prominent sharp teeth, that look like fangs. These fangs along with their long snout give them a very distinctive look.

FACTS:

- ◆ This fish is fished commercially in France and Spain and is significant in Madeira, where it is considered a delicacy.
- ◆ The Black scabbardfish moves up to shallower waters in the night to feed.
- ◆ The British waters provide a feeding habitat for the juveniles.

[Video](#) link to see a black scabbardfish in Ireland performing 'vertical bobbing'.





DISCOVER

DEEP SEA SPECIES



Image: Canva

Anglerfish

LOPHIUS PISCATORIUS

SIZE: Up to 200cm in length

LOCATION: West coast

DEPTH: Up to 2000 metres

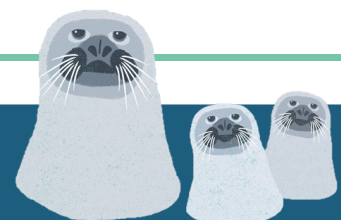
WHAT DOES IT LOOK LIKE?

Anglerfish have wide and compressed bodies that are darkly coloured with a marbled pattern and white bellies. Around the body, the skin forms leaf-like flaps and the dorsal spine has a 'lure' which hangs in front of the face and is used to attract prey. The anglerfish's many sharp teeth ensure that prey do not escape once lured in.

FACTS:

- ◆ The anglerfish often buries itself in the seafloor sediment and due to its patterning will be well hidden.
- ◆ It can extend its jaws and stomach to swallow prey up to twice its length.
- ◆ When females release their eggs, they do so in a long chain which can number around 2,800,000 eggs.

Try our
Anglerfish pop-
out card craft on
page 21.





DISCOVER

DEEP SEA SPECIES



© naturescot

Orange roughy

HOPLOSTETHUS ATLANTICUS

SIZE: 75 cm in length

LOCATION: North-west of Scotland

DEPTH: Over 1800 metres

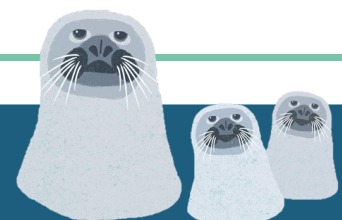
WHAT DOES IT LOOK LIKE?

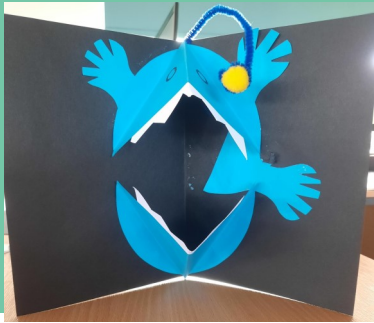
These fish are bright reddish orange, which is where they get their name from. They have a round body shape which is compressed from the sides. They have large eyes and spines towards the end of their dorsal fin. More spines are also positioned on each half of the fork shaped tail.

FACTS:

- ◆ This is a very long-living sea creature capable of living for over 100 years.
- ◆ The orange roughy is another species which is commercially important but has become vulnerable due to overfishing.
- ◆ The head can produce mucus giving it its other common name “slimehead”.

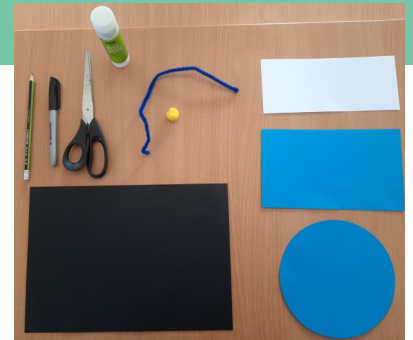
To learn even more about the Orange roughy, view this [video](#).





CRAFT

ANGLERFISH POP-OUT CARD



Make this eye-catching 3D pop out card featuring an Anglerfish, complete with jaggy teeth and bright lure.

WHAT DO I NEED?

Black or dark blue
A4-size card

Light blue paper or card (or
coloured in white paper)

Pen or pencil

Pipe cleaner

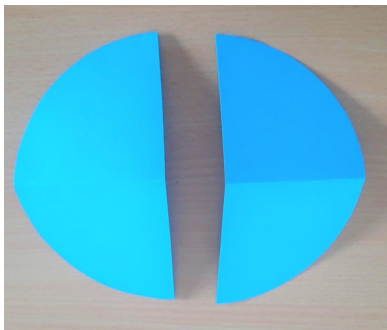
Glue

White paper

Scissors

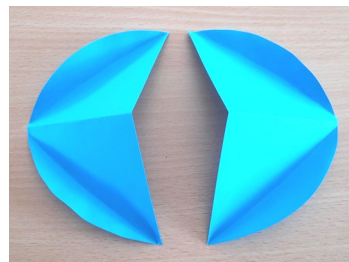
A yellow or white
pom pom

1



Cut out a circle of blue paper or card (you can draw around a bowl or plate) and then cut that circle in half.

2



Now fold the round edges of the semi-circles, so that the paper sticks up, almost like a pyramid, when placed on a flat surface.

3

Cut a jaggy, zig-zag line down the middle of the white rectangular paper. Make sure to keep both halves, these will be the teeth.



4

Using the light blue piece of paper, cut out two matching sized fins and a larger tail. To do this draw out a tail or fin shape on the paper and once you have cut them out, make small snips on the round edges.



Sharp scissors are required to cut through card. Please always supervise children around scissors.

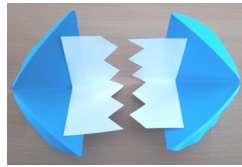
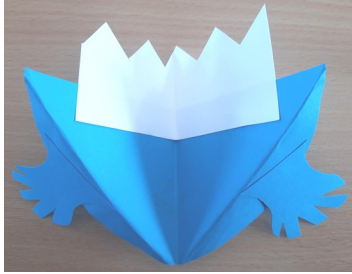


CRAFT

ANGLERFISH POP-OUT CARD

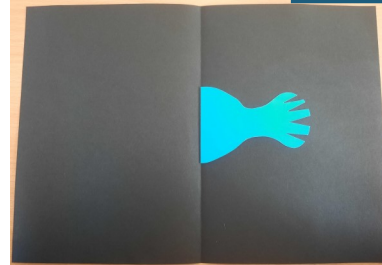
5

Glue the teeth onto each semi-circle. Then choose one semi-circle and glue the fins to either side, just under the teeth.



6

Fold the dark A4 piece of cardboard in half. Glue the tail down next to the fold in the middle of the cardboard.



7



Now glue the semi-circle with the fins to the cardboard, just above the tail. Glue one flap on either side of the fold. This will let the jaw pop up when the card is opened and lie flat when it is closed.

8

Now repeat these steps with the lower jaw, below the upper jaw.



9

Use the pipe cleaner and pom pom to make a lure and attach this to the head (use paper if you do not have these items).

Finally, use a pen or pencil to draw on some eyes.



10

Write on a message and give the card to someone you know who likes weird and wonderful creatures!





WORDSEARCH

ANSWERS

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

DISCOVER

GLOSSARY

ADAPTATION

A natural process by which an animal or plant becomes fitted to its surroundings.

BIODIVERSITY

The variety of species or environments on the planet. The more variety, the healthier the planet.

BIOLUMINESCENCE

The light produced by a chemical reaction within a living organism.

CLIMATE CHANGE

Change in temperature and weather across the Earth that can be natural or caused by human activity.

CRUSTACEAN

An animal from the group that includes crabs, lobsters and shrimps which usually has a h

COMPRESSION

A force that pushes something together, making it smaller .

ECOSYSTEM

A community of animals, plants, micro-organisms, non-living things and their shared environment.

GLACIER

A thick mass of ice that covers a large area of land .

JUVENILE

A young animal that is not yet fully grown.

METABOLISM

The chemical reactions in the body's cells that change food into energy.

PHOTOSYNTHESIS

The process in which plants use sunlight, water and carbon dioxide to make their own food.

PLANKTON

Tiny organisms that drift in the sea, carried along by tides and currents. An important food source for larger species.

PREY

An animal which is hunted by another animal for food.

SESSILE

Largely unable to move due to being attached to a surface.

STREAMLINED

Having a shape that allows quick or efficient movement through air or water.

SUBMERSIBLE

A small underwater craft used for deep sea research.