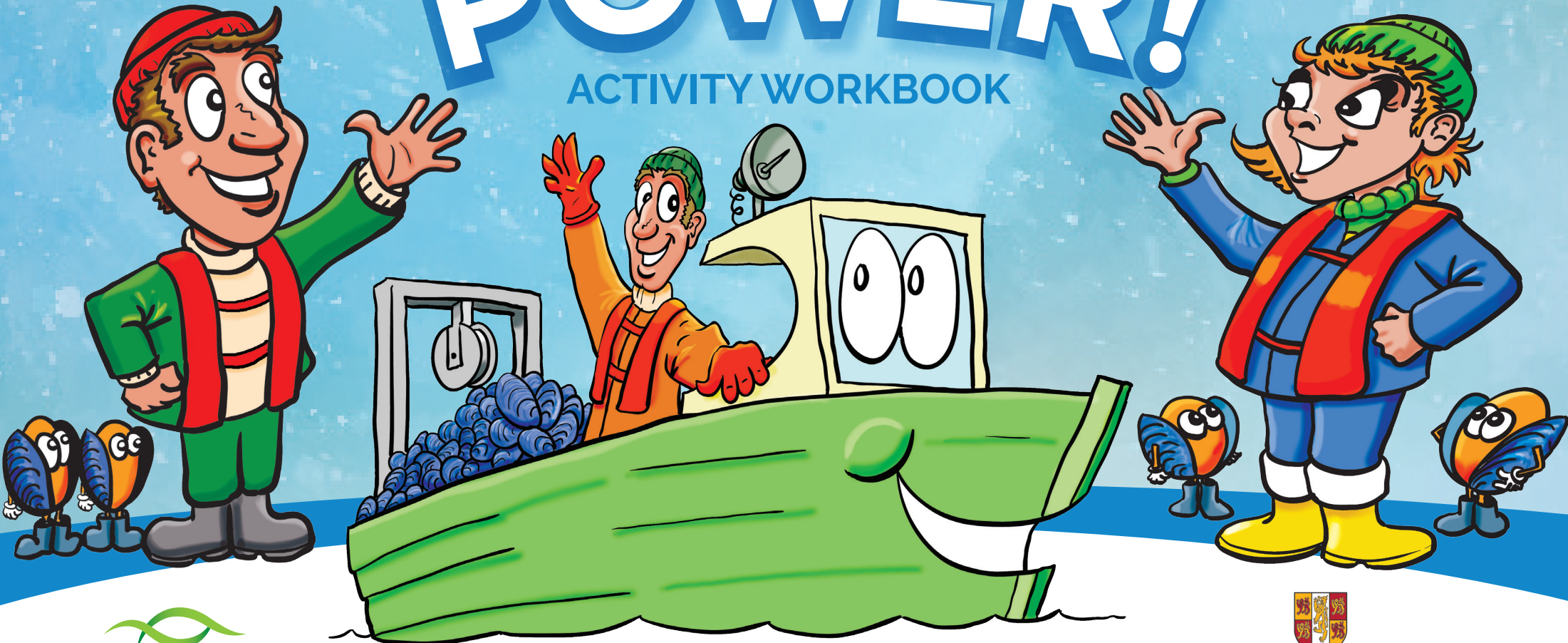


MUSSEL POWER!

ACTIVITY WORKBOOK



IRISH SEA PORTAL PILOT PROJECT FUNDING AGENCY AND PARTNERS



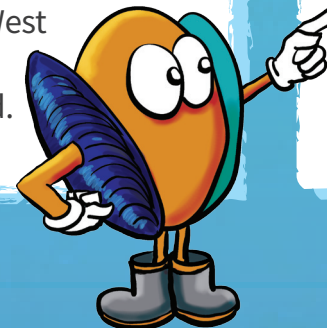
The Irish Sea Portal Pilot Project gratefully acknowledges funding received from various agencies on both sides of the Irish Sea.



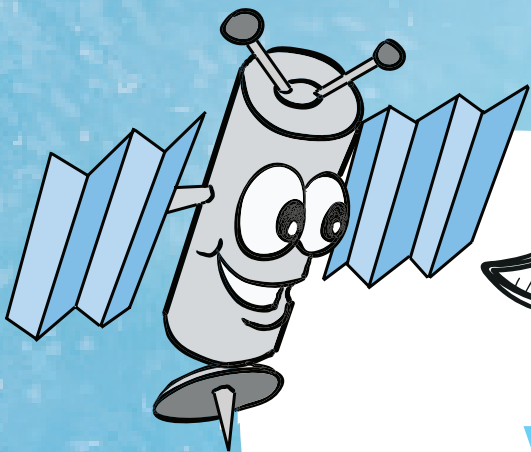
This project is active within the Irish counties of Carlow, Cork, Dublin, Kerry, Kildare, Kilkenny, Meath, Tipperary, Waterford, Wexford and Wicklow and is supported by the Southern Regional Assembly.



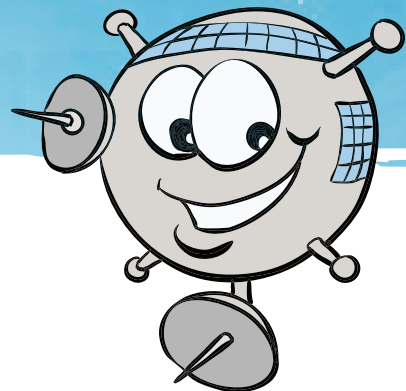
Part-funding is gratefully received from the Ireland Wales Programme 2014-2020. This European Territorial Co-operation (ETC) programme connects organisations, businesses and communities on the West coast of Wales with the South-East coast of Ireland.



The project is active within the Welsh counties of Carmarthenshire, Ceredigion, Conwy, Denbighshire, Flintshire, Gwynedd, Isle of Anglesey, Pembrokeshire, Swansea, Wrexham and is supported by the Welsh European Funding Office.



BIM and Bangor University have set up an exciting project called the Irish Sea Portal Pilot that will bring information to fishermen working at sea in the benthic mussel industry.



WE LIVE IN AN AGE OF INFORMATION!

Benthic mussels are shellfish that grow on the seabed before being collected for seafood.

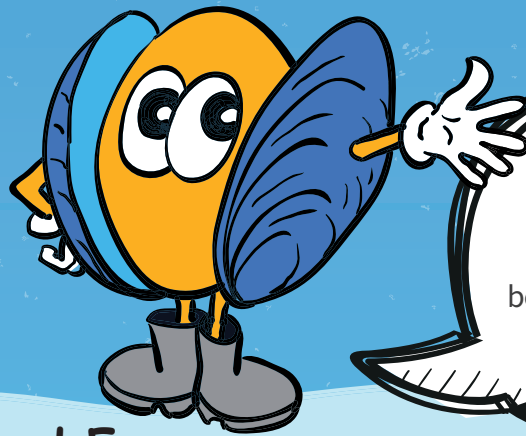


This project is to help people who grow benthic mussels in both Ireland and Wales to improve the way they do business using technology.

This book is to tell a whole range of different people the story of mussels in the Irish Sea and to have fun!



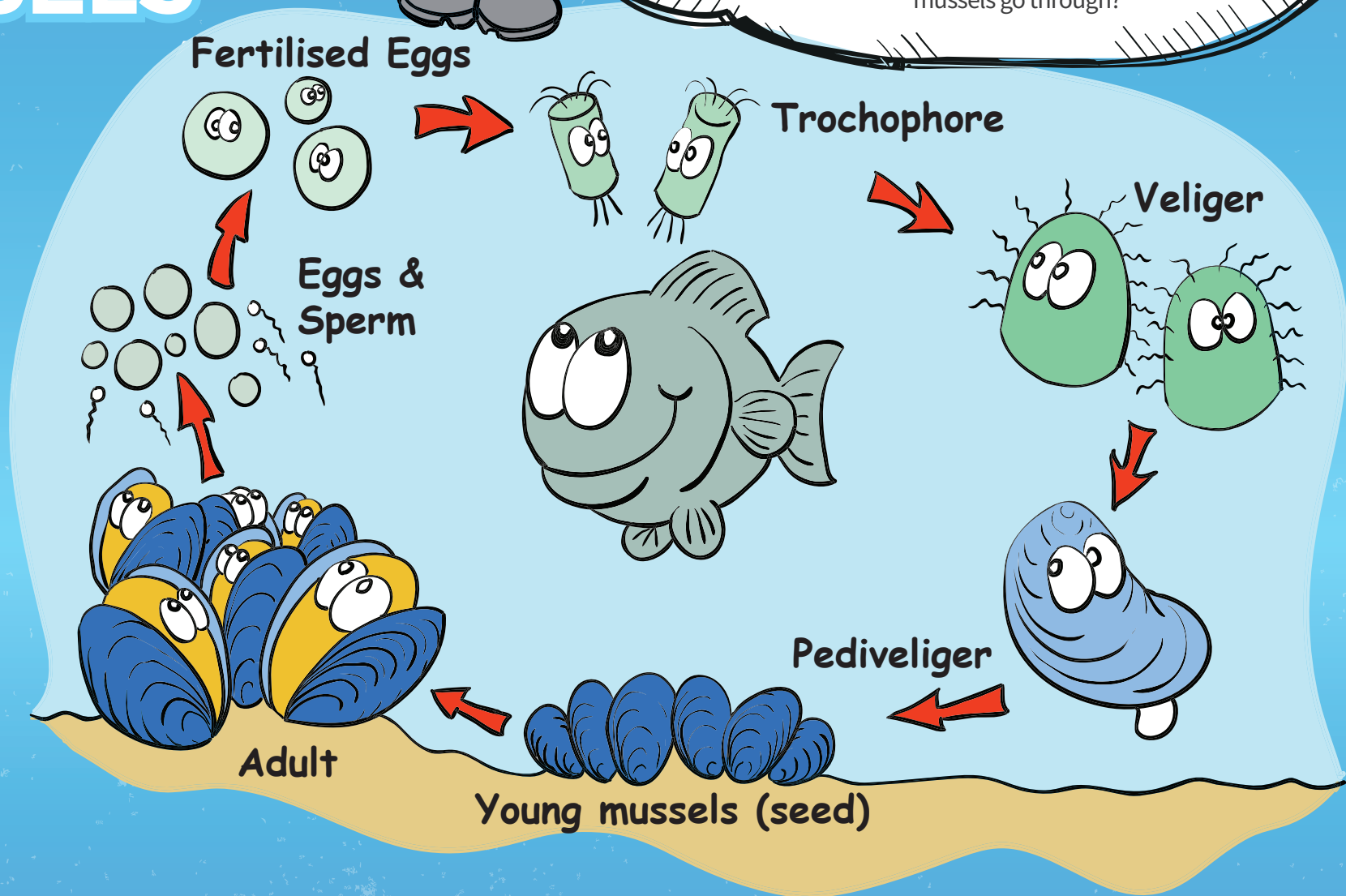
THE SECRET LIFE OF MUSSELS



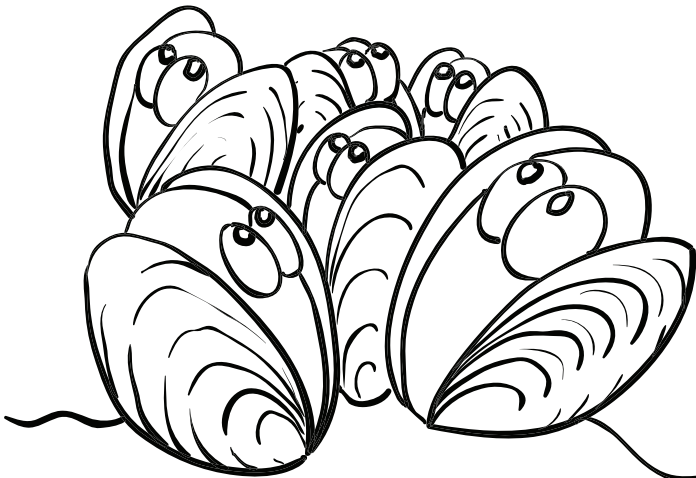
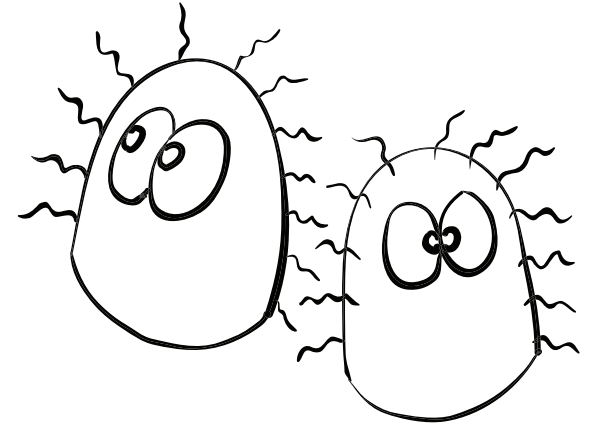
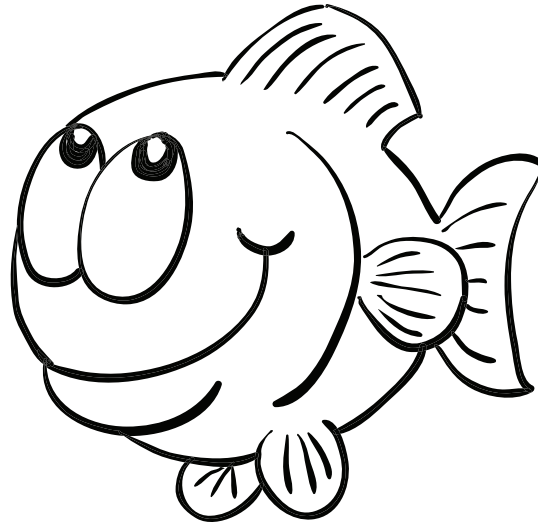
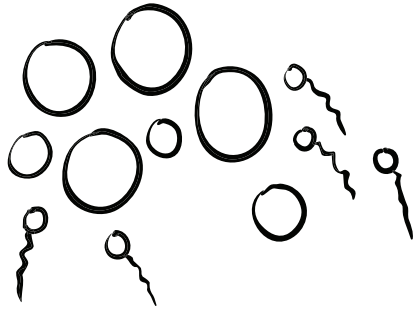
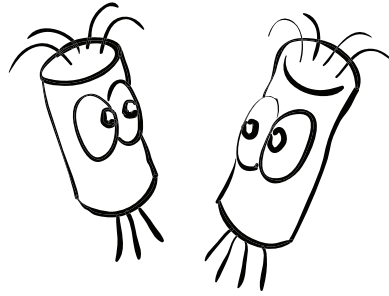
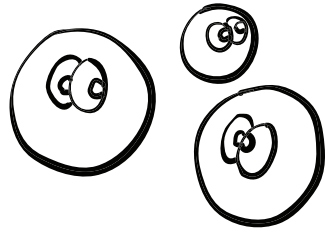
Mussels belong to a group of animals called bivalves. This means they have two (bi) shells (valves). Many bivalves have a life cycle like the one in the picture.

Mussels go through several growth stages and vary between swimming in the water and living on the seabed.

Can you memorise the different stages mussels go through?



Fill in the arrows and add the name of the stages.



HOW IT WORKS

The benthic mussel industry works in several steps.

First, mussel fishermen collect small mussels, called seed (IE síol, WA hadau) from the wild.

Fishermen and scientists know where the seed is from previous years and specific surveys.

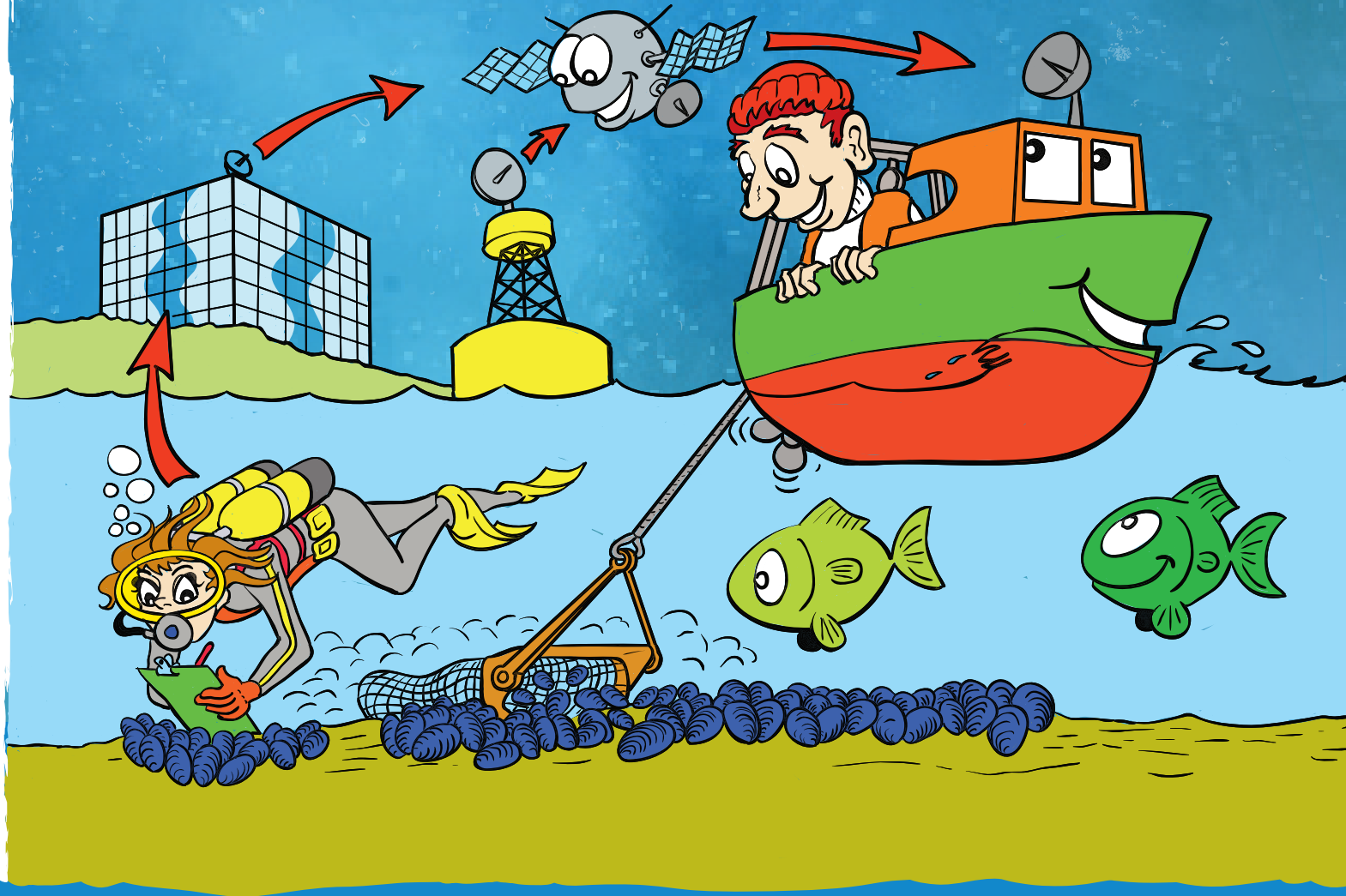
They take the seed and move it to sheltered places, like Wexford harbour in Ireland or the Menai Strait in Wales, where it grows big enough to eat and sell.

Mussels are healthy, sustainable and tasty seafood and are worth a lot of money.

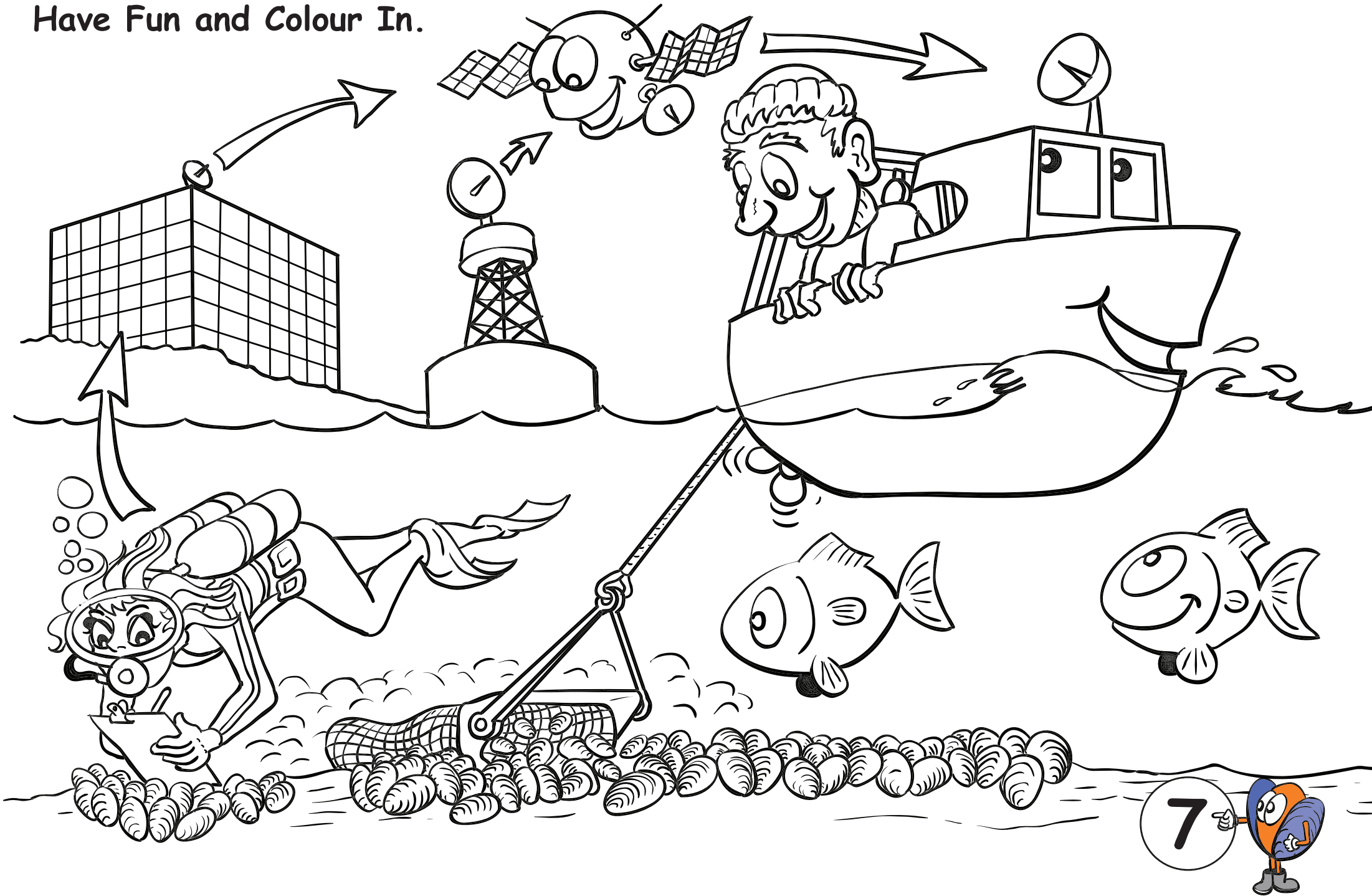
In Ireland and Wales, over €12 million or £10 million of mussels are sold every year.

Benthic mussel fishermen harvest nearly 15,000 tonnes of mussels every year in Ireland and Wales; that's the same weight as nearly 1,200 double decker buses.

BENTHIC MUSSEL INDUSTRY



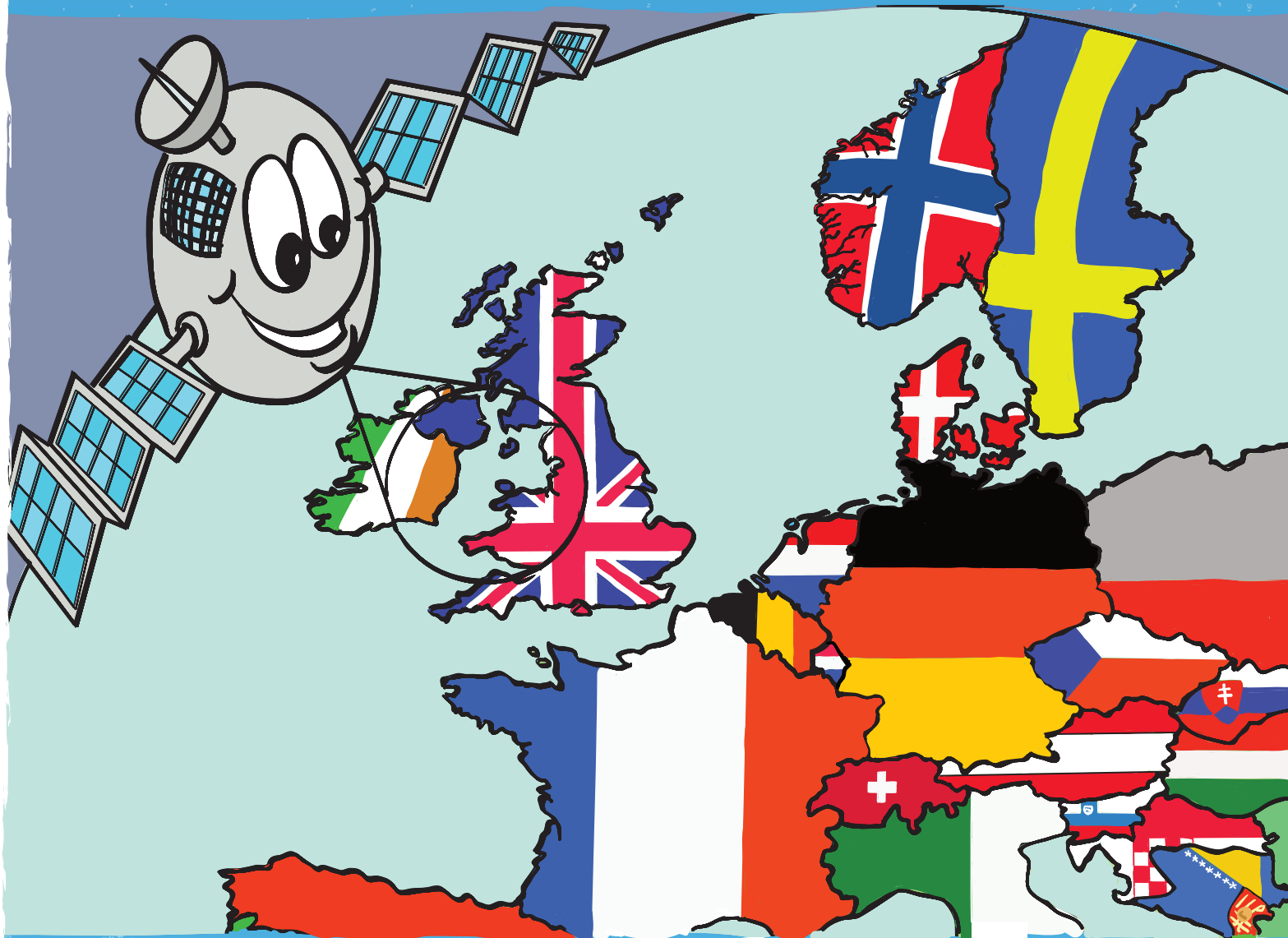
Have Fun and Colour In.



THE PROJECT AREA

Ireland and Wales share a very important border! Can you guess what it is?

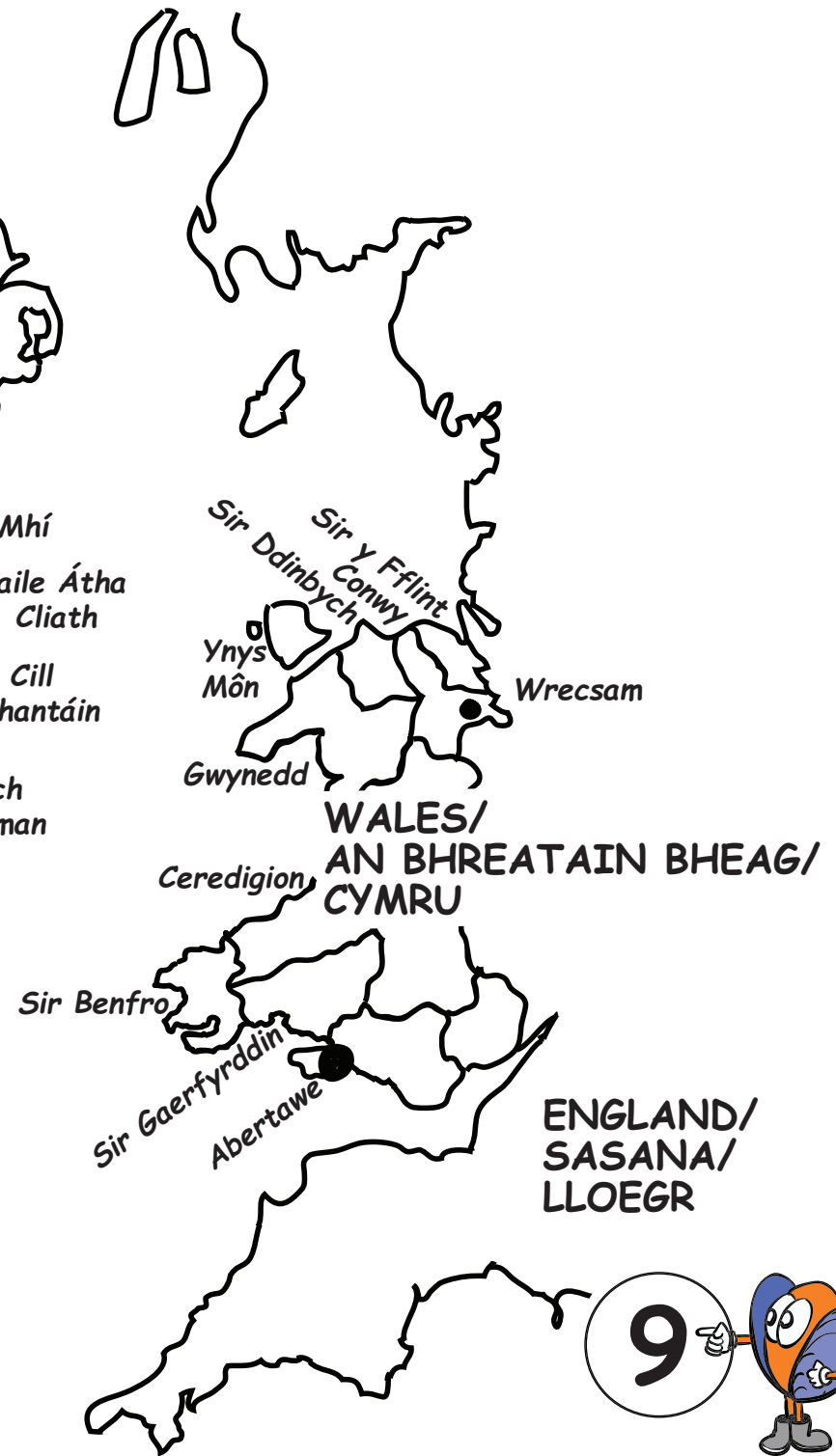
It's the Irish Sea! The Irish Sea, or Muir Éireann in Irish or Môr Iwerddon in Welsh, may look small on this map but it's filled with almost 1 billion Olympic swimming pools of water! That's an awful lot of water to share!



Can you name the project counties from their Irish and Welsh names?

Colour in each county in different colours.

ATLANTIC/ATLANTACH/ATLANTIG



THE IRISH SEA

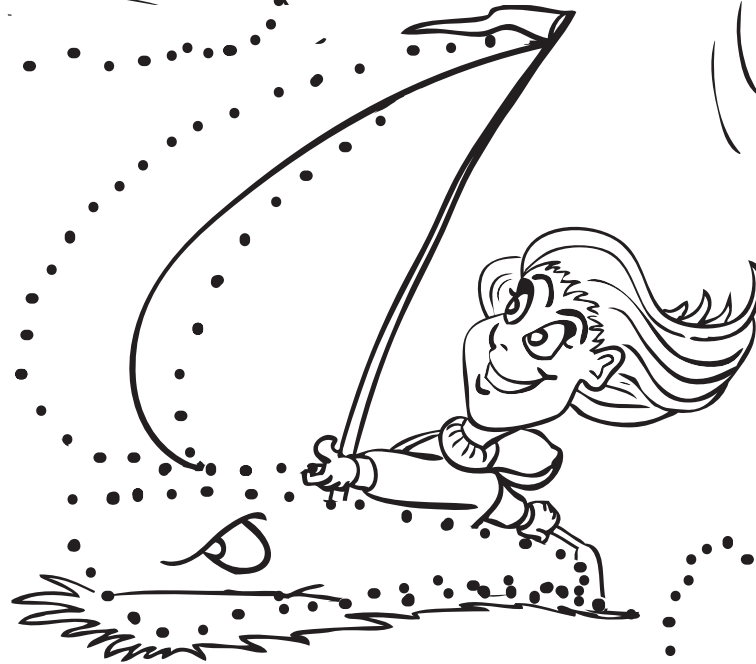
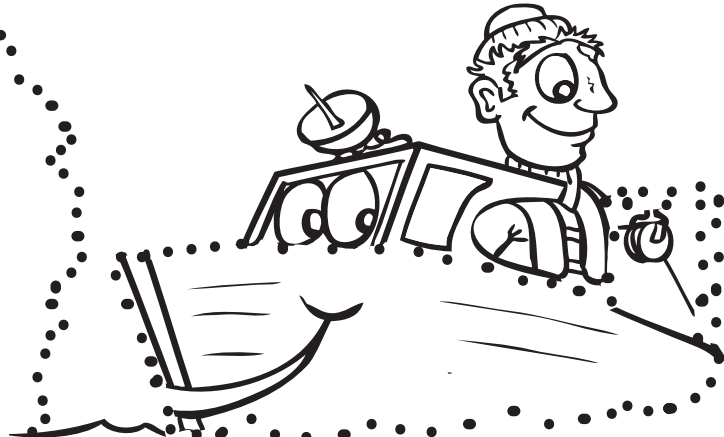
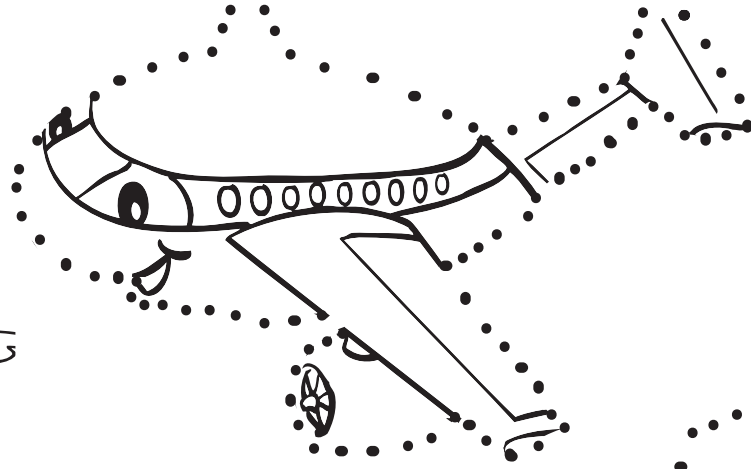
The Irish Sea is really important to many people in both Ireland and Wales.

We use it for fishing, transport of goods and people, recreation, industry, generating energy and sharing information and power using undersea cables.

As we share the Irish Sea for a whole range of different uses, it's important we look after it to make sure it stays in good condition for everyone to use.



Join the Dots.



TIDES AND WAVES

Tides are caused by the moon and sun and create a rise and fall of the sea level on our coasts.

Did you know that some tides are bigger and some are smaller than others? These are called spring and neap tides which are important to mussel fishermen.

Waves are also very important. They are mostly created by wind from the Atlantic and can make being out at sea very rough.

If it's very rough would you like to be on a boat? Mussel fishermen need to know how big the waves will be to make sure it is safe to go out fishing.

Currents are different to waves and tides. They are created by wind, flow from rivers and large scale processes like the Gulf Stream and even the spin of the earth. Currents are important as they control where seed will settle and where food for mussels will be.



IRISH SEA PORTAL PILOT MATCH-UP

Can you match all the Irish and Welsh words to the English version?

A. Taoide _____

B. Eolaí _____

C. Iascaire _____

D. Diúilicín _____

E. Farraiige _____

F. Eire _____

G. Tonn _____

H. Bád _____

I. An Bhreatain Bheag _____

J. Trá _____

1. _____ Tide

2. _____ Wave

3. _____ Mussel

4. _____ Sea

5. _____ Beach

6. _____ Wales

7. _____ Boat

8. _____ Fisherman

9. _____ Scientist

10. _____ Ireland

A. Llanw _____

B. Gwyddonydd _____

C. Pysgotwr _____

D. Cragen las _____

E. Môr _____

F. Iwerddon _____

G. Ton _____

H. Cwch _____

I. Cymru _____

J. Traeth _____

SEABED

It is important to know how deep the water is and what the seabed beneath it is like.

In the old days mariners used lead lines to find out how deep the ocean was.

Nowadays, modern technology, such as sonar, has made figuring out how deep the water is much easier.

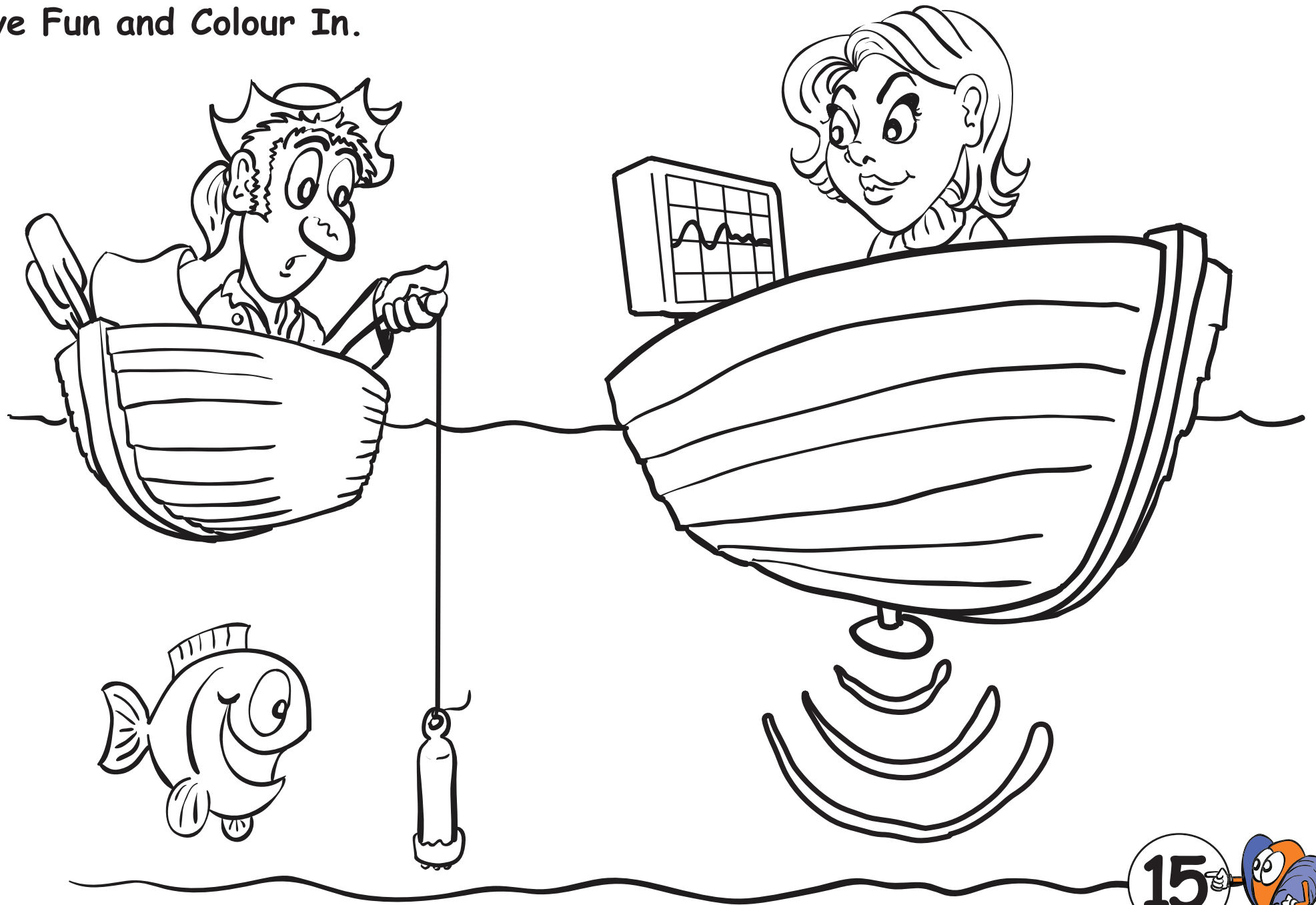
Sonar works by bouncing sound off the seabed and listening for the echo.

Can you think of an animal that uses sonar?

What we hear tells us important things such as how rocky or sandy the seabed is and how deep the water is.



Have Fun and Colour In.



NEIGHBOURS AT SEA

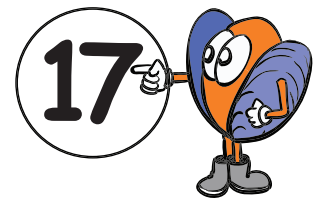
Ireland and Wales are neighbours and have a lot of things in common. They share culture, sports, trade and transport. Sharing in so many different ways means it is important to work together, communicate and exchange information.

The Irish Sea Portal is a type of website that is a useful tool for sharing knowledge. The portal can help a whole range of people communicate about mussel farming using technology like mobile phones, computers and the internet.

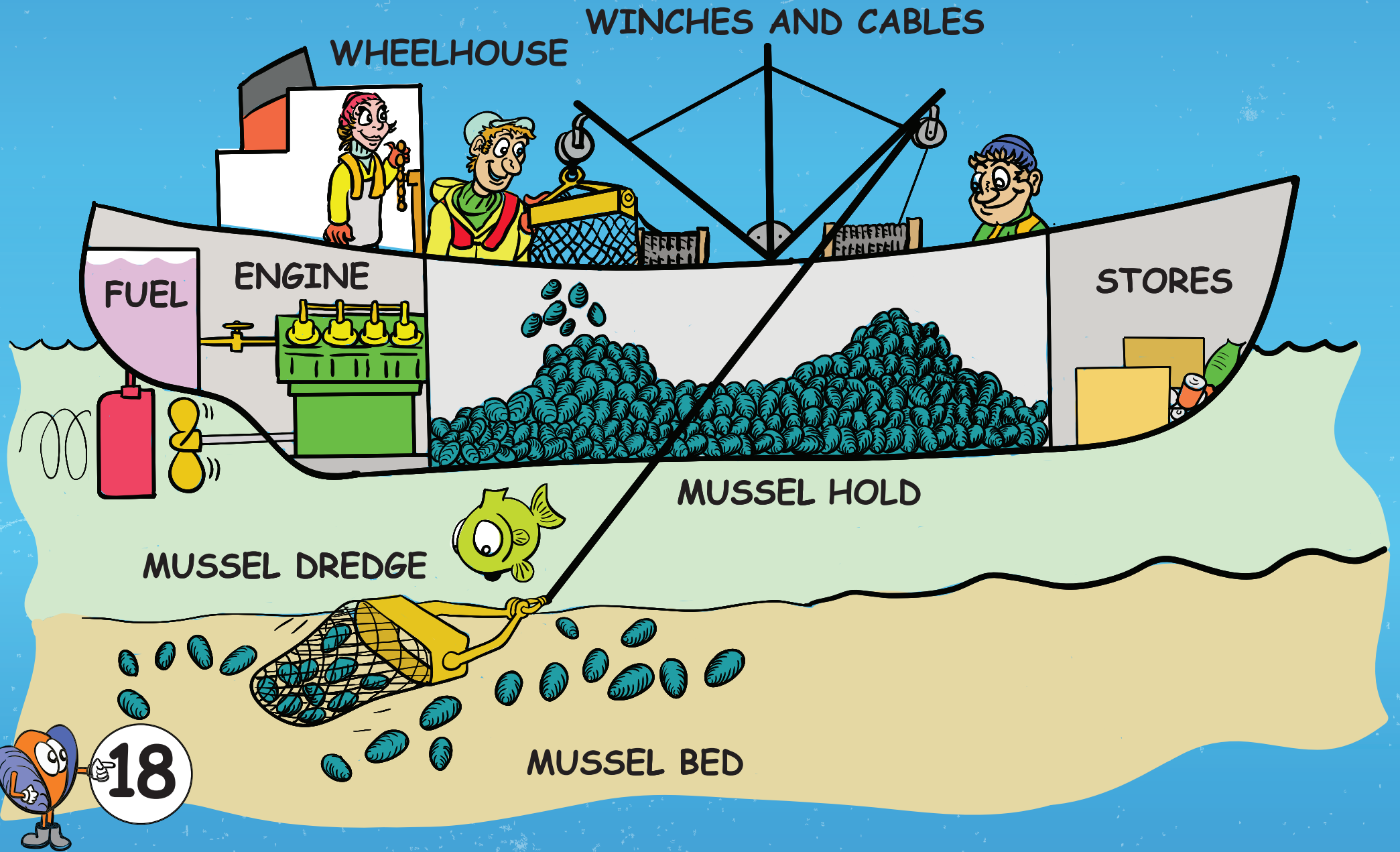
The portal can help us solve problems and share information, allowing us to find clever ways to work better with each other.



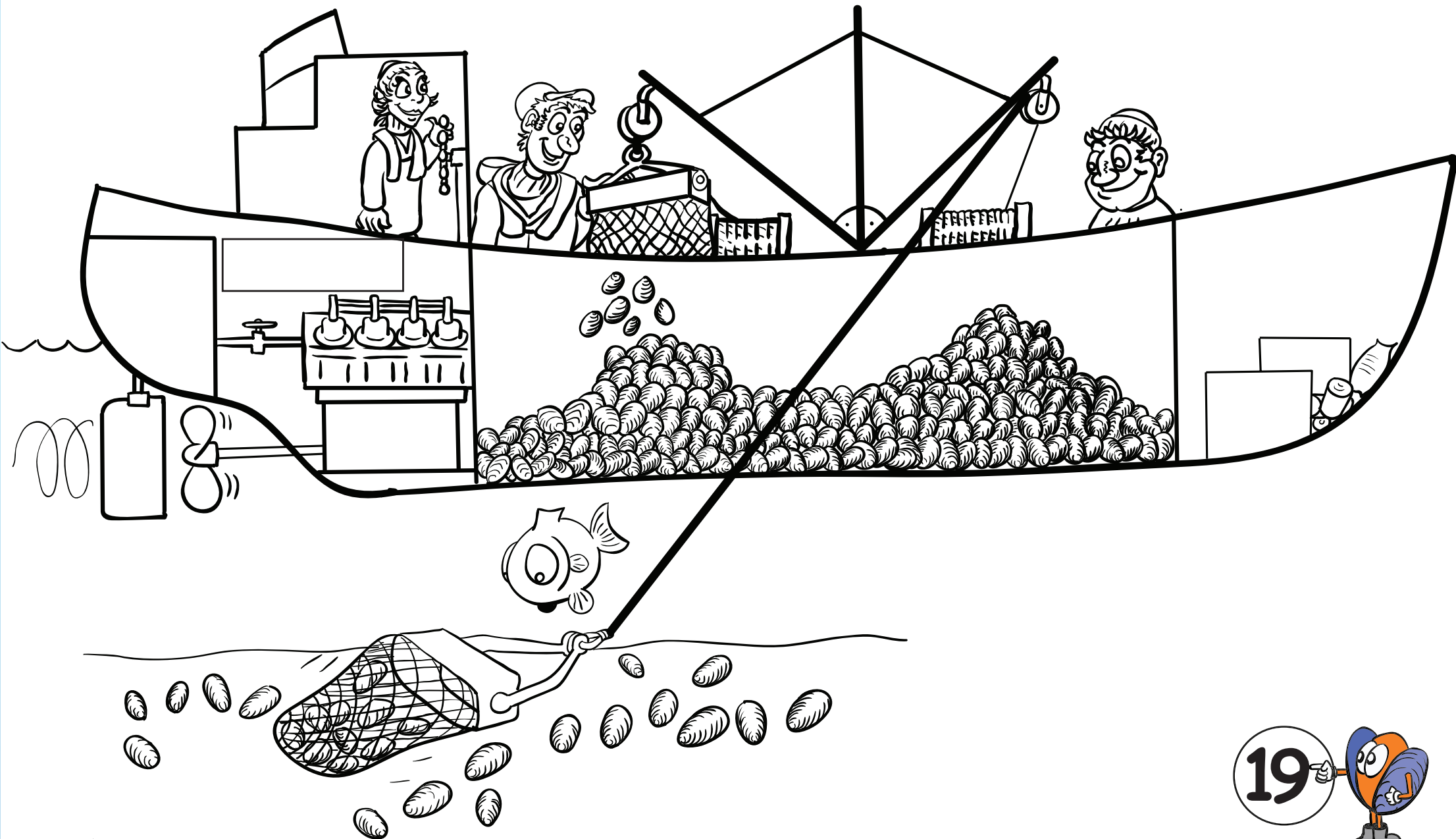
Draw your own example of
people working together.



A MUSSEL DREDGER



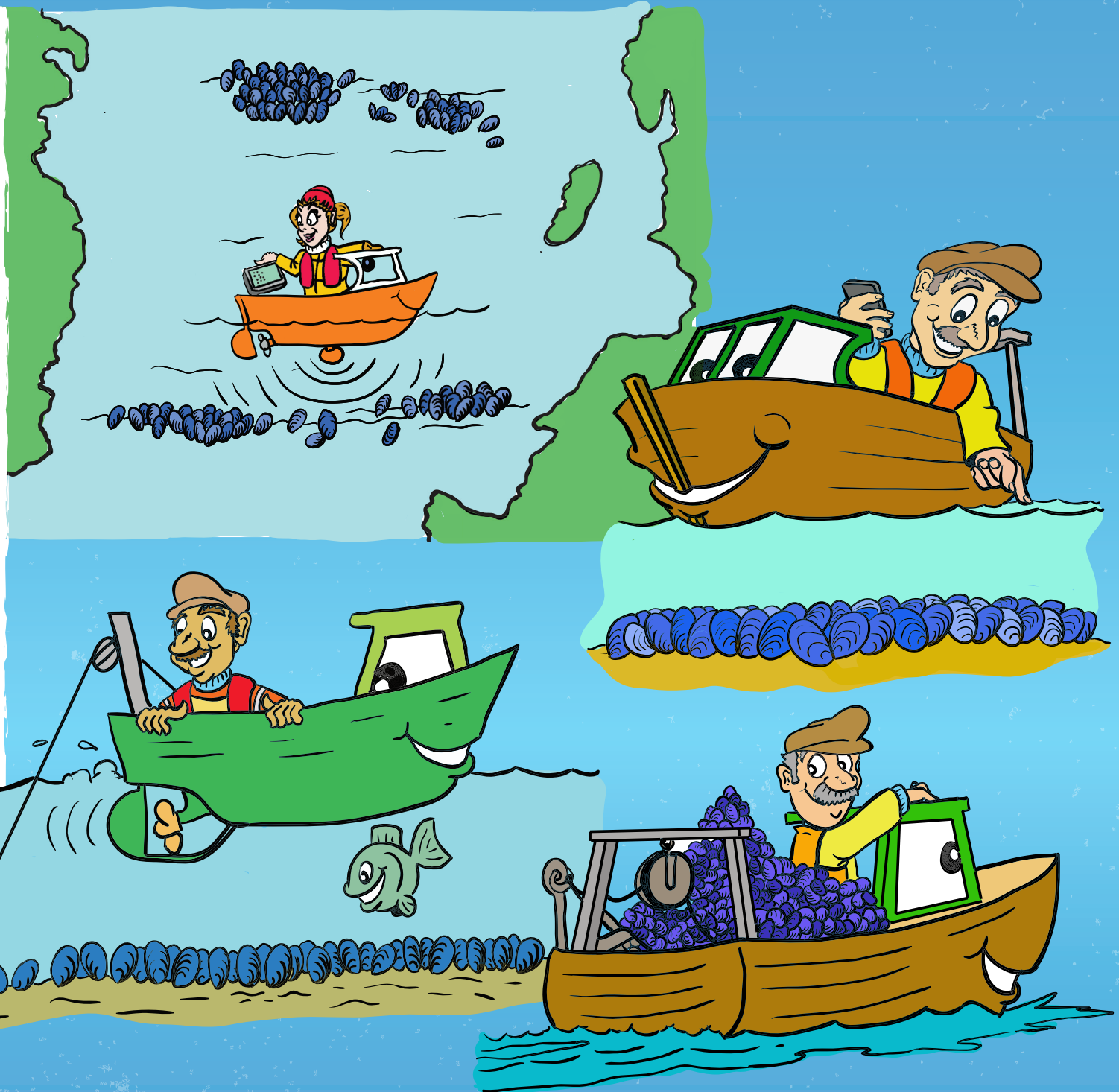
Design your own Mussel Dredger.



FISHING FOR SEED

So now that we know what the seabed is made of, what the weather forecast is and what the tide will be, we need to know where mussel seed is going to be.

Using information from previous years and special techniques, scientists look for seed in the early Summer. Using the portal, the fishermen will be able to use the information from scientists to collect seed and transport it to their on-growing area. Having a special web portal for growers to use means they can get all the information they need in one place! How handy is that?



ISPP WORDSEARCH

Have fun trying to find these key words in English, Irish and Welsh

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

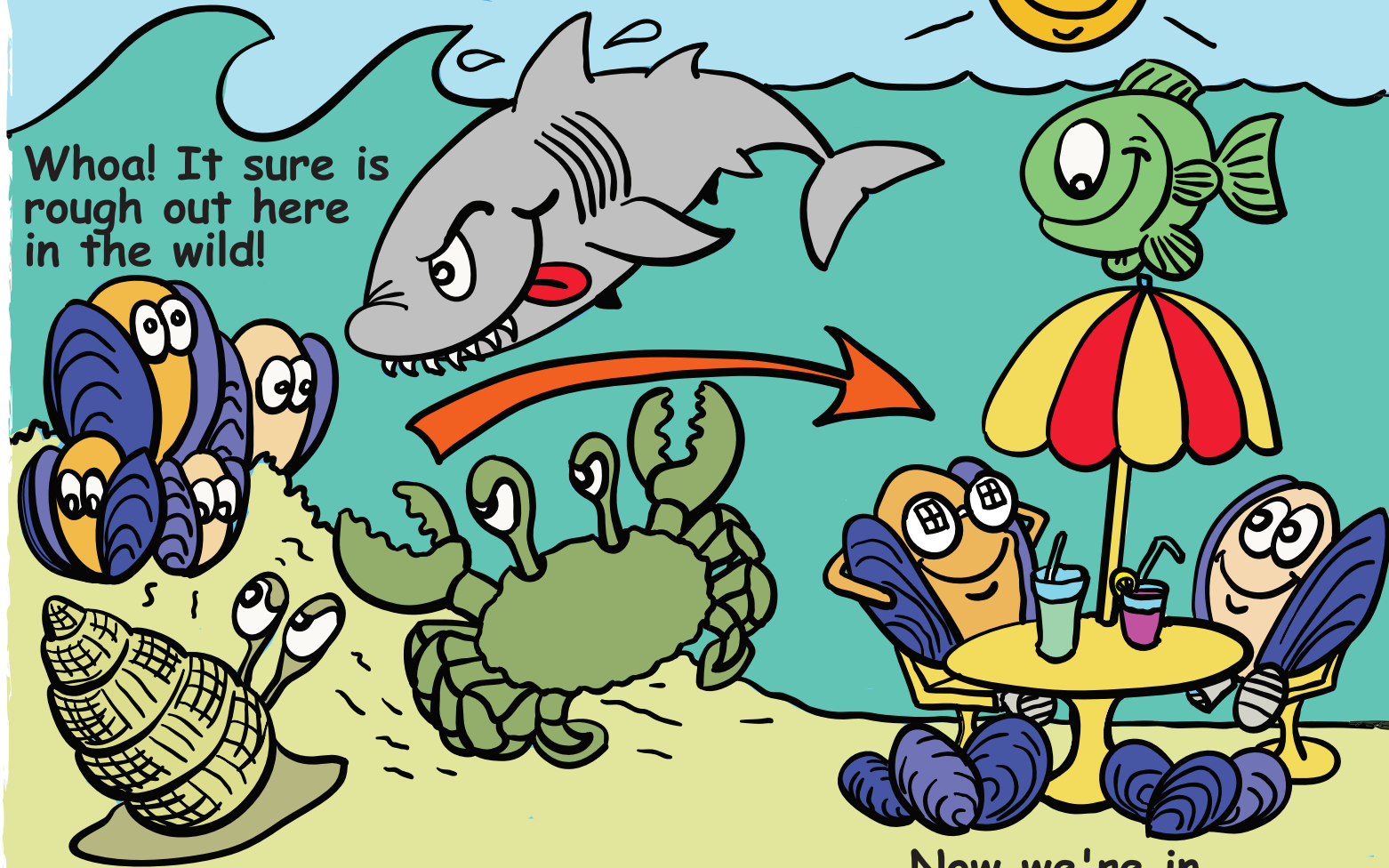
MUSSEL, SEABED, WALES, MOR, SATELLITE, PÓRTAN, PORTAL, FISHERMAN, CYMRU, CWCH, STARFISH, INFORMATION, EIRE, VESSEL, EOLAÍ, CRAB.

WHY MOVE SEED?

During the summer, the fishermen collect the seed from the mussel beds and move them to sheltered bays, this is called transplanting.

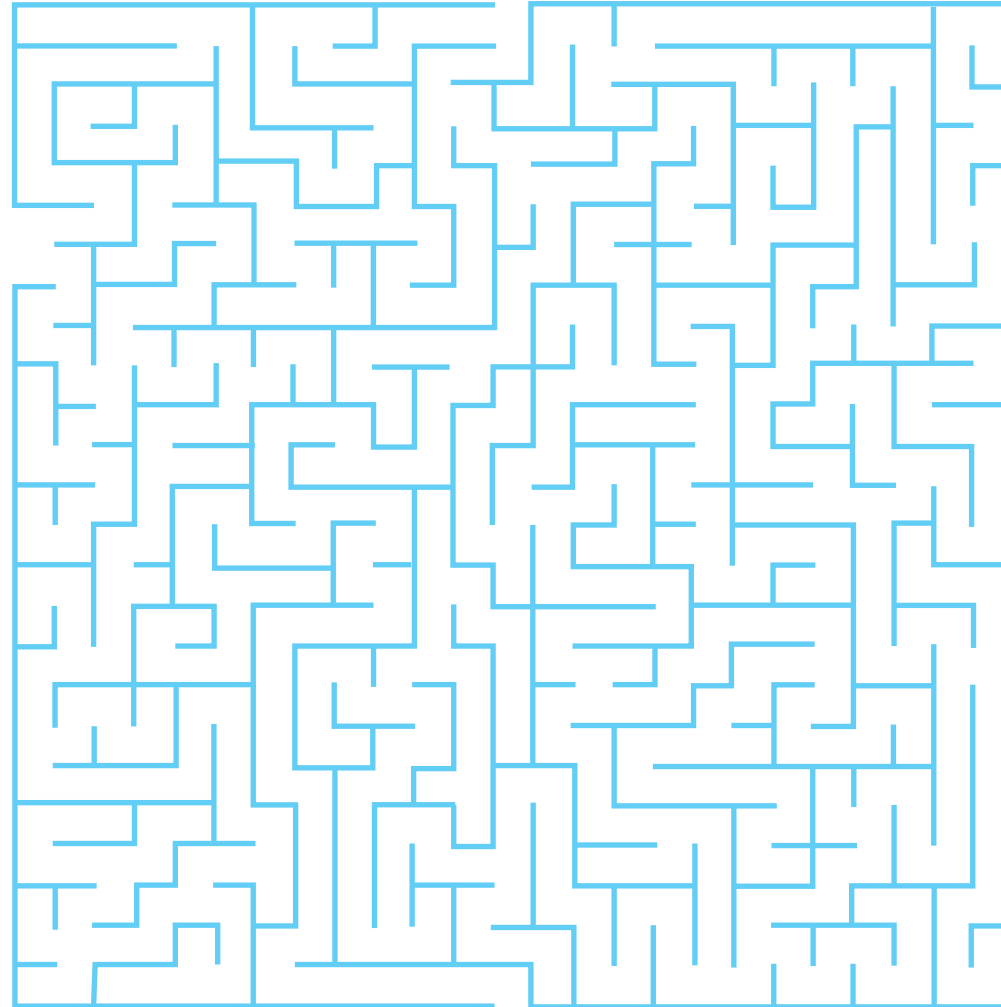
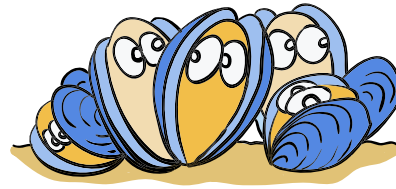
The juvenile mussels, called seed, are moved because out in the wild they are vulnerable to predators and rough stormy weather, especially over the winter. Most juveniles don't hang around over the winter so moving them ensures they stay around to grow large enough to sell.

Whoa! It sure is rough out here in the wild!



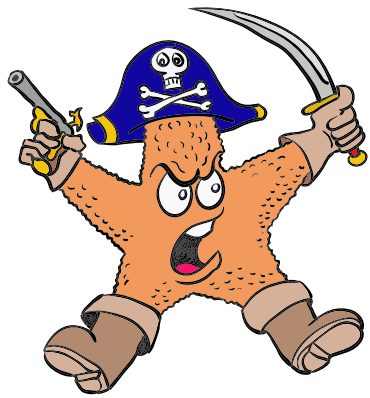
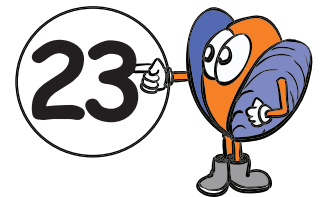
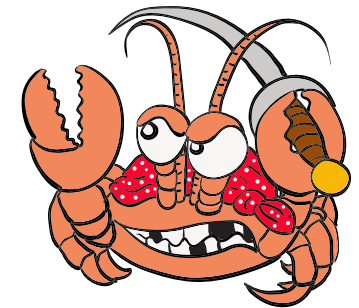
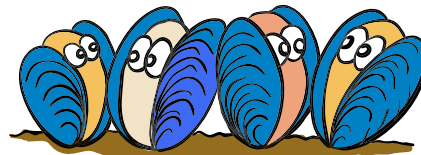
Now we're in a sheltered bay life is a breeze!

Mussel Seed



Guide your boat through the maze to the mussel beds

Mussel Bed

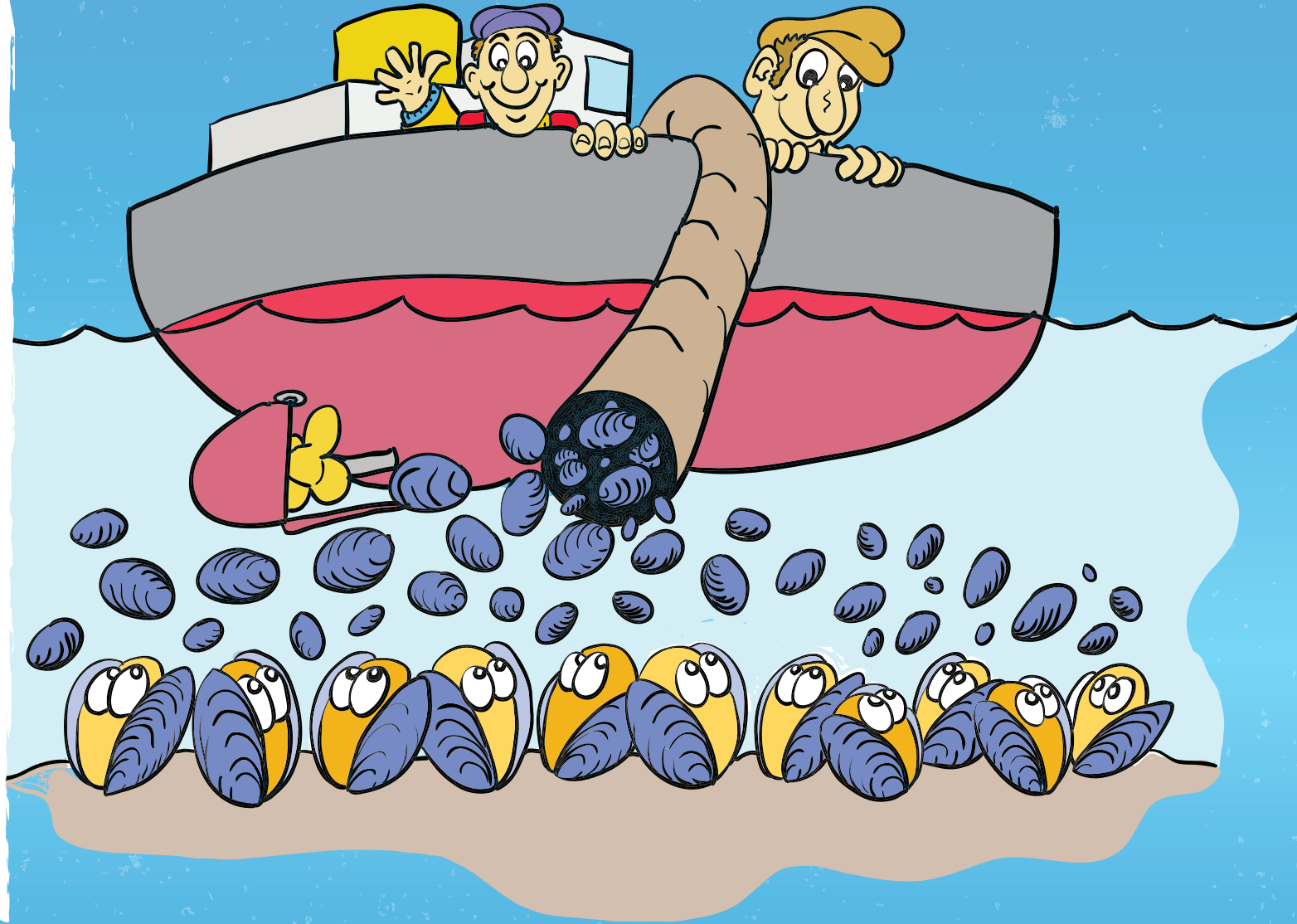


Guide your boat through the maze to the mussel beds

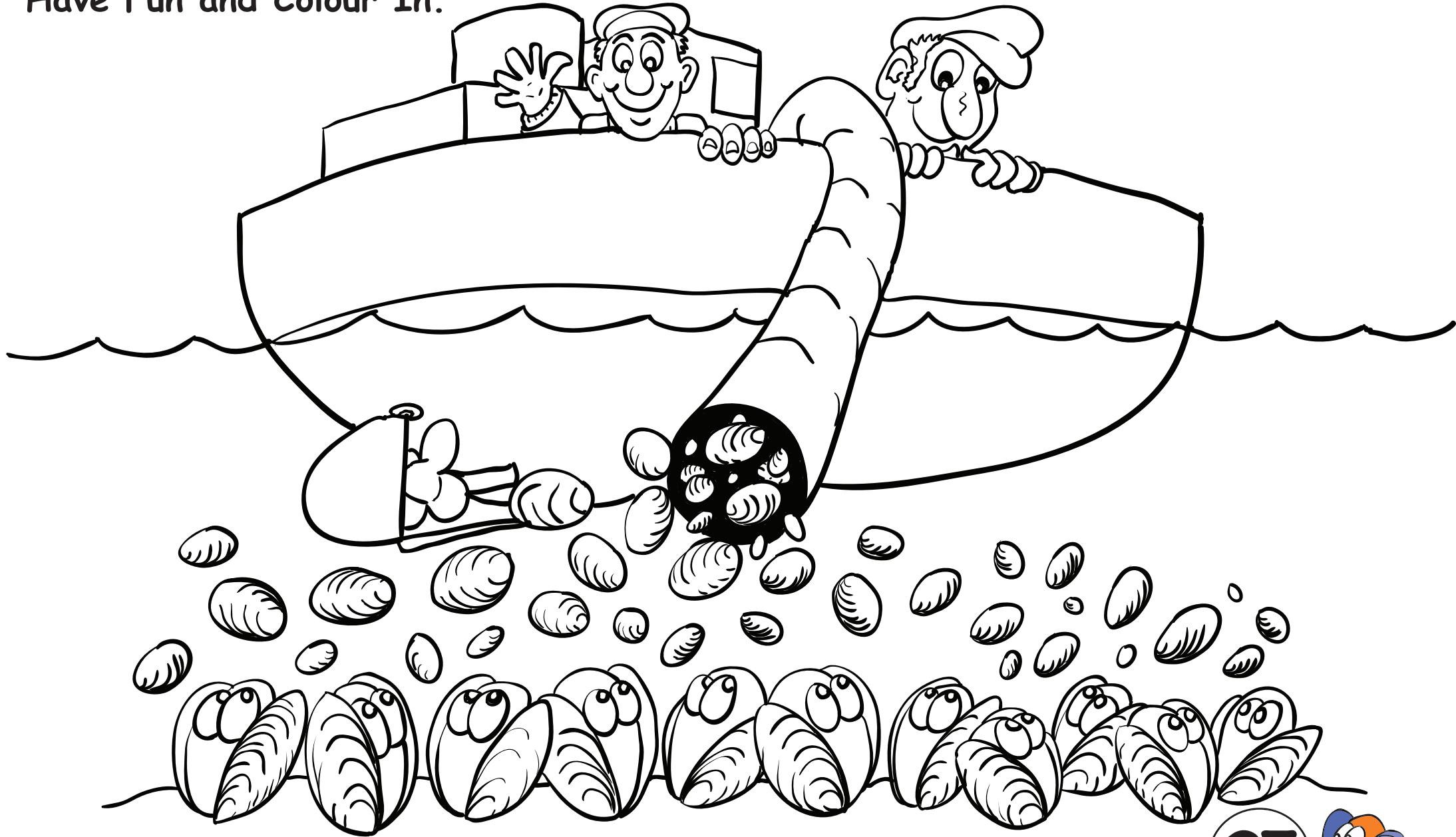
RELAYING SEED

After the seed is collected, fishermen pump it out onto a safe sheltered on-growing ground. This means the mussel seed will be safe and have plenty of space and food to grow.

Here, the mussels grow for the next year or two until they are big enough to eat and for the shops and restaurants to sell.



Have Fun and Colour In.



THE PORTAL

Technology is useful to mussel fishermen in a number of ways.

1. Firstly, what will the weather be like? Will it be safe to go to sea?
2. What will the tides, waves and currents will be like? Can the fisherman get to where they want to?
3. They need to know where the seed is likely to be.
4. It allows them to stay in touch with scientists, markets and other fishermen.
5. What is the seabed like where I am? Will it be good for growing mussels?
6. What price do mussels sell for?



HOW MANY WEBSITES DO YOU NEED TO ACCESS TO FIND THE FOLLOWING INFORMATION?

Have a go at finding the following:

- 1 Can you find what the weather will be like tomorrow where you are?
- 2 What time will the tide be at its highest point tomorrow?
- 3 Can you find the nearest mussel seed to you on a map?

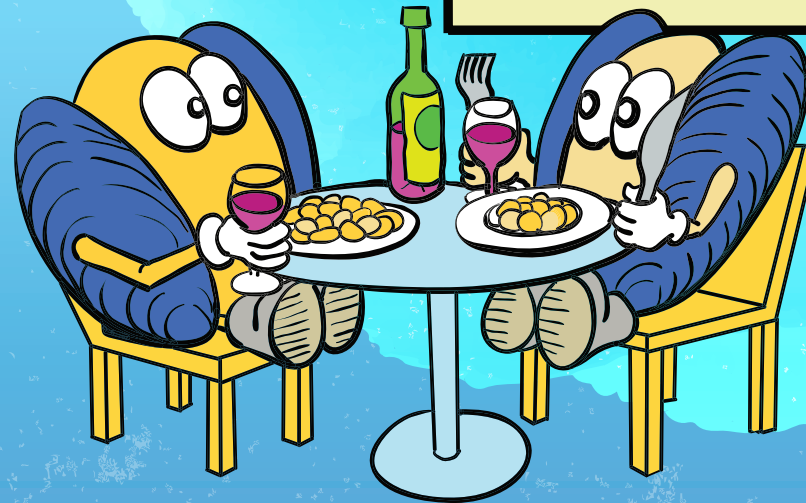
Would this task be easier if the information you wanted was all in one place?

MUSSELS FOR SALE

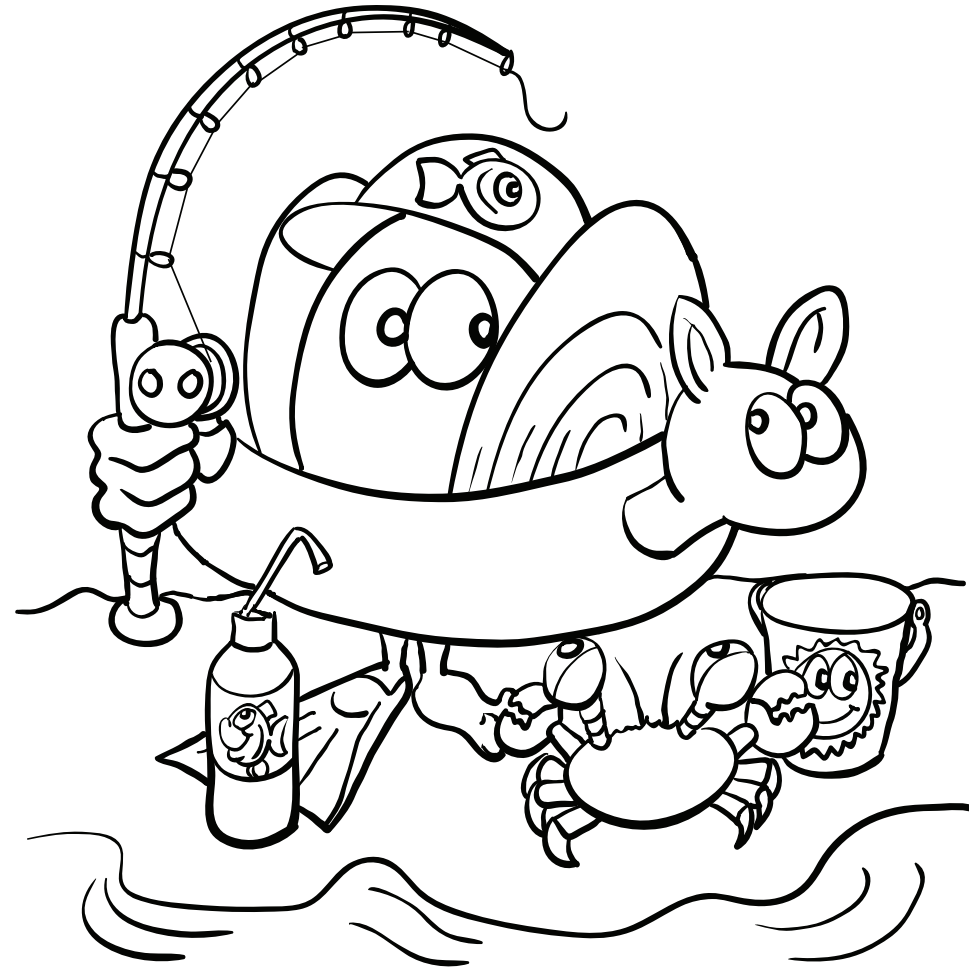
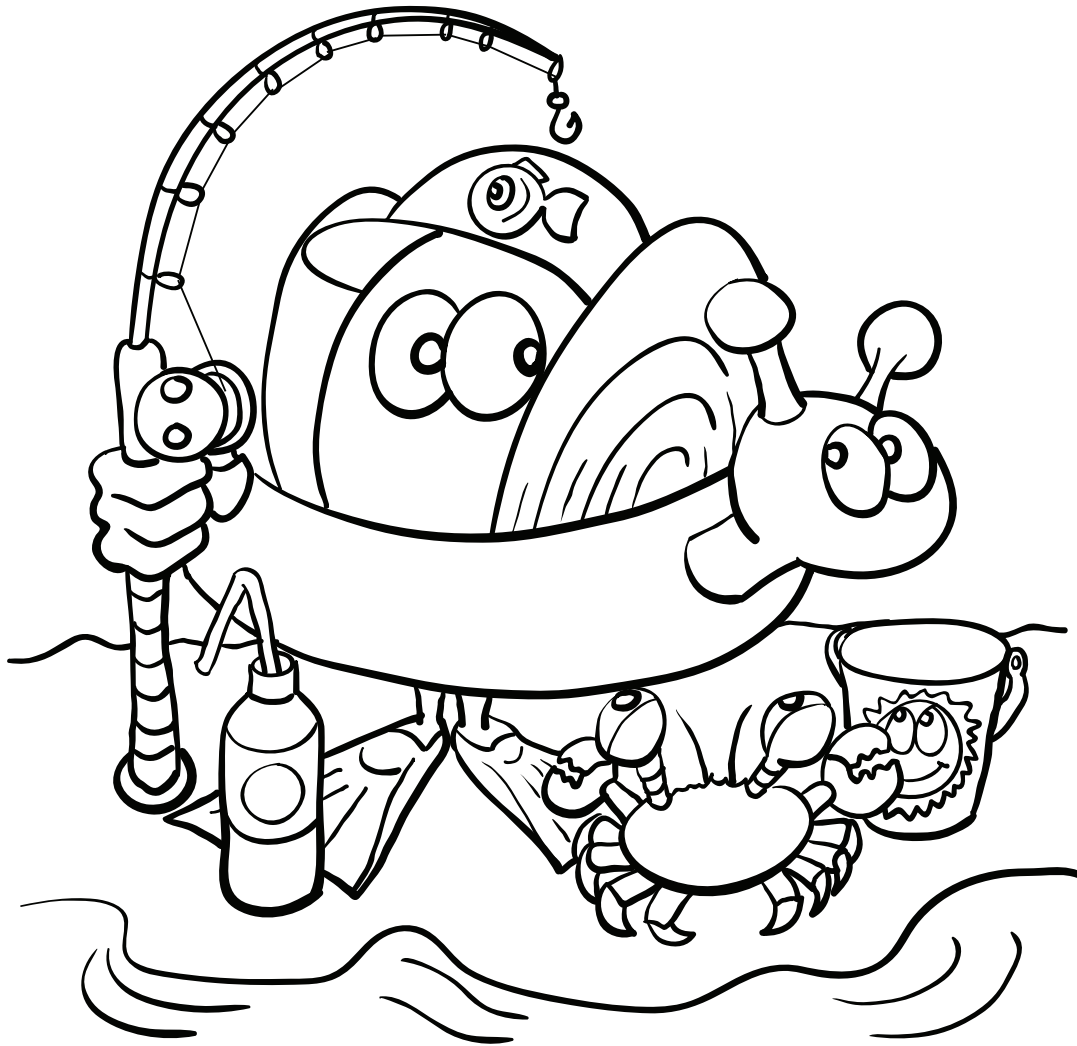
After the mussels have grown to market size they are harvested for sale. Harvest can take several forms but in the Conwy estuary in Wales fishermen are still using the same technique for 200 years.

This is called hand raking and is a low impact way of collecting mussels by hand.

Did you know that mussels are a great source of protein, minerals and vitamin B12? They are much leaner in fat than red meats and are tasty.



Spot the 10 differences.



MUSSEL RECIPE

This is a yummy recipe you can make at home with the help of an adult. Mussels are very tasty, packed with nutrients and easy to cook. It's also fun to eat out of a shell!

Ingredients

You will need...

1kg mussels

A knob of butter

One onion diced (optional)

One clove of garlic chopped (optional)

Small glass of apple juice or vegetable stock

The first thing you will need to do is clean the mussels! Here's how...

1. Look at each of the mussels. If any of them are broken or have a cracked shell, throw them away. If you find one open, tap it on the shell. If it doesn't close within a minute or so, throw it away. If you've bought mussels that are prepackaged and de-bearded you can skip steps 2 and 3.
2. Use a stiff brush to scrub each mussel on both sides under cold running water.
3. After scrubbing each mussel, use a paper towel to hold the beard, and gently pull it to remove it. If you pull out part of the mussel along with the beard throw it away.

4. Once you have scrubbed and removed the beards, give them a final quick rinse.

That's it! Now on to the cooking...

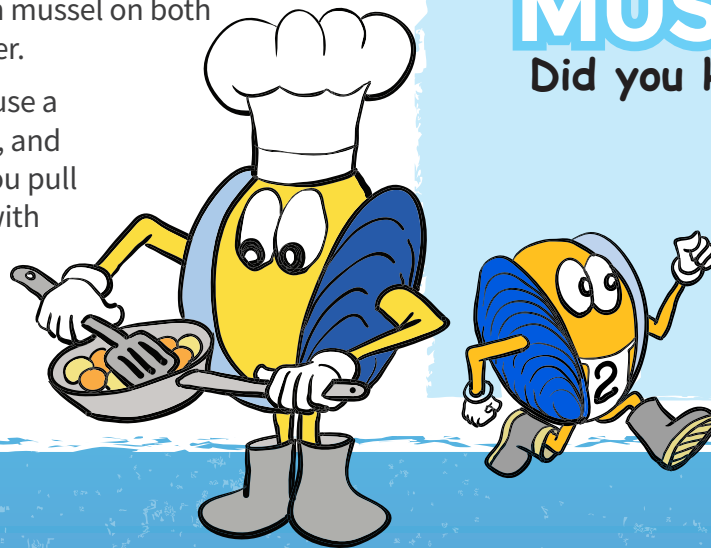
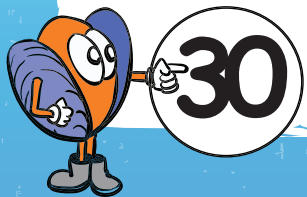
5. Heat the butter in a large pan. Add the onion and garlic and cook gently for two minutes. If you are not using onion and garlic, you can skip this step.
6. Add the apple juice or vegetable stock and the mussels to the pan. Put the lid on top of the pan and shake gently a few times. Cook for about two minutes and shake again. Cook for another three to four minutes, until all the mussels have opened. Throw away any that remain closed.
7. Spoon the mussels into a big bowl and pour over the juices from the pan. Serve with some crusty bread for all to share.



MUSSEL POWER

Did you know that mussels are full of goodness!

- * High in omega 3
- * Rich in minerals
- * Low in fat
- * A good source of protein



CAN YOU ANSWER THE FOLLOWING QUESTIONS?

What is the name of the industry we've been looking at?

- Benthic mussel industry
- Rope grown mussel industry
- Intertidal oyster industry

What two areas does the project cover?

- Wales and Scotland
- France and Spain
- Ireland and Wales

Tides are created by:

- The stars and asteroids
- The Sun and the Moon
- The rotation of the Earth

Name 3 important things mussel fishermen need to know before going to sea

Which of these things would you not find on a mussel dredger?

- Fuel and an engine
- Winches and cables
- Bricks and car parts

How much money do mussels from Ireland and Wales make every year?

- €12 million (£10 million)
- €100 million (£85 million)
- €1 million (£0.85 million)

Why do fishermen move seed from the wild to on-growing areas?

- To keep them safe from predators and storms
- Because it's a lot warmer
- Because the mussels ask to

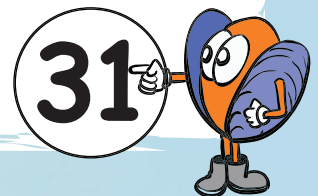
Why is technology important to fishermen?

- It makes their job safer
- It helps them stay in touch with scientists
- It helps them access useful information
- All of the above

Name 3 ways Ireland and Wales share the Irish Sea

Wondering where to find the answers? They're in this book and also on the web portal! See if you can use the web portal to find them and any other cool information!

www.ispp.ie





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