



Education Pack Keystage 1 & Z







Where does if Come from?



Hastings Aquarium is situated on the south coast of England – its beach is washed by the English Channel. The English Channel is one of the busiest shipping lanes in the world. Therefore, like many coastal towns. Hastings will have some pollution washing up on the shores every year. This pollution is not directly dangerous to humans but can kill the local marine and bird life.

So where does this pollution come from? Unfortunately, humans are the biggest polluters of the seas. From an empty sun cream bottle to carelessly discarded drinks cans, these things can be washed into the seas by the rising tide and become a death trap for unsuspecting fish and mammals.

Facts and figures:

- A lot of litter is dropped in our waterways each year with little thought to the result. A plastic drink bottle can stay around for 450 years and a newspaper lasts for up to 1 year
- It can take 25000 years for some radioactive chemicals to lose their activity
- Over 2 billion kilos of industrial water are dumped off the UK shores each year.
- 5 billion kilos of oil enter the sea each year but only 4% of that is from oil tanker accidents the rest is from routine shipping and oil refining operations.
- Fertilisers and chemicals from industry and agriculture are washed into our waterways and end up in our seas. Each year the industry dumps into the north sea:- 10 billion kilos of mercury, 12,000 kilos of cadmium, 1 million 250 thousand kilos of lead, 200,000 kilos of copper.
- Over 1.4 billion litres of sewage are disposed of in our coastal waters every day, but worst of all, nearly all disposable nappies made since the 1950's are still there - why are they called disposable?
- · Around 2 million sea birds and 100,000 marine mammals are killed each year by debris such as fishing nets.







You will need:-

- > Old newspapers
- > A Fine wire mesh
- > Wooden spoon
- > Plastic bag
- > Bucket
- > Plastic tray
- > Absorbent cloths
- > Weights (heavy books)

Method:-

Soak the newspaper overnight in a bucket of water

Drain away any excess water, then using the wooden spoon mash the paper into a pulp

Mix the pulp with an equal volume of water and pour onto your tray

Lay a dry cloth on to a clean flat surface, slide the wire mesh into the pulp, making sure the mesh is covered.

Lift out the wire mesh and place it pulp side down onto the dry cloth and press down hard.

Peel off the mesh leaving the pulp on the cloth. Cover with another dry cloth and press down firmly. Repeat steps 5 and 6 until remaining pulp is all used up. Put the plastic bag on top of your pulp and cloth sandwich then place your weight on top of this.

After about 3 hours, gently peel off the cloths leaving you with sheets of damp paper. Lay the sheets out flat to finish drying. When totally dry your paper is ready to use.





organise a Liffer Walk around your school







The oldest fish

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The Whale Shark is estimated to live up to 70 years or more. Who is the oldest person you know? Make a graph showing the ages of your family and the Whale Shark.

The Longest flier

The Four-Winged Flying Fish has been recorded making flights of 1109m long, which lasted 90 seconds and was around 11m in height. See who can jump the longest distance from a standing start or a run up.

The Largest Shellfish

The biggest Giant Clam was found on the Great Barrier Reef in Australia and was 1.09m long x 0.73m wide and weighed 262.9kg!

The fastest fish

The Sailfish can swim faster than a cheetah can run. The sailfish has been timed at 109km/h (68.18mph) whilst the cheetah reaches 60-63mph. The sailfish will swim 100m in under 6 seconds. How fast can you do it?.



Fish in Focus





Skelefon

Like humans, all fish have internal skeletons. Some fish have bony skeletons like humans and others have skeletons made of cartilage. Cartilage has an advantage over bone because it is flexible and tough. We have cartilage in our noses and ears.

Lungs

Unlike air-breathing animals, fish have gills. The gills are used to extract the oxygen that is present in water. The gills absorb this dissolved oxygen into the bloodstream where it is carried around the body. Gills are also used to sift food particles from the water. A basking shark swims along with its mouth open when feeding. Over half a million litres of water will pass through its mouth in an hour. The fish strains the water over hundreds of long bristles called gill rakers which capture thousands of tiny creatures called plankton, which they feed on.





Skin

Fish do have skin but it is covered in transparent scales. Scales can be used to tell the age of a fish in much the same way as counting the number of rings in a tree. Fish are also covered in slimy mucus which helps them glide through the water more easily and it also protects them against parasites. Some fish also have the ability to change colour, which is very useful for hiding and hunting. A colour change happens using a network of nerves attached to special pigment cells hidden beneath the skin surface.



Muscles

In most fish more than half the body weight is taken up by muscle. Fish have two types of muscle – red and white. The red muscle is used when the fish is swimming normally and the white muscle is only used for rapid bursts of speed.

Teefh

Most fish have teeth, some of them have fangs that are visible to the eye, such as catfish, and others have crushing plates which are set in the back of the throat, such as a wrasse. All the teeth, no matter what the type, are made specifically for one purpose (i.e. grasping, cutting or tearing) depending on the diet of the fish.







Fish focus on objects rather like a telescope, they do this by moving their eye lens backwards and forwards. Humans focus their eyes by changing the shape of the lens in the eye.

Ears

Fish do have ears! However, they are not visible but hidden under a protective flap on the side of the head, just above the gills.



Fish Scales

Over 70% of our planet surface area is open water, so the variety of marine life is stunning. On your visit to Blue Reef Hastings you will see a varied collection of fish that live in and around the coastal waters of Britain. We also have a selection of colourful tropical fish which live in warmer oceans.

Fish need to stay fairly waterproof while living in the oceans and they manage this by having scales. These are transparent plates which vary in size, shape and texture depending on the type of fish. There are three main groups of scales: placoid, ganoid and cycloid.



Sharks and rays have millions of tiny tooth-like scales called denticles. If you rub them the wrong way they feel rough like sand paper.



Many ancient fish like the coelacanth have diamond shaped scales that fit together like a mosaic. C. Cycloid

Bony fish (teleosts) such as wrasse and bass have small rounded overlapping scales.



In order to swim, steer, balance and brake in the water fish have fins. It is possible to guess a fish's way of life by the shape of its fins. Slim knife-like pectoral fins and a deeply forked tail indicate that it is a fish built for speed, such as a mackerel. In contrast, large broad-sided fins and a wide square ended tail (good for manoeuvring) are found on slow swimming fish that live in rocks and reefs, such as wrasse.

Pictured below are the different types of fins:-





Defection

Fish can detect vibration caused by currents and other sea creatures. This aids them when hunting and also when they are being hunted. The fish detects this vibration using its lateral line. The lateral line is a fluid filled tube which runs underneath a line of scales on either side of the fish. Vibration signals are sent via this tube directly to the brain.

Flotation

To help some fish float better they have a swim bladder which acts like a life jacket to aid buoyancy. Other fish do not have this floatation device but have a large oily liver or extra oily flesh which also helps.





Nature is a great designer and humans have copied some of these fishy designs. For instance shark skin was used as an early form of sand paper. More recently, British Aerospace have used the basic structure and design of denticles to make a special covering for their aircrafts. They have replicated it using thousands of metal "scales" which reduce the amount of drag and therefore increase speed, much like they do in sharks.

If you were a designer, what part of a sea creature would you utilise? See if you can design something using a special attribute that sea creatures have.

The male seahorse broods the eggs and then gives birth, instead of the female



An electric ray can generate electricity up to 220 volts, enough to light a four bedroom house!

Sharks have been around for 350million years – that's longer than dinosaurs!

LAN FILES



Octopuses have green blood and three hearts. Octopuses change colour to match their surroundings when they feel threatened.

A cod can live up to 40 years and can grow up to 1.5m in length.





Sea creatures

Each plant or animal lives in an optimum habitat that is suited to their way of life. However some can also survive in more than one area, these include transient animals such as orcas. Many of the sea creatures who live at Blue Reef are in tanks that have been specially designed to mimic their natural habitat.

Below are pictures of some sea dwelling creatures. See if you can place them in their correct habitat.



food and filtration

Many sea creatures live by eating small pieces of waste (called detritus) that float in the water. They separate these pieces of food by filtering it. You can try this filtering yourself by the method below:

- You will need:-
- 1 x sieve
- 1 x funnel
- **2 x plastic containers**
- **1 x jug of water**
- **1** x circle of soft paper (e.g. blotting paper)
- A selection of pebbles, gravel and sand





Method:

- Mix your pebbles and sand mix with water. Pour it through the sieve
 - into your plastic container. What happens?
- Fold your circle of paper into four and push your finger through the
- Folds to make a pocket. Put your pocket into the funnel. Place the funnel in the top of your plastic container and pour the water through the paper funnel. What happens?
- The above process is a simplified version of what many sea creatures need to do to survive, these creatures are called "filter feeders".

See if you can find the names of three filter feeders.

food webs

All animals have to eat to survive – some eat plants, some eat other animals and some, like humans, eat both. There are however, some creatures that can survive on the waste products of other animals and plants. Nothing is wasted in the sea.

Almost all food webs start with the sun. Floating plants use the sun to turn water and carbon dioxide gas into food. Tiny animals eat the plants; they in turn are eaten by shellfish and worms. Crabs and larger shellfish eat the smaller animals and these are eaten by larger fish and birds.



Draw Your own Food Web

Now see if you can draw your own food web based on a rock pool. Here are some facts that may help you.

Seaweed use the sun's light to make their food.
 Periwinkles (small shellfish) eat seaweed
 Dog whelks eat smaller shellfish.
 Birds eat shellfish.
 Anemones filter tiny particles out of the water.





Plant or Animal?

The sea is full of all sorts of weird and wonderful things, many of which are difficult to categorise at first glance. You need to ask yourself several questions before you decide what group to put each of the following into.

Below are some different types of sea creatures; see if you can categorise them into plant or animal using the questions below. You may need to look up some of the answers in your library or online or by asking one of the aquarists when you visit Blue Reef.



Question	Yes/No	Plant/Animal
Does it move?		
Can it come on its own?		
Is it moved by water?		
Does it eat?		
Does it grow?		
Can it lay eggs?		

Sea Plants

There are many different types of plants that grow in the seas and oceans of our planet. The variety and colours can be just as vivid as the ones that we see in our parks and gardens. Much of the seaweed that we can find washed up along the beach is called bladderwrack as it lives in coastal waters

Many of the animals that we see along the shoreline are dependent on seaweed for food and shelter when the tide is out, for example small creatures can be found among the fronds of the plant. They are protected from the drying out effects of the sun and wind by the slippery mucus covering on the seaweed.

Seaweed, like many other green plants, contains chlorophyll which is a substance that is essential for capturing the sun's rays to make their own food through the process of photosynthesis. To enable them to float on the surface of the water to get closer to the sun's rays the bladderwrack has pairs of air bladders along its fronds.

Seaweed is used as a useful source of food for both humans and animals. In parts of Scotland, bladderwrack is dried and used as cattle fodder. Kelp is farmed in the waters off the coast of Ireland and is used for food as well as for its medicinal properties

Animals without backbones

Some of the animals that live in the sea have no backbones. In fact, some have no skeleton at all, just a hard outside shell. Animals have different ways of living and growing in shells, many of these shells grow with the creature but some have to shed their shells and find new ones.

Cobsters lose their old shells by splitting them along the centre of the top of the shell. They fold themselves up and emerge through the cracked shell with a new larger soft shell. This new shell makes the lobster very vulnerable so it pumps up its new shell with water and hides until it has

Crabs grow until they are too big for their shell. They then absorb all of the hard calcium from their shell making it soft. This makes the shell easier to split. The crab then comes out of this old soft shell wearing a new shell which swells up and hardens allowing growing room.





Reriwinkles and other aquatic snails grow by adding small amounts of material to the shell at a time. They add more to one side than the other which is why the shell coils.

Mussels make new shells as they grow. You can see the growth lines on the side of their shells and as with the rings in a tree they are a record of how old a mussel is.



Seahorses

Seahorses are very unusual in the marine world as they swim upright. Their head and bent neck make them look very much like horses. Seahorses are close relatives of the pipefish which swim horizontally, like snakes.



Seahorses are covered in bony plates and have fins that are shaped like streamers. As they swim along, they look similar to fronds of seaweed. This makes them very hard to spot in the water.

Seahorses are in the most danger from humans as they are popular in traditional medicine recipes and as jewellery or accessorises.

Seahorses mate for life and if their mate dies they become ill or unhappy. Like all fish, they lay eggs but the male keeps the eggs in a pouch until they hatch. When the male gives birth there can be up to 180 babies at one time.





Make your own Animal

See if you can design you own fish with markings to suit its environment:



Section 4: Numeracy





Did you get all of the answers correct? If so, see if you can find some other sea creatures and count how many legs they have.



Fish and other sea creatures come in many different shapes and sizes. What shape would you use to describe the following fish shapes? For example, circle, star, oblong etc.

This starfish is shaped like a





This shark is shaped like a

This angelfish is shaped like a





This pufferfish is shaped like a



In the fish tanks below, you will see different numbers of fish and sea creatures.



Make a Bar Chart

To compare the number of seahorses in the tanks we can use a bar chart. Colour in the correct box on your graph every time you cross off a seahorse in a tank. Which tank has the most seahorses?

How many seahorses are there altogether? How many animals are there in each tank?

Make a Bar Charf

To compare the number of seahorses in the tanks we can use a bar chart. Colour in the correct box on your graph every time you cross off a seahorse in a tank. Which tank has the most seahorses?

How many seahorses are there altogether? How many animals are there in each tank? How many animals are there in each tank?







How much ??



The tank pictured above hold 6 litres of water. It is a similar size to one in a pet shop.

If you had six tanks all of the same size, how much water would they hold in total? The tanks would hold a total of litres of water.

If one tank was only half full, how many litres would be in that tank? The tank would hold litres of water.

If you had 2 full tanks, 1 half full tank and no water in the other 3, how many litres in total? There would be a total of litres of water.

The tanks at Blue Reef are huge. See if you can estimate how much water is in the Ocean Reef Tank (this is the tank with the tunnel in). My estimate is...... litres of water. To see if you are right, ask one of our friendly aquarists to find out the answer.

How many 6 litre tanks would it take to fill it up? It would take..... tanks.

figures



Some fish lay lots of eggs but not all the eggs will hatch and grow into adult fish.

Many die or are eaten by other sea creatures. That's why some fish lay so many eggs.

A fish lays 20 eggs, only half hatch out. However, only half of these grow to be adults. How many adult fish are there?

There are adults.

One of the Blue Reef tanks has 30 fish in it. It is too crowded. Half of the fish are taken out and put in another tank.

How many fish are in each tank?

There are fish in each tank.

Even More Figures!

Different types of fish lay different numbers of eggs or give birth to different numbers of young. For example:



How many young or eggs might each animal produce in 3 years?

How many young or eggs might each fish produce in 10 years?

Life Span

Some sea creatures can live a very long time. Sadly only a few will reach great ages as many will be killed or eaten by other animals.

Below is a chart showing the expected life spans of different creatures, including humans.



Life Span



How many of these sea creatures can live longer than a human? There are sea creatures that can live longer

How many of these could not live longer than a human? There are sea creatures that cannot live longer





Listed below is a selection of sea creatures, can you fill in the missing vowels?



Can you rearrange these fish into alphabetical order?

Cod	
Plaice	
Catfish	
Bass	
Haddock	
Salmon	
Wolf Fish	
Dogfish	

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crabs

Crabs come in all shapes and sizes but they all share common features. They each have 10 legs; the two at the front of their bodies are known as claws. The crab uses these both to eat its food and also to protect it from attack. Crabs like to live in holes in rocks or in shipwrecks but they do come out from time to time to go in search of their next meal. When the tide goes out, you can often find them among the rockpools.

Crabs can survive for several hours out of the water but they need to keep in the shade to stop them drying out. Crabs have hard shells to protect them from attack by other creatures, such as birds. If a crab loses a leg in a fight or if one gets bitten off by a predator, it is able to grow another. This means you may see a crab with one leg smaller than the rest.

What two things does a crab have to protect itself?

What happens if a crab loses a leg?

How many legs does a crab have?

Where do crabs like to live?

How long can a crab survive out of water?



Can you draw a picture of a thornback ray?







Wrife a Story



Write a story about what you think life is like under the sea. Maybe you could be a ray or a crab? Describe where you live; is it under a rock or in a shipwreck? What other creatures are nearby? Are they friendly? What will you feed on?

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Draw a picture of yourself as a Sea creature



classifying fish

How do you find out the name of a plant or animal? You can go through a book, comparing it will all the pictures you see. However, that could take a very long time. A quicker way is to ask questions about it and to use the answers to guide you to the right name. This question tool is called a KEY.

Look at the pictures of the fish below. They are all fish but they look very different.



create your own key

Follow the instructions below to create a key. Think of a question that divides the fish into two pairs. For example, "is the fish flat from top to bottom?" (This separates the stingray and flounder from the cod and shark). Now you need a second question that with split the shark and cod. Think of a third question to separate the stingray and flounder.

Can you create your own key for some other creatures?





Section 6: Just for fun!







The rock pools and the sandy seabed are full of many different creatures. Some of which can be very hard to spot. See if you can find the following in our shoreline area:-







🕷 Anenomes





What else can you find in this habitat?
What special thing can an anemone do to hide from the sun?
How many different types of crab can you see?
Which creature was hardest to spot?
f you were a sea creature, which one would you be?
What special features would you have?
How would you make sure you were safe from predators?
Can you draw what you would look like in the space below?

class Projects





Create your own newspaper or newsletter

Get together with your class and see if you can produce your own newspaper or newsletter about all of the things that you have seen at Blue Reef. You will need to include:

- > Pictures ask your teacher to take photographs on your visit.
- > Articles each pupil choose a creature to write about.
- > Interviews pick a few class members to act as reporters and you can interview one of the aquarists at Blue Reef.
- > Features write a feature on a subject voted on by the class, i.e. how pollution affects the marine environment.



Design a poster

On a large sheet of sugar paper create a poster connected with the sea and marine life. Before creating the poster it is important to discuss:-What information should be included on the poster Who the poster will be aimed at, e.g. adults or children The layout and design There are a lot of posters around the aquarium for inspiration and don't forget to ask our friendly aquarists for ideas on current marine topics.

Shark Quiz!

- **1. Which creature is a shark's closest living relative?**
- 2. What is the largest shark in the world?
- **3. Name the largest shark native to British waters.**
- 4. What is the lesser-spotted dogfish also known as?
- 5. Nursehound sharks and lesser-spotted dogfish lay eggs. What are these eggs called?
- 6. What is the nursehound shark also called?
- 7. Name the smallest shark in the world?
- **8.** What happens if some sharks stop swimming?
- 9. How long have sharks been on the planet?
- **10. How much longer is this than humans?**
- **11. What is unusual about the smooth-hound shark?**
- **12.** How many shark species can be found in UK waters?



Wordsearch

Can you find all the words that relate to pollution?

CYZPDFCXFUZCFEX WONHLGLUMXQBDKA IIXYRAFDQAUVOBT JSSLRKNGPWY KLYI ASPGFLETWOOKXND YPVOHELGIIWGQDC XIYSIKPWOCNNSFE ILQEISWOPCOCDIY GLYSUBOVLXAKRSN WOEETNCNXLZHLHC IDLISABSIUUOXVQ EHRHMNRIMNCTTCU TDQENRVVRKGWISJ OHLITTEREDAWGOK FOODCHAINRSTADN



Make a Treasure Chesf



Colour in your treasure chest with your favourite sea creatures and pirates. Carefully cut out the box and glue the flaps together. Make sure that you leave the top of the box so that you can store your treasure inside.

