14 LIFE BELOW WATER

Plastic Pollution

dynamic earth LEARNING

Background Science

Increased awareness of plastic pollution in the oceans has become known as the 'Blue Planet Effect'. After David Attenborough presented the world in 2017 with images of Clownfish trying to build nests from waste polystyrene cups and turtles eating plastic shopping bags, there has been public outcry and political change. This effect has reached the classroom too and many children around Scotland are campaigning to rid their schools and communities of single-use plastics. This provides a great opportunity to learn about sustainable use of resources, food chains, and natural environments.

But why has plastic become so prolific? Single-use plastic has become a common material in modern life, used in everything from food packaging to cleaning products and so is incredibly useful. Consumption of plastic is ever-increasing; 300 million metric tons are used annually worldwide and approximately 8 million tons of this washes into the oceans. This has the immediate effects of polluting our oceans and trapping marine life. It also has a very long-lasting effect on our environment as it never fully decomposes, but breaks into progressively smaller pieces through exposure to UV light and wave action over thousands of years. Plastic doesn't break DOWN, it breaks UP! It is clear that microscopic plastic pieces are now present in all levels of the food chain; plankton have been found to consume micro fragments of polystyrene and plastics have also been found in sea salt used for cooking. The full environmental and health impacts of this are not yet known, as more time and study is required. (Check out this interesting video on what the future could hold though! https://vimeo.com/300261023)

In the UK, new policies have come into force to reduce the amount of single-use plastics in use. Since the plastic bag charge was introduced in Scotland, usage reduced by 80% in just one year. Plastic microbeads were banned in 2018, preventing microplastics from being used in cosmetics and cleaning products. Plastic cotton bud sticks were banned in 2019 as they were discovered to be the most prolific type of plastic waste on beach cleans around Scotland's coasts; and plastic straws are also set to be banned.

As well as policy changes, there are lots of actions we can take individually or in school and community groups to reduce our plastic consumption and to limit its impact on the environment.

Useful Web Links

The filmmakers of A Plastic Ocean have released the research they compiled during filming, which has a lot of useful information:

http://plasticoceans.uk/programmes/science/the-science-behind-the-film

Curriculum Links

Sciences
I can use my knowledge of the interactions and energy flow between plants and animals in ecosystems, food chains and webs. I have contributed to the design or conservation of a wildlife area. **SCN 2-02a**

I have contributed to investigations into the role of microorganisms in producing and breaking down some materials. **SCN 2-13a**

I can report and comment on current scientific news items to develop my knowledge and understanding of topical science. **SCN 2-20b**

Art And Design
I can develop and communicate my ideas, demonstrating imagination and presenting at least one possible solution to a design problem. **EXA 2-06a**

People, Place and Environment
I can discuss the environmental impact of human activity and suggest ways in which we can live in a more environmentally responsible way. **SOC 2-08a**

Activity: Rubbish Timeline

Creating a rubbish decomposition timeline helps to contextualise the breakdown rates of different materials and emphasises the persistence of plastic in the environment. The next few pages will have all the resources you need to run this activity.

Instructions

1. Play video. When prompted, pause for the activity.

2. Source items of rubbish the same as those in the video, or use the downloadable pictures provided. The items are: paper, cardboard, a cotton sock, a rubber welly, fruit, plastic bubble wrap, plastic straws, a nappy, a polystyrene cup, and a plastic bottle. These items can be changed to reflect your school's rubbish items.

3. Have the learners decide how long each item will take to breakdown once it becomes rubbish. Create a timeline and place the items at 1 month, 2 months, 1 year, 100 years, and never.

4. Download the additional information sheets to help learners work it out.

5. Key discussion points are that the natural materials (fruit, cotton sock, rubber welly) take relatively short amounts of time to break down and decompose completely. In contrast, the synthetic materials (drinks bottle, straws, poly cup) will only break down into microscopic pieces and not decompose.

POLYSTYRENE CUP

I BREAK DOWN INTO TINY PIECES,
BUT NEVER COMPLETELY GO AWAY.
I END UP IN THE OCEAN WHERE FISH
AND BIRDS EAT ME.

COTTON SOCK

I AM MADE OF NATURAL FIBRES.
I AM BIODEGRADABLE AND BREAK
DOWN FASTER THAN SYNTHETIC
MATERIALS.

FRUIT

I AM COMPOSTABLE AND CAN BE
BROKEN DOWN BY BUGS
AND BACTERIA.

BOTTLE

I AM MADE OF P.E.T. PLASTIC.
I BREAK DOWN INTO TINY PIECES
THAT TAKE A LONG TIME TO GO AWAY.

STRAWS

I AM MADE OF POLYPROPYLENE
PLASTIC. I AM SMALL AND LIGHT
SO EASILY GET WASHED THROUGH
SEWERS TO THE SEA.

WELLY

I AM MADE OF NATURAL MATERIAL
THAT COMES FROM TREES!
BUT I STILL TAKE A WHILE TO
TOTALLY BREAK DOWN.


1
MONTH


2
MONTHS


1
YEAR

Answers

1 month: paper, fruit
2 months: cardboard
1 year: cotton sock
100 years: rubber welly
Never: polystyrene cup, straws, bubble wrap, plastic bottle, nappy

Activity: Microplastic Identification

There are many sources of plastic waste, many more than can be seen with the naked eye! Some plastics are designed to be tiny, for example the microbeads in face wash, whereas other microplastics originate from bigger sources, such as the tiny polystyrene pieces that break off from takeaway containers.

The video shows some sources of plastic under the microscope and this activity allows your learners to identify more sources for themselves. There are lots of opportunities to talk about these sources and what the alternatives to them could be.

Instructions

1. Download each of the magnified photos of plastic waste from the ocean.

2. Play video. When prompted, pause for the activity.

3. Have your learners decide the source of each photo and which is the biggest threat to marine life. There is no right or wrong answer to this, all the sources are a threat, let your learners decide what they feel is the most urgent!

4. This activity has differentiated worksheets for learners; one worksheet is a matching activity with sources and microplastics on the same page to be joined up with a line. Alternatively, learners can just look at the big magnified photos and try to figure out where the microplastics have come from without any hints.

5. Check the information sheet for the answers!

6. Extension question: How might the functions of a healthy ocean, as discussed in section 1, be affected by ocean plastic pollution?

Take a look at the magnified photos to see if you can tell where each one has come from.
Draw a line from the photo to the item and match them up!

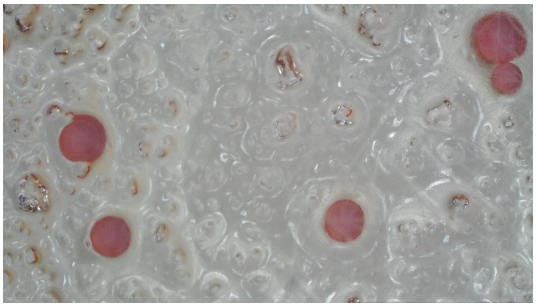
Polystyrene Cup

Fleece

Fishing Net

Nurdles

Face Wash



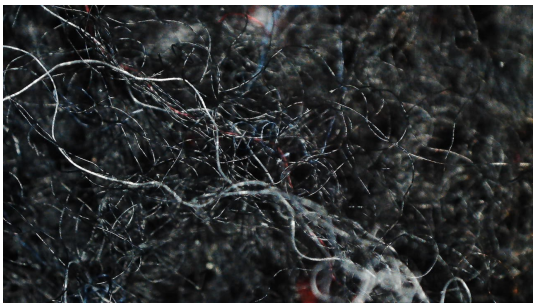


Image 1

This material has tiny fibres that break off in the washing machine and go into waterways. They are very difficult to get out of the sea and can be eaten by plankton and other tiny sea creatures.

Image 2
All these pink bits are plastic microbeads that wash away down the sink and end up in the sea.
These are often mistaken for fish eggs by sea creatures.

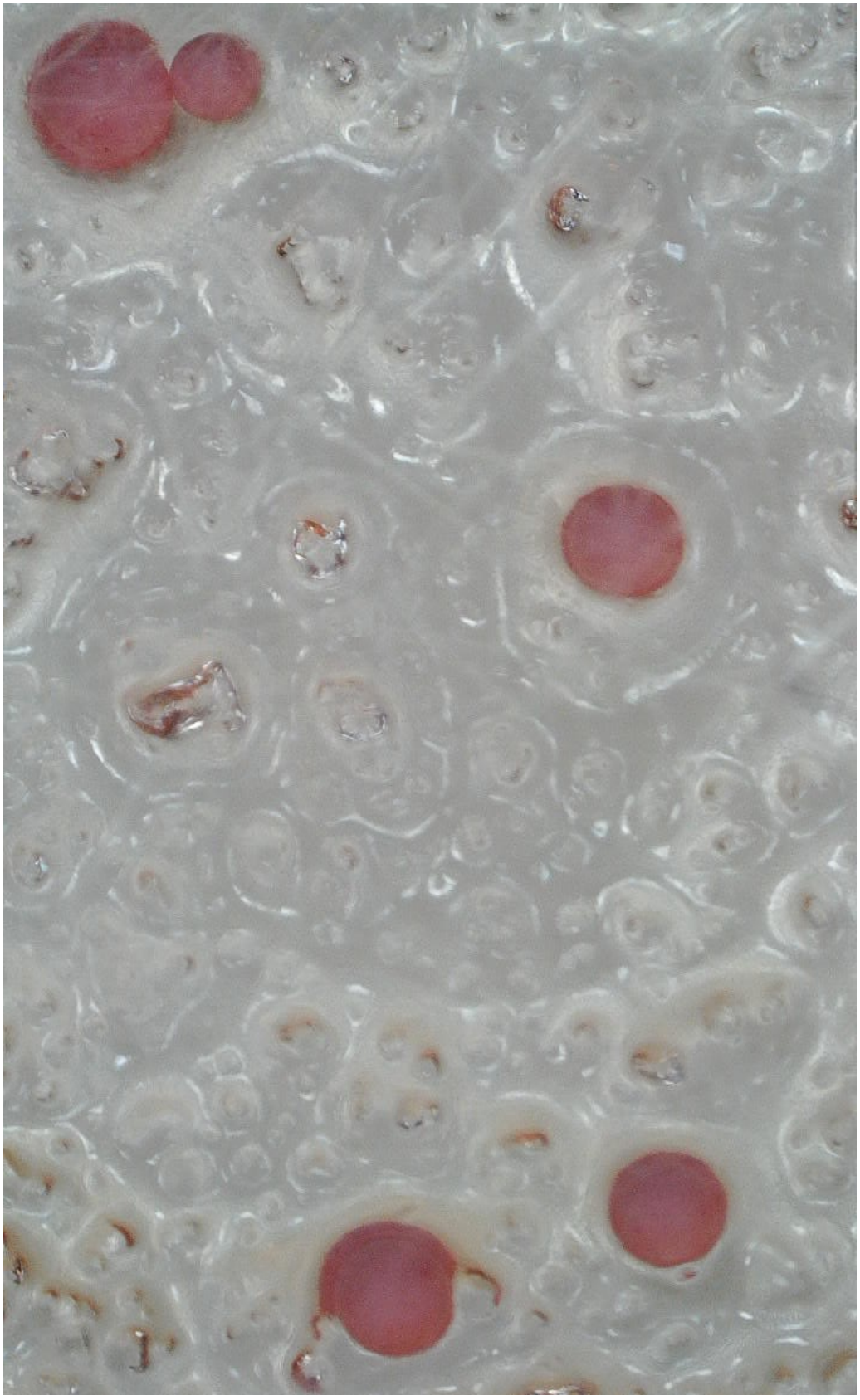


Image 3

These plastic beads are melted down and moulded into all sorts of different things. Before they are used, it is easy for them to get lost because they are so tiny! They may get blown away by the wind or washed away by the rain and end up in the sea.

Image 4

These pieces break up and get smaller and smaller. Because they are very light they are easily transported around the planet and can be accidentally eaten by birds and sea creatures.

Image 5
This material is used lots out at sea, but once it breaks it is often left there as litter.

Answers!

Polystyrene Cup

Fleece

Fishing Net

Nurdles

Face Wash