

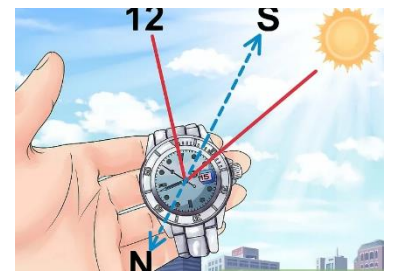
## Activity 1:



Study the map of Cyprus and orienteer yourself using the map and the compass given to you. Align the edge of the compass with the starting and finishing point. Rotate the compass housing until the orienting arrow and lines point N on the map. Rotate the map and compass together until the red end of the compass

How to orient yourself without a compass?

Use your watch: If you don't have an analog watch, you can visualize where the numbers would be on the face. Take the watch off and align the hour hand with the sun. Imagine a line that intersects the halfway point between the hour and 12:00. That line is pointing south. For example, if it's 4:00, the halfway line will be pointing to 2:00. Note that in the summer, you will need to adjust for Daylight Savings by one hour, so move your hour hand back an hour. If you're in the Southern hemisphere, align the sun with 12:00 and the imaginary line will be pointing north.



Track the sun: This one takes more time. Find a patch of land that gets direct sunlight. Put a stick in the ground and place a mark at the tip of its shadow. Then mark the line that the stick's shadow makes as it travels across the ground from west to east. Now stand perpendicular to the line with the west on your left and east on your right and you should be looking at true north.

Draw an imaginary line straight down from the North Star to the ground. This direction is true north, and if you can find a landmark in the distance at this point, you can use it to guide yourself.



A lot of non-compass ways of navigation rely on the sun—what do you do on a cloudy day?

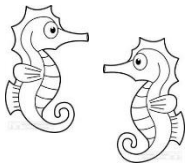


Sometimes you can still get a shadow on a cloudy day, but as a backup, look at your environment. Moss typically grows on the north side of trees and rocks. Look for multiple samples to confirm. If it's a generally shaded or wet environment, the moss may grow on all sides. However, if you find a grove of trees that receives consistent sun, you have a decent indicator of north. Another way is to look at the hillsides. If you have a view of multiple hills, the drier, less-vegetated hillsides will face south.



Another way is to look at the hillsides. If you have a view of multiple hills, the drier, less-vegetated hillsides will face south.

Within church architecture, orientation is an arrangement by which the point of main interest in the interior is towards the east. The east end is where the altar is placed, often within an apse. The façade and main entrance are accordingly at the west end.

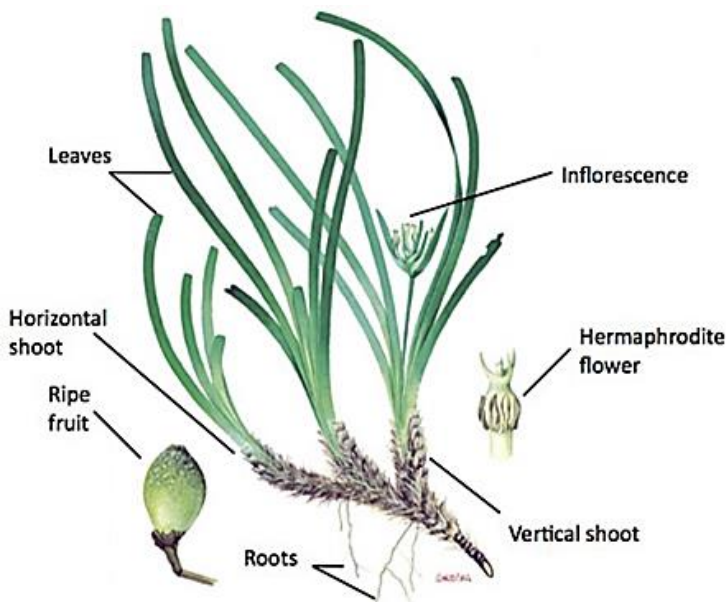


### Activity 2:

Make a collection of items from the beach that attracted your interest and curiosity (strange, unique, first time you've seen them etc)! Put them in the box given to you and bring them to the group:

- Present your items to us!
- A story is hidden behind the items you collected. Choose one item and tell us its story (Where did it come from? How did it end up at the beach? What future is it expected to have and why? Does it affect the environment and how?)

### Activity 3:



The following photos given to your group are photos presenting *Posidonia oceanica* (commonly known as Neptune grass or Mediterranean tapeweed), which is a seagrass species (sea plant) that is endemic to the Mediterranean Sea. Try to find samples of *Posidonia oceanica* or parts of the plant at the beach or in the sea and present them according to the information given to you at the back of each photo.



*Posidonia oceanica* forms large underwater meadows that are an important part of the ecosystem. Its presence is a marker for lack of pollution. It is found at depths from 1–35 metres (3.3–114.8 ft), according to water clarity.



Subsurface rhizomes and roots stabilize the plant while erect rhizomes and leaves reduce silt accumulation. The leaves are ribbon-like, appearing in tufts of 6 or 7, and up to 1.5 metres (4.9 ft) long. Average leaf width is around 10 millimetres (0.39 in). The leaves are bright green, perhaps turning brown with age, and have 13 to 17 parallel veins. The leaf terminus is rounded or sometimes absent because of damage. Leaves are arranged in groups, with older leaves on the outside, longer and differing in form from the younger leaves they surround. The rhizome type stems are found in two forms: one growing up to 150 centimetres (59 in) beneath the sand and the other rising above the sand. All stems are approximately 10 millimetres (0.39 in)



Balls (Neptune balls) of fibrous material from its foliage, known as egagropili, wash up to nearby shorelines. These little balls are usually found as clumped-together with lots of sand inside, didn't have much use till date, when researchers at Fraunhofer Institute of Chemical Technology has found that they can be converted into high-quality building insulation that is environmentally friendly too. Being plentiful, renewable and above all useless till date, makes this dead seaweed as a perfect alternative to other forms of insulation currently being used in buildings. Not only is the weed mold-resistant and completely non-flammable, it also doesn't rot and converting it into insulation doesn't need chemicals as well. Moreover, it can absorb water vapor and release it again without having any effect on its insulation properties.



It is a flowering plant which lives in dense meadows or along channels in the sands of the Mediterranean.



The fruit is free floating and known in Italy as "the olive of the sea" (l'oliva di mare).



The presence of Posidonia can be detected by the masses of decomposing leaves on beaches, which stop the erosion of the coastline in the Mediterranean Region.

## Some more information about *Posidonia oceanica*:

The genus *Posidonia* is named after Poseidon, the Greek god of the seas, while *oceanica* refers to its former wide distribution. Carl Linnaeus gave the first botanical description of this species

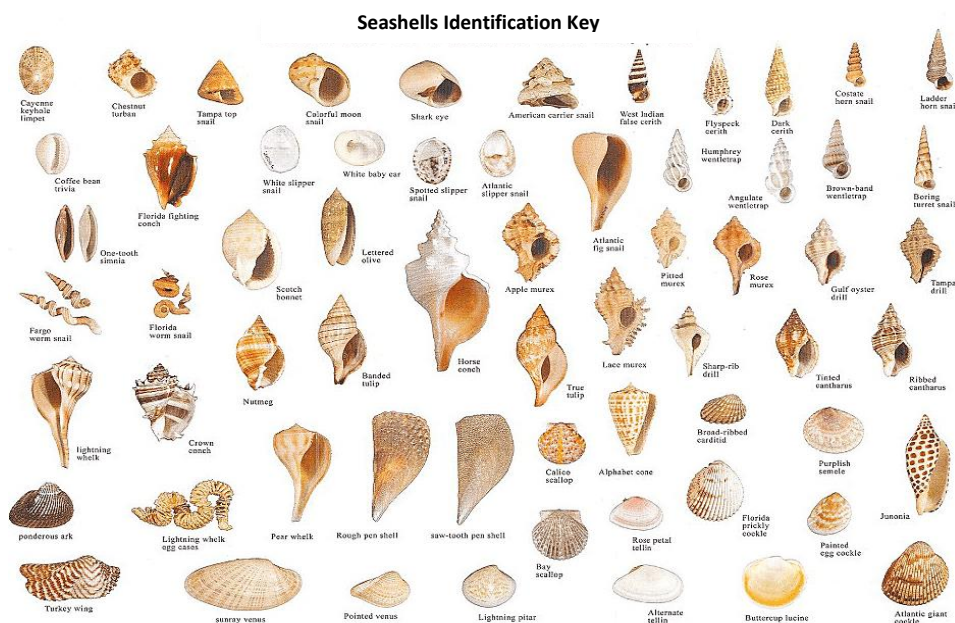
In 2006 a huge clonal colony of *P. oceanica* was discovered south of the island of Ibiza. At 8 kilometres (5.0 mi) across, and estimated at around 100,000 years old,[4] it may be one of the largest and oldest clonal colonies on Earth.[5][6][7]

More than half of the oxygen we breathe comes from the sea. *Posidonia oceanica* has been called “the lungs of the Mediterranean” because it is one of the most important sources of oxygen provided to coastal waters. A study from the Mediterranean Advanced Research Institute (IMEDEA) and the BBVA Foundation states that the Mediterranean *Posidonia* population produces 14 to 20 litres of oxygen per square metre every day. In addition, the *Posidonia* habitats have a significant role as a carbon sink, absorbing carbon dioxide, storing carbon at an average rate of 83 g C/m<sup>2</sup> per year, and helping to alleviate the effects of climate change.

Unfortunately, this important aquatic plant is in great danger of disappearing in the next few years. The *Posidonia* meadows are declining in many parts of the Mediterranean because of pollution, coastal development (such as shoreline hardening, urban and harbour infrastructure), fishing activities, and the mooring of ships that sweep the plants with their anchors and chains. This overall decline has been measured as approximately 10% over the last 100 years (Pergent et al. 2009), but a recent analysis of area coverage indicates a 34% decline in distribution area or degradation in the past 50 years (Telesca et al. 2015). Measures are being taken by the EU and many national and international organisations for its protection and conservation.

## Activity 4:

In your groups find different types of seashells on the beach. Find as many as possible! The identification key given to you, will help you in your research.



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## Some important facts about seashells!

### Seashells are Mobile Homes

A seashell isn't an animal. It's a portable home for a wide variety of animals. The animals that naturally live in these homes are mollusks. That said, not all mollusks use a shell. The cephalopod family, which includes the octopus and squid, don't use a mobile home to keep them safe. Instead, they use other means of defense, like their ink or poisonous suction cups on their tentacles. One thing that all mollusks have in common, whether they use a shell or not, is that they're all invertebrates. This means they don't have a rigid backbone. Most of the smaller mollusks, like clams or sea snails, use seashells as a means of defense against predators.

### A Mollusk Has Only One Shell

Mollusks craft only one shell throughout their lifetime. They utilize a variety of proteins and calcium carbonate to create their exoskeleton. This becomes their home for the rest of their lives. The cool thing about seashells is that they grow with the animal. As the mollusk gets older and bigger, so does the shell. It expands a little bit with each passing day, giving more space for the animal inside. It's important to note that very few animals keep their exoskeleton through all phases of their life. Most animals shed their exoskeletons as they get older. They then craft a newer, bigger one that better fits their size. Mollusks, mentioned, stick with the one they started with.

### The Exception to Seashell Facts: Hermit Crabs

The only exceptions here are hermit crabs. They aren't mollusks – they're crustaceans (little crabs). Despite this, they use seashells too. However, they don't craft their own shell. Instead, they wait for a mollusk to die and then they'll occupy the empty shell. They'll use a wide variety of seashell types too, as long as they fit in it and can carry the shell around with them. This isn't a new practice either. Hermit crabs existed for millions for years and they've always used other animal shells to shield them from predators. In fact, the oldest hermit crab using a shell (an ammonite shell) dates as far back as 130 million years ago.

### Shell Patterns and Colors Have Engineering Purposes

Aren't seashells pretty? They often display a wide array of colors and unique patterns. However, it turns out those beautiful designs aren't for display only. Scientists believe that mollusks use these patterns and colors as engineering blueprints. The design lets the animal figure out where to place their mantle, ensuring they grow their shell in the right spots. However, nobody knows what kind of pigment mollusks use to create these colors. It's another fascinating mystery about these creatures and their seashells.

## Argonauts and Their Special Seashells

Cephalopods, like octopi and squids, are mollusks that don't build a shell. There is one type of octopus, however, that didn't evolve this way: the Argonaut. Argonauts are the only known octopi that have a shell. However, they have the ability to leave their shell for a short period. Their shell features a unique design that lets the octopus inside bring it around while also reducing drag. You can't keep an Argonaut away from their shell for too long. Doing so will kill the animal. Also, only female Argonauts create a shell. Unlike other seashell mollusks, they don't secrete the shell-crafting chemicals from their mantles. They use their arms to build and repair the shell, thus guaranteeing each shell is always unique to the animal.



## How Many Seashell Types are There?

Found a beautiful seashell while walking down the beach? Great, but how do you tell what kind of animal it was for? Seashell identification is no easy task. Let's get that little hurdle out of the way. This is because there are possibly over 200,000 mollusks in the world and all of them create unique types of shells.

## Seashell Shapes are Important Too

While there are thousands of seashells, you can boil them down to two major types and two general shapes. Let's discuss the shapes first. The first common shape is a smooth, round design. This makes it easy for the animal to scoot around the ocean rather quickly. Mollusks that create these shells depend on stealth and speed to avoid predators lurking around them. On the other hand, there are seashells riddled with spiky and uneven surfaces. These are more common in tropical waters since there are more predators in these areas. Mollusks with these seashells don't move around too quickly; instead, they depend on their shell's design to ward off predators. They can use the sharp edges to hurt animals hunting them down. Some mollusks carry deadly poison in the pointy ends of their shells. Others rely on the thickness or heaviness of their shell to dissuade bigger creatures from attacking them. Clams and oysters are a great example of the latter. Their shells are tightly shut, making it almost impossible for big fish to crack them open. Biting the shell isn't effective either due to the shell's durable nature.

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## Flat and Cone Seashell Types

There are two general types of seashell types. The first type is the flat shell. These are common for oysters and clams. More often than not, these are bivalve shells. A bivalve shell has two halves that open and closes, held together at the hinge by a powerful ligament. The animal rests inside this enclosure. Clams that bear pearls use bivalve shells.

Cone types are the other general shape. This is what you'll find when looking at sea snails, the Nautilus, or Argonaut. Their shell shape makes it hard for predators to swallow them whole and these animals are often poisonous too.

## They Open to the Right

Did you know the vast majority of shells are dextral? This means their opening is to the right. Only a select few shells are sinistral, meaning they open to the left. Shell collectors love sinistral shells because of their rarity. If you ever happen to come across sinistral shells, don't pass up the chance to grab it! Beware, however, because there are now a lot of fake sinistral shells on the market too. That said, animals with sinistral shells have a difficult time reproducing. They can't mate with their dextral counterparts. Instead, they have to go through the extra effort of scouring the vast ocean for another sinistral. This mating complication may explain why sinistrals are rare.

## People Used Seashells as Currency

Money is a universal need, even in the earliest days of human history. When the days of bartering were over, trade utilized rare and precious metals like gold or silver as currency. However, cowry shells were also a lucrative form of money as well. Cowry shells functioned as currency in places like China, India, and even in the Arabian peninsula. To this day, you can use cowry shells as money in Papua New Guinea. However, they only use it now as a form of a nostalgic artifact, like a means of honoring their ancient customs. Shells were great forms of money for two reasons: uniform shells of high quality were hard to come by and these shells were durable. More often than not, only the rich and well-established nobles could use seashells as money on a regular basis.



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## Seashells as Instruments

Remember a while back we mentioned how seashells are great for amplifying ambient sounds? This same property makes them ideal wind instruments. Many places across the world, such as Japan and the Caribbean, use seashells for musical purposes. Perhaps the most popular instrument made from seashells is the conch. People also refer to it as a seashell horn. There are other instruments to try out, like seashell flutes from Japan or seashell ocarinas. There are indications that the first musical instruments may be seashells fashioned to blow musical notes. However, there are no concrete pieces of evidence to prove this theory. As of today, the oldest known instruments came from bones, fashioned into early forms of flutes.

## Seashells Make Great Fertilizers

Remember we said mollusks make their shells out of calcium carbonate? This very property also makes shells an amazing ingredient for effective fertilizers. Calcium carbonate helps maintain the pH levels in the soil and they help cut down the toxicity in the soil. They also make it easier for plants to absorb other important nutrients in the soil. Of course, they also provide calcium which is important for better plant growth. You also don't have to worry about harmful chemicals. Using seashells as fertilizers are great for people trying to maintain an organic farm.

## Oldest Human Art

Think seashell art is a new thing? Think again! We've used seashells to express our artistic side for thousands of years. As a matter of fact, newer discoveries hint that Homo Sapiens were not the first ones to convey a sense of art on a wall or shell. A discovery in Indonesia focuses on a clamshell dating some 430,000 to 540,000 years ago. The amazing fact is that there are clear signs of "art" on the shell's surface. Even more amazing is that it wasn't a Homo Sapien responsible for the art; instead, scientists point out the art was by a member of the Homo Erectus species. Homo Erectus is an ancient ancestor to modern humans and this discovery hints that even ancient ancestors had some level of intelligence to convey art.

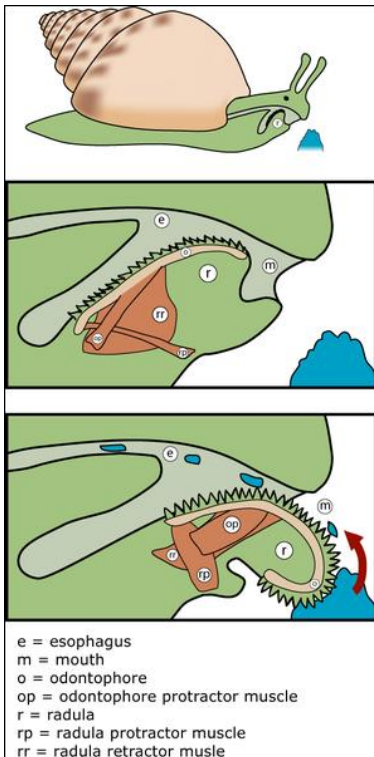
## Activity 5:

### WHAT CREATES THOSE CIRCULAR HOLES ON SEASHELLS?

One question beach lovers often ask us is how are those incredibly circular holes made on the shells? The holes are so perfect, that the shells can be used as a necklace pendant (see image below).



The holes you see on these shells are made by carnivore marine snails, or more specifically by their radula. A radula is similar to our tongue in that it assists the snail to eat. However, unlike a human’s tongue a radula looks and functions like a chainsaw (see image below). The radula is comprised of teeth like structures that have the ability to cut through hard surfaces, such as a calcareous shell. The snail will stay in one place while the radula chainsaws through the shell, hence creating a beautiful concentric circle. Once the snail breaks through the shell, it will kill and eat the animal inside. Unfortunately, a sad ending for the prey but enabling the carnivore marine snail to survive another day.



### Radula

The radula is located inside the snails mouth and acts like a chainsaw drilling through tough surfaces.

## Activity 6:

*Lagocephalus sceleratus* (Gmelin, 1789), commonly known as the silver-cheeked toadfish, is an extremely poisonous marine bony fish in the family Tetraodontidae (puffer fishes). It is an invasive toxic species well established in the Mediterranean, coming from the tropical waters of the Indian and Pacific Ocean through the Suez Canal. Public campaign was set to inform Mediterranean countries on the risks associated with its consumption that may lead to death because of the tetrodotoxins in its body. Its back is grey or brown with darker spots and it has a white belly. A characteristic silver band runs along the sides of the fish. The silver-cheeked toadfish can measure up to 40 centimetres. It seems to be characterized by great adaptability, especially in terms of eating habits, since it is often fed with any type of fish already caught in the nets of fishermen (damaging them at the same time with its sharp teeth) of all ages and its nutritional intensity seems to be consistently high throughout the year, negatively affecting the food chain in the sea.



- This fish is poisonous, its inwards and its skin contain a toxin (tetrodotoxin TTX) which can cause death from muscular paralysis, respiratory disorder and circulatory system failure.

- "Lagocephalus" is a relatively new unknown species which recently (2003) entered the Mediterranean from the Red Sea and has already been acclimatized and is breeding in our seas.



### Characteristics

- It is bludgeon shaped with a large head and a slender forked tail

- It has large, light colored eyes with a silver iris. It has 4 characteristic teeth, 2 on the upper jaw and 2 on the lower, which resemble a rabbit.

- The upper part of the body is Olive-green-brownish colored with many dark brown or black spots and has no scales. There is a thin silver line on the side of its body and its underbelly is white, smooth and flat and has the ability to inflate like a balloon.

- It lives in shallow waters, ranging from 15 to 50 meters and rarely up to 100 meters in depth, in rocky seabeds, vertical rocks on shorelines and reefs.

- Its length ranges from 2 to 60 cm and can rarely reach 1 meter in length and 7 kilos in weight.



**In case you catch on of these fish or any other unusual species please inform the local Port authorities.**

## Activity 6:

Study the following photos, the posters and the article given to you! What is the main problem discussed? The 6W questions will help you discuss details about the problem in your groups:

**WHO?**

**WHAT HAPPENED?**

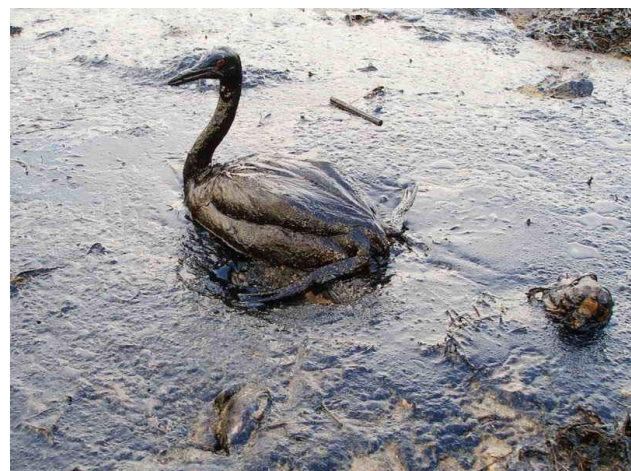
**WHEN?**

**WHERE?**

**WHY?**

**WHICH SOLUTIONS?**











# EUROPE IS THE 2<sup>nd</sup> LARGEST PLASTIC PRODUCER IN THE WORLD

70-130,000 t  
**MICROPLASTICS**  
in the sea/year

fragments <5mm  
enter the food chain  
impacting wildlife and people

150-500,000 t  
**MACROPLASTICS**  
in the sea/year

the **most visible** form  
of plastic pollution

500,000 tonnes of waste fit in

**66,000 TRASH TRUCKS**



OUT OF THE PLASTIC TRAP: SAVING THE MEDITERRANEAN FROM PLASTIC POLLUTION  
© SHUTTERSTOCK / RICH CAREY / WWF - INFOGRAPHIC: BIANCO TANGERINE





MOST PLASTICS ARE NOT BIODEGRADABLE AND **REMAIN IN THE ENVIRONMENT** FOR HUNDREDS OF YEARS



OUT OF THE PLASTIC TRAP: SAVING THE MEDITERRANEAN FROM PLASTIC POLLUTION © JURGEN FREUND / WWF - INFOGRAPHIC: BIANCO TANGERINE



**1 SEA TURTLE OUT OF 2 HAS INGESTED PLASTICS**

Michael OUT OF THE PLASTIC TRAP: SAVING THE MEDITERRANEAN FROM PLASTIC POLLUTION © BRENT STIRTON / GETTY IMAGES / WWF-UK - INFOGRAPHIC: BIANCO TANGERINE

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## The Mediterranean at risk of becoming 'a sea of plastic', WWF warns

Posted on 08 June 2018

Today, plastic represents 95 per cent of the waste floating in the Mediterranean and lying on its beaches.

Rome, Italy – The Mediterranean Sea is turning into a dangerous plastic trap, with record levels of pollution from microplastics threatening marine species and human health, according to a new WWF report released today.

Coinciding with World Oceans Day, the WWF report “Out of the Plastic Trap: Saving the Mediterranean from plastic pollution” raises the alarm on the dramatic effects that excessive plastic use, poor waste management and mass tourism are having on one of the most visited regions in the world.

Bringing together the most recent data and scientific evidence on plastic use in Europe and the many ways in which it impacts marine life, the report presents a detailed roadmap of the urgent actions institutions, businesses and citizens need to take to stop plastic waste from reaching the sea.

“The impacts of plastic pollution in the Mediterranean are also being felt across the world and are causing serious harm both to nature and human health. Worsening plastic pollution will threaten the Mediterranean’s global reputation for tourism and seafood, undermining the local communities who depend on these sectors for their livelihoods. The plastics problem is also a symptom of the overall decline in the health of the Mediterranean and must serve as a rallying call for real action,” said John Tanzer, Leader, Oceans, WWF International.

Today, plastic represents 95 per cent of the waste floating in the Mediterranean and lying on its beaches. Most of this plastic is released into the sea from Turkey and Spain, followed by Italy, Egypt and France, with tourists visiting the region increasing marine litter by 40 per cent each summer.

Large plastic pieces injure, suffocate and often kill marine animals, including protected and endangered species, such as sea turtles and monk seals. But it is microplastics – smaller and more insidious fragments – that have reached record levels of concentration of 1.25 million fragments per km<sup>2</sup> in the Mediterranean Sea, almost four times higher than in the “plastic island” found in the North Pacific Ocean. By entering the food chain, these fragments threaten an increasing number of animal species as well as people.

“In Europe, we produce an enormous amount of plastic waste, the majority of which is sent to landfills, resulting in millions of tonnes of plastic entering the Mediterranean Sea each year. This contaminating flow, combined with the Mediterranean being semi-enclosed, has seen harmful microplastics reach record concentration levels, threatening both marine species and human health,” said Giuseppe Di Carlo, Director, WWF’s Mediterranean Marine Initiative.

“We cannot let the Mediterranean drown in plastic. We need to act urgently and across the whole supply chain to save our ocean from the pervasive presence of plastics.”

According to the report, delays and gaps in plastic waste management in most Mediterranean countries are among the root causes of plastic pollution. Out of the 27 million tonnes of plastic waste produced each year in Europe [1], only a third is recycled; half of all plastic waste in Italy, France and Spain ends up in landfills. Recycled plastics currently account for only 6 per cent of plastics demand in Europe.

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WWF is urging governments, businesses and individuals to adopt a number of actions to reduce plastic pollution in urban, coastal and marine environments in the Mediterranean and globally. These include:

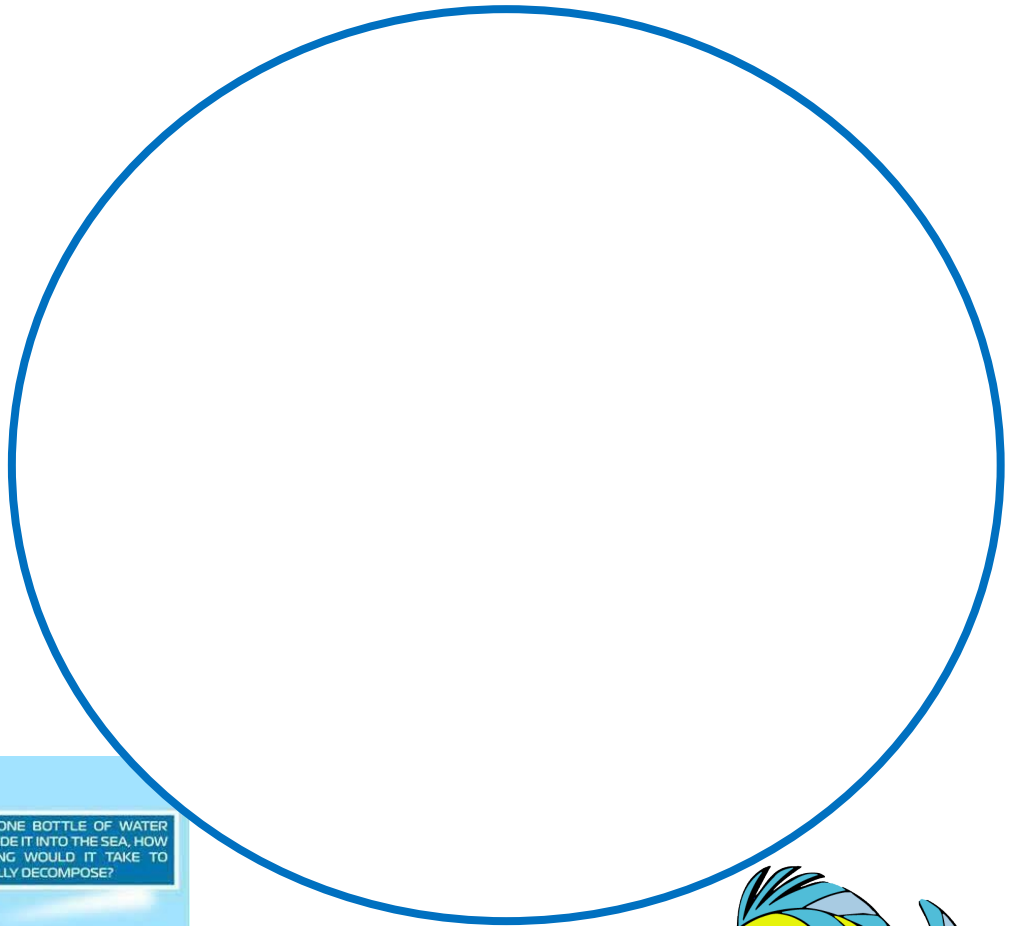
the adoption of a legally-binding international agreement to eliminate plastic discharge into the oceans, supported by strong national targets to achieve 100 per cent plastic waste recycled and reusable by 2030 and national bans for single-use plastic items such as bags.

a call to businesses to invest in innovation and design toward more effective and sustainable plastic use.

“Plastic pollution is too pervasive to be solved by one continent, one government or one industrial sector alone, and it affects us all. It is only by acting together that we can free our oceans, rivers, cities and lives from unnecessary plastic,” concluded Di Carlo.

## **Activity 7:**

Search for plastics and microplastics in the beach. Collect the big plastics and use the following working sheet to identify the microplastics, how long does it take them to decomposed and how they end up in our food.



### HOW LONG UNTIL IT'S DECOMPOSED?

IF ONE BOTTLE OF WATER MADE IT INTO THE SEA, HOW LONG WOULD IT TAKE TO FULLY DECOMPOSE?

- TOILET ROLL: 1 MONTH
- PLASTIC BAGS: 10-20 YEARS
- CIGARETTES: 10 YEARS
- CARDBOARD: 2 MONTHS
- DRINKS CANS: 200 YEARS
- FISH HOOKS: 600 YEARS
- PLASTIC CUTLERY: 100-1000 YEARS
- GLASS: 4000 YEARS
- DIAPERS: 450 YEARS
- SOME PLASTICS: NEVER

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Beauty Shell Inc. EXFOLIATING FACIAL SCRUB NOW WITH MICROBEADS

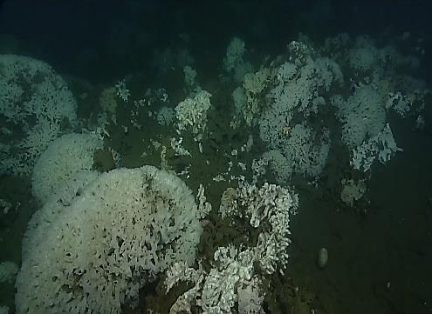





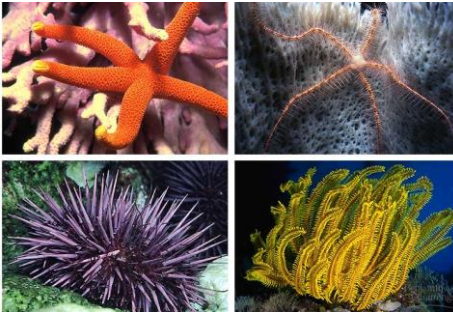
NOW WITH MICROBEADS

NOW WITH MICROBEADS

NOW WITH MICROBEADS

## Activity 8:

Let's find some marine invertebrates. You can discover them either in the sea (if the weather allows swimming), either in little ponds on the rocky sides of the beach, either on the sand! Keep in mind that you will not be able to find them all!!!

<p style="text-align: center;"><b>Sponge</b></p> 	<p style="text-align: center;"><b>Cnidarians</b></p> 	<p style="text-align: center;"><b>Marine Worms</b></p> 
<p style="text-align: center;"><b>Bryozoa</b></p> 	<p style="text-align: center;"><b>Mollusks</b></p> 	<p style="text-align: center;"><b>Arthropods</b></p> 
<p style="text-align: center;"><b>Other</b></p>	<p style="text-align: center;"><b>Echinoderms</b></p> 	<p style="text-align: center;"><b>Other</b></p>

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## Activity 9:

This beach has been awarded the Blue Flag, an exclusive global eco-label awarded to beaches with...

In your groups, investigate the area and decide on the criteria that must be met and maintained in this beach in order to be awarded the Blue Flag. Brainstorm your ideas and then organize and present your ideas in a concept map.