

Reference paper 120 Hours 2020

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Sources:

WWF

National Geographic

Center for Biological Diversity

The Story of Plastic

British Plastics Federation

TRVST

Science Daily

Æra

abc news





20 years



30 years



200 years



400 years

In the first decade of this century, we made more plastic than all the plastic in history up to the year 2000.

Every year, billions of pounds of more plastic end up in the ocean.

Studies estimate that there are now up to 51 trillion pieces of plastic in the ocean — from pole to pole, from the surface to the sea floor.

Not one square mile of ocean surface anywhere on earth is free of plastic pollution.



450 years



500 years



450 years

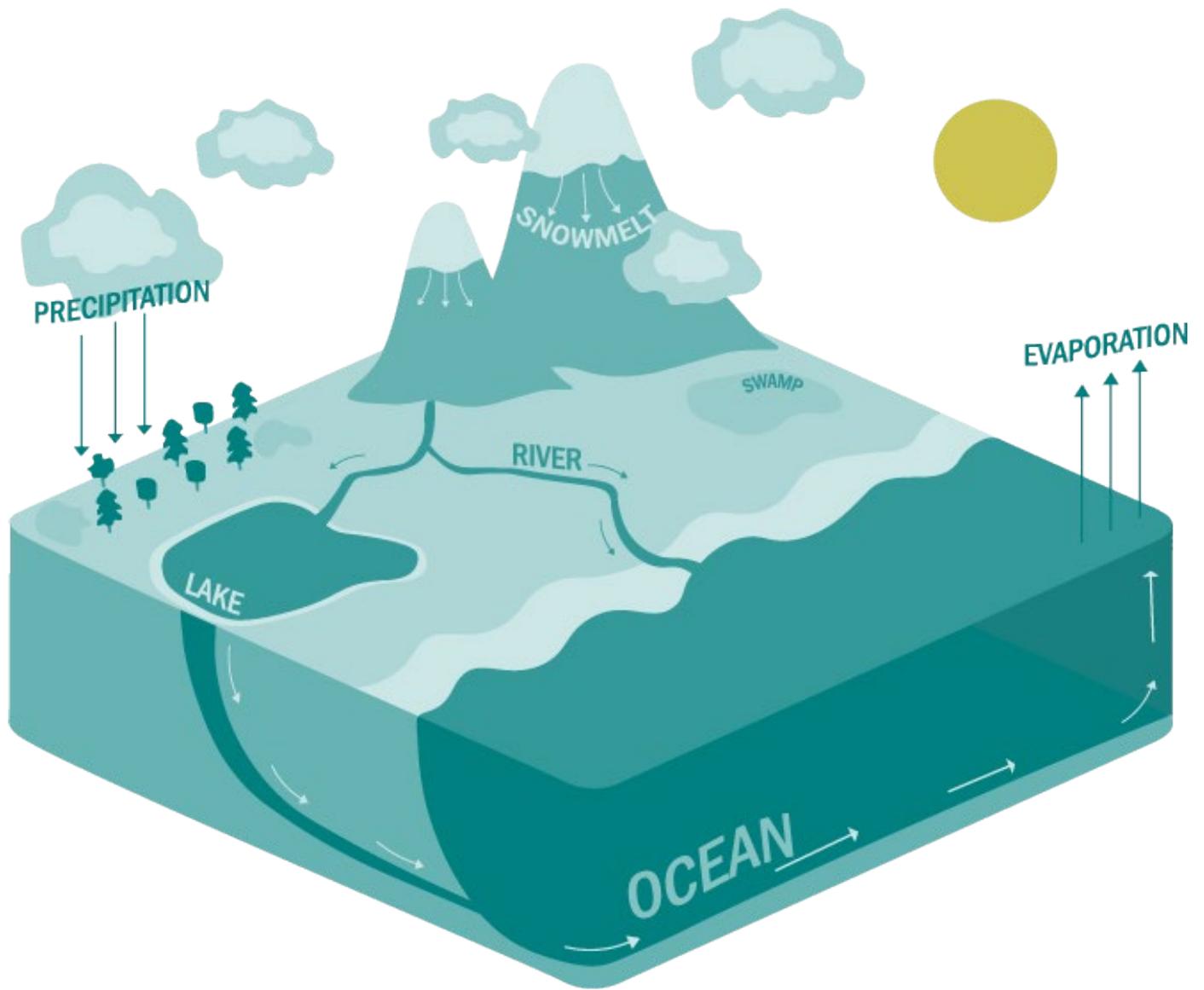


500 years



500 years

The Water Cycle



For ocean you are
and to ocean you will return



94 percent of plastics in the ocean lies underneath the surface.

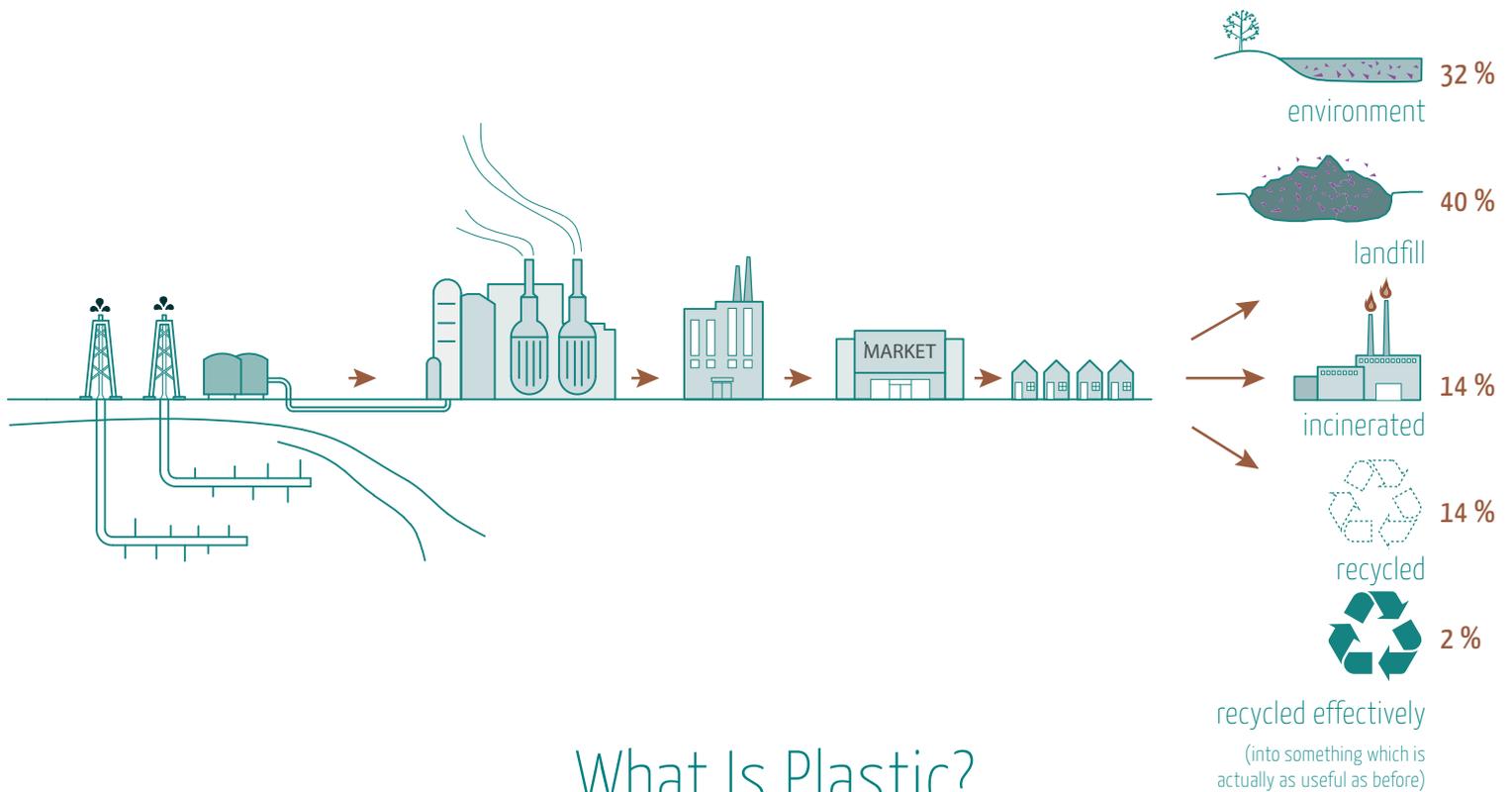
The Water Cycle

The water cycle is the circulation of water between the ocean, the atmosphere and the surface of the earth, such as lakes, rivers and swamps. The cycle is continuous and has no starting point. Every drop of water that exists on land, will at one point in time end up in the ocean - in 10 days, or in 10 millenniums.

Water is in constant motion and alternates between ice, liquid and vapour. The sun, which drives the water cycle, heats water in the ocean. Some of it evaporates as vapour into the air. The vapour eventually condenses and comes down as precipitation (rain, snow, hail).

The water can be contained for a long period of time in glaciers, snow, lakes, and as ground water. This time period can last thousands of years. The melt water from glaciers and snow will either become a part of the earth's groundwater or go directly into the rivers, lakes and ponds. Either way, it eventually reenters the ocean.

Plastic waste becomes a part of the water cycle. In the end it doesn't matter if the plastic is broken up in the forest or in water, if it is burned or eaten. The moment a piece of plastic is able to travel with the winds and water it will most likely end up in our ocean. The cycle of water sees to that.



What Is Plastic?

Plastic is a wonderful material, if you look at it from a design perspective. It is versatile, lightweight, flexible, moisture resistant, strong, and relatively inexpensive. Plastic can be all the colours of the rainbow, and is one of few materials that can be transparent. It is incredibly durable and it can do almost anything.

Plastic can either be *synthetic* or *biobased*. Synthetic plastics are derived from crude oil, natural gas, or coal, whilst biobased plastics come from renewable products such as carbohydrates, starch, vegetable fats and oils, bacteria, and other biological substances.

When we consider the way in which we use plastic, it is clear to see that it has many characteristics. It is a material that we can find in an almost endless number of applications. Despite this, we can put the different types of plastic into two groups known as *thermoplastics* and *thermosets*.

Most of the plastics we know are thermoplastic. Several things in our everyday life are made of thermoplastics, such as food packaging, LEGO, and drinking bottles. Once it has been made, we can heat it and reform it as many times as we wish. Its ability to be reformed is crucial in the life cycle of plastic as it helps the recycling process and enables us to reduce the amount of plastic that we manufacture.

The other main type of plastic, thermosets, cannot be reheated. Therefore, thermosets cannot be reused and is almost impossible to recycle.



When Does Plastic Become Pollution?

Plastic waste, or plastic pollution, is the accumulation of plastic objects in the Earth's environment that *adversely* affects wildlife, habitats, and humans. Basically any plastic object can end up as plastic waste.

There is a moment in the life of a plastic object when it is transformed from being a functional object, to being pollution. What is that moment?

There are different perceptions of when this moment happens. It might happen today, it might happen in five hundred years. Some will say that when the object has fulfilled its function, or lost its function, it becomes garbage. An example of this can be your shampoo bottle. Once the bottle is empty, it becomes garbage.

The consumers are often blamed for littering, but most people claim they don't litter. How does trash still end up in the wrong places daily?



Life span

20 years



Average time in use

12 minutes

Our Plastic Behaviour

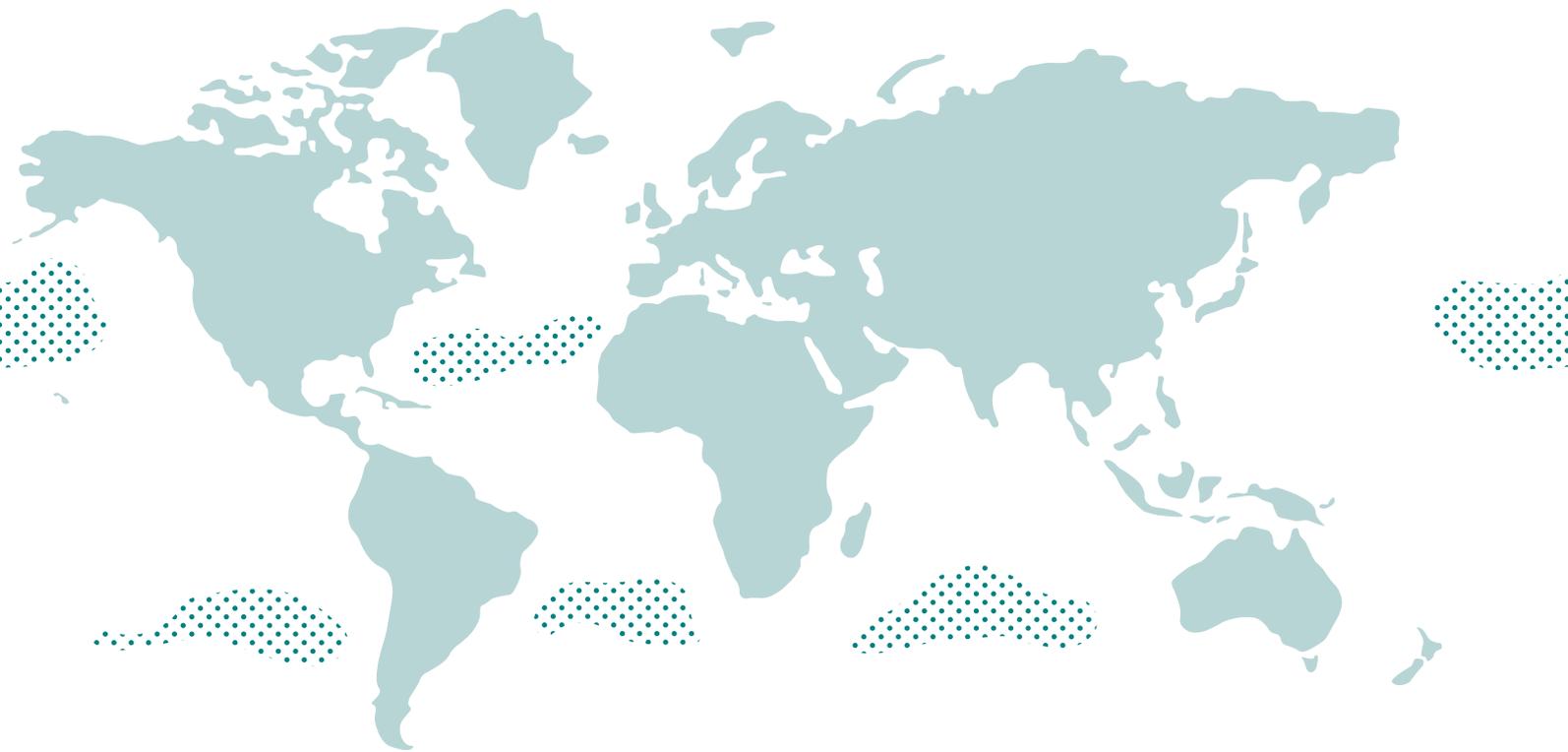
We throw trash in full trash cans. We throw trash in the wrong kind of trash can, making them even fuller. We miss the trash can. We sort out the things that have value, and place them visibly so someone who has lost it or wants it takes it with them. We forget our coffee cups at the bus stop. And the things that are small enough, we leave behind because they ‘don’t matter’.

And when the system doesn’t answer people’s needs, the people find their own solutions. We place things that are too big for our pockets in visible places so someone cleans it up. We make our own trash cans. We make our own ashtrays, because we don’t want to set the trash cans on fire. We make our own recycling stations on the streets.

Most people don’t litter on purpose, but we do things that lead to littering. People don’t really know how littering happens and what trash is. They’re not conscious about the fact that they are littering. In urban contexts, when people do litter consciously, we do it knowing that someone will come clean up. And people see the large pieces of garbage disappearing, whilst we don’t notice the small pieces.

It is too easy to blame the consumers when the system is inconsiderate of our habits and needs. Littering happens in the interaction between people, the system, and the surroundings.

Nobody manages to clean up all there is of trash. They prioritize that which is most visible. The small pieces of garbage are left behind, and this is the trash that most often ends up in the ocean.



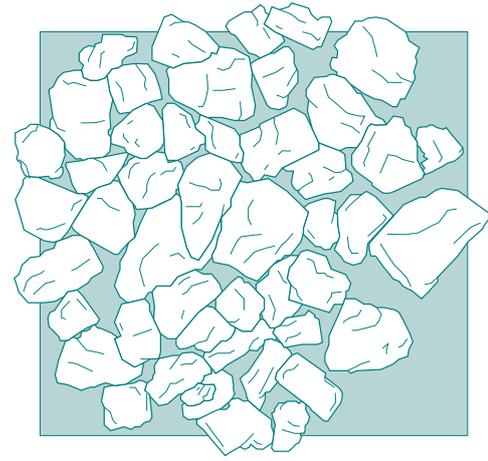
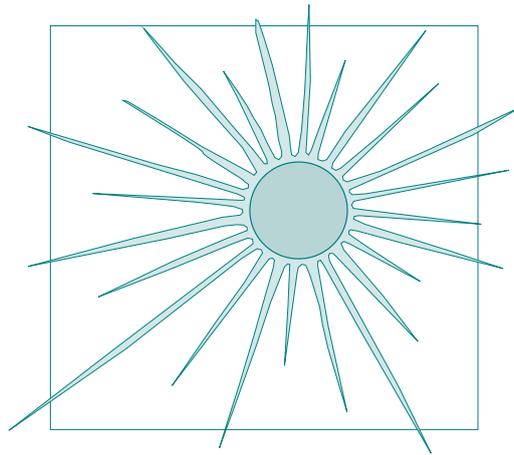
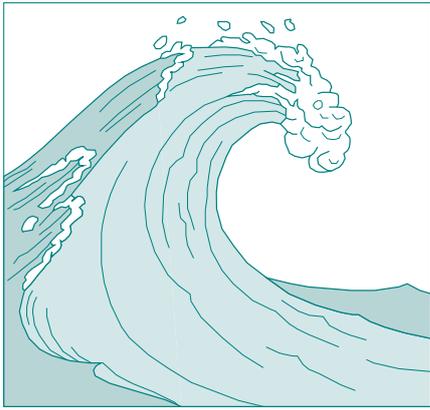
The Great Ocean Garbage Patches

Unfortunately, plastic is so durable that the EPA reports “every bit of plastic ever made still exists.” All five of the Earth’s major ocean gyres are inundated with plastic pollution. The largest one has been dubbed the Great Pacific Garbage Patch.

The Great Pacific Garbage Patch is a collection of marine debris in the North Pacific Ocean, spanning waters from the west coast of North America to Japan.

About 54 percent of the debris in the Great Pacific Garbage Patch comes from land-based activities in North America and Asia. The remaining 20 percent of debris in the Great Pacific Garbage Patch comes from boaters, offshore oil rigs, and large cargo ships that dump or lose debris directly into the water. The majority of this debris—about 705 000 tons—is fishing nets. More unusual items, such as computer monitors and LEGOs, come from dropped shipping containers.

For many people, the idea of a ‘garbage patch’ conjures up images of an island of trash floating on the surface of the ocean. In reality, these patches are almost entirely made up of tiny bits of plastic, called microplastics. Microplastics can’t always be seen by the naked eye. Even satellite imagery won’t show a giant patch of garbage. The microplastics of the Great Pacific Garbage Patch can simply make the water look like a cloudy soup. This soup is intermixed with larger items, such as fishing gear and shoes.



Plastic breaks up by the motion of waves, the ultraviolet light from the sun, and the salt in the ocean.

Microplastics

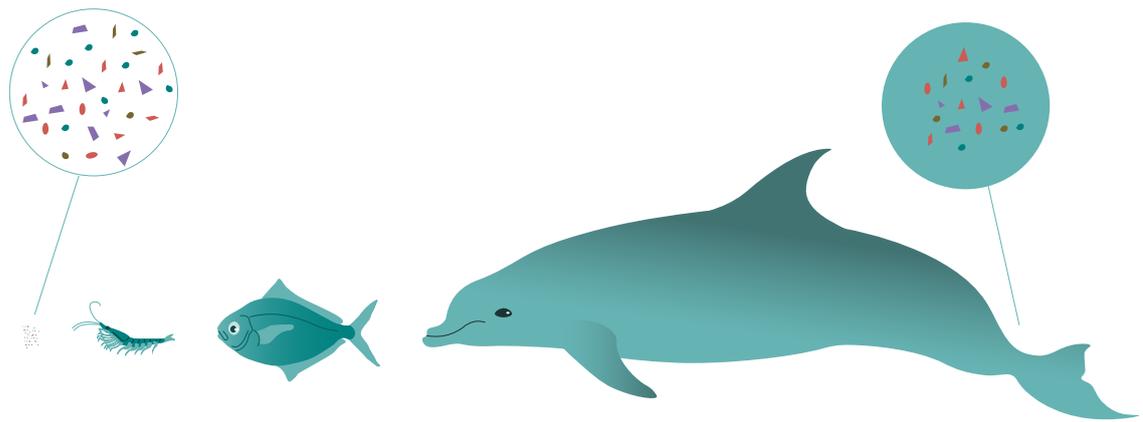
Plastic does not break down; it breaks up.

Plastic breaks up into smaller and smaller pieces, until it eventually turns into what we call microplastics. Microplastics are not a specific kind of plastic, but rather any type of plastic fragment that is less than 5 mm in length. Microplastics can be so tiny that they blend with the dust that blows around the earth. This has been observed all over the globe, from the Arctic to the Sahara.

There are two basic kinds of microplastics: *primary* and *secondary*.

Primary microplastics, such as microbeads used in personal care products or the pellets used in plastics manufacturing, are intentionally manufactured small.

Secondary microplastics are when larger pieces of plastic break up into smaller and smaller pieces. Once a piece of plastic enters the sea, sunlight, wind, waves, and salt break down the plastic waste into microplastics.

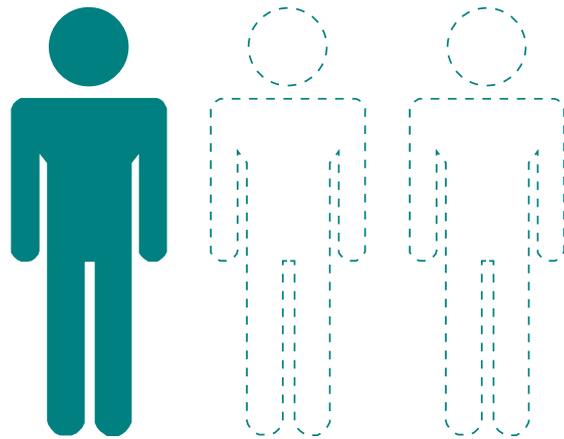


Microplastics In The Food Chain

Scientists are still sorting out the central question underlying the research: what harm does ingesting microplastics cause to human health? Microplastics have been detected in drinking water, salt, and other food. So far, no harm has been demonstrated, but this is due to lack of research. Doctors have observed alarming connections between plastic and health in humans in areas with high levels of plastic pollution (we recommend watching *The Story of Plastic*).

But for fish and other marine and freshwater wildlife, studies find that microplastics disrupt reproductive systems, stunt growth, diminish appetite, cause tissue inflammation and liver damage, and alter feeding behavior. A study shows that plastic particles in water may end up inside fish brains. The plastic can cause brain damage, which is the likely cause of behavioral disorders observed in the fish.

Some organisms consume more microplastics than plankton. They are eventually eaten by fish. The fish are eaten by larger fish and marine mammals, like dolphins. At this point in the food chain, the plastic is so small that it is found not only in the dolphin's stomachs, but all over their bodies, for instance in their skin. This means that you can probably find some microplastics in the skin of many humans as well.



1 of 3 humans get their main source of protein from the ocean.

How Does Plastic Harm The Ocean?

Thousands of animals, from small finches to blue whales, die grisly deaths from eating and getting caught in plastic.

Fish in the North Pacific ingest 12 000 to 24 000 tons of plastic each year, which can cause intestinal injury and death and transfers plastic up the food chain to bigger fish, marine mammals, and human seafood eaters. A recent study found that a quarter of fish at markets in California contained plastic in their guts, mostly in the form of plastic microfibers.

Sea turtles can mistake floating plastic garbage for food. They can choke, sustain internal injury and die — or starve by thinking they're full from eating plastic. Tragically, research indicates that half of sea turtles worldwide have ingested plastic.

Hundreds of thousands of seabirds ingest plastic every year. Plastic ingestion reduces the storage volume of the stomach, causing starvation. It is estimated that 60 percent of all seabird species have eaten pieces of plastic, with that number predicted to increase to 99 percent by 2050. Dead seabirds are often found with stomachs full of plastic, reflecting how the amount of garbage in our ocean has rapidly increased in the past 40 years.

Marine mammals also ingest, and get tangled up in, plastic. Large amounts of plastic debris have been found in the habitat of critically endangered Hawaiian monk seals, including areas that serve as pup nurseries. Entanglement in plastic debris has also led to injury and mortality in the endangered Steller sea lion, with packing bands the most common culprit. Dead whales have been found with bellies full of plastic.



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