



Helena Haraštová • Diarmuid Ó Catháin



ALL ABOARD!

# SUBMARTINES

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Albatros

SUBMARTINES





# Before we go aboard

Since time immemorial, humans have longed to discover the undersea world. Although deep-diving submersibles have made great progress, **we know barely 1/10<sup>th</sup> of the ocean bed.**

Oceans cover **3/4 of our planet's surface.** So why is our planet known as Earth and not Sea?



## Dangerous pressure

It is so difficult to explore the ocean deep because of **hydrostatic pressure.** This force presses down on all objects in water. The deeper the water, the greater the pressure! It is as though you were carrying the whole weight of the world on your back.



As we get deeper and deeper, ever less **sunlight** reaches us. Its typical reach is no more than 650 feet, which is merely half the height of the Empire State Building. Most water in the ocean lies in perfect darkness.

As the light fades, the **water temperature** drops rapidly. Creatures of the deep must cope with temperatures only just above freezing. *Brrr...*



## How to build a submarine

As research submarines must be equipped to deal with whatever dangers may await below the surface, they are very difficult and expensive to make.

The **OUTER SHELL** is made of durable metals like titanium or steel, which are resistant to cold temperatures.

The pressure within the **CABIN** is at the level the researchers are used to.

Space for the crew is protected by a second, **INNER HULL.**

High-intensity **LIGHTS** allow the crew to inspect life in the ocean.

A clever **ROBOTIC MANIPULATOR** takes samples from the seabed or the water.

SONAR sends out sound waves.

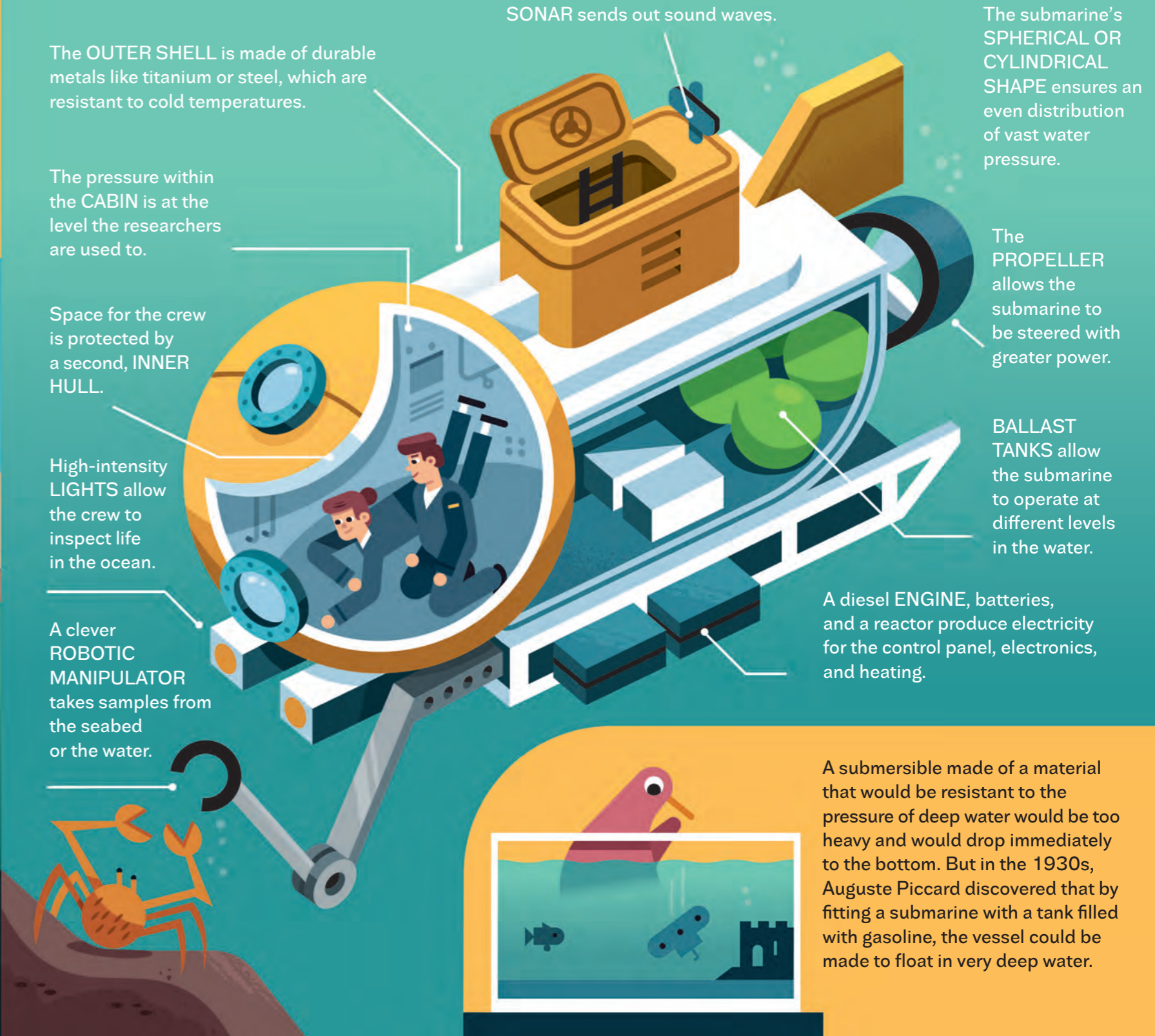
The submarine's **SPHERICAL OR CYLINDRICAL SHAPE** ensures an even distribution of vast water pressure.

The **PROPELLER** allows the submarine to be steered with greater power.

**BALLAST TANKS** allow the submarine to operate at different levels in the water.

A diesel **ENGINE**, batteries, and a reactor produce electricity for the control panel, electronics, and heating.

A submersible made of a material that would be resistant to the pressure of deep water would be too heavy and would drop immediately to the bottom. But in the 1930s, Auguste Piccard discovered that by fitting a submarine with a tank filled with gasoline, the vessel could be made to float in very deep water.





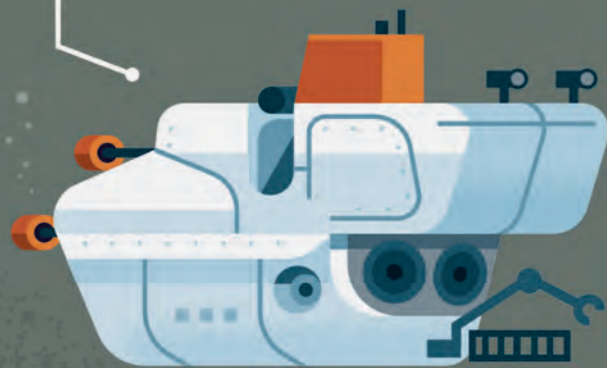
# Human creations in the deep

Slowly but surely, humans are penetrating to the deepest parts of the world's oceans. They build incredibly sophisticated machines that perform their work flawlessly in extreme conditions. So what are these machines?

## Which deep-submergence vehicles have broadened our knowledge of the oceans?

### 1 Alvin

One of the oldest functional submarines still in use. Since entering operation in 1964, it has made over 4,600 dives. In 1966, *Alvin* even helped recover a hydrogen bomb from the bottom of the Mediterranean Sea!



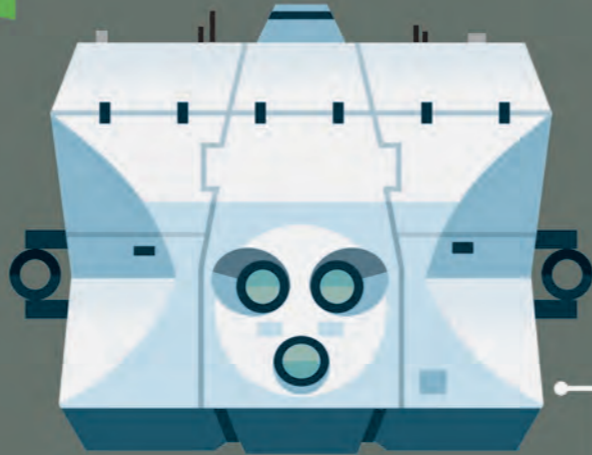
### 2 Deepsea Challenger

In 2012, this cigar-shaped mini-submarine (it is only 24 feet long) transported James Cameron, the famous film director, to the Mariana Trench.



### 3 Limiting Factor

This mini-submarine for 2 people has gradually conquered the five deepest known undersea trenches. It was the first human creation to manage repeated deep dives.



## Tourist submarine

For the enthusiastic amateur, this mini-submarine with a partially glazed bottom is just the thing. It will take you about 1,300 feet below the surface.



## Deep-submergence vehicle

Forget the bathyscaphes of old: this is a state-of-the-art underwater champion! Deep-submergence vehicles can dive several miles under the surface. They have excellent orientation capability, allowing them to control their own movement and conduct independent research.



## Remotely operated underwater vehicle (ROV)

Remote-controlled robotic vehicles are used in deep, dangerous places. They can enter narrow openings in rock. As well as filming undersea life, they perform repair work on oil rigs and attach ropes to sunken wrecks. Their super-precise robotic hands are perfect for collecting samples.



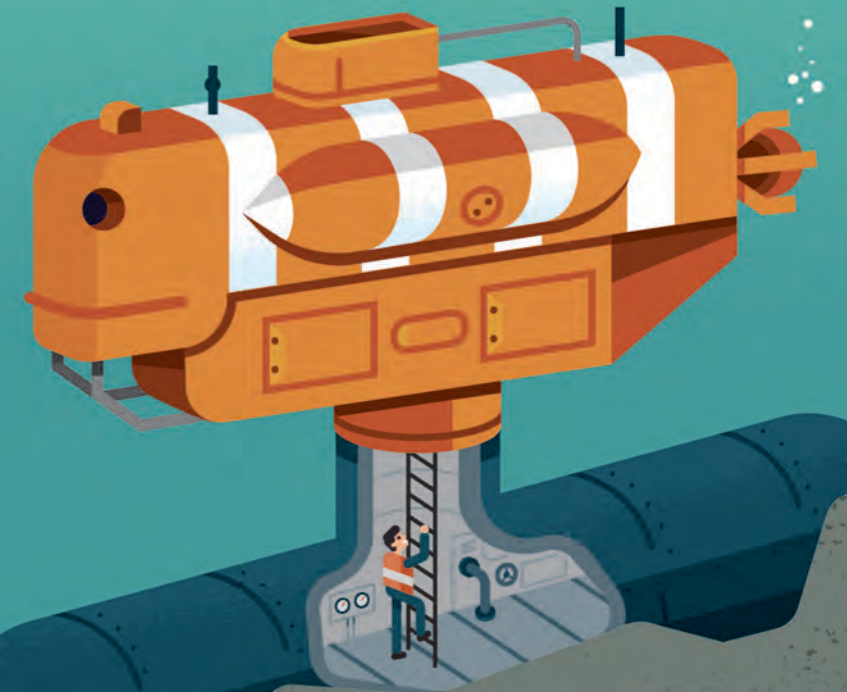
## Ocean glider

This small unpowered machine measures the temperature and salinity of the water, charts sea currents, records sound, and even helps to forecast hurricanes.



## Deep-submergence rescue vessel

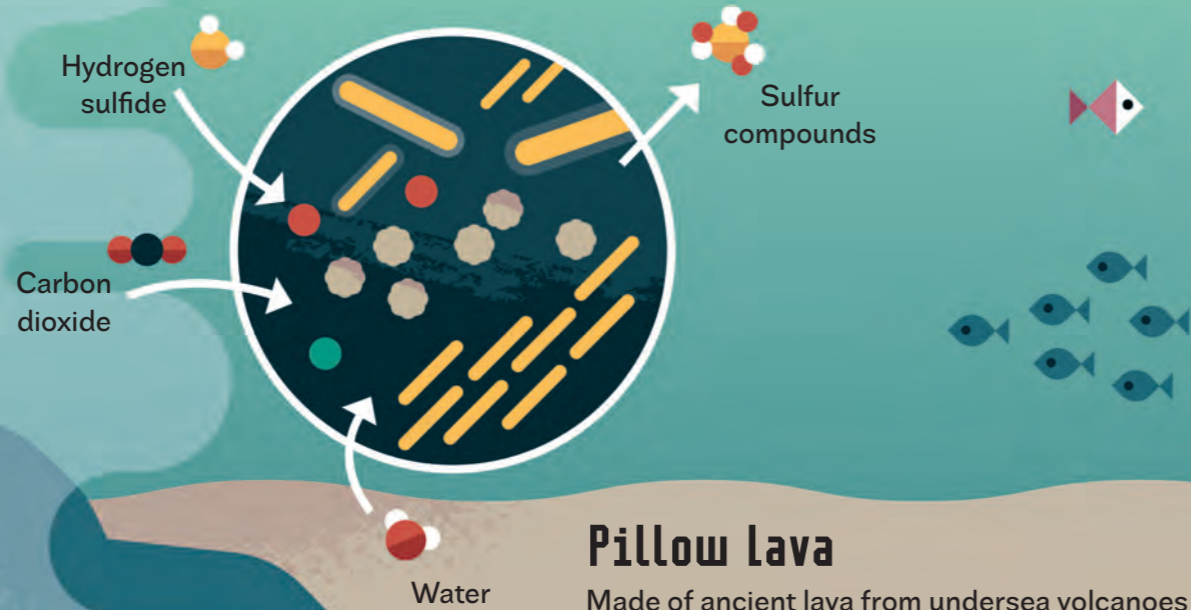
When a submarine breaks down in the deep, its crew members cannot simply swim away. But help may be at hand from a deep-submergence rescue vehicle.





# Life in the deep

How can there be life in the absence of sunlight? Well, it begins with tiny bacteria. Bacteria thrive near undersea faults, where the water is rich in metallic elements and sulfur compounds from inside the Earth. Bacteria can trigger a complex chemical reaction known as **chemosynthesis**, during which toxic sulfur compounds form organic substances crucial for higher life forms, such as mollusks, echinoderms, annelids, and predatory fish.



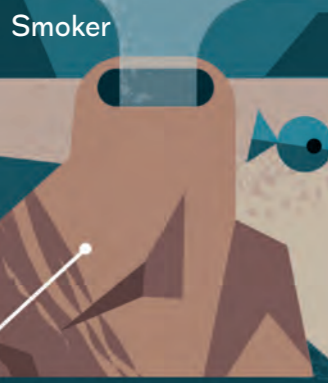
In the past, people measured the depth of the sea using a plumb line dropped from a ship. Today we use sonar (a device that sends sound signals downwards) to measure the sea's depth and to determine the exact contours of the seabed. We have truly come a long way!



I feel as if I've traveled back in time!



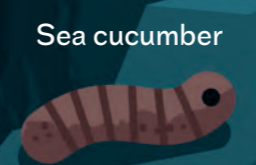
**Crinoid**  
Although a crinoid looks like a plant, it is actually a predatory animal. It has remained practically unchanged since prehistoric times!



**Pillow lava**  
Made of ancient lava from undersea volcanoes cooled by cold water, these pillows would not be very pleasant to lie on. *Ow!*



**Black and white smokers**  
These unremarkable-looking vents – called **black smokers** and **white smokers** – constantly spew out very hot water (up to 750 °F). The water comes from inside the Earth. It is extremely acidic and delivers **highly toxic substances** to the seabed. This place is home to 3,000 times more creatures than anywhere else in the ocean! They have learned to make use of the toxic substances and the hot water.





# Color in the ocean

Just below the ocean's surface, Karl encountered beautiful coral reefs. They are known as "rainforests of the ocean" for good reason: although they occupy only a tiny proportion of the world's waters, they are home to about a quarter of all marine life.



## What are corals?

Corals are creatures that form hard protective shells of calcium carbonate. Calcium carbonate acts as a kind of glue by which whole colonies of polyps stick together.

## Karl, we have a problem!

Corals are very sensitive to the temperature and salinity of the sea. Today, the climate crisis, unsuitable farming, overfishing, and the use of sunscreens all contribute to the corals suffering, turning white, and even dying at an alarming rate.



## Pride of the tropics

To live happily, corals need warm, sunlit water, which explains why they thrive most in the tropics. The world's largest coral reef – the **Great Barrier Reef** – stretches along the east coast of Australia for an amazing 1,600 miles.



# Icy Waters

In the icy waters around the North and South Poles, the deep water is hidden under an impenetrable layer of ice.

Life in the deep is explored with the help of robotic mini-submarines adapted for conditions where the pressure is high and the temperature is low.

## The most interesting inhabitants of the Arctic



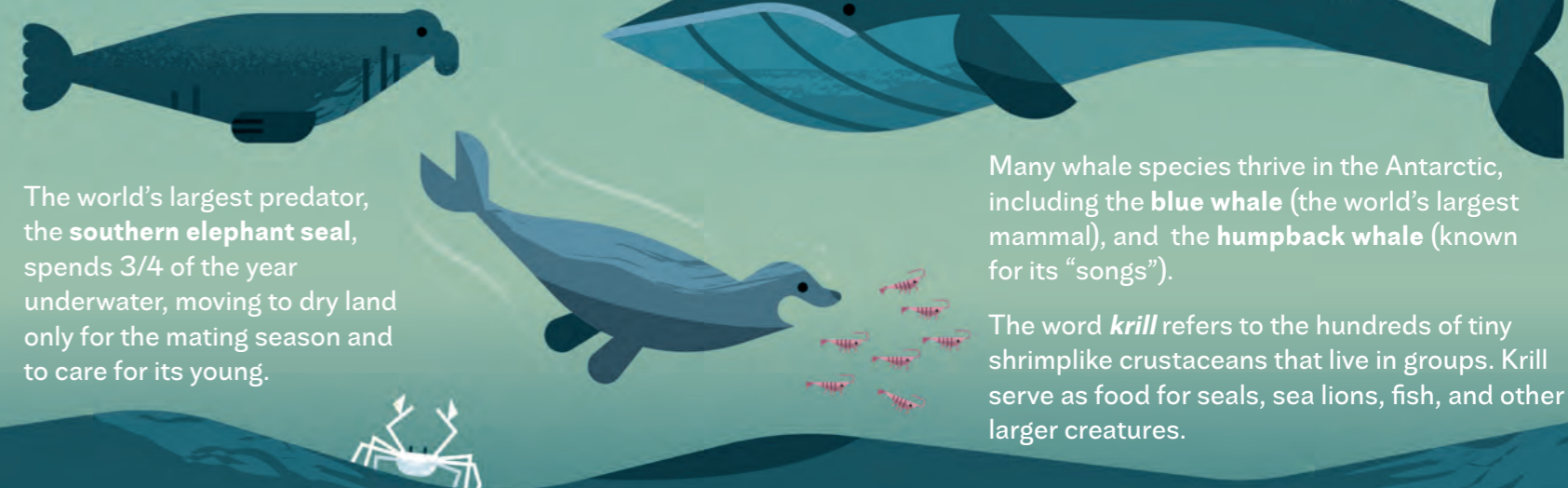
What's this?  
A sea unicorn?

This majestic creature is a **narwhal**. Its long "horn" is actually an elongated left canine tooth.

The **beluga whale** lives in groups whose members communicate by constant whistling, whimpering, and chirping.

The **Greenland shark** can grow to a length of 21 feet. It commonly lives for around 200 years!

## The most interesting inhabitants of the Antarctic



The world's largest predator, the **southern elephant seal**, spends 3/4 of the year underwater, moving to dry land only for the mating season and to care for its young.

Many whale species thrive in the Antarctic, including the **blue whale** (the world's largest mammal), and the **humpback whale** (known for its "songs").

The word **krill** refers to the hundreds of tiny shrimplike crustaceans that live in groups. Krill serve as food for seals, sea lions, fish, and other larger creatures.



**Congratulations!**

You are now a true undersea researcher. Climb aboard!  
We're going down!







Are you interested in the ocean and its mysterious inhabitants? Would you like to go underwater to see the fish, octopuses, jellyfish, and sharks for yourself? Do you dream of traveling to the dark depths of the seabed?



Karl the kiwi bird says yes to all these questions. He is forever looking at the calm surface of the ocean, imagining that one day he will explore the underwater world up close and in detail.



Come join Karl on a research submarine and discover the glories and secrets of the ocean – and so much more! Plus, you will learn which machines people use for their watery travels, how a submarine works, why deep oceans remain unexplored, and what kinds of superpowers the inhabitants of the deep have.



All aboard! We're going down!



Check out the other titles in this series:



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