



# BEYOND SIGHT: THE EXTREMES OF THE OCEAN

MOST OF US WILL NEVER VISIT THE MAJORITY OF THE OCEAN – SO LET'S EXPLORE IT'S EXTREMES IN THIS GUIDE!

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*Caroline Hattam, Plymouth Marine Laboratory*

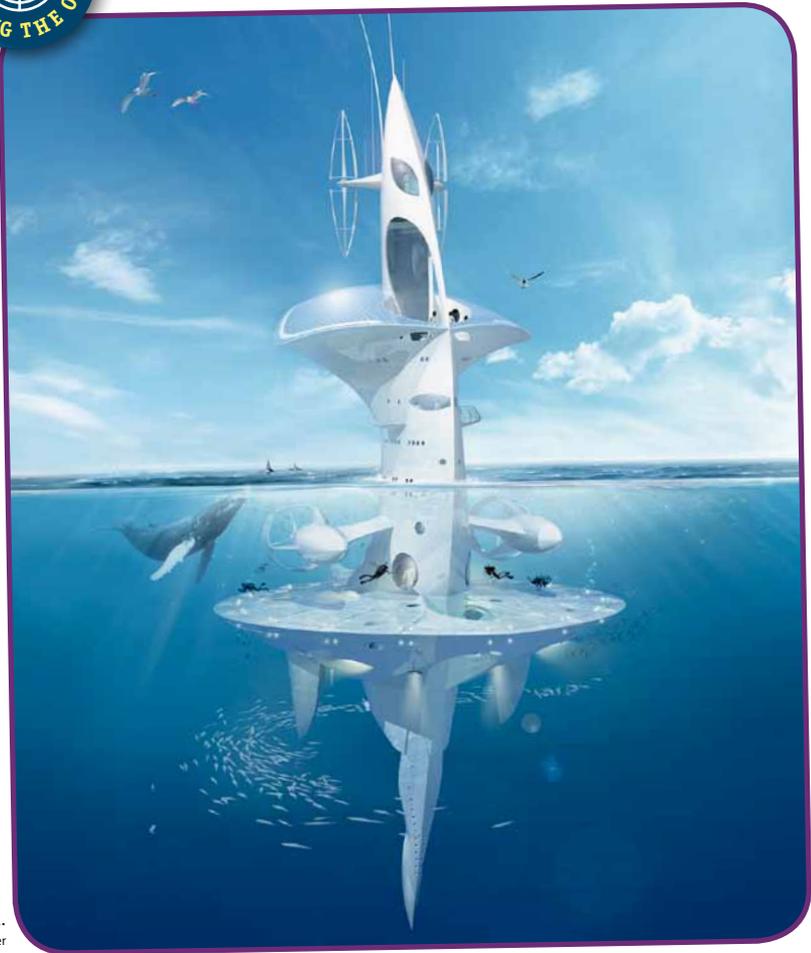
Most of us only experience the ocean when we go to the coast, or perhaps if we take a ferry journey. We may just get a glimpse of its vast expanses in a documentary on the television. Even modern day **seafarers**, such as explores or people who work at sea, will only ever see a small fraction of the ocean.

# EXPLORING THE OCEAN



Humans have visited less than 10 percent of the ocean. This means that we know very little about the other more than 90 percent, which is still unexplored! While the technology exists to send people to the Moon, much of the equipment needed to explore beyond the **coastal zone** is still in development. This is because reaching the bottom of the ocean is not unlike travelling to the Moon – it requires a lot of specialist technology and an awful lot of money! It was only in 2012 that the technology was available for the first solo descent to the bottom of **Challenger Deep** (the deepest point of the ocean) and you can find out more about this in Chapter 13.

A GRAPHIC RENDITION OF THE SEAORBITER.  
© Jacques Rougerie, SeaOrbiter



This may begin to change with the construction of floating oceanographic laboratories, such as the SeaOrbiter. Like an ocean-going space station, the SeaOrbiter will have laboratories and living space under the water's surface. It will allow scientists to spend extended periods under the ocean's surface to learn more about life and conditions there.



## MODERN OCEAN EXPLORERS

Humans have been ocean explorers for thousands of years, as we learnt in Chapter 3, but there are some notable recent ocean explorers who have changed the way with think about the oceans:

### Jacques Cousteau

(1910-1997)

oceanographer,  
film-maker

and underwater explorer: he made expeditions to the Mediterranean, the Red Sea and the Indian Ocean and brought the ocean to people's living rooms through more than 120 television documentaries and 50 books. He also founded the Cousteau society which aims to help protect the ocean from the dangers of human activity.



### Jacques Piccard

(1922-2008)

oceanographer  
and engineer:

he designed and developed underwater vehicles for studying the ocean and, together with Lt. Don Walsh, was part of the first manned exploration to the bottom of **Challenger Deep**. They surprised the scientific community when they observed fish and shrimps at the bottom of the ocean, as scientist thought no life could survive the pressure at this depth. This discovery led to the prohibition of the dumping of nuclear waste in ocean trenches.

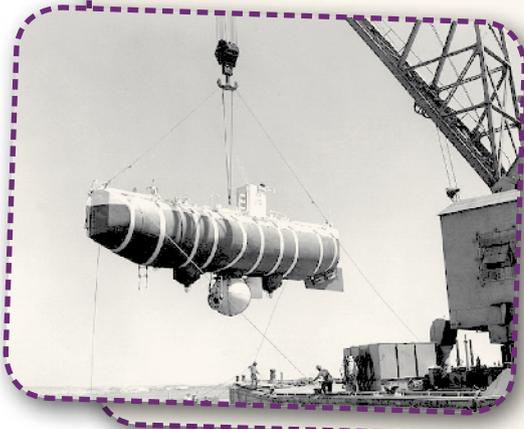


### Sylvia Earle

(1935-present)

oceanographer,  
aquanaut, author  
and former chief

scientist of NOAA (National Oceanic and Atmospheric Administration, USA): she has led over 70 marine expeditions including more than 6 500 hours underwater. In 1970 this included the Tektite 2 project where she and four other women spent two weeks underwater at a depth of 15 metres, living in a specially designed 'underwater **habitat**' from where they could study ocean life and the effects of living underwater on the human body. In 1979 she also walked for two and a half hours at 381 metres underwater in a pressurised metal suit, similar to a space suit, with only a communication line connecting her to a submersible.



TRIESTE, ONE OF THE MOST IMPORTANT DEEP-DIVING RESEARCH BATHYSCAPHES.  
© US Navy

## SUPPORTING **LIFE** ON EARTH

Much of the ocean we don't see is cold (and some of it frozen), unimaginably deep, and a long way from land. These ocean extremes are exceptionally important to life on Earth and therefore also human existence. They provide a multitude of **ecosystem services**.



THE FROZEN OCEAN.  
© Nat Wilson, Flickr

The frozen oceans of the Arctic and Antarctic affect the **climate** of the entire planet, influencing the currents of the **Thermohaline Circulation** that transport heat around the Earth. The ocean's ice sheets also provide unique **habitats** for marine life such as microorganisms, fish, mammals and birds.

The thin sunlit zone of the upper ocean is home to millions upon millions of microscopic life forms that contribute to the oxygen in our atmosphere. The wind-driven **surface currents** in this ocean zone help to transfer **nutrients** and life around the planet. This zone is also important for shipping and fisheries.

The vast deep sea is central to the recycling of **nutrients** that supports life in the rest of the ocean. It is being explored as a source of new resources, such as minerals, oil and gas, and deep sea fisheries. Biotechnology companies (companies that use living **organisms** to create useful products) are also interested in the deep sea as the **organisms** living there could provide solutions to medical and engineering problems.



# HOW **PEOPLE AFFECT** THE EXTREMES

Despite the fact that most of these ocean extremes have never been visited by humans, the impact of human activities is felt throughout the ocean.

For example:

- Plastics are particularly problematic and are found on the seabed and in the **water column** from the Arctic to the Antarctic.
- Many pollutants, such as DDT (a chemical compound used as an insecticide on farms) and heavy metals, are found throughout the marine environment, even in Arctic sea ice.
- Fishing is altering the structure of marine **food chains** by removing **species** and it is changing fragile marine **habitats**, such as deep sea coral **reefs**, **seamounts** and **sponge** fields.
- The impact of deep sea resource extraction is unknown, but scientists are concerned that mining activities could harm **habitats** about which we know very little.

FIRE BOAT RESPONSE CREWS BATTLE THE BLAZING REMNANTS OF THE OFFSHORE OIL RIG, DEEPWATER HORIZON, ON APRIL 21, 2010.  
© US COAST GUARD



PLASTIC SANDWICH BAG FLOATING IN THE WATER COLUMN. FISH THAT FEED ON VARIOUS SALPS, JELLYFISH, ETC. MISTAKE SUCH GARBAGE FOR FOOD AND MAY TRY TO EAT IT WITH FATAL CONSEQUENCES.

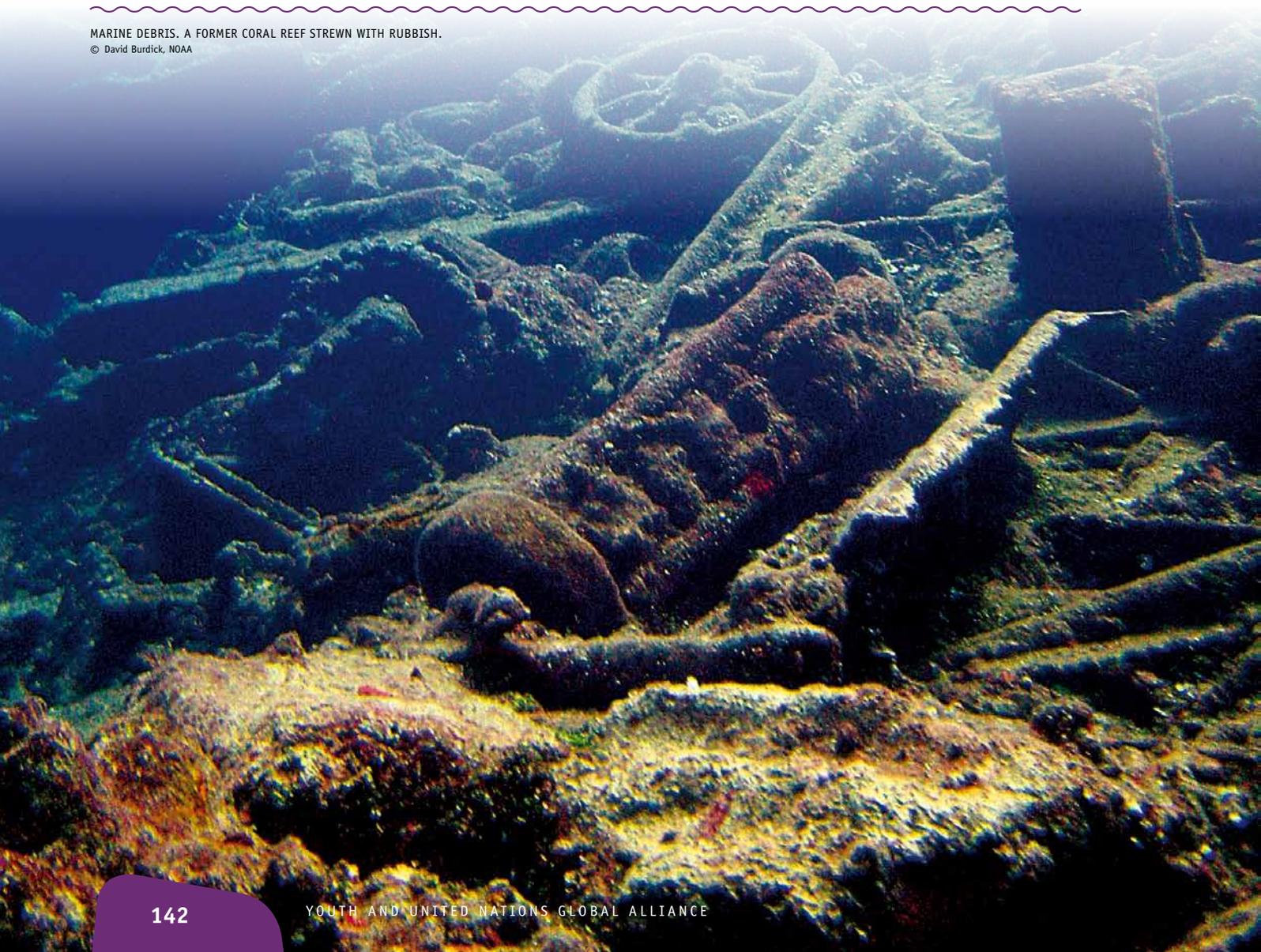
© Ben Mierement, NOAA

Who takes responsibility for these vast, distant areas of ocean is constantly in question. There are international **Conventions** that define the rights and responsibilities of

countries using the world's ocean, such as the **UN Convention on the Law of the Sea**, but people's use of the sea is changing. International legislation and regulations

therefore need to adapt to prevent the overexploitation of resources and the protection of **species, habitats** and other undiscovered treasures.

MARINE DEBRIS. A FORMER CORAL REEF STREWN WITH RUBBISH.  
© David Burdick, NOAA



## CONCLUSION

It is not just the coastal ocean that we need to take care of, but the global ocean as a whole. Managing the ocean, however, is challenging because no one country has responsibility for it: countries, communities and individuals need to work together for a common goal.

The following chapters introduce the frozen ocean, the sunlit zone and the deep sea. They explain why these ocean extremes are important to humans, how we are using them and how scientists are trying to learn more about these challenging environments.

## LEARN MORE

- :: BBC Nature: [www.bbc.co.uk/nature/habitats/Deep\\_sea](http://www.bbc.co.uk/nature/habitats/Deep_sea)
- :: BBC One Frozen Planet series: [www.bbc.co.uk/programmes/b00mfl7n](http://www.bbc.co.uk/programmes/b00mfl7n)
- :: MarineBio The Open Ocean: <http://marinebio.org/oceans/open-ocean>
- :: WWF Oceans: Threat and Management: [wwf.panda.org/about\\_our\\_earth/teacher\\_resources/webfieldtrips/oceans\\_threat](http://wwf.panda.org/about_our_earth/teacher_resources/webfieldtrips/oceans_threat)