

# The ARCTIC

By Carla Yorukoglu

The Arctic is beautiful and awe-inspiring. It is also a vital element of the Earth's climate system, helping to regulate global temperatures. Warm water comes into the region by strong currents from the Atlantic and Pacific, where it cools, sinks and eventually returns to the global oceans. During the long dark winter, heat is lost to the atmosphere and the central Arctic Ocean begins to freeze.

But the Arctic is witnessing the direct effects of climate change at an alarming rate. So what do we currently know about the changing Arctic?

- Arctic temperatures are rising twice as fast as the global average.
- Trees, shrubs and sea life are spreading north.
- Sea ice is rapidly shrinking and thinning.
- The ice-free season is getting longer.
- Ice is melting in areas that never used to thaw.

These changes affect biodiversity and local communities, but also have global effects via climate change and sea-level rise.

## A pristine Arctic?

### The impact of plastic pollution

Plastic pollution is a worldwide issue. Enough plastic waste to fill eight Wembley Stadiums enters the oceans each year, and even the most remote water and shorelines of the Arctic are vulnerable to contamination. These plastics reach the Arctic and become trapped in ice as it forms, and then released upon melting.

Plastic waste threatens the lives of marine mammals and other wildlife. Seals, polar bears and whales ingest the tiny particles of plastic and can get tangled in plastic bags, ropes and netting.

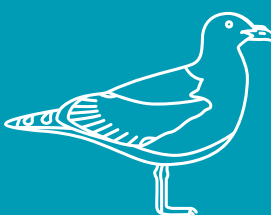
## Scientists are working hard to save our planet from a sea of plastic



4,000 fewer tonnes of plastic enters our oceans each year thanks to the 2018 UK ban on microbeads from cleaning products and some cosmetics, which was informed by NERC research.



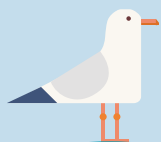
Single-use plastic bag sales have fallen by 86% since the introduction of the 5p plastic bag charge across the UK between 2011 and 2015. The policy introduced in England featured references to NERC research.



**+90%**

More than 90% of fulmars, one of the main seabirds foraging in the Arctic, have been found with plastic in their gut. This affects their ability to feed.





The BAS Twin Otter is a high-wing, twin-engine aircraft.



The Arctic Research Station is open from March through to September.



## Planes, ships and research stations

Researchers need safe and capable equipment to operate in the Arctic, and NERC-funded resources help them to do this:

### Aircraft

Aircraft operated by the British Antarctic Survey, such as the Twin Otters and the larger Dash-7, are used for scientific research in the Arctic, as well as in the Antarctic. These aircraft have been specially modified to carry a range of externally mounted sensors, and the associated monitoring and recording equipment inside.

### RRS *Sir David Attenborough*

To carry out ambitious research cruises in the Arctic, we need ice-strengthened vessels like the RRS *Sir David Attenborough*. These vessels help to generate new knowledge and understanding about the societal implications of environmental change, from the atmosphere to the sea-bed. The RRS *Sir David Attenborough* will operate in the Arctic in the northern summer, providing researchers with access to a range of specialist laboratories, facilities and instruments.

### Arctic Research Station

The UK's Arctic Research Station provides researchers with access to the international research community in Ny-Ålesund, Svalbard. With accommodation, laboratories, a workboat and dedicated station manager, the station supports a wide range of science such as marine research, space physics and research into snow and ice.



The



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## Melting Greenland

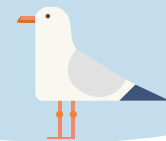
The Greenland Ice Sheet is the second biggest on Earth and is roughly seven times the size of the UK. As with all of the Arctic, it's melting at an increasing speed. If fully melted, the Greenland Ice Sheet would add around seven metres to global sea levels, so it's crucial to understand why it's melting faster and how the ice sheet's stability will change in future.

Scientists are hoping to unravel how dark particles and algae are accelerating the melting of the ice-sheet as part of the NERC-funded Black and Bloom project.

Early research shows that, by darkening the ice surface, they make it reflect less sunlight and absorb more of its heat, creating a larger layer of meltwater on the surface where the algae can thrive. Climate change will likely speed this up even more.

### What lies beneath?

If you could lift off the ice sheet that covers Greenland you would see a complex and rocky landscape, which is much more diverse than the smooth surface of the ice several kilometres above. Mapping this detail is vital to understanding and predicting how ice sheets move and how they will react to future global warming. To do this, scientists use aircraft with radar that penetrate the ice sheet and bounce back from the rocky landscape below. By timing how long this takes, they can calculate how much ice sits above.



## Science in action

The Changing Arctic Ocean programme is a five-year, £20 million joint programme funded by NERC and the German Federal Ministry for Education and Research. Within the programme, there are 16 projects with more than 200 scientists from 32 German and UK research institutions. The four projects funded by NERC are:

**ARISE:** Can we detect changes in Arctic ecosystems?

**DIAPOD:** How do changes in the Arctic affect the copepod – a small shrimp-like animal essential to the diet of whales, seals and fish?

**ChAOS:** How do changing sea ice conditions impact biological communities, processes and ecosystems?

**Arctic PRIZE:** How are changes in sea ice cover affecting the Arctic's ability to support marine life?

## Arctic uncovered

- Home to iconic animals such as polar bears, walrus and narwhals – the 'unicorns of the sea'.
- Four million people live above the Arctic Circle, including at least 400,000 from indigenous communities.
- The Greek navigator Pytheas is thought to have been the first person to discover the region in the 4<sup>th</sup> century BC.

