OUR IMPACT
2021/22
Our work continues to have global impact. This annual collection of stories demonstrates the passion of our people and the truly exceptional work they are undertaking to pursue and promote ground-breaking research and innovation.

We believe that if we all have a deeper understanding of the ocean, we can unlock its potential and provide solutions to problems facing the world today.

Because by helping our ocean, all life on Earth will benefit.
30 MILLION PEOPLE WERE IN FULL TIME EMPLOYMENT THROUGH THE OCEAN ECONOMY IN 2010

BY 2030, EMPLOYMENT IN OCEAN BASED INDUSTRIES WILL REACH 40 MILLION PEOPLE²

OVER HALF OF ALL THE OXYGEN ON EARTH IS PRODUCED BY OUR OCEAN²

A QUARTER OF OUR ENERGY SUPPLIES COMES FROM THE OCEAN³

OUR OCEAN PROVIDES THE MAIN SOURCE OF PROTEIN FOR 1 BILLION PEOPLE²

95% OF ALL THE UK’S IMPORTS AND EXPORTS TRAVEL VIA OUR OCEAN PORTS³

OUR OCEAN SUPPORTS THE LIVELIHOODS OF OVER 3 BILLION PEOPLE¹

55% OF ALL THE OCEAN BASED INDUSTRIES WILL REACH 40 MILLION PEOPLE¹

95% OF ALL THE UK’S IMPORTS AND EXPORTS TRAVEL VIA OUR OCEAN PORTS³

Our planet is a blue planet. 70% of its expanse is covered by the ocean.

With a rapidly changing climate there’s a lot to worry about, our fate is bound to our ocean. So, we go deeper, with our charitable goals we pledge to advance, share, enable and innovate. To unlock the potential and provide solutions to problems facing the ocean today and tomorrow.

AN OCEAN OF WONDER
Our ocean contains 97% of all water and covers 70% of Earth.²

By 2030, the economic output from our oceans is predicted to reach US $3 trillion.¹

Our ocean is home to the majority of Earth’s biodiversity.²

The ocean is our planet’s largest ecosystem.¹

76.6% of our vast ocean floor remains unmapped in enough detail.³

95% of internet traffic travels by subsea cable.³

95% of UN World Ocean Day 2022 (un.org/en/observances/oceans-day)

National Oceanography Centre (noc.ac.uk)
British Oceanographic Data Centre (bodc.ac.uk)

² UN World Oceans Day 2022 (un.org/en/observances/oceans-day)
³ National Oceanography Centre (noc.ac.uk)
AN OCEAN OF WORRY

To influence positive change for our ocean and planet we provide unbiased and independent research to governments, business, academics and the public.

Some of the headline evidence we provided this year was published in the Sixth Intergovernmental Panel on Climate Change (IPCC) Report and the Met Office State of the UK Climate Report 2021.

ANNUAL SPRING BLOOM OF PHYTOPLANKTON HAS SHIFTED EARLIER
IPCC CLIMATE CHANGE 2022: IMPACTS, ADAPTATION AND VULNERABILITY

CLIMATE CHANGE IS A MAJOR THREAT TO HUMAN WELLBEING AND THE HEALTH OF THE PLANET
IPCC CLIMATE CHANGE 2022: IMPACTS, ADAPTATION AND VULNERABILITY

CLIMATE CHANGE IS CONTINUING TO CAUSE SUBSTANTIAL DAMAGE TO OPEN OCEAN MARINE ECOSYSTEMS
IPCC CLIMATE CHANGE 2022: IMPACTS, ADAPTATION AND VULNERABILITY

OCEAN WARMING AND ACIDIFICATION HAVE ADVERSELY AFFECTED FOOD PRODUCTION FROM FISHERIES
IPCC CLIMATE CHANGE 2022: IMPACTS, ADAPTATION AND VULNERABILITY

SCIENTISTS ARE PREDICTING THE LOSS OF MUCH OF THE WORLD’S CORAL REEFS AND LOW-LYING COASTAL WETLANDS
IPCC CLIMATE CHANGE 2022: IMPACTS, ADAPTATION AND VULNERABILITY

ABOUT HALF OF THE WORLD’S MARINE SPECIES ARE MIGRATING POLE-WARD IN AN ATTEMPT TO SURVIVE IN COOLER WATERS
IPCC CLIMATE CHANGE 2022: IMPACTS, ADAPTATION AND VULNERABILITY

IN EUROPE, SEA LEVEL RISE REPRESENTS AN EXISTENTIAL THREAT FOR COASTAL COMMUNITIES AND THEIR CULTURAL HERITAGE
IPCC CLIMATE CHANGE 2022: IMPACTS, ADAPTATION AND VULNERABILITY

IN EUROPE, COASTAL FLOOD DAMAGE, PREDICTED TO INCREASE TEN FOLD BY END OF THE 21ST CENTURY
IPCC CLIMATE CHANGE 2022: IMPACTS, ADAPTATION AND VULNERABILITY

SINCE THE 1900’s, THE SEA LEVEL AROUND THE UK HAS Risen BY AROUND 16.5CM
MET OFFICE STATE OF THE UK CLIMATE REPORT 2021

OCEAN WARMING AND ACIDIFICATION HAVE ADVERSELY AFFECTED FOOD PRODUCTION FROM FISHERIES
IPCC CLIMATE CHANGE 2022: IMPACTS, ADAPTATION AND VULNERABILITY

ALL THE TOP TEN WARMEST YEARS RECORDED IN THE UK SINCE 1884 HAVE OCCURRED THIS CENTURY
MET OFFICE STATE OF THE UK CLIMATE REPORT 2021

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MET OFFICE STATE OF THE UK CLIMATE REPORT 2021
The second report from the IPCC emphasises that climate change is a major threat to human wellbeing and the health of the planet. It has highlighted that climate change is continuing to cause substantial damage to open ocean marine ecosystems.

Ocean warming and acidification have adversely affected food production from fisheries in some oceanic regions, and forecast levels of climate change, plus habitat destruction, will lead to the loss of much of the world’s coral reefs and low-lying coastal wetlands.

The next 20-50 years will see a change in the Earth’s climate, and how that will affect nature and humans will depend on how plants, animals and people adapt.

There is a rapidly closing window of opportunity to both reduce greenhouse gas emissions and develop climate resilient adaptation measures. By conserving, protecting and restoring ocean ecosystems, we can reduce the vulnerability of biodiversity to climate change.

Tide gauge records provide robust observational evidence that sea level around the UK continue to rise due to increased rate of ice loss from the Greenland and Antarctic ice sheets, as well as continued glacier mass loss and warming of the ocean.

Our long term records show that over the past few decades the rate of sea level rise in the UK is increasing. As sea levels rise there can be greater impacts from storm surges. Last year storm surges of over 1.5m were seen during Storm Arwen, but extreme sea levels were avoided as this occurred during low water and a neap tide.
GOAL 1
ADVANCE

Undertake internationally excellent research and technology development to advance the frontiers of knowledge about the ocean

To solve the huge problems facing our world and climate today, we need to go deeper. We need to go further in our thinking than ever before. That’s why with the intellect and dedication of world leading scientists, we’ve pursued deeper understanding and have collaborated on the most influential, agenda setting research and reports this year, both at home and internationally. Whilst our facts highlight threats to human wellbeing, our long-term goal to advance solution-focused work continues stronger than ever. We are committed to not only understand the issues better but to mitigate the impacts on our coasts and deep ocean.

Predicting change

From real-life ocean observations, we can inform digital climate models to forecast how the world will respond to climate change caused by increasing carbon dioxide in the atmosphere.

UN Ocean Decade endorsed initiative FLAME will act as the international focal point and coordinator for understanding the impacts of future climate change in the global coastal ocean.

Within the project we’ll generate innovative, high-resolution, projections of future coastal ocean climates and the impacts on coastal ecosystems, hazards, services and resources. We will do this at the local-regional scales necessary for informed decision making across a range of polar, temperate, subtropical and tropical regions.

STRENGTH IN NUMBERS

We joined with other leading UK climate science organisations to develop a new national alliance focused on climate solutions for society. Together, with six Natural Environment Research Council (NERC) supported centres and the Met Office, we will work together as the new UK National Climate Science Partnership (UKNCSP) to respond to threats posed by a rapidly changing climate by putting climate science at the forefront of the solutions agenda.

Recognising the urgency of accelerating action towards the goals of the Paris Agreement and UN Framework Convention on Climate Change, the UKNCSP will play a leading role in the development of an end-to-end climate strategy.

The solutions-focused approach is supporting the UK Government in developing and evaluating solutions to the challenges of mitigating and adapting to climate change. The partnership will also work with the public and private sectors to ensure decision makers and businesses have access to the climate information they need, in order to build resilience and adapt to the pressing challenges of the coming decades.

“The UK has world-leading capabilities for monitoring, modelling and predicting UK and global climate change and its impacts. We need to continue to develop these capabilities to address new challenges, provide early warning of potential high impact changes that may emerge and evaluate specific policy options to mitigate and adapt to climate change. The UKNCSP provides the foundations to enable the UK to continue to lead in these areas.”

PROFESSOR ANGELA HATTON
DIRECTOR OF SCIENCE AND TECHNOLOGY
NATIONAL OCEANOGRAPHY CENTRE

BLUE MEADOWS

A study underway on the Isle of Man is investigating, for the first time, the Island’s marine and coastal role in storing carbon to help mitigate climate change.

Blue carbon habitats such as seagrass meadows, which are found around the Isle of Man, capture significant amounts of carbon, and they can also protect coastal communities against storms and flooding, improve ocean health and provide habitats for a multitude of species and commercially important fisheries.

Understanding the management and restoration of these environments supports the Manx government’s ambition to achieve carbon neutrality on the Isle of Man by 2050.

CARBON VAULT

In a world-first, our research off the coast of Scotland suggested that storing carbon dioxide (CO₂) under the sea is both viable and safe.

The process, known as carbon capture and storage (CCS), is regarded as one of the most effective tools in the fight against climate change. The process involves separating the CO₂ generated during industrial processes and injecting it directly into rock formations or depleted oil and gas reservoirs deep underground. Evidence from our pilot study will now help inform the direction of technology development for the long-term monitoring of offshore CO₂ storage reservoirs. It is a huge step forward in ensuring regulators that the process is safe by being able to monitor any potential leaks as well as assess any potential damage to marine life.
SAFETY FIRST
Working on behalf of the Government of Saint Lucia through the Disaster Vulnerability Reduction Project we installed three new tide gauges to help reduce the island’s vulnerability to natural hazards and climate change. The network of tide gauges will continuously measure and report sea level and tidal variability, providing valuable information to local seafarers and port authorities, as well as being an important addition to the Caribbean Early Warning System for tsunamis and other coastal hazards.

Alongside an existing tide gauge installed by NOC under the Commonwealth Marine Economies Programme in 2016, the data from these gauges will be transmitted in near real-time to the Sea Level Station Monitoring Facility, enabling the data to be publicly accessible globally.

With the frequency of coastal inundation due to storm surges projected to increase and global mean sea level likely to rise by up to 0.23m by 2050*, the installations will help local planning authorities to decide how high to build coastal defences to protect coastal populations from the dangers of flooding. In addition, the gauges will enable the Saint Lucia Meteorological Service to produce tide tables that show times and heights of sea level to aid safe navigation and port operations.

RAPID RESPONSE
The eruption of the Tongan Volcano Hunga Tonga – Hunga Ha’apai, which culminated in the most explosive eruption in more than a hundred years, took the world by surprise and highlighted global vulnerability to large magnitude volcanic events. The most explosive phase of the eruption broke the only seafloor telecommunications cables that connected the Kingdom of Tonga to international telecommunications, effectively cutting an entire nation off from the rest of the world for more than five weeks, at a critical time for disaster responses.

Commitment to our Values and Sustainability and Social Responsibility Strategy (see Goal 7) saw us rally into action and form an international collaboration. Working with the National Institute of Water and Research (NIWA), New Zealand; the Japan Agency for Marine-Earth Science and Technology (JAMSTEC); collaborators across the Kingdom of Tonga and submarine cable companies, we coordinated ambitious research to understand the processes that drove the eruption and the resultant cascades of events.

We led a NERC Urgency Grant, which enabled real-time surveys to be performed within two months of the event – revealing powerful seafloor flows triggered by the eruption, travelling at fast speeds over tens of kilometres, explaining the widespread damage to seafloor telecommunications cables. These findings were immediately translated to local stakeholders and submarine cable companies to select optimal locations for the repaired cables and design new cable routes that are more resilient in the region.

The power of the Hunga Tonga – Hunga Ha’apai eruption was unexpected, but there are many similar volcanoes along the Tonga Trench Arc. A new NERC Global Seedcorn project aims to improve our knowledge of these kinds of hazards, identifying other volcanoes that pose a similar risk. This research builds on our strong background in assessing threats to critical infrastructure and volcanic hazard research across the Pacific including a similarly rapid response to the 2019 eruptions of Tonga Volcano F and La’au.

*Source: Intergovernmental Panel on Climate Change (IPCC), 2007.
GOAL 2
SHARE
Create public benefit from all of NOC’s capabilities

Our science must go deeper than just gaining academic understanding. Understanding needs to translate into awareness, action and positive change. That’s why we’re inspiring and empowering the next generation of ocean scientists and technologists through community events, school projects, education resources and online engagement. We’re helping young people have a deeper connection and a deeper understanding of the ocean. We passionately believe positive change for the planet starts with ocean literacy.

SMALL BUT MIGHTY
Our scientists, engineers and mariners worked with students from King Edward VI School in Southampton to send an autonomous research sailboat on a 46-day expedition of discovery.

Named ‘KES Kraken’ by the students, the mini-boat was built over several weeks as part of a hands-on after school project. The students equipped it with a sail and a satellite tracker, as well as a unique suite of scientific sensors, that enabled them to track in real time the air and water temperature and compare it with NOC research.

During the build, to support our commitments to ocean literacy, NOC scientists dropped in to provide support and educational talks on ocean and environmental issues including microplastics and climate change.

Once complete, KES Kraken was launched into the Atlantic Ocean by our crew on board RRS Discovery on the 19th February. After 46 days at sea KES Kraken was successfully recovered on the shores of Brazil having travelled 40,000km and provided the captivated students with a unique and unforgettable experience.

The King Edward VI School project is a collaboration between NOC, Educational Passages non-profit and EU Interreg iFADO project, with additional support from the EU-funded GOCART project and the NERC-funded DIAPOD projects.

“We really enjoyed working with this group of young students to engage them in oceanography in such a unique way. It’s so important to inspire people from a young age, especially on crucial environmental issues like climate change and microplastics that they might not otherwise be exposed to in school.”

DR B.B. CAEL
RESEARCHER
NATIONAL OCEANOGRAPHY CENTRE

“I hope all students involved in the project were inspired by the NOC experts who visited the school, and have dedicated their careers to science. It was also wonderful to see Sixth Form assisting younger students with the project.”

DR MAYOR
TEACHER
KING EDWARD VI SCHOOL

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WORLD OCEAN DAY
In London our Board of Trustees and Executive team welcomed friends, supporters and Ocean Alliance partners from across government and business who, like us, recognize the need to act to protect our ocean and our planet.
Our position as the UK’s leading marine charity, having left the public sector in 2019, allows us to unite and explore new innovative opportunities. Keynote speaker The Right Honourable Lord Goldsmith, Minister of State for the Pacific and the International Environment, acknowledged our work has been key to understanding the urgency with which we need to act to protect our ocean.
Internationally, as part of the United Nations Ocean Conference, we partnered with aligned research organisations, UN agencies and industry partners in delivering many side events. We participated on a number of exciting panels to raise awareness and champion ocean sustainability, women leadership and empowerment, and inclusive governance. All causes supported by our vision, mission and values.
Digitally, our education focused hybrid event on site in Southampton, allowed us to broadcast live into classrooms and homes internationally. Our experts shared knowledge on the challenges we face, as well as the solutions we’re helping to advance.

CASTING FURTHER
Into the Blue is our latest free and online resource designed to share our understanding of the ocean environment and enable everyone to dive deeper.
In each episode we unravel the complexity of issues facing today’s ocean and the variety of ways a healthy ocean supports human wellbeing and prosperity. These conversations complement the already popular “Under the Surface” pages on our website, glitting more accessibility to ocean literacy. The podcast introduces the wealth of talented scientists and engineers working at NOC and gives them a platform to educate and inform about their passion projects and world-leading work.

MOOC
The highly successful Massive Open Online Course (MOOC) ran for its fifth year with 2021-22 seeing new lectures launched on Somalia upwelling and fisheries. The free course introduces learners to innovative marine technology and their applications used to tackle the challenges of sustainable management of marine ecosystems.

NATIONAL OCEANOGRAPHY CENTRE OUR IMPACT 2021/22

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NATIONAL OCEANOGRAPHY CENTRE
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OUR IMPACT 2021/22
We pride ourselves on being the spokespeople for the ocean. We’re a trusted source of facts and our people are passionate.

We share stories of our research and experiences in lots of different ways, so you might see some of our work in the news, or in a magazine, you may have read our newsletters or visited our website. If so, we’re delighted you’ve joined us as part of our growing ocean news community.

Microplastics are of emerging global concern, due to their potential to cause harm across ecosystems, but more data is needed about their spread in the ocean, and their interaction with plankton – a food source for many aquatic organisms.

In order to fill this data gap, we’re training citizen scientists at The Wildlife Trusts to generate a microplastic and plankton time-series using Stanford University’s PlanktoScope. The PlanktoScope, a low-cost flow imaging microscope, is composed of a Raspberry Pi computer and a camera, two lenses for magnification and a flow system. The flow system affords efficient imaging of microscopic particles in a water sample as they move past the camera.

Over 3,800 volunteers from The Zooniverse, an online citizen science platform, helped to digitise historical data of tides and sea level near Liverpool.

We launched the UK Tides Citizen Science Project in January 2021 and asked you to help transcribe handwritten tide data from two gauges in Hilbre Island and George’s Pier between 1853–1903.

The new data gathered will help the science community understand how tides and extreme sea levels have changed over the past two centuries and allow them to better quantify the risks we face from flooding in the future.

“Wildlife Trusts all over the country, at coastal locations and inland on our waterways, are preparing to construct PlanktoScope to take a closer look at the animals and plants that live hidden from the naked eye in our waters. We are excited about the opportunities that having these specialised microscopes will bring. We hope to raise awareness of these tiny life forms and use the PlanktoScope to give us the ability to monitor long term and help us address conservation questions about the health of our waters, both fresh and salty. The adventure awaits!”

DR LISSA BATEY
HEAD OF MARINE CONSERVATION
THE WILDLIFE TRUSTS
GOAL 3
INNOVATE

Successfully translate world-leading and innovative research and technology developments to achieve wider impact

The brilliant minds at the helm of ocean discovery need equally brilliant technology to push the boundaries of innovation. That’s why the latest, cutting-edge technology plays a major underpinning role in our work. This technology doesn’t just take us to the depths of the ocean; it gives us a deeper understanding of everything past, present and future, from the coastal deep-ocean to pristine coral reefs. Thanks to pioneering measurement technology, we’re living our value of innovation.

INDUSTRY ALLIANCE

The launch of the BORA Blue Ocean Research Alliance® has helped us bridge the gap between industry and science to support sustainable research and development. Together the BORA Blue Ocean Research Alliance® is providing researchers access to hard-to-reach areas and taking ownership of scientific data and knowledge at every step of the way.

The BORA Blue Ocean Research Alliance® successfully developed a prototype essential ocean variable sensor box and deployed it for trials in the North Sea with Subsea7. The first complete box is now being commissioned in Brazil with Subsea7 on one of their client sites and will be in service for 18 months to supply key data on the health of the ocean in that region. There are also projects in development to research acoustic monitoring in deep-sea canyons and management of endangered species.

DOUBLE ACT

Digital Twins, a virtual representation of an object or system, have the potential to be a massive step-change in the way we understand our evolving environment. These intelligent systems, using simulations or data-based methods such as machine learning, are already revolutionising how some sectors work. Our experts are championing progress towards digital twins of the ocean and environment and the technology could be a solution to better environmental targets and paradigm shift in protecting and managing our oceans.

In pursuit of this vision, our experts lead a community report, which has outlined the building blocks necessary for unlocking the true potential of environmental digital twins. The recommendations cover everything from a conceptual framework, management and governance, common language to pilot studies and computational architecture. This first report, ‘An Information Management Framework for Environmental Digital Twins (IMF®)’ is just the first collaboration into this exciting digital frontier.

“With innovation at its heart, BORA Blue Ocean Research Alliance® will help push the limits of scientific knowledge, setting the standard for collaboration between the industrial and scientific communities and delivering meaningful research on a global scale that will provide benefits for all communities.”

HUW GULLICK
ASSOCIATE DIRECTOR
NOC INNOVATIONS
MAPPING UNKNOWN

It covers 70% of our blue planet yet the ocean is still a greater mystery than our moon. But Seabed 2030 is set to change that. Endorsed by the UN Ocean Decade, it’s an international effort to chart the world’s entire ocean floor. This year the total amount of sea floor mapped now stands at 25.6%, reflecting an increase of 10.1 million square kilometres of new bathymetric data. This increase is equivalent to an area around the size of Europe, and slightly larger than the Sahara – Earth’s largest hot desert. As the global centre for Seabed 2030, NOC’s British Oceanographic Data Centre brought together the regional compilations into a single, global, harmonised, data set. This will help identify underwater hazards and inform sustainable marine resource management and infrastructure development, ultimately saving lives.

76.6% OF THE SEA FLOOR IS UNMAPPED IN ENOUGH BATHYMETRIC DETAIL

THE GEBCO SEABED 2030 PROJECT AIMS TO MAP THE WHOLE OCEAN TO THE ORDER OF TENS OF METRES IN SCALE BY 2030
GOAL 4
ENABLE

Provide world-class underpinning capabilities that enable the UK and global ocean scientific endeavour

To reach beyond surface-level knowledge, we need a range of excellent facilities and specialist teams. That’s why we have research ships, ocean observatories and moorings, along with state-of-the-art laboratories, and an extensive oceanographic library and specimen collection. And, because deeper knowledge will only ever come from sharing what we have, we operate these services on behalf of the entire UK marine research community. So, together, we can go deeper than ever before into our united ocean.

ANNUAL HEALTH CHECK

The Porcupine Abyssal Plain Sustained Observatory (PAP-SO) is the longest-running abyssal time-series study site in the world, with observations dating back to 1895. This expedition saw 18 researchers and engineers make the same pilgrimage to take ocean health checks, including annual sampling and servicing of infrastructure that cannot be achieved autonomously.

It may sound like every year is the same but new technology and methods, such as our new Marine Snow Catchers, are fundamental to these expeditions. They continue the legacy of carbon and climate recording and also allow us to study new threats such as microplastics in the Twilight zone and beyond.

Recently endorsed as a UN Ocean Decade Initiative, JETZON, looking at the study of the Twilight Zone, the dimly lit region extending from a few hundred metres depth to 1,000m. It is poorly understood from almost any perspective. However, it contains possibly the world’s largest and least exploited fish stock and recycles ~80% of the organic material that sinks out of the productive surface waters. Expeditions like this continue our understanding of these valuable ocean zones.

OCEAN SENSORS

Three novel marine sensor suites, integrated by our engineers into Autosub Long Range (ALR), were successfully validated as part of an expedition with our pioneering Oceanids project team.

Two of them, AutoNutS nutrient sensors and CarCASS carbonate chemistry sensors, are both based on the Lab-on-Chip technologies developed in-house at NOC. All three sensors can now be used for autonomous monitoring of the oceans without the need for an on-site presence by a research ship, a significant step on the road to the future Net Zero Oceanographic Capability large research infrastructure.

EARLY CAREER RESEARCHERS, SUPPORTED TO JOIN THE EXPEDITION BY POSTDOCTORAL FELLOWSHIPS FROM NOC’S CLASS PROJECT

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FLOAT AND SINK
Using RRS Discovery we deployed the first of the UK’s new fleet of Biogeochemical (BGC) Argo profiling floats. The fleet of 15 robotic floats makes up 50% of the UK’s contribution to BGC Argo and is a vital source of ocean data, transforming the understanding of oceanic processes at depths up to 2,000m. The deployment formed part of our RAPID project’s expedition to the Atlantic, where we serviced a collection of moorings that help measure ocean currents and examine the effects on short-term weather and long-term climate.

The floats – which saw an investment from the Natural Environment Research Council (NERC) and NOC of £3.7million – have successfully performed several 24-hour cycles from the surface to depths of 2,000m, marking a huge step towards the UK’s enhanced ocean observations capability.

WORLD-CLASS RESEARCH SHIPS
The ability to explore remote and challenging areas at sea is critical to understand the complex nature of our oceans in order to predict future change. Thus, we operate two world class royal research ships on behalf of the marine community;

RRS Discovery

15 days on passage to destination

118 days in refit*

RRS James Cook

14 days in refit

114 days in refit

75 days alongside

14 days on passage to destination

33 days alongside

15 days on passage to destination

*RRS James Cook undertook a longer refit period due to starboard motor repair.

UNDER PRESSURES
Alongside scientists from the Scottish Association for Marine Science (SAMS) we embarked on an expedition to the North Atlantic Subpolar Gyre to measure ocean changes and how they affect the UK’s weather systems.

The team made observations of ocean variables such as temperature, salinity, carbon, and oxygen, as well as deploying a new pressure recorder to measure water pressure at the seafloor. The pressure recorder will remain in the water for ten years and the data it gathers will be harvested remotely without the need to recover the device. The pressure at the bottom of the sea is three hundred times greater than air pressure on land, and how it changes over time tells scientists about the ocean currents. The new pressure recorder will pave the way for new zero capture methods to measure the huge ocean currents that flow through the North Atlantic.

ARGO FLOATS

“Argo floats have been taking the temperature of the top 2km of the ocean for the past 20 years, forming the beating heart of our system of ocean observations and revolutionising the information we have to guide climate solutions for society. This new generation of BGC-Argo floats, with their additional sensors, will provide a step change in our understanding of how the ocean’s changing biology, chemistry and physics interact to drive the ocean carbon cycle, including the exchange of carbon between the atmosphere and the ocean.”

NATHAN BRIGGS
OCEAN BIOCHEMIST
NATIONAL OCEANOGRAPHY CENTRE

ADDRESSING KNOWLEDGE GAPS
We set off on the latest CLASS expedition to advance knowledge of some of the richest and most complex deep-sea ecosystems on Earth.

The Whittard Canyon system is home to a variety of species, including cold-water coral reefs, clams, deep-sea oysters. It is a key area for understanding the interaction between coastal, shelf waters and the open ocean, however, there are currently gaps in knowledge in how the system responds to human impacts such as climate change and bottom trawling. To address these knowledge gaps we collected sustained ocean observational data of the canyon using our own recently trialled new Autonomous Underwater Vehicles (AUV) equipped with the latest sensors.

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UNDER PRESSURES
Alongside scientists from the Scottish Association for Marine Science (SAMS) we embarked on an expedition to the North Atlantic Subpolar Gyre to measure ocean changes and how they affect the UK’s weather systems.

The team made observations of ocean variables such as temperature, salinity, carbon, and oxygen, as well as deploying a new pressure recorder to measure water pressure at the seafloor. The pressure recorder will remain in the water for ten years and the data it gathers will be harvested remotely without the need to recover the device. The pressure at the bottom of the sea is three hundred times greater than air pressure on land, and how it changes over time tells scientists about the ocean currents. The new pressure recorder will pave the way for new zero capture methods to measure the huge ocean currents that flow through the North Atlantic.

WORLD-CLASS RESEARCH SHIPS
The ability to explore remote and challenging areas at sea is critical to understand the complex nature of our oceans in order to predict future change. Thus, we operate two world-class royal research ships on behalf of the marine community;

RRS Discovery

15 days on passage to destination

118 days in refit*

RRS James Cook

14 days in refit

114 days in refit

75 days alongside

14 days on passage to destination

33 days alongside

15 days on passage to destination

*RRS James Cook undertook a longer refit period due to starboard motor repair.
BOATY PASSES THE TEST
The most anticipated expedition of the year saw us complete the final deep-sea tests of our newest ocean robotics, sensors and control software. A culmination of several years of shore-based trials, this expedition deployed several autonomous underwater vehicles (AUVs) out into Haig Fras, a Marine Protected Area of Celtic Sea lying about 35 km northwest of the Isles of Scilly, and the deep waters of the Whittard Canyon complex 300 km to the southwest.

In the first week Autosub 5, our new work-class AUV, carried out its first ever science survey by taking part in a sidescan sonar mission that helped generate habitat maps. It also took part in its first ever overnight mission on multibeam and camera surveys. In its second week, Autosub 5 achieved its deepest ever dive, reaching an incredible depth of 4,197.48 m. It spent 14 hours in the water undertaking 50 km of multibeam and sidescan sonar mapping south of the Whittard Canyon. On a separate deployment it also collected 25,000 images of the seafloor and marine life, including starfish, eels and lobsters. These successful milestones marked its official commissioning into active service.

Autosub LongRange 3, better known as Boaty McBoatface, successfully spent several unaccompanied days completing surveys and capturing seabed imagery all using the University of Southampton’s unique and low power 3D visual mapping system BioCAM. Making a hat trick of success for the expedition, the Deepglider, built to withstand the 600 atmospheres of pressure found in the deepest parts of the ocean professed south of Whittard Canyon down to targeted depths of 4,000 m.

BOSCORF
The British Ocean Sediment Core Research Facility (BOSCORF) is the UK’s largest deep-sea sediment repository and state-of-the-art research facility. Our core collection holds unique geological samples used by scientists worldwide to investigate topics such as geo-hazards, climate change and marine ecosystems.

BODC
The British Oceanographic Data Centre (BODC) provides instant access to over 150,000 unique data sets with 1,640 new data sets processed this year alone. Our data help provide answers to both local questions such as the likelihood of coastal flooding, or global issues such as the impact of climate change. This year our data are being used in projects to:

• Research of the feasibility of a tidal power lagoon in Swansea Bay.
• Research on the change in dissolved oxygen concentration in seawater, as a consequence of climate change.
• Impact of bottom trawling fishing gear on the benthic habitats in the UK EEZ.
• Research on the effects of salinity on tidal turbine blades.
• Planning the nuclear decommissioning of Dounreay.

ARGO DATASETS
SENT TO MET
OFFICE
ARGO SETS
PROVIDED
3629
DELAYED MODE ARGOS SETS
PROVIDED
GOAL 5
GROW & DIVERSIFY
Responsibly grow and diversify revenue to sustain our mission with a critical mass of scientific and technical capability.

As the UK’s leading marine charity, we’ve worked hard and smart to get the best results for our oceans from careful use of time, resources and funding. With newly defined donation streams we’ve carved out exciting new ocean literacy and education offerings for the next generation of science and engineering students. We’ve built on our reputation as the spokesperson of the ocean, maintaining our authority on the world stage as an impartial expert. New business-sector relationships, aligned to our purpose and five-year plan, have already seen creation of several exciting partnerships and missions.

ACTION IN ALLIANCE
We launched a new fundraising call to enable individuals and businesses to protect the future of the ocean by joining our Ocean Alliance. The funding programme will be an essential resource for global ocean research and vital technological development, empowering society to become more involved in the global science needed to support a sustainable ocean.

The Ocean Alliance is a group of partners that promotes knowledge, innovation and sustainable use of the ocean and funds the research and technology development needed to make a positive impact and drive change. As the largest, most connected and vital ecosystem on earth, the ocean sustains all life. Yet today, ocean conservation receives less than 1% of global charitable giving. With the United Nations Decade of Ocean Science highlighting the importance of including the ocean in climate conversations, NOC is encouraging those interested in protecting the oceans and the planet to join the Ocean Alliance and have their say in how to directly impact the global scientific findings, innovations and policies needed to tackle climate change.

The alliance comprises four funds:

**THE ADVANCE FUND**
BRINGING SCIENTIFIC SOLUTIONS TO THE WORLD’S MOST COMPLEX PROBLEM

**THE INNOVATE FUND**
USING SCIENCE AND TECHNOLOGY TO FUEL INNOVATIVE SOLUTIONS TO CREATE A THRIVING OCEAN ECONOMY FOR ALL

**THE EMPOWER FUND**
INFORMING GOVERNMENT POLICIES, GOOD CORPORATE PRACTICES, AND A STEP CHANGE IN PUBLIC AWARENESS OF THE ROLE THE OCEAN PLAYS

**THE EDUCATE FUND**
A DIVERSE WORLD OF FUTURE SCIENTISTS TO ENSURE THE OCEAN REGAINS AND MAINTAINS ITS HEALTH

When we can understand the ocean and its ecosystems, we are in a better position to know how to not only preserve it, but also to manage it to ensure that it is protected for the future. At NOC we have the existing scale, experience and infrastructure to deliver the science needed to drive forward global action, but require the financial support to continue driving discovery and pursue bold new lines of ocean research in ways other funding types cannot.

We want our supporters to come with us on this journey and learn about the impact they are having."

SOFIE BENNETT
HEAD OF PHILOSOPHY
NATIONAL OCEANOGRAPHY CENTRE

EUROPEAN GLIDER CENTRE OPENS
Working in partnership with Teledyne Marine, NOC took the stage at Oceanology International 2022 to announce a new European Glider Service Centre.

Based in our Southampton dockside location, the Service Centre will offer an official service, support and repair facility for Teledyne Slocum Gliders.

“Our new NOC Glider Service Centre builds on years of expertise from servicing our own underwater glider fleet – part of the largest autonomous vehicle fleet in Europe – to offer a commercial service incorporating our own in-house Calibration Laboratory and Pressure Testing Facility.”

HUW GULLICK
ASSOCIATE DIRECTOR
NOC INNOVATIONS

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ASSOCIATE DIRECTOR
NOC INNOVATIONS
Together with the West of England P&I Club (West P&I) we were proud to announce Adeola Dahunsi and Selasi Yao Avornyo as the two students selected for the second year of our collaborative international bursary programme.

They joined their first sea-going research expedition in July to get hands-on experience of working and living on an oceanographic research ship. As part of the science team on board the RRS James Cook (JC238) they travelled to the North Atlantic Subpolar Gyre to measure ocean changes and how they affect the UK’s weather systems.

The West P&I Seagoing Science Bursary provides financial support to enable students and early career researchers in the field of marine science or oceanography, or from developing countries who are keen to become involved in the field of marine science or oceanography, to gain practical experience of ship borne science.

“It’s so exciting to be able to provide this sea-going experience thanks to the bursary programme with West P&I. Adeola and Selasi were selected for it because of their research interests, which fit with the expedition objectives, plus the commitment and talent they demonstrated during the bursary programme’s first year which had to be run completely online.”

DR SAMIA BURRIDGE
HEAD OF PHILANTHROPY
NATIONAL OCEANOGRAPHY CENTRE

NET ZERO DECOMMISSIONING SURVEY

We proved it’s possible to launch an autonomous underwater vehicle (AUV) from shore to undertake a long-distance, high-tech, low-impact marine monitoring survey.

This huge step forward in technology may eventually replace the current approach for environmental monitoring at decommissioned oil and gas sites, which need dedicated ships and teams of people offshore.

Our technical mission ended up being a great success and provides a huge step forward in operations offshore and the journey to net zero.

“Our goal is to improve the environmental protection of the North Sea at a reduced cost and impact to the environment. We aim to demonstrate how this leading robotic technology could be used worldwide to support this crucial ocean monitoring.”

DR DANIEL JONES
ASSOCIATE HEAD OF OCEAN BIOGEOSCIENCES
NATIONAL OCEANOGRAPHY CENTRE
GOAL 6

GOVERNANCE
Transforms the way the National Oceanography Centre is governed and operated.

Our approach is not just about ensuring we are operating in line with company and charity law but encouraging responsibility and accountability that will ultimately improve performance and ensure we operate in a sustainable manner. We use two routes to achieve good governance; a sound governance framework for operation and an adherence to Charity Governance Code that aligns with our values and culture. This year we have pressed on with our continuous improvement journey.

GOVERNANCE FRAMEWORK
We have worked to improve our governance framework, we have reviewed our audit approach and developed a more practical and sustainable route, that is linked to the identified risk areas and meets the requirements of the charity governance code.

CYBER SECURITY AND DATA PROTECTION
Cyber security activity has seen significant investment during this year and we have recruited a new Head of Information Technology and a Cyber Security Manager who have increased our skills and improved our approaches.

We have delayed our Cyber Essentials Accreditation submission, to dedicate resources to completing a ship Cyber review for the two NERC research vessels we operate. Installation of our new Active Directory setup and completing a third-party vulnerability assessment have improved our current position, and our ability to adapt to future threats. We will continue with Cyber Essentials Accreditation and aim to complete this in spring 2023.

This year we began work to analyse the current status of Data Protection policies and procedures, and other information available to staff in relation to current data protection legislation. This has included reviewing and updating Data Privacy Impact Assessments and reviewing and updating all privacy notices on the NOC website. This activity will continue next financial year, where we aim to improve our training approach for the organisation.

Recruitment of a new Information Governance & Publications Officer during Q3 provides the further resource needed to support this activity.

There were no reportable data protection breaches during the financial year.

RISK MANAGEMENT
The Trustees continue to have oversight of the risk management of the organisation. Staff training and workshopping have continued through 2022, this has helped embed risk understanding, and improve monitoring and reporting across the organisation.

As our maturity increases, we will continue to develop improved approaches to support our staff who on a day-to-day basis manage our operational risks in specialist areas.

ETHICS, SAFFEGUARDING AND CONFLICTS OF INTEREST
We have reviewed our Research Integrity Policy, and have identified the need to deliver specific training in this area.

The training programme is in development and we will look to roll this out during the next financial year. A full review of NOC’s Safeguarding Policy, Safeguarding Guidance and Reporting Procedure had been conducted by the Legal & Governance team, considering current Charity Commission guidance; UKRI guidance and requirements for projects that receive UKRI funding; and current legislation and practice. This update provides the inclusion of comprehensive description for specific scenarios to help considerations and support to our staff.

There were no externally reportable conflicts of interest and no significant governance or control issues during the financial year.

RECRUITMENT
We have continued to develop our skills with the recruitment of new leaders across Corporate Business Support who are contributing to significantly improving our operations and governance.

DUE DILIGENCE
Carrying out effective due diligence allows NOC to make good decisions to understand and mitigate risks; and to ensure that in working we comply with our governance, and terms and conditions flowed down by our funders, customers, regulators including the Charity Commission and Scottish Charity Regulator (OSCR) and other third parties.

NOC has reviewed and updated its approach to due diligence of our partners with whom we work with. The new approach includes an enhanced due diligence process for new projects and is being undertaken prior to NOC and /or National Oceanography Centre Innovations Limited (NOC Innovations) entering into an agreement with a third party.

It also outlines a route for monitoring projects with other parties where a specific risk in relation to the other party is identified.
Responsibly grow and diversify revenue to sustain our mission with a critical mass of scientific and technical capability

As the UK’s leading marine charity, we’ve worked hard and smart to get the best results for our ocean from careful use of time, resource and funding. With newly defined donation streams we’ve carved out exciting new ocean literacy and education offerings for the next generation of science and engineering students. We’ve built on our reputation as the spokesperson of the ocean, maintaining our authority on the world stage as an impartial expert. New business-sector relationships, aligned to our purpose and five-year plan, have already seen creation of several exciting partnerships and missions.

SUCCESS IS SILVER

We were awarded the Investors in People (IIP) Silver accreditation – an accolade awarded to just 15% of organisations assessed. This is the first time NOC has achieved Silver, and reflects the positive progress made since our last assessment in 2018, especially during the last two years as we transitioned into a charity and navigated the pandemic.

Results from a recent staff survey showed 80% of staff agreed or strongly agreed that NOC was a great place to work. Our people also believe that we have supported them exceptionally well during the COVID-19 pandemic.

Our initiatives are providing a measured and integrated approach to supporting the current and future wellbeing of our people.

We are all incredibly proud of this achievement, and we are committed not only to maintaining the Silver standard, but to exceeding it in the future. The same week we won the award we published our Sustainability and Social Responsibility Strategy, which sets People as one of our five pillars of culture, alongside community, environment, operations and research ethics.

“IIP THE INVESTORS IN PEOPLE ASSESSOR DESCRIBED OUR WELLBEING STRATEGY AS BEING OUTSTANDING”

PROFESSOR ED HILL CBE CHIEF EXECUTIVE NATIONAL OCEANOGRAPHY CENTRE
COLLABORATION AWARD

It was an incredibly proud day for everyone at NOC when SeaDataCloud, a collaborative project involving our British Oceanographic Data Centre, was awarded a "les Étoiles de l’Europe" trophy.

The award was presented by the French minister of Research and Innovation in Paris, as part of the 2021 Horizon Europe summit. This innovative project is the latest in a series of EU projects to develop open infrastructure called SeaDataCloud, set up to enable the management and sharing of marine data and information across Europe and beyond. The SeaDataCloud project, managed by the team at the BODC and its European partners, has considerably advanced the technological infrastructure of SeaDataCloud, with the adoption of cloud and high-performance computing capabilities.

“We are delighted that SeaDataCloud has been presented with this prestigious French award that recognises excellence in project coordination and European-wide collaboration. We have a long association with SeaDataCloud - as data providers and technical experts – and we are immensely proud of our contribution to this latest project. It represents a huge step forward for the international exchange of marine data and information.”

MARK HEBDEN
SENIOR MARINE DATA MANAGER
NATIONAL OCEANOGRAPHY CENTRE
PROJECT LEAD FOR SEADATACLOUD

CARBON CHANGES

Science expeditions have been an integral part of learning about our oceans for a very long time. We currently operate two world-class scientific research vessels, RRS James Cook and RRS Discovery, which have travelled around the world completing important missions and exploring every aspect of the ocean.

But our social media campaign #pastpresentfuture explored the exciting and innovative ways we’re upholding our commitment to the environment and moving towards the 2040 future of net-zero oceanographic capability.

ENVIRONMENT AWARDS

Our Environmental Management System was recertified with ISO14001, with its effectiveness demonstrated through operational processes, internal audit programme, monitoring, measurement, leadership and processes.

Our dedicated team ensured that we met objectives and demonstrated regulatory and legal compliance. We were re-accredited with 0 non-conformities and only four minor observations.

DECARBONISATION PLAN

We set ourselves new challenging science-based targets, driven by the Paris Agreement, to reduce our Scope 1 emissions by 27.5%, Scope 2 emissions by 46%, and Scope 3 by 46% with an ultimate goal of becoming a zero-emissions based organisation by 2040.

Scope 1 emissions relate to the direct burning of fossil fuel on site (gas consumption) and Scope 2 emissions relate to the indirect generation of electricity for use on site (electricity consumption). This year we have generated 233,775 GWh of our own energy through our solar PV array.

We made good progress already this year, with annual gas consumption reduced by 26% from the 2019 baseline. The reduction in electricity consumption has been less significant (only 5% compared to 2019), but associated carbon emissions have decreased substantially due to the decarbonisation of grid electricity. The grid is expected to decarbonise further by 2030, which would allow us to meet the 2030 Scope 2 Target for building energy use without the need for further reduction in energy consumption. We are engaged with our partner consultants to ensure a decarbonisation roadmap is fit for future and meets the required need to achieve our targets at 2030 and 2040.

As an international research centre, travel is an inevitable part of our scope 3 emissions. As part of our new decarbonisation plan, we have committed to reducing our business travel by 23% over the next 4 years. We have launched our Sustainable Travel and Commuting Guidance to support and guide staff to choose lower carbon modes of travel.

COLLABORATION RECOgnition

Staff were rewarded for all their hard work and contributions over the year at our annual Summer Celebration and Values Awards event.

Held in person at our sites and ships we saw 14 awards, all reflecting our corporate values, presented to peer-nominated colleagues. As a fantastic celebration of all we’ve achieved together this event is always the highlight of our social calendar and especially so this year as it marked our first in person staff event since the pandemic.
FIT FOR FUTURE
To continue to see us thrive in all that we undertake, we have embarked on an ambitious journey of internal transformation. Our Fit for Future programme, spanning our long-term strategy, will create a collaborative, welcoming and inclusive environment that accommodates post-pandemic working styles and is synonymous with creativity and unity. It will actively encourage cross-functional working and facilitate rich and unique conversations that drive scientific, technological and collaborative innovations. The look and feel of this environment will be more than the sum of its parts, creating not only an exceptional technological, and collaborative innovations. The rich and unique conversations that lead to scientific, encouragement cross-functional working and facilitate an exemplary environment where our teams are able to work to their full potential, collaboratively and seamlessly.

This creative environment will be supported by highly efficient, digitally connected, corporate business services, ultimately creating more time for world class services, ultimately creating more time for world class services, ultimately creating more time for world class services, ultimately creating more time for world class services, ultimately creating more time for world class services, ultimately creating more time for world class science, executive, accountable and collaborative workplace but also somewhere to showcase NOC to the external environment.

The transformation will become enabling and energising, delivering an environment that accommodates post pandemic working styles and the potential to be at sea for weeks or even months, in essence to promote positive values that lead to respect for their colleagues. To galvanise inclusive culture onboard research ships, the film is being shown on board both NERC ships, operated by NOC, as part of the onboarding training for those setting sail.

We’ve gotten smarter at project management by further integrating our bespoke business systems. The resource planning and financial outputs are now directly linked, enabling staff to more effectively plan out time and directly see the financial impact from their planning. There is now the possibility to assess performance of projects on a real-time basis where information is kept up to date. Regular proactive reporting to senior leaders, much earlier in the plan, means our people and business benefit from quicker and more informed decision making.

RESPECT AT SEA
Creating an even more inclusive workplace culture is an ongoing priority for marine science institutions worldwide. Given the unique working environment of research ships and the potential to be at sea for weeks or even months, it’s essential to promote positive values that lead to respect for their colleagues.

To this end, NERC launched a thought-provoking training video designed to empower ocean researchers and remind them of their responsibilities to respect colleagues and promote inclusion. The video is the latest element of NERC’s EDI (Equality, Diversity and Inclusion) commitments and features some NOC oceanographers and marine engineers who share their joy of going to sea and calls for colleagues to share their joy of going to sea and calls for colleagues to share their joy of going to sea.

We strive for excellence in this area, whether that is through delivering education and awareness or driving change to our cultural practices.

**CODE OF CONDUCT**
We take a comprehensive view of our entire supply chain and work closely with our suppliers to ensure social responsibility is at the heart of what we do. Last year we reported that a Supplier handbook had been drafted and was ready to be launched this year. We’ve updated to facilitate that the implementation was very successful and has helped consolidate vendor relationships and further improve our due diligence processes.

“Working globally and leading the broad science and technology around our vast ocean is one of the great challenges of our age. This needs the talents of many people from different backgrounds to make it possible, and to engage with diverse communities about the importance of the sea in all our lives.

We strive for excellence in this area, whether that is through delivering education and awareness or driving change to our cultural practices.”

**OCEAN EDUCATION**
If there was ever a day in the year for us to shout that extra bit louder about our passion and hopes for the ocean, it’s the United Nations International World Oceans Day, this year framed around the theme of revitalisation.

Supporting the UN Decade of Ocean Science and the UN Ocean Conference, we proudly participated in events locally, virtually and internationally. Schools, homes and offices tuned in to our dedicated day of education, through our hybrid talks and online classroom sessions, all delivered by our skilled ocean literacy ambassadors.

To galvanise inclusive culture onboard research ships, NERC (Natural Environment Research Council) launched a thought-provoking training video designed to empower ocean researchers and remind them of their responsibilities to respect colleagues and promote inclusion. The video is the latest element of NERC’s EDI (Equality, Diversity and Inclusion) commitments and features some NOC oceanographers and marine engineers who share their joy of going to sea and calls for colleagues to share their joy of going to sea.

Wherever we go, whatever we do, we treat each other with respect. The film is being shown on board both NERC ships, operated by NOC, as part of the onboarding training for those setting sail.

**BUSINESS SMART**
We’ve gotten smarter at project management by further integrating our bespoke business systems. The resource planning and financial outputs are now directly linked, enabling staff to more effectively plan out time and directly see the financial impact from their planning. There is now the possibility to assess performance of projects on a real-time basis where information is kept up to date. Regular proactive reporting to senior leaders, much earlier in the plan, means our people and business benefit from quicker and more informed decision making.

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**SUBJECT MATTER EXPERTS & LIVE Q&A**
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**HYBRID HOT TOPIC PANEL DISCUSSIONS**
1207
ONLINE DELEGATES
175K
TOTAL SOCIAL MEDIA REACH
4235
VIEWS ON DEMAND
6.2%
AVERAGE SOCIAL MEDIA ENGAGEMENT

"Working globally and leading the broad science and technology around our vast ocean is one of the great challenges of our age. This needs the talents of many people from different backgrounds to make it possible, and to engage with diverse communities about the importance of the sea in all our lives. We strive for excellence in this area, whether that is through delivering education and awareness or driving change to our cultural practices."

CAIT ALLEN
ASSOCIATE DIRECTOR FOR ENGAGEMENT NATIONAL OCEANOGRAPHY CENTRE
STAY IN TOUCH

The National Oceanography Centre is one of the world’s top oceanographic institutions. We provide the UK’s National Capability needed to be a top global player, to lead and participate in international co-operations.

We undertake world-leading research in large scale oceanography and ocean measurement technology innovation; working with government and business to turn great science and technology into advice and applications. We support scientists in universities and research institutes with facilities, research infrastructure and irreplaceable data assets – enabling the UK to harness the full power and diversity of its ocean science talent.

To get bite-sized updates on our Science and Technology, Latest News, Public Events, Career Opportunities and Educational Resources, subscribe to Ocean News via our website or follow us on social media: