

# Impact Report 2024



Scientists discover that oxygen can  
be produced in total darkness in parts  
of the deep sea (p.18/19)

.....



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# Our mission

## Discover



### RESEARCH

..to discover new knowledge about the ocean through world-class, transformational research

## Communicate



### EDUCATION

...to communicate this new knowledge through inspirational education and public engagement

## Apply



### ENTERPRISE

...to apply this knowledge through government, business and research partnerships to solve some of the greatest challenges facing our planet

# Governance / leadership

## Trustees

Diana Murray (Chair)	Dr Deborah McNeill
Keir Ashton	Prof Colin Moffat
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Prof. Michele Stanley - Associate Director Innovation
Prof. Ben Wilson - Associate Director Research
Hazel Farnell - Head of HR
John Barrie - Head of Finance
Mike Spain - Head of Enterprise



Editors: Dr Anuschka Miller & Euan Paterson

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Cover image: Polymetallic nodule. Credit: Geiger Laboratories, Northwestern University, USA

We do this with a vision for a healthy and sustainable ocean.



# Our impact highlights

## Creating new knowledge

We delivered 93 research projects and published findings in 92 peer-reviewed papers

**92**  
publications

## Providing microbial cultures

Our Culture Collection of Algae and Protozoa sent 1,694 cultures to 47 countries for use in research, education and business.

**1,694**  
living cultures

## Sequencing seaweed

We contributed to the publication of 110 new genome sequences for macroalgal species. This expanded the globally known macroalgal sequences from only 14 to now 124.

**110**  
genomes

## Training the next generation

We had 107 students on our 4-year BSc Marine Science programme; 49 on our 2-year MSc Aquaculture, Environment and Society; and 32 postgraduate research students (MRes & PhD)

**188**  
students

## Supporting blue economy

We delivered 84 commercial contracts and ran 36 professional development training courses for 1,495 participants gaining skills in seaweed cultivation or use of robots.

**1,495**  
course participants

## Inspiring with outreach

Our Ocean Explorer Centre had 5,000 visitors; we reached >3,500 school children across Scotland with free STEM workshops and engaged >800 people through community events

**>9,300**  
people

## Digital engagement

We grew our online presence by 22%, with 44,263 active social media followers and 281,987 unique visits to our main website. We also launched our own podcast.

**22%**  
growth

## Greening our estate

Our wood biomass heating system saved 62.14 tonnes of CO<sub>2</sub> compared to oil. 20% of our 4000 lights were upgraded to energy-efficient LED.

**62t**  
less CO<sub>2</sub>

## Exploring with robotics

Underwater gliders gathered ocean data on four missions: they spent 339 days in the water, completing 3,920 dives covering 5,899km.

**5,899km**  
ocean surveyed

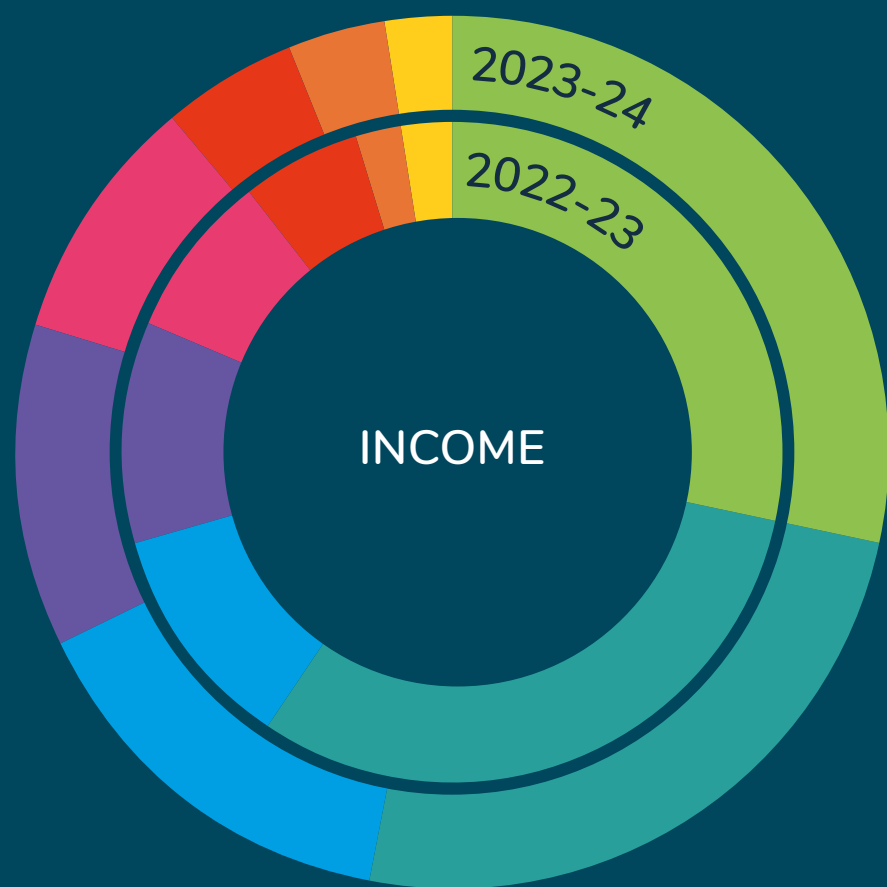
## Research vessel activity

Our coastal vessel Seòl Mara spent 53% of her ocean-going time supporting research, 33% providing learning experiences for SAMS undergraduates, and 14% supporting visiting universities.

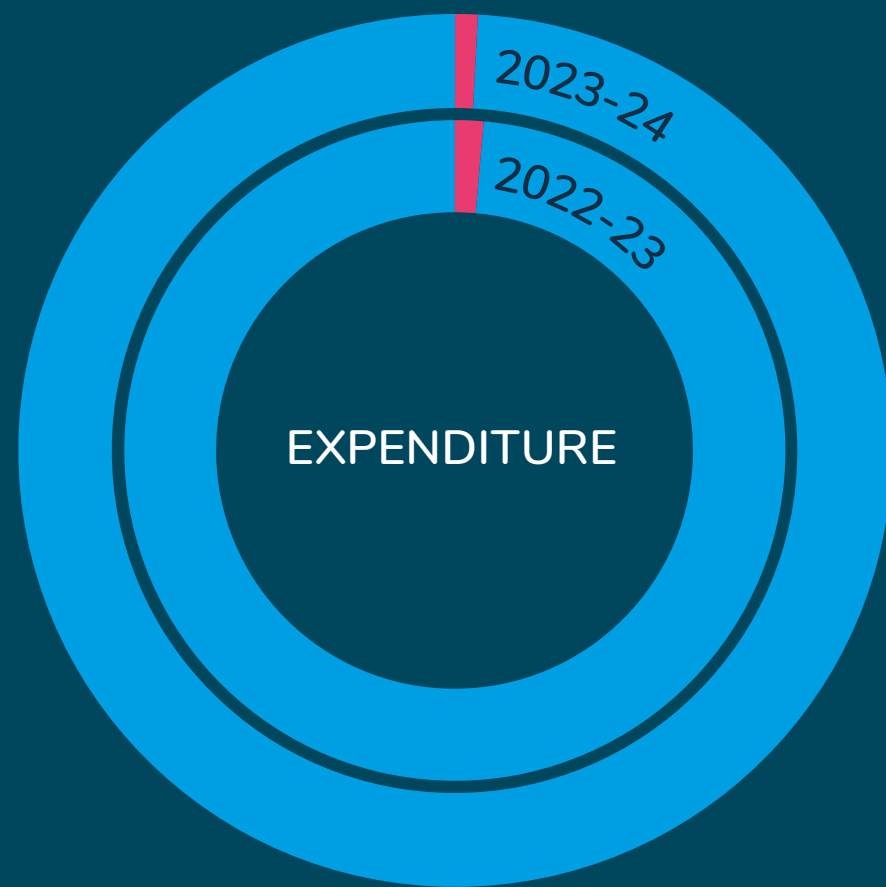
**53%** time  
for new research



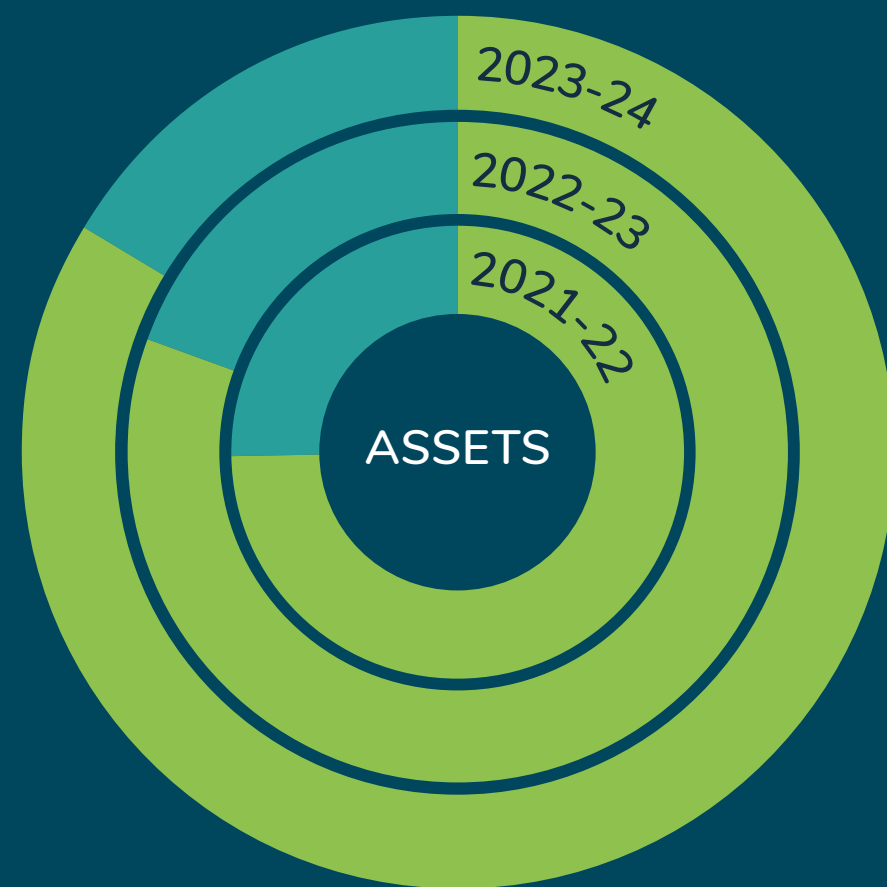
# Financial\*



INCOME	2023-24	2022-23
Research income (other)	£3.12M	£3.17M
UK Government grants/NERC	£2.72M	£3.46M
Education income	£1.64M	£1.26M
Consulting activities	£1.31M	£1.25M
Trading activities	£0.99M	£0.90M
European/EU grants	£0.55M	£0.66M
Charitable income (other)	£0.41M	£0.23M
SIMBA unit and components	£0.26M	£0.27M
<b>TOTAL</b>	<b>£11.01M</b>	<b>£11.2M</b>



EXPENDITURE	2023-24	2022-23
Cost of raising funds	£0.01M	£0.01M
Charitable activities	£11.81M	£11.82M
<b>TOTAL</b>	<b>£11.82M</b>	<b>£11.84M</b>



ASSETS	2023-24	2022-23	2021-22
Fixed assets	£14.32M	£14.36M	£14.80M
Other assets	£2.77M	£3.96M	£4.96M
<b>TOTAL</b>	<b>£17.08M</b>	<b>£18.31M</b>	<b>£19.76M</b>

## RESERVES

The primary aim of the reserves policy is to ensure that SAMS holds adequate funds to maintain the longer-term sustainability of the marine science research undertaken by our scientists and to manage short term volatility in income or liquidity.

The total funds held by The SAMS Group at the year-end amount to £12,877k (2023 - £10,907k). This consists of unrestricted funds in surplus of £8,813k (2023 surplus £7,769k), and restricted funds of £4,064k (2023 - £3,138k).

\* Reporting covers financial year 1 Apr 2023 to 31 Mar 2024

# Global impact

## ARCTIC

Fieldwork to explore how climate change and hydro-electric expansion is affecting the rivers feeding into Hudson Bay (p. 21)

## SCOTLAND

SAMS continues to embed scientific evidence at the centre of Governmental decision-making, providing oversight and assurances to deliver maximum impact for Scotland's seas (p. 20-21)

## FLORIDA STRAITS

Anchored instruments and ocean robots quantify the transport of carbon and nutrients by the Gulf Stream over 2000 miles to improve our understanding of how it may respond to climate change (p. 26-7)

## PACIFIC OCEAN

The discovery of dark oxygen is challenging the scientific consensus of how oxygen is produced and has even called into question how life on Earth began (p. 18-19)

## CHILE

Providing expert advice and insight to help inform Chile's blue carbon agenda (p. 36)

## GREENLAND

Collaborated with colleagues from the Greenland Climate Research Centre (GCRC), used robotics and artificial intelligence (AI) to study organisms on deep Greenlandic fjords-walls (p. 15)

## AZORES

CCAP have dispatched more than 13,000 orders to more than 100 countries as far afield as Azores, Gambia and Fiji (p. 42-43)

## RED SEA, EGYPT

Our BSc Marine Science degree students spent 12 days at the Red Roots Sea facility studying human stressors on tropical marine ecosystems in the Red Sea (p.14)

## NAMIBIA

Working with coastal communities to assess the impact of climate changes which are on course to reduce the safety and effectiveness of a fishing industry vital for food and income sources in Namibia (p.30-31)

## ANTARCTICA

SAMS supported the creation of the first continent-wide mapping study of plant life across Antarctica, making use of space technology (p.30-31)

SIMBA LOCATIONS



# Our research

for sustainable & healthy oceans

- Ocean currents
- Polar seas
- Carbon cycling
- Climate change
- Ecosystem health
- Marine mammals
- People and the sea
- Marine conservation
- Biotechnology
- Marine energy
- Algae
- Deep sea
- Robotics
- Aquaculture
- Food security





# January

"Whales that have their nostrils wider apart are better equipped to smell 'in stereo'."

Dr Conor Ryan

## Solving the seaweed biodiversity crisis

SAMS leads the new GlobalSeaweed SUPERSTAR project working on solutions to the biodiversity crisis in global seaweed stocks.

The project, led by Prof. Elizabeth Cottier-Cook and funded by the UK's Global Centre on Biodiversity for Climate (GCBC), involves some of the world's most prominent seaweed scientists and industry leaders. It works towards a global strategy, or 'Seaweed Breakthrough', to be launched at COP31 in 2026 to urgently protect wild stocks.

Seaweeds are vital for the functioning of the marine ecosystem, supporting an immense biodiversity of marine organisms. There are more than six million seaweed farmers in 56

countries worldwide who rely on seaweed for their livelihoods. The vast majority of farmers are in Asia, which accounts for more than 95% of global seaweed farming.

Yet, wild seaweed communities are predicted to lose up to 71% of their current distribution by 2100, either through overharvesting or climate-driven impacts, such as pollution, invasive species or pest and disease outbreaks.

## What's that smell?

SAMS honorary research fellow Dr Conor Ryan finds evidence that baleen whales can sniff out feeding opportunities through their blowholes.

Baleen whales include blue, humpback and right whales and, feed on quantities of zooplankton, such as krill and fish to maintain their bulk. Their ability to accurately locate an abundance of zooplankton in the vast ocean has puzzled scientists, but Dr Ryan may have the answer.

When zooplankton are grazing on microscopic plant-like phytoplankton, a chemical called dimethyl sulfide is released into the sea and then into the air. The scent from this chemical is already known to attract seabirds and to trigger a feeding frenzy. It may also be a signal to baleen whales, which might be able to smell in stereo on account of having two nostrils (unlike dolphins which have a single nostril).





# Rain harms coastal sea urchins

The ‘freshening’ of seawater around the UK through heavier rainfall caused by climate change may spell disaster for sea urchins.

Scientists from SAMS, British Antarctic Survey and the University of Cambridge, showed how sea urchins exposed to diluted seawater for long periods show signs of physical deterioration. Their research also found that even slight changes in salinity – or saltiness – trigger changes to urchin behaviour as they try to cope with their new conditions.

Urchins are slow moving bottom feeders, making them especially vulnerable to rapid changes to their habitat. As our climate warms, Britain’s weather is becoming more extreme; in Scotland precipitation has increased by 20% since the 1960s. Salinity is one of the critical environmental factors that affect the biology of marine organisms, with increased rainfall and glacial melting reducing the salinity of coastal waters.



# February

## The ‘virtual marine biologist’

SAMS scientists collaboraed with colleagues from the Greenland Climate Research Centre (GCRC), used robotics and artificial intelligence (AI) to study organisms on deep Greenlandic fjords-walls.

The team conducted 18 subsea video surveys to depths of 120 metres across the length of the fjord Nuup Kangerlua, near to the Greenlandic capital Nuuk and used the footage to create 3D models. A trained AI system, a ‘virtual marine biologist’, was then used to identify and accurately measure the various organisms present.

Their findings will help to create and inform assessments of ecosystem composition and functioning in this hard-to-reach environment, giving an insight into how climate change may be affecting marine life there.



## SAMS adopts rainbow mark

Alongside our partners at the University of the Highlands and Islands (UHI), we signed up to The Scottish LGBTI+ Rainbow Mark during LGBT History Month to support inclusive social spaces across the Highlands and Islands, Moray and Perthshire.

The Scottish LGBTI+ Rainbow Mark (The Rainbow Mark) was developed with LGBTI+ people and aims to: increase positive LGBTI+ visibility; provide information and tools to enable better LGBTI+ inclusion; reduce isolation and minority stress for LGBTI+ people; and create more welcoming places in Scotland.



# A cut, colour and climate change

UHI hair and beauty students are proving they are a cut above the rest by bringing climate change into their chats with clients, thanks to a collaborative project with students at SAMS.

Under the Scissors, funded by the Scottish Government's Climate Engagement Fund, brought together hair and beauty students from UHI Moray and UHI marine science students from SAMS to help spread the word on our changing environment.

The SAMS students shared their knowledge about climate change, helping to develop cue cards and other materials that prompt conversations in the training salon at UHI Moray.

"We're trying to normalise climate change in everyday conversation. The weather is often a topic of conversation when people are in the salon, so it's easy to then talk about these wider issues."

Dr Kerry McInnes, a Research Fellow at UHI Moray



# March

## Salmon farming software used in Chile

Computer software built by SAMS Enterprise has been making waves in the salmon farming industry and was showcased at a major aquaculture conference, AquaSur, in Chile.

NewDEPOMOD is a particle-tracking modelling software, designed to predict dispersion of fish farm waste discharges in the marine environment. It was built with support from the Sustainable Aquaculture Innovation Centre, working alongside the salmon farming sector and farm sites regulator the Scottish Environment Protection Agency (SEPA).

It is now prescribed, recommended and used around the world, including in Chile, allowing farmers to calculate the optimal production levels at each farm site, while complying with regulatory standards.



## Oban – a home from home

International students on a highly-rated European aquaculture course at SAMS have praised the welcome they received in Oban, where they spent the first six months of their Masters degree.

SAMS, leads the Erasmus Mundus Joint Masters Degree in Aquaculture, Environment and Society-STAR (ACES-STAR), which also involves teaching at the universities of Crete and Nantes.

The course attracts students from all over the world and the current intake of 25 students said they found Oban to be a 'home from home'. With a limited supply of private rental accommodation in the town, some of the students took advantage of the SAMS Host Family Scheme, which involves local families hosting a student.

"Oban, you have a special place in my heart. I spent six wonderful months here. It was my first time abroad, the warm hospitality of the Scottish people made me feel at home and cured my homesickness."

Subash Yadav Ahir



# New Red Sea field course

Marine science students from SAMS swapped the temperate waters of Argyll for the tropical Red Sea as they embarked on the Oban institute's maiden field course in Egypt.

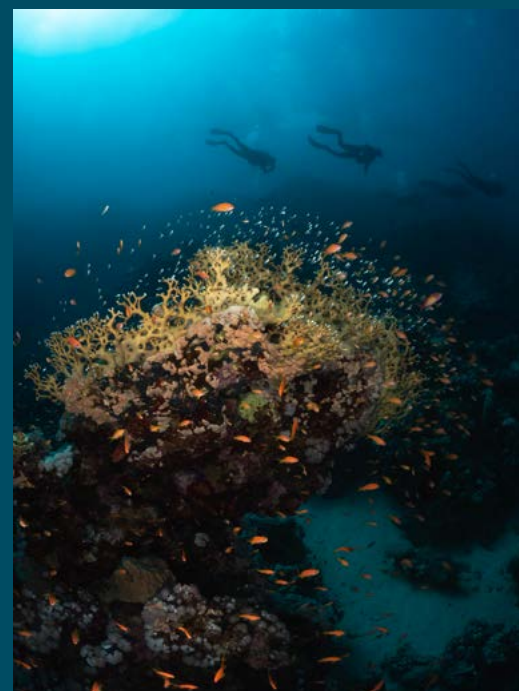
The 15 students, representing all four years of the BSc Marine Science degree, spent 12 days at the Red Roots Sea facility in El Quseir and saw warm-water sealife such as turtles, large moray eels and lionfish during snorkelling and diving expeditions.

The field course introduced underwater survey techniques, and the accompanying SAMS staff gave lectures on tropical marine ecosystems. The group also took part in beach litter and microplastic surveys.

Among the extra-curricular activities were recreational scuba diving and a day trip to visit the ancient temples at Luxor.

Prof. John Howe, BSc programme leader, was among the lecturers on the Tropical Marine Ecosystems field course. He said: "This was a really successful first trip to the Red Sea and the feedback from the students has been fantastic, so we are keen to do this on a regular basis.

# April



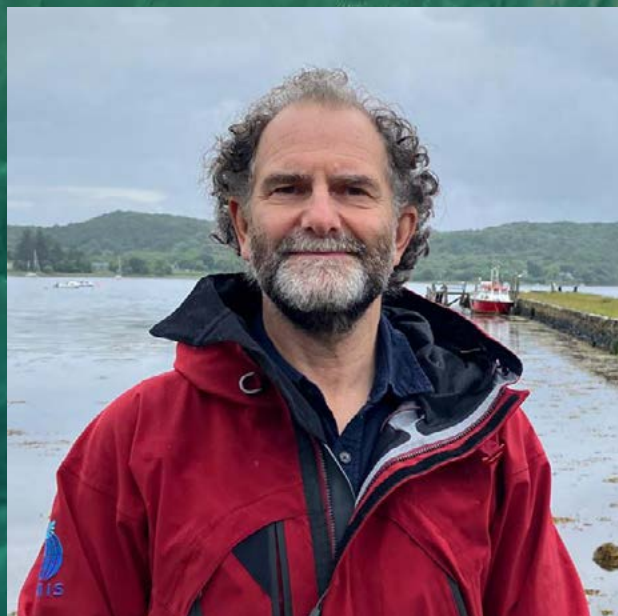
## Outreach with a distance

Budding marine scientists at an event in Edinburgh's Dynamic Earth became ocean explorers for the day by operating an underwater vehicle 120 miles away in a lab at SAMS.

As part of the North Sea 3D event at the science centre, part of the Edinburgh Science Festival, SAMS staff gave over control of one of their remotely operated vehicles (ROVs), which was sitting in a test tank in SAMS' Scottish Marine Robotics Facility.

Through a remote connection, visitors to the event were able to steer the ROV around the test tank and take on a series of challenges.





"Scotland has such a rich marine heritage, and a bright but complex marine future."

Prof. Mark Inall

## SAMS physicist becomes government adviser

SAMS physical oceanographer Prof. Mark Inall was appointed as Chief Scientific Adviser to Scottish Government's Marine Directorate for the next three years.

Drawing on his extensive academic experience and networks, Prof Inall will further embed scientific evidence at the centre of decision-making and provide oversight and assurance which delivers maximum impact for Scotland's seas. Prof. Inall will continue part time in his role as marine physicist at SAMS.

The role of the Chief Scientific Adviser Marine is to provide independent challenge to our science advice and evidence, which informs our work across marine and freshwater policy areas. The Chief Scientific Adviser Marine also works with the Chief Scientific Advisor for Scotland and the Scottish Science Advisory Council to help ensure that Scottish Government has access to the best scientific advice to inform its work across all policy areas.



## SAMS' role in informing policy

### IT'S GOOD TO #WHALETALK!

APRIL - SAMS highlighted its expertise in marine mammal research at an event in Edinburgh as an audience of MSPs, policy advisers and industry and third sector representatives attended 'Scotland: Europe's Whale Watcher'.

The evening event, jointly organised by SAMS and the Royal Society of Edinburgh (RSE), was held in the RSE buildings in Edinburgh's city centre and featured presentations on how Scotland was becoming a European leader on marine mammal monitoring and research.

Following opening remarks by RSE General Secretary Prof Michael Keating, SAMS Chair

and RSE Fellow Diana Murray introduced the four speakers: Dr Denise Risch (SAMS), Prof Peter Tyack (University of St Andrews), Alison Lomax (Hebridean Whale and Dolphin Trust) and Susannah Calderan (SAMS).

The speakers explored how Scotland, through its research community, citizen science, NGOs and wildlife charities, has organically created a combined expertise in marine mammal research and monitoring that would be the envy of many larger nations. Collaborative efforts are beginning to form which bring together local knowledge and cutting-edge scientific discovery, complemented by exciting new uses of artificial intelligence.

### PARLIAMENTARY EVIDENCE

JUNE - SAMS Director Prof. Nick Owens and marine biologist Dr Helena Reinardy gave evidence to the Scottish Parliament's Rural Affairs and Islands Committee during its investigation into the Scottish salmon farming industry.

Prof. Owens, who is also a member of the Scottish Science Advisory Council (SSAC),

told MSPs that there is an "imbalance" in how different sections of communities are sometimes represented on the issue of new salmon farms in their areas.

Dr Reinardy was quizzed on the issue of sea lice, as SAMS has entered into research in this area.

### TIME TO NOTICE 'INVISIBLE' PLANKTON

SEPTEMBER - Microscopic plankton in the global ocean are crucial to supporting marine life and produce oxygen for the planet but are undervalued and poorly understood because of a lack of studies, according to a report co-authored by a SAMS scientist.

Prof. Paul Tett is among the international experts who contributed to the Plankton Manifesto, which was unveiled during last week's 79th session of the United Nations General Assembly in New York.

The report emphasises the critical role of plankton in addressing the global crises of climate change, pollution, and biodiversity loss. Plankton generate roughly half of the planet's oxygen and absorb vast amounts of carbon.

Despite their immense importance, plankton are under threat and remain poorly understood. The Plankton Manifesto calls for immediate global recognition and action to protect these vital organisms.





# The summer of dark oxygen

A discovery in the dark depths of the Pacific Ocean by a team led by Prof. Andrew Sweetman is challenging the scientific consensus of how oxygen is produced - and has even called into question how life on Earth began.

Reference: Sweetman et al (2024) Evidence of dark oxygen production at the abyssal seafloor. *Nature Geoscience*, 17, 737-739



Photosynthetic organisms like plants and algae use energy from sunlight to create the planet's free oxygen. However, new evidence, published in July 2024 in *Nature Geoscience*, has shown how oxygen is also produced in complete darkness at the seafloor 4,000 metres below the ocean surface, where no light can penetrate.

Prof. Sweetman and his team made the 'dark oxygen' discovery while on ship-based fieldwork in the Clarion-Clipperton Zone to assess the possible impacts of deep-sea mining. This process would extract polymetallic nodules that contain metals such as manganese, nickel and cobalt, which are required to produce lithium-ion batteries for electric vehicles and mobile phones.

In the experiments, Prof Sweetman and colleagues found nodules to be carrying a very high electric charge, which could lead to the splitting of seawater into hydrogen and oxygen in a process called seawater electrolysis.

SAMS Director Prof. Nicholas Owens described the finding as one of the most exciting in ocean science in recent times. The paper attracted significant discussion the world over.

Polymetallic nodule

Images credit: Geiger Laboratories, Northwestern University, USA





## Record ocean heatwave

Just as the UK was in the midst of a new marine heatwave, new analysis was published of the unprecedented sea surface temperatures of up to 5°C higher than normal off northwest Europe in June 2023.

A new study by a consortium of British and Irish institutions, including SAMS, showed the region experienced its longest recorded category II marine heatwave (16 days). This means temperatures around the British Isles reached a 16°C peak in June instead of 13.5°C.

Prof. Mark Inall and Dr Sam Jones co-authored the paper and contributed data from an autonomous underwater glider. The glider was patrolling the north-east Atlantic at the time of the heatwave last June.

## Seaweed removes atmospheric carbon

An international team of researchers, including SAMS' Prof. Michael Burrows calculated that the world's seaweed forests transport around 56 million tonnes of carbon to deep ocean sinks.

Historically, seaweed forests have been excluded from the 'blue carbon' toolbox due to uncertainties about their ability to remove carbon in the long-term. This study closes this critical knowledge gap and reveals new opportunities for climate change mitigation in polar and temperate areas, where carbon removal options by coastal ecosystems are currently limited.

The findings, published in *Nature Geoscience*, showed that the seaweed forests of Australia, the USA, New Zealand, Indonesia and Chile have a particularly high carbon removal capacity.

## Hydro-electric schemes affect Arctic rivers

PhD student Adam Francis represented SAMS on fieldwork in the Canadian Arctic, exploring how climate change and hydro-electric expansion is affecting the rivers feeding into Hudson Bay. For three weeks and in temperatures down to -40°C, Adam was based Sanikiluaq, on the Belcher Islands, which is on almost exactly the same latitude as SAMS.

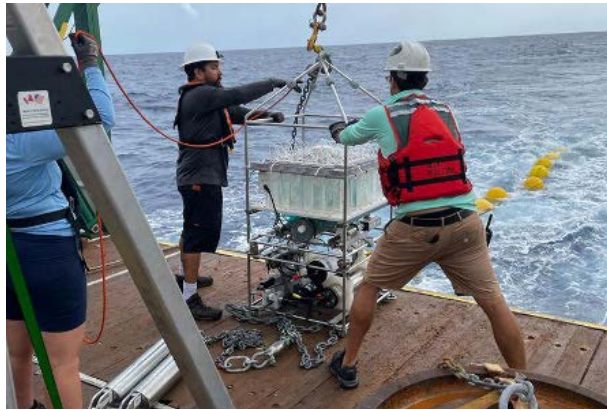
The research team worked with the indigenous Inuit people, who have noticed major changes in the environment. Thinner and less predictable sea ice, water circulation and salinity changes and declines in populations of native animals are all impacts of climate change. But there has also been a lesser-known impact from a huge increase in hydro-electric schemes built on many large rivers surrounding Hudson Bay.

These schemes change the timing and the intensity of the flow of freshwater into Hudson Bay with more water being released in winter to meet higher energy demands of cities in the colder times of year. These rivers would naturally have the greatest flow during the spring melt season in May/June but recently these modified catchments now cause water to flow under the winter sea ice in different and largely unknown patterns around Hudson Bay.

# May







# Carbon in the Gulf Stream

We have the Gulf Stream to thank for our (relatively) mild Scottish winters. But it transports more than just heat. It also contains nutrients and carbon.

The ocean overall removes 25% of emitted carbon dioxide from the atmosphere and has thereby slowed down climate change. But scientists fear that the the ocean will not be able to continue carbon uptake at this rate.

The NERC and NSF funded C-Streams project is exploring the role of the Gulf Stream and wider North Atlantic in carbon cycling and removing carbon from our atmosphere. They are using novel moored and drifting instruments and ocean robots to measure the changes in carbon and nutrients at various water depths over 2000 miles going northeast from the Florida Straits.

In 2024 the research team updated the Florida Strait mooring with new sensors and deployed three biogeochemical Argo floats in the Gulf Stream to study how ocean properties reach the surface, interact with the atmosphere, and contribute to carbon absorption. The £4M project is led by the University of Liverpool. SAMS contributors are Dr Robyn Tuerena, Dr Clare Johnson and UHI PhD student Alice Rolandini Jensen.

[Watch the short project film here \(digital only\)](#)



# A unique MRes

A new and unique Masters by Research (MRes) in Marine Science was launched to take advantage of the multi-disciplinary marine science research at SAMS.

The course offers students the flexibility to study a range of topics, from the deep sea to coastal environments, including oceanography, biotechnology, marine governance and policy, plastic pollution, aquaculture and robotics.

The first intake was in autumn 2024, covering topics such as: nitrogen uptake by ulva; microplastics in the marine environment; and host-pathogen interactions in brown seaweeds.

“SAMS research covers a plethora of topics relating to the sea and society and we wanted to offer a research Masters programme that took advantage of the knowledge and facilities here.

Programme leader Dr Bernadette Snow

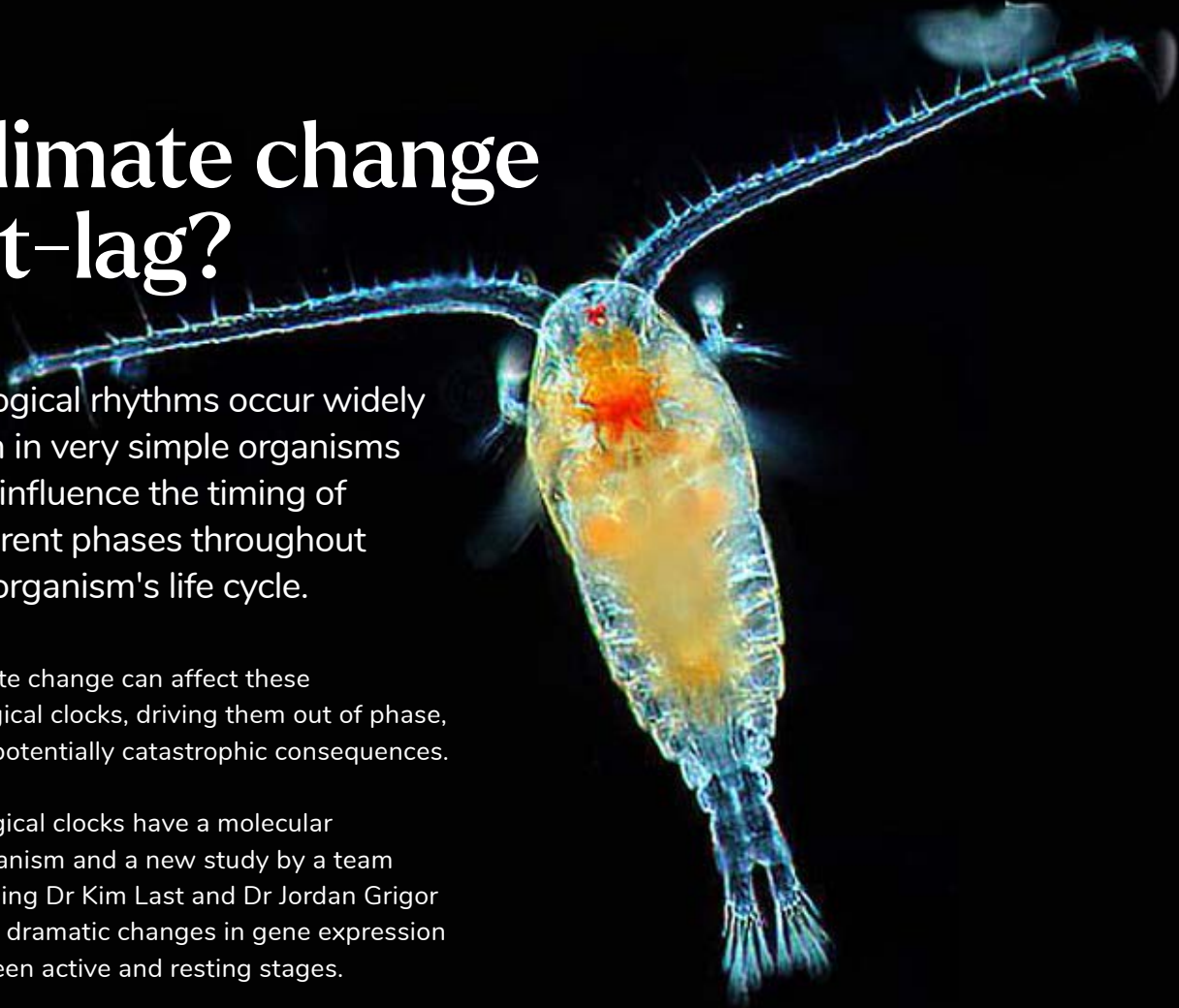
June

# Climate change jet-lag?

Biological rhythms occur widely even in very simple organisms and influence the timing of different phases throughout the organism's life cycle.

Climate change can affect these biological clocks, driving them out of phase, with potentially catastrophic consequences.

Biological clocks have a molecular mechanism and a new study by a team including Dr Kim Last and Dr Jordan Grigor found dramatic changes in gene expression between active and resting stages.





# Maiden Arctic voyage

A team from SAMS was on board the RRS Sir David Attenborough as the UK's polar research vessel made its first science expedition to the Arctic.

The research ship made sail for south-east Greenland to help advance our understanding of the region's rapidly decaying ice sheet and its impacts on ocean and global climate systems.

Led by an interdisciplinary team of 40 scientists and support staff from renowned research institutes worldwide, including SAMS, the KANG-GLAC project embarked on a six-week mission to study Greenland's glaciers and life in coastal waters around the edge of the world's largest island.



RRS Sir David Attenborough in front of A23a iceberg, 1 Dec 2023  
(2) (Credit. Theresa Gossman, Matthew Gascoyne, Christopher Grey)

# Sea ice surprise

A presumption that rapidly melting Arctic sea ice will open up new shipping routes sparked a warning from scientists investigating the fast-changing ice conditions.

Although seasonal sea ice – the ice that thaws in summer and reforms in winter – has been shrinking at a rate of knots because of climate change, this has released thick and centuries-old multi-year ice from further north into shipping channels.

Scientists investigating 15 years of sea ice charts from the Canadian Arctic are now warning shipping companies and sailors that this thicker ice could be more hazardous and more unpredictable, creating so-called 'choke points' in existing shipping routes.

The shipping industry is worth trillions of dollars in annual trade and accounts for the transport of nearly 90% of all goods globally, so the state of the route through the Northwest Passage is of high interest.

The study, published by Dr Alison Cook of SAMS in the journal Communications Earth & Environment, also highlights potential impacts for coastal communities along the routes of the Northwest Passage, as many Canadian Arctic communities rely on maritime traffic for the supply of goods.



# July

# Underwater camera on plankton patrol

A hi-tech underwater device that scans water samples for potentially dangerous algae blooms – the first of its type to be deployed in UK waters – has produced tens of millions of images in its first year of operation.



The Imaging FlowCytobot (IFCB) uses a combination of lasers and cameras to detect and photograph microscopic, single-celled phytoplankton in the water, before uploading data for specialist analysis, detection and monitoring.

While phytoplankton are a critical part of the ocean ecosystem, some species can reproduce,

or 'bloom', to toxic levels. Humans eating shellfish that have absorbed these toxic phytoplankton can become ill and blooms can also be fatal to farmed fish. Early warning of such phytoplankton blooms is therefore crucial to the aquaculture industry.

The IFCB was deployed at a Scottish Sea Farms site in Shetland by a

research team from UHI partners SAMS and UHI Shetland, with help from Scottish Sea Farms, which operates the Cole Deep site. It is the first time that an IFCB has been deployed at a working fish farm anywhere in Europe. The research team is using artificial intelligence to train the system to identify different species of phytoplankton at the farm.

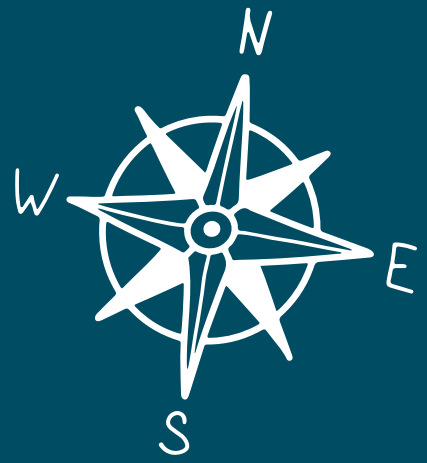




Image credit: Clipper Round the World Yacht Race.



# JULY Clipper Race connections



With a shared passion for the ocean, visits to SAMS by the Clipper Round the World Yachting Race competitors made for perfect additions to the festivities when the crews stopped off in Oban.



As part of the race's events programme, SAMS hosted two key events, as well as organising five days of hands-on science busking at the North Pier in Oban, in association with other local charities, including the Hebridean Whale and Dolphin Trust, and the Scottish Seabird Centre.

SAMS welcomed minibuses packed with visitors, including crew representatives and race officials, to have a guided tour of the specialist facilities. The teams from SAMS' Scientific Robotics Academy and Scottish Marine Robotics Facility demonstrated gliders, drones and rovers as tools to identify marine litter, whilst in the education building, SAMS Enterprise showed how 3D visualisations and AI are helping marine scientists to map

large areas of seabed and structures in the ocean. Marine mammal specialists introduced visitors to underwater sounds and how to protect marine wildlife from harm, and a final activity in the Ocean Explorer Centre highlighted the benefits and complexities of marine protected areas.

SAMS also hosted the Clipper Connect Business Series event 'Blue Horizon: sustainable marine tourism in Argyll & the Isles', co-curated by Clipper, Argyll & Bute Council, Visit Scotland, Bid4Oban and SAMS.

The success of Oban as a host town for the Clipper Race and then the Royal National Mòd in October contributed decisively to being named as Scotland's Town of the Year 2024.



# Green Antarctica

A SAMS scientist who has helped to create the first continent-wide mapping study of plant life across Antarctica has described the work as a ‘game changer’ which will change perceptions of the continent.

The study, published in *Nature Geoscience*, reveals growth in previously uncharted areas and is set to inform conservation measures across the region. The satellite survey of mosses, lichens and algae across the continent will now form a baseline for monitoring how Antarctica’s vegetation responds to climate change.

Scientists used a European Space Agency satellite to sweep the continent, combined with field measurements taken over several summer seasons, and detected almost 45 square kilometers of vegetation – roughly three

times the size of Lake Windermere in the Lake District, UK.

Dr Matthew Davey, SAMS principal investigator on polar algae and physiology, who was involved in coordinating the expeditions and science, said: “This is a major breakthrough and a game-changer in our understanding of these Antarctic ecosystems.

The international team, led by the University of Edinburgh with the Norwegian Institute for Nature Research, British Antarctic Survey and SAMS, found that over 80 per cent of the vegetation growth was

contained within the Antarctic Peninsula and neighbouring islands. The team estimates this growth makes up only 0.12 percent of Antarctica’s total ice-free area, highlighting the importance of monitoring key areas of vegetation abundance.

Antarctic vegetation, dominated by mosses and lichens, has adapted to survive the harsh polar conditions and each type plays an important role in carbon and nutrient cycling on a local level, experts say. Until now, their spatial coverage and abundance across the continent remained unknown.



# Climate risk assessment of fisheries in Namibia

Eight large-scale fishery sectors provide important food and income sources to people in Namibia. Changes in climate are likely to affect the target species while weather instability may reduce the safety and effectiveness of fishing.



A new study by a consortium including SAMS’ Dr Bernadette Snow calculates the climate risk for different fisheries.

Small-scale, recreational and rock lobster fisheries were identified to have the greatest overall risk while rock lobsters and crabs were the most climate-sensitive species.

The findings were discussed with local fishing communities in five workshops across Namibia to explore options for climate adaptations.





## Celebrating 'exceptional' students

An 'exceptional' undergraduate student who has been involved in five research projects and deputised on an oceanographic cruise to the North Atlantic while in only her second year of study, was named SAMS student of the year.



Nele Thomsen, who graduated along with 44 other students from SAMS this year, has undertaken three summer internships during her BSc Marine Science and has travelled to Svalbard and Tromsø in Norway.

In her second year of study she joined a research ship to gain experience but was unexpectedly promoted to replace a senior chemist who tested positive for Covid-19 the day before the ship sailed. Research

undertaken by the German student, in addition to her undergraduate degree, has contributed to five scientific studies, which are now in the process of being written as academic papers. She is now studying a PhD at SAMS, exploring how copepods are affected by environmental stresses and pollution.

Nele was one of seven award winners at the graduation ceremony, including fellow graduates Janika Sander, who won

the Tim Boyd Prize for Oceanography, Jamie Nathaniel, who was presented with the Overall Achievement Award, and Niamh Docherty, who gained the Academic Excellence Award.

Nicole Allison won the Johanna Fehling Memorial Prize for the best PhD student research paper; Kavya Shibu won the ACES-STAR Dissertation Prize and Adam Francis was awarded the Graham Shimmield Prize for Biogeochemistry.



## New university role

SAMS Director Prof Nick Owens is heading up research activity at UHI after being appointed to the university's senior executive team as Vice-Principal for Research and Innovation.

Prof Owens, who has been Director of SAMS since 2015 and is continuing in the role, has previously led the British Antarctic Survey and brings considerable experience in managing complex research organisations. He will play a crucial role in shaping the research strategy of UHI, of which SAMS is a partner.

## Carbon-mapping first

A new series of reports, authored by SAMS scientist Prof. Michael Burrows and published by a coalition of nature charities, means the UK is the first nation to map and estimate the amount of carbon stored in its seabed habitats, including in Marine Protected Areas (MPAs).

The Blue Carbon Mapping Project, completed on behalf of WWF, The Wildlife Trusts and the RSPB, reveals that 244 million tonnes of organic carbon are stored in just the top 10cm of UK seabed habitats, with 98% stored in seabed sediments such as mud and silt.

UK seabed habitats could capture up to 13 million tonnes of organic carbon every year – almost three times the amount sequestered by the UK's forests – 4.8 million tonnes – although forests cover a much smaller area (32,500 km<sup>2</sup>).

The Blue Carbon Mapping Project highlights how physical disturbances to the seabed, including from human activity such as bottom trawling, as well as moorings and offshore developments, pose threats to blue carbon stores. Disturbing seabed habitats can release large amounts of carbon into the atmosphere, worsening climate change.





# SEPTEMBER Oban up to the challenge

West Highland hospitality and world class marine science came together in Oban as SAMS welcomed 267 delegates to the biennial Challenger Society Conference.

Last held in Oban in 2006, the conference is one of the largest gatherings of marine scientists in the UK and tackled issues from climate change and biodiversity loss to diversity and ocean education.

While Oban offered a range of activities that demonstrated the area's rich culture and stunning location, organisers first of all praised the quality of science discussion in the Corran Halls venue and the exceptionally collegiate atmosphere throughout the four days.

The prestigious Challenger Medal was awarded to Prof Penny Holliday, chief scientist

at the National Oceanography Centre, and Challenger Fellowships were awarded to Anna Katavouta and Tiago Dotto while the Challenger-Woodward Fellowship went to Alastair Lough. The Norman Heaps prize for best talk went to Molly Phillips, with Lucy Goodwin as runner-up and the The Cath Allen Prize for best poster was won by Ruth Hawley, ahead of Viktoria Nikolaus. The president's art prize went to Colin Pelton.

The Challenger Society takes its name from the HMS Challenger, the ship that embarked on the first oceanographic cruise of its type in 1872. Among the scientists on board was John

Murray who would go on to establish the Scottish Marine Station, the precursor to SAMS. Sir John's great-grandson, Alex Murray, was a special guest during the week as was Philip Pearson, great-grandson of the expedition's stoker Charlie Collins, and author of 'A Challenger's Song'.

SAMS Director Prof Nick Owens, who along with Argyll and Bute Council chief executive Pippa Milne, gave the welcome to the conference, praised the local organising committee for ensuring Oban put on a Challenger Society Conference that delegates will remember with great fondness.



# 2024 CHALLENGER SOCIETY CONFERENCE



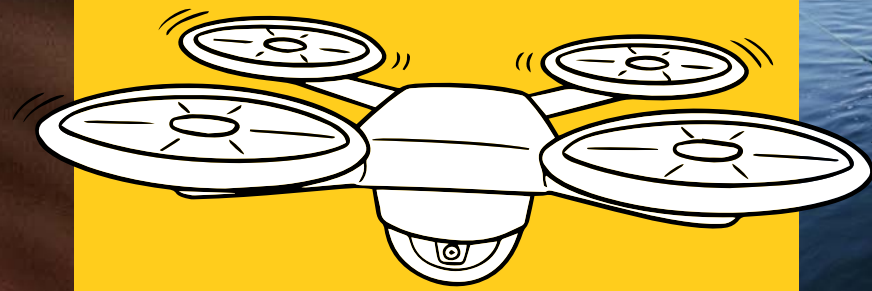
# October

## Seeking out natural products

The Culture Collection of Algae and Protozoa (CCAP) at SAMS will be part of a new £4.5m research project to develop the use of natural products in the agriculture, pharmaceutical and manufacturing industries.

The collection is part of the Natural Products BioHUB (NP BioHUB) project, led by Swansea University, which gained funding from UKRI's £25m Accelerating the Green Economy programme.

The NP BioHUB aims to lead innovation in natural products use in the agricultural, pharmaceutical, and manufacturing industries to become healthier, greener, and more sustainable.



## High hopes for airborne research

SAMS contributed to a landmark report which outlines the future development of uncrewed aerial systems (UAS) in support of low-carbon environmental science research in the UK.

The report, commissioned by the Natural Environment Research Council (NERC), was compiled by UK environmental science centres to review the UAS landscape in support of low-carbon environmental science research.

UAS enable research that is currently beyond the reach of traditional aircraft and other methods - playing a crucial role in supporting cutting-edge science, while contributing to reduced carbon emissions.

Recommendations on how best to invest in and support environmental science research using these technologies are published in the report: Net Zero Aerial Capability (NZArC) Scoping Report: A Review of the Role of Uncrewed Aerial Systems in the Decarbonisation Strategy of NERC Aerial Activities.

Dr Phil Anderson, who heads up SAMS' Scientific Robotics Academy, and SAMS UAS pilot Richard Dale were authors on the report.

## Preparing Europe's seaweed industry for climate warming

As the seaweed farming industry in Europe expands, scientists have warned that seaweeds currently thriving in the cooler coastal waters of the north Atlantic could begin to vanish over the next 50 years.

Climate change is expected to bring higher ocean temperatures, increased storms and unpredictable salinity fluctuations because of increased rainfall. Temperature has a major influence on seaweed growth and seaweed farms can be susceptible to storm damage.

However, a paper by SAMS seaweed scientist Dr Reina Veenhof in *Frontiers in Marine Science* says that sufficient investment in seaweed farming research and development could help safeguard the industry for decades to come.

The paper also explored measures to better prepare the seaweed for a change in conditions and looked at the use of priming at the early gametophyte stage of seaweed cultivation.





# November

## Hunting 'ghost fishing' gear

SAMS scientists used sonar and remotely operated vehicles to find examples of 'ghost fishing' and other lost creel gear in Scottish seas, as they attempt to reduce the risk of marine mammal entanglement.

Ghost fishing refers to lost fishing gear like creels that can collect on the seabed and continue to fish without ever being collected. Rope associated with the gear can also become an entanglement hazard. In Scottish waters approximately six humpback whales and 30 minke whales become entangled in active creel fleets each year, but the numbers that succumb to lost creel gear remains unclear.

The SAMS team used a boat to tow a side-scan sonar system, known as a towfish, to locate objects they believed to be creels. They then deployed a remotely-operated vehicle (ROV) to observe the objects in detail.

The success of the trial paves the way for better monitoring of this marine litter problem, potentially including increased use of underwater robotic vehicles in known hotspots to reunite fishermen with their gear.

## A good ambassador

Dr Alasdair O'Dell received a letter of thanks from His Majesty's Ambassador to Chile for his invaluable contribution the country's blue carbon research.

Dr O'Dell was keynote speaker at the seminar 'Advances in Blue Carbon in Chile and Scotland, organised by the British Embassy Santiago, together with Chile's Corporate Leaders Group for Climate Action.

His contribution will directly inform Chile's blue carbon agenda.



## Sea lice solutions

SAMS scientists Drs Helena Reinardy and Kim Last, convened a workshop on sea lice that brought together researchers, industry, regulators and policy makers has sought to offer solutions to the growing problem of farm infestation.

The workshop, 'Innovations in Sea Lice Monitoring', was part of the annual Marine Alliance for Science and Technology Scotland (MASTS) Science Conference in Glasgow.

The sea louse, *Lepeophtheirus salmonis*, is one of the major challenges facing sustainable Atlantic salmon farming in Scotland, but there is currently limited knowledge on the life cycle and distribution of this organism.

Meanwhile, SAMS has been trialling new methods of detecting sea lice larvae in the water column. The team has been expanding its expertise in sea lice research, from microscopic analysis to field capturing techniques.





# Protecting world heritage

SAMS helped UNESCO's Environmental DNA (eDNA) Expeditions to take an inventory of marine biodiversity at 21 of UNESCO's 51 World Heritage marine sites, in an effort to protect the world's most vulnerable species and habitats.

The 51 world heritage sites host over one third of the world's vulnerable and endangered marine species, a fifth of the world's blue carbon, and at least 15% of the global surface area of coral reefs. Yet most of the sites are threatened by climate change.

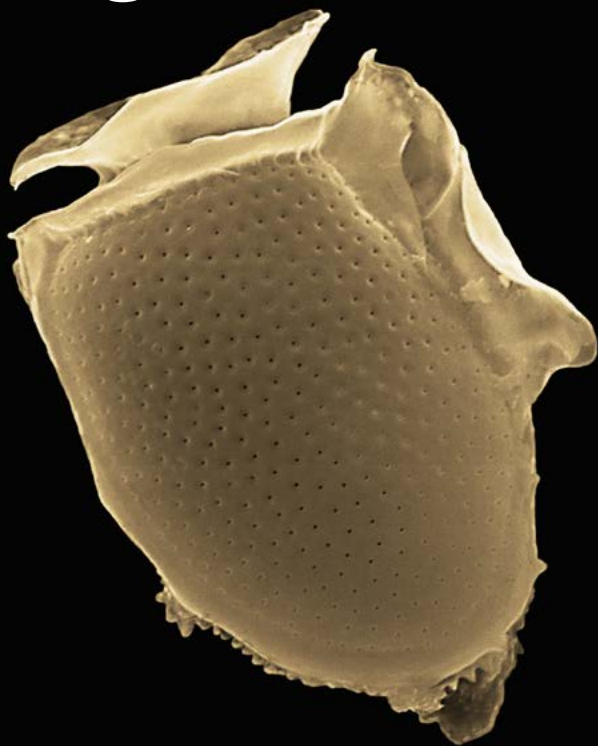
Prof Mike Burrows assisted with the climate change susceptibility work, supporting 250 volunteers – aged six and upwards, from 19 countries – who identified over 4,000 species. Their data suggest that warming oceans risk pushing many species outside of their known thermal ranges, raising key questions about how to protect them.

# An early warning

Harmful algal blooms (HABs) are a major threat to marine ecosystems, aquaculture industries, and human health, but predicting these blooms is difficult due to the many environmental and biological factors that influence their behaviour.

A SAMS study tested new 'ensemble' to improve predictions of algal blooms and their toxins in Scotland.

The results showed that ensemble models consistently outperformed individual models, making forecasts more accurate. Better forecasting allows industry to act earlier, improving food safety.



# December

## A growing collection

The Culture Collection of Algae and Protozoa (CCAP) is one of the world's most biodiverse collections, looking after microalgae, protozoa, algal pathogens and also species of macroalgae (seaweed).

In 2024, it celebrated 20 years at SAMS, a relatively short, but extremely significant time in its 100-year history.

More than 3,000 strains are currently stored and cultured by a team of scientists in the purpose-built laboratory, supported by UK Research and Innovation's Natural Environment Research Council (NERC-UKRI).

CCAP has recently added to its analytical and genomic research capabilities, helping to explore further the potential uses of algae. Algae are already used in nutraceuticals, pharmaceuticals, beauty products, food and other industries.

The collection was founded by Professor Ernst Georg Pringsheim at the Botanical Institute of the Charles University of Prague in the 1920s. In response to the Nazi invasion of Prague, Pringsheim and his cultures moved to England where the collection was expanded and eventually taken over by E A George for Cambridge University in 1947, coming to its current home in 2004 when SAMS' Sir John Murray Building opened.

Since then, 1,303 strains have been added to the collection. In the same period, the team has also despatched more than 13,000 orders to more than 100 countries, as far afield as the Azores, Gambia and Fiji.

Visit [www.ccap.ac.uk](http://www.ccap.ac.uk) to find out more...



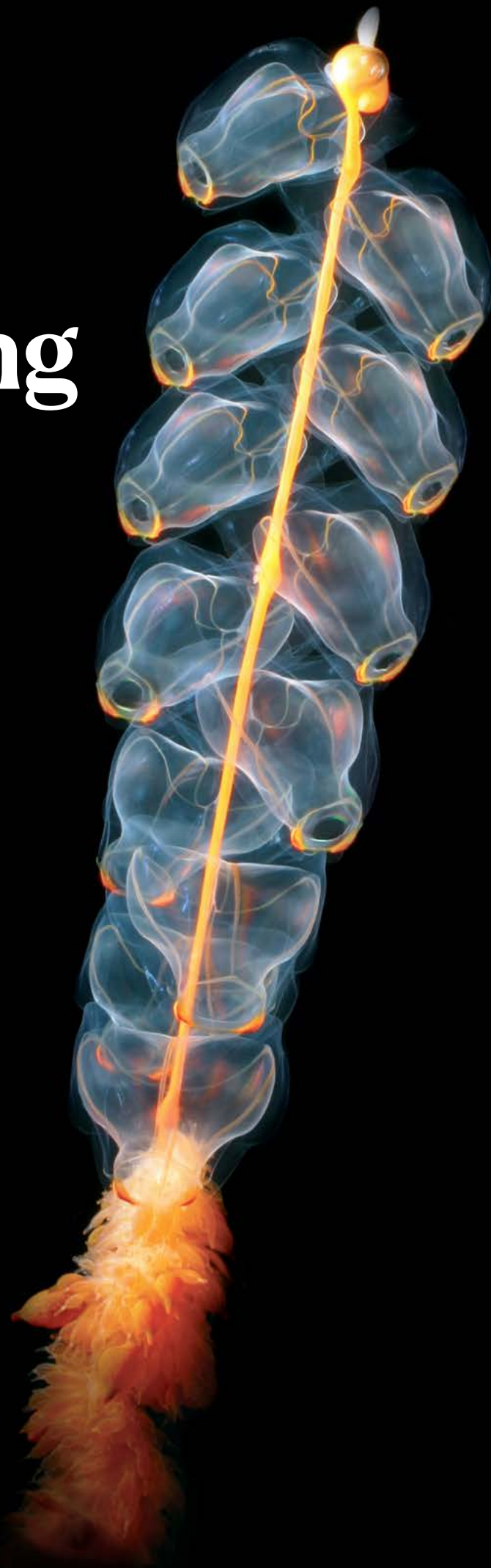
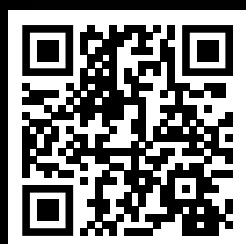
# Fundraising at SAMS

In 2022 SAMS began a brand-new journey seeking philanthropic supporters who share our commitment for advancing marine research, education, and scientific innovation.

To those who have responded straight away with generosity and kindness, and to those who have opened their minds to deep dive further into our fascinating body of ocean research; **thank you!**

We have big plans for the future, and 2025 sees us plan what that journey looks like. We're looking forward to a future of nurturing our existing donors, building new relationships, and inviting others to be part of the SAMS family.

[www.sams.ac.uk/support-sams](http://www.sams.ac.uk/support-sams)



## Green shoots from blue growth

Made possible thanks to a £199k grant from The Coop Group and Co-Op Foundation's £3.5m Carbon Innovation Fund, SAMS has joined forces with two other leading Scottish research institutes – the Environmental Research Institute (ERI) and Scotland's Rural College (SRUC).

We're investigating the potential for repurposing marine wastes as resources to both filter water and to reduce reliance on synthetically produced or mined fertilisers, enhancing blue-to-green circularity in the food system.



## The SAMS student support fund

The very best talent can come from any background, and we strive to nurture promising students, both from the UK and internationally, irrespective of financial, cultural or socio-economic circumstances.

Generous grants from philanthropic trusts enabled us to launch this impactful initiative which offers crucial support for SAMS students during their studies. As well as bursaries, discretionary hardship awards, and contributions towards specialist field trips, paid summer internships have also been made possible, allowing the scientists of the future to work alongside established researchers and gain invaluable hands-on experience.



The team from the Coop Foundation visiting the CCAP facility at SAMS. Image - Rosie Boyko, SRUC



# Welcoming our first corporate supporters on board

SAMS aims to nurture an environment where impactful corporate relationships can thrive and where shared values align to create powerful change for people and planet.

## A MISSION TO INVEST IN RESEARCH THAT MATTERS

We entered the second year of our partnership with registered B Corp, Mission Performance.

As part of their unique approach to addressing the company's carbon emissions, they are investing directly in carefully selected charities, of which SAMS is proud to be the ocean representative. Any funds raised via the partnership will be used specifically for our revolutionary work with micro-algae.

## POWERING THE NEXT GENERATION OF SCIENTISTS

At the end of 2024, we agreed an exciting new partnership with the BlueFloat Energy | Nadara Partnership, focussed on inspiring and nurturing the next generation of science and technology talent.

Through its Broadshore and Bellrock Offshore Wind Farm projects, BlueFloat Energy and Nadara are supporting SAMS' core ocean literacy and STEM programmes throughout 2025 – directly funding a brand-new STEM post, broadening access to robotics via a funding boost to the SAMS Scientific Robotics Academy, as well as supercharging student, early career scientist and STEM training opportunities for young people through student bursaries and internships.



## TAPPING INTO SUPPORTING MARINE HABITATS

In 2023-24 we welcomed the first company to join up to our brand-new Corporate Supporters scheme.

Water Plus, a water retailer working with businesses, public sector and not-for-profits, added SAMS to its growing portfolio of environmental charity partners. They helped SAMS explore more about the potential around blue carbon capture and storage, and to complete feasibility work in this area, supporting future scientific approaches and research.

# Thank you!

We'd like to thank all the philanthropic funders, donors and supporters who stood by our side in 2023 and 2024, as together we strive for a healthier ocean for a stronger planet...



- |                           |                                |                                    |
|---------------------------|--------------------------------|------------------------------------|
| Aquatec                   | MDPI                           | Sylvia Aitkin Charitable Trust     |
| Cobb Charitable Trust     | Nortek UK                      | The Thriplow Charitable Trust      |
| Dr George West            | Planet Ocean Ltd               | Valeport Ltd                       |
| Ettrick Charitable Trust  | Seal Analytical                | And those who wish to be anonymous |
| Henhurst Charitable Trust | Subsea Commercial Services Ltd |                                    |
| Kaiser Trust              | Swale Technologies Ltd         |                                    |

And not forgetting all those who have donated online, during a visit to the Ocean Explorer Centre or who have fundraised in aid of SAMS. You're all brilliant. You are all change-makers.

**OUR APPROACH TO FUNDRAISING** - Fundraising at SAMS is built on meaningful relationships, underpinned by trust, respect, authenticity, integrity, and a shared commitment to protecting the ocean as one of humanity's most vital resources. We want our donors to feel connected to our work, to our people, and to truly understand the incredible impact of their donations.

We will always ensure that our fundraising is not intrusive or persistent and doesn't create undue pressure to donate. We comply with the Fundraising Regulator's Code of Fundraising Practice and Fundraising Promise, and we're registered for the Fundraising Guarantee through the Scottish Fundraising Adjudication Panel.

We have not received any complaints in regard to our fundraising activities this year. We have worked with commercial participators this year and have been delighted to have Ellen Packham and Atul Kumar supporting our trust and foundation endeavours as professional fundraisers.



# Peer-reviewed journal articles & reviews



SAMS Author(s)	Title	Journal
Allison NL, Dale AC, Narayanaswamy BE, Turrell WR	Investigating local trawl fishing as a source of plastic beach litter	Marine Pollution Bulletin
Armitage P, Burrows MT, Rimmer JEV, Blight AJ, Paterson DM	Multidecadal changes in coastal benthic species composition and ecosystem functioning occur independently of temperature-driven community shifts	Global Change Biology, 8
Barrett NJ, Harper EM, Last KS, Reinardy HC, Peck LS	Behavioural and physiological impacts of low salinity on the sea urchin Echinus esculentus	Journal of Experimental Biology, 2
Barton S, Yang M, Batchelor-McAuley C, Mitchell E et al	Fluoro-Electrochemistry Based Phytoplankton Bloom Detection and Enumeration;	ACS ES&T Water, 11: 4858-4871
Bates AE, ..., Burrows MT et al	Overcome imposter syndrome:	Biological Conservation
Benjamins S, Williamson W, Billing S-L, Yuan Z, Collu M, Fox C, Hobbs L, Masden EA, Cottier-Cook EJ, Wilson B	Potential environmental impacts of floating solar photovoltaic systems	Renewable and Sustainable Energy Reviews
Berthou S, Renshaw R, ..., Jones S, Inall M et al	Exceptional atmospheric conditions in June 2023 generated a northwest European marine heatwave which contributed to breaking land temperature records	Communications Earth & Environment, 1
Brewin RJW, T..., Brunner L, Dall'Olmo G	Lab on a Secchi disk: A prototype open-source profiling package for low-cost monitoring in aquatic environments	Limnology and Oceanography - Methods
Bridges AEH, ..., Narayanaswamy BE et al	Review of the Central and South Atlantic Shelf and Deep-Sea Benthos: Science, Policy, and Management	Oceanography and Marine Biology
Brito J, Soszynski A, Heymans JJ et al	Drivers of trophodynamics of the open-ocean and deep-sea environments of the Azores, NE Atlantic	Progress in Oceanography
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Burmeister K, Schwarzkopf FU, Rath W, Biastoch A, Brandt P, Lübbecke JF, Inall M	Dependency of simulated tropical Atlantic current variability on the wind forcing	Ocean Science, 2: 307-339
Calderan S, Boisseau O, Lacey C, Leaper R, van Geel N, Risch D	A preliminary description of Atlantic white-sided dolphin (Lagenorhynchus acutus) vocalizations	Marine Mammal Science

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Cecchetto MM, Smith CR, Nunnally CC, Sweetman AK	High benthic community respiration and ecosystem response to phytodetrital input in a subpolar fjord on the West Antarctic Peninsula	Limnology and Oceanography
Clinton M, Wyness AJ, Martin SAM, Brierley AS, Ferrier DEK	Association of microbial community structure with gill disease in marine-stage farmed Atlantic salmon (Salmo salar);	BMC Veterinary Research, 1
Cockell CS, Green DA, ..., Davey MP et al	BioMoon: a concept for a mission to advance space life sciences and astrobiology on the Moon	Discover Space, 1
Cole G, Lavender E, Naylor A, Girling S, Aleynik D, Oppel S, Dodd J, Thorburn J	Physiological responses to capture, handling and tagging in the critically endangered flapper skate (Dipturus intermedius).	Conservation Physiology, 1
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Corrochano-Fraile A, Carboni S, Green DM, Taggart JB, Adams TP, Aleynik D, Bekaert M	Estimating blue mussel (Mytilus edulis) connectivity and settlement capacity in mid-latitude fjord regions	Communications Biology, 1
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De Luca Peña LV, Dewulf J, Staes J, Moulart I, Vandamme S, Heymans JJ, Taelman SE	Assessing the sustainability of Blue Economy activities using an ecosystem and life cycle-based approach:	Ocean & Coastal Management
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Filbee-Dexter K, ..., Burrows MT et al	Carbon export from seaweed forests to deep ocean sinks	Nature Geoscience, 6: 552-559



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<b>Fraser NJ</b> , <b>Fox AD</b> , <b>Cunningham SA</b> , Rath W, Schwarzkopf FU, Biastoch A	Vertical Velocity Dynamics in the North Atlantic and Implications for AMOC	Journal of Physical Oceanography, 9: 2011-1024
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Frontier N, <b>Marlow J</b> , Giles A, Morley SA, Clark MS, Peck LS	Growth and ecophysiology of two Antarctic benthic predators; <i>Isotealia antarctica</i> and <i>Urticinopsis antarctica</i>	Journal of Experimental Marine Biology and Ecology
Gaurisas DY, <b>de Jonge DSW</b> , <b>Sweetman AK</b> , Bernardino AF	Effects of increased temperature and altered POC composition on a bathyal macrofaunal community in Cabo Verde, NE Atlantic	Progress in Oceanography
Geffen AJ, Nash RDM, <b>Fox CJ</b>	How well do connectivity tools agree over the full life cycle?	Journal of Fish Biology
<b>Gonçalves GRL</b> , Koomson A, Aggrey-Fynn J, Nyarko BK, <b>Narayanaswamy BE</b>	Invisible Peril	Marine Pollution Bulletin
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Hall AJ, Kershaw JL, Fraser S, <b>Davidson K</b> , Rowland-Pilgrim S, Turner AD, McConnell B	Estimating the risks of exposure to harmful algal toxins among Scottish harbour seals	Harmful Algae
<b>Halsband C</b> , <b>Thomsen N</b> , <b>Reinardy H</b>	Climate change increases the risk of metal toxicity in Arctic zooplankton	Frontiers in Marine Science
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Hoppe CJM, Fuchs N, Notz D, <b>Anderson P</b> et al	Photosynthetic light requirement near the theoretical minimum detected in Arctic microalgae	Nature Communications, 1
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<b>Kumari P</b> , Matsushima R, Hirayama T, Mikami K	Responses of the marine filamentous red alga 'Bangia' sp. ESS1 to recurrent changes in seawater concentration	Algal Research
Luan Q, <b>Mitchell E</b> , Henley SF, Orkney ACM, Bouman HA, Braun JS, Poulton AJ, <b>Davidson K</b>	Water mass influence on spatial and seasonal distributions of diatoms, dinoflagellates and coccolithophores in the western Barents Sea	Polar Biology
Mahari WAW, Waiho K, Fazhan H, Azwar E, Shu-Chien AC, <b>Hersi MA</b> et al	Emerging paradigms in sustainable shellfish aquaculture:	Aquaculture, 740835
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# Advancing together into a new ocean age

Change is a characteristic of life, and we live in a period of particularly dramatic changes in climate, biodiversity, geopolitics, and technologies.

These shifts are threatening the health of the ocean and the prosperity of our coastal communities. Despite best intentions, we do not currently have the knowledge or skills, let alone the mindset, to rectify these challenges.

Yet robotics and AI, systems thinking and transdisciplinary collaborations offer amazing new opportunities to accelerate our understanding and capabilities in marine science.

At SAMS we are preparing to be at the forefront of a new ocean age. Together with our trustees we are exploring how to give greater voice to the ocean in boardroom decision making. And, at the same time as we are canvassing widely for the best ideas for our next five-year strategy, we are also horizon scanning and developing a 25-year roadmap. We are looking to grow our network, locally, nationally and

internationally to build a modern 'clan' of ocean people. And we will invest heavily to grow and deliver more essential ocean science.

The best future for the ocean and for SAMS depends on empowering talented people. We need a diverse team of trustees, marine scientists and experts in supportive fields and are recruiting a new chairperson for our board and new senior colleagues in research and commercialisation.

In recent years we were steered wisely by some amazing board members, whose tenure has come to an end: science journalist Susan Watts, educator Dr Deborah McNeill and marine scientist colleagues Prof Colin Brownlee and Dr John Baxter helped us with our ongoing development of SAMS into a well-managed and modern organisation. My gratitude for their service and support runs

deep, and I hope they will remain part of our ocean clan. And I am very pleased to welcome new trustees Keir Ashton, Louise Ledgard, Laura Dance, and Hugh Raven who joined us during the year: we look forward to working with you in the years to come.

I am proud of what SAMS has achieved in 2024 and look forward with excitement to 2025. Thank you to our trustees, our funders, donors, clients, supporters and the many students who entrust their future to us, and especially my colleagues at SAMS – we all have lots of important work to do!



Professor Nicholas JP Owens  
SAMS Director







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