

2019-20

# Annual Report

Independent marine science since 1884

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Cover image: Photo by Alasdair O'Dell. A large seaweed harvest takes place at SAMS' seaweed farm, Loch Linnhe, to understand methods required for large-scale seaweed aquaculture.

# About SAMS

Our vision is an ocean in balance that is healthy and sustainable. We work towards this by...

- **DISCOVERING** new knowledge about the oceans through world-class, transformational research
- **COMMUNICATING** our new knowledge through inspirational education and public engagement and
- **APPLYING** this knowledge through government, business and research partnerships to solve some of the greatest challenges facing our planet

Our research embraces the great challenge of our time: how to provide sustainable food and energy for a growing human population while safeguarding the health, biodiversity and productivity of the natural environment. SAMS focuses on marine related aspects of this challenge, conducting research around the world, across disciplines and at all scales with our partners and stakeholders. To ensure any new knowledge we generate is used we educate, inspire, advise and collaborate with all sectors of society.

Founded by Sir John Murray in 1884 in Edinburgh, SAMS is the United Kingdom's oldest independent and dedicated marine science organisation, engaged in research, education and enterprise.

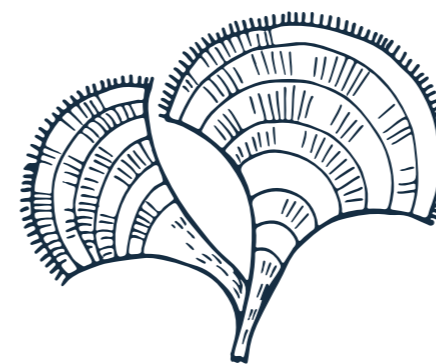
SAMS is a company limited by guarantee governed by its Memorandum and Articles

of Association. It is also a registered Scottish charity with a membership. It operates two wholly owned active subsidiary companies: SAMS Research Services Limited and SAMS Limited.

SAMS is a founding academic partner of the University of the Highlands and Islands, an Associated Institution of the United Nations University, and a delivery partner of UK Research and Innovation – Natural Environment Research Council.

**Registered office:**  
**Scottish Association for Marine Science**  
**Dunbeg | Oban**  
**Argyll PA37 1QA**  
**Scotland | United Kingdom**

**Charity Number:** SC009206  
**Registered Number:** SC009292



# Welcome!

We had another rich and varied year, and can only celebrate a selection of highlights in this annual report. We have been fulfilling our mission of conducting some great research, inspiring the next generation and providing solutions to achieve sustainable oceans. Beyond that we also engaged in a major exercise to develop our 2020-2025 strategic plan. Although the strategy was not published during the reporting year, most of the groundwork was laid during this period with numerous consultation meetings with staff, trustees and stakeholders. I was particularly keen to test the robustness of our business model – what I call the three-legged stool model. The three legs of the SAMS business model are research, education and enterprise. I am pleased to report this was deemed to be a sound basis for the next five years for SAMS but we sharpened its description to the more dynamic discover, communicate and apply. You will see many world-class examples of each of these in this report.

Of course, all this thinking about the future cannot be considered in isolation. Last year's activities were carried out against the background of Brexit and climate change. The former did not influence us unduly, and I'm pleased

to say some of what is reported here was funded by the EU and produced in collaboration with European colleagues, with some of whom we have worked for many years. As I write we are still uncertain what the future will look like.

On climate change, SAMS is among the leading UK organisations conducting research into its impacts on the physical, chemical, biological and social marine system. Not only do we try to disentangle what is a phenomenally complex problem, we also try to discover and communicate understanding and prediction to manage its consequences and mitigate the causes where possible. We are part of the solution and there are examples of our work to demonstrate that.

I cannot end without a reference to the COVID-19 pandemic, which descended on us in the last weeks of this formal reporting year, heralding a quite exceptional period for human society. It may be appropriate to detail some of our responses in next year's report but suffice to say here, SAMS remained open to continue our work to discover, communicate and apply.

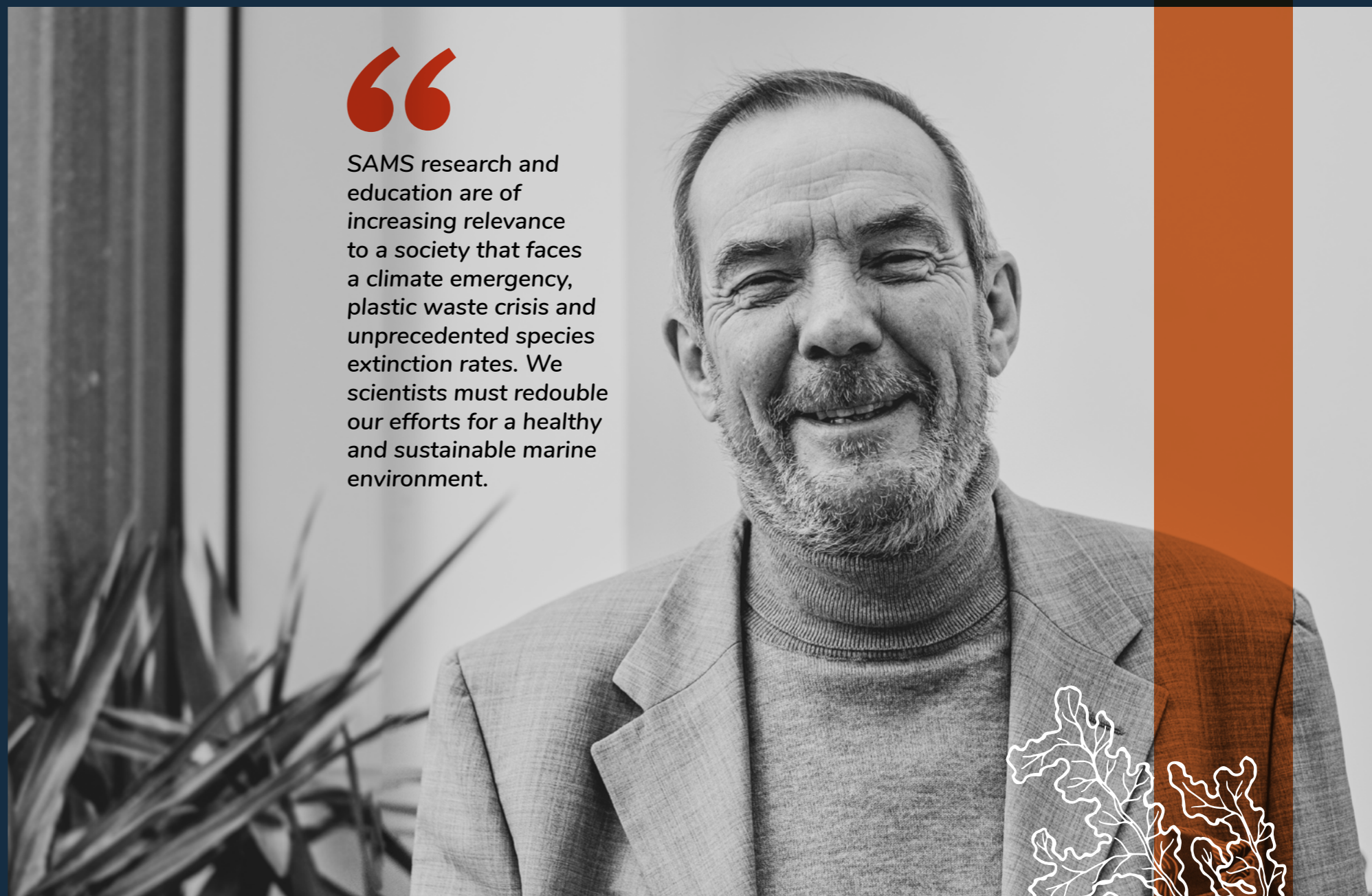
I hope you enjoy our report.



Professor Nicholas JP Owens  
SAMS Director



**SAMS research and education are of increasing relevance to a society that faces a climate emergency, plastic waste crisis and unprecedented species extinction rates. We scientists must redouble our efforts for a healthy and sustainable marine environment.**

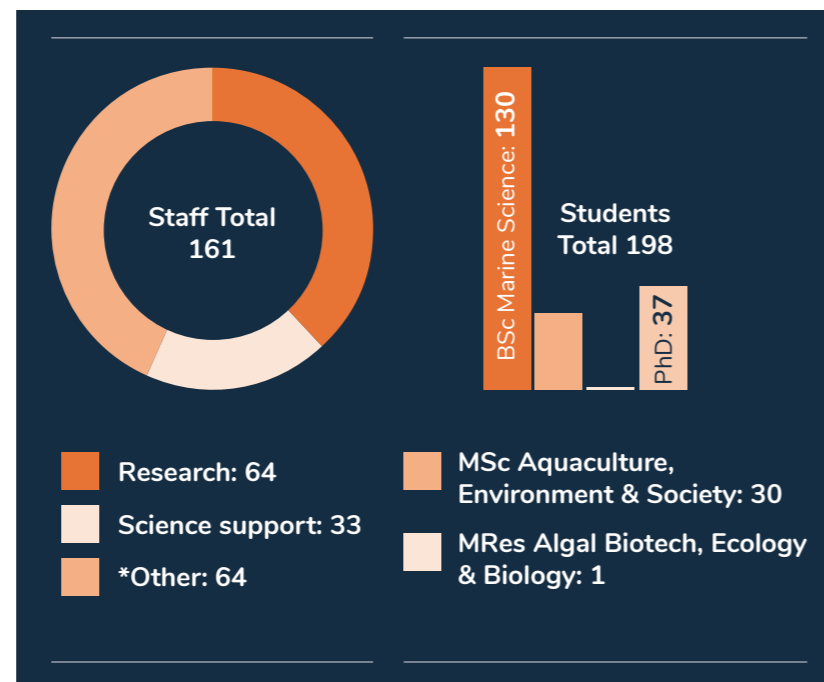
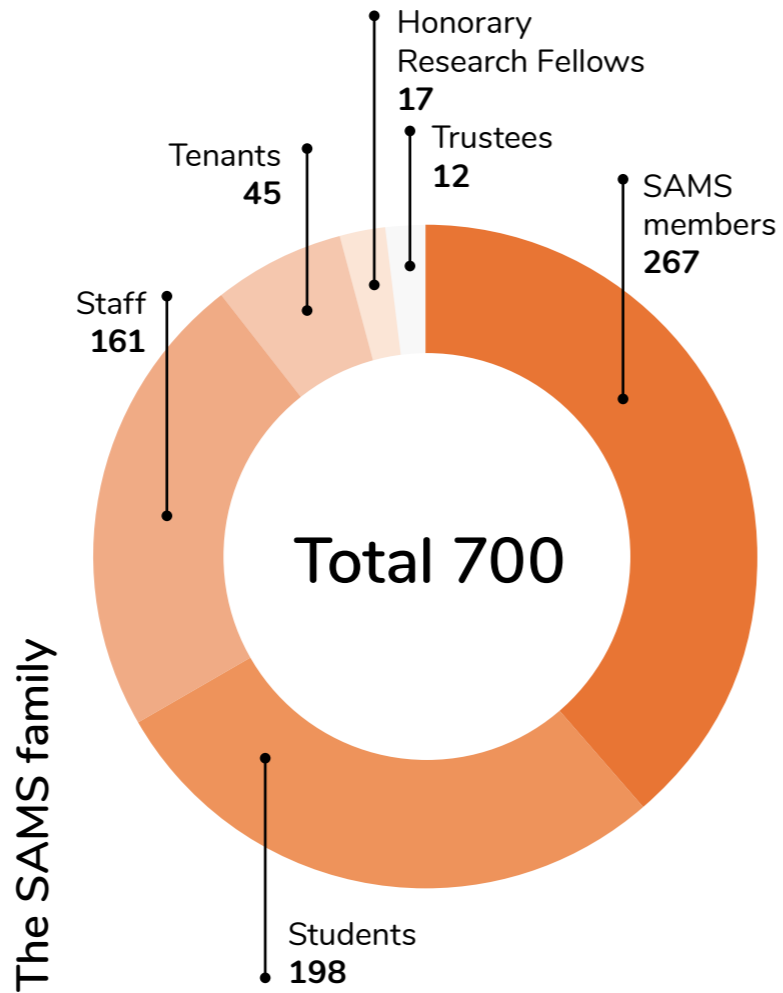




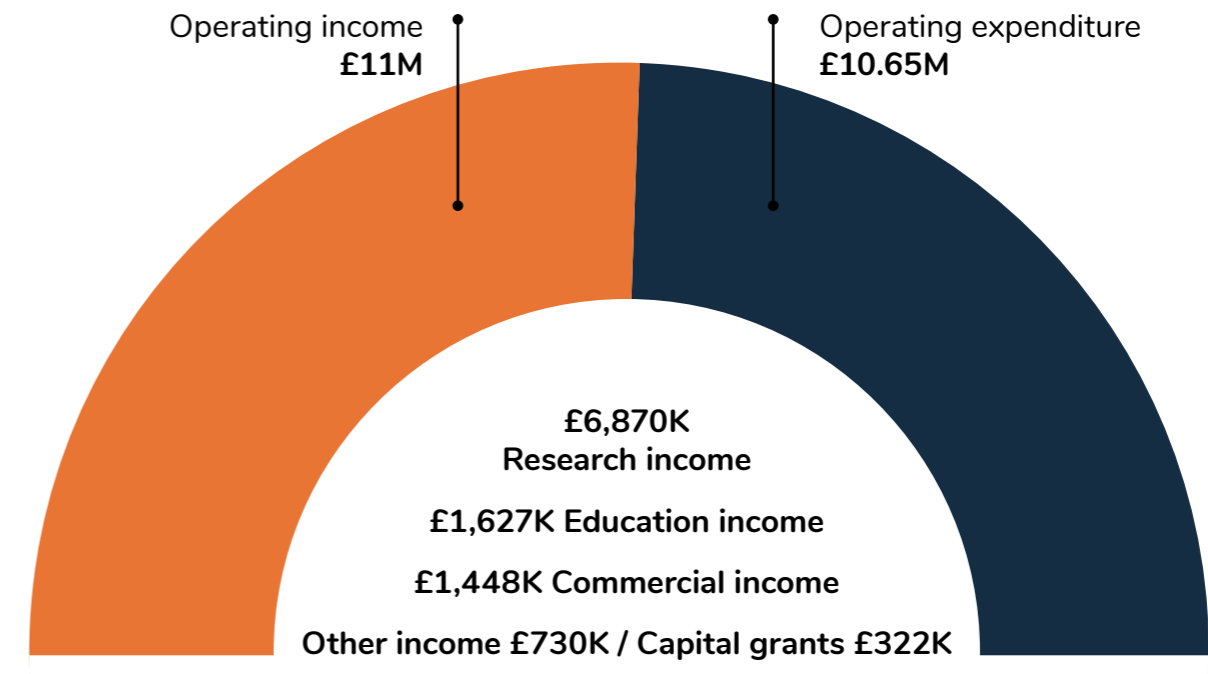
# At a Glance

## Activities

- 3** TAUGHT PROGRAMMES
- 67** COMMERCIAL contracts
- 118** FUNDED research projects
- 121** PEER-REVIEWED publications
- 527** SCHOOL pupils trained
- 1,334** ALGAL CULTURES supplied [www.ccap.ac.uk](http://www.ccap.ac.uk)
- 5,101** VISITORS to the Ocean Explorer Centre



## Finance



\*Education, Enterprise, Professional Services, Management

# Research overview

SAMS researchers study many aspects of the marine and coastal environment to further develop our understanding of how the ocean system works and the role our seas and global oceans play in the planetary ecosystem and human society. Our team also develops solutions that help society manage the marine environment in a sustainable manner and that support marine-based businesses with environmentally friendly know-how. We have a particular geographic focus on the North Atlantic and Arctic oceans but conduct research all around the world.

Internally we no longer operate in discipline-specific departments but in three multi-disciplinary research areas that cover the discovery, underpinning and applied research spectra that are of relevance to academia, governments, regulators, communities, NGOs and industry. The following pages thus report some highlights from our Ocean Systems, Dynamic Coasts and Blue Economy Research Areas.

We have been working on both a public corporate strategy and an internal research strategy during much of the reporting period, trying to prepare for an uncertain future outside the European Union. We have ambitious plans to enhance our reputation for research excellence and to increase the impact and influence of our science. We will apply our research expertise to the large global challenges of climate change, biodiversity loss and the need for sustainable food and energy for a still growing human population.

Towards the end of the reporting year we entered the coronavirus pandemic period that affected our research in many ways. While most of our activities moved from the laboratory to home-working in a virtual environment, a substantial amount of field and laboratory work had to be postponed or amended. The laboratory remained open as we deliver frontline services with our monitoring work for harmful algae and had to maintain our living cultures and resources. A substantial number of staff were furloughed but most of our researchers worked from home, focusing on data analysis, paper and proposal writing.

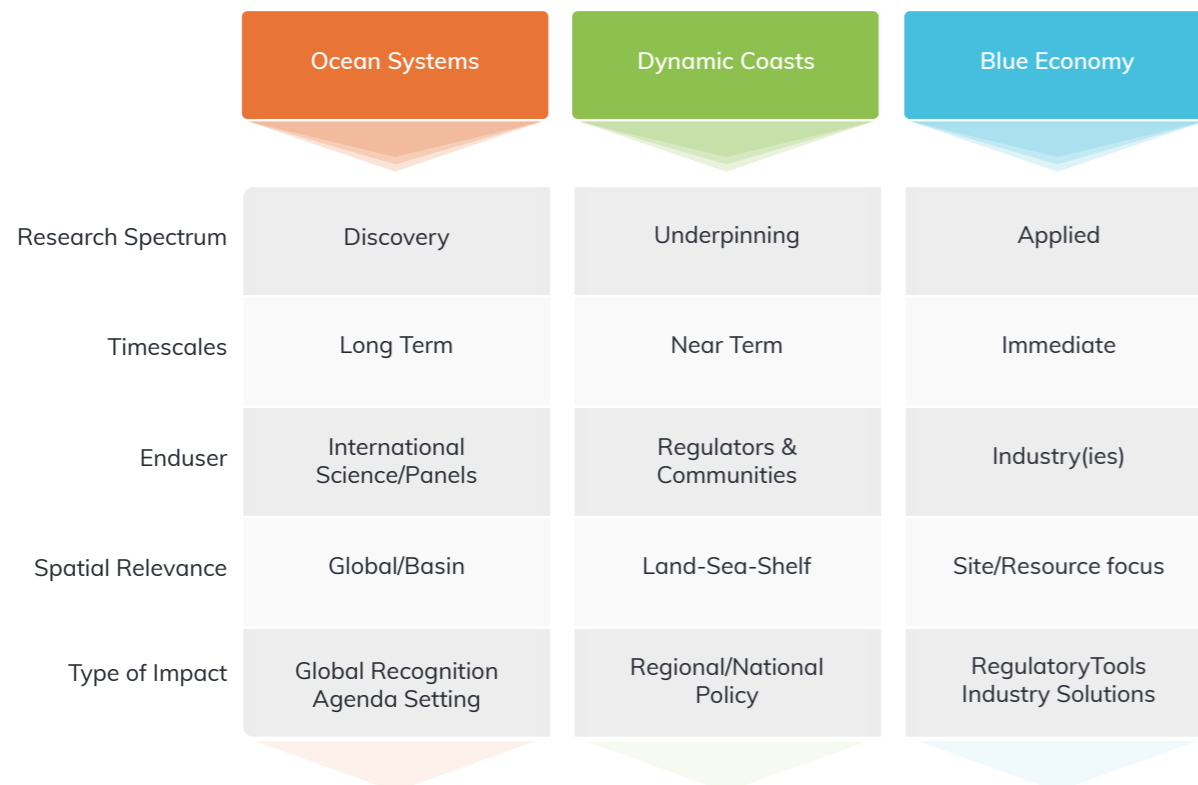


Figure: SAMS research is organised into three trans-disciplinary research areas.

## The Covid-effect on research Dr Helena Reinardy

In March 2020 I travelled to Longyearbyen in the High Arctic, carrying in my luggage newly designed primers for epigenetic marker genes. At the University Centre in Svalbard I conducted qPCR gene expression analyses on polar cod larvae over a hectic four days, hastened by the sudden notification that the laboratory was closing due to the worsening COVID-19 pandemic sweeping through Europe.

I shortened the PCR protocol to the minimum and the final qPCR plate was run and saved, and the data was snatched away on a USB drive 15 minutes before the doors were closed and locked. The island was going into lockdown and I only had a couple of hours to pack up and leave on the last plane. But I knew that exciting data was safe in my pocket, ready to be analysed.

The research is part of a collaboration with Nord University and Tromsø University investigating epigenetic changes in polar cod exposed to oil under climate change conditions.

“



# Ocean Systems Research

This research area explores the key processes that comprise the interconnected systems by which our oceans function. These processes range in scale from molecular to planetary and cover all scientific disciplines. Research topics include Arctic science, large-scale oceanography, climate change, ecosystem function and marine plastics.

79 staff members and research students are interested in this research area, led by **Professor Finlo Cottier** and **Dr Raeanne Miller**. Ocean Systems Research Area consolidates core areas of activity related to ocean circulation, climate change, ecosystem processes, impacts of a retreating cryosphere and marine plastics.

## All eyes on the Arctic

The Arctic ecosystem remained a major point of interest in this research area, incorporating the oceanographic, biological and chemical expertise among SAMS scientists.

**Professor Finlo Cottier** was among an influential group of scientists that produced a discussion paper on how the changing Arctic is linked to the UK's climate.

Professor Cottier was also part of a team behind a research paper based on results of novel fieldwork working during the depths of the constantly dark Arctic winter. Along with Norwegian collaborators, SAMS scientists switched off every source of light – even from their ship – plunging themselves into complete darkness, to examine the marine biology of the polar north.

By then using a super sensitive light sensor developed at SAMS and echo sounders to detect the presence of organisms in the Barents Sea, they discovered that marine creatures, from tiny zooplankton to fish, reacted to even the smallest detection of light, often

moving away from the source.

Light dictates how marine organisms behave, acting as a prompt for when to migrate through the water column to find food and avoid predators. It is hoped this latest discovery will allow scientists to better predict how an increase in light penetrating the Arctic seas – a result of the reducing sea ice cover brought on by climate change – will impact on marine communities.

The findings, published in *Communications Biology*, also raise questions over how we currently survey Arctic marine populations in winter, including commercially-important fish.

## The rhythm of life

A team of marine biologists led by **Dr Kim Last** have discovered that despite permanent daylight during the Arctic summer, internal biological clocks continue to provide the rhythm of life.

Researchers had previously suspected that the daily cycles of biology would cease during the Arctic summer when the sun is permanently above the horizon and day and night become indistinguishable. They expected the lack of a light-dark trigger to affect the proper

functioning of the circadian clocks that affect tourists and marine plankton alike.

The research showed that the genes of copepods kept ticking even under snow-covered sea-ice and at a time when there is virtually no difference between day and night. Whilst in the southern Arctic, circadian clock genes generally cycled daily in the north, and only a few hundred miles from the North Pole, their clock had changed.

## AUV unearths Arctic seabed

SAMS scientists captured images from a seabed exposed for the first time in thousands of years because of rapid glacial ice retreat in the Arctic.

The research team, led by **Dr John Howe**, used an Teledyne Gavia AUV to get close to the edge of four glaciers in Svalbard.

The results from the AUV survey, which include photographs, sonar images and crucial oceanographic information such as temperature and salinity, have helped scientists to understand how the increasing rate of melting caused by climate change is affecting the seabed below the glaciers.

Using satellite images, combined with AUV seabed data, the research team calculated retreat rates of glacial ice for past 10 years. Two of the glaciers, Kronebreen and Kongsbreen, have been retreating by up to 300 metres per year, some of the fastest retreat rates for Svalbard glaciers.

## Discovering the ocean's 'hidden' eddies

SAMS scientists working with robotic gliders measured previously hidden patches of water between the Arctic and Atlantic oceans that could dramatically alter our understanding of how the ocean's food web forms.

Created in the northern part of the Barents Sea, as cooler and fresher water from the Arctic moves south and becomes trapped within the warmer and saltier water from the Atlantic, these eddies – circular movements of water that have broken off from an ocean current – measure roughly 30 kilometres across.

Despite their size, the eddies are invisible to satellites and had gone unnoticed until SAMS oceanographers picked up some unusual readings during a trial mission of a glider.

## Running AMOC

SAMS oceanographers published a series of papers outlining changes in the North Atlantic and the effect of a freshening Arctic on the Atlantic Overturning Meridional Circulation (AMOC), the vast ocean current that carries heat from the tropics to the Arctic.

Building on data from the RAPID and OSNAP mooring arrays, deployed in 2004 and 2014 respectively, and glider missions, **Professor Stuart Cunningham** led a research cruise (DY120) to the north east Atlantic under Covid-19 restrictions, which retrieved moorings that had been at sea for 27 months.

The iAtlantic project, involving SAMS researchers, was also launched during the reporting period. The project is the biggest

ever mounted in the planet's second largest ocean and involves more than 30 partners, funded by the EU. It is being co-ordinated by Edinburgh University.

The research team will use an array of hi-tech devices, including AUVs, to scan the deep ocean from the Arctic to South America. They want to assess the effects of climate change on plants and animals using genomics, physics, machine learning and other specialisms.

While this particular eddy's surface temperature was similar to the surrounding water, masking it from satellites, its lower salt content made it stand out in the glider readings.

SAMS oceanographer **Dr Marie Porter**, lead author on a report about the discovery, said her findings had implications for understanding the distribution of nutrients that fuel the entire Arctic ecosystem.

## It's getting hot out there

**Professor Mike Burrows** headed an international group of marine scientists that compiled the most comprehensive assessment of how ocean warming is affecting the mix of species in our ocean.

Researchers from the UK, Japan, Australia, USA, Germany, Canada, South Africa and New Zealand analysed three million records of thousands of species from 200 ecological communities across the globe.

Reviewing data from 1985 – 2014, the team showed how subtle changes in the movement of species that prefer cold-water or warm-water, in response to rising temperatures, made a big impact on the global picture.

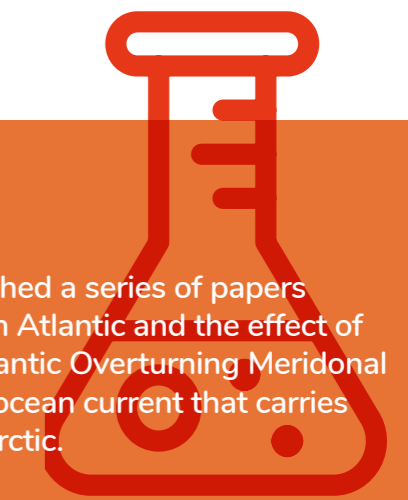
The findings, published in the journal *Nature Climate Change*, show how warm-water species increase and cold-water marine species become less successful as the global temperature rises. However, the study also suggests that some cold-water species will continue to thrive by seeking refuge in cooler, deeper water.

## The robotics age

SAMS AUVs, drones and gliders continue to patrol the coastal waters and open ocean, collecting data for oceanographic studies, coastal mapping and harmful algal blooms.

Representatives from the Centre of Excellence for Sensing and Imaging Systems (CENSIS) visited SAMS during the reporting period to learn about the range of applications used by SAMS researchers.

Graham Kerr, CENSIS technical director said: "We leave SAMS with a huge amount of information. The staff here working in technology are well qualified and are involved in projects that you can see will have impacts."



# Dynamic Coasts Research

The Dynamic Coasts Research Area (RA) delivers natural and social science to underpin the management of coastal and shelf seas ecosystems.

Dynamic Coasts research currently comprises a portfolio of projects investigating coastal oceanography, the impacts of aquaculture on coastal ecosystems, changes in natural communities and marine mammal ecology. A smaller number of projects are working on fish ecology and fisheries, marine habitat mapping, invasive species ecology and marine social sciences.

68 staff members and research students were involved in this research area. In the first part of the reporting year the leaders were Dr Suzi Billing and Dr Clive Fox which later changed to Dr Tom Adams and Dr Helena Reinardy.



## Research project focus

### Marine Protected Area Management and Monitoring

MarPAMM is an environment project to develop tools for monitoring and managing a number of protected coastal marine environments in Ireland, Northern Ireland and Western Scotland. To manage Marine Protected Areas effectively requires knowledge on species and habitats, realistic monitoring approaches and technologies, and the support from coastal communities and businesses. SAMS staff contribute habitat mapping and communication work.

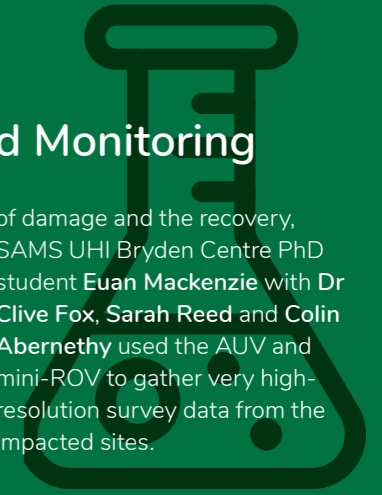
In May 2019 Dr John Howe and Dr Clive Fox joined the RV Celtic Explorer for a successful

sampling and survey trip to the Malin Shelf. They collected ROV, multibeam and grab samples in addition to drop-down video to characterise benthic fauna around Malin Head, Hempton's Turbot Bank and Innishtraul Island. They also deployed a laser-scanner on the ROV Eltanin for very high-resolution imagery of wreck, sand wave and rocky reef habitats. They found a new site for flame shell nests and surveyed a sabellaria reef.

Loch Carron was recently designated as a Scottish MPA after scallop dredging had damaged fragile flame shell beds. To characterise the extent

of damage and the recovery, SAMS UHI Bryden Centre PhD student Euan Mackenzie with Dr Clive Fox, Sarah Reed and Colin Abernethy used the AUV and mini-ROV to gather very high-resolution survey data from the impacted sites.

In October Colin Abernethy, Dr Emily Venables and Dr John Howe undertook an AUV survey in the Firth of Lorn to identify skate and rays and to provide high-resolution imagery and bathymetry of flapper skate sites. This project, led by James Thorburn from St Andrews, produced excellent AUV-collected photographs and augers well for future deployments.



## 50 years Lorn Pelagic Observatory

In January 1970 Professor Paul Tett collected the first plankton samples from what is now known as the Lorn Pelagic Observatory (LPO), located off the Gregg Isles between Dunstaffnage and Lismore. It is a salinity-stratified fjordic site in the inner Firth of Lorn. The LPO is a long-term monitoring station where Professor Tett – and others – have been collecting samples for phytoplankton and associated pelagic protozoa. It is the oldest such station in the UK.

As plankton are sensitive indicators of changes in the ecosystem, such a long time-series of plankton data helps us understand the changing state of the pelagic habitat on the west coast of Scotland, identifying for example a decrease in the abundance of diatoms in the Celtic Sea. The data from the LPO contributed substantially to the development of a plankton life-form indicator as a policy-approved tool to assess pelagic biodiversity. In 2019 it contributed to a publication on the first assessment of the pelagic plankton community on a UK-wide scale (McQuatters-Gollop A.... Tett P, 2019, Ecological Indicators 101: 913-925).

In the Year of Coasts and Waters Tett has been calling for the continued support for the LPO. Maintaining long-term monitoring stations like the LPO is extremely valuable in times of rapid climate and ecosystem change yet it is difficult to attract the necessary support.

**How would wind turbines on fish farms affect seabirds?** With a growing blue economy, space in desirable coastal waters is becoming increasingly crowded. Fish farms are thus likely to expand increasingly into more remote, exposed off-grid areas.

To reduce fossil fuel use, these could install wind turbines on their sites. There are concerns that such wind turbines could pose risks to birds attracted to fish farms for food or shelter. Dr Steven Benjamins undertook a thought experiment with UHI colleague Dr Elizabeth Masden and Strathclyde engineer Dr Maurizio Collu to assess the impacts on coastal birds if a generalised Scottish west coast fish farm integrated four small wind turbines. They found that the potential risks to bird species would depend on their abundance and behaviour, eg whether they were attracted to aquaculture sites for feeding or resting, whether they were night active and how manoeuvrable they were. Large gulls and European shag were identified to be at greatest potential risk, but large data gaps concerning how Scottish seabirds interact with this significant and widespread industry still remain.

**How do mine tailings affect cod?** Dr Helena Reinardy tested how mine tailings affect Atlantic cod embryos and larvae. She found mine tailings sticking to the mature fish eggs, negatively affecting larvae and causing epigenetic changes in the early life stages of cod.

**Public collects coastal microplastic samples for SAMS research** Professor Bhavani Narayanaswamy and PhD student Lola Paradinas have been studying seasonal and temporal variations in microplastic abundance along the north and west coast of Scotland. To obtain samples from the entire area at the same time, they trained and equipped a team of citizen scientists. Working with skilled volunteers enabled the research to cover a much wider area to monitor microplastic contamination levels.

**Microplastics in Arabian Sea invertebrates** Dr Appalanaidu Sura from the National Centre for Coastal Marine Research, Ministry of Earth Science, India visited SAMS as a POGO Fellow, working alongside Professor Bhavani Narayanaswamy. Their project focussed on identifying microplastics in benthic invertebrates from the Eastern Arabian Sea, Indian Ocean. The fellowship provided training for Dr Sura and established links between SAMS and NCCR.

**Fukushima fishers worry about release of treated water** It's been 9 years since the earthquake, tsunami and nuclear disaster devastated Fukushima. As part of an ESRC-funded project, Dr Leslie Mabon and his collaborator Professor Midori Kawabe of Tokyo University of Marine Science and Technology have been studying the recovery efforts and continued concerns of fishers and coastal communities in Fukushima. They found that fishers are very concerned over their livelihoods as the Japanese Government prepares to release treated water stored at the Fukushima site into the north-west Pacific Ocean.

**Developing research collaborations in Taiwan** Dr Leslie Mabon has established new links with social scientists in Taiwan, a coastal nation with big aspirations for offshore renewable energy. With his PhD student Yi-Chen Huang from Robert Gordon University and scholars from National Yang Ming University and Academia Sinica he published a synthesis of environmental social science research conducted in Taiwan. He also began collaborating with Taiwan's Industrial Technology Research Institute (ITRI) on low-carbon energy infrastructure, and was invited to speak at an international Public Outreach Forum for Geologic Carbon Storage in Taipei.

**Publications galore for fisheries PhD students** Fisheries PhD students, Jacob Bentley (UHI) and Ismet Saygu (C University, Turkey) had a great year with both being awarded their PhDs and producing seven peer-reviewed publications between them. They had used Ecopath software to model the marine foodwebs in the Irish Sea and Gulf of Mersin, Turkey. Jacob's Irish Sea model explores the combined effects of environmental changes, food-web dynamics and fisheries on stocks.

His work has received attention from ICES, the organisation responsible for providing fisheries advice to the EU. Ismet explored the effects of changing trawl mesh sizes on the foodweb in the Bay of Mersin. The work also highlighted how invasive species coming through the Suez Canal affect the ecosystem in the eastern Mediterranean.

Both students have since secured marine-related Postdoc positions. Jacob is working with the UN Environment Programme World Conservation Monitoring Centre in Cambridge while Ismet is taking up a research position in the Azores. Supervision was by Drs Clive Fox, Natalia Serpetti and Professor Sheila Heymans.

**First year of small grant support** Over the last year the Dynamic Coasts research area awarded grants that helped support the successful setup of experiments on combined impacts of temperature and pH changes; a training workshop for SAMS staff on remotely-operated-vehicles; attendance at an ICES Working Group; and a collaboration visit to Hebridean Whale and Dolphin Trust.

# Blue Economy Research

This research area develops industry solutions and regulatory tools, channeling SAMS' expertise in fundamental and applied marine science to support commercial users of the marine environment to gain wealth from the oceans without degrading the very system we all depend on.

Blue Economy Research 84 staff members and research students are involved in this research area, led by **Dr Adam Hughes** and **Dr Sally Rouse** during the reporting period.

### A new industry for Scotland

Often referred to as the seafood capital of Scotland, Oban took its place as the seaweed capital of Scotland for two days in February 2020 as optimism and anticipation grew around a new Scottish industry.

The town hosted 180 attendees at the fourth annual Scottish Seaweed Industry Association (SSIA) meeting and the following day around 80 delegates attended workshops at SAMS to discuss the future of the industry in Scotland. Researchers showcased the many areas of seaweed research ongoing at the institute and gave presentations on how it can support industry development.

The workshops were run through four research projects: GENIALG, the socioenvironmental benefits of seaweed farming; INTEGRATE, the capitalisation of Integrated Multi-Trophic Aquaculture (IMTA) in the Atlantic Area; AquaVitae, a survey on seaweed farming policy; and a University of the Highlands and Islands Bryden Centre PhD looking at the social acceptance of an economically viable seaweed industry.

As one of the keynote speakers on the opening day, Dr Zalina Dzhatieva of Argyll and Bute Council presented a report compiled by SAMS, entitled *Feasibility of Seaweed Farming in Argyll and Bute and Emergent Opportunities*.

### Marine mammals conference

The marine mammals team at SAMS

travelled to Barcelona in December 2019 to present talks and posters at the world's largest marine mammal conference.

The World Marine Mammal Conference brought together The European Cetacean Society (ECS) and The Society for Marine Mammalogy (SMM) to attract leaders in the field from every continent.

The gathering of interdisciplinary experts enabled discussion amongst marine mammal scientists and policy makers from more than 60 countries and was a key opportunity to foster international partnerships and collaborations.

The SAMS team, headed up by **Professor Ben Wilson**, included **Dr Denise Risch**, **Dr Steven Benjamins**, **Dr Nienke van Geel** and PhD students **Charlotte Findlay** and **Texa Sim**.

The scientists spoke on subjects ranging from acoustic deterrent devices (ADDs) and their effect on marine mammals to the future of the Bottlenose dolphins in the Sound of Barra.

### Shellfish aquaculture faces tipping point

The global shellfish aquaculture industry may have just 40 years to adapt to the changing climate as global warming, ocean acidification and extreme weather events place an increasing risk to its viability.

That was the conclusion of a SAMS research paper published in spring

2020, which modelled the effect that climate change and ocean acidification would have on the industry in 117 countries worldwide. The authors of the paper were **Phoebe Stewart-Sinclair**, **Dr K Last**, **D Ben Payne** and **Dr Tom Wilding**.

Ocean acidification occurs as increasing amounts of carbon dioxide dissolve into our seas. This has an effect for many marine creatures, including commercially-important shellfish like mussels, oysters and scallops.

Examining each country's exposure to environmental changes, and the ability of each aquaculture sector to adapt, the scientists' model showed 2060 would mark a 'tipping point' in the viability of the current global shellfish industry. The model used in the study was based on the Representative Concentration Pathway (RCP) 8.5 scenario, in which the global average temperature rises 3.7 degrees Celsius by 2100, and drew on shellfish production figures data from the United Nations' Food and Agriculture Organization (FAO). The model did not include the potential increased threat of disease in warming waters.

### Tracking HABs with UK first technology

SAMS has been investigating how robotics can help the aquaculture industry to automate water sampling processes at farming sites.

As part of the PRIMROSE project, which exists to improve harmful algal

bloom (HAB) predictions, researchers have trialled sea-based and airborne methods of collecting water samples from sites. SAMS researchers involved in PRIMROSE are **Professor Keith Davidson**, **Dr Phil Anderson**, **Dr Callum Whyte**, **Dr Dmitry Aleynik** and **Steve Gontarek**.

During the reporting year, SAMS also received delivery of the UK's first FlowCytobot, an automated, submersible imaging flow cytometer that can generate images of phytoplankton and track harmful algal bloom events.

The aquaculture industry and associated policy makers require a rapid early warning of the development of HABs and a better understanding of their response to environmental forcing in

a changing climate.

At the close of the reporting year, plans were being made to offer a PhD studentship to help achieve the first UK installation of a FlowCytobot, producing high resolution phytoplankton data for the early warning of HABs.

### Prestigious fellowship

SAMS marine ecologist **Dr Georgina Robinson** was identified as rising star of UK research when awarded a UK Research and Innovation (UKRI) Future Leaders Fellowship worth £1.2m to fund her research for the next six years.

She is working to help address global food shortage by recycling waste from food production industries – all with the

help of the humble sea cucumber. She plans an overhaul of the current 'nitrogen cycle' process by which excess nitrogen in the form of animal waste from industries like agriculture and aquaculture is turned back into an inert gas and released into the atmosphere. Instead, Dr Robinson proposes a system that will recycle this waste by using it to feed sea cucumbers and marine worms – so-called deposit feeders – which can then be farmed as a high-protein food source for humans and livestock and may even be used to generate electricity.

Sea cucumber has been referred to as a superfood, as it is high in protein, low in fat and rich in vitamins and minerals. It is eaten throughout Asia and the Middle East and there are studies currently investigating its medicinal qualities.



## Influencing global policy

Around 95 per cent of the world's \$12billion seaweed farming industry is based in developing nations and therefore susceptible to a lack of biosecurity and the impacts of climate change, such as ocean warming. At the same time, the industry is going through a rapid expansion, which scientists fear could confound the current problems.

To this end, the SAMS-led GlobalSeaweedSTAR project has been the United Nation's Food and Agriculture Organisation (FAO) to work on global policy to help safeguard the industry.

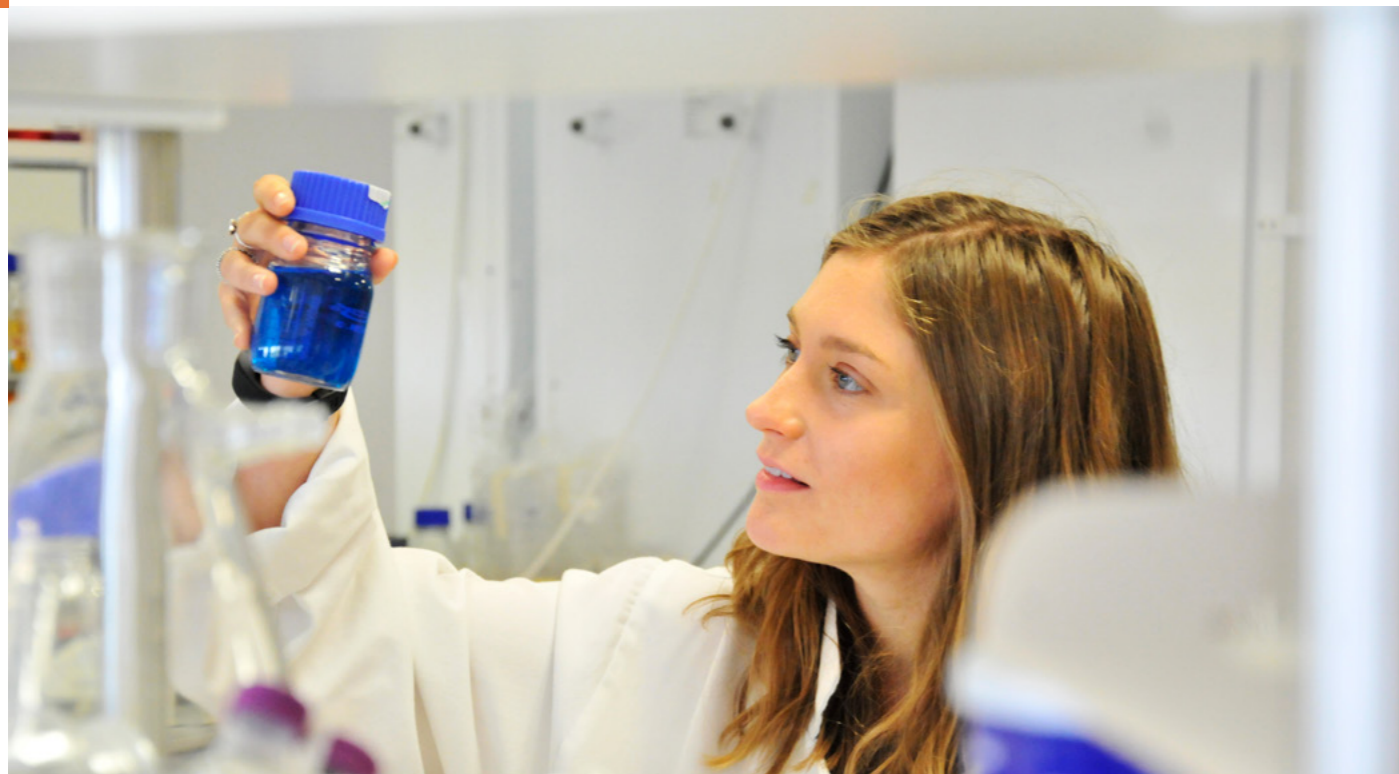
Thanks to representation from the project, funded through UK Research and Innovation's Global Challenges Research Fund, the Food and Agriculture Organisation (FAO) now intends to include seaweed alongside marine animals, such as finfish and shrimp, in producing advice on biosecurity, which aims to prevent the spread of disease and pest species.

Project lead **Professor Elizabeth Cottier-Cook**, who previously authored an international policy brief for seaweed cultivation, addressed an FAO-led meeting

in Paris in May 2019 to secure a side meeting at the FAO's Subcommittee on aquaculture (COFI/AQ).

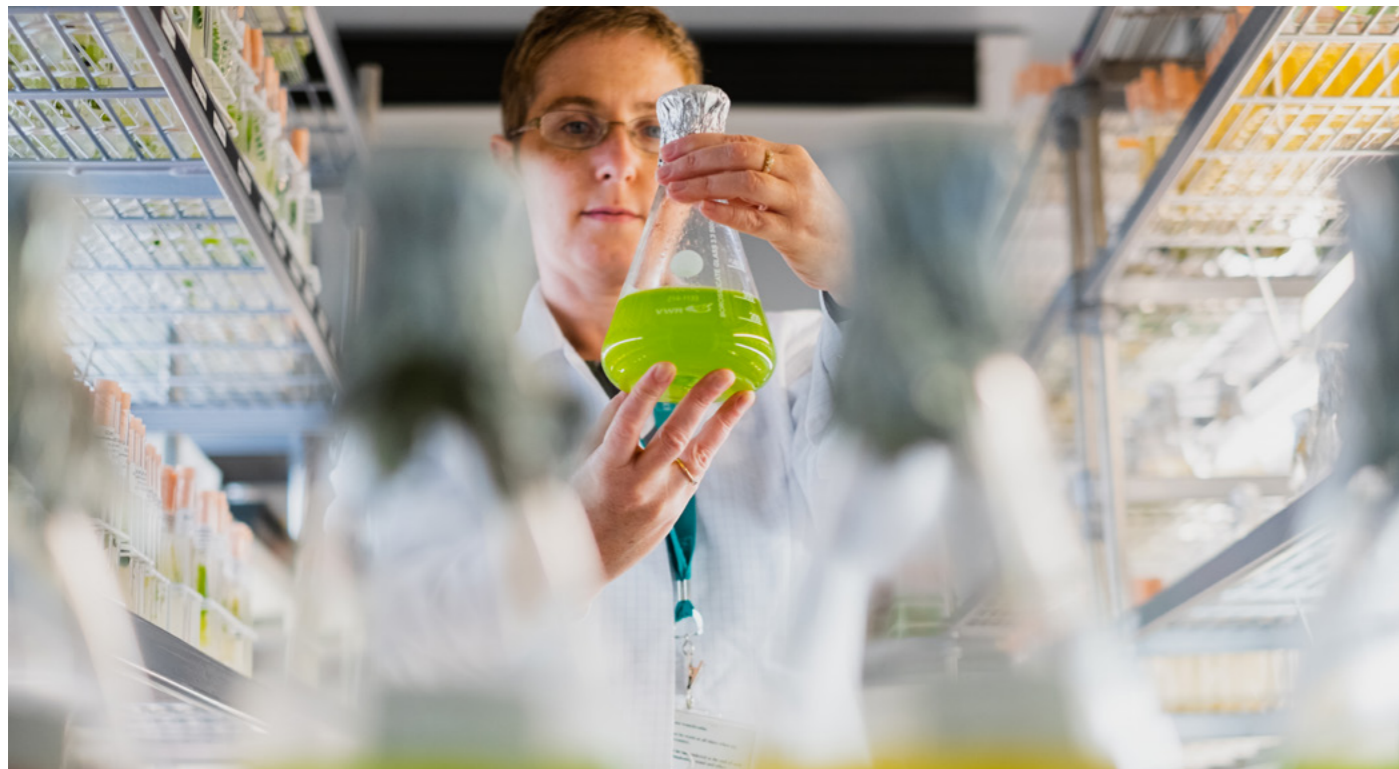
At this meeting, the FAO pledged to include aquatic plants in its Progressive Management Pathway, a management framework for aquaculture biosecurity. It is being developed in conjunction with the World Organisation for Animal Health (OIE), the World Bank, the Norwegian Agency for Development Cooperation (NORAD) and more than 25 other countries from around the world.





SAMS' molecular work helps scientists to discover new applications for algae, with potential uses in fuel, food, medicine and pharmaceuticals.

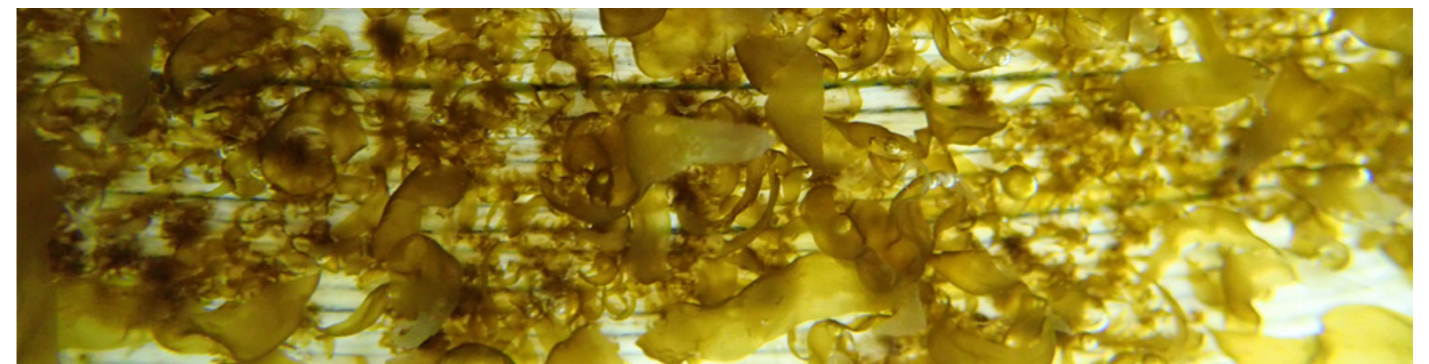
# Outstanding infrastructure for research and development of algae



The Culture Collection for Algae and Protozoa (CCAP), hosted by SAMS, is the UK's algal library, maintaining around 3,000 strains of algae and protozoa for use in research and industry.



SAMS operates an experimental seaweed farm for growing its own seaweed; the harvested material has been used in research projects around the world.



SAMS grows seaweed in a dedicated nursery by initially winding seeded twine around a plastic pipe, before being deployed at our seaweed farm, or delivered to other farms.



### 2019 Prizes

Johanna Fehling Memorial Prize:  
**PAUL DEES**

Johanna Fehling Memorial Prize  
**JACOB BENTLEY**

Prize for Best ACES Dissertation  
**MARY ARNALDO**

SAMS Council Award for Academic  
Excellence  
**SIMON VON SACHSEN COBURG  
UND GOTHA**

SAMS Award for Overall Achievement  
**ALISTAIR WALKER**

Tim Boyd Prize for Polar Science  
**FRED FLEET**

Highlands and Islands Student  
Association Sports Club of the Year  
**UHI WIND AND WAVE CLUB**

University of the Highlands and Islands  
Sporting Blues Awards  
**IAIN WALSINGHAM AND  
JOE PENHAUL-SMITH**

SAMS UHI Undergraduate Student of  
the Year Award  
**ELEANOR LAWRIE**



SAMS UHI student of the year Eleanor Lawrie had paused her studies for two years to care for her sick mother, Karen, before completing her Marine Science BScH with flying colours.

## Education

### Graduation 2019

The Argyllshire Gathering Halls in Oban were once again the backdrop for a SAMS UHI graduation event.

Friday 6 September 2019 was the date when the first two PhD students received their doctorate awards from the University of the Highlands and Islands, with another four PhD students awarded their PhDs from the University of Aberdeen. During the same event 17 Master degrees were awarded and 21 undergraduate students graduated with a BSc Marine Science qualification.

The graduation keynote was delivered by former BBC Newsnight science editor and SAMS trustee Susan Watts, who first worked with SAMS during the IceChaser cruise in 2008.

### Mental health support

The past year has seen a major effort to address student mental health issues.

UHI has invested into access to digital mental health support for all students and appointed a Mental Health Officer who provides cross partner support, meeting regularly with registry officer for undergraduates, Polly Crooks. We ran a 'resilience' training workshop and produced reference materials for Personal Academic Tutors.

The SAMS Graduate School arranged weekly welfare drop-in sessions for postgraduates, signposted local and national resources in the new PGR students' support handbook, updated the supervisors and Personal Academic Tutor reference resources, and updated the SAMS intranet with all resources.

*"I chose to study here because I wanted a PhD experience that was more personal and intimate. I wanted to be part of a university, which knew who I was. The reputation of SAMS was also a factor in my decision. I have enjoyed the opportunity to broaden my knowledge by mixing with researchers from different marine science disciplines. I have had a fantastic experience studying in such a beautiful location. It has been so much more than just a PhD."*

Dr Winnie Courtene-Jones



The first two PhD graduates from the University of the Highlands and Islands were Dr Winnie Courtene-Jones (left) and Dr Andrea Garvetto (Back row: Michael Rayner, Professor Nicholas Owens, Professor Neil Simco and Professor Bhavani Narayanaswamy)

# Education... continued

## Marine Science BSc

Course leader: Dr John Howe, Deputy: Dr Arlene Ditchfield

### Student numbers

A record 38 new students arrived to join the programme in September 2019, of which 13 came from European Union countries. We thus have now a total of 130 undergraduates, eight more than last year.

### New VLE platform

The largest change, requiring substantial effort on behalf of all the teaching staff, was the change from Blackboard to Brightspace as the university's Virtual Learning Environment. Led by **Shona Magill**, all lecturing staff had to be trained and supported to learn how to use this platform. Overall the transition went well and staff felt that Brightspace is a good platform.

### Survey results

Our National Student Survey results, where we had scored 100% satisfaction for the past two years, dropped to 86%. Some students were unhappy with issues in relation to assessment feedback. Staff shortages after redundancies may also have contributed to the drop in satisfaction ratings. In the Guardian league table 2020 UHI's four courses in Earth and Marine Sciences achieved 8th place nationally, second in Scotland.

### Student exchanges

After three years of Coastal Carolina University (CCU) from South Carolina, USA visiting SAMS for a 3-week field course in May with their undergraduates, this year saw the signing of an exchange agreement. Two third-year SAMS students subsequently studied at CCU for the first semester, learning about topics such as shark biology and marshes not available at SAMS UHI.

### ERASMUS exchanges

Five SAMS UHI students successfully applied to study at the University Centre in Svalbard, one of them for a full 12 months. Two students went to Van Hall Larenstein in the Netherlands, again one for the entire 3rd year of their study.

At the same time we had eight students from Val Hall Larenstein coming to study on our BSc programme, one from the Natural History Museums-Paris and one from the University of Alicante.

Both incoming and outgoing Erasmus student reported 100% overall satisfaction with their exchange experience.

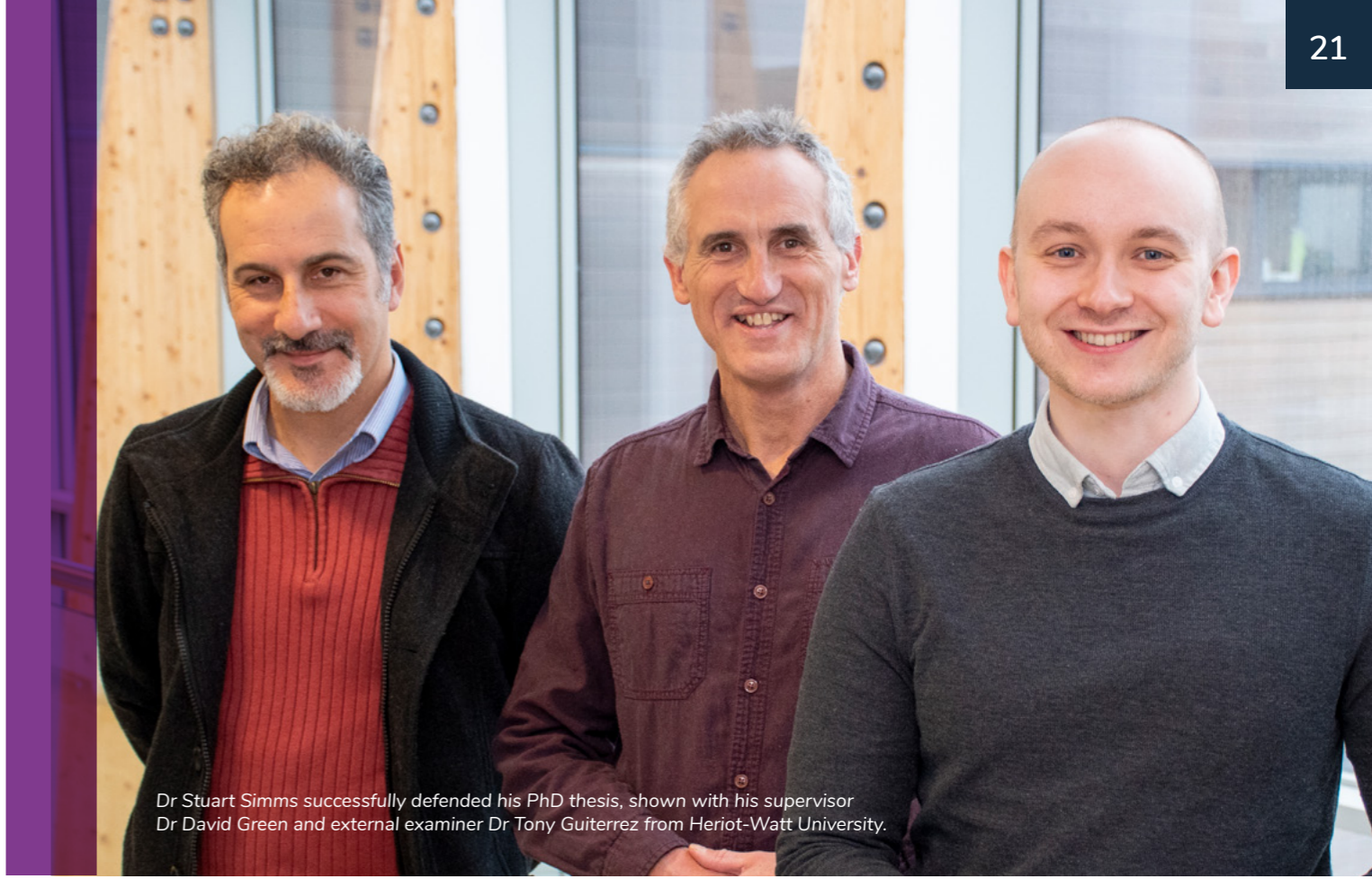
### Student accommodation

Students have a number of accommodation options. Most stay in private accommodation. The SAMS Margaret Barnes Residence can accommodate up to 11 students on site, while a private landlord operated the Distillery Apartments in the centre of Oban as student accommodation for up to 22 students. The Distillery Apartment arrangement came to an end in the summer of 2020. Student residencies are mostly allocated to first year students and those with additional needs.



*"I believe both sets of students will benefit greatly from being immersed in a different culture, both socially and academically. I also hope all of these young academics find shared experiences and create international networks that last throughout their careers."*

Dr John Howe - on the new exchange programme with Coastal Carolina University



Dr Stuart Simms successfully defended his PhD thesis, shown with his supervisor Dr David Green and external examiner Dr Tony Guterrez from Heriot-Watt University.

## Taught Masters

### ERASMUS Joint Masters in AquaCulture, Environment and Society (ACES+)

Programme Leader **Professor Elizabeth Cottier-Cook** delivered a new module in 'Managing Biological Lifecycles – Micro and Macro Algae' for the ACES+ course in the autumn of 2019. It is a unique module in Europe.

At the beginning of the 2019-20 academic year, the fifth cohort made up of 21 students hailing from 14 countries in Europe, North America, Asia and Africa joined the first year of this 2-year programme. They spent six months at SAMS before relocating to the University of Crete in Greece. Meanwhile the nine students in the second year studied in Nantes, France and undertook their dissertation at a partner and location of their choice.

20 of the first-year students were funded by Erasmus Mundus Scholarships and one by the Scottish Aquaculture Innovation Centre.

The Education, Audiovisual and Culture Executive Agency of the European Commission has indicated that Brexit will not affect ACES+ funding.

### MSc Industrial Biotechnology

13 students studying for an MSc in Industrial Biotechnology at the University of Strathclyde took an optional blue biotechnology module that was delivered fully online in response to the coronavirus.

## Postgraduate research

### Head of SAMS' graduate school: Professor Bhavani Narayanaswamy Registry officer: Fiona Tindall/Anna Kane

36 students were registered on postgraduate research programmes at SAMS during the reporting year: 35 undertaking PhDs and one the MRes in Algal Biotechnology, Biology and Ecology. One MRes and six PhD students started their research programmes in October 2019, funded through IBioIC, SUPER DTP, E4 DTP and the Arctic PRIZE project. We also hosted a PhD student from Lews Castle College UHI. 10 students completed and/or submitted their research during the reporting period.

EU funding streams support nearly 40% of our postgraduate research students, which is unlikely to continue post Brexit. This may result in a substantial reduction in our PhD student numbers unless alternative funders emerge.

Research topics cover the entire spectrum of SAMS science. Students are also encouraged to broaden their skills through a Professor development portfolio delivered by the SAMS graduate school including training in GDPR, communications, library usage and health and safety. The UHI Graduate School offers training in effective writing, delivering seminars and viva preparations.



We were very impressed and grateful for the speed and efficiency with which SRSL came to our assistance with hatchery water sampling, providing the required equipment and training at very short notice.

Kate MacKichan  
Environment Team Leader  
Scottish Sea Farms



# Enterprise & Innovation



## SAMS Research Services Ltd (SRSL) Providing solutions for an ocean in balance

SAMS' specialist marine consultancy supports individuals, industry and organisations that work with our seas to maximise productivity whilst safeguarding the marine environment.

Founded in 2002, SRSL is the wholly-owned trading subsidiary and an integral part of SAMS. SRSL operates at the interface between academic and business. This 'innovation space' is recognised as an important area to stimulate employment, new businesses and wealth generation.

infrastructure of a research laboratory for the benefit of our customers, so that they can improve their business performance and reduce the conflicts between their commercial activities and the marine environment.

SAMS' commercial activities are financially critical to SAMS to help fill the funding gap generated by research grants mostly not paying the full economic cost of the research.

SRSL can leverage the expertise, skills and knowledge of world-leading scientists and the cutting-edge

SRSL provides a bespoke service with all commercial projects operating under a strict ISO accredited quality management framework (ISO9001 and ISO17025).

In the reporting year SRSL had a turnover of £1.488m allowing it to contribute £233k to SAMS and to cover £867k of researcher salary costs.

### Our activities in 2019-20

SRSL delivered 67 contracts in the reporting year. Throughout the year we observed a reduction in open tender work reflecting the uncertainty of Brexit and in the last quarter saw a coronavirus pandemic-related downturn in activities due to delays and cancellations in projects. Alongside delivering the core consultancy work, SRSL's business plan focuses on building sustainable income streams in five areas of core activity.

#### Sea ice monitoring

SIMBA is a tool that was designed by our polar scientists to estimate the thickness and condition of sea ice. SRSL commercially builds SIMBA units for the polar ice research market and has further improved the reliability of the units and the customer focus of the team. We have expanded our capacity and capability during the reporting year and continue to research the potential of the unit for flood and avalanche forecasting with the Scottish Avalanche Information Service and the Scottish Environmental Protection Agency as partners.

has adopted and specified its use and we are working with the regulators in Canada, Norway and Chile to adopt NewDEPOMOD as a preferred modelling tool there too. We are also reviewing the potential for the commercialisation of Meramod (for the Mediterranean) and Tropomod to further globalise our market.

Like SIMBA, NewDEPOMOD has been through the HIE Pathfinder programme during the reporting year to focus future business and marketing activities.

and have seen a doubling of enquiries.

#### Marine growth estimates

With partners in the offshore energy sector, we are now delivering marine growth assessment services and plan to expand this offering to the wider oil and gas decommissioning and global marine renewables markets. We invested considerable resources and effort to build capacity and capability both within our team and through new academic and industrial partnerships. This sector performed particularly strongly this year.

#### NewDEPOMOD

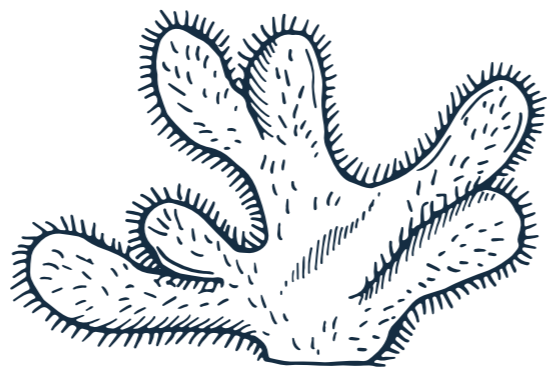
Our aquaculture modelling software NewDEPOMOD has been highly successful with annual licences sold not just in the UK but also in the USA, Norway, Chile, Canada and Tasmania. The regulator in Scotland

#### Seaweed hatchery

The seaweed hatchery continued to supply seaweed 'seed' to a growing number of farmers, although the national industry itself is at a very early phase. In the reporting year we have continued to improve and refine our nursery facilities and methodology

#### Sea-lice modelling

Marine Scotland Science requires sea lice modelling for new and expanding fish farms and we thus continue to operate the SAMS-developed sea lice connectivity model for the industry. We have added a dedicated modeler to the team during the reporting year.



# Membership

## Communications & Development committee

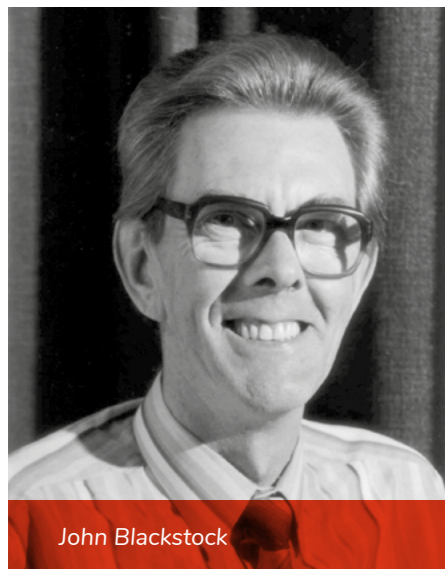
SAMS Board recognises the importance of communication and engagement for the flourishing of SAMS and has thus set up a new committee to strategically advise on and guide activities. The main remits of this group, are communicating SAMS activities with the wider world, engaging with all stakeholders, fundraising activities, and membership. Chaired by Susan Watts.

## Farewell to old friends & colleagues

John Blackstock joined the Association in 1969, originally to work with Harold Barnes as a biochemistry assistant with a focus on barnacles. But from early on John also published single author papers on invertebrate enzyme activity and pollution, which saw him promoted to Principal Scientific Officer. He became project leader in ecological biochemistry and metal analysis and started collaborating with Tom Pearson. This work focused on chemical and biological monitoring of industrial activities and environmental pollution of the marine environment. When faced with redundancy in the late 1980s the two set up the environmental consultancy SEAS Ltd, operating out of

the Dunstaffnage laboratory. John passed away on 5 June 2019.

Stafford Day LLB arrived at SAMS in 2010 following a short-lived attempt to retire from a successful professional career as senior partner in legal firm Tassels in Faversham, Kent, where he was known as a fearsome solicitor advocate despite his gentle and humorous nature. He split his 'retirement' time between being SAMS' legal secretary and a tour guide at Inveraray Castle. A rare 'Dickensian' gentleman, Stafford was a very popular and much respected member of the SAMS team. He passed away suddenly on 24 October 2019, aged 74.

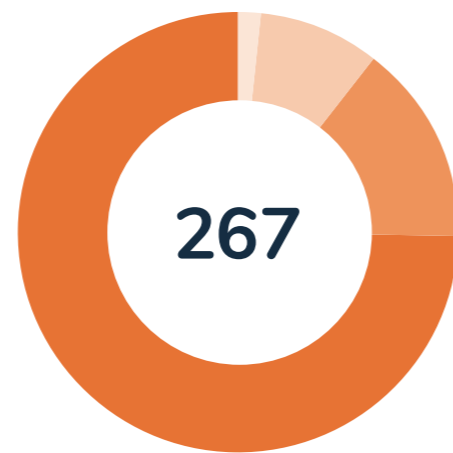


John Blackstock



Stafford Day

## Current members



- 5 Honorary & Life
- 26 Corporate
- 42 Students & unwaged
- 194 Ordinary

## 30th Annual Newth Lecture

This year's Newth Lecturer, Dr Ibon Cancio, is from the Plentzia Marine Station of the University of the Basque Country, an EMBRC partner.

### Scientia potentia est and marine biology is the proof by Dr Ibon Cancio

Our 30th annual Newth Lecture, delivered on 6th of December 2019 at SAMS in memory of former SAMS president Professor David Newth, was an animated whistle stop tour of the history of European marine stations. The lecture took the listeners from the first station formed in 1843 in Ostend, Belgium to today, describing – with musical interludes – their evolving purpose and contributions. The speaker, Dr Ibon Cancio, also charted the importance of marine science, in particular fisheries, in transforming transnational collaborations building on the spirit of the Challenger Expedition. He then made the case that marine science is 'sexy' and 'powerful' as it enables people to change the world with new knowledge, technologies and industries. As such, research funding into marine research should not be considered as expenditure for governments but investment. An important message to present to funders of marine research!

The presentation was recorded and can be viewed on the SAMS YouTube channel at <https://www.youtube.com/watch?v=H6w5Xm91VQY>



## SAMS Honorary Fellows

- |                      |                    |                          |                      |                         |
|----------------------|--------------------|--------------------------|----------------------|-------------------------|
| Dr Robert Batty      | Professor John Day | Professor Angela Hatton  | Dr Ken Jones         | Professor David Meldrum |
| Dr Ruth Brennan      | Dr Stefan Gary     | Professor Sheila Heymans | Dr Ray Leakey        | Professor Geoff Moore   |
| Dr Susannah Calderan | Dr John Gordon     |                          | Professor Jane Lewis | Dr Pedro Murúa          |
| Dr Clive Craik       | Dr Fiona Hannah    |                          | Dr Andy McLeod       |                         |



Teacher question  
“What do you think about  
the future?”

Pupil answer  
“Bad. But I want it  
to be good.”



# Public Engagement

## Ocean Explorer Centre

We welcomed 5101 visitors to our Centre during the reporting period, which is 10% more than the previous year. As the facility is small, we are now at full capacity during the summer months, when we have up to 110 visitors a day which are as many as we can reasonably engage with. We hosted two interns in the summer of 2019 who wanted to learn about environmental education and helped us staff the Centre. The OEC is open every working day 10am to 4pm, with reduced hours during the winter. The centre and our shop were managed by **Helen McNeill** supported by **Elaine Walton** and a number of staff volunteers.

During the reporting year the contract with our café operators came to an end and Argyll and Bute Council won

the new contract. Due to the onset of Covid-19 towards the end of the reporting year, they have not yet taken up their new tenancy.

We delivered workshops to 527 school children on topics including microplastics, marine pollution, seaweed and urchin biology, Loch Etive and Falls of Lora ecology and oceanography life on an Arctic expedition, robotics, flapper skate conservation and, for Highers pupils, workshops on careers in conservation and marine science. Some of these workshops were delivered off-site, for example in Northern Ireland for the MarPAMM project. Several staff members contributed to delivering these workshops. The long-term SAMS

champion for school engagement is microbiology support scientist **Elaine Mitchell**.

We also ran a number of events at the centre, including an Oban Winter Festival activity’ by our ACES Masters students highlighting where our seafood comes from, several craft workshops and seashore safaris. We also hosted a large STEM event organised by Argyll and Bute Council with local primary schools where we contributed sessions on marine microplastics and the changing Arctic.

Due to the coronavirus pandemic, we decided to close the facility from 19 March 2020. It remained closed throughout 2020.



A full-sized female flapper skate model was produced as a tool for the MarPAMM project to engage audiences in conversations about marine conservation of mobile species and Marine Protected Areas. ‘Flappy’ lives in the Ocean Explorer Centre but travels widely - last year from school classes on the island of Ireland to the Scottish Government.



SAMS UHI Graduate and Founding Director of textile design tenant company Crùbag, Jessica Giannotti, demonstrates the print making process to visiting primary school pupils learning about microplastics.

## Our plastic oceans: children use art to talk about microplastics

Collaboration between SAMS tenant company Crùbag, SAMS and the children of years 6 and 7 of Taynuilt and Kilchrenan Primary Schools developed a set of 24 microplastics-inspired and fabric-covered notebooks to grow awareness of microplastics in our oceans.

**Professor Bhavani Narayanaswamy** and her PhD students, including Lola Paradinas, study the distribution of microplastics in the marine environment

and share their findings and concerns widely. This project started when SAMS UHI marine science graduate and designer **Jessica Giannotti** from Crùbag teamed up with material and textile designer **Renuka Ramanujam** to tell the story of microplastic pollution through textile print. They invited pupils from Taynuilt to learn about microplastics. They toured SAMS and the Ocean Explorer Centre with **Dr Anuschka Miller**, learned about the equipment used to research and monitor

microplastics from Bhavani and Lola, and cleaned a beach at Dunstaffnage to collect some of their own data. They then learnt design and print making from Jessica and Renuka, exploring the power of design to express themselves about their concerns and hopes for the future.

The notebooks are now on sale through the Crùbag website, with a cut of the income going to the enterprising children: <https://crubag.co.uk/collections/our-plastic-oceans>

# Our People

## Influencing policy at home and abroad

Seaweed and marine invasive species expert Professor Elizabeth Cottier-Cook has been advising government and NGOs on the need for increased marine biosecurity measures.

As part of her GlobalSeaweedSTAR project Professor Cottier-Cook presented to the United Nations' Food and Agriculture Organization (FAO) on the need for improved global biosecurity to protect the seaweed farming industry, which supports millions of people in developing nations.

She also spoke to the UK Parliament's Environmental Audit Committee on invasive species and their management.

## Ruby anniversary of Norwegian link

A 40-year relationship between SAMS and a Norwegian marine consultancy and research company was further strengthened in the summer of 2019 when the Nordic delegation paid a visit to Dunstaffnage.

The group from Akvaplan-niva gave a presentation on their own work in the marine environment and learned about the research carried out at SAMS.

Among the Norwegian party were the company's founder Professor Stig Falk-Petersen, who first came to SAMS as a visiting student in 1979, and company director Salve Dahle, whose first experience of Oban was on honeymoon in 1975.

Also in attendance was Dr Sabine Cochrane, a senior scientist with Akvaplan-niva who worked for the Scottish Environmental Advisory Service Ltd. at the Dunstaffnage site from 1988 to 1991.

## Sea change in research area leadership

Drs Tom Adams and Lucie Novoveska took up posts as co-leaders (CoRALs) within the Dynamic Coasts and Blue Economy research areas, respectively, towards the end of the reporting period.

Dr Adams' current work makes use of computer models of biological and physical processes, mainly to investigate the environmental impacts and interactions of aquaculture in Scotland's west coast environment. He succeeded Dr Clive Fox.

Dr Novoveska is a senior researcher in algal biotechnology and previously worked in industry.

Her research interests range from using microalgae for wastewater treatment to sustainable production of high value compounds.

She took over from Dr Sally Rouse, who left SAMS to lead an environmental advisory team on offshore energy at Marine Scotland Science.

## A new Professor

Bhavani Narayanaswamy became the newest Professor at SAMS, when she was recognised for her research in deep sea science and microplastics, as well as developing the graduate school at SAMS UHI.

Originally from India, via Sussex, she joined SAMS in 2005. Over the course of her 20-year career, Professor Narayanaswamy has developed an international reputation for her research on deep sea and Arctic ecosystems and, more recently, the distribution and abundance of microplastics in the world's oceans. She has helped to attract over £5.3 million of research funding to SAMS UHI and has collaborated with researchers across the world.



## Most cited researcher

Professor Michael Burrows was included in a prestigious list of global scientists who have been recognised for their research over the past decade.

Professor Burrows was named on the Highly Cited Researchers list by citation database website Web of Science.

The annual list identifies researchers who demonstrated significant influence in their chosen field or fields through the publication of multiple highly cited papers during the last decade.

## SAMS hosts VIP visits

During the reporting year, SAMS hosted visits from influential chief executives and a member of Her Majesty's Government.

Professor Sir Mark Walport, then in his capacity as UK Research and Innovation chief executive, and the Minister for the Cabinet Office and de facto Deputy Prime Minister David Lidington MP both toured the facilities in the summer of 2019.

Professor Walport's visit was part of a wider University of the Highlands and Islands visit and the former Government Chief Scientific Adviser learned about the latest research in marine renewable energy, Arctic studies, robotics and advances in sustainable food in the marine environment.

Mr Lidington had a whistle-stop tour of the Sir John Murray Building with senior SAMS scientist Professor Mike Burrows.

In January 2020, VisitScotland chief executive Malcolm Roughead visited SAMS as part of his annual 'listening tour' in what is Scotland's Year of Coasts and Waters.



Prof Sir Mark Walport discusses marine robotics with Prof Mark Inall during his visit to SAMS

# Finance

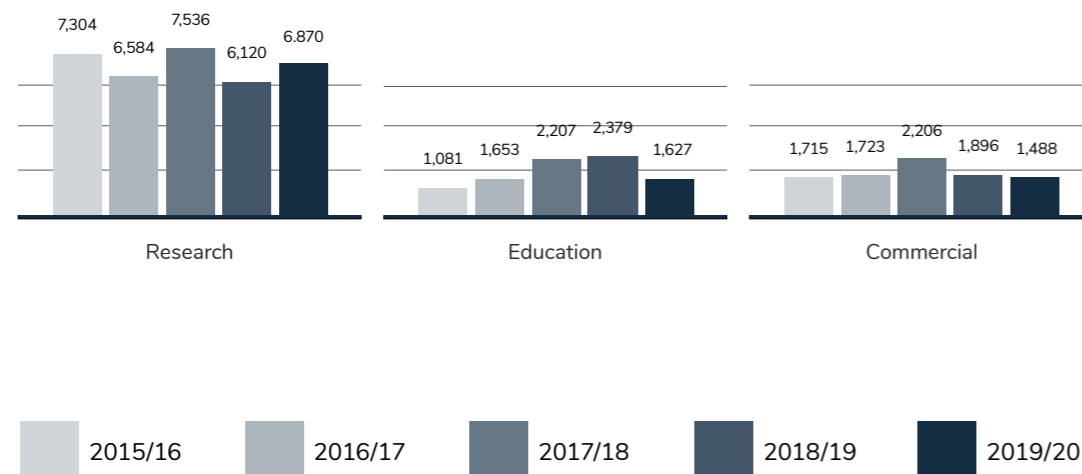
## 2019/20 Financial performance

The SAMS group achieved a surplus of £259k in the reporting period compared with a £2.2M deficit the year before. The surplus included a benefit from the reduction in our pensions liability of £743k. Excluding the movements in pension provision, SAMS made an operational deficit of £484k. Cash flow across the SAMS group increased by £0.607M.

## Institutional Reform and Development Plan (IRDP)

The IRDP has been focusing on rebalancing and consolidating the SAMS finances. Good progress has been made in particular with the introduction of Netsuite as the main software to track, report, manage and forecast SAMS' overall and project specific financial performance and staff activities. Netsuite is now fully implemented and allows SAMS to develop more efficient processes.

## Income over five years



## Financial Summary

	2019/20 £000	2018/19 £000	Change %
Operating Income	10,997	10,252	(7%)
Operating Expenditure excluding grant funded depreciation	(10,649)	(10,6558)	(1%)
<b>Operating Surplus/(Deficit) before exceptional item</b>	<b>348</b>	<b>(306)</b>	
Other income		199	
Pension Surplus / (Deficit) Obligation	743	(1,301)	
Depreciation funded by grants received in previous year	(832)	(797)	
<b>Surplus/(Deficit) transferred to reserves</b>	<b>259</b>	<b>(2,205)</b>	



### Research

Research grants and contracts brought in a total of **£6.870M** in the reporting year, of which 46% came from the Natural Environment Research Council. This was 12.25% more than in 2018/19. The OSNAP DECADE project and Georgina Robinson's

Future Leaders fellowship were the largest new projects. With £1.312M we also achieved the highest income from the European Union in the past five years, with Horizon 2020 income up by 37% despite the looming Brexit. Income from the Research

Excellence Grant, that is meant to fill the gap from funders who do not pay the Full Economic cost of delivering the research, fell to 0.986M from £1.143M the previous year because of a new way of distributing some of the funds.



### Education

Education contributed **£1.627M**, accounting for 17% of SAMS income from undergraduate, Master and PhD programmes as well as short courses and field station activities. The undergraduate BSc (Hons) Marine Science course brought in £0.6M and PhD training £0.883M.



### Enterprise

SAMS Research Services Ltd achieved an income of **£1.488M**. This was less than forecast largely because of delays in the start dates of projects. SRSL contributed a profit of £0.233M to SAMS and paid £0.867M towards the salary bill of SAMS employees. Sales from our algal culture collection, conferences and rents added £0.73M to income and an additional £0.322M came from capital grants.





# Peer-reviewed journal articles & reviews

## Peer-reviewed

Abhinav KA, Collu M, **Benjamins S**, Cai H, **Hughes A**, Bod J, Jude S, Leithead W, Lin C, Liu H, Recalde-Camacho L, **Serpetti N**, Sun K, **Wilson B**, Yue H, Zhou BZ (2020) Offshore multi-purpose platforms for a Blue Growth: a technological, socio-economic, and environmental review. *Science of the Total Environment* Vol 734. PP138256. <https://doi.org/10.1016/j.scitotenv.2020.138256>

Alcalde J, Heinemann N, **Mabon L**, Worden RH, de Coninck H, Robertson H, Maver M, Ghanbari S Swennenhuis F, Mann I, Walker T, Gomersal S, Bond CE, Allen MJ, Haszeldine RS, James A, Mackay EJ, Brownsort PA, Faulkner DR, Murphy S. (2019) Developing full-chain industrial carbon capture and storage in a resource- and infrastructure-rich hydrocarbon province. *Journal of Cleaner Production*, Vol 233. PP963-971. <https://doi.org/10.1016/j.jclepro.2019.06.08>

Audsley A, Bradwell T, **Howe J**, Baxter JM (2019). Distribution and classification of pockmarks on the seabed around western Scotland. *Journal of Maps* Vol 15. Issue 2. PP807-817. <https://doi.org/10.1080/17445647.2019.1676320s>

**Badis Y**, Klochkova TA, **Brakel J**, **Arce P**, Ostrowski M, Tringe SG, Kim GH, **Gachon CM** (2019) Hidden diversity in the oomycete genus

*Olpidiopsis* is a potential hazard to red algal cultivation and conservation worldwide. *European Journal of Phycology*, Vol 55. Issue 2, PP162-171. <https://doi.org/10.1080/09670262.2019.1664769>

Bayley DTI, **Mogg AOM**, Purvis A, Koldewey HJ (2019) Evaluating the efficacy of small-scale marine protected areas for preserving reef health: A case study applying emerging monitoring technology. *Aquatic Conservation-Marine and Freshwater Ecosystems*, Vol 29. Issue 12. PP2026-2044. <https://doi.org/10.1002/aqc.3215>

Bedford J, Ostle C, Johns DG, Atkinson A, Best M, Bresnan E, Machairopoulou M, Graves CA, Devlin M, Milligan A, Pitois S, Mellor A, **Tett P**, McQuatters-Gallop A. (2020) Lifeform indicators reveal large-scale shifts in plankton across the North-West European shelf. *Global Change Biology*. PP1-16. <https://doi.org/10.1111/gcb/15066>

**Bentley JW**, Hines DE, Borrett SR, **Serpetti N**, Hernandez-Milian G, **Fox C**, **Heymans JJ**, Reid DG. (2019) Combining scientific and fishers' knowledge to co-create indicators of food web structure and function. *ICES Journal of Marine Science*, Vol 76, Issue 7. PP2218-2234. <https://doi.org/10.1093/icesjms/fsz121>

Berge J, Geoffroy M, Daase M, **Cottier F**, Priou P, Cohen JH, Johnsen G, Mckee D, Kostakis I, Renaud P, Vogeles D, **Anderson P**, **Last KS**,

Gauthier S. (2020) Artificial light during the polar night disrupts Arctic fish and zooplankton behaviour down to 200m depth. *Communications Biology*, Vol 3, Issue 1. <https://doi.org/10.1038/s42003-020-0807-6>

Biersma EM, Torres-Díaz C, Molina-Montenegro MA., Newsham KK., Vidal MA, Collado GA, Acuña-Rodríguez IS, Ballesteros GI, Figueroa CC, **Goodall-Copestake WP**, Leppe MA, Cuba-Díaz M, Valladares MA, Pertierra LR Convey P. (2020) Multiple late-Pleistocene colonisation events of the Antarctic pearlwort *Colobanthus quitensis* (Caryophyllaceae) reveal the recent arrival of native Antarctic vascular flora. *Journal of Biogeography*/47. PP1663-1673. <https://doi.org/10.1111/jbi.13843>

Boute P, Bremmer J, **Fox C**, Lankheet M, Molenaar P, Polet H, Rijnsdorp A, Schram E, Servilli A, Stepputtis D, Tiano J, Van Opstal M (2020) ICES Working Group on Electrical Trawling (WGELECTRA) ICES Scientific Reports. 2:37. 108 pp. <https://doi.org/10.17895/ices.pub.6006>

**Brown TA**, **Rad-Menéndez C**, JRay JI, Skaar KS, Thomas N, **Ruiz-Gonzalez A**, Leu E (Eva Leu) (2020) Influence of nutrient availability on Arctic sea ice diatom HBI lipid synthesis. *Organic Geochemistry*. Vol 141.103977. <https://doi.org/10.1016/j.orggeochem.2020.103977>

Buayam N, **Davey MP**, Smith AG, Pumas C (2019) Effects of Copper and pH on the Growth and Physiology of *Desmodesmus* sp. AARLG074. *Metabolites* 9 (5):84 <https://doi.org/10.3390/metabo9050084>

Bunbury F, Helliwell KE, Mehrshahi P, **Davey MP**, Salmon DL, Andre Holzer A, Smirnoff N, Smith AG (2020). Responses of a Newly Evolved Auxotroph of *Chlamydomonas* to B12 Deprivation. *Plant Physiology*. Vol 183. Issue 1 PP267-278 <https://doi.org/10.1104/pp.19.01375>

**Burrows M**, Bates AE, Costello M,

Edwards M, Edgar G, **Fox C**, Halpern BS, Hiddink JG, Pinsky M, Batt R, Molinos JG, Payne BL, Schoeman D, Stuart-Smith R, Poloczanska S (2019) Ocean community warming responses explained by thermal affinities and temperature gradients. *Nature Climate Change* Vol 9, Issue 12. PP1-5. <https://doi.org/10.1038/s41558-019-0631-5>

**Burrows MT**, Hawkins SJ, Moore J, Adams L, Sugden H, Firth L, Mieszkowska N. (2020) Global-scale species distributions predict temperature related changes in species composition of rocky shore communities in Britain. *Global Change Biology*. Vol 26. Issue 4. PP2093-2105. <https://doi.org/10.1111/gcb.14968>

Calmes B, **Strittmatter M**, Jacquemin B, Perrineau M-M, Rousseau C, **Badis Y**, Cook M, Destombe C, Valero M, **Gachon CM**. (2020) Parallelisable non-invasive biomass, fitness and growth measurement of macroalgae and other protists with nephelometry. *Algal Research*. Vol 46. <https://doi.org/10.1016/j.algal.2019.101762>

Campbell I, Kambey CSB, Mateo JP, Rusekwa SB, Hurtado A, Msuya FE, Stentiford GD, **Cottier-Cook EJ**. (2020). Biosecurity policy and legislation for the global seaweed aquaculture industry. *Applied Phycology* Vol 32. PP2133-2146. <https://doi.org/10.1007/s10811-019-02010-5>

Carter AL, Wilson A, Meriwether W, Bello M, Hoyos-padilla EM, **Inall ME**, Ketchum JT, Schurer A, Tudhope AW. (2020) Assessing opportunities to support coral reef climate change refugia in MPAs: A case study at the Revillagigedo Archipelago. *Marine Policy*. Vol 112. 103769. <https://doi.org/10.1016/j.marpol.2019.103769>

Carter GDO, Cooper R, Gafeira J, **Howe JA**, Long D (2020) Morphology of small-scale submarine mass movement events across the northwest United Kingdom. *Geomorphology*, 365. PP107282. DOI: <https://doi.org/10.1016/j.geomorph.2020.107282>

[geomorph.2020.107282](https://doi.org/10.1016/j.geomorph.2020.107282)

Cohen JH, **Last KS**, Waldie J, Pond DW (2019) Loss of buoyancy control in the copepod *Calanus finmarchicus*. *Plankton Research* Vol 41. Issue 5. PP787-790. <https://doi.org/10.1093/plankt/fbz036>

Corrales X, Katsanevakis, Coll SM, **Heymans JJ**, Piroddi C, Ofir E, Gal G. (2019) Advances and challenges in modelling the impacts of invasive alien species on aquatic ecosystems. *Biological Invasions*. Vol 22, Issue 3. PP907-934. <https://doi.org/10.1007/s10530-019-02160-0>

**Cottier-Cook EJ**, Minchin D, Geisler R, Graham, J, Mogg A, Sayer MD, Matejusova I (2019) Biosecurity implications of the highly invasive carpet sea-squirt *Didemnum vexillum* kott, 2002 for a protected area of global significance. *Management of Biological Invasions* Vol 10. Issue 2. PP311-323. <https://doi.org/10.3391/mbi.2019.10.2.07>

**Courtene-Jones W**, Quinn B, Ewins C, **Gary SF**, **Narayanaswamy B**. (2020) Microplastic accumulation in deep-sea sediments from the Rockall Trough. *Marine Pollution Bulletin* 154 PP111092 <https://doi.org/10.1016/j.marpolbul.2020.111092>

Culhane FE, Briers RA, **Tett P**, Fernandes TF (2019) Response of a marine benthic invertebrate community and biotic indices to organic enrichment from sewage disposal. *Journal of the Marine Biological Association of the United Kingdom*. Vol 99. Issue 8. PP1721-1734. <https://doi.org/10.1017/S0025315419000857P>

Dabrowska A, KamennayaN, Murton BJ, **Zubkov MV** (2019) Impact of ferromanganese ore pollution on phytoplankton CO<sub>2</sub> fixation in the surface ocean. *Marine Pollution Bulletin* Vol 146. PP1002-1006. <https://doi.org/10.1016/j.marpolbul.2019.07.062>

Dalaiden Q, Goosse H, Klein F, Lenaerts JTM, **Holloway M**, Sime L, Thomas ER.

(2020) How useful is snow accumulation in reconstructing surface air temperature in Antarctica? A study combining ice... core records and climate models. *The Cryosphere* Vol. 14. PP1187-1207. <https://doi.org/10.5194/tc-14-1187-2020>

Darienko T, Rad-Menéndez C, Campbell C, Pröschold T. (2019) Are there any true marine *Chlorella* species? Molecular phylogenetic assessment and ecology of marine *Chlorella*-like organisms, including a description of *Droopiella* gen. nov. *Systematics and Biodiversity* Vol 17(8) PP811-829. <https://doi.org/10.1080/14772000.2019.1690597>

Davey MP, Norman L, Sterk P, Huete-Ortega M, Bunbury F, Bradford KWL, Stockton S, Peck LS, Convey P, Newsham K, Smith AG. (2019) Snow algae communities in Antarctica: metabolic and taxonomic composition. *New Phytologist*. 222(3) PP1242-1245 <https://doi.org/10.1111/nph.15701>

Dhanji-Rapkova M, O'Neill A, Maskreya BJ, Coates L, Swan SC, Teixeira Alves M, Kelly RJ, Hatfield RG, Rowland-Pilgrim SJ, Lewis AM, Turner AD. (2019) Variability and Professor essionors iles of lipophilic toxins in bivalves from Great Britain during five and a half years of monitoring: azaspiracids and yessotoxins. *Harmful Algae* Vol 87. 101629 <https://doi.org/10.1016/j.hal.2019.10162>

Dick MH, Waeschenbach A, Trott TJ, Onishi T, Beveridge C, Bishop, JD, Ito M, Ostrovsky AN. (2020) Global Distribution and Variation of the Invasive Cheilostome Bryozoan *Cribilina mutabilis*. *Zoological Science*, 37(3). PP217-231 <https://doi.org/10.2108/zs190142>

Eastabrook CL, Whitworth P, Robinson G, Caldwell GS. Diatom-Derived Polyunsaturated Aldehydes Are Unlikely to Influence the Microbiota Composition of Laboratory-Cultured Diatoms. *Life*. Vol 10, Issue 9. <https://doi.org/10.3390/life10030029>

Forster D, Lentendu G, Filker S, Dubois E, Wilding TA, Stoeck T (2019) mproving eDNA-based protist diversity assessments using networks of amplicon sequence variants. *Environmental Microbiology*. Vol 21, Issue 11. PP4109-4124. <https://doi.org/10.1111/1462-2920.14764>

Fox C, Albalat Am, Valentinsson D, Nilsson H, Armstrong F, Randall P, Catchpole T. (2020) Survival rates for *Nephrops norvegicus* discarded from Northern European trawl fisheries. *ICES Journal of Marine Science* Vol 77. PP1698-1710. <https://10.1093/icesjms/fsaa037>

Freer JJ, Hobbs L. (2020) DVM: The world's biggest game of hide and seek. *Frontiers for Young Minds* Vol 8. 44. <https://doi.org/10.3389/frym.2020.00044>

Frey MM, Norris SJ, Brooks IM, Anderson PS, Nishimura K, Yang X, Jones AE, Nerentorp Mastro Monaco MG, Jones DH, Wolff EW. (2020) First direct observation of sea salt aerosol production from blowing snow above sea ice. *Atmospheric Chemistry and Physics* Vol 20 Issue 4. PP2549-2578. <https://doi.org/10.5194/acp-20-2549-2020>

Fruehe L, Cordier T, Dully V, Breiner H-W, Lentendu G, Pawlowski J, Martins C, Wilding T, Stoeck T. (2020) Supervised machine learning is superior to indicator value inference in monitoring the environmental impacts of salmon aquaculture using eDNA metabarcodes. *Molecular Ecology*. Online 19PP. <https://doi.org/10.1111/mec.15434>

Caihong F, Xu Y, Gruess A, Coll M, Heymans JJ, Fulton EA, Shannon L, Halouani G, Velez L, Akoglu E, Lynam C, Shin Y-j. (2019) Making ecological indicators management ready: Assessing the specificity, sensitivity, and threshold response of ecological indicators. *Ecological Indicators* Vol 105, PP16-28. <https://doi.org/10.1016/j.ecolind.2019.05.055>

Galparsoro I..... Tett P. (2020) Global stakeholder vision for ecosystem-based marine aquaculture expansion from coastal to offshore areas. *Reviews in Aquaculture*, 19PP E-pub. <https://10.1111/raq.12422>

García-Martin EE, Daniels CJ, Davidson K, Lozano J, Mayers KMJ, McNeill S, Mitchell E, Poulton AJ, Purdie DA, Tarran GA, Whyte C, Robinson C. (2019) Plankton community respiration and bacterial metabolism in a North Atlantic Shelf Sea during spring bloom development (April 2015). *Progress in Oceanography*. Vol 177. 101873. <https://doi.org/10.1016/j.pocean.2017.11.002> Seasonal changes in plankton respiration and bacterial metabolism in a temperate shelf sea

García-Martín EE, Daniels C, Davidson K, Davis C, Mahaffey C, Mayers K, McNeill S, Poulton AJ, Purdie D, Tarran G, Robinson C. Seasonal changes in plankton respiration and bacterial metabolism in a temperate shelf sea. *Progress in Oceanography*, 177, 101884. <https://doi.org/10.1016/j.pocean.2017.12.002>

Garvetto A, Perrineau M-M, Dressler-Allame M, Bresnan E, Gachon CMM. (2019) Ectrogella" Parasitoids of the Diatom Licmophora sp. Are Polyphyletic. *The Journal of Eukaryotic Microbiology*. <https://doi.org/10.1111/jeu.12750>

Garvetto A, Badis Y, Perrineau M-M, Rad-Menendez C, Bresnan E, Gachon CMM (2019) Chytrid infecting the bloom-forming marine diatom *Skeletonema* sp.: Morphology, phylogeny and distribution of a novel species within the Rhizophydiales. *Journal of Fungal Biology* Vol 123, Issue 6. PP 471-480. <https://doi.org/10.1016/j.funbio.2019.04.004>

Geoffroy M, Daase M, Cusa M, Darnis G, Graeve M, Santana Hernández N, Berge J, Renaud P, Cottier F, Falk-Petersen S. (2019) Mesopelagic

Sound Scattering Layers of the High Arctic: Seasonal Variations in Biomass, Species Assemblage, and Trophic Relationships. *Frontiers in Marine Science*. Vol 6. Article 364. 18 PP. <https://doi.org/10.3389/fmars.2019.00364>

Giljan G, Kamennaya NA, Otto A, Becher D, Ellrott A, Meyer V, Murton BJ, Fuchs FM, Amann RI, Zubkov MV (2020) Bacterioplankton reveal years-long retention of Atlantic deep-ocean water by the Tropic Seamount. *Scientific Reports* Vol 10, Issue 1. PP11. <https://doi.org/10.1038/s41598-020-61417-0>

González-Moreno P, Lazarro L, Montserrat V, Preda C, Adriaens T, Bacher S, Brundu G, Cottier-Cook EJ et al. Consistency of impact assessment protocols for non-native species (2019) *NeoBiota*, 44. 1-25. <https://doi.org/10.3897/neobiota.44.31650>

Greenhill L, Stojanovic T, Tett P (2020) Does marine planning enable progress towards adaptive governance in marine systems? Lessons from Scotland's regional marine planning process. *Maritime Studies* 19(5) 17PP <https://doi.org/10.1007/s40152-020-00171-5>

Greenhill L, Kenter JO, Dannevig H. (2020) Adaption to climate-change related ocean acidification: An adaptive governance approach. *Ocean & Coastal Management*. Vol 191 105176. <https://doi.org/10.1016/j.ocecoaman.2020.105176>

Holbrook HA, Scannell ASG, Benthuisen JA, Feng M, Oliver ECJ, Alexander L, Burrows MT, Donat MG, Hobday AJ, Moore PJ, Perkins-Kirkpatrick SE, Smale Dan A, Straub SC, Wernberg T. (2019) A global assessment of marine heatwaves and their drivers. *Nature Communications*

Vol 10. <https://doi.org/10.1038/s41467-019-10206-z>

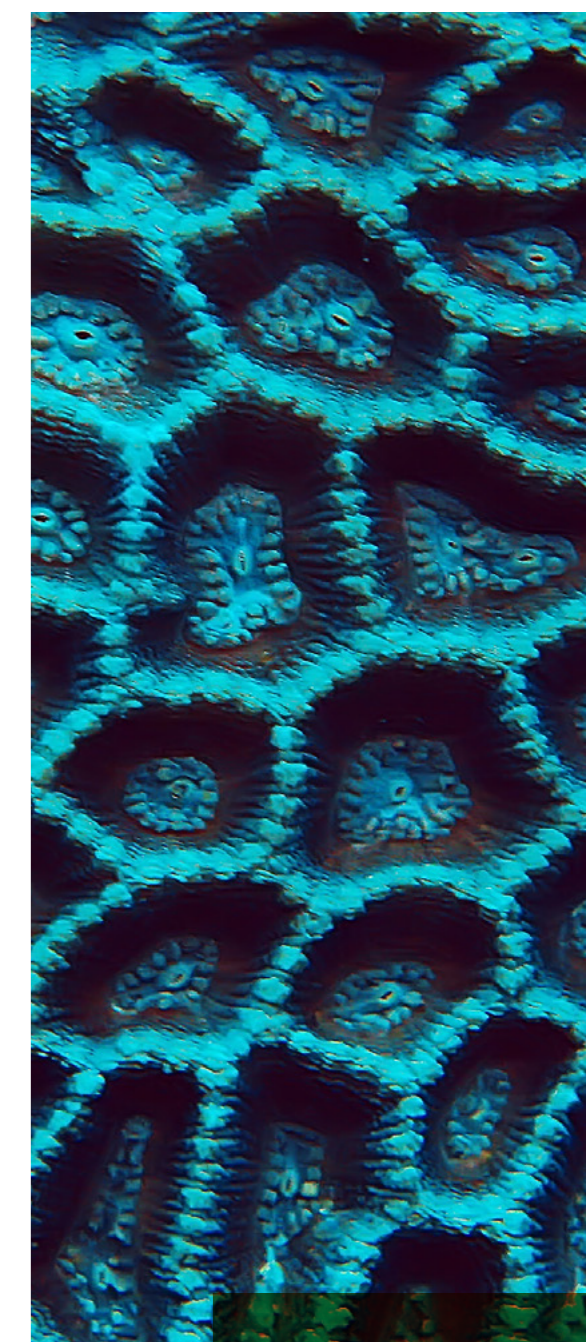
Holliday PN, Bersch M, Berx B, Chafik L, Cunningham S, Florindo-Lopez C, Hatun H, Johns W, Josey SA, Larsen KMH, Mulet S, Oltmanns M, Reverdin G, Rossby T, Thierry V, Valdimarsson H, Yashayaev I (2020) Ocean circulation causes the largest freshening event for 120 years in eastern subpolar North Atlantic. *Nature Communications* Vol 11(1) 585. <https://doi.org/10.1038/s41467-020-14474-y>

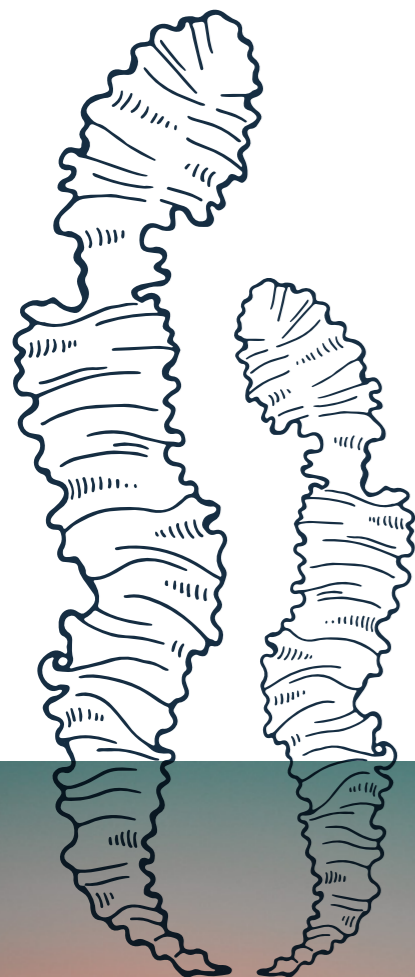
Howe J, Husum K, Inall M, Coogan J, Luckman A, Arosio R, Abernethy C, Verchili D. (2019) Autonomous underwater vehicle (AUV) observations of recent tidewater glacier retreat, western Svalbard. *Marine Geology* Vol 417, 42PP. <https://doi.org/10.1016/j.margeo.2019.106009>

Huang YC, Fan MF, Yang CY, Mabon L (2020) Social science studies of the environment in Taiwan: what can the international community learn from work published within Taiwan? *Local Environment* Vol 25, Issue 1. PP36-42. <https://doi.org/10.1080/13549839.2019.1693987>

Hughes KA, Prescott OL, Peyton J, Adriaens T, Cottier-Cook EJ et al. (2020) Invasive non-native species likely to threaten biodiversity and ecosystems in the Antarctic Peninsula region. *Global Change Biology* Vol 26. PP2702-2716. <https://doi.org/10.1111/gcb.14938>

Husum K, Howe JA, Baltzer A, Forwick M, Jensen M et al. (2019) The marine sedimentary environments of Kongsfjorden, Svalbard: an archive of polar environmental change. *Polar Research*. Vol 38. Issue 3. 3 <https://doi.org/10.33265/polar.v38.3380>





Hutchison ZL, Green DH, Burrows MT, Jackson AC, Wilson B, Last KS. ...Survival strategies and molecular responses of two marine mussels to gradual burial by sediment. *Journal of Experimental Marine Biology and Ecology*. Vol 527. 13PP. <https://doi.org/10.1016/j.jembe.2020.151364>.

Huthnance JM, Inall ME, Fraser NJ. (2020) Oceanic Density/Pressure Gradients and Slope Currents. *Journal of Physical Oceanography*. Vol 50, Issue 6. PP1643-1654. <https://doi.org/10.1175/JPO-D-19-0134.1>

Im SH, Klochkova TA, Lee DJ, Gachon CMM, Kim GH, Buschmann A. (2019) Genetic toolkits of the red alga *Pyropia tenera* against the three most common diseases in *Pyropia* farms. *Journal of Phycology* Vol 55, Issue 4. PP801-815. <https://doi.org/10.1111/jpy.12857>

Johns CT, Grubb AR, Nissimov JI, Natale F, Knapp V, Mui A, Fredricks HF, Van Mooy BAS, Bidle KD. (2019) The mutual interplay between calcification and coccolithovirus infection. *Environmental Biology*. Vol 21, Issue 6. PP1896-1915. <https://doi.org/10.1111/1462-2920.14362>.

Johnson CL, Inall M, Gary S, Cunningham S (2020) Significance of climate indices to benthic conditions across the northern North Atlantic and adjacent shelf seas. *Frontiers in Marine Science*. Vol 7. 19PP. <https://doi.org/10.3389/fmars.2020.00002>

Jones S, Inall M, Porter M, Graham JA, Cottier F (2020). Storm-driven across-shelf oceanic flows into coastal waters. *Ocean Science* 16 Vol 2. PP 3890493. <https://doi.org/10.5194/os-16-389-2020>

Kambey CSB, Campbell I, Sondak CFA, Adibi RMN, Lim PE, Cottier-Cook EJ (2020) An analysis of the current status and future of biosecurity frameworks for the Indonesian seaweed industry. *Journal of Applied Phycology* E pub. <https://doi.org/10.1007/s10811-019-02020-3>

[doi.org/10.1007/s10811-019-02020-3](https://doi.org/10.1007/s10811-019-02020-3)

Kerrison P, Twigg G, Stanley M, De Smet D, Buyle G, Martinez Pina A, Hughes A (2019) Twine selection is essential for successful hatchery cultivation of *Saccharina latissimi*, seeded with either meiospores or juvenile sporophytes. *Journal of Applied Phycology*. 10 PP <https://doi.org/10.1007/s10811-019-01793-x>

Kostakis I, Roettgers A, Orkney HA, Bouman HA, Porter M, Cottier F, Berge J, McKee D. (2020) Development of a bio-optical model for the Barents Sea to quantitatively link glider and satellite observations. *Philosophical Transactions of the Royal Society A*. Vol 378, Issue 1281. <https://doi.org/10.1098/rsta.2019.0367>

Kuliasha CA, Fedderwitz RL, Finlay JA, Franco SC, Clare AS, Brennan AB (2019) Engineered Chemical Nanotopographies: Reversible Addition-Fragmentation Chain-Transfer Mediated Grafting of Anisotropic Poly(acrylamide) Patterns on Poly(dimethylsiloxane) To Modulate Marine Biofouling. *Langmuir* Vol 36. Issue 1. <https://doi.org/10.1021/acs.langmuir.9b03117>

Laudicella VA, Beveridge C, Carboni S, Franco SC, Doherty MK, Long N, Mitchell E, Stanley MS, Whitfield D, Hughes AD (2020) Lipidomics analysis of juveniles' blue mussels (*Mytilus edulis* L. 1758), a key economic and ecological species. *PLoS ONE* Vol 15. Issue 2. <https://doi.org/10.1371/journal.pone.0223031>

Laudicella VA, Whitfield PD, Carboni S, Doherty MK, Hughes AD (2019) Application of lipidomics in bivalve aquaculture, a review. *Reviews in Aquaculture* Vol 12 Issue 2. 678-702 <https://doi.org/10.1111/raq.12346>

Legge O, Johnson M, Hicks N, Jickells T, Diesing M, Aldridge J, Andrews J, Artioli Y, Bakker DCE, Burrows MT, Carr N, Cripps G, Felgate SL, Fernand L, Greenwood N, Hartman S, Kroeger S, Lessin G, Mahaffey C, Mayor D, Parker R, Queiros M, Shutler JD, Silva T, Stahl H, Tinker J, Underwood GJC, Van der Molen J, Wakelin S, Weston K, Williamson P. Carbon on the Northwest European Shelf: Contemporary Budget and Future Influences. *Frontiers in Marine Science*. Vol 7. 23PP. <https://doi.org/10.3389/fmars.2020.00143>

Lo Giudice Cappelli E, Clarke J, Smeaton C, Davidson K, Austin WEN (2019) Organic carbon rich sediments: benthic foraminifera as bio-indicators of depositional environments. *Biogeosciences* Vol 16, Issue 21. PP4183-4199 <https://doi.org/10.5194/bg-2019-125>

Mabon L. (2019) Enhancing post-disaster resilience by 'building back greener': Evaluating the contribution of nature-based solutions to recovery planning in Futaba County, Fukushima Prefecture, Japan. *Landscape and Urban Planning* Vol 187. PP105-118. <https://doi.org/10.1016/j.landurbplan.2019.03.013>

Mabon L. (2019) Making climate information services accessible to communities: What can we learn from environmental risk communication research? *Urban Climate* Vol 31, 100537. <https://doi.org/10.1016/j.uclim.2019.100537>

Mabon L, Shih WY, Kondo K, Kanekiyo H, Hayabuchi Y (2019) What is the role of epistemic communities in shaping local environmental policy? Managing environmental change through planning and greenspace in Fukuoka City, Japan. *Geoforum* Vol 104. PP158-169. <https://doi.org/10.1016/j.geoforum.2019.04.024>

Mabon L, Shih WY (2019) Mapping the socio-political landscape of heat mitigation through urban greenspaces: the case of Taipei Metropolis.

*Environment and Urbanization* Vol 31, Issue 2. PP552-574. <https://doi.org/10.1177/0956247818767318>

MacArthur M, Naylor LA, Hansom JD, Burrows MT, Loke LL, Boyd I. (2019) Maximising the ecological value of hard coastal structures using textured form liners. *Ecological Engineering: X* Vol 1. 100002 <https://doi.org/10.1016/j.ecoena.2019.100002>

Marquardt M, Skogseth R, Wiedmann I, Vader A, Reigstad M, Cottier F, Gabrielsen TM (2019) Vertical export of marine pelagic protists in an ice-free high-Arctic fjord (Adventfjorden, West Spitsbergen) throughout 2011-2012. *Aquatic Microbial Ecology* Vol 83. PP65-82. <https://doi.org/10.3354/ame01904>

Mateo J, Campbell I, Cottier-Cook EJ, Luhan MRJ, Ferriols VME, Hurtado AQ (2020) Analysis of biosecurity-related policies governing the seaweed industry of the Philippines. *Journal of Applied Phycology* Vol 32, Issue 3. <https://doi.org/10.1007/s10811-020-02083-7>

McCarthy GD, Brown PJ, Flagg CN, Goni G, Houpert L, Hughes CW, Hummels R, Inall M, Jochumsen K, Larsen KMH, Lherminier P, Meinen CS, Moat BI, Rayner D, Rhein M, Roessler A, Schmid C, Smeed D. (2019) Sustainable observations of the AMOC: Methodology and Technology. *Reviews of Geophysics*. 8755-1209. <https://doi.org/10.1029/2019RG000654>

McLean DL, Parsons MJG, Gates AR, Benfield MC, Bond T, Booth DJ, Bunce M, Fowler AM, Harvey S, Macreadie PI, Pattiaratchi CB, Rouse S, Partridge JC, Thomson PG, Todd VLG, Jones DOB (2020) Enhancing the Scientific Value of Industry Remotely Operated Vehicles (ROV's) in our oceans. *Frontiers in Marine Science* Vol 7. 20PP. <https://doi.org/10.3389/fmars.2020.00220>.

McQuatters-Gollop A, Atkinson A, Aubert A, Bedford J, Best M, Bresnan E,

Cook K, Devlin M, Gowen R, Johns DG, Machairopoulou M, McKinney A, Mellor A, Ostle C, Scherer C, Tett P (2019) Plankton lifeforms as a biodiversity indicator for regional-scale assessment of pelagic habitats for policy. *Ecological Indicators* 101: 913-925 <https://doi.org/10.1016/j.ecolind.2019.02.010>

Meneghesso C, Seabra R, Broitman BR, Wetthey DS, Burrows MT, Chan BKK, Guy-Haim T, Ribeiro PA, Rilov G, Santos AM, Sousa LL, Lima FP (2020) Remotely-sensed L4 SST underestimates the thermal fingerprint of coastal upwelling. *Remote Sensing of Environment* Vol 237. 111588. <https://doi.org/10.1016/j.rse.2019.111588>

Mignerot L, Nagasato C, Peters AF, Perrineau M-M, Scornet D, Pontheaux F, Djema W, Badis Y, Motomura T, Cock JM (2019) Unusual patterns of mitochondrial inheritance in the brown alga *Ectocarpus*. *Molecular Biology and Evolution* Vol 36, Issue 12. PP2778 – 2789 <https://doi.org/10.1093/molbev/msz186>

Millan-Aguinaga N, Soldatou S, Brozio S, Munnoch JT, Howe J, Hoskisson PA, Duncan KR (2019) Awakening ancient polar actinobacteria: diversity, evolution and specialized metabolite potential. *Microbiology* Vol 165, Issue 11. PP1169-1180. <https://doi.org/10.1099/mic.0.000845>

Monteiro JP, Rey F, Melo T, Moreira ASP, Arbona J-F, Skjermo J, Forbord S, Funderud J, Raposo D, Kerrison PD, Perrineau M-M, Gachon C, Domingues P, Calado R, Rosario Domingues M (2020) *Biomolecules*. Vol 10 (1) 107. <https://doi.org/10.3390/biom10010107>

Murua P, Patino DJ, Leiva FP, Munoz L, Mueller DG, Kuepper F, Westermeier R, Peters AF (2019) All disease in the alginophyte *Lessonia berteroa*: A pathogenic interaction linked with host adulthood in a seasonal-dependant manner. *Algal Research* Vol 39,

101435. 10PP. <https://doi.org/10.1016/j.algal.2019.101435>

**Murua P**, Mueller DG, Etemadi M, Van West P, **Gachon CMM** (2020) Host and pathogen autophagy are central to the inducible local defences and systemic response of the giant kelp *Macrocystis pyrifera* against the oomycete pathogen *Anisulpidium ectocarpii*. *New Phytologist*. 166PP. <https://doi.org/10.1111/nph.16438>

**Nissimov JI**, Talmy D, Haramaty L, Fredricks HF, Zelzion E, Knowles B, Murat Eren A, Vandzura R, Laber CP, Schieler BM, Johns CT, More KD, Coolen MJL, Follows MJ, Bhattacharya D, Van Mooy BAS, Bidle KD (2019) Biochemical diversity of glycosphingolipid biosynthesis as a driver of Coccolithovirus competitive ecology. *Environmental Microbiology* Vol 21. Issue 6. 16PP. <https://doi.org/10.1111/1462-2920.14633>

**Novoveská L**, **Ross ME**, **Stanley MS**, Pradelles R, Wasiolek V, Sassi J-F (2019) Microalgal Carotenoids: A Review of Production, Current Markets, Regulations, and Future Direction. *Marine Drugs*, 17, 640. <https://doi.org/10.3390/md17110640>

**Obata O**, **Ditchfield A**, **Hatton A**, Akunna J (2020) Investigating the impact of inoculum source on anaerobic digestion of various species of marine macroalgae. *Algal Research*. Vol 46, 101803. <https://doi.org/10.1016/j.algal.2020.101803>

Oliver ECJ, **Burrows MT**, Donat MG, Sen Gupta A, Alexander L, Perkins-Kirkpatrick SE, Benthuyzen JA, Hobday AJ, Holbrook N, Moore PJ, Thomsen MS, Wernberg T, Smale DA. (2019.) Projected marine heatwaves in the 21<sup>st</sup> century and the potential for ecological impact. *Frontiers in Marine Science* <https://doi.org/10.3389/fmars.2019.00734>

Osterhus S, Woodgate R, Valdimarsson H, Turrell B, de Steur L, Quadfasel D, Olsen SM, Moritz M, Lee CM, Larsen

KMH, Jonsson S, **Johnson C**, Jochumsen K, Hansen B, Curry B, **Cunningham S**, Berx B (2019) Arctic Mediterranean exchanges: a consistent volume budget and trends in transports from two decades of observations. *Ocean Science* Vol 15. PP379-399. <https://doi.org/10.5194/os-15-379-2019>

Paullada-Salmerón JA, **Cowan ME**, Loentgen GH, Aliaga-Guerrero M, Zanuy S, Mañanós EL, Muñoz-Cueto JA (2019) The gonadotropin-inhibitory hormone system of fish: The case of sea bass (*Dicentrarchus labrax*) *General and Comparative Endocrinology* Vol 279. PP184-195. <https://doi.org/10.1016/j.ygcen.2019.03.015>

**Penhaul Smith JK**, **Hughes AD**, McEvoy L, **Day JG**. (2019) Tailoring of the biochemical Professor essoressor iles of microalgae by employing mixotrophic cultivation. *Bioresource Technology Reports*. Vol 9. 100321. 11PP. <https://doi.org/10.1016/j.biteb.2019.100321>

**Porter M**, Henley S, Orkney A, Bourman H, Hwang B (P), **Dumont E**, **Venables EJ**, **Cottier F**. (2020) A polar surface eddy obscured by thermal stratification. *Geophysical Research Letters* Vol 47, Issue 6. <https://doi.org/10.1029/2019GL086281>

Proud R, Mangeni-Sande R, Kayanda R, Cox MJ, Nyamweya C, Ongore C, Natugonza V, Everson I, Elison M, **Hobbs L**, Kashindve BB, Mlaponi EW, Taabu-Munyaho A, Mwainge VM, Kagoya E, Pegado A, Nduwayesu E, Brierley AS (2020) Automated classification of schools of the silver cyprinid *Rastrineobola argentea* in Lake Victoria acoustic survey data using random forests. *ICES Journal of Marine Science*, Vol 77, Issue 4. PP1379-1390. <https://doi.org/10.1093/icesjms/fsaa052>

Puerta P, **Johnson CL**, Carreiro-Silva M, Henry L-A, Kenchington E, Morato T, Kazanidis G, Rueda J, Urra J, Ross

S, Gonzalez-Irusta J, Arnaud-Haond S, Orejas C (2020) Influence of water masses on the biodiversity and biogeography of deep-sea benthic ecosystems in the North Atlantic. *Frontiers in Marine Science*. Volume 7, Issue 239. 25PP. <https://doi.org/10.3389/fmars.2020.00239>

**Reinhardt HC**, Pedersen KB, Nahrgang J, Frantzen M (2019) Effects of mine tailings exposure on early life stages of Atlantic cod. *Environmental Toxicology & Chemistry/SETAC*. Vol 38 Issue 7. PP1446-1454. <https://doi.org/10.1002/etc.4415>

Reynolds S, **Davey MP**, Aldridge DC. (2019) Harnessing synthetic ecology for commercial algae production. *Scientific Reports* Issue 9. 9756. <https://doi.org/10.1038/s41598-019-46135-6>

**Risch D**, Norris T, Curnock M, Friedlaender A (2019) Common and Antarctic Minke Whales. *Frontiers in Marine Research* Vol 6, PP247. <https://doi.org/10.3389/fmars.2019.00247>

Rizouli A, Kuepper F, Louizidou P, **Mogg AOM**, **Azzopardi E**, **Sayer MDJ**, Kawai H, Hanyuda T, Peters AF (2020) The Minute Alga *Schizocladia ischiensis* (Schizocladiphyceae, Ochrophyta) Isolated by Germling Emergence from 24 m Depth off Rhodes (Greece) *Diversity* Vol 12 Issue 3. <https://doi.org/10.3390/d2030102>

**Rouse SA**, Lacey N, Hayes P, **Wilding T** (2019) Benthic conservation features and species associated with subsea pipelines: considerations for decommissioning. *Frontiers in Marine Science*. Vol 6, PP200. <https://doi.org/10.3389/fmars.2019.00200>

**Rouse S**, Porter JS, **Wilding T** (2020) Artificial reef design affects benthic secondary productivity and provision of function habitat. *Ecology and Evolution* Vol 10, Issue 4. 9PP. <https://doi.org/10.1002/ece3.6047>

<https://doi.org/10.1002/ece3.6047>

Rowland-Pilgrim S, **Swan S**, O'Neill A, Johnson S, Coates L, Stubbs P, Dean K, Parks R, Harrison K, Teixeira M, Walton A, Davidson K, Turner A, Maskrey B (2019) Variability of Amnesic Shellfish Toxin and *Pseudo-nitzschia* occurrence in bivalve molluscs and water samples – Analysis of ten years of the official control monitoring programme. *Harmful Algae* Vol 87, 101623. 26PP. <https://doi.org/10.1016/j.hal.2019.101623>

Safi G, Giebels D, Arroyo NL, **Heymans JJ**, Raoux A, Schueckel U, Tecchio S, de Jonge V, Niquil N (2019) Preciado I, Vitamine ENA: A framework for the development of ecosystem-based indicators for decision makers. *Ocean & Coastal Management* Vol 174, PP116-130. <https://doi.org/10.1016/j.ocecoaman.2019.03.005>

Saygu I, **Heymans JJ**, **Fox CJ**, Ozbilgin H, Eryasar AR, Gokce G (2019) The importance of alien species to the food web and bottom trawl fisheries of the Northeastern Mediterranean, a modelling approach. *Journal of Marine Systems* 103253 <https://doi.org/10.1016/j.jmarsys.2019.103253>

Shih W-Y, **Mabon L**, Puppim de Oliveira JA (2020) Assessing governance challenges of local biodiversity and ecosystem services: Barriers identified by the expert community. *Land Use Policy* Vol 91, 104291. <https://doi.org/10.1016/j.landusepol.2019.104291>

Stevens T, **Mee L**, Friedrich J, **Aleynik D**, Minicheva G (2019) Partial recovery of macro-epibenthic assemblages on the north-west shelf of the Black Sea. *Frontiers in Marine Science* Vol 6 Issue 474. 16PP. <https://doi.org/10.3389/fmars.2019.00474>

**Stewart-Sinclair PJ**, **Last KS**, **Payne BL**, **Wilding T** (2020) A global assessment of the vulnerability of shellfish aquaculture to climate change and ocean acidification. *Ecology and Evolution* 17 PP E-pub. <https://doi.org/10.1002/ece3.6149>

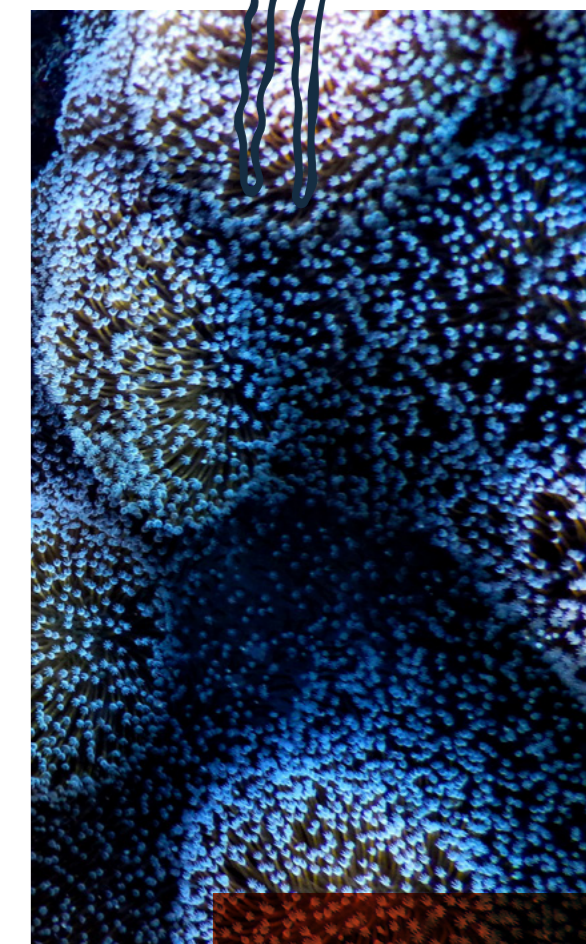
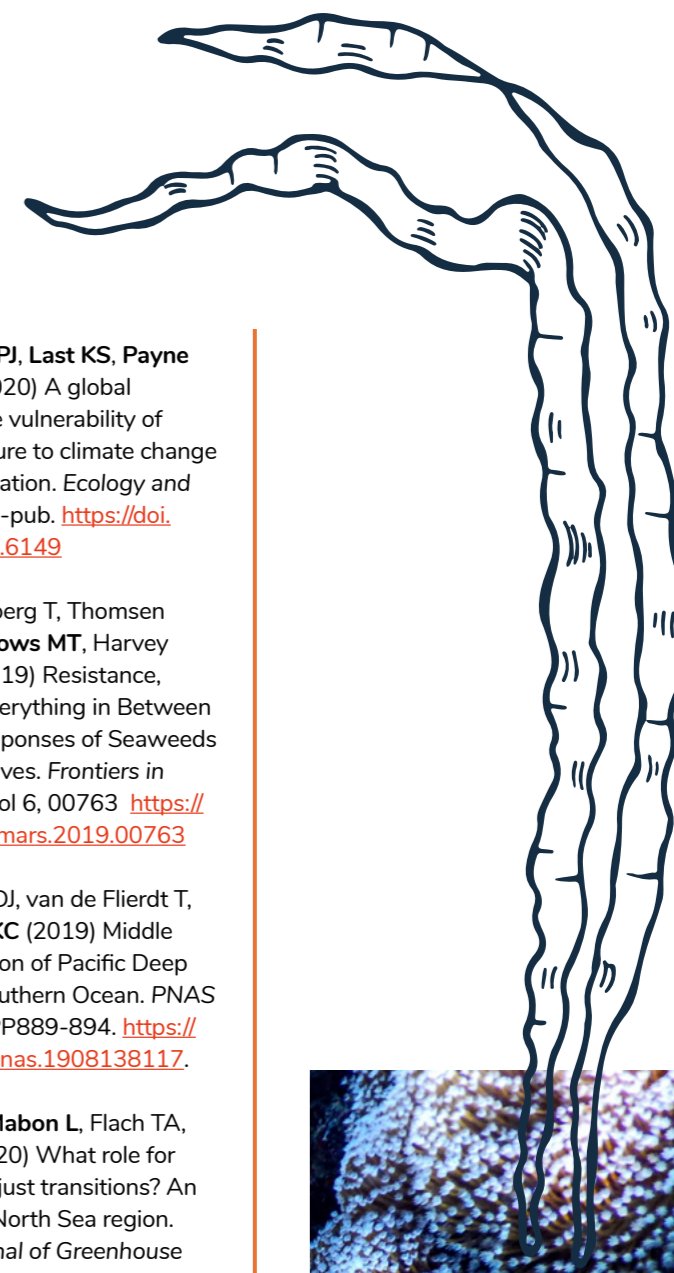
Straub SC, Wernberg T, Thomsen M, Moore PJ, **Burrows MT**, Harvey BP, Smale DA (2019) Resistance, Extinction, and Everything in Between – The Diverse Responses of Seaweeds to Marine Heatwaves. *Frontiers in Marine Science* Vol 6, 00763 <https://doi.org/10.3389/fmars.2019.00763>

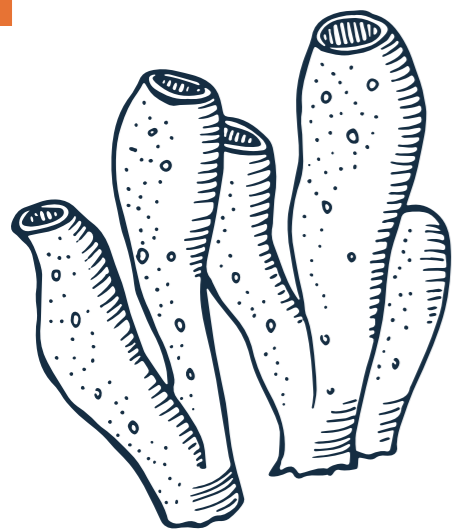
Struve T, Wilson DJ, van de Fliedert T, Pratt N, **Crockett KC** (2019) Middle Holocene expansion of Pacific Deep Water into the Southern Ocean. *PNAS* Vol 117 Issue 2. PP889-894. <https://doi.org/10.1073/pnas.1908138117>

Swennenhuis F, **Mabon L**, Flach TA, de Coninck H (2020) What role for CCS in delivering just transitions? An evaluation in the North Sea region. *International Journal of Greenhouse Gas Control* Vol 94, 102903. <https://doi.org/10.1016/j.ijggc.2019.102903>

Trainer V, **Davidson K**, Wakita K, Berdalet E, Suttleston M, Myre G (2020) Evaluating, reducing and mitigating the cost of Harmful Algal Blooms: A compendium of case studies. *PICES Press* Vol 28, Issue 1. PP30-32. <https://meetings.pices.int/publications/pices-press/volume28/PPJan2020.pdf>

Tsiamis K, Salomidi M, Gerakaris V, **Mogg A**, Porter E, **Sayer M**, Kuepper F (2020) Macroalgal vegetation on a north European artificial reef (Loch Linnhe, Scotland): biodiversity, community types and role of abiotic factors. *Journal of Applied Phycology* Vol 32. PP1353-1363. <https://doi.org/10.1007/s10811-019-10918-2> *Annual Report 2020 papers*





**Tuerena R**, Williams RG, Mahaffey C, Vic C, Green M, Naveira-Garabato A, Sharples J (2019) Internal Tides Drive Nutrient Fluxes Into the Deep Chlorophyll Maximum Over Mid-ocean Ridges. *Global Biogeochemical Cycles* Vol 33 Issue 8. <http://doi.org/10.1029/2019GB006214>

**Tuerena R**, Ganeshram RS, Humphreys MP, Browning T, Bouman H, Piotrowski AP (2019) Isotopic fractionation of carbon during uptake by phytoplankton across the South Atlantic subtropical convergence. *Biogeosciences Discussions* Vol 16, Issue 18. PP3621-3625. <https://doi.org/10.5194/bg-2019-162>

Visch W, **Rad-Menendez C**, Nylund G, Pavia H, Ryan MJ, **Day J** (2019) Underpinning the Development of Seaweed Biotechnology: Cryopreservation of Brown Algae (*Saccharina latissima*) Gametophytes. *Biopreservation and biobanking* Vol 17 Issue 5. 9 PP. <https://doi.org/10.1089/bio.2018.0147>

Wangpraseurt D, You S, Azam F, Jacucci G, Gaidarenko O, Hildebrand M, Kuehl M, Smith AG, **Davey MP**, Deheyn DD, Chen S, Vignolini S. (2020) Bionic 3D printed corals. *Nature Communications* Vol 11, Issue 1.1748. <https://doi.org/10.1038/s41467-020-15486-4>

Ward G, Faisan J, **Cottier-Cook EJ**, **Gachon C**, Hurtado A, Lim P-E, Matoju I, Msuya F, Bass D, Brodie J. (2019) A review of reported seaweed diseases and pests in aquaculture in Asia. *Journal of the World Aquaculture Society* Vol 51 Issue 4. PP815-828. <https://doi.org/10.1111/jwas.12649>

Wegner Koch C, Cooper LW, Lalande C, **Brown TA**, Frey KE, Grebmeier JM (2020) Seasonal and latitudinal variations in sea ice algae deposition in the Northern Bering and Chukchi Seas determined by algal biomarkers. *PLoS ONE* 15 (4) PP e0231178 <https://doi.org/10.1371/journal.pone.0231178>

[pone.0231178](https://doi.org/10.1371/journal.pone.0231178)

Wells ML, Karlson B, Wulff A, Kudela R, Trick C, Asnaghi V, Berdalet E, Cochlan W, **Davidson K**, De Rijke M, Dutkiewicz S, Hallegraef G, Flynn KJ, Legrand C, Paerl H, Silke J, Suikkanen S, Thompson P, Trainer VL (2019) Future HAB science: Directions and challenges in a changing climate. *Harmful Algae* Vol 91. 101632. <https://doi.org/10.1016/j.hal.2019.101632>

Westermeier R, **Murua P**, Robles M, Marria M, Patino D, Munoz L, Mueller DG (2019) Population biology and chemical composition of the red alga *Callophyllis variegata* (Rhodophyta; Cryptonemiales) in southern Chile. *Journal of Applied Phycology*, 9PP. <https://doi.org/10.1007/s10811-019-01988-2>

Yang X, Frey M, Rhodes RH, Norris SJ, Brooks IM, **Anderson PS**, Nishimura K, Jones AE, Wolff EW (2019) Sea salt aerosol production via sublimating wind-blown saline snow particles over sea ice: parameterizations and relevant microphysical mechanisms. *Atmospheric Chemistry and Physics* Vol 19, PP8407-8424. <https://doi.org/10.5194/acp-19-8407-2019>

## Book Chapters

**Boswarva K**, Howe J, Obando R, **Fox C**, **Narayanaswamy B**, Haussermann V, **Abernethy C**. (2019) Habitat Mapping in the fjords of the Chilean Patagonia using an Autonomous Underwater Vehicle. *Seafloor Geomorphology as Benthic Habitats (Second Edition)* 2, PP337-353 <https://doi.org/10.1016/B978-0-12-814960-7.00018-X>

Hegseth EN, Assmy P, Wiktor JM, Kristiansen S, Leu E, Tverberg V,

Gabrielsen TM, Skogseth R, **Cottier F** (2019). Phytoplankton seasonal dynamics in Kongsfjorden, Svalbard and the adjacent shelf. *Advances in Polar Ecology Vol 2*, Springer. PP173-277. [https://doi.org/10.1007/978-3-319-46425-1\\_6](https://doi.org/10.1007/978-3-319-46425-1_6)

Hop H, **Cottier F**, Berge J. (2019) Autonomous Marine Observatories in Kongsfjorden, Svalbard. *Advances in Polar Ecology Vol 2*, Springer. PP 515-533. [https://doi.org/10.1007/978-3-319-46425-1\\_13](https://doi.org/10.1007/978-3-319-46425-1_13)

Pavlov AK, Leu E, Hanelt D, Bartsch I, Karsten U, Hudson SR, Gallet J-C, **Cottier F**, Cohen JH, Berge J. (2019) The underwater light climate in Kongsfjorden and its ecological implications. *Advances in Polar Ecology Vol 2*, Springer. PP137-170. <https://doi.org/10.1007/978-3-319-46425-1>

Suckling CC, Kelly MS, **Hughes AD**, **Cottier-Cook EJ** (2020) *Psammechinus miliaris* - chapter 27. *Developments in Aquaculture & Fisheries Science. Sea Urchins: Biology and Ecology*. Elsevier. PP487-496. <https://doi.org/10.1016/B978-0-12-819570-3.00027-5>

Tverberg V, Skogseth R, **Cottier F**, Sundfjord A, Walczowski W, **Inall ME**, Falck E, Pavlova O, Nilsen F. (2019) The Kongsfjorden Transect: seasonal and inter-annual variability in hydrography. *Advances in Polar Ecology Vol 2*. Springer. PP49-104. [https://doi.org/10.1007/978-3-319-46425-1\\_3](https://doi.org/10.1007/978-3-319-46425-1_3)

Jeffreys RM, Robson L, **Narayanaswamy B** (2020) Impacts of climate change on deep-sea habitats, relevant to the coastal and marine environment around the UK. *MCCIP Science Review 2020. Marine Climate Change Impacts Partnership*. PP293-321 <https://doi.org/10.14465/2020.arc14.dsh>

## Reports

Bates RE, Chocholek M, **Fox C**, **Howe**

J, Jones N. SIFIDS Scottish Inshore Fisheries Integrated Data System. WP3 Final report.. Development of a Novel, Automated Mechanism for the Collection of Scallop Stock Data <https://www.masts.ac.uk/research/emff-sifids-project/>

**Bentley JW**, **Serpetti N**, **Fox C**, Reid D, **Heymans JJ** (2019) Modelling the food web in the Irish Sea in the context of a depleted commercial fish community. Part 2: ICES Ecopath with Ecosim Key Run. SAMS Report no 294. 80PP. <https://doi.org/10.6084/m9.figshare.6323120.v1>

Bresnan E, Baker-Austin C, Campos CJA, **Davidson K**, Edwards M, Hall A, McKinney A, Turner AD (2020) Impacts of climate change on human health, HABs and bathing waters, relevant to the coastal and marine environment around the UK. *Marine Climate Change Impacts Partnership, MCCIP Science Review 2020*. 25PP [https://www.mccip.org.uk/media/2025/22\\_human\\_health\\_harmful\\_species\\_2020.pdf](https://www.mccip.org.uk/media/2025/22_human_health_harmful_species_2020.pdf)

Farinas A, Adonegi E, Beggs S, **Bentley JW**, Borges MF, de Carvalho-Souza G, Doray M, Howell D, Isaac P, Laffargue P, Lehuta S, Llope M, Louzao Arsuaiga M, Martinez I, Pedreschi D, Petitgas P, Preciado Ramirez I, Reid D, Rincon Hidalgo MM, **Serpetti N**, Szalaj D, Torres Leal M, Travers-Trolet M (2019) Working Group on Ecosystem Assessment of Western European Shelf Seas (WGEAWESS). *ICES Scientific Reports. ICES Working Group Report Vol 1 Issue 64*. 75PP. <https://doi.org/10.17895/ices.pub.5604>

Last EK, Ferguson M, **Serpetti N**, **Narayanaswamy B**, **Hughes D** (2020) Geodia and other massive sponges on Atlanto-Arctic upper bathyal mixed sediment. *Marine Biological Association of the United Kingdom, Plymouth*. 30 PP. [https://www.marlin.ac.uk/assets/pdf/habitats/marlin\\_habitat\\_1199\\_2020-01-21.pdf](https://www.marlin.ac.uk/assets/pdf/habitats/marlin_habitat_1199_2020-01-21.pdf)

**Last EK**, Ferguson M, **Serpetti N**, **Narayanaswamy B**, **Hughes D** (2020) Geodia and other massive sponges on Atlanto-Arctic upper bathyal coarse sediment. *Marine Biological Association of the United Kingdom, Plymouth*. 30 PP. [https://www.marlin.ac.uk/assets/pdf/habitats/marlin\\_habitat\\_1190\\_2020-01-21.pdf](https://www.marlin.ac.uk/assets/pdf/habitats/marlin_habitat_1190_2020-01-21.pdf)

Parks R, **Swan S**, **Davidson K**, Turner A, Maskrey B, Powell A, Ford C, Petch RG (2019) Annual report on the results of the *E. coli*, biotoxin, phytoplankton and chemical contaminants Official Control Monitoring Programmes for Scotland – 2018. *CEFAS contract reports: C7711-C7715*. 76PP. <https://www.cefas.co.uk/media/201901/c-users-ocm00-desktop-del-shellfish-cefas-annual-report-fss-2018-final-260319.pdf>

Perez-Espona, **Goodall-Copestake WP**, Hollyman P, Belchier M (2019) Preliminary assessment of genetic diversity in bycatch-caught darkbelly skate (*Bathyraja meridionalis*) from South Georgia. *Commission for the Conservation of Antarctic Marine Living Resources. WG-FSA-2019/19*. Scientific Report. <https://www.ccamlr.org/en/wg-fsa-2019/19>

Wright P, Pinnegar JK, **Fox C** (2020) Impacts of climate change on fish, relevant to the coastal and marine environment around the UK. *MCCIP Science Review 2020*, 28 PP <https://10.14465/2020.arc16.fish>

## Policy advice

**Cottier F**, Miller R, **Narayanaswamy B**, **Inall M**, **Cunningham S**, **Last K** (2018) Written Evidence submitted to the Environmental Audit Committee; *Changing Arctic Inquiry*. pp9



During the reporting year SAMS became a Cycle Friendly Employer for our commitment to the high number of staff who cycle to and from work. The award from Cycling Scotland comes after SAMS extended the cycle path leading to the campus, refurbished changing rooms and shower facilities on site and constructed a new cycle shed and bike repair station. Staff also formed a Bicycle Users Group to best reflect the needs of those cycling to work.

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