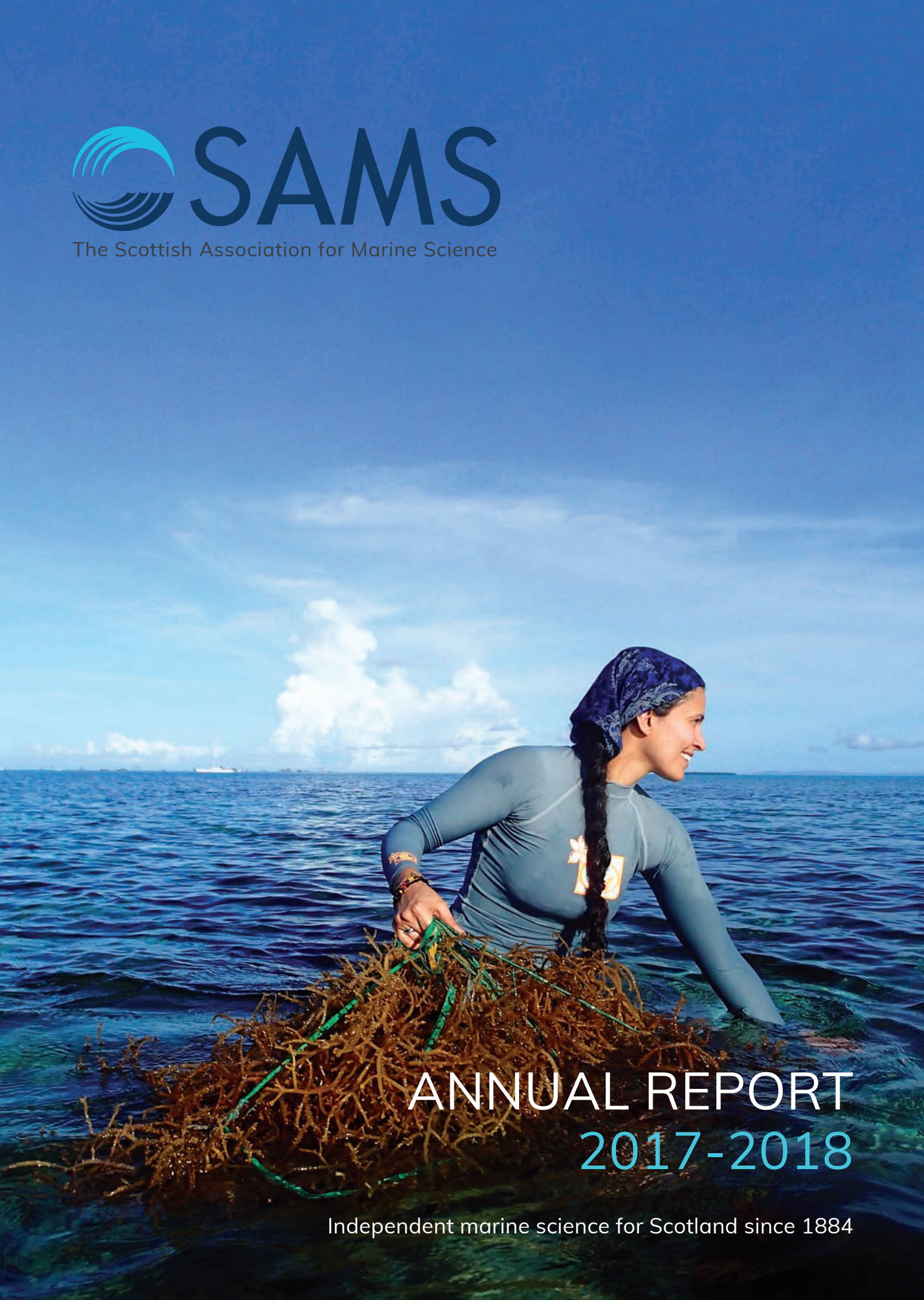
SAMS

The Scottish Association for Marine Science



ANNUAL REPORT 2017-2018

Independent marine science for Scotland since 1884

Office bearers as confirmed at 103rd AGM of the Association

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Registered Office
Scottish Marine Institute
Oban, Argyll PA37 1QA
Scotland, United Kingdom

About SAMS
SAMS' purpose is to conduct world-leading research and create new knowledge about the seas and oceans, about how they work, their interaction with the rest of the planet and with humanity. SAMS research embraces the great challenges of our time: the provision of sustainable food and energy and global climate change, in the face of increasing human population and therefore pressure on the marine environment. SAMS research extends from the atmosphere above the sea to its greatest depths, and from pole to pole. Importantly, a key purpose of SAMS is to promote and make this new knowledge available for society, from school children to university students and from inndustry to world leaders.

SAMS is a company company limited by guarantee (No. SC009292) governed by its Memorandum and Articles of Association. It is a registered charity with the Office of the Scottish Charity Regulator (No 009206) with a membership. The liability of the members is limited to a maximum of £1 each.

SAMS has wholly owned active subsidiary companies: SAMS Research Services Limited and SAMS Limited.

SAMS is a founding partner of the University of the Highlands and Islands, and an Associate Institution of the United Nations University. It is also a partner in the Marine Alliance for Science and Technology for Scotland and the Scottish Alliance for Geoscience, Environment and Society.

CONTENTS

Front cover photo: Dr Valeria Montalescot (SAMS) harvesting seaweed for Globalseaweed STAR project in the Philippines.

Editor: Anuschka Miller

PROFESSOR
NICHOLAS OWENS
SAMS DIRECTOR

WELCOME

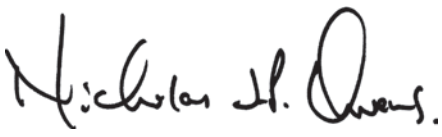
The last 134 years have seen the fortunes of this Association rise and fall. To weather storms, we have been pursuing a strategy of diversification. Over the past year our students and staff have delivered 104 funded research projects and 39 commercial contracts across all marine science disciplines, enabled by 40 research funders and 30 clients, and in collaboration with the widest possible partnerships. We have generated 105 publications and educated 115 undergraduate, 32 taught Master and 40 postgraduate research students. For the first year we had more students than staff at SAMS!

This report provides examples that highlight how what we do matters at all scales. For example, locally we work with partners to develop Oban into a university town with the educational, economic, social and cultural wealth this unlocks. Regionally we collaborate with organisations in Scotland, Northern Ireland and the Republic of Ireland to develop a joint monitoring and management approach to protect the marine environment that knows no national borders; while internationally we co-create new seaweed farming knowledge alongside colleagues from developing nations, and join partners across the Arctic circle exploring how we can best prepare for the changes the Arctic is undergoing. We add our expertise to political debates on topics such as aquaculture in Scotland, and our commercial subsidiary SRSL helps clients operate profitably and sustainably in the marine environment.

In the past year we have particularly focused on improving the information and mechanisms to manage our multitude of research, education and enterprise activities in accordance with an institutional reform and development plan to achieve long-term sustainability. With great sadness we also had to re-balance our science staffing to keep SAMS' competences well aligned with our funders' strategic research agendas. We have also been diversifying our Governing Council.

While the challenges Brexit might bring remain uncertain, SAMS is in the hands of competent and dedicated people at all levels of the organisation who are united by a commitment to excellence in marine research, education and enterprise and a common belief in the possibility of a future for the marine environment that is both economically beneficial for society and ecologically sustainable.

Many thanks to all those responsible for the content and production of the report. I hope you enjoy reading it as much as I have done.



Professor Nicholas Owens
SAMS DIRECTOR

SAMS AT A GLANCE 2017-2018

Operating costs

105 peer-reviewed journal papers

104 funded research projects

40 research funders

39 commercial contracts (> £5k)

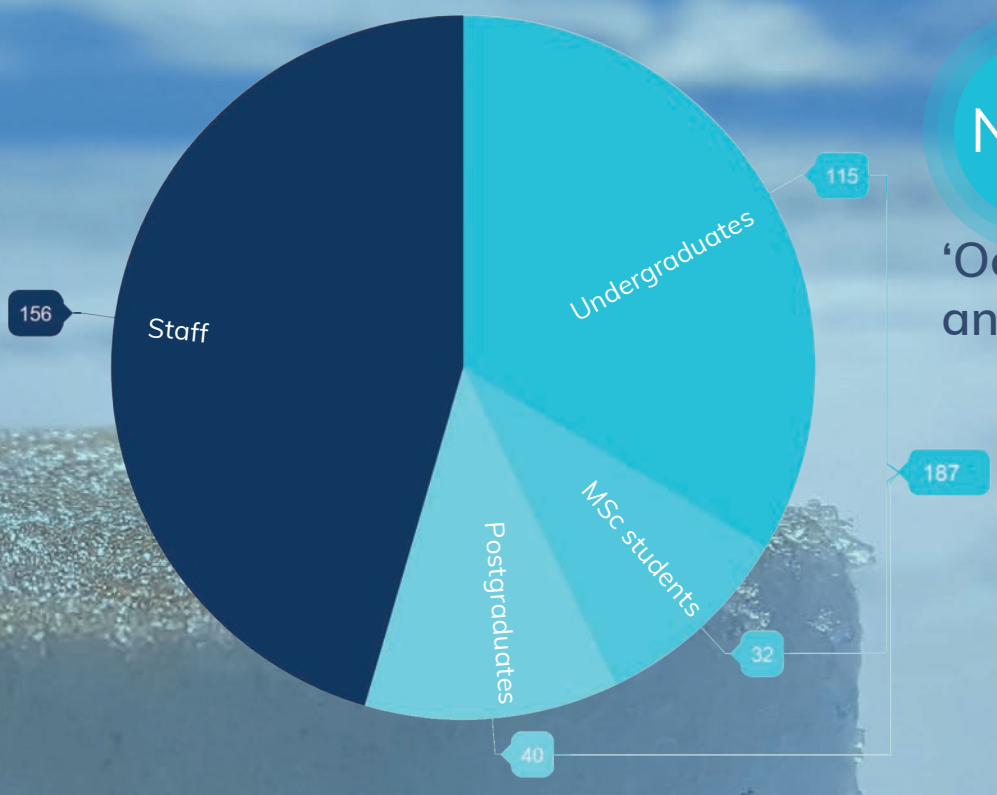
30 clients

1,420 algal cultures supplied

4,530
visitors to Ocean Explorer Centre
www.oceanexplorercentre.org

New **seaweed hatchery** produced 4 km seeded line

For the first year we had more students than staff:



NEW

New degree stream in ‘Oceanography and Robotics’

3,806 Facebook followers

92 YouTube videos

7,690 Twitter followers

750 school pupils trained

372 media mentions

4km

RESEARCH OVERVIEW

New science structure

During the reporting year SAMS has re-organised its research into three broad research areas which consider the research spectrum, timescales, enduser, spatial relevance and type of impact of research projects. Each research area has a senior research area leader and a younger co-leader to convene and coordinate science meetings and activities in each area.

	Ocean Systems	Dynamic Coasts	Blue Economy
Research Spectrum	Discovery	Underpinning	Applied
Timescales	Long Term	Near Term	Immediate
Enduser	International Science/Panels	Regulators & Communities	Industry(ies)
Spatial Relevance	Global/Basin	Land-Sea-Shelf	Site/Resource focus
Type of Impact	Global Recognition Agenda Setting	Regional/National Policy	RegulatoryTools Industry Solutions

SAMS co-delivers NERC's new £22M national capability research programme CLASS

Since 1975 SAMS and the National Oceanography Centre have been monitoring the flow of the eastern subpolar North Atlantic along the (extended) Ellett line between Scotland, the Rockall Trough and, since 1996, Iceland. Various projects have contributed to the data gathered along the EEL, recently for example OSNAP, Atlas and AtlantOS. Gliders increasingly supplement the data collection during cruises.

NERC's new CLASS project (Climate Linked Atlantic Sector Science) is taking over the baton of funding this research that collects both oceanographic and biogeochemical data. In the past year we deployed and recovered the Ellett Array with nearly 100% data return. Three tall wire moorings are redeployed for 2018-2020. The first Seaglider was deployed along part of the EEL, but unfortunately could only achieve 20% of the planned science due to technology failure.

OCEAN SYSTEMS RESEARCH

SAMS' Arctic adventures continue...

In 2017 SAMS was awarded the leadership of two of the first four large Arctic projects funded by NERC through its £10m Changing Arctic Ocean programme.

Prof Finlo Cottier leads the £1.2m Arctic PRIZE project that investigates how seasonality, ice cover and ocean properties determine the large-scale ecosystem structure of the Arctic Ocean. The first two PRIZE cruises took place during permanent light and then during the little researched Arctic winter in permanent darkness, launching robotic gliders in the Barents Sea. The January cruise also utilised a new, ultra-sensitive light sensor developed by Shane Rodwell and Dr Phil Anderson to investigate impacts of light pollution from ships.

The DIAPOD project, led by Prof David Pond, explores the changing roles of diatoms and the dominant zooplankton group. *Calanus* is a critical link in the Arctic food web, predicted to decline in warming waters, which may affect the wider food web and the cycling of carbon.

In September 2017 Oban became the gateway to the Arctic, when SAMS hosted the three-day UK Arctic Science Conference, welcoming 125 scientists organised by the NERC Arctic Office. A public evening lecture on our relationship with the Arctic by BBC presenter Tom Heap even attracted an audience of 250.

"We in Argyll and Bute are extremely proud of SAMS and they are rightly regarded as one of the jewels in Scotland's academic crown, an opinion that I found on my recent trip to the Arctic was universally shared by the international scientific community."

Brendan O'Hara MP, UK Arctic Science Conference welcome speech, 19 Sep 17

Overturning in the Subpolar North Atlantic Program (OSNAP)

The international OSNAP project provides a continuous record of full-water column, trans-basin fluxes of heat, mass and freshwater in the sub-polar North Atlantic. It operates a transatlantic observing system of two legs. SAMS is involved in OSNAP East, which runs from SE Greenland to Scotland. The 2013-18 project was awarded a £1.2m extension to continue until August 2020, hopefully to be extended further. The OSNAP array was recovered and redeployed during a series of cruises in the summer of 2018. Nearly 100% of data were returned from all mooring instruments. The OSNAP infrastructure also hosted novel sensors to quantify fluxes of nutrients and uptake of anthropogenic carbon in the subpolar gyre for EU programmes Atlas and AtlantOS.

Neap-spring tidal cycles in the deep-sea

The seafloor of the deep sea is a globally important net sink for carbon. Nevertheless we know little about how it is formed and the boundary layer just above it. Dr Robert Turnewitsch and co-workers published evidence that and how the neap-spring tide affects settling particles in the waters just above the seafloor.

OCEAN SYSTEMS RESEARCH

RESEARCH AREA LEADER

Prof Finlo Cottier

RESEARCH AREA CO-LEADER

Dr Raeanne Miller

DYNAMIC COASTS RESEARCH

New mooring network to monitor Marine Protected Areas

The EU INTERREG VA funded COMPASS project draws together partners from western Scotland and the northern parts of Ireland to provide data and modelling to underpin the management of Marine Protected Areas in the region.

In its first year, COMPASS has established a network of acoustic moorings for monitoring of cetaceans and noise, and has worked towards re-establishing the Tiree Passage time series of temperature and salinity, a record begun in 1981 but discontinued in 2014. A new long-term mooring in the Lynn of Lorn is planned for next year. SAMS has also contributed our high resolution west coast model WestCOMS, which is being interfaced to a model of Irish waters to provide the best–available physical model of the region.

Microplastics research grows at SAMS

In the year that saw the dramatic increase in public awareness about the issue of plastic waste in the marine environment following the broadcast of Blue Planet II, two new PhD microplastics projects commenced at SAMS UHI. These explore 1) the distribution of microplastics on Scotland's coastline and 2) whether a novel hyperspectral infrared camera mounted on a drone can be used to remotely quantify microplastic pollution in the sea surface in Scotland and Antarctica. Final year PhD student Winnie Courtene-Jones published her findings that half the benthic macroinvertebrates collected from 2200m in the Rockall Trough had ingested microplastic and that the concentration of microplastic fibres in deep-sea water was comparable to that in surface waters. In 2018 another publication reported that the quantity of microplastic ingestion by deep-sea invertebrates had been surprisingly consistent over the past four decades. SAMS' microplastics research group is headed by Dr Bhavani Narayanaswamy.

UK climate change report cards

To provide policy-makers with timely, independent and non-biased information on the state of the marine environment, 400 scientists contributed to the 2017 UK Marine Climate Change Impacts Partnership report card that summarises how climate change is affecting our seas and coastlines. Seven SAMS scientists contributed to the 2017 report cards: Prof Michael Burrows was single author of the chapter on intertidal species, while Prof Liz Cottier-Cook led the chapter on non-native species. SAMS also contributed to chapters on the Atlantic meridonal overturning circulation, on temperature and on human health.

Global warming threat to fish stocks

SAMS scientists have predicted that by 2100 the joint pressures of climate change and sustainable fishing could force commercially important fish species like cod, haddock and herring to migrate further north. Species such as whiting, hake and saithe are predicted to replace the somewhat colder water species around the UK. These conclusions are based on an integrated ecosystem model and were published by lead author Dr Natalia Serpetti in *Nature Scientific Reports*.

DYNAMIC COASTS RESEARCH

RESEARCH AREA LEADER

Dr Clive Fox

RESEARCH AREA CO-LEADER

Dr Suzi Billing

BLUE ECONOMY RESEARCH

Making space for aquaculture

The EU funded AquaSpace project investigated spatial and socio-economic constraints on the expansion of aquaculture in Europe and tested tools to help overcome these. SAMS' Prof Kenny Black and latterly Prof Paul Tett led this project with its 22 partners and 17 case studies which came to the end of its funding during the reporting year. The project created a digital ToolBox, a Masters Module, a CPD module, and 17 case studies which can all be accessed on www.aquaspace-h2020.eu

Global Challenge Research supports seaweed farmers

A new £6m Global Challenge Research Fund grant 'GlobalSeaweedSTAR' kicked off during the reporting year. The project aims to protect and develop the future of the seaweed industry in developing countries. Led by Prof Liz Cottier-Cook, the four-year international consortium includes partners from Indonesia, the Phillipines and Tanzania.

Salmon farming information for the Scottish Parliament

On 30 January, a team from SAMS and the university including Prof Nick Owens, Prof Paul Tett, Dr Adam Hughes and Dr Lindsay Vare gave evidence to the Scottish Parliament's Environment, Climate Change and Land Reform Committee based on a commissioned report entitled 'Environmental Impacts of Salmon Farming in Scotland'.

The report reviewed the scientific evidence relating to the environmental effects of salmon farming to inform parliamentary decisions on the future direction of Scottish aquaculture. Prof Paul Tett, lead author of the report, also gave evidence to the Rural Economy and Connectivity Committee.

How will decommissioning affect fisheries?

SAMS is working increasingly with Marine Scotland Science (MSS), the scientific division of Marine Scotland. MSS is currently the principal partner on three SAMS NERC Oil and Gas Innovation projects.

Dr Sally Rouse conducts two projects assessing the potential consequences of offshore pipeline decommissioning options to commercial fisheries, benthic species and features of conservation interest. The third project is developing novel imaging techniques to quantify the nature and extend of marine growth associated with offshore energy infrastructure. Sally works with the Offshore Energy Environmental Advice group, which sits within the renewables and energy programme.

MSS co-designed the project objectives and methodologies and to date have directly applied the outputs of our research in the consultation of 20 decommissioning programmes. MSS provide access to high resolution spatial fisheries data which Dr Rouse uses in her analysis.

MSS staff also co-supervise two SAMS UHI PhD students researching methods for optimising the decommissioning of concrete mattressses funded by the European Social Fund.

BLUE ECONOMY RESEARCH

RESEARCH AREA LEADER

Dr Adam Hughes

RESEARCH AREA CO-LEADER

Dr Sally Rouse

EDUCATION

Marine Science BSc (Hons)

In its 17th year, the Marine Science BSc honours programme was joined by 38 new students in September 2017, bringing the total undergraduate student population to 115 over the four years of the programme. In 2017 the lecturing team introduced a new stream in oceanography with robotics that allows students with a particular interest in physical oceanography and technology to develop the numerical and technical expertise careers in these fields require. This is the second stream offered to marine science students alongside the well-established Arctic studies option. The programme is now well tuned and our students awarded the programme with an astonishing 100% overall satisfaction score in the National Student Survey. Dr John Howe was the programme leader for the BSc in 2017-18.

Taught Masters

The year saw 15 students enrol on the Ecosystem-based Management of Marine Systems MSc course jointly delivered with the University of St Andrews. Although a larger intake than in previous years, this was unfortunately the last cohort as the programme will be discontinued following changes at St Andrews. The SAMS programme leader in 2017-18 was Dr Clive Fox.

The two-year Erasmus Mundus Joint Masters Degree in AquaCulture, Environment and Society (ACES) that we run in collaboration with the Universities of Crete and Nantes welcomed its third cohort of 17 students of 12 different nationalities in September. The first cohort of three students graduated. The programme was successful in attracting EU funding for a further four cohorts of students, adding Radbound University Nijmegen to the consortium. This program will now be led from Crete although SAMS will continue to administer it. Programme leader in 2017-18 was Prof Liz Cottier-Cook.

SAMS has been delivering an optional Blue Biotechnology module as a part of the Industrial Biotechnology Innovation Centre Master in Biotechnology run through the University of Strathclyde. In 2017-18 15 students selected the module, which was led by Dr Michele Stanley.

Postgraduate research

In June 2017 the University of the Highlands and Islands achieved research degree awarding powers and in March 2018 approved a one-year MRes in Algal Biotechnology, Biology and Ecology. This replaces an existing MSc Marine Science programme, which had focused on algal biotechnology and was awarded through the University of Aberdeen. Three students joined this programme, which was led by Dr David Green.

Our PhD student community brings together 40 mostly full-time students researching questions covering the entire spectrum of SAMS research. Funding hails from a range of sources such as doctoral training partnerships, the European Social Fund and the Marie Curie Programme. In 2017-18 we were joined by 12 new students, who focus on their own research project but also benefit from a new training portfolio. With such a sizeable graduate school, SAMS hosted the UHI Postgraduate Conference 7-8 Nov 17. The SAMS graduate school is led by Dr Bhavani Narayanaswamy.

Two PhD students this year won national awards: Winnie Courtene Jones, who investigated the effects of microplastics on the deep ocean, was the overall winner of the P1 Marine Foundation National Student Awards. Kati Michalek, who studied how mussels will cope in a changing climate, was Higher Education Learner of the Year at the Lantra Scotland Land-based and Aquaculture Learner of the Year Awards.

2017 Graduation

The SAMS UHI Graduation took place on Friday 8 Sep 2017 at the Argyllshire Gathering Halls in Oban. This year's keynote address was delivered by Michael Russell MSP. 18 undergraduates and 6 Masters students graduated as did one PhD graduand.

"The SAMS undergraduate degree really stood me in good stead, as my lecturers in Hamburg knew of SAMS' research reputation. They loved that we had such a multi-disciplinary course and that I had studied in Svalbard as part of the degree."

Daniel Burt, BSc (Hons) Marine Science with Arctic Studies First Class graduate 2017

2017 Prize Giving

Johanna Fehling Memorial Prize:
Kati Michalek and Winnie Courtene Jones

SAMS Award for Special Achievement:
Maryam MacCorquodale

SAMS UHI Student of the Year:
Shannon Lafferty

SAMS Council Award for Academic Excellence:
Daniel Burt

Tim Boyd Prize for Oceanography:
Jamie Rodgers

UHI Sporting Blues Award:
Jamie Rodgers

Best ACES dissertation:
Patricia Alves Pereira

ENTERPRISE AND INNOVATION

SAMS Research Services Ltd: enabling productive oceans

SAMS engages commercially with industry and organisations across the UK, in Europe and globally through our wholly owned subsidiary, SAMS Research Services Ltd (SRSL), an integral part of SAMS which works closely with our scientists and support scientist teams to commercialise their knowledge, skills and expertise. SRSL delivers specialist marine environmental consultancy, to support individuals, industry and organisations who work with our seas and oceans to ensure sustainable interaction and safeguard the marine environment. . In the financial year 2017-2018, SRSL recorded an operating surplus of £436k on a turnover of £1.87M delivering a wide range of marine science based services such as surveys, sampling and analysis, scientific review, reporting and interpretation on marine field work, environmental impact and marine spatial planning.

NewDEPOMOD launched

A major milestone in the past year has been the successful commercialisation of the SAMS developed particle deposition modelling software, DEPOMOD. Continuously updated over a period in excess of ten years and now in a third version release as NewDEPOMOD, it is used in the finfish aquaculture industry and by the industry regulator in Scotland to model the environmental interactions of fish farms. The modelling software is supplied through an annually renewable licence. SRSL additionally provides training and support for users and modelling service to customers on a consultancy basis. NewDEPOMOD has been strategically commercialised as one of five identified product/ service deliverables in line with customer demand to provide a sustainable revenue stream for SAMS and support on-going marine science research.

Autonomous snow and ice measurements

For the last six years, SRSL has been supplying a novel autonomous device for sea ice measurement in the polar ice research market. Developed originally through the SAMS research team, the Sea Ice Mass Balance Array (SIMBA) measures and records snow and ice depth and structure and transmits data in real time via the satellite network to a user's operational base. SRSL is now working with the Scottish Avalanche Information Service, SEPA and European partners, trialling SIMBA in the mountain environment to provide vital information for avalanche and flood forecasting. SIMBA is also being trialled on river and sea ice bound shipping channels in a potential forecasting capacity.

ISO accreditation

To achieve the business objectives and ensure SAMS delivers to the needs and expectations of its customers, SRSL operates and manages a Quality Management System (QMS) that is compliant, and accredited, to ISO9001 and ISO17025. The QMS is integrated within the business operation and aims at developing and improving our internal processes and procedures ensuring a focus on customer's requirements, consistency and quality of service, and efficiency of operation. For more information, please visit www.srsl.com

Monitoring toxic algae in Scottish waters

SRSL was awarded the contract to continue the official regulatory control monitoring of toxin producing phytoplankton in Scottish waters for Food Standards Scotland. This human health essential seafood security

work, managed by subcontract from CEFAS, involves sea water analysis for toxic phytoplankton from 40 shellfish harvesting locations around the Scottish coast and will be provided over the next 3-year period.

Sea Creatures Exhibition

SRSL wrote the educational interpretation for an immersive and interactive exhibition displaying the plasticised anatomy of 50 iconic marine animals such as sharks, whales, penguins and 150 body parts and organs. The Sea Creatures exhibition toured London, Edinburgh, Harrogate and other venues in the autumn of 2018.

Phyconet: building an academia-industry microalgal research network in UK

Dr Michele Stanley is Co-Director of Phyconet, a BBSRC 5 year funded Network in Industrial Biotechnology and Bioenergy. It has been developing a 700-member-strong interdisciplinary microalgal research community from UK academia and industry that networks with other algal groups and supports funded collaborations. Last year Dr Stanley was part of an algal biotechnology networking event in New Zealand where algal researchers and industry representatives from New Zealand and the UK discussed progress and opportunities in the exploitation of microalgae, particularly as feedstock for aquaculture and as sustainable sources of novel bio-products. Dr Stanley provided an overview of the UK algal sector and highlighted CCAP..

Phyconet provided funding for a Business Innovation Voucher between SAMS and BioPower Technologies Ltd to investigate using vegetable by-products as supplements for microalgal growth.

SAMS and the UHI Aquaculture Knowledge Exchange Hub

The UHI aquaculture knowledge exchange hub was formed to bring all UHI aquaculture activity under a single umbrella to better coordinate our activity and to offer a more coherent 'shop window' to external stakeholders. The UHI partnership has considerable expertise in areas including wild fish interactions (The Rivers and Lochs Institute, Inverness), marine hatcheries and training (NAFC Shetland) and environmental interactions (SAMS). The hub has secured funding from the University's Innovation Fund (Scottish Funding Council) to support activities including industry workshops looking at skills and training and the development of an Aquaculture Industry Engagement Fund which enables businesses to access UHI expertise to address a specific problem or issue.

Passive acoustic monitoring knowledge exchange with Marine Scotland Science

In March 2018, Dr Nienke van Geel started a 12-month NERC-funded Knowledge Exchange Innovation Placement with Marine Scotland Science. She is working on the passive acoustic monitoring dataset collected along the Scottish east coast since 2013 as part of the East Coast Marine Mammal Acoustic Study project (ECOMMAS). These acoustics recordings provide insights into the underwater soundscape and reveal a variety of natural, biological and anthropogenic sounds.

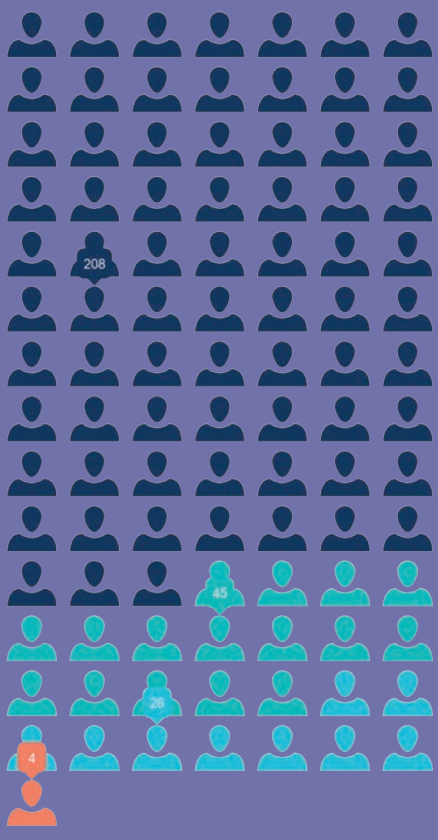
The UK is required to monitor levels of ambient underwater noise, as it is identified by the EU as one of the Marine Strategy Framework Directive's (MSFD) Descriptors for 'Good Environmental Status'. Comprehensive baseline noise monitoring is essential to assess and mitigate impacts of noise producing activities on marine species. However, to date, such large-scale and long-term noise assessments are largely missing. The primary purpose of Dr van Geel's secondment is thus the development of background noise reporting protocols through analysis of the ECOMMAS data.

The comprehensive acoustic data can also provide information on the year-round occurrence and abundance of whale, dolphin and porpoise species, which can aid the development of effective conservation measures and the legally required environmental impact assessment for coastal developments. Finally, transfer of required acoustic analysis skills to MSS staff contributes to maintaining in-house expertise and capability to analyse broadband recordings for the presence of cetaceans and MSFD relevant ambient noise measures beyond the duration the placement.

LEARNED SOCIETY

Membership

TOTAL: 283 (268 in 2016/17)



Life/honorary: 4
Corporate: 26
Students/unwaged: 45

Ordinary: 208

Bursary award

During the reporting year we awarded one £1k bursary to a SAMS member: Victoria Fowler, PhD student with BAS/ University of East Anglia to work on 'Understanding the foray behaviour in *Calanus finmarchicus*'.

New seabed book

Exploring Britain's Hidden World: A natural history of seabed habitats
by Keith Hiscock

For over 40 years Dr Keith Hiscock has been exploring and studying the shore and seabed communities of the northern hemisphere, setting up the Marine Life Information Network that is a go to digital resource about species in the seas and coasts around the British Isles. A diver, photographer, educator and conservationist, Keith published a sumptuously illustrated book on the diversity of life inhabiting the seabed of the shallow seas around Britain. The publication, supported in part by a SAMS bursary, covers history, methodology, forces shaping the environment, habitats, ongoing changes, conservation and new technologies. The 272-page hardback book is published by Wild Nature Press for RRP £25.

SAMS seminar series

Lunchtime research seminars with external and internal speakers are open to SAMS members and communicated to a list of email contacts. Any member who wants to join the email list should register their interest with Rachel. Culver@sams.ac.uk

Remembering SAMS' former director Graham Shimmield

On his birthday on 1 December 2017 colleagues and friends from across the UK came together to celebrate the life, career and legacy of the late Professor Graham Shimmield.

As SAMS director, he was responsible for developing new research strands in Arctic science, biotechnology and social science, masterminded the Sir John Murray building, initiated teaching and commercial portfolios, and by introducing an incubator for marine biotech businesses, began the development of the technopole that continues to grow at Dunstaffnage.

'SAMS has lived on the heritage that Graham built,' summarised SAMS President Professor Geoffrey Boulton.

28TH NEWTH LECTURE

A DAY AT THE SEASIDE WITH PROFESSOR COLIN MOFFAT

Did the late 'King of Pop' Michael Jackson predict the creation of ecosystem services? How many tonnes of gold are in the ocean? And how much is marine tourism actually worth?

These were questions raised during the 2017 SAMS Newth Lecture, which challenged our thinking and entertained us in equal measure.

Delivered with typical aplomb by Marine Scotland's Head of Science Professor Colin Moffat, 'A day at the seaside, a life with our seas' highlighted the importance of Scotland's marine environment and covered topics as diverse as marine tourism, ocean acidification and legacy contaminants.

Professor Moffat challenged the researchers in the audience to provide more long term data, stressing the importance of marine science to the environment.

Using the Michael Jackson lyric from Earth Song 'What about all the things that you said we were to gain', Professor Moffat introduced the concept of ecosystem services. It was perhaps a stretch to suggest the King of Pop had invented the notion through his 1995 hit but, in reality, marine tourism is now worth £3.7billion annually to the economy.

Professor Moffat noted Atlantic salmon was the UK's biggest food export; that Scotland's seas were among the most biologically productive in the world, supporting more than 8,000 species of animals and plants; and that there were 20 million tonnes of gold in the ocean.

"The Blue Planet II series attracted 14 million viewers, the biggest show of 2017," he said. "Why do 14 million people sit down to watch TV when it's showing something marine? It shows the enthusiasm people have for the seas and the environment."

"When I grew up in Stonehaven I used to spend hours on the shore. I remember, as I walked in the sand my footprints would stay there until the tide came in and washed them away again. I always enjoyed that part of life. We have an affinity with the coast."

Professor Moffat punctuated his free-flowing, entertaining and comical lecture style with many serious messages, not least regarding ocean acidification.

He said: "Every day the world's oceans absorb around 22 million tonnes of carbon dioxide. There's no problem with the oceans absorbing CO_2 – they've always absorbed CO_2 – but they are having to absorb even more."

Explaining how the average pH of the ocean has dropped from 8.2 to 7.9, he added: "We are having an impact. We're not only having an impact on pH but we're seeing whole carbon structures changing. So, folks, it's walk-to-work week next week!"

However, Professor Moffat concluded his lecture by giving hope for the future, indicating that with improved data quality and spatial coverage, marine science could help answer a variety of pressing environmental questions.

"Ultimately, sustainable management of marine and coastal ecosystems is about the management of human activities. Given the progress we've made to date and the commitment shown, we will succeed in achieving the right balance and continue to have a life with our seas."

SOCIETAL ENGAGEMENT

Think globally, act locally: SAMS and the university town project

Over the past two decades student numbers in Oban have slowly been increasing and between SAMS, Argyll College, Ballet West and the Lorn and Islands District General Hospital the town is now home to over 800 students, amounting to 10% of the population.

This de facto university town gives local school leavers more choice about their futures and attracts students from other areas to come to Oban for their education, reversing the regional trend of decreasing population numbers and the brain drain caused by young people leaving the area. The university town helps local employers recruit a more skilled workforce. It also adds a sizeable consumer group of lecturers, students, conference delegates and visiting parents and friends that contribute to the local economy mostly during the low tourist season.
In August 2017 Highlands and Islands Enterprise established the Oban as a University Town Project with currently ten partners and organised into a steering committee and four project teams (infrastructure, academic offer, business engagement, and communications). SAMS is closely involved in all teams. The project was officially launched in 2018 aiming to make sure that further growth brings benefits to the town.

Brendan O'Hara, MP for Argyll and Bute, explained: "Argyll and Bute has much to offer to future industries such as marine science, tourism, aquaculture, fishing and clean energy. But to succeed we need to create the scientists, designers and engineers to fill the high value, high skilled jobs. That's why employers and businesses must be involved in the development of the university town so the curriculum responds to industrial needs."

Public engagement flourishes

With 4,530 visitors SAMS' Ocean Explorer Centre welcomed 10% more people than previously. We organised several events including an open day as part of the winter festival with displays and activities from undergraduate students attracting c 200 visitors and another weekend-long Festival of the Sea in May. SAMS was furthermore a partner in the NERC funded Future of our Seas project that trained early career researchers in public engagement.

Ticking right in the social media sphere

In the social media world SAMS' Twitter account (@ ScotMarineInst) achieved 'Blue Tick' verified status, acknowledging SAMS as a recognisable and credible institution within the social media world. Of 974 million Twitter accounts only 256 k were verified at the time of the award.

SAMS FACILITIES

SAMS RESEARCH VESSELS

RV Calanus **29** days at sea

RV Seol Mara **62** days at sea

The Scottish Marine Robotics Facility has the following capabilities

- **2** AUVs
- **2** gliders
- **12** quad copters
- **5** in-house designed remotely piloted aircraft to measure meteorology, turbulence or ocean colour
- **6** teaching RPA robots
- Drifters
- Landers
- Moorings

culturecollection
of algae and protozoa

1420 cultures supplied

164 units of media sold

36 patent strains accepted for deposit/storage

670 orders processed (271 UK, 296 Europe, 103 RoW)

133 papers published in 2017 referring to CCAP strains

19 new strains added

23,302 website visits

981 followers on Instagram within 1 year

SAMS seaweed farms:

2 experimental seaweed farms growing *Saccharina latissima*, *Alaria esculenta*, *Laminaria hyperborea*, *Palmaria palmata* and *Ulva*

Supporting **3** large EU projects, **2** PhD and **2** undergraduate projects

New hatchery: produced 4 km seeded line

FINANCE

SAMS made a surplus in 2017-18

The Association made a surplus of £1,031k in 2017/18 (2016/17 deficit of £171k). This outturn included other income of £1.130m (2016/17 credit £660k). The most significant items in other income in 2017/18 were £834k in relation to backdated RDEC claims and £281k grant income to cover redundancy costs (2016/17 settlement of a long running legal dispute with a builder). In addition, the Association benefited from the reduction in its Universities Superannuation Scheme (USS) liability which provided a further credit in year of £198k (2016/17 credit £250k).

The Group also benefited from the positive contribution of £283k, up from £120k in 2016/17, received from the subsidiary company SRSL which continued to make good progress, complementing the Science activities carried out across the group.

Negative cash flows across the group amounted to £180k.

New Institutional Reform and Development Plan (IRDP)

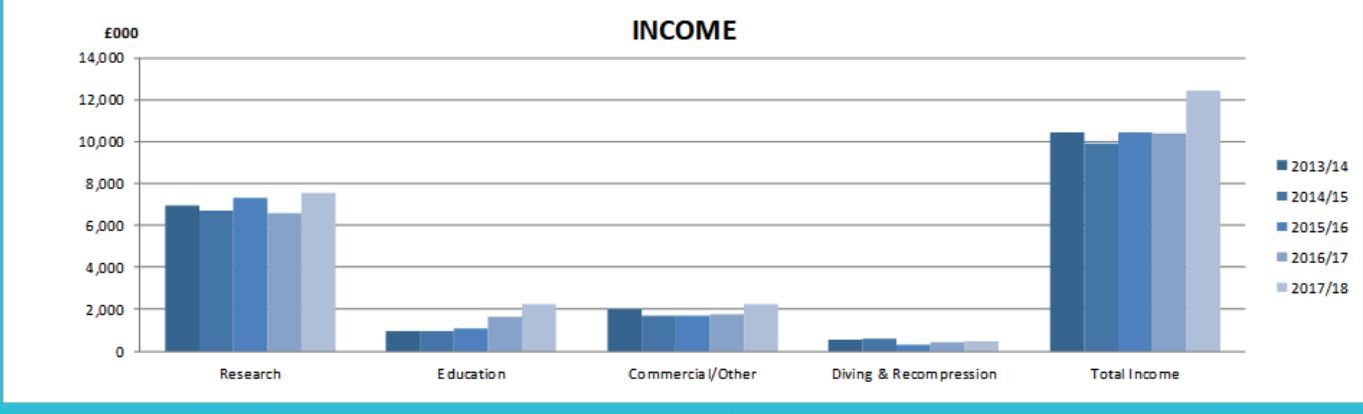
Following an in-depth review, SAMS embarked on the delivery of a major Institutional Reform and Development Plan (IRDP). The IRDP lays out a two-phase transformation of SAMS to achieve long-term sustainability. The first phase focuses on immediate rebalancing and consolidation, incorporating many interventions already underway. The second phase builds on the first to develop SAMS' activities, resource-base and influence in science, enterprise, education and outreach. Together with key partners, SAMS will further enhance the delivery of our vision of conducting world-class science whilst contributing to education, policy and public action to secure healthy and sustainable oceans.

The key financial elements of the IRDP phase 1 include:

- Reduction in salary overhead: a programme of redundancies was completed during 2017/18 with the anticipated annual savings exceeding those included in the IRDP.
- Implementing robust financial and wider business management, information and reporting systems: the introduction of new business systems and processes is ongoing.
- Strategic cost reviews and close monitoring of the establishment, with the target of maintaining staff costs within 60% of total income: achieved.
- Improved overhead recovery on projects: exercise completed; financial benefits in future years.

Financial Summary	2017/18 £000	2016/17 £000	Change Change%
Operating Income	12,165	10,382	17.2%
Operating Expenditure excluding grant funded depreciation	(11,626)	(10,610)	(9.6%)
Operating Surplus/(Deficit) before exceptional item	539	(228)	
Other income	1,130	660	
Pension Deficit Obligation	198	250	
Extraordinary Items	0	(174)	
Depreciation funded by grants received in previous years	(836)	(679)	
Surplus/(Deficit) transferred to reserves	1,031	(171)	

Total income over five years



Research grants and contracts

Income from research grants and contracts increased during the year by 8%. Research contributed 61% of total income with NERC continuing to be our single largest research funder.

Education

As an Academic Partner of the University of the Highlands and Islands we deliver both undergraduate and postgraduate education. As illustrated in the chart above income generated from Education activities has increased to £2.2m, accounting for 18% of SAMS total income.

Enterprise

SAMS Research Services Ltd (SRSL), our subsidiary enterprise, strives to enhance SAMS international reputation for Science Consultancy and fills the gap in science funding from other sources. SRSL accounts for most of SAMS enterprise activity and had a very successful year, increasing profits on a turnover of £1.8m up from £1.4m.

Effective Management of Resources

Staff costs remain the highest proportion of expenditure representing 59% (2016/17 - 66%) of operational income. Total staff costs for the year amount to £7.1m (2016/17 £6.9m). As mentioned above SAMS completed a redundancy programme as part of the delivery of the IRDP.

SAMS continues to take advantage of its UHI shared procurement activities achieving savings in several areas including insurance and science equipment.

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OUR PEOPLE

Professorships

During the reporting year Sheila Heymans and Elizabeth Cottier-Cook were awarded the title of Professor from the University of the Highlands and Islands. Both delivered well attended inaugural lectures.

Royal Society of Edinburgh

SAMS Trustee and Chair of the Research Committee Professor Sandy Tudhope from the University of Edinburgh became a Fellow of the Royal Society of Edinburgh.

Professorial comings and goings

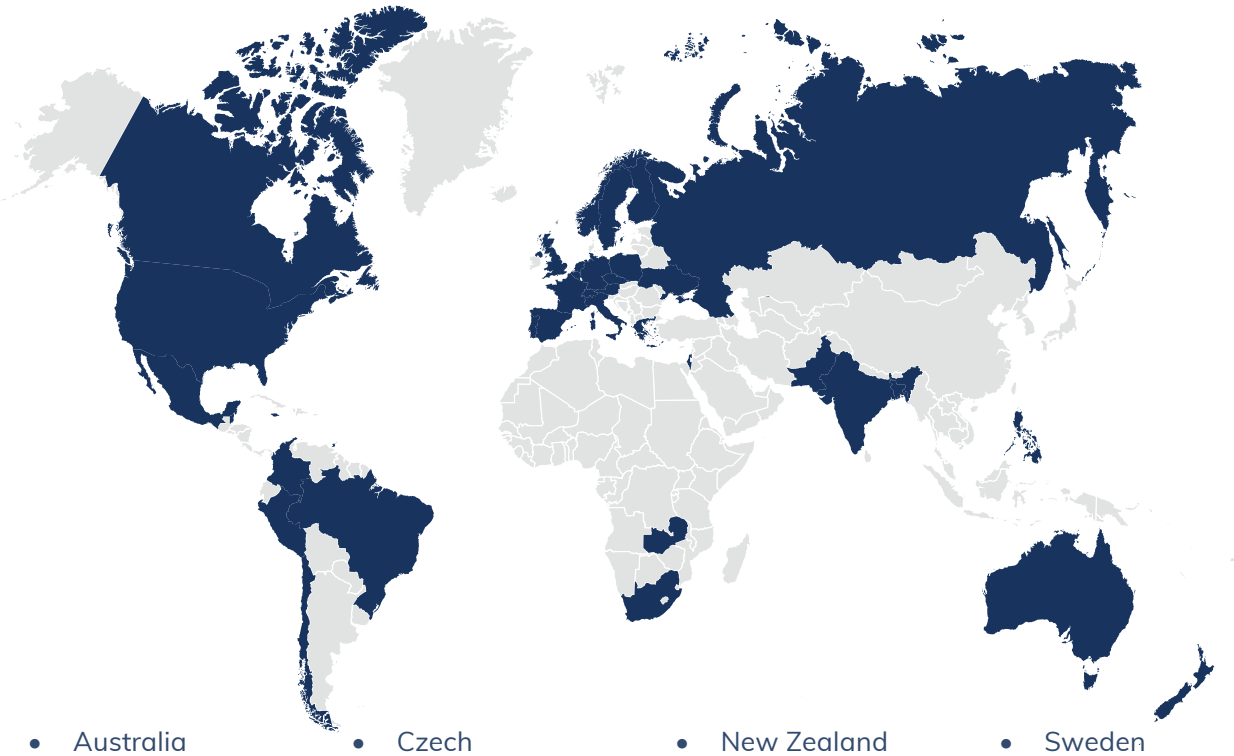
The eminent microbial ecologist Professor Mikhail Zubkov joined SAMS from the National Oceanography Centre, while Professor Sheila Heymans left to take up the post of Executive Director of the European Marine Board. Professor Kenny Black took early retirement as did fellow aquaculture researcher Dr Maeve Kelly.

Diving into uncharted waters

The National Facility for Scientific Diving is no longer operational but Dr Martin Sayer and most of the NFSD team have formed Tritonia Ltd to deliver scientific and commercial diving and recompression services. They continue to be based at SAMS.

SAMS IS INTERNATIONAL

Countries of origin of SAMS staff and students



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- Trinidad & Tobago
- UK
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- USA
- Zimbabwe

SAMS STAFF

1 April 2017 – 31 March 2018

Senior Management

Owens, Prof Nicholas JP (Director)

Miller, Prof Axel EJ (Deputy)

Davidson, Prof Keith (Associate, Education)

Guthrie, David (SRSL)

Haddon, Andrew (Finance)

Hausrath, Michelle (HR)

Heymans, Prof Sheila JJ (Associate, Research)

MacKerron, John (Finance)

Science Team

Adams, Dr Thomas
Aleynik, Dr Dmitry
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Benjamins, Dr Steven
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Brown, Dr Thomas
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Campbell, Dr Iona
Carey, Dr Nicholas
Carpenter, Dr Trevor
Cottier, Prof Finlo
Cottier-Cook, Prof Elizabeth
Crocket, Dr Kirsty
Cunningham, Prof Stuart
Dale, Dr Andrew
Day, Prof John
De Boever, Frederik
Ditchfield, Dr Arlene
Fox, Dr Clive
Fraser, Dr Neil
Gachon, Dr Claire
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Glud, Prof Ronnie N
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Hobbs, Dr Laura
Houpert, Dr Loïc
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Hughes, Dr Adam
Hughes, Dr David
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Kenter, Dr Jasper
Kerrison, Dr Philip
Last, Dr Kim
Macleod, Dr Adrian
Martino, Dr Simone
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Narayanaswamy, Dr Bhavani
O'Donnell, Christopher
Payne, Dr Benjamin
Perrineau, Dr Marie-Mathilde
Pond, Profr David
Porter, Dr Marie
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Robinson, Dr Georgina
Rochford, Meghan
Ross, Dr Michael
Rouse, Dr Sally
Serpetti, Dr Natalia
Stanley, Dr Michele
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Tett, Prof Paul
Toberman, Dr Matthew
Turnewitsch, Dr Robert
van Geel, Dr Nienke
Whyte, Dr Callum
Wilding, Dr Thomas
Wilson, Prof Ben
Zubkov, Prof Mikhail

SRSL / Enterprise Team

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Hausrath, John
Jowitt, Paul
Livingstone, Craig
Miller, Dr Raeanne
Murray, Sine
Nickell, Dr Thomas
Stewart, Alan
Thompson, Phillip
Vare, Dr Lindsay
Wittich, Anja

Support Science Team

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Brennan, Debra
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Hagan, Bernhard
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MacLeod, Eilidh
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McNeill, Sharon
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Smith, Norman
Swan, Sarah
Thomas, Naomi
Thurston, Dr Simon
Twigg, Dr Gail
Venables, Dr Emily
Wilson, Karen
Wright, Ben

Professional Services Team

Arce, Dr Paola
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Beaton, Kenneth
Black, Derek
Burnip, Melvin
Bury, Dr Helen
Campbell, Elizabeth
Campbell, Karen
Clay, Christopher
Cook, Nicola
Crabb, Andrew
Crooks, Polly
Cullen, Jacqueline
Culver, Rachel
Dale, Richard
Day, Stafford
Dobkowski, Krystian
Forgrieve, Sarah
Fraser, Dr Stephen
Gontarek, Steven
Greenwood, Susan
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MacKinnon, Lorna
MacKinnon, Rory
MacLean, Kenneth
MacLucas, Nigel
Macpherson, Lorna
Magill, Shona
McLuckie, Gillian
McNeill, Helen
Miller, Dr Anuschka
Miller, Jocelyn
Paterson, Euan
Purdie, Claire
Robertson, Sharyn
Roseblade, Marc
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Slezak-Bialecka, Joanna
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Steuben Dale, Marieke
Tindall, Fiona
Wallace, Dr Keri
Watt, Lorna

OUR SCIENCE
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RESEARCH - EDUCATION - ENTERPRISE

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