2020 - 2025

SAMS
Scottish Association
for Marine Science

STRATEGY

...to secure healthy & sustainable oceans

Providing research, education and enterprise that society needs to protect and make use of our seas and oceans.

Our PhD student Euan Mackenzie uses robots to study the resilience and recovery of protected flame shell beds in Scotland

FOREWORD

Turning the Tide

We must take urgent collective action if we want future generations to experience and benefit from healthy seas and oceans.

The commitment to saving the oceans as Earth's largest ecosystem is embedded in the UN Sustainability Goals and many treaties and targets, as is the development of a sustainable blue economy. To succeed we need detailed knowledge, diverse skills and new technologies. It falls on the shoulders of the global marine science community to build the essential knowledge, skills and technologies that are missing.

This strategy shows how we will direct our research, education and partnership working with governments, industry and the public to benefit both society and the natural world. As the oldest marine research organisation in the United Kingdom we will empower our team of researchers to use their ingenuity in observing, understanding and predicting the changes in our ocean to develop new solutions to the problems of climate change, depletion of marine life, water pollution, waste, and food security. And we will encourage them to develop environmentally advanced innovation and commercialisation products to benefit the blue economy.

We need to deliver our institutional strategy at a time of great socio-economic uncertainty. Brexit and Covid-19 present major challenges that may severely impact our funding landscape. This strategy articulates our key goals. However, we shall remain flexible and agile in our operational planning.

Let us ensure that our children and grandchildren can still stand on a cliff in a strong fresh breeze, splash through the waves of a pristine sandy beach, explore with childhood relish the biological diversity of rockpools at low tide, marvel at the abundant life below the waves, and bathe in the sensory bombardment of a quayside fish market.

If our mission resonates with you, join us on our journey: become a colleague or collaborator, a student or customer, a funder or tenant, a supporter or a member of our Association.

Professor Nicholas J P Owens
SAMS Director

Diana Murray CBE
Chair of SAMS Board

A' TIONNDADH AN LÀN

Feumaidh sinn gnìomhachadh gu deifreach le chèile ma tha sinn ag iarraidh gun cuir ginealaichean ri teachd eòlas air fairgeannan is cuantan fallaine agus gum bi buannachd aca asta.

An dealas a th' ann airson na cuantan a shàbhaladh mar an t-eag-shiostam as motha air an Talamh, tha e freumhaichte ann an Amasan Seasmhachd nan DA agus mòran chùmhnantan is thargaidean, mar a tha cruthachadh eaconamaidh gorm seasmhach cuideachd. Airson soirbheachadh feumaidh sinn eòlas mionaideach, sgilean iol-ghnèitheach agus teicneòlasan ùra. Tha e a' tuiteam air guailnean choimhearsnachd saidheans mara na cruinne an t-eòlas, na sgilean agus na teicneòlasan uile-chudromach a tha a dhìth a thogail.

Tha an ro-innleachd seo a' sealltainn mar a stiùireas sinn ar rannsachadh, ar foghlam agus ar n-obair ann an com-pàirteachas le riaghaltasan, gnìomhachas agus am mòr-shluagh a chum leas a' chomainn-shòisealta agus an t-saoghail nàdurraich an dà chuid. Mar a' bhuidheann rannsachadh mara as sine san Rìoghachd Aonaichte bheir sinn an comas don sgioba de luchd-rannsachaidh againn an innleachdas a chur an gnìomh ann a bhith a' sgrùdadh, a' tuigsinn agus a' ro-innse nan atharrachaidhean anns a' chuan againn gus fuasglaidhean ùra a dhealbhadh air duilgheadasan atharrachadh na cìomaid, crìonadh am beatha na mara, truailleadh, sgudal, lùth agus tèarainteachd bìdh. Agus bheir sinn brosnachadh dhaibh a bhith a' dealbhadh bathar ùr-ghnàthachaidh is malairteachaidh a bhios adhartach a thaobh na h-àrainneachd a chum leas an eaconamaidh ghuirm.

Feumaidh sinn ar ro-innleachd stèidheachdail a thoirt gu buil an àm mòran mì-chinnt a bhith ann sa chomann-shòisealta agus san eaconomaidh. Tha dùbhlain mhòra an lùib Bhreatamach agus Covid-19 a dh'fhaodadh bualadh gu trom air an raon-tìre anns a bheil sinn a thaobh maoineachaidh. Tha an ro-innleachd seo a' cur an cèill nam prìomh amasan againn. Air a shon sin, bidh sinn fhathast sùbailte, cleasmhor sa phlanadh obrachail againn.

Dèanamaid cinnteach gum faod ar clann agus ar n-oghaichean seasamh fhathast air bearradh ri oiteag sgairteil, a bhith a' plubraich tro na tonnagan air tràigh ghainmhich gun smal, a' cur eòlas le sunnd an leanabais air a' bhith-iomadachd ann an òban sna creagan ri muir-tràigh, a' gabhail iongnadh de phailteas na beatha fo na stuadhan, agus gam bogadh fhèin sa mhòr-phailteas de nithean a mhothaicheas na càiltean ann am margadh èisg taobh a' chidhe.

Ma tha sibh ann an co-mhothachadh ris a' mhisean againn, nach tig sibh leinn air ar turas: bithibh nur co-oibriche air an taobh a-staigh no an taobh a-muigh, nur n-oileanach no nur custamair, nur maoinichear no nur gabhaltach, nur neach-taice no nur ball don Chomann againn (www.sams.ac.uk/membership).

Our blue planet faces big challenges

The global ocean is the most important component of Earth's life support system and helps to stabilise the climate. But it is seriously degraded and is under threat of ecosystem collapse from climate change, ocean acidification, pollution, and overexploitation.

These stressors are caused by human activities and behaviour and the demand for seafood, shipping, mineral resources, coastal development, energy, waste disposal and tourism are still growing. The need for marine conservation and economic development of marine industries can thus be in conflict. Sustainable development has become the promoted solution. The United Nations have articulated these challenges in 17 Sustainable Development Goals, of which SAMS activities contribute substantially to five.

The UN's Decade of Ocean Science for Sustainable Development (2021-30) aims to grow the scientific understanding of the ocean's responses to pressures and the effectiveness of different management actions to deliver 'the ocean we need for the future we want'. As the **only marine organisation that is affiliated with the United Nations University,** SAMS will play a leading role in this global endeavour.

The United Kingdom is undergoing Brexit, which requires new legal and regulatory frameworks to protect and manage our coastal waters and to develop the blue economy such as offshore renewable energy, fishing and aquaculture. SAMS will contribute to this endeavour as the **only marine science organisation on the west coast of Scotland,** a region that is rich in both the economic and the conservation assets the government values.

Scotland is a maritime nation with larger areas of sea than land under its control, a highly complex coastline and diverse oceanographic environments. Scotland plans to strengthen its involvement in the Arctic, and we will contribute our understanding and established networks gained during **decades of research into all aspects of the changing Arctic Ocean** to support this national ambition. Scotland looks to the sea for future economic development and strives for clean waters that remain attractive to residents and tourists. Both our research and the **education of the future ocean workforce** will be important for Scotland to achieve the right balance between development and conservation.

Climate change happens everywhere. In Scotland SAMS contributes diverse knowledge and monitoring to climate-related changes in ocean currents and the distribution of commercially important and protected marine species. We have a track-record in investigating unexpected events at short notice.

What makes SAMS special?

SAMS is ideally placed to address global, UK and Scottish marine issues because of a broad research portfolio, its family of staff and students that are committed to independent science in the service of healthy seas, outstanding infrastructure, and being embedded in a community that makes its living from, and by, the sea.

Our purpose & mission

We do this with a vision to secure healthy and sustainable oceans.

Discover

RESEARCH

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

Discover

Communicate

EDUCATION

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

Communicate

Apply

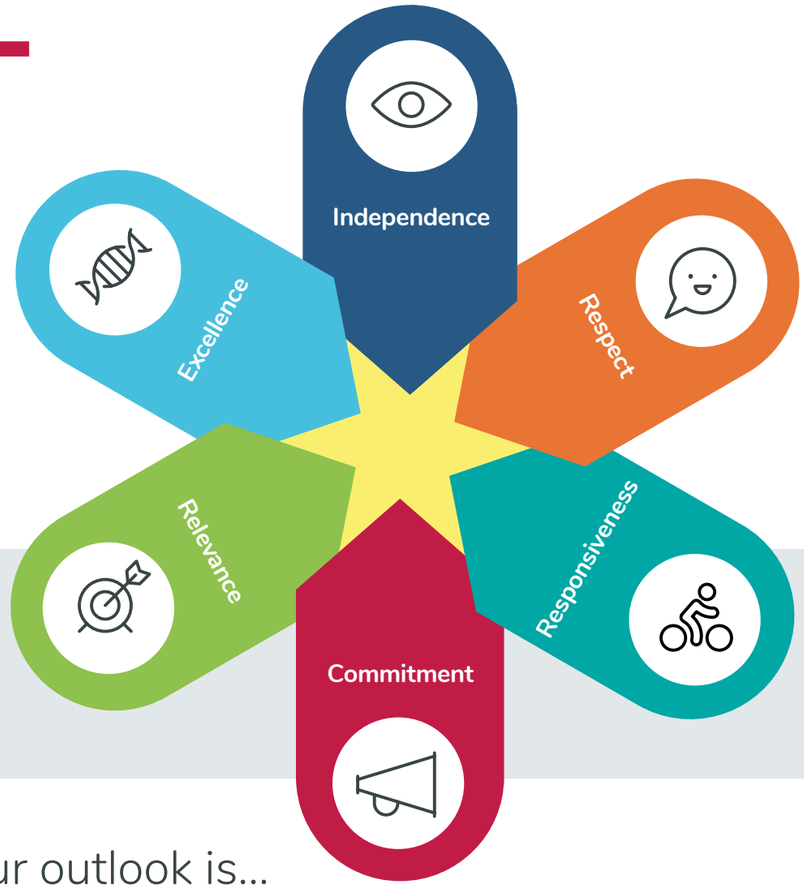
ENTERPRISE

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

Apply

Our values

…underpin all that we do:



Our outlook is…

- **COLLABORATIVE**
  we work with partners in academia, business, government, regulatory bodies, voluntary organisations and civic society regionally, nationally and internationally
- **GLOBAL**
  in perspective, operations, networks, and relevance
- **DIVERSE**
  in our science, our people and the challenges we tackle
- **CREATIVE**
  in our research, education, commercial contracts, communication and internal processes

Working with **partners** to achieve our goals and magnify our impact

RESEARCH

Our multidisciplinary research team focuses on three complex societal challenges: to increase our understanding of ocean systems; to provide tools and knowledge to manage the health and uses of our changing coasts; and to support the development of a sustainable blue economy.

SAMS Research Areas

Ocean Systems

FIELDS

Arctic science

Physical oceanography

Ecosystem function

Robotics

Dynamic Coasts

FIELDS

Climate change impacts

Marine conservation

Pollution

Fisheries

Social science

Blue Economy

FIELDS

Aquaculture

Energy generation

Seaweed industry development

Biotechnology

RESEARCH

SAMS is the only marine research centre on the complex west coast of Scotland, bordering the North Atlantic, where warm surface waters flow northwards and cold, deep water southwards.

Our researchers study many aspects of the marine environment to develop an understanding of the ocean system. We have experts on ocean currents and water mixing, the geology and shape of the seabed, the chemistry and contamination of seawater and sediments, and marine life from the tiniest microbes to the mighty whales. We explore the resources we take from the ocean, and how people interact with the marine environment. Our interests range from the air above the sea surface to the seabed of the deepest ocean trenches. While we have a particular geographic focus on the North Atlantic and Arctic oceans, we conduct our research all around the world.

This diversity is a characteristic strength of SAMS and has skilled us to work and communicate across disciplines and with different stakeholders. We aim to be the place where outstanding marine scientists want to work in agile research teams on developing solutions to globally important topics.

Ocean Systems	Dynamic Coasts	Blue Economy	
Discovery	Underpinning	Applied	Research spectrum
Long term	Near term	Immediate	Timescales
International science / panels	Regulators & communities	Industry(ies)	End user
Global / basin	Land-sea-shelf	Site / resource focus	Spatial relevance
Global recognition agenda setting	Regional / national policy	Regulatory tools industry solutions	Type of impact

CASE STUDY 1

Climate change
in the North Atlantic

For 50 years SAMS scientists have maintained a hydrographic time series along a line from the west coast of Scotland to Iceland to investigate how and why ocean currents, temperature and salinity vary over time and water depth.

We collect these data using ships, moored instruments, satellites and ocean gliders and add them into large ocean observation progammes that cover the subpolar North Atlantic. The data propose that the Atlantic Ocean circulation that co-determines weather patterns across the world is closely related to processes in our home patch of water between Greenland and Scotland.

Our biologists have been studying climate related changes in marine life around Scotland and the rest of the world. We have been surveying plankton in the Firth of Lorne for 50 years. We investigate and predict shifts in the distribution of marine species around the world. We work on ocean heat waves. We monitor all the shellfish producing waters of Scotland for toxic algae and study non-native marine species. The knowledge these studies generate helps society manage the use and protection of our coasts.

CASE STUDY 2

Seaweed:
making it work for nature and people

Seaweed fuels the marine food chain and provides an important habitat for marine life along all our coasts. It captures carbon and produces oxygen. It is also the raw material for major industries, providing us with food, energy, chemicals and bioremediation.

Underpinned by infrastructure that includes two research seaweed farms and a seaweed hatchery, we have developed leading expertise in seaweed cultivation, molecular phycology, algal diseases and pests, algal bioenergy and biosecurity.

SAMS research and education supports the development of seaweed farming as a new rural industry for Scotland. It also helps seaweed farmers in developing countries – often women – to improve the profitability, capacity and sustainability of their farms. We are working with the Food and Agriculture Organisation of the UN to develop biosecurity protocols for the seaweed industry.

Over the next few years we want to continue on our mission to maximise the profitability of seaweed aquaculture and to reduce its environmental impacts through the development of circular economy pathways and networks.

Championing ocean education since 1884

In the 1990s SAMS became a founding member of what is today Scotland's newest university. The University of the Highlands and Islands has been developed to grow economic prosperity, reverse the brain drain and address the issue of an ageing and declining population in the Highlands and Islands.

Under the auspices of the university SAMS has been developing innovative marine science undergraduate and postgraduate programmes, with approximately 200 students studying full-time at SAMS every year: SAMS runs Scotland's only Marine Science BSc (Hons) programme with optional streams in Arctic Studies and in Oceanography and Robotics. Masters programmes provide advanced education in Aquaculture, Environment and Society and in Algal Biotechnology, Biology and Ecology. Around 40 doctorate researchers are embedded into the research institute registered mostly at the University of the Highlands and Islands but also through doctoral training partnerships at other universities.

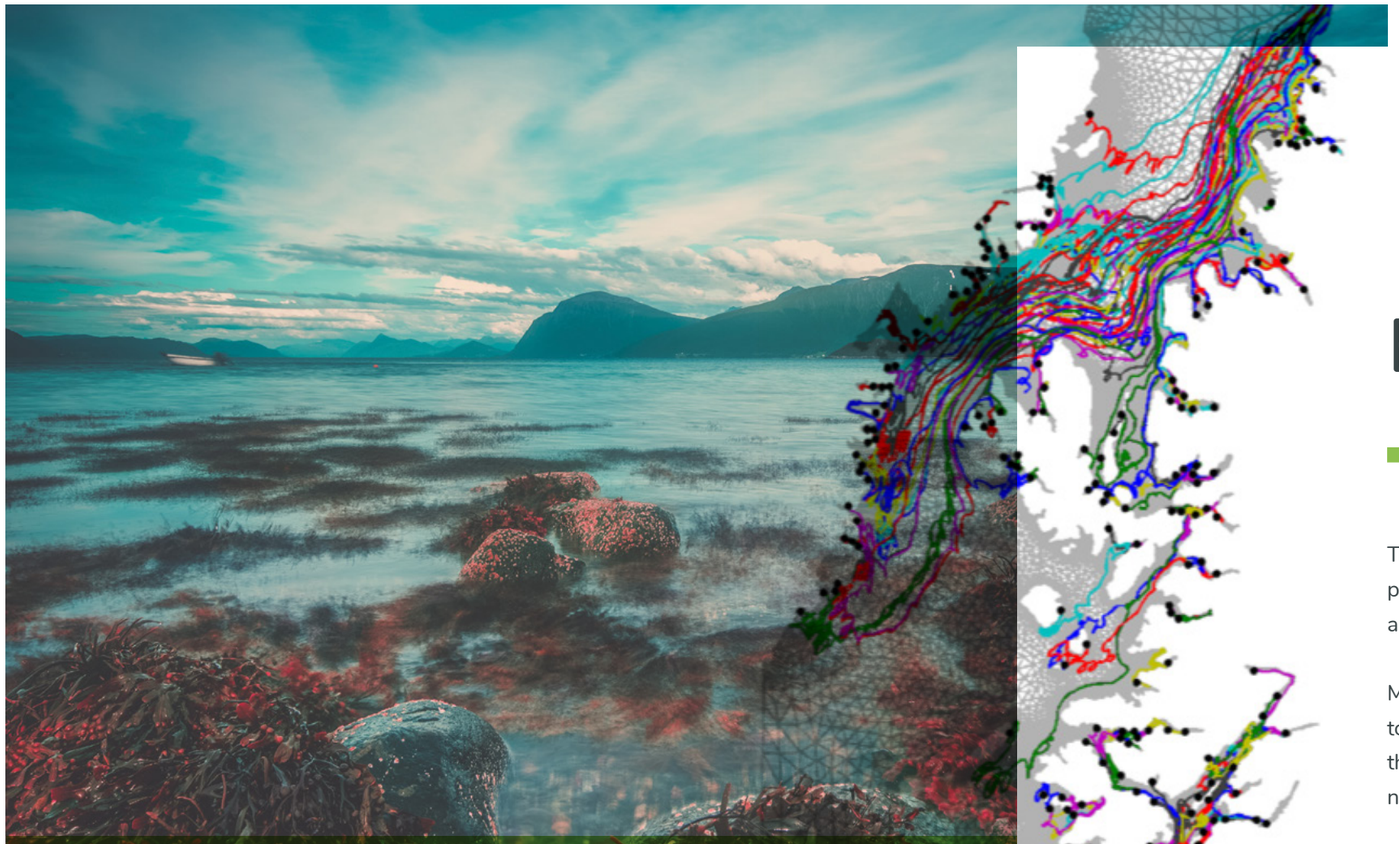
To build a sustainable relationship between people and the marine environment our past, present and future students are equipped with a broad understanding of the marine system and the ability to seek and evaluate evidence, a commitment to the stewardship and use of the oceans and a diverse range of technical, scientific, communication and management skills. We will continue to give them education that equips them for a successful and meaningful career. For reasons of quality of engagement, vibrancy and financial sustainability we aim to increase our student numbers slightly and to grow the proportion of international students.

We will further seek to diversify our offer through the university's world leading capabilities in **distance learning** and through **collaborative overseas degree opportunities** with international partners.

EDUCATION

SAMS has been championing ocean education since its beginning: training students such as polar explorers William Speirs Bruce (1884) and Fridtjof Nansen (1886) and establishing a museum and aquarium as early as the 1890s. Today, we educate over 200 full-time marine science students on BSc, Master and PhD programmes and are contributing to developing Oban as a university town.

#universityonthebeach



Our specialist marine consultancy

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

ENTERPRISE

The use of the marine environment for the benefit of people has been increasing dramatically in recent years and the blue economy is set to grow further.

Marine science can support businesses and civil society to succeed in their marine endeavours. But translating the complexities of the science to address the specific needs of companies and individuals requires new skills.

SAMS thus operates a subsidiary company to engage with users of the sea across the world using a commercial project management and customer care culture. SAMS Research Services Ltd (SRSL) makes the high-end scientific expertise and research infrastructure of SAMS available to help individuals, industry and organisations who work with our seas and oceans to solve their diverse problems and ensure their interactions with the environment are sustainable.

SRSL is also the vehicle for the commercialisation of products and services developed in-house and in collaboration with key business partners.

5

key business sectors

SRSL, our innovation hub, aims to increase the surplus it generates to support SAMS' research capability. To do this, we are growing our business in five target areas that are based on SAMS' intellectual property:

NewDEPOMOD
predicting the impact of fish-farm discharges on the seabed to optimise operations to match environmental capacity

Sea lice modelling
modelling sea lice populations to help forecast their movement and abundance

Seaweed nursery / shellfish hatchery
underpinning the seaweed and aquaculture industry

Snow Ice Mass Balance Apparatus (SIMBA)
a tool to monitor sea-ice thickness and potentially predict snow avalanches and flooding

Marine growth assessments
monitoring marine infrastructure for the oil and gas, marine renewables and decommissioning sectors

Engaging society

Scotland's Minister for Public Finance and Migration Ben Macpherson MSP with Prof Nick Owens

1
Engaging with policy makers

SAMS is often called on to give evidence to politicians about the state of the marine environment, climate change and the developing blue economy. We do this through the Scottish Science Advisory Council (Prof M Inall), commissioned reports, responding to consultations, producing international policy briefs, and presenting at parliamentary hearings. We also host visits by politicians and engage with regulators and civil servants in relevant departments. Going forward we will put increasing importance on this element of our work.

2
Engaging the public

SAMS has a strong record in media and social media communications to promote our research, engage with our various stakeholders and enhance ocean literacy. We aim for monthly coverage in BBC news online and for frequent TV and radio coverage. Our target is to increase follower numbers by 25% per year across Twitter, Facebook, Instagram and LinkedIn and to double our subscribers for our biannual Ocean Explorer magazine and our monthly Ocean Explorer updates.

3
Engaging the next generation

Our deepest values and interests are often formed during childhood. SAMS therefore engages with children of all ages to pass on our fascination, knowledge and care about the marine environment. We organise and contribute to events and deliver workshops in our Ocean Explorer Centre and in schools and clubs. Going forward we will also train and support teachers and engage effectively with young people using digital platforms.

4
Engaging with industry

Increasingly our research includes businesses and community groups as partners, making sure the research addresses actual needs and the results are implemented and become useful. To widen our network of industrial contacts we will attend and present our work at relevant trade shows and publish articles in the trade press.

Unlocking
the secrets hidden in algal genomes

Algae really matter: they produce most of our oxygen and are at the base of aquatic food webs, thereby determining the biological productivity of the ocean.

They are extensively used and yet much of their biology remains resolutely hidden from us.

In our Culture Collection of Algae and Protozoa (www.ccap.ac.uk), a UK national facility, we maintain thousands of algae from all over the world, which we use for in-depth genomics studies about algae.

We have generated the most detailed analysis of cultures of blue-green algae (Cyanobacteria) in the world by sequencing the genomes of 34 strains and the genomes of all the bacteria and viruses that surround them. We are now collaborating in an international consortium to genome sequence ~75 % of all cultured blue-green algae strains.

We contribute to the Darwin Tree of Life (DToL) programme, aiming to deliver the whole genomes of >500 of our strain holdings. We are also working on sequencing some of our seaweeds.

Software for efficient
and sustainable fish farms

DEPOMOD is a particle-tracking model that predicts how fish farm wastes, such as fish faeces and uneaten feed, accumulate on the seabed.

SAMS researchers have been developing the software since the 1990s and continue to improve and modernise the model to include up-to-date knowledge and to be compatible with the latest technology.

By modelling what happens to these wastes in the water and on the seabed at a specific farm location, the farmer and the regulator can estimate how far the waste may travel and how and where it may build up. This knowledge can help them decide where to locate farms and how many fish a site may be able to sustain while meeting the required environmental standards.

The latest version of the software, NewDEPOMOD, was released in 2017, with licence sales building across the globe. It is currently the only accepted depositional model in Scottish aquaculture regulation. Licences are also active in Chile, Norway, Australia, France, the Faroe Islands, and the USA.

Find out more: www.srsl.com/depomod

Strategic Objectives 2020 – 2025

Our people are at the heart of what we do. We will continue to employ the most competent people that embody our values and empower them to deliver solutions to the challenges our oceans face under the changing conditions we encounter.

1 Research excellence

Enhance SAMS' reputation for research excellence

Deliver and be recognised for excellence in all areas of our research, from discovery science to innovation

Support the public needs of UK and Scottish governments with national capability science and facilities

Be a place where outstanding people want to work

2 Providing solutions

Provide business solutions for sustainable seas

Translate the outcomes of our research into innovation and commercial opportunities

Operate a successful commercial subsidiary that supports marine businesses to operate profitably and sustainably

Become a market leader in our key business sectors

3 Education for a better future

Inspire and train future generations

Provide an exceptional student experience

Deliver a future-oriented higher education curriculum with inspirational learning opportunities informed by the most up-to-date research

Attract high calibre students from across the world

Encourage and support young people to value, study and protect the marine environment

Review and grow our membership programme as part of our public engagement activities

4 Impact and influence

Increase the impact and influence of our science

Build strong external relationships with science communities, industry and UK/Scottish governments

Develop a route to providing, and co-creating, evidence for policy makers in their decision-making and industrial partners in their innovation

Influence regional, national and international bodies through science communication and public engagement

5 Efficient operations

Support marine science with outstanding professional services and infrastructure

Continue to invest in outstanding professional services and facilities

Operate flexible and inclusive policies and processes that are responsive to change and encourage diversity

Increase the environmental sustainability of SAMS operations and estate

Optimise the utilisation of the SAMS facilities and estate

We will achieve these objectives by the continual review and improvement of our three business pillars

Goals for achieving our objectives

1 Institutional structure

- Be a successful academic partner of the University of the Highlands and Islands
- Strengthen links with relevant national and international universities and expand our activities with the United Nations University and other UN bodies
- Further strengthen performance of SRSL and its integration into the SAMS culture in perspective, operations, networks, and relevance

2 Financial stability

- Generate annual income surplus of >£500k
- Grow and diversify sources of income
- Maintain quantity of pure research and grow applied research
- Build philanthropic income
- Investigate new income opportunities such as digital memberships and carbon offsetting through our seaweed farms
- Provide robust institutional information to support nimble and effective decision-making
- Understand and manage risk, cost and resources to deliver strategic priorities

3 Develop our people

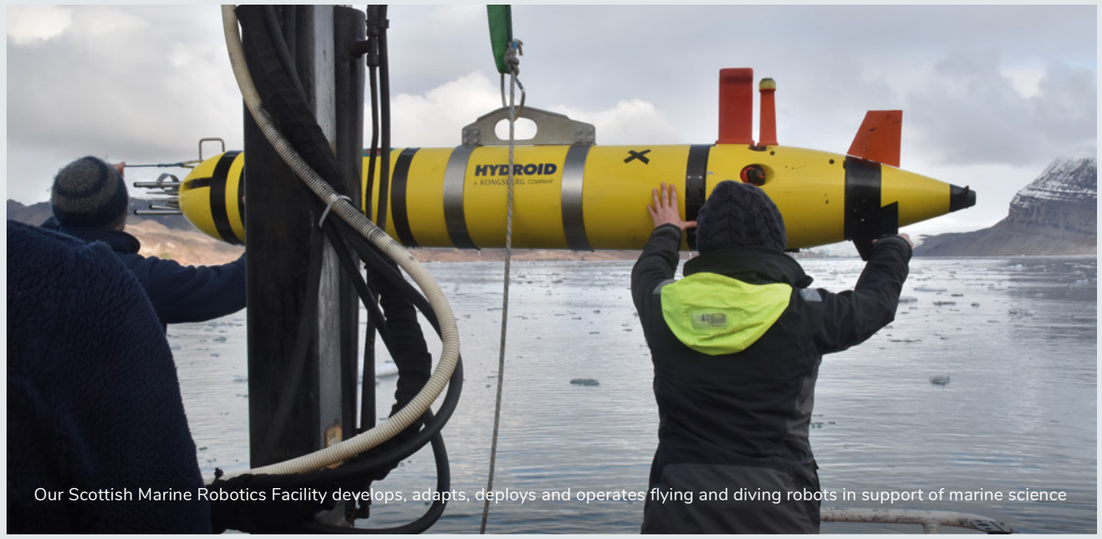
- Attract, support and develop high quality and diverse staff and students
- Be a family-friendly, flexible employer dedicated to equality and providing at least the living wage to all employees
- Enhance leadership and management capabilities through talent spotting and mentoring
- Inspire and celebrate excellent performance
- Engage staff in delivering this strategy against our core values

4 Education

- Maintain student satisfaction ratings
- Expand undergraduate student numbers to 160 and maintain PhD student numbers
- Increase the proportion of international students
- Diversify our HE through the development of masters level courses

5 Research

- Create agile teams to predict, prepare for and respond to society's marine research needs
- Apply our research expertise to global challenges grounded in regionally relevant effort, knowledge and experience
- Shape and maintain the conditions and infrastructure to facilitate excellent research and researchers
- Effectively communicate our new knowledge to those who can make use of it



Our Scottish Marine Robotics Facility develops, adapts, deploys and operates flying and diving robots in support of marine science

Goals for achieving our objectives

6

Valuing our environment

- Increase sustainability of operations and achieve environmental accreditations (ISO 14001 and 45001)
- Undertake a carbon audit and reduce institutional carbon emissions by 7.5% per year
- Inform and engage the public in our efforts to tackle climate change and biodiversity loss

7

Effective and efficient facilities

- Provide a sustainable and safe working environment and first-class facilities
- Operate effective and efficient administrative and quality assurance processes that are externally accredited (ISO 9001)
- Promote staff well-being through work-life policies and health promoting activities and facilities
- Support, maintain and promote our world leading, nationally significant research infrastructure such as the Culture Collection of Algae and Protozoa and the Scottish Marine Robotics Facility

It is imperative that we remain flexible & agile to take advantage of unforeseen opportunities.

Maintaining outstanding professional services and facilities

Sarah Reed: Ocean explorers need a ship

We need a new research vessel to support our and our partners' coastal research, commercial projects and to train students. Our new vessel should allow us to deploy all our sampling equipment, survey gear and robots safely and with ease. It needs to be able to take us further offshore for longer trips than our current vessels. And we have ambitions to operate a greener vessel with innovative features.

Dr Kim Last: Nurturing marine life and sustainable businesses

The Alan Ansell aquarium underpins our research, education and commercial activities. Going forward we will focus on developing our seaweed aquaculture nursery area. This will enable Scotland and the UK to diversity our food sources securely and sustainably and to support small local businesses.

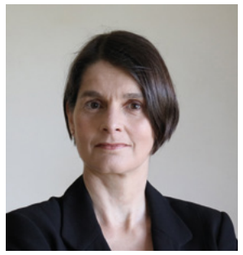
Dr Mark Hart: Delivering quality – every time

Excellent academic and commercial research relies on being consistent in how we sample, analyse, process and report our work. For our commercial projects we thus operate under a strict ISO accredited quality management framework that we are increasingly introducing to research management e.g. in the running of the Culture Collection of Algae and Protozoa. We are also rolling the ISO accreditation out to health and safety, the wellbeing of our people and the environment.

Steve Gontarek: Looking after our greatest product - data

To excel as a research institute we need to maintain our advanced skills in data management, informatics and development services and the supporting facilities with high-performance computing and data storage systems and advanced web data services. We will continue to invest in the development of our highly skilled technical staff and the required hardware to benefit fully from our data through the application of FAIR data principles and value-added data services.

Trustees



Hazel Allen

Consultant, lawyer and chartered accountant, former Finance Director of UHI

Mark Batho

Vice Principal at Abertay University. Former CEO of Scottish Funding Council

Prof John Baxter

Former Principal Marine Adviser at Scottish Natural Heritage

Sarah Brown

Consultant in environmental communication and facilitation

Prof Colin Brownlee

Former Director of the Marine Biological Association of the UK

Lisa Chilton

Head of Development, University of Aberdeen

Ian Dunn

CEO Plantlife International, previously COO of University of Southampton and CEO of Galapagos Conservation Trust

John MacKerron

Senior roles at Scottish & Newcastle, Greene King, Macmillan Cancer Support, SAMS and Chest, Heart & Stroke Scotland.

Dr Deborah McNeill

Director Glasgow Science Festival

Diana Murray

Former CEO Royal Commission on the Ancient and Historical Monuments of Scotland and Historic Scotland

Dr Magnus Nicolson

Chairman, CEO and COO of life science companies in US, UK, Sweden and the Gulf

Susan Watts

Writer, broadcaster, speaker, former Science Editor at BBC Newsnight

Delivering independent marine science in Scotland since 1884

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Scottish Association for Marine Science

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