



SCOTTISH
ASSOCIATION
for MARINE
SCIENCE

ANNUAL REPORT 2010-11



Front cover Sea ice research using dog sleds: an Inuit hunter returns home carrying on his sled both his catch and a bespoke EM-31 device that collects sea ice thickness data.

Photo: Rory MacKinnon, SAMS

ABOUT US

The Scottish Association for Marine Science is a Learned Society with ca 450 members who share an interest in marine science. The Association is governed by a non-executive Council elected by SAMS members at the Annual General Meeting in early November. SAMS is both a charity (009206) and a Company Limited by Guarantee (SC009292) registered in Scotland.

SAMS' mission is to work towards improving the knowledge about and the sustainable stewardship of the marine environment through research, education, knowledge exchange and services to business. The organisation maintains two strategic partnerships: it is a partner of the new University of the Highlands and Islands and of the UK's Natural Environment Research Council. It is also part of two Scottish pooling initiatives, in marine science and geoscience.

SAMS operates the Scottish Marine Institute where 150 employees conduct research and provide education and services in marine science. Six departments deliver the mission: There are four science departments (Biogeochemistry and Earth Sciences; Ecology; Microbial and Molecular Biology; Physics, Sea Ice and Technology), an education and an infrastructure department. Much of SAMS' research is conducted within four research themes: Dynamic Oceans; Marine Renewable Energy; Arctic Seas; and People and the Sea. Education delivers a BSc (Hons) Marine Science, BSc (Hons) Marine Science with Arctic Studies, trains ca 30 postgraduate research students and provides a range of short courses for professionals. Masters programmes are under development. The new Sheina Marshall building, dedicated to education, also acts as a field station for visiting university or special interest groups.

To deliver services to business SAMS operates a wholly owned commercial subsidiary called SAMS Research Services Limited (SC224404). SAMS also operates a business incubator known as the European Centre for Marine Biotechnology (SC205318) that currently hosts two tenant companies.

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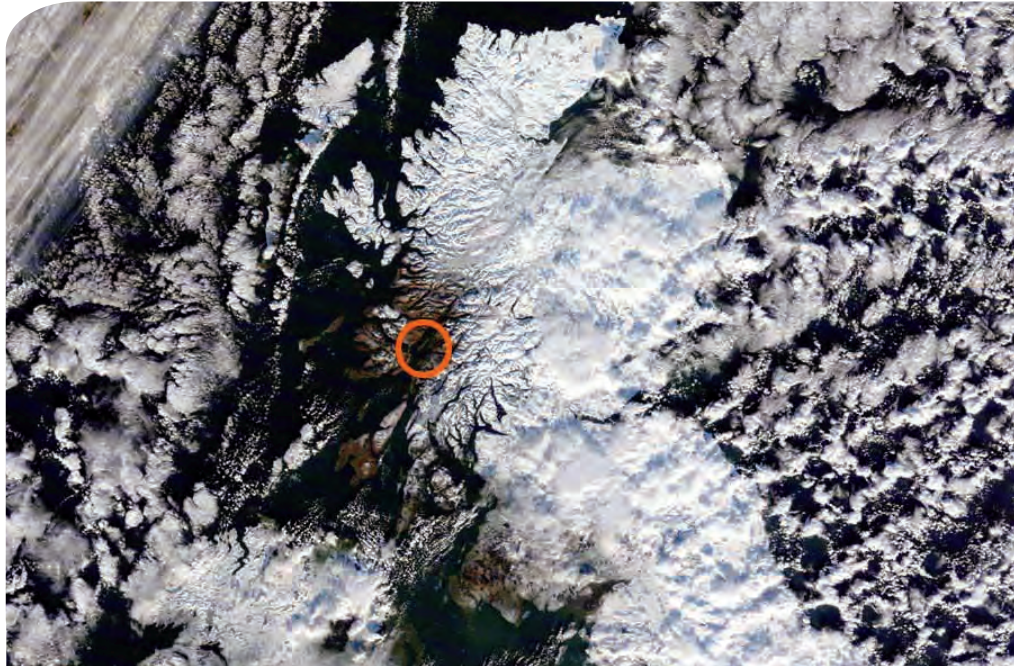


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Director's Introduction



On 29 November 2010 HRH The Duke of Gloucester opened our new Sheina Marshall Building on a day that saw Oban soaked in sun but most of the UK under a thick blanket of snow.

Though I do not keep accurate records, it always seems to me that the sun shines more in Dunstaffnage Bay when we have key visitors, allowing me to nonchalantly say "oh, it's always like this" when they wax lyrical about the stunning landscape that surrounds us. Of course, the myth is dispelled for the sodden tourists that choose a camping holiday in mid-August (I was subjected to this as a child but still love the place).

One of our key visitors was Prince Richard, the Duke of Gloucester, who flew into SAMS on a sun-soaked winter's day when the snow covered islands and highland peaks and deep blue waters that almost surround us were the backdrop to the inauguration of our new teaching building, the Sheina Marshall Building. Most of the UK was under a thick blanket of snow and many of our guests were trapped at home but, like many others, Prince Richard was compelled to admire the landscape that all students will enjoy as they take their lunch in the student canteen. What a fantastic combination of assets: a superb state of the art facility in a stunning sea of opportunities!

The Sheina Marshall building will be the centrepiece in a series of new developments that have led us to rename the Dunstaffnage Marine Laboratory as the Scottish Marine Institute. The building itself is a £6.1M development funded by the Scottish Funding Council and Highlands and Islands Enterprise with support from the European Regional Development Fund channelled through the University of the Highlands and Islands Strategic Delivery Body. Its two storeys include superb teaching facilities: lecture and seminar rooms, teaching laboratories, computer suites, meeting and eating spaces and staff offices. We have also created the space that will become the Scottish Ocean Explorer Centre; more about that next year.

The new building is not just intended as a means to improve how we deliver our unique UHI marine science degree; it provides a base for developing essential skills needed to generate a sustainable marine economy at home and abroad.

The past five years have witnessed a huge wake up call that the sea is a place of

opportunity but also that, without careful management, it can lose its resilience and rapidly decline. This is why we are offering a broad range of training: Continuous Professional Development, field courses, undergraduate degrees, masters' degrees and PhDs. Student numbers are growing in all of these areas, helped by UHI's university title and SAMS hosting of the Graduate School for MASTS (Marine Alliance for Science and Technology for Scotland).

How will these skills benefit Scotland's economy? SAMS is the largest employer in northern Argyll outside the public sector. We take our regional development role very seriously and are working with the private sector to create a marine knowledge-based economy for the West Coast of Scotland. The space in our European Centre for Marine Biotechnology is fully occupied with a number of successful innovative businesses and we are working on some good ideas for additional ones. Between us, we have the seeds for a major development. Highlands and Islands Enterprise have seized this opportunity to plan and, very shortly, begin building the European Marine

Science Park as an extension to the Scottish Marine Institute (see the fantastic 'fly through' of the complex on YouTube). We are jointly planning the biggest investment to date in the new sustainable marine economy on Scotland's West Coast.

All of these developments rely upon the quality of our science. During 2010 we worked hard to maintain our competitiveness on a national and international scale, enjoying the many successes that are described in this Annual Report. We maintained a high level of grant capture from research councils - particularly NERC and the European Union - and a number of commercial successes that take SAMS staff around the entire planet. SAMS staff worked with Marine Scotland on development of social and economic objectives for the Scottish Marine Plan and coordinated a key European project to help implementation of the European Marine Strategy Directive. Our work continued to

be highly visible and I was delighted to present my annual review to Council almost entirely based on news releases from the BBC on-line news service!

We are proud of our achievements but I do not want to understate the challenges that are ahead. These are extraordinarily turbulent times due to the entire world struggling to find a new economic order. Marine science is largely a long-term investment in a world that is increasingly focussed on the 'immediate'. We have to demonstrate our worth within this reality without compromising our values. This is not for the faint hearted and I am fortunate to head a fantastic team of enthusiastic and skilled specialists who believe in what they are doing and enjoy doing it. Our human landscape neatly matches the rugged, ever changing and inspiring natural landscape that surrounds us.

Laurence Mee



Science Highlights

Biogeochemistry & Earth Sciences

The Biogeochemistry and Earth Sciences Department (BGES) unites the disciplines of marine biogeochemistry, geochemistry, geology and radiochemistry. The department comprises 14.7 staff (4.7 principle investigators, 2 post-doctoral research assistants, 1 administrator, 7 support scientists) and 7 post-graduate students.

Our research aims encompass the investigation of rates, patterns and processes of natural and anthropogenic change in the marine environment on a range of temporal scales from longer-term (hundreds of thousands of years) to short-term (annual, seasonal, diurnal, and even tidal). We have the capability and flexibility to conduct research on a wide range of marine biogeochemical processes including past climate systems. To target key questions within this context the team employs a range of skills including analytical chemistry, molecular biology, geology, lander technology and engineering. These skills are deployed in laboratory, mesocosm and field studies; the latter conducted in coastal and oceanic waters spanning tropical, temperate and polar environments.

The department undertakes a portfolio of carefully selected fundamental and applied research, commercial activity and education. BGES has three broad strategic research areas where we wish to maintain and develop our UK and international reputation and identity.

(1) Marine biogeochemistry and 'in situ' benthic technologies: this research area

draws together analytical, microbial, molecular and novel benthic-technology techniques and includes fundamental studies of biogas production, sediment and water column biogeochemistry, carbon cycling and ocean acidification. This work is developed by Henrik Stahl, Angela Hatton, Robert Turnewitsch and (now on a partial contract and based in Denmark) Ronnie Glud.

(2) Industrial impacts on the ocean: this is a relatively new but expanding field for both the department and SAMS, but one that draws on the wide range of skills within the whole BGES team. Historically, this more applied research was started under Tracy Shimmield, with projects such as the baseline environmental study for Dounreay, the British Underwater Testing Centre (BUTE), Raasay and latterly the large inter-departmental project on Deep-Sea Mine Tailings Placement (DSTP) in Papua New Guinea (PNG). Smaller projects such as the acoustic identification of shellfish debris and fish farm monitoring continue to reinforce BGES' strong links to industry.

(3) Palaeoceanography: this research area is based on the use of marine sediments as archives of environmental change over a wide temporal range. A presently developing area is seafloor geological and geomorphological mapping using multibeam echo sounders (MBES) and side scan sonar (SS) technologies. Another focus is the use of sedimentary deposits and the development of new sediment-based approaches to reconstruct palaeo-changes of fluid dynamics and current flow in the

deep sea. These research areas are developed by Robert Turnewitsch and John Howe.

Last year was a successful year for the BGES Department in attracting funding, both for blue-skies and applied science. Overall the department was successful in obtaining six new NERC research grants and two EU research projects with a total value of £ 2.3 m in grant funding. The applied research continues with the EU 8th EDF funding (PNG). The department organised and participated in two major ocean cruises: a TopoDeep cruise led by Robert Turnewitsch to the Northeast Atlantic (R/V Meteor) and an Oceans 2025 cruise to northwestern Svalbard (RRS *James Clark Ross*). At the close of the year BGES had a further highlight with news from Prof Ronnie Glud that, in collaboration with BGES, benthic landers had been successfully deployed in the Challenger Deep of the Mariana Trench at 10971m depth, the deepest point of the oceans on Earth.

In addition the department published 15 papers in refereed journals, seven book chapters and one reviewed report. Staff supervise six PhD students and one MSc. Public engagement continues apace with two appearances on two BBC television programmes, 'Coast' and 'Men of Rock', as well as in radio interviews, and as part of the 'Today' programme on Radio 4.

RESEARCH HIGHLIGHTS

DISSOLVED INORGANIC PHOSPHORUS TRAPPING AT A WATER-COLUMN REDOXCLINE: IMPLICATIONS FOR OCEAN ANOXIC EVENTS ?

Geochemical records suggest the ocean has undergone periods of at least partial deeper-ocean anoxia (oxygen-free waters) or euxinia (oxygen-free and sulfidic waters). This is very likely to have had major implications for the biogeochemical and biological functioning of the ocean. Moreover, as a number of modern ocean regions currently lose oxygen an improved understanding of the biogeochemistry of ocean anoxia is urgently needed.

During long-lasting ocean anoxia two counteracting feedback loops involving redox control of the dynamics of the phytoplankton nutrient dissolved inorganic phosphorus (DIP) might have co-existed, helping to stabilise the redox-state of the atmosphere and oceans. This concept implies that, during deeper-ocean anoxia, the DIP transfer from the deep anoxic into the oxic surface ocean is uninhibited by processes taking place at the redoxcline (the interface between oxic and anoxic waters). This implicit assumption requires testing because iron (Fe) and manganese (Mn) dynamics at oxic / anoxic water-column redoxclines have the potential to form a DIP trap, inhibiting DIP transport from anoxic deep into oxic surface waters (see Figure).

Using a time-series dataset of Fe, Mn, DIP and dissolved oxygen distributions in the Eastern Gotland Basin of the Baltic Sea we provide estimates of the efficiency of this Fe- and Mn-driven DIP trap. This efficiency was estimated by calculating the ratios of (1) the downward flux of DIP adsorbed and/or co-precipitated into the settling authigenic Fe- and Mn-rich particles just above the redoxcline and (2) the upward turbulent-diffusive DIP flux across the redoxcline. Depending on the assumed particle densities we find average trapping efficiencies of between 38% and 63%. The efficiencies are significant in that they seem to impact cyanobacterial dynamics in the central Baltic Sea.

We also calculated likely trapping efficiencies for anoxic events in the open oceans which could possibly amount to several tens of percent. Implications of the DIP trapping mechanism during ocean anoxic events for ocean and global biogeochemistry now need to be tested.

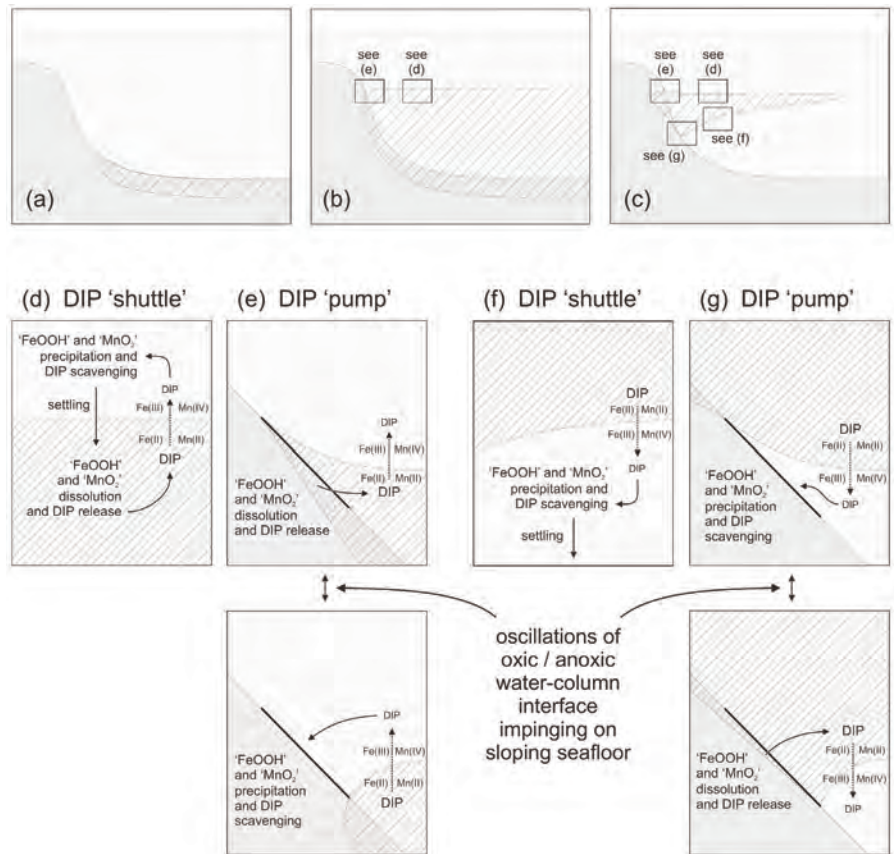


Figure: Fe²⁺, Mn²⁺ and redox-controlled DIP traps. Sediments and water column: darker and lighter grey; anoxic / euxinic areas: hatched. FeOOH: particulate Fe oxyhydr)oxides; MnO : particulate Mn oxides or (oxyhydr)oxides. Basin with (a) anoxic / euxinic sediments and an oxygenated water column; (b) oxic / anoxic (euxinic) oxygen minimum zone (OMZ) in slope sediments and intermediate water column. Processes occurring at the redoxclines in (b) and (c) are detailed in (d) - (g). Concepts of Fe²⁺ (and Mn²⁺) controlled DIP 'shuttles' and 'pumps' with oxic waters occurring above anoxic waters were first introduced by Shaffer (1986).

Publication

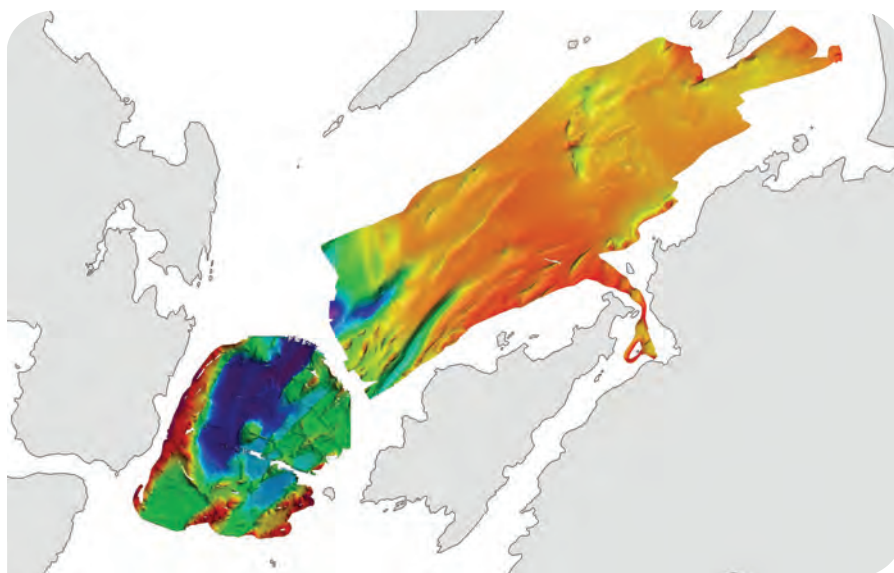
Turnewitsch, R. and C. Pohl (2010). An estimate of the efficiency of the iron- and manganese-driven dissolved inorganic phosphorus trap at an oxic/euxinic water column redoxcline. *Global Biogeochemical Cycles* 24, GB4025, 24, GB4025, doi:10.1029/2010GB003820.

Robert Turnewitsch

INIS HYDRO: SEABED MAPPING PROJECT

The INIS Hydro project will develop a standardised seabed survey specification which will be used to acquire accurate and high-resolution seabed mapping data in key geographical areas, some of which were last mapped as long ago as the 1850s. The project will provide a high-resolution seabed baseline data set for over 1400km² of seabed in the Republic of Ireland, Northern Ireland and Scotland using state-of-the-art multibeam echosounder equipment to the most rigorous international standards. On completion of survey operations, the data will be made available for free download on the internet. Seabed areas have been chosen which have high environmental significance, which are currently poorly surveyed and which pose a current risk to safe navigation. Project partners are; Agri-Food and Biosciences Institute (AFBI), Geological Survey of Ireland, Irish Marine Institute (IMI), Maritime and Coastguard Agency, Northern Lighthouse Board (NLB) (Scotland) and the United Kingdom Hydrographic Office.

The SAMS work package will deliver a bathymetric map of 553 km² of the Firth of Lorn from Oban to Scarba (see Figure) using the research vessel R.V. *Calanus*. Backscatter data will also be collected. The backscatter data will aid in the positioning of grab



samples, and together these will be used to generate a seabed sediment map. In addition to the seabed mapping, further value will be provided in the form of hydrographic measurements of tidal velocities.

INIS Hydro is part-financed by the European Union's INTERREG IVA Cross-border Programme managed by the Special EU Programmes Body.

Figure: INIS Hydro project preliminary survey data (SAMS and Northern Lighthouse Board) of the Firth of Lorn, northwest of the Isle of Kerrera. (Image courtesy of Mike Spain, Northern Lighthouse Board).

J.A. Howe

ARCTIC-BIOGEOCHEMISTRY, OCEAN-ACIDIFICATION, CARBON-CAPTURE AND STORAGE PROJECTS

During summer 2010 (July/Aug) the benthic biogeochemistry group led by Henrik Stahl participated in the SAMS Arctic expedition onboard RRS *James Clark Ross* to the west coast of Svalbard, where 14 chamber- and eddy-correlation-lander deployments were made in fjord, shelf and slope environments. The deployments were complemented with laboratory core incubations and sediment-porewater chemistry from each site. This cruise was followed by one in Nov/Dec 2010 to the Ampere Seamount (TOPODEEP) in the eastern mid Atlantic, where no less than 17 deployments were made with chamber-, eddy-correlation- and profiling landers on and around the seamount.

Other activities for the group included the installation and running of the cabled HYPOX online observatory in Loch Etive, which quasi-continuously (every 10 min) monitors oxygen, salinity, temperature, pressure and current speeds in both surface and bottom waters in the upper hypoxic basin in Loch Etive. The first nine months of collected data show evidence of multiple overturning events within six months, something that has never been recorded before, and extensive efforts are currently undertaken by Dmitry Aleynik to model these events with a newly developed 3D-hydrographic model.

Furthermore, 2010 saw the start of two new NERC-funded projects on ocean acidification (Benthic OA) and carbon capture and storage (QICS), which has involved the set-up of a flume facility at SAMS for OA experiments and establishing a suitable site for an *in situ* release experiment of CO₂ within the QICS project. The latter included coordination of multiple site surveys in the vicinity of SAMS using multibeam, sub-bottom profiling, CTD and coring as well as seeking permission for the proposed experiment and informing and interacting with stakeholders from local up to government level.

Ecology



The Ecology Department is organised into four sub-groups designed to gather individuals with similar and common interests and to distribute management and strategy among the PIs. These groups are not intended to create autonomous areas within the department but to foster a greater sense of collective responsibility towards developing SAMS and Departmental strategy. The Ecology department comprises 26 staff: 13 Principal Investigators, 8 Research Associates, 5 Science Support staff and 12 PhD students.

(1) The Benthic Group, led by Kenny Black, largely deals with soft-bottom systems, impacts of human activity in coastal regions and the ecology of deep sea systems.

(2) The Ecological Processes Group, led by Clive Fox, focuses on processes and mechanisms in shelf, coastal and intertidal

food webs and ecosystems.

(3) The Renewables Group led by Ben Wilson includes research ranging from studies into potential impacts of renewable energy devices to studies into potential new sources of energy from marine organisms (e.g., macroalgal cultivation).

(4) Finally, the Social Science group or Centre for Coastal and Ocean Governance addresses the changes in human behaviour needed to improve social, economic and ecological aspects of marine systems.

Each of the four groups has a particular approach to fulfilling the departmental-level aspects of SAMS strategy, for delivering key elements of the science themes, education and business objectives and for meeting the financial targets of running the Department. Group plans are outlined in the Department

Business Plan, including upcoming plans for project proposals and identification of new opportunities for funding and development of areas of science in the coming year.

The Department has a strong emphasis on delivering high-impact, relevant science in the form of publications (this year 29). Our aim is to raise the reputation of SAMS' ecological science through communication of our work in highly cited journals, through presentations at international conferences, and through membership of learned societies and international working groups. At a national level, we aim to play a leading role in MASTS to cement our position at the forefront of our science in Scotland, the UK and as a significant contributor to marine ecology at a global scale.

SEASONAL SHIFTS AND THE VELOCITY OF CLIMATE CHANGE ACROSS THE GLOBE

Climate change challenges organisms to adapt or move to track changes in environments in space and time. As part of an international working group on the impacts of climate change on marine species, we developed two measures of thermal shifts from analyses of global temperatures over the past 50 years to describe the pace of climate change that species should track: the velocity of climate change (geographic shifts of isotherms over time) and the shift in seasonal timing of temperatures. Both measures are higher in the ocean than on land at some latitudes, despite slower ocean warming. These indices give a complex mosaic of predicted range shifts and phenology changes that deviate from simple poleward migration and earlier springs or later falls. They also emphasize potential conservation concerns because areas of high marine biodiversity often have greater velocities of climate change and seasonal shifts. The work was supported by NERC's Oceans 2025 programme and the US National Center for Ecological Analysis and Synthesis at the University of California, Santa Barbara.

M. T. Burrows

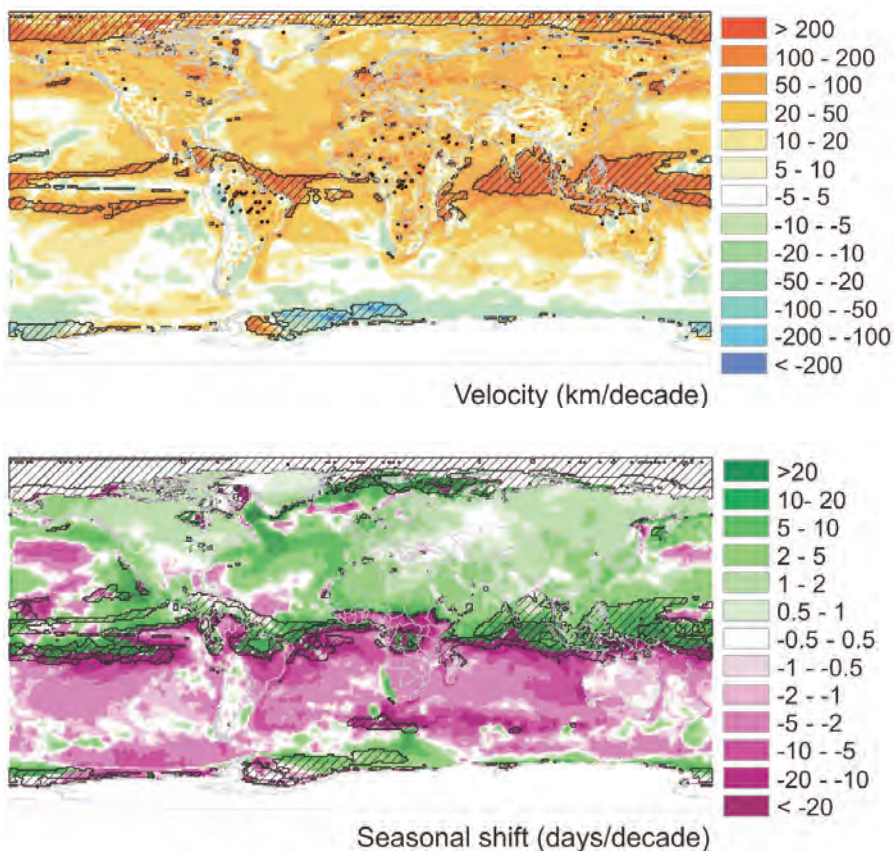


Figure: Global analyses of climate change velocity and seasonal shifts from 1960 to 2009 show that impacts on ocean and land biota will be comparable and that local shifts often deviate from expected poleward expansion and earlier spring events. Shaded areas show where shallow gradients and small seasonal changes predict big impacts.

COLD WATER CORALS ON OIL PLATFORMS

The cold-water coral *Lophelia pertusa* is an important habitat-forming organism highly vulnerable to damage by trawling. Occurrence in UK shelf waters is patchy and localized and the few known sites are a prime focus of attention for conservation agencies. However in some circumstances, growth of *L. pertusa* can be prolific enough for the coral to qualify as a fouling organism.

In 2010-11 two contracts awarded to SAMS by J.P. Kenny Ltd, subcontracted from BP, used collected specimens and ROV video footage to quantify calcareous marine fouling on seabed risers in the Schiehallion Oilfield west of Shetland. The extra mass imposed by fouling was seriously compromising riser buoyancy. The first short contract identified the fouling organism as *L. pertusa* and gave preliminary estimates of fouling biomass on the buoyancy modules along the risers (estimates later found to agree well with actual measurements). A second, longer contract used ROV survey footage to quantify coral growth and other fouling along different sections of the risers. Data from the literature was used to estimate the likely course of settlement and growth of coral on the riser pipes and associated structures. Scanning electron microscopy was used to investigate structural aspects of coral attachment to the polymer surfaces of the buoyancy modules, and options for mitigation of fouling were discussed in the project report.

D. J. Hughes

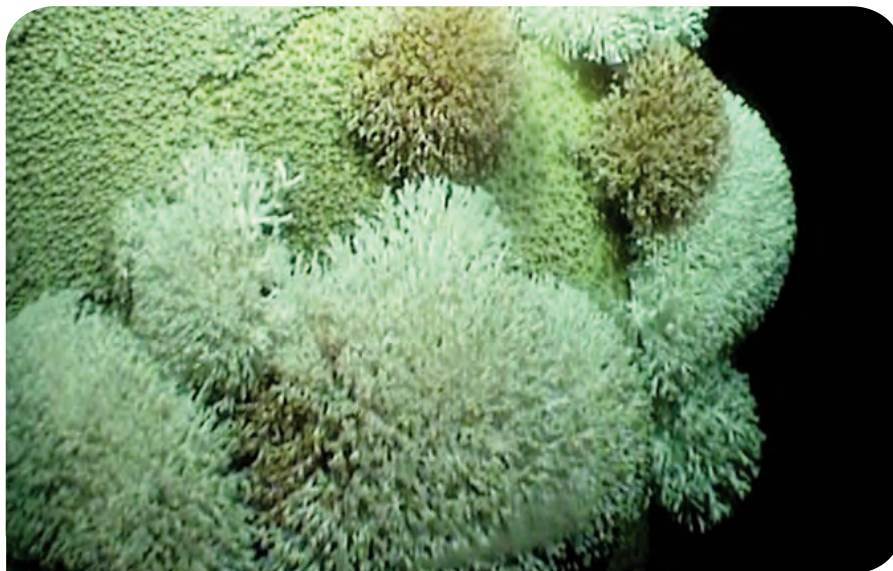


Figure: Colonies of the cold-water coral *Lophelia pertusa* on a buoyancy module, Schiehallion Oilfield. Both white and brown colour morphs of *L. pertusa* are visible. The yellow buoyancy module has a diameter of approximately 1.3 m.

SAMS ENGAGES IN POLICY RELEVANT SCIENCE: THE CENTRE FOR SUSTAINABLE COASTS

The Centre for Sustainable Coasts (www.smi.ac.uk/centre-for-sustainable-coasts) is the social science and policy hub at SAMS.

The Centre is engaged in a variety of research and commercial projects that bridge the science policy gap and engage with decision makers and industry over the challenges that face the marine environment, communities and maritime industries. We are focused on strengthening the links between science and society at local, national, and international scales and supporting efforts to manage and conserve coastal and marine resources.

2010/11 has been a busy period for the group with a variety of initiatives and outputs supporting marine policy development. Recently a team from SAMS including Tavis Potts, Thom Nickell, Elanor Bell, Branka Valcic and Ruth Brennan completed research on the challenges that face the management of marine protected areas in Scotland. This report for Scottish Environment Link explored the range of management options and tools for ensuring an ecologically viable network is created and supported by communities.

Other recent applied research included a collaboration in 2011 between SAMS and the Macaulay Institute (now the James Hutton Institute) on issues and challenges facing marine litter management in Scotland and supporting a marine litter strategy to meet Marine Strategy Framework Directive commitments.

Currently, James Hutton Institute and SAMS Centre for Sustainable Coasts are working together to provide an outlook of system trends and scenarios for the South China Sea social-ecological system (funded by the World Bank through the Global Environmental Facility).

Tavis Potts & Branka Valcic



PRACTICAL GUIDANCE FOR ECOSYSTEM BASED MANAGEMENT: THE KNOWSEAS PROJECT

KnowSeas, a four year SAMS led EU FP7 project has had a highly successfully year of research. In collaboration with our European partners we have been developing tools to implement the Ecosystem Approach to Management. We have developed and implemented our Conflict Resolution tool. The system which combines multicriterion analysis with participatory GIS was used to facilitate Marine Spatial Planning involving potential tidal energy sites in the Mull of Kintyre.

The first comprehensive study of European attitudes towards the seas was another major research output of the project this year. The resulting report provides the solid social science base to guide and support implementation of the Marine Strategy Framework Directive.

*L. Mee
T. O'Higgins
H. Wilson*

Microbial and Molecular Biology

The Microbial and Molecular Biology Department comprises 28 staff members (26.5 FTE) and five PhD students. There are eight principal investigators, five Research Associates, 14 Science Support staff and one administrator.

The Department has two broad strategic research areas:

(1) Marine algal biology (including biochemistry, biology, ecology and taxonomy): This research area, which draws on the CCAP resource, includes fundamental studies of micro-algal taxonomy and phylogenetics, micro- and macro-algal stress biochemistry and immune response, biofuels and the ecology of harmful algae.

(2) Pelagic microbial ecology and biogeochemistry (including UK coastal and Arctic waters): this research area includes fundamental studies on algal-bacterial symbiotic relationships, the role of bacteria in biogenic gas production, microbial siderophores, the role of inorganic and

organic nutrients, grazers and viruses on microbial community composition and activity, harmful algal bloom initiation, and physical/biological modelling of microbial communities and species.

Within these above areas staff undertake a portfolio of fundamental research, applied research, commercial activity and teaching. As part of the fundamental and applied science we contribute to four Oceans2025 themes and host the CCAP NERC national facility. In the past year we have led or contributed to four other NERC grants and two major harmful algae based EU projects (WATER and Asimuth). The department leads the major EU biofuels project BioMara and participates in three further EU funded projects (Assemble, DIMBA and SPICOSA). Applied science funding has also been obtained from SARF, DEFRA, Supergen, the Carbon trust, the Crown Estate and Scarborough Borough Council for work related to biofuels and aquaculture (nutrients and harmful algae).

The Department also conducts commercial activities, including the major Food Standards Agency Scotland monitoring programme for biotoxin-producing phytoplankton. Other commercial funding has been received through CCAP sales and from The Crown Estate, SSPO, AEA Technology and Fugro.

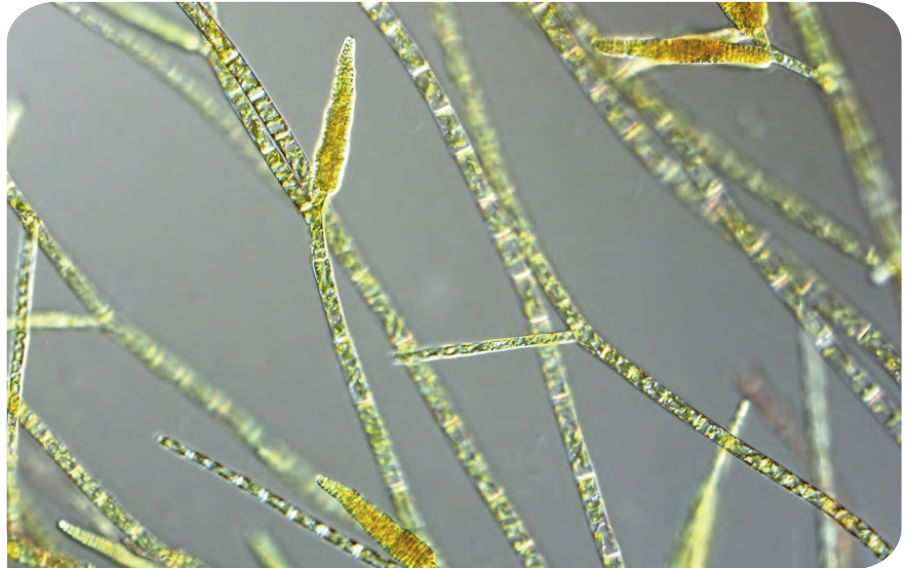
As for teaching contributions the Department leads five modules within the BSc(Hons) Marine Science at SAMS, and contributes to all levels of the degree and its administration. The Department is also active in CPD teaching activity, having developed and run courses in algal culturing, algal cryopreservation, harmful algae, and phytoplankton taxonomy.

The Department published 22 peer reviewed publications, one book chapter and seven other non-refereed academic documents.

FIRST SEAWEED GENOME ENTIRELY DECRYPTED

SAMS staff have been working with an international consortium led by the Station Biologique de Roscoff (SBR), France, on this ground-breaking work, that was published in *Nature*, since 2004. SAMS scientists identified and annotated through over 600 gene sequences. Dr. Heesch, while still working at SBR, compiled a genetic map instrumental for locating genes on the chromosomes of *Ectocarpus*. The SAMS group studies the physiology and evolution of the seaweed immune system, namely the mechanisms that ensure the seaweed's defence against pathogens. The effects of disease on algae can have high costs, both environmentally and economically as seaweeds are used for alginate and biofuel production and as food crops. The SAMS group aims to improve their understanding of pathogen interactions with the seaweed host, so that we can understand better the environmental impact of disease on natural algal populations, and design efficient disease control strategies.

The availability of a complete inventory of the genetic information possessed by this brown seaweed has a broad significance, and will greatly accelerate efforts to understand the algal biology in the coming years. The *Ectocarpus* genome was also featured in a special issue of the journal



New Phytologist. As many breakthroughs in genomics come from the comparison of different organisms, Dr. Gachon participated in the decryption of the genome of *Pythiummultimum*, a devastating root pathogen of grasses, against which there is currently hardly any treatment.

Together with Dr. Zambounis, who received a SAMS bursary to perform this work, she is currently involved in the genome

sequencing of the red seaweed laver (*Porphyra* sp.) and of the carrageen-producing alga *Chondrus crispus*.

C. Gachon
F. Kuepper
S. Heesch
M. Strittmatter

HARMFUL ALGAE RESEARCH

Marine dinoflagellates are an ecologically important group of microscopic algae naturally present in marine waters. A few species produce potent neurotoxins that can cause severe poisoning of humans and other fauna. This occurs when the algae that make these toxins are accumulated by filter-feeding shellfish such as mussels and oysters. The latter concentrate the algae and their toxins to very high levels that can cause a range of syndromes, e.g., paralytic shellfish poisoning (PSP).

An investigation into the diversity of the harmful dinoflagellate *Alexandrium tamarense* in Scottish waters was conducted by scientists from SAMS (Keith Davidson and Romain Pete) in collaboration with colleagues from NUI Galway and IFREMER Brest and published in the journal *Protist*. *A. tamarense* is capable of producing potent neurotoxins that accumulate in shellfish. Subsequent human consumption may result in the aforementioned paralytic shellfish poisoning (PSP). Human health is safeguarded by monitoring. However, as both non-toxic West European (Group III) and the neurotoxic North American (Group I) ribotypes of *A. tamarense* exist that are morphologically indistinguishable considerable uncertainty exists surrounding the biogeography of *A. tamarense* and the factors governing toxicity. In this work, use of fluorescent *in situ* hybridization allowed us to demonstrate, for the first time, the co-occurrence in the water column of both toxic and non-toxic *A. tamarense* and to show the patchiness of *A. tamarense* populations and their possible organization in thin layer structures of the water column.

Gymnodinium catenatum is another dinoflagellate that can cause PSP. A longstanding question has been why these dinoflagellates produce PSP neurotoxins. A

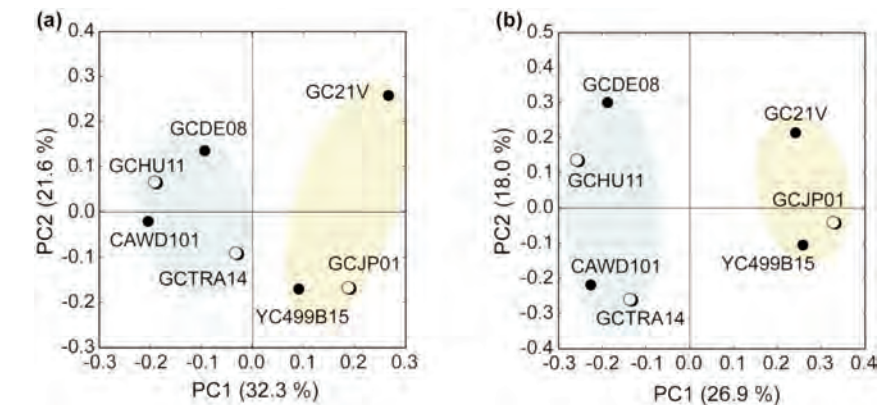


Figure: UniFrac principal-coordinates analysis of the *G. catenatum* bacterial communities, comparing (a) community structure and (b) community membership. Closed circles, toxic *G. catenatum*; open circles, non-toxic *G. catenatum* cultures. Light blue shading, Southern Hemisphere cultures; orange shading, Northern Hemisphere.

hypothetical answer was that the alga does not actually make them. Instead, bacteria that either live inside or around the dinoflagellates, are believed to make them. If this was true, it is further hypothesised that only a few bacterial species would be responsible for this toxin production. The work at SAMS sought to address the question of whether specific bacteria were linked with toxic strains of *G. catenatum* as compared to non-toxic *G. catenatum* strains. To test this, we used molecular techniques to profile the bacterial community of the toxic (normal) and non-toxic *G. catenatum* strains.

This analysis revealed that there were no bacterial strains that correlated exclusively with either toxic or non-toxic *G. catenatum*. Instead, statistical analysis of the molecular data revealed that the bacterial communities were more closely related to other cultures isolated from the same geographic region, irrespective of whether they were toxic or

not. Principal coordinate analysis (see figure above) of the bacterial communities from the seven *G. catenatum* cultures showed that the bacterial communities from Southern Hemisphere and Northern Hemisphere cultures clustered closest to other cultures isolated from the same hemisphere. This indicates that the subtle differences of each algal strain and/or the water mass they were isolated from influences the types of bacteria that live with them, and that when these cultures are grown in the laboratory, these differences are preserved. So while we concluded from this and other work that bacteria were not directly linked with PSP toxin production, the work demonstrated remarkably the bacterial community from each culture retained a "memory" of the geographic location from which it was isolated.

K. Davidson
D. Green
M. Hart
R. Pete

Physics, Sea Ice and Technology



The PSIT Department comprises 19 staff (17.7 FTE): 9 Principal Investigators, 5 Research Associates, 5 Science Support staff and 5 PhD students. Activities of the Department are driven by making observations of the physical marine environment, underpinned by technological development of platforms and communications and supported with a hydrodynamic modelling capability. It comprises three research groupings.

(1) Physical Oceanography Group (10.2 FTE + 5 PhD students): The research focus is on oceanic, shelf and coastal exchange processes. A unifying strand is the flow of stratified water over topography and mixing. Coastal and fjordic modelling at SAMS is now focused on unstructured grid models. SAMS has a long history of observations of oceanic transport and the primary activity relates to the Ellett Line. This has now been developed further through the use of ocean glider technology. In physical oceanography SAMS is pioneering the use of gliders. It is committed to developing the opportunities relating to glider operations in the Atlantic and is a member of a recent EU consortium to develop a glider hub at SAMS. The

department's AUV is fully operational and missions have included the demonstration of intense mixing in shallow surface layers of the coastal ocean and deployments in the Arctic. New activities in 2011/12 are planned with participation in a consortium in the NERC Ocean Surface Boundary Layer TAP.

(2) Sea Ice Group (2 FTE): The Sea Ice Group studies the mechanisms by which the physical processes occurring in the polar seas affect ocean-atmosphere interactions. The approach is primarily observational and covers sea ice dynamics, thermodynamics and mechanics, ocean wave propagation, water mass modification and oil-ice interactions. There is a strong technological and remote sensing aspect to the Group portfolio making use of autonomous sensors to remotely track regional and inter-annual changes. The sea ice group has achieved considerable reputational impact through participation in two major EU projects, Arctic Ocean Sea-Ice and Ocean Circulation Changes Using Satellite Methods and Arctic Climate Change, Economy and Society. These have provided a platform for extensive technology development in drifting ice buoys. A high profile project during 2010 was

the deployment of electromagnetic sensors on Inuit sleds to determine sea ice thickness around Greenland. Staff in the Sea Ice Group represent the UK at the International Arctic Science Committee.

(3) Marine Technology Group (5.5 FTE): The mission of the Marine Technology Group is to improve ocean observations by developing new technologies and also by applying existing technologies to problems in novel ways. The Groups' particular expertise lies in the development and deployment of smart autonomous platforms with real-time communication with the project scientist. The Marine Technology Group has designed, constructed and deployed Ice Mass Balance buoys for monitoring the seasonal evolution of the sea ice. They have developed new coastal drifters for measuring dispersion flows through the Corryvreckan and for passive acoustic monitoring of coastal waters.

DRIFTERS IN THE GREAT RACE

The Technology Development Group has achieved considerable success in the design and deployment of a new class of low-cost coastal drifter. These drifters use the mobile phone network to communicate their position so that their track is logged and they can be recovered after deployment. Their first application has been to map the Great Race, the tidal stream emanating from the Gulf of Corryvreckan, and its eddy structure as part of a NERC Standard Grant led by Dr Andy Dale. Further developments have included the addition of acoustic sensors to detect porpoises and dolphins along the track of the drifter, providing a new way to map marine mammal distributions in coastal waters.

*A. Dale, K. Jackson
B. Hagan, A. James
and B. Wilson*

SEEBECK POWER GENERATOR

A NERC Technology innovation grant has allowed SAMS researchers in the Technology Development Group to explore new power sources for instruments in the polar regions. In collaboration with the British Antarctic Survey they have successfully constructed a prototype power supply that is extremely robust, contains no moving parts, and makes use of the temperature difference that exists between the extremely cold air (-30 to -40°C) and the relatively warm ocean (-1°C) utilising a phenomenon called the Seebeck effect to generate thermoelectric energy. Refinements of this technology would be capable of powering sea-ice instrumentation during the polar winter, when other sources of energy (e.g. solar and wind) are either unavailable or unreliable. This work has recently been published in the journal *Cold Regions Science and Technology*.

*B. Hagan, K. Jackson,
D. Meldrum, A. James and B. Jones*

AUTONOMOUS UNDERWATER VEHICLE IN THE ARCTIC

SAMS continues to develop its expertise in operating remote vehicles for ocean observation. In summer 2010 aboard the RRS James Clark Ross, a team of oceanographers from SAMS used the REMUS autonomous underwater vehicle (AUV) in the Arctic for the first time. The AUV is a positively buoyant, propeller-driven robot that moves along a pre-programmed subsurface path to measure the horizontal variations of ocean properties. It was specifically designed to measure the amount of turbulent mixing in the ocean, to a maximum depth of 600 metres, for durations of up to 10 hours and distances of around 70 km. In the Arctic the science objective was to measure the amount of mixing in and around the inshore branch of the West Spitsbergen Current which carries relatively warm water of North Atlantic origin into the Arctic Ocean through the Fram Strait. SAMS researchers were interested in how the heat (around 50 Tera Watts) carried by this important – yet variable – current is transferred to Arctic Ocean water, sea-ice, and the atmosphere.

*T. Boyd
E. Dumont
M. Inall*

OCEAN-GLACIER PROCESSES IN GREENLAND

The Physics Group spent part of summer 2010 in southeast Greenland measuring the oceanographic properties of the fjord waters. The glaciers that discharge into these fjords have been accelerating, retreating and thinning over the last decades and are responsible for a doubling of the contribution from the Greenland Ice Sheet to sea level rise. Whilst rising air temperatures and surface melt have long been considered to be important controls on ice sheet stability, the role of the ocean has only recently been studied systematically. SAMS is combining its expertise in fjordic processes with glaciological expertise from collaborators in the Swansea University to understand how warming fjord waters circulate and interact with the glaciers. SAMS oceanographers made the first measurements of turbulent mixing from this region and successfully deployed and recovered a long-term mooring in waters 1000m water deep and heavily populated with large icebergs. This work will continue in summer 2011 through a NERC Small Grant to study the adjacent shelf waters in the region.

*F. Cottier
M. Inall
C. Griffiths*

Report from Honorary Fellows

Robert Batty

During the last year Robert Batty has continued to participate in SAMS work on the patterns of juvenile plaice growth on sandy beaches which has so far resulted in the publication of one manuscript; this work will continue through the next year.

Work continued on the environmental impact of marine renewable energy with a particular interest in the risk of collision between marine vertebrates (fish, mammals and diving birds) and marine energy converters, i.e., tidal stream turbines. This has been part of the European funded project EquiMar. The risks are largely unknown but mathematical models, estimating encounter rate and the probability of evasion or avoidance, can help to indicate the magnitude of problem and need and focus for further investigation and/or monitoring. An evasion model for fish, based on detailed knowledge of fish behaviour in predator-prey interactions, was developed last year and presented at the ICOE 2010 conference in Bilbao. That model was based on responses to visual looming stimuli and in the Figure the effects of blade velocity, fish size and blade thickness on predicted probability of collision evasion are shown. Fish and other vertebrates can also make evasive responses that are triggered by transient sounds. These responses have evolved to detect the rise in pressure ahead of an attacking predator but will also act as cue for evasion of collision with turbine blades. In collaboration with colleagues at the University of Edinburgh, we are using the output from their Computational Fluid Dynamic models to predict the pressure profile ahead of an approaching turbine blade and the likelihood that the threshold for response will be exceeded at a distance that will allow successful evasion by fish. A model to predict encounter rates of marine vertebrates with tidal stream turbines (developed at SAMS) was used in a commercial contract (in collaboration with SMRULtd) as part of the Environmental Assessment for a commercial tidal stream array.

I have also continued with teaching on the Marine Science degree, contributing to two modules: Behaviour and Biomechanics of Marine Animals, and Marine Zoology.

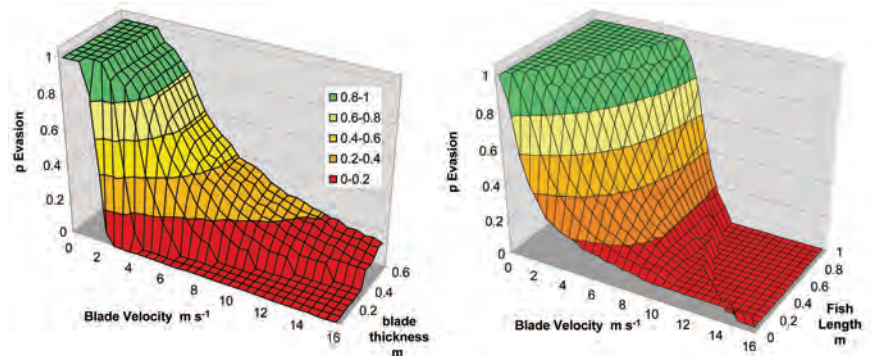


Figure: Model predictions of pEvasion at 10°C. Left graph with varying blade thickness and a fish length of 0.3 m. Right graph with varying fish length and a blade thickness of 0.3 m.

Robin Gibson

Robin Gibson's current principal activity is as Managing Editor of *Oceanography and Marine Biology: An Annual Review*, a publication that has been associated with SAMS/SMBA since its founding by the late Harold Barnes at Millport in 1962. Volume 48 was published during the year.

Previous studies on the behavioural ecology of juvenile plaice (*Pleuronectes platessa*) designed to examine the factors determining depth selection were analysed and accepted for publication. Marking and recapture experiments with ~2500 fish caught on a local sandy beach at depths of 0.5 and 2.5 metres demonstrated that nearly all fish subsequently released at their depth of capture stayed at that depth and few moved to other depths. In contrast, nearly all fish reciprocally transplanted between these depths returned to their depth of capture, some within 2 days and very few remained at the transplant depth (see Figure). The results indicate that juvenile plaice have a fidelity to, and can actively select, a particular depth, although there may be some movement between depths which, at the time of the experiment (August/September 2011), was mostly directed offshore. The mechanism(s) underlying this remarkable fidelity and 'homing' ability remain to be investigated.

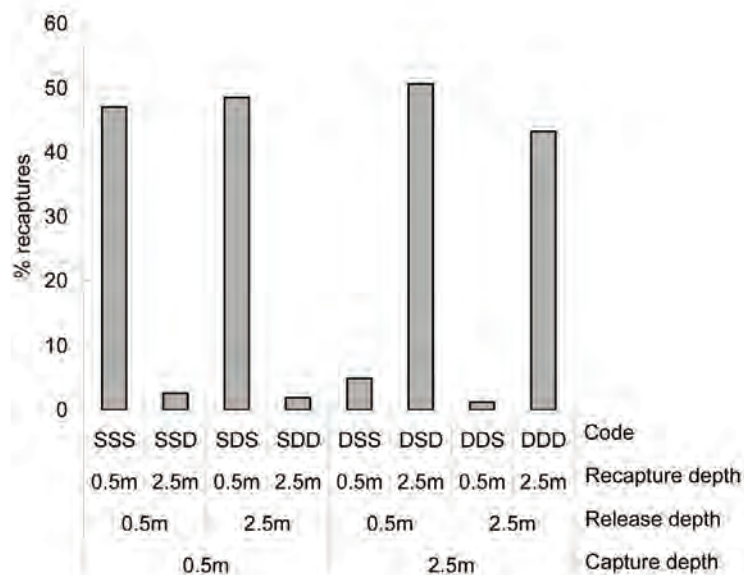


Figure: Recaptures of marked plaice expressed as a percentage of the two experimental treatments (replaced where initially captured (SS, DD) or transplanted to another depth (SD, DS)). S = shallow (0.5m), D = deep (2.5m).

Publications

Gibson, R.N., R.J.A. Atkinson and J.D.M Gordon (eds.). (2010). *Oceanography and Marine Biology: An Annual Review* **48**, 1-386.

Gibson, R.N., M.T. Burrows and L. Robb (2011 in press). Field experiments on depth selection in juvenile plaice *Pleuronectes platessa*. *Marine Ecology Progress Series*.

J.C.A Craik

In 2010 the mink-seabird project was continued for the sixteenth successive year. This work monitors the harmful effects of feral American mink on seabirds, wildfowl and waders breeding on about 100 small islands in sea lochs, firths and sounds in a study area lying along the mainland coast from Mallaig to West Loch Tarbert. It also protects the more important colonies of breeding seabirds by local removal of mink. As in previous years, mink removal was successful at most colonies but failed at some. There were three interesting developments during the year.

The first involved a mussel farm at South Shian in Loch Creran where, in 1996, a group of us (including the then owner, Roger Thwaites) adapted a mussel raft to allow terns to nest on it. In the intervening years, the raft has been greatly improved and has attracted steadily increasing numbers of nesting terns. In April 2010 it was completely renovated and the nesting area was doubled. In summer 2010, 177 pairs of Common Terns nested there, a record number for the site, and together they fledged 110 young. This was a greater number of fledged young than at any of the natural sites in this large study area in 2010, largely because mink and otter (the main predators of tern chicks) could be excluded from the raft. Tern rafts thus offer a promising way of solving the mink problem.

Second, annual monitoring of these colonies over many years has revealed that a surprisingly high proportion of nests contain the eggs of two bird species (mixed clutches). During 1990-2009, 163 mixed clutches were found among 96,080 clutches examined (0.17%). These involved 13 species (four gull species, three ducks, two geese, two terns, Oystercatcher and Shag) and 22 species-pairs. During the year, a second instalment of this work (covering 1996-2009) was written up and accepted for publication by the journal *Seabird*. The behaviour that leads to mixed clutches seems to be a crude parallel of the highly refined egg parasitism seen in cuckoos; in other words, the "guest" species may be trying to increase its offspring at no cost to itself by having some raised by other birds. It probably targets birds of its own species, with which the chance of success would of course be much higher. Indeed, recent work elsewhere has shown that intraspecific mixed clutches are about a hundred times more frequent than interspecific ones. The latter probably arise



by "mistake", although other interpretations are possible. Most of the guest eggs recorded in this work were unlikely to have been successfully reared by their hosts since the two species were so different. However, a very few cases of successful rearing of a guest egg by another species have been recorded by other workers, always when guest and host species were closely related.

Third, in April 2010 Clive Craik discovered a dense colony of the opisthobranch gastropod *Akera bullata* in a seawater pond near Oban (see Figure). The most notable feature of this sea snail is its swimming behaviour. For most of the year its appearance is drab and nondescript but, for about two weeks in spring around the time of mating, *Akera* is almost magically transformed. Groups of swimmers perform an elegant underwater ballet just below the water surface. The beauty of each animal is enhanced by glancing blue iridescence, probably caused by interference of light in the integument that is highly stretched by the strong swimming muscles. I estimated the pond (25 x 5 x 1.5 m deep) to contain at least 2,800 individuals. Many still photographs and video clips of swimming groups and individuals were obtained. Studies are in progress of the growth rate, reproductive cycle, swimming movements and other aspects of this attractive but little-known species.

Figure: Two swimming *Akera bullata* and an unidentified fly in a pond near Oban in April 2010.

John D.M Gordon

Work continued on digitising trawl catch and fish biological data from surveys carried out in the Firth of Lorne and adjacent sea lochs during the 1970s. This was funded in part by a Medins contract.

I collaborated with Dr Odd Aksel Bergstad, project leader of Patterns and Processes of the Ecosystems of the Northern Mid-Atlantic (MAR-ECO), a Census of Marine Life Project and others to compile deep-water demersal fish survey data for the Northeast Atlantic. The objective was to compare the patterns of distribution of deep-water demersal fishes of the North Atlantic mid-ocean ridge, continental slopes, islands and seamounts. I was honoured to be invited to the Decade of Discovery presenting the results of the Census of Marine Life which was held in London in October 2010.

Collaboration with Professor Priede and others continued to compare historical SAMS deep-water trawl survey fish data with more recent data obtained by the University of Aberdeen. I have also input into a synthesis of the MAR-ECO and ECO-MAR projects.

I am an editor of *Oceanography and Marine Biology: An Annual Review*.

Publications

Priede, I.G., J.A. Godbold, N. King, M.A. Collins, D.M. Bailey, J.D.M Gordon (2010). Deep-sea demersal fish species richness in the Porcupine Seabight, NE Atlantic Ocean: global and regional patterns. *Marine Ecology* **31**, 247–260.

Priede, I.G., J.A. Godbold, T. Niedzielski, M.A. Collins, D.M. Bailey, J.D.M Gordon and A.F. Zuur (2011). A review of the spatial extent of fishery effects and species vulnerability of the deep-sea demersal fish assemblage of the Porcupine Seabight Northeast Atlantic Ocean (ICES Sub-area VII). *ICES Journal of Marine Science* **68**, 281–289.

Heymans, J.J., K.L. Howell, M. Ayers, M.T. Burrows, J.D.M. Gordon, E. Jones, and F. Neat (2011). Do we have enough information to apply the ecosystem approach to management of deep-sea fisheries? An example from the West of Scotland. *ICES Journal of Marine Science* **68**, 265–280.

Gibson, R.N., R.J.A. Atkinson and J.D.M. Gordon (eds.) (2010). *Oceanography and Marine Biology: An Annual Review* **48**, 1–386.

Jake Rice

As institutions have to implement commitments made to an ecosystem approach, more integrated management, and greater societal inclusiveness, policy and management of human activities in the oceans has changed greatly in the past decade. This much broader framework in which institutions and civil society will operate makes new demands on leaders in government at all levels, ocean industries, non-governmental organisations, and communities.

In collaboration with the Director of SAMS I have been working to prepare a "masterclass" session for leaders from all these sectors of society, where we will explore needs and opportunities and build new capacity to govern in this larger ocean framework. We have developed a curriculum outline, recruited candidate expert instructors, obtained and incorporated feedback from the prospective audience for this course, and commenced the search for funding for this new form of training leaders in how to excel in a world where everything is changing - the marine ecosystems, the industries and communities, and the expectations of society. As funding sources are beginning to emerge we are set to focus on recruiting enrollment for the first offering.

J.Murray Roberts

Since taking up his appointment at Heriot-Watt University in September 2009 Dr Roberts has remained involved with two of the grants he maintained at SAMS.

In May 2010 his research group collaborated with an ASSEMBLE project led by Dr Covadonga Orejas examining feeding ecology in cold-water corals from the Mingulay Reef Complex and Ms Beatriz Francisco de Mora continued her PhD research through the European Project on Ocean Acidification (EPOCA).

Dr Roberts secured further funding through the UK Ocean Acidification Research Programme to support offshore sampling and long term experiments on cold-water corals sampled from Mingulay and Rockall Bank in 2011 and 2012.

He joined a Marine Scotland cruise to the Mingulay reefs in April 2010 and afterwards explained his research work at the Castlebay Community School on Barra. The Mingulay

reef complex is being considered as a future Special Area of Conservation by the Scottish Government.

Work begun at SAMS through the European deep-sea ecology project HERMIONE continues with detailed study of the spatial biodiversity patterns across the Mingulay reefs and the relationship between deep-sea corals and water mass history throughout the Atlantic – the latter closely related to the evolving Trans-Atlantic Coral Ecosystem Study 'TRACES'.

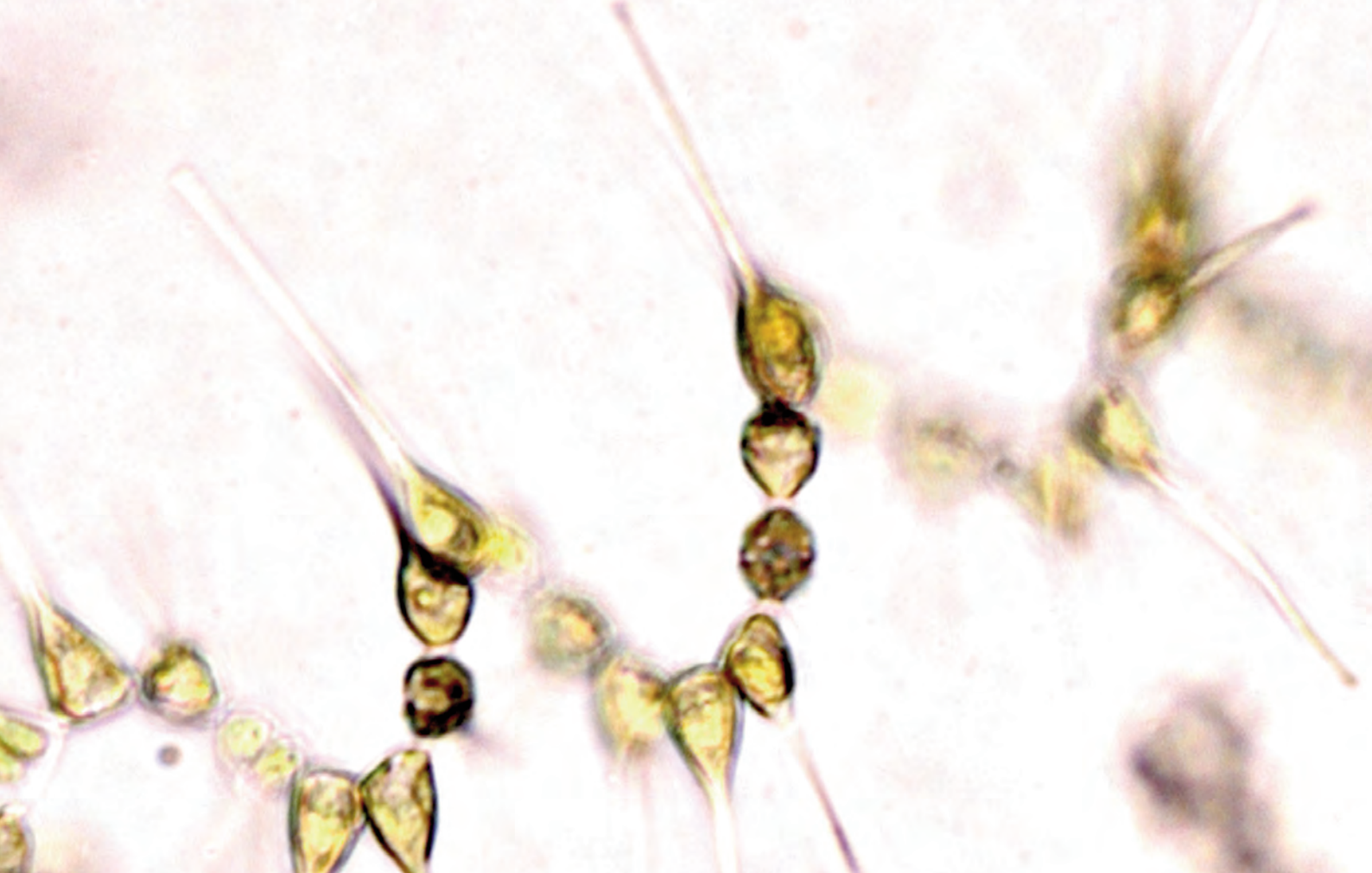
In August 2010 Dr Roberts was involved in hosting the 45th European Marine Biology Symposium at Heriot-Watt University where he launched a new United Nations Environment Programme – World Conservation Monitoring Centre report 'Deep-water sponge grounds'.

Throughout 2010 Dr Roberts and his research group redeveloped their cold-water coral resource website www.lophelia.org and

launched it with a new video introduction by Sir David Attenborough in January 2011. This website was a component of the Esmée Fairbairn Foundation projects 'Deep-sea Conservation for the UK (DCUK)' initiated at SAMS in 2005. Dr Roberts concluded these two projects on behalf of the DCUK partners at the Porcupine Marine Natural History Society conference (St Andrews, April 2010) and was an invited speaker at the UK-Australia Frontiers of Science Marine Meeting (Perth) and the ARC Centre of Excellence for Coral Reef Studies 'Coral Reefs in a Changing Environment' (Canberra, October 2010).

In early 2011 Dr Roberts became Director of Heriot-Watt University's Centre for Marine Biodiversity and Biotechnology where he leads a group of four postdoctoral researchers, two PhD students and one MRes student.

National Facilities



Culture Collection of Algae and Protozoa

The NERC funded Culture Collection of Algae and Protozoa (CCAP), located at SAMS, is a component of the UK's National Capability (NC) scientific infrastructure. It is an internationally important Biological Resource Centre (BRC) providing cultures (cyanobacterial, protistan, macroalgal), bioinformatic data, services and advice to the scientific community.

Over the last four years, the CCAP has developed and populated the CCAP Knowledgebase (<http://www.ccap.ac.uk>) that hyperlinks quality-controlled biological material held in the CCAP to manually-curated molecular, bibliographical and taxonomical information. As part of this exercise a systematic molecular barcoding program of CCAP strains, has been undertaken and currently over 1250 strains are hyperlinked with at least one Genbank accession number (>1800 strains planned for January 2012). Additionally, the algal holdings have been linked with Algaebase

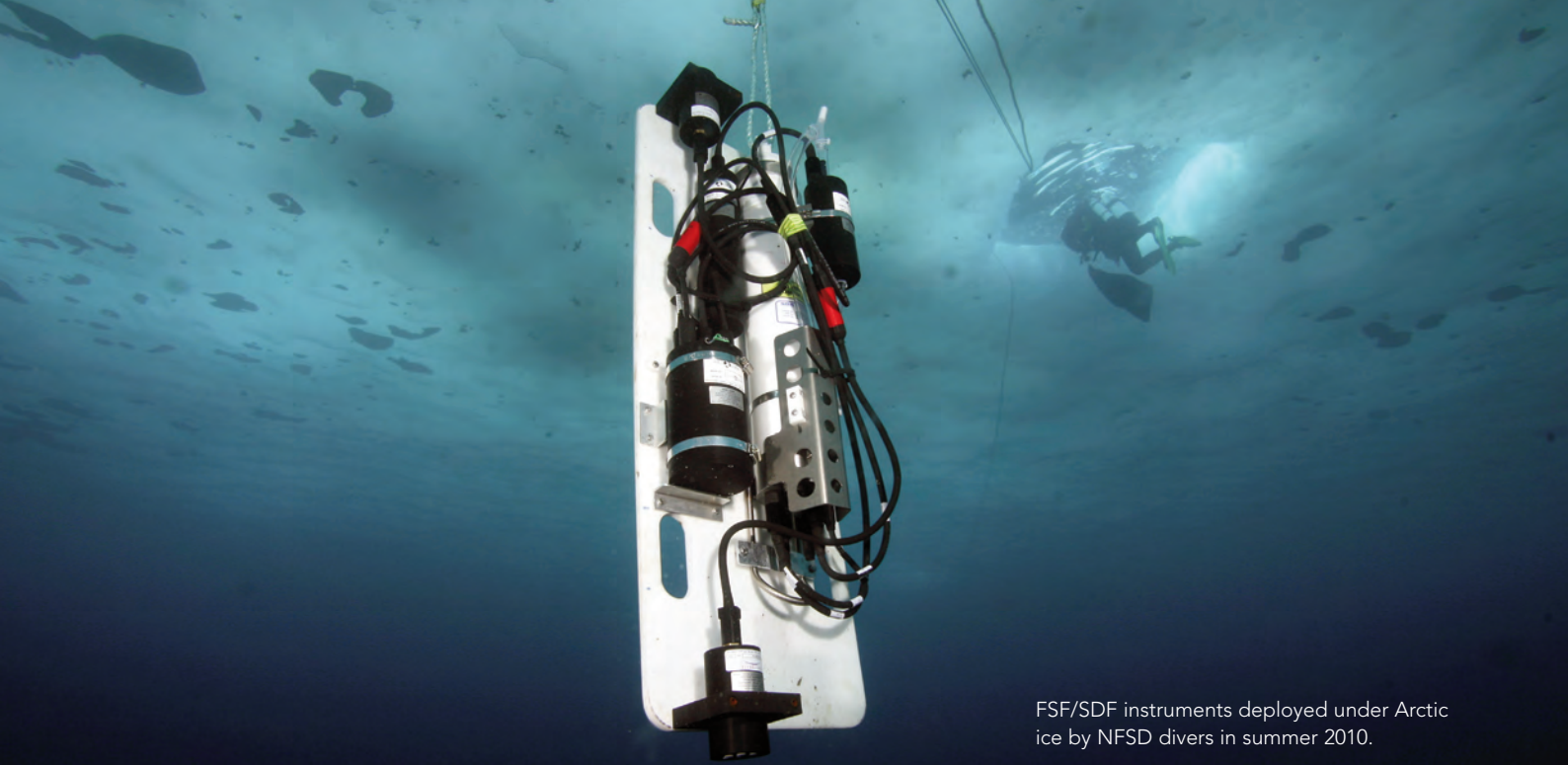
(<http://www.algaebase.org/>), the most comprehensive online resource on algal taxonomy.

In 2010/11, 62 new strains were added to the collection, with 13 being ex-type cultures (newly described taxa to science): these include both algae and protozoa (details of all holdings and accessions are listed on the CCAP website www.ccap.ac.uk).

The Collection underpins scientific research, training and commercial activities in the UK and world-wide. In 2010/11 there was a further increase in demand with 700 orders being serviced with the provision of >1750 cultures to non-SAMS users and the accession of eight new patent deposits.

Additionally CCAP has developed and delivered two Continuous Professional Development (CPD) courses on algal cultivation and the conservation of biological resources. The courses have been targeted at the emerging algal

biotechnology sector with attendees coming from both academic and commercial organisations. In addition to the UK, delegates have come from Belgium, Denmark, France, Germany, the Netherlands, Hungary, Ireland, Israel, Italy, Mexico, Norway, South Korea, Spain and the USA, reflecting the global importance of these areas of science.



FSF/SDF instruments deployed under Arctic ice by NFSD divers in summer 2010.

National Facility for Scientific Diving

The NERC Facility for Scientific Diving (NFSD) at SAMS provides divers, equipment, training and scientific/technical support that underpins a wide range of interdisciplinary research in the underwater environment.

The primary level of service delivers practical support for diving-related underwater scientific projects (see picture above) through providing additional manpower for groups with limited diving experience, total project management for scientists with no diving experience and/or specialist equipment loans for groups with diving experience but limited resources.

On a secondary level, the Facility undertakes to ensure proper adherence to Health and Safety legislation as applied to diving at work activities. This can be through targeted training programmes, communicating advice and guidance for senior management with legal responsibilities for diving at work, undertaking safety audits on behalf of the NERC Health and Safety management structure and facilitating a wider interactive dialogue with others in the higher education field and the Health and Safety Executive.

The NFSD is the main service provider and the major supporter of research within the UK that involves scientific diving through its support and maintenance of an extensive underwater research programme, its support for the UK Scientific Diving Supervisory Committee (SDSC), its interactions with other diving industry bodies, its ongoing diving research and evaluation programme, and its focussed training programme for

scientists and technicians involved with working underwater. In addition to diving services per se, the NFSD also provides support and training in associated small boat operations and in emergency diving medicine.

The increased number and diversity of projects supported through the NFSD continues to be maintained. This is leading to a far wider diversification of project areas being supported and the NFSD is the only diving facility worldwide that is supporting, either directly or indirectly, such diverse topics as sea-level measurement, water-quality assessment, underwater light measurement, functional ecology, cell biology, animal genomics, paleoclimatology, ocean acidification, biogeochemistry, eco-physiology, habitat mapping and maritime science-based archaeology, in addition to an expanding research presence in the fields of diving and hyperbaric medicine. The range of disciplines that can be supported was further increased in 2010 through the development and validation of new diving-based technology (including a collaboration with the NERC Field Spectroscopy Facility). The profile of the facility is continuing to be increased through membership of industry and cross-sectorial committees at the national level plus international collaborations within the area of raising the profile of scientific diving as a valid and cost-effective research tool. A consistent capacity over the past 2-3 years is now producing an expanding publication output (see Figure).

The Dunstaffnage Hyperbaric Unit, hosted within the SAMS Diving Unit, is one of four NHS-registered centres for the emergency treatment of diving incidents. In 2010, the unit treated 13 divers for symptoms of decompression illness. In total, the divers received 29 treatments adding up to 125 treatment hours. Unfortunately, there were also two diving fatalities in the area covered by the Unit during the year. The unit benefits from the medical support of five specially trained doctors from the Lorn Medical Centre.

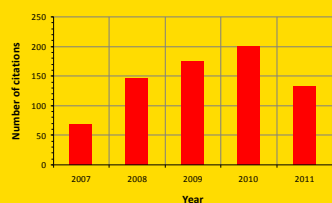
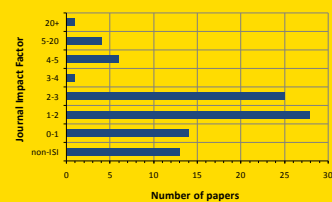


Figure: (Top) Number of papers (grouped by Impact Factor) and (Bottom) citations of those papers originating from NFSD support to various science programmes during 2006-2010.

Education

SAMS HIGHER EDUCATION

This has been another noteworthy year of higher education activities for SAMS. Specific areas of activity are reported below, but it is also worthy of note that 2010 marks the first year of implementation of the targets articulated in the 2009-2013 Education Business Plan.

New Teaching Infrastructure

In November, we were extremely proud to have HRH Prince Richard, Duke of Gloucester, make the formal opening of the Sheina Marshall Building. Whilst the whole of Scotland was at a literal snow-related stand-still, Dunstaffnage enjoyed a remarkable 'biscuit tin' day of soft, winter sunshine and mirror-calm coastal waters. The event was the culmination of the £6.1 million project, funded by the European Regional Development Fund, Highlands and Islands Enterprise, and the Scottish Funding Council. The new infrastructure provides an unparalleled training facility, with a two-story building containing lecture theatres, laboratories, study rooms and canteen, as well as the Scottish Ocean Explorer Centre - a public engagement facility.

Postgraduate Research Training

Over the year a further intake of postgraduate students commenced at SAMS: seven new PhDs and two MSc (by research). 'Renewable energy' features strongly in the cohort, with a new group of students on looking at the impacts of energy harvesting devices in the water: MaREE, funded jointly by HIE and the European Regional Development Fund; and a studentship sponsored by Harper McLeod, a commercial law firm with an interest in corporate social responsibility. The Marine Alliance for Science and Technology for Scotland (MASTS) Graduate School saw the intake of the first cohort of postgraduate students, three at SAMS, and others co-supervised by SAMS staff across the partnership.



Undergraduate & Postgraduate Teaching

The eleventh cohort of UHI undergraduates arrived in September. This provided our largest undergraduate intake since delivery began, and is a great credit to the growing reputation of the programme. We held our second formal UHI Graduation Ceremony in September, with graduands and staff donning gowns. Karl Attard gained a first class honours, but the ceremony was also notable that it celebrated the achievements of our first BSc(Hons) Marine Science with Arctic Studies graduates: Carl Ballantine and Jordan Grigor received their awards from Professor Jane Francis, an Arctic Palaeoclimatologist, from the University of Leeds.

Continuing Professional Development

The other highlight of the year for SAMS Education was the delivery of our first tranche of Continuing Professional Development (CPD) programmes. Staff from the Microbial and Molecular Biology and Ecology departments, created a number of short courses: 'ECOPATH and ECOSIM Modelling', 'Cryopreservation of Marine Algae', 'Marine Spatial Planning' and 'Algal Culturing Techniques'. These attracted delegates from across the world, and provide an excellent platform for future growth in this area of business for the Institute.

Axel Miller



SAMS Research Services Ltd

SAMS Research Services Report

BUSINESS DEVELOPMENT, KNOWLEDGE EXCHANGE AND COMMERCIAL ACTIVITIES

SAMS recognises the importance of Business Development (BD) and Knowledge Exchange (KE) activities and to ensure that the knowledge gained through its research is utilised, it has created a dedicated Business Development Department with five staff, two of which were new posts.

The Business Development Department has responsibility for maintaining the existing client base, as well as identifying and managing new customers to ensure that any potential opportunities identified are converted to business. This department delivers marine environmental services and consultancy through SAMS' wholly-owned trading subsidiary SAMS Research Services Ltd (SRSL).

SRSL's mission is to facilitate the sustainable development and utilization of the marine environment through world-class environmental surveying, sampling, monitoring and analysis. We focus on three key markets; renewable energy generation, biofuel production and marine impacts of mining. In these sectors we have already established an enviable reputation built on delivering independent and high-quality marine environmental services, underpinned by cutting-edge research.

For more information: www.samsrsl.co.uk

Another key area of responsibility for the BD Department is Knowledge Exchange, where skills and intellectual property are made use of to obtain funding to support science and take ideas to market.

This year, two SAMS projects were successful in securing Genomia Fund awards. The Genomia Fund is a seed/pre-seed award which seeks to support emerging technologies:

(1) CCAPmetagenome is a collaborative proposal involving the University of Edinburgh, GenePool, and the gene sequencing technology company, Illumina. The project is aimed at sequencing the genome of selected oil-producing strains of microalgae stored in CCAP.

(2) HoloPharm is also a collaborative proposal involving the Marine Biodiscovery Centre in Aberdeen, and Glycomar in Oban, which aims to screen Scottish sea cucumbers

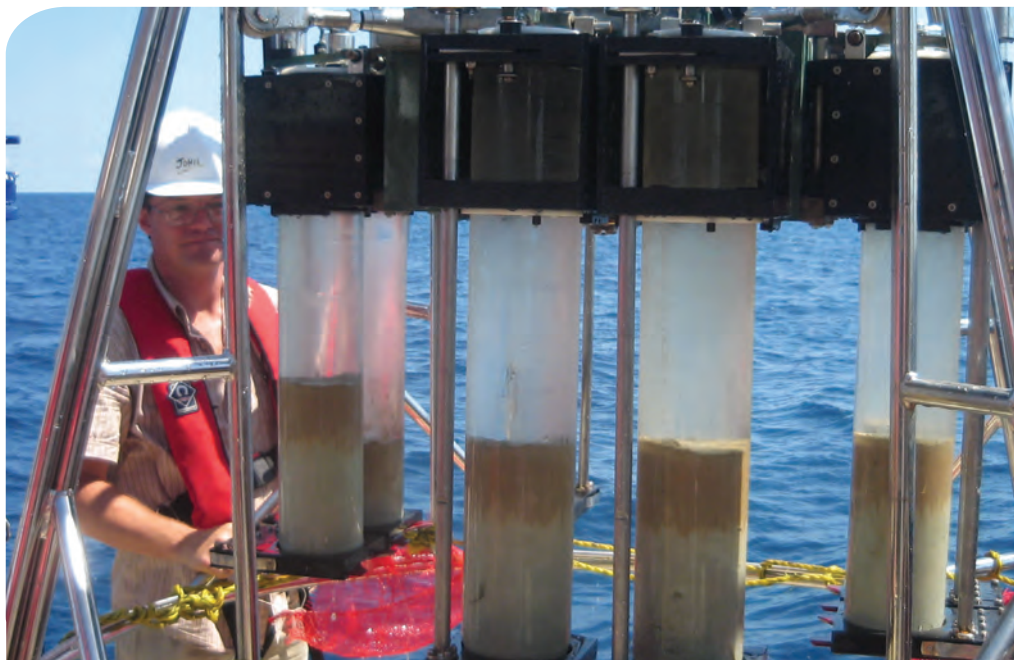


Figure: Successful recovery of sediment samples during a project cruise in Papua New Guinea.

for biomedical activity and to develop a sustainable supply through cultures here at the Scottish Marine Institute.

SAMS was also successful in a collaborative bid to the Scottish Funding Council's Horizon Fund, which supports the development of Marine Scotland's innovative marine renewables consenting policy ("Deploy and Monitor"). In this project, SRSL is partnered with ERI, ICIT (Heriot- Watt), Pelamis Wave Power, E.On, Scottish Power Renewables, Vattenfall and MacArthur Green.

SRSL's project portfolio spans the breadth of the marine sciences, from Environmental Impact Assessment (EIA) services to policy development.

An example of work that SRSL has carried out is the Independent Evaluation of Deep Sea Tailings Placement (DSTP) in Papua New Guinea (PNG). This was funded by the European Union through the 8th European Development Fund. The main objectives were to critically assess all existing information on past and present mining operations using DSTP in Papua New Guinea and provide guidelines for future DSTP marine environmental monitoring in the context of international best practice.

In the final phase of the project, SAMS

scientists developed guidelines for the use of DSTP in PNG for the Papua New Guinea Government, to inform new policy on deep sea mine tailings placement and environmental monitoring. The guidelines address international best practice for regulatory frameworks and environmental considerations, initial mine development, preliminary site evaluation, environmental baseline surveys, mining operations, future mine closure plans and post-mining monitoring.

SRSL is a member of the following Framework Agreements:

- (1) Framework Agreement for the Provision of Renewables Research and Technical Advice (DECC) 2010
- (2) Framework Agreement for the Provision of Specialist Advice on the Interactions between Renewable Energy Devices and Marine Mammals and Basking Sharks (SNH), 2010
- (3) SNH Framework Agreement for Marine Aquaculture Casework for Aquaculture, with Hambrey Consulting Ltd (SNH), 2010
- (4) Framework Agreement for "Consulting Services relating to Environmental Impact Assessment (EIA) for Overhead, Underground and Marine Transmission Lines

and Associated Substations,” with Scott Wilson Ltd (SSE).

This year SRSL also developed a formal collaboration with the James Hutton Institute to provide joint consultancy services for the implementation of marine planning and coastal zone management in Scotland.

SELECTION OF PROJECTS 2010/11

The following project list gives an indication of the spectrum of clients we are working with using SAMS skills and expertise to provide services and solutions:

- INIS Hydro; Bathymetric Survey Program of Renewable Energy Interest Sites off the West Coast of Scotland (European Union INTERREG), with the Maritime Coastguard Agency (MCA) and the Northern Lighthouse Board, 2011
- Vessel Charter for the Argyll Array Offshore Wind Farm Bird Surveys (Scottish Power Renewables) 2011
- EIA Services (monthly Bird and Marine Mammal Surveys) in the Sound of Islay (DP Energy) 2011
- Consultancy Services for Artificial Reef Effects of Offshore Wind Turbine Base in the Sound of Islay (Scottish Power Renewables) 2010/11
- Consultancy Services relating to Biofouling of Offshore Structures (British Petroleum) 2010-11
- Underwater Noise Acoustic Characterisation of Turbine Operations Vessel at the European Marine Energy Centre, EMEC (OpenHydro) 2010
- Underwater Noise Acoustic Characterisation Survey of Dynamic Positioning Vessel at EMEC (Voith Hydro) 2010
- Detailed Ecological Guidance to Support the Application of MPA Selection Guidelines within Territorial and Offshore Waters Adjacent to Scotland to SNH, 2011
- Broadscale surveying of Priority Marine Features (PMF) and Marine Protected Area (MPA) search features within Lochs Linnhe, Etive, Leven and Eil for Scottish Natural Heritage (SNH/Marine Scotland), 2011
- Development of specific regulatory guidelines for Deep Sea Mine Tailings Placement for Lihir and Ramu mines, Papua New Guinea Mineral Resource and World Bank, 2011
- Investigation into upwelling along the RAI coast with specific reference to the Basamuk area, Papua New Guinea Mineral Resource Authority, 2011
- Mapping of Intertidal Seaweed Resources of the Outer Hebrides, Scottish Enterprise and Highlands and Islands Enterprise, 2010
- Kelp Cultivation Trials, Scottish Enterprise, 2010-11

*T. Shimmield
K. Page*

Learned Society

Learned Society

At the end of the reporting period SAMS had a total of 463 members (456 in 2009-10) – see Figure for the breakdown in the different membership categories. Without changes in subscriptions or activities nor a recruitment drive, SAMS membership numbers have remained relatively stable over the past decade.

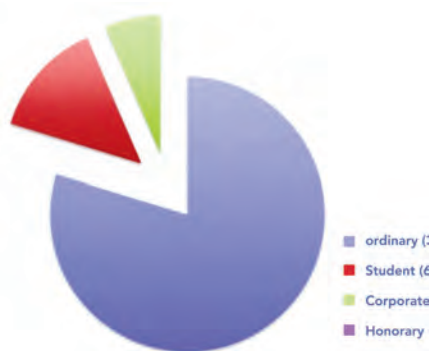


Figure: Breakdown of the different membership categories in the Learned Society of SAMS.

During the reporting period members received a copy of the Annual Report 2009-10 (on CD-ROM). They were also sent a copy of a the fundamentally redesigned newsletter - issue 35 - now known as the Ocean Explorer magazine.

All members were invited to attend the 96th Annual General Meeting (AGM) on 5 November 2010 at the Scottish Marine Institute. The AGM was followed by the 21st

Annual Newth Lecture, held to commemorate former Association president Dr David Newth. The lecture was presented by Dr Paul Tett on 'Modelling for Science and Policy: From Loch Striven to the European Court of Justice'.

Beyond the privileges of membership set down in the Articles of Association, SAMS also operates a research bursary that awards annually up to four bursaries to applying members. In the reporting period two grants were awarded (see Table).

No Scottish Marine Group meetings occurred during the reporting period but new meetings have been set for the coming year. Association members Professor Anton Edwards and Dr Tom Leatherland are organising an autumn meeting on 20 October at Perth College UHI, while the Dean of the MASTS graduate school, Professor Axel Miller, will coordinate the postgraduate prize meeting.

The Association honours the memory of members, staff and students who passed away during the reporting period:

Dr Duncan James Lesley Mercer (20.1.1971 – 26.9.2010) had worked for a decade in the marine technology development group at SAMS before his 2007 move to the ARC Centre for Excellence for Autonomous Systems in Sydney, Australia. His research interest was in low level embedded systems.

Dr Clifford H. Mortimer (1911-2010) was director of the Association from 1957-1968 when the decision was taken to move from Millport to Oban. Dr Mortimer then moved to Wisconsin where he developed an outstanding career in limnology and became founding director of the Centre for Great Lakes Studies. To his 99th birthday SAMS staff had sent Dr Mortimer their very best wishes and a bottle of Oban Whisky.

Dr Johanna Fehling (25.10.74 – 17.2.2011) was among the first UHI-registered PhD students to complete her doctorate at SAMS. She worked with Drs Keith Davidson, Chris Bolch and Paul Tett on the harmful diatom *Pseudonitzschia* in Scottish waters, and went on to post-doctoral positions at the University of York and Uppsala University.

Dr Michael Richmond Droop (3.11.1918 - 20.3.2011) was one of the Association's most highly regarded scientists who developed the 'Droop Equation' (or Cell-Quota Model) that relates growth rates of algal cells to their internal nutrient content. The relocation of the Culture Collection of Algae and Protozoa (marine) to Oban was in large parts due to Michael's work.

Anuschka Miller

Table: Research bursary awards to SAMS members during the reporting period

NAME	INSTITUTION	PROJECT TITLE	AWARD
Helle Rusz Hansen	University of Copenhagen	How clean is biogas? Focus on arsenic	£1000
Dr Antonios Zambounis	University of Thessaly	Genomics of various macroalgae and their pathogens	£1032
TOTAL			£ 2,032

SAMS PUBLIC ENGAGEMENT

ENGAGING THE WORLD IN MARINE SCIENCE

A cornerstone of SAMS activities is to work towards enthusing and informing the public about the importance of a healthy marine environment and of innovative marine research and technology developments, and to encourage dialogue with relevant stakeholder groups. Websites and publications, events and visits, exhibitions and the media all play important roles in engaging the wider world in marine science.

THE WEB – CONNECTING US ANYTIME TO ANYWHERE

During the reporting period several new websites were developed: while the learned society's website for the membership remains at the established address at www.sams.ac.uk, the key website for our research and higher education activities is now published at www.smi.ac.uk for the Scottish Marine Institute in a new design and format. A commercial website for services to business was launched at www.samsrsl.co.uk. We also produced a number of smaller research project websites, and staff continue to contribute both text and images to other websites.

We have also produced a number of blogs: the Ocean 2025 ICE CHASER II expedition blog and a student blog detailing the study experience of a SAMS UHI student at the University Centre on Svalbard were both hosted on the SAMS website (and are now transferred to the smi site) while Dr Tavis Potts maintains a regular discussion blog on sustainable seas (<http://sustainable-seas.blogspot.com>).

EVENTS AT SAMS

On 16 September 2010 SAMS played host to the 10th UHI Annual Lecture, the first hosted by Professor Matthew MacIver CBE as the new Chair of the UHI's Board of Governors. In a large marquee UHI welcomed hundreds of visitors including politicians and government administrators, Scottish academics, teachers, business and local community members as well as students and staff from across the UHI network to the UHI's prestigious flagship event of the year. The lecture was delivered by EU fisheries policy expert Poul Degnbol who is currently Head of Advisory Programme for the International Council for the Exploration of the Sea (ICES). Honorary fellowships were awarded to prize-winning journalist and



author Neal Ascherson and to Sandy Cumming CBE, champion of the economic development of the region in various posts including - until March 2010 - chief executive of Highlands and Islands Enterprise. Christopher MacDonald of Lews Castle College UHI was awarded 'UHI student of the year 2010'.

On 29 November 2010 when most of the country had ground to a halt due to heavy snowfall, SAMS celebrated the opening of the Sheina Marshall building in blazing sunlight. HRH The Duke of Gloucester had managed to reach Oban by helicopter to conduct the official opening, and was joined by around 60 other visitors largely from the north of Scotland. The MASTS annual science meeting that was planned to commence later that day and the naming of the research building in honor of Sir John Murray had to be cancelled however due to worsening weather conditions.

In early February SAMS and partners from Argyll College and Ballet West organised an event to celebrate the award of university title to UHI which was held in the Sheina Marshall building space that will eventually house the Scottish Ocean Explorer Centre. Many representatives from Oban and numerous students and staff attended the event that was hosted by SAMS Head of Education Professor Axel Miller. Speeches were delivered by Professor Jack Matthews, former SAMS director who had initiated the Association's engagement with UHI, Wilma Campbell as Chair of Argyll College, PhD student Karen Alexander, Lachlan Beaton from Highlands and Islands Enterprise, and SAMS Director Professor Laurence Mee.

FIRST FESTIVAL OF THE SEA

Between 21 and 30 May 2010 the area around Oban celebrated the marine environment in over 50 events. Activities included a parade and opening event by the area's primary school children, art exhibitions, numerous open days (the SAMS open day attracted a record 800 visitors), lunchtime and evening lectures, discovery walks, marine sport sessions, photography, Gaelic and cooking workshops, a public debate, boat trips, a closing ceilidh and much more. While over 35,000 visitors came into contact with the festival through exhibitions at the ferry terminal, an artist's studio, and at the Scottish Sea Life Sanctuary, 5,200 people specifically attended festival events.

The festival was funded by the Scottish Government through a Science Engagement Grant, the European Union through the LEADER programme, and SAMS with further support from Yeoman Glensanda, Live Literature, and vast volunteer support by the local community.

SCOTTISH OCEAN EXPLORER CENTRE UPDATE

During the reporting period the building infrastructure for this marine exhibition and outreach centre was completed. To develop the exhibition and to furnish the outreach centre SAMS needs to raise a total of £366,940 of which £224,711 have already been committed by The Robertson Trust (£134 k), SAMS (£40.711k), the Stevenson Family Charitable Trust (£25k) and the UHI Development Trust (25k). The fundraising is led by the UHI Development Trust but suffered a set-back by the departure of the Trust's Director at the end of 2010.



ENTHUSING THE NEXT GENERATION

In the reporting period SAMS scientists visited eight primary and three secondary schools talking to children about marine renewables, climate change, ocean acidification, seaweeds, shore ecology, marine invasives, Arctic sea ice and classification systems. SAMS furthermore contributed a workshop to the Argyll and Bute Regional Environmental Education Forum's environment fair in Campbeltown, and Anuschka Miller chaired the ABREEF steering committee. Staff also delivered a workshop to adults with learning difficulties and contributed exhibition stands for the Oban Games, the Arduaine Garden open day, a school eco day, and the Moray Science Festival. The Connel guides received a talk on ocean acidification. SAMS also developed programmes including talks and tours for visiting groups including the Scottish Agricultural College and a French Lycee. SAMS also hosted a heat of the Big

Green Challenge and several work experience pupils.

Undergraduate student Sarah Cresswell developed and, with the help of other undergraduate students, delivered a workshop on Marine Protected Areas to all S2 pupils at Oban High School as part of her third year project.

Staff furthermore supported Scotland's Curriculum for Excellence with two contributions using the GLOW system that allows schools throughout Scotland to either participate in the event or benefit from the recording: one session focused on marine renewables and biofuels, the other on climate change and the oceans.

SAMS IN THE NEWS

SAMS appeared in a number of television and radio programmes as well as online: a BBC Landward programme featured marine biofuel research carried out in the BioMara project. The finale of the Census of Marine Life saw SAMS' Dr Bhavani Narayanaswamy speak on various BBC channels. Dr Charlie Bavington's biotechnology research into medicinal properties of starfish slime that started at SAMS and is now carried on at ECMB tenant company Glycomar was covered on BBC Breakfast and BBC World as well as on radio (Today), web (bbc news online) and in the press (including the Daily Mail). BBC Alba broadcast news features on the Festival of the Sea and the UHI Annual Lecture. Australia's ABC network reported

SAMS work on the deep-water placing of mine tailings in Papua New Guinea. The successful deployment of a biogeochemistry lander in the Mariana Trench was widely covered and made it to the front page of BBC news online and the top 10 most read stories on 17 January 2011. Professor Ronnie Glud was interviewed on the Today programme, and the lander deployment was further covered by 5 Live, the World Service, BBC Scotland and BBC Cornwall. Dr Liz Cook was a guest on BBC 4 Material World in a feature on marine invaders. Science journalist Richard Hollingham joined the ICE CHASER II expedition and his reports were widely covered in the British media, especially radio and online. SAMS research also featured on 'The Naked Scientist' radio programme, BBC Radio Cambridgeshire, Radioaustralia and others.

Numerous articles on SAMS research appeared in the press including the Herald, the Times, the Press and Journal, the Oban Times, Kincardineshire Observer, Mearns Leader, Fish EU, Fishfarming Expert, Forargyll.com, Inverness Courier and in publications such as NERC's Planet Earth, the Annual Report of the TOTAL Foundation and others.

*R. MacKinnon
H. McNeill
A. Miller
L. Sadler*

SAMS INFRASTRUCTURE



COMPLETION OF THE SHEINA MARSHALL BUILDING

In November 2010 SAMS completed the third stage of its redevelopment of the Dunstaffnage site: New teaching facilities were opened and the former Argyll College building was prepared for the development of Scottish Ocean Explorer Centre. The new development provides 469 m² of state of the art teaching laboratory space in four laboratories, including one which can accommodate up to 60 students; two IT laboratories which together can accommodate up to 40 students and 242m² of lecture rooms including a 55 seat lecture room. Students have access to a study room and a 60 seat café serves students and staff across the site. The SOECC has 166 m² of display space, a small cinema, a workshop space, a marine technology garden and a shop and seasonal coffee shop. The SOEC will enable SAMS to bring its science and the understanding of sustainable use of Scotland's seas closer to the public, through state of the art displays and public outreach programmes. A fund raising programme is currently underway to find the £367k initial sum to develop the display and staff resources needed to take forward the SOEC project to the next stage.

The new building was designed to incorporate a high level of energy efficiency measures. The heating is provided by two woodchip boilers and a reserve oil fired boiler. The environment of the building is controlled by a sophisticated building management system which monitors internal and external ambient conditions, and controls both heating and ventilation via

automatic mechanical windows. Lighting is responsive to external light conditions and within laboratories maintains artificial illumination only where it is necessary. The building surrounds will be landscaped and planted to enhance the ecology of the area.

The new development was completed by Barr Construction with a total project cost of approximately £6.1m, funded by the Scottish Funding Council, Highlands and Islands Enterprise with support from the European Regional Development Fund channelled through the University of the Highlands and Islands Strategic Delivery Body.

RESEARCH VESSELS

RVs *Calanus* and *Seol Mara* between them provided 137 days of support for research (93.5 days), SAMS UHI teaching (12 days), external charter (20.5 days) and to support university field courses (11 days). SAMS employed two permanent crew members and brought in relief crews as necessary.

During the reporting period *Calanus* was fitted with a new radar, sounder, 24v track plotter, and echo sounder repeater in plot, as well as a new CCTV system covering her work areas. We also constructed rail and seating for bird and mammal surveying. *Seol Mara* received new railings, 24v track plotter and autopilot. The pontoon was equipped with a new crane, CCTV security system and lockable container.

HEALTH AND SAFETY

Staff safety training was provided including: Safety induction for new students (28) and staff (16); CoSHH database (chemical safety advisor) (15); Automated external defibrillation (12); First Aid at Work (12); Oxygen Administration (12); Personal Survival Training (12); Recompression Familiarisation (12); Diving Supervisor (8); Fire extinguisher (4); Fire warden (4); First on Scene (First Aid) (4); Overhead crane (3); HIAB crane (3); Chainsaw use (ice cutting) (2); Forklift (2); Portable Appliance Testing database and visual inspection (2); BOC gases (1) and Legionella control (1)

The number of reported accidents (7) remained low. One of these, involving a knee injury sustained in the engine room of *Calanus*, was a RIDDOR reportable incident; near misses (3) showed an increase but were minor.

Following the decision by the incumbent Head of Health and Safety to take partial retirement in 2011, a trainee/assistant Laboratory Safety Advisor was appointed from within SAMS staff. When the present Head eventually retires, the new assistant is expected to step into this role.

Ken Jones
Ivan Ezzi

Appendix

SAMS STAFF

on 31 MARCH 2011

Director

Professor Laurence Mee

Deputy Director

Dr Ken Jones

Associate Directors

Ms Fran McCloskey

Dr Tracy Shimmield

Company Secretary

Mrs Elaine Walton

PA to the Director

Ms Lorna MacKinnon

Biogeochemistry and Earth Sciences

Dr John Howe (Head)

Dr Angela Hatton (Deputy)

Dr Richard Abell

Mr Colin Abernethy

Mr Tim Brand

Professor Ronnie Glud

Miss Natalie Hicks

Mr Morten Larsen

Mr John Montgomery

Mrs Leah Morrison

Mr Andrew Reynolds

Dr Arlene Rowan

Dr Henrik Stahl

Dr Robert Turnewitsch

Mr Gangi Reddy Ubbara

Ecology

Dr Michael Burrows (Head)

Dr Kim Last (Deputy)

Dr Thomas Adams

Miss Karen Alexander

Mr John Bainbridge

Dr Steven Benjamins

Ms Christine Beveridge

Dr Kenny Black

Ms Ruth Brennan

Mr Lars Brunner

Mr Jim Elliott

Dr Elizabeth Cook

Dr Clive Fox

Dr Sheila Heymans

Dr Adam Hughes

Dr David Hughes

Miss Zoe Hutchison

Dr Maeve Kelly

Mr Peter Lamont

Dr Vicki Last

Ms Shona Magill

Miss Raeanne Miller

Dr Bhavani Narayanaswami

Dr Thom Nickell

Dr Tim O'Higgins

Dr Tavis Potts

Dr Ian Rae

Dr Branka Valcic

Dr Tom Wilding

Dr Ben Wilson

Microbial and Molecular Biology

Dr Keith Davidson (Head)

Dr David Green (Deputy)

Mrs Undine Achilles-Day

Miss Avril Anderson

Dr Elanor Bell

Mrs Debra Brennan

Mrs Christine Campbell

Mrs Alison Clarke

Dr John Day

Mrs Joanne Field

Dr Claire Gachon

Dr Mark Hart

Dr Svenja Heesch

Dr Frithjof Kuepper

Dr Ray Leahey

Miss Sian Lordsmith

Mr Adrian MacLeod

Mrs Eleanor Martin

Miss Sharon McNeill

Miss Cecilia Rad Menedez

Mrs Elaine Mitchell

Dr Linda O'Higgins

Mr Michael Ross

Mrs Rachel Saxon

Mr Peter Schiener

Dr Stephen Slocombe

Dr Michele Stanley

Ms Sarah Swan

Dr Paul Tett

Miss Naomi Thomas

Ms Andrea Veszelovszki

Mrs Averil Wilson

Miss Qian Yi Zhang

Physics, Sea Ice and Technology

Dr Finlo Cottier (Head)
Dr Keith Jackson (Deputy)
Dr Dmitry Aleynik
Mr John Beaton
Dr Tim Boyd
Dr Andy Dale
Miss Estelle Dumont
Mr Colin Griffiths
Mr Bernard Hagan
Dr Phil Hwang
Dr Mark Inall
Dr Vladimir Ivanov
Mr Alistair James
Mr David Meldrum
Mr Shane Rodwell
Professor Toby Sherwin
Miss Emily Venables
Dr Jeremy Wilkinson

Education

Professor Axel Miller (Head)
Dr Lois Calder (Deputy)
Mrs Polly Crooks
Mrs Joyce Moore
Ms Linda Robb

Boats

Mr Chris Ireland
Mr Norman Smith

Business Development

Mr Dave Gunn
Mr John MacDonald
Dr Keri Page
Mrs Irene Partridge

Communications

Dr Anuschka Miller (Head)
Mr Rory MacKinnon
Mrs Helen McNeill
Mrs Laila Sadler

Contracts

Mr Derek Black (Head)
Miss Angela Anderson
Mrs Fiona Hart
Mrs Gillian McLuckie
Miss Helen Wilson

Diving

Dr Martin Sayer (Head)
Miss Elaine Azzopardi
Mr Hugh Brown
Dr Simon Thurston

Facilities

Mr David Mathias (Head)
Mr Alasdair Black
Mr Peter Bentley
Mr Brian Clark
Mr John Hill
Mr John Kershaw (Aquarium)
Mr Fraser MacDougall
Mr Kenny MacLean

Finance

Mrs Sarah Kennedy (Head)
Mrs Liz Campbell
Miss Sharyn Farmer
Mrs Lindy Lamb
Mrs Lorna Watt

Health and Safety

Mr Ivan Ezzi

Human Resources

Mr Ian Crawford (Head)
Ms Karen Campbell
Miss Jacqueline Cullen
Ms Rachel Culver
Mrs Shirley Kersley
Ms Margaret Sime

ICT and Information Services

Mr Steve Gontarek (Head)
Ms Olga Kimmins
Ms Nicola Longman
Mr Nigel MacLucas
Ms Elspeth Norris
Mr Lovro Valcic

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Bresnan E, Fernand L, Davidson K , Edwards M, Milligan S, Gowen R, Silke J, Kroger S, Raine R. Apr-10. Climate Change impacts on Harmful Algal Blooms (HABs). MCCIP Annual Report Card 2010-11, 10 annual report card

Cottier F , Inall ME , Hwang B , McKee D. Dec-10. Investigating the availability of remotely sensed data for Scotland's seas based on current and emerging technology. , 84 Commissioned contract report for Scottish Gov.

Fox CJ . Nov-10. West coast fishery trials of a twin rig Nephrops trawl incorporating a large mesh top sheet for reducing commercial species gadoid bycatch. S.I.S.P. 03/10. Scottish Industry Science Partnership Reports, 39 Contract Report

Hughes DJ . Aug-10. Analysis of marine biofouling on R16 water injection riser, Schiehallion oilfield, west of Shetland. , 11 Commissioned contract report

Hughes DJ , Hughes JA. Apr-10. Marine Climate Change Impacts, Annual Report Card 2010-2011. Marine Climate Change Impacts Partnership Annual Report Card, 12 Report

Hwang B , Lavergne T. Sep-10. Triple Comparison of OSI SAF Low Resolution Sea ice drift products. EUMETSAT Associate & Visiting Scientist scheme, final report (v1.3), 17 project report

Hwang B , Lavergne T. Sep-10. Validation and Comparison of OSI SAF Low and Medium Resolution and IFREMER/Cersat Sea ice drift products. EUMETSAT Associate & Visiting Scientist scheme, 27 project report

Millner R, Fox CJ , Capell R, Combes J. Apr-10. Marine Stewardship Certification Assessment Report, Osprey Trawlers North Sea ICES IVb twin rigged plaice fishery: Certification Report 82116/v3. MSC Certification Reports, 161 Consultancy report

Morris S, Stubbs B, Brunet C, Davidson K . Apr-10. Spatial distributions and temporal profiles of harmful phytoplankton, and lipophilic toxins in Common mussels and Pacific oysters from four Scottish shellfish production areas (2009).Final project report to the Food Standards Agency Scotland (FSAS). , 57 contract report

Narayanaswamy BE , Ojaveer H, Boxshall G, Appeltans W, Danovaro R, Holm P, Nickell TD . Mar-10. Diversity of European Seas - Finding New Life. , 55 Non-Technical report

Nickell TD , Davidson K , Fox CJ , Miller P, Hays G. Apr-10. Developing the capacity to monitor the spatial and temporal distributions of jellyfish in western Scottish waters. , 80 Contract Report

Sayer MDJ . Feb-10. NERC Facility for Scientific Diving: Annual Report. NERC Services and Facilities Annual Report 2008/09, 73-76 Annual Report

Swan SC , Davidson K . Mar-10. Monitoring Programme for the Presence of Toxin Producing Plankton in Shellfish Production Areas in Scotland. Reporting period: 01 January 2009 - 31 December 2009. , 53pp + appendix Contract annual report

POSTGRADUATE RESEARCH PROJECTS

AWARDED

Blicker M,

PhD, University of Copenhagen (Royal Scientific Investigations Greenland). *Arctic Macrofauna.*(Glud RN, Sejr M, Rysgaard S)

Carlsson MS,

PhD, University of Southern Denmark). *Degradation of mussel fecal pellets.*(Holmer M, Petersen JK, Glud RN)

Davies JS,

PhD, University of Plymouth. *Identification of areas of nature conservation importance in deep waters of the UK continental shelf, to contribute towards spatial planning and the development of an ecologically coherent network of MPAs in the North-East Atlantic.*(Howell K, Narayanaswamy BE, Stewart H, Jacobs C, Johnston CM)

Echavarri Bravo V,

MSc. Heriot-Watt University. *Characterisation of the growth and effects of acidophilic bacteria on calcium carbonate and algal coccoliths.*(Hartl M, Green DH)

Nordi G,

PhD, Overseas (Fiskerihoejskolen i Torshavn) *Aquaculture and benthic biogeochemistry.*(Glud RN)

Strittmatter M,

PhD, University of the Highlands and Islands. *Molecular biology of the Ectocarpus / Eurychasma pathosystem.* (Kuepper F, Gachon C, Van West P)

ONGOING RESEARCH

Achilles-Day U,

MSc, University of the Highlands and Islands. *Phylogeography of Paramecium vursaria endosymbionts.* (Gachon C, Leakey R)

Alexander K,

PhD, University of the Highlands and Islands (SUPERGEN). *Impacts of offshore power production - mitigation through habitat production.*(Wilding TA, Potts TW, Heymans JJ, Bryden I)

Andrews, G (now Notman)

PhD, University of the Highlands and Islands (NERC). *Biodiversity and ecosystem functioning* (Burrows MT, Hawkins S, McGill R)

Bainbridge J,

PhD, University of the Highlands and Islands (MaREE). *Marine spatial planning, innovation and renewable energy. Supporting a transition to sustainable regional economies.*(Potts TW, Valcic B)

Bell CW,

PhD, University of Aberdeen (NERC). *The small scales that control the large scales: retaining the important physics of narrow tidal straits in large scale ocean models of Western Scotland.*(Dale AC, Boyd TJ, Sherwin TJ)

Brennan R,

PhD. University of the Highlands and Islands (SAMS). *What lies beneath: probing the cultural depths of nature conservation conflict in the Outer Hebrides.*(Potts TW, MeeLD)

Carreira C,

PhD. University of Copenhagen. *Eirus microscale dynamics.*(Glud RN, Middelboe M)

Chivers A,

PhD. University of Aberdeen (NERC-MASTS). *The biodiversity and ecology of seamounts located in the NE Atlantic.*(Narayanaswamy BE, Turnewitsch R, Mair J)

Clark N,

PhD. Scottish Association for Marine Science (NERC). *Understanding the oceanic methane paradox: a microbial approach.*(Rowan A, Hatton AD, Hart M)

De Francisco Mora B,

PhD. University of the Highlands and Islands (EU-EPOCA). *Effects of ocean warming and acidification on the cold-water coral Lophelia pertusa.*(Last KS, Stahl H, Miller AEJ, Roberts JM)

DeRoo C,

PhD. University of Alaska Fairbanks (US NSF). *Modelling household behaviour to understand adaptation, mitigation, and transformation in Northern subsistence systems.*(Kofinas G, Valcic B)

Eckford-Soper L,

PhD. University of the Highlands and Islands (NERC). *The competitive dynamics of toxic and non-toxic ribotypes of the harmful dinoflagellate Alexandrium tamarense.* (Davidson K, Bresnan E, Turrell L)

Hughes SL,

PhD. University of the Highlands and Islands (FRS). *Inflow of Atlantic water to the North Sea: variability and influence on North Sea climate.* (Dale AC, Gallego A, Gillibrand P)

MacLeod A,

PhD. University of the Highlands and Islands (SUPERGEN). *Do artificial hard substrates facilitate non-native species in low and high energy environments?* (Stanley MS, Cook EJ, Day JG)

McIntyre K,

PhD, University of the Highlands and Islands (NERC). *Post-glacial fjordic landscape evolution: the onshore and offshore limits of the Younger Dryas ice sheet Western Scotland.* (Howe JA, Shimmield TM, Bradwell T)

Miller R,

PhD. University of the Highlands and Islands (SUPERGEN). *Offshore renewable energy structures as artificial islands: implications for dispersal, population connectivity and biogeography of coastal species.* (Burrows MT, Fox CJ, Inall ME)

Mogg A, PhD. University of the Highlands and Islands (NERC). *Production of dimethylsulphoxide by marine phytoplankton: the role of bacterial associates.* (Hatton AD, Green DH, Hart M)

Moossen H, PhD. University of Glasgow (SAGES). *Palaeoclimate reconstructions from Arctic and Nordic shelf seas: development and application of multiple proxies.* (Bendle J, Cottier F, Austin WEN, Howe JA)

Orr K, PhD. University of the Highlands and Islands (BIOMARA). *Modelling the ecosystem effects of harvesting seaweed for biofuel production.*(Heymans JJ, Wilding TA, Hughes DJ)

Porter M, PhD. University of the Highlands and Islands (SAGES). *Linking recent variability in Atlantic Ocean circulation and glacier mass balance in Greenland and Norway.* (Sherwin TJ, Rea B, Mair D)

Rabindranath A, PhD. University of St Andrews (self-funded). *Application of bio-acoustic techniques to observe and model arctic zooplankton behaviours.*(Brierley A, Cottier F)

RadMenendez C, MSc. University of the Highlands and Islands (NERC). *Genetic and phenotypic stability of *Thalassiosira pseudonana* (Bacillariophyceae).* (Stanley MS, Day JG)

Riley J, PhD. University of Southampton (NERC-SOFI). *Shipboard studies of the influence of inorganic seawater chemistry on calcareous microplankton and the biological carbon pump.* (Leakey RJG, Achterberg EP, Sanders R, Tyrell T, Rees A)

Schiener P, PhD. University of the Highlands and Islands (BIOMARA). *Ethanol production from algal biomass.*(Green DH, Stanley MS, Black KD)

Shellcock C, PhD. University of the Highlands and Islands (BIOMARA). *Molecular aspects of algal biofuels for the 21st Century.* (Stanley MS, Day JG, Green DH)

Soegaard D, PhD. Nature Institute in Nuuk, Greenland. *Sea-ice microbiology and associated gas exchange.* (Rysgaard S, Glud RN)

Stott K, PhD. University of St Andrews (SAGES). *Extending the marine instrumental climate record for European waters using the long-lived marine bivalve *Arctica islandica*.* (Wilson R, Inall ME, Austin WEN)

Suckling C, PhD. British Antarctic Survey. *Calcified marine invertebrates: the effects of ocean acidification.* (Peck LS, Cook EJ)

Toberman M, PhD. University of the Highlands and Islands (NERC-MASTS). *Thin surface layers - new perspectives on ocean mixing and colour.* (Inall ME, Boyd TJ, Cunningham A)

Turner G, PhD. University of the Highlands and Islands (NERC). *Benthic O₂ turn-over studied by eddy correlation.*(Glud RN, Stahl H, Berg P)

Venables E, PhD. University of the Highlands and Islands (NERC). *Internal tides over oceanic topography and their influence on mixing.* (Inall ME, Sherwin TJ)

Widmer C, PhD. University of St Andrews (MASTS). *Effects of climate variability on asexual reproduction and ecology of some important jellyfish species from British waters.*(Brierley A, Fox CJ)

SAMS RESEARCH GRANTS AND CONTRACT INCOME RECEIVED

Project Leader	Title	Funding body	Duration	Award
Maeve Kelly	Commercialising seaweed production (Redweed 2)	Highlands and Islands Enterprise	24 months	£3,820.00
Tom Wilding	SARF 036	SARF	24 months	£3,281.00
Kenny Black	Benthic recovery processes	SARF	36 months	£1,932.29
Mark Inall	SARF 012	SARF	24 months	£5,110.00
Dave Gunn	Public sector research exploitation fund	Economic Impact Team, DIUS	33 months	£314,652.00
Keith Davidson	Nuisance Blooms	DEFRA	8 months	£4,056.00
Kim Last	Measuring the effects of suspended particulate matter and smothering on the behaviour, growth and survival of key species found in areas associated with dredging	MEPF	30 months	£47,708.00
Ben Wilson	The use of acoustic devices to warn marine mammals of tidal stream energy renewable devices	The Scottish Government	6 months	£1,742.00
Tom Wilding	The systematic assessment of the environmental impact of Scottish shellfish farmers	SARF	24 months	£61,787.09
Ben Wilson	Estimates of collision risk of harbour porpoises and marine renewable devices at sites of high tidal stream energy	The Scottish Government	18 months	£16,887.82
Keith Davidson	Karenia III	The Crown Estate	18 weeks	£14,255.00
Anuschka Miller	Festival of the Sea	The Scottish Government and Argyll and the Islands Leader	12 months	£19,820.50
Keith Davidson	Developing the capacity to monitor the spatial and temporal distribution of jellyfish in western Scottish waters	The Crown Estate	18 months	£14,938.20
Keith Davidson	Karenia IV	The Crown Estate	4 months	£106.55
Clive Fox	West coast fishery trials of a twin rig nephrops trawl incorporation a large mesh top sheet for reducing commercial gadoid species bycatch	The Scottish Government	4 months	£4,370.00
Clive Fox	West coast forum desk study	Marine Scotland	4 months	£5,924.00
John Day	Control of grazers	The Carbon Trust	36 months	£197,282.00

SAMS RESEARCH GRANTS AND CONTRACT INCOME RECEIVED

Keith Davidson	Karenia 2010	The Crown Estate	6 months	£29,374.00
Kenny Black	Modelling sea lice dispersal in the Clyde sea system	Marine Scotland	60 months	£51,512.00
Adam Hughes	SARF 081	SARF	3 months	£562.00
Tavis Potts	Litter	Marine Scotland – via Macaulay Institute	3 months	£7,958.00
Paul Tett	Ecohealth	CEFAS	15 months	£2,054.00
Keith Davidson	Jellymeet	The Crown Estate	2 months	£11,304.00
Jeremy Wilkinson	ACCESS	EUFP7	36 months	£7,165.00
Lois Calder	COBO	EUFP6	36 months	£43,032.42
Kenny Black	ECASA	EUFP6	36 months	£648.38
Murray Roberts	HERMES	EUFP6		£562.27
Jeremy Wilkinson	DAMOCLES	EUFP6	48 months	£8,253.70
Mark Inall	Millennium	EUFP6	48 months	£4,638.38
Axel Miller	Ecosummer	EUFP6	48 months	£305,835.63
Maeve Kelly	SPIES DETOX	EUFP6	36 months	£3,713.72
Kenny Black	AQUAGRIS	EUFP6	24 months	£1,985.20
Tavis Potts	Science and policy integration for coastal systems assessment	EUFP6	48 months	£109,340.70
Axel Miller	Scocrates-Erasmus mobility	EU	ongoing	£5,741.98
Murray Roberts	Trans-Atlantic coral ecosystem studies	EUFP6	24 months	£9,949.65
Axel Miller	Ecosummer Strittmatter	EUFP6	36 months	£134,763.00
Axel Miller	Ecosummer Loenberg	EUFP6	36 months	£86,939.00
Ben Wilson	Equitable testing and evaluation of marine energy extraction devices in terms of performance, cost and environmental impact	EUFP7	36 months	£57,364.98
Axel Miller	Ecosummer Gontikaki	EUFP6	36 months	£87,326.00
Kim Last	European project on ocean acidification	EUFP7	48 months	£34,686.40
Toby Sherwin	THOR	EUFP7	48 months	£29,229.24
Maeve Kelly/ Adam Hughes	Enrichment of aquaculture systems by introduction of commercially underdeveloped marine species from different trophic levels	EUFP7	24 months	£73,176.75
Laurence Mee	Knowledge based sustainable management of Europe's seas	EUFP7	48 months	£104,026.71
Laurence Mee	Knowledge based sustainable management of Europe's seas	EUFP7	48 months	£45,248.00

SAMS RESEARCH GRANTS AND CONTRACT INCOME RECEIVED

Claire Gachon	Disease and immunity in brown algae	EUFP7	36 months	£12,211.00
Bhavani Narayanaswamy	Hotspot ecosystem research and man's impact of European seas	EUFP7	36 months	£3,507.96
Frithjof Kuepper	ASSEMBLE	EUFP7	48 months	£130,179.22
Henrik Stahl	<i>In situ</i> monitoring of oxygen depletion in hypoxic ecosystems of coastal and open seas and land locked water bodies	EUFP7	36 months	£27,570.01
Kenny Black	Assessing the causes and developing measures to prevent the escape of fish from sea cage aquaculture.	EUFP7	48 months	£15,827.38
Frithjof Kuepper	Assemble TA	EUFP7	48 months	£633.00
Keith Davidson	Asimuth	EUFP7	36 months	£19,607.20
Laurence Mee	EMBRC	EUFP7	36 months	£9,350.84
Ben Wilson	DRIFTING EARS	PSRE Innovation Fund	12 months	£5,000.00
Lovro Valcic	IOS APP	PSRE Innovation Fund	12 months	£5,810.00
John Day	OSMO ALGAL OIL	PSRE Innovation Fund	12 months	£5,000.00
Michele Stanley	FAT ALGAE	PSRE Innovation Fund	12 months	£5,000.00
Tracy Shimmiel	PATENT APP	PSRE Innovation Fund	12 months	£5,000.00
Axel Miller	MASTS Grad School	MASTS	60 months	£2,368.00
Maeve Kelly	AAAG	EU INTERREG	36 months	£12,920.18
Kenny Black	Monfish	Nuffield Foundation	ongoing	£7,000.00
Bhavani Narayanaswamy	Stavros Core	Stavros Niarchos	36 months	£7,302.00
Mark Inall	Mariclim		36 months	£8,675.00
David Green	Siderophore	San Diego State University	24 months	£5,839.00
Keith Davidson	FINAL	IFREMER	33 months	£1,903.13
Tracy Shimmiel	Sages	SAGES	48 months	£61,379.00
Bhavani Narayanaswamy	Deseo	Individuals	ongoing	£11.84
Maeve Kelly	SUPERGEN	ESPRC	48 months	£28,831.30
Tavis Potts	The effectiveness of certification and eco-labelling in improving the sustainability of fisheries and aquaculture resources	ESRC	24 months	£4,118.49
Liz Cook	Aliens II	Esmée Fairbairn	36 months	£38,763.00
Anushka Miller	Marine Science Festival	Argyll Leader	12 months	£607.00
Ken Jones	Aquarium Upgrade SDB	UHI Millennium Institute	24 months	£39,485.11

SAMS RESEARCH GRANTS AND CONTRACT INCOME RECEIVED

Jeremy Wilkinson	Buoy Drift	Danish Technical University	48 months	£14,004.00
David Green	Siderophore Extn	San Diego State University	24 months	£5,765.66
Bhavani Narayanaswamy	EuroCOML synthesis	European Census of Marine Life	12 months	£3,115.78
Toby Sherwin	SAGES PhD Porter	SAGES	36 months	£13,678.00
Tim Boyd	SCICEX	Office of Navel Research Boston	12 months	£197.03
Michele Stanley	BioMara	Special EU Programmes Body/The Crown Estate/HIE	48 months	£883,924.82
Bhavani Narayanaswamy	EuroCOML 2010	The TOTAL Foundation	24 months	£50,698.13
Dan Sinclair	Sages PhD Douarin	SAGES	36 months	£2,215.00
Bhavani Narayanaswamy	Sloan Synthesis	Sloan Foundation	11 months	£13,039.00
Tavis Potts	ECOBAR - Benthic indicators for monitoring the ecosystem of the Barents Sea	Research Council of Norway	24 months	£11,018.00
Ken Jones	New build - teaching block	UHI Millennium Institute		£4,647,990.71
Keith Davidson	Water	Northern Periphery Programme	36 months	£40,810.79
Kim Last	Teaching at Newcastle University	Newcastle University	12 months	£8,322.40
Frithjof Kuepper	Macroalgal and oomycete benthic diversity in the Canadian Marine Arctic	The TOTAL Foundation	48 months	£1,379.85
Laurence Mee	GEF	United Nations University	12 months	£22,318.58
Mike Burrows	Urban Research on biodiversity on artificial and natural coastal environments - enhancing by intelligent design	Marine Biological Association	36 months	£5,684.00
Liz Cook	Effect of ocean acidification on life history traits in native and non native amphipod crustaceans and implications for invasion success	The British Ecological Society	2 months	£1,352.00
Ben Wilson	Underwater acoustic interactions between emerging tidal-energy technologies and vertebrates	Scottish Natural Heritage	36 months	£14,692.00
John Day	BPS conference	Individuals	6 months	£3,853.00
Jeremy Wilkinson	Deployment of ice buoys	Greenpeace	1 months	£27,362.00
Michele Stanley	Shellcock PhD - BioMara	Special EU Programmes Body/The Crown Estate/HIE	36 months	£14,662.00

SAMS RESEARCH GRANTS AND CONTRACT INCOME RECEIVED

Michele Stanley	Orr PhD - BioMara	Special EU Programmes Body/The Crown Estate/HIE	36 months	£13,690.00
Tom Wilding	Alexander PhD - Supergen	SDB/HIE/ERDF & HIPP	36 months	£32,082.00
Michele Stanley	MacLeod PhD - Supergen	SDB/HIE/ERDF & HIPP	36 months	£34,310.00
Michael Burrows	Miller PhD - Supergen	SDB/HIE/ERDF & HIPP	36 months	£32,744.00
Tom Wilding	Yassir Al Borae PhD	Saudi Arabian Cultural Office	36 months	£15,817.00
Phil Hwang	Sea-ice-ocean atmosphere variability in the Canadian Basin of the Arctic Ocean	The Royal Society	24 months	£7,491.00
Steve Gontarek	To support the archival of priority marine data sets within the MEDIN DAC network - digitisation and checking of 70s inshore fisheries data	MEDIN	5 months	£353.00
Steve Gontarek	To support the archival of priority marine data sets within the MEDIN DAC network - digitisation of plankton data inshore fisheries data	MEDIN	5 months	£72.00
David Meldrum	International travel	JCOMM	4 months	£2,473.00
Liz Cook	NNRAP Cook	Food & Environment Research Agency	12 months	£1,300.00
Tim Boyd	Travel grant	Royal Society	1 month	£4,000.00
Ronnie Glud	Greenland Glud	Greenland Climate Research Centre	5 years	£114,410.55
Kenny Black	Marine renewable energy and the environment	UHI ERDF	3 years 10 months	£164,667.00
Tavis Potts	Bainbridge PhD MaREE	UHI ERDF	36 months	£13,086.00
Kim Last	Hutchison PhD MaREE	UHI ERDF	36 months	£13,730.00
Ben Wilson	Aquaterra Tidal Impact	Aquaterra	2 months	£9,178.00
Kenny Black	<i>Didemnum</i>	Scottish Natural Heritage (SNH)	2 months	£2,945.00
Phil Hwang	Sea Ice Drift	Norwegian Metereological Inst.	3 months	£9,126.33
Kenny Black	Whitby kelp	Atkins Ltd	6 months	£6,600.48
Keith Davidson	BPS summer student	British Phycological Society	2 months	£840.00
Kim Last	MASTS 111	Newcastle University	12 months	£226.00
Bhavani Narayanaswamy	Ampere Seamount mini grant	CenSeam, FAO Mireille Consalve	3 months	£1,263.68
Tim Boyd	Submarine science	Office of Naval Research Globa		£4,113.10
Kenny Black	<i>Didemnum</i> II	SNH	5 months	£4,076.00

SAMS RESEARCH GRANTS AND CONTRACT INCOME RECEIVED

Frithjof Kuepper	Brown algae	University of Aberdeen	4 years	£4,792.74
Phil Hwang	Hwang talk	MOERI	12 months	£1,145.87
Keith Jackson	Satice	European Science Foundation	36 months	£19,635.32
Angela Hatton	MSc Dayton	Nikki Dayton	12 months	£851.00
Adam Hughes	MSc Humphreys	Morgan Humphreys	12 months	£574.00
Sheila Heymans	Oak 2	Oak Foundation Ltd	5.5months	£11,649.19
Toby Sherwin	Glider workshop	Marine Science Coordination Co	6 months	£5,738.00
Maeve Kelly	Holopharm	Genomia Management	12 months	£7,333.00
Ben Wilson	Van Geel PhD	Harper MacLeod LLP	36 months	£8,470.00
Ken Jones	MASTS meeting	MASTS	4 months	£276.00
Michele Stanley	CCAP algae genomes	Genomia Fund/SAMS Innovation Fund	12 months	£7,000.00
Mark Inall	MASTS port	MASTS	4 months	£6,500.00
Michele Stanley	Algal Bioenergy SIG director	NERC/Technology Strategy Board	24 months	£6,647.00
Jeremy Wilkinson	CryoSat - consortium grant	NERC	68 months	£35,251.95
Axel Miller	Additional skills training	NERC	ongoing	£1,225.00
Lois Calder	ISFA PhD - (Batty)	NERC	36 months	£174.00
David Meldrum	ASBO	NERC	36 months	£14,842.04
Frithjof Kuepper	Iodovolitisation	NERC	36 months	£3,302.54
Toby Sherwin	C Johnson PhD Extn	NERC	60 months	£622.00
Angela Hatton	Unravelling the methane paradox	NERC	36 months	£68,398.00
Mark Inall	ECOMAR	NERC	60 months	£61,508.22
Keith Jackson	SASSI	NERC	42 months	£69,718.38
Angela Hatton	Production of dimethylsulphoxide by marine phytoplankton: the role of bacterial associates	NERC	36 months	£15,591.00
John Howe	Post glacial fjordic landscape evolution: the onshore and offshore limits of the Younger Dryas ice sheet, western Scotland	NERC	36 months	£17,884.69
Angela Hatton	Sequencing the sea sulphur cycle	NERC	24 months	£114.28
Clive Fox	Population structuring of cod around the UK: scale, mechanisms and dynamics	NERC	32 months	£1,156.82
Murray Roberts	TRACES European workshop and meetings	NERC	2 days	£2,910.59

SAMS RESEARCH GRANTS AND CONTRACT INCOME RECEIVED

Tim Boyd	Temperature microstructure during the IPY: quantifying the impact of warm subsurface water on melting Arctic sea ice	NERC	24 months	£20,332.29
Ronnie Glud	Carbon mineralisation of shelf and coastal sediments: a holistic approach using state of the art lander technology and the eddy-correlation technique	NERC	36 months	£56,968.38
Toby Sherwin	Modelling of the Wyville Thomson Ridge	NERC	24 months	£5,428.02
Frithjof Kuepper	<i>Eurymedusa</i>	NERC	36 months	£27,651.87
Ronnie Glud	Micro-heterogeneity of carbon mineralisation and metal mobilisation in marine sediments	NERC	30 months	£75,255.77
Mark Inall	DIMES	NERC	60 months	£20,006.09
Andrew Dale	STRATHLOCHY	NERC	36 months	£26,477.82
	Novel ice characterisation experiment - phase 1	NERC	24 months	£34,681.85
Martin Sayer	NFSD	NERC	60 months	£315,779.74
Robert Turnewitsch	Topodeep	NERC	24 months	£125,217.49
Toby Sherwin	Rapid watch	NERC	36 months	£9,040.77
Keith Davidson	The competitive of toxic and non toxic ribotypes of the harmful dinoflagellate <i>Alexandrium mikimotoi</i>	NERC	36 months	£19,599.08
Ronnie Glud	Turner PhD	NERC	36 months	£18,017.76
David Meldrum	Using the seebeck effect to power sea ice instrumentation	NERC	24 months	£19,650.53
Andrew Dale	Great race eddies and turbulence	NERC	36 months	£133,605.71
Jeremy Wilkinson	Sea ice processes and mass balance in the Bellinghausen Sea	NERC	42 months	£189,579.12
Mike Burrows	Larval quality	NERC	36 months	£2,587.14
Finlo Cottier	Panarcive	NERC	18 months	£11,472.54
Jeremy Wilkinson	Inuit	NERC	12 months	£46,535.41
Henrik Stahl	CCS	NERC	36 months	£29,234.34
Ray Leakey	OABTT1	NERC	36 months	£131.00
Ronnie Glud	BENTHIC OA	NERC	36 months	£85,409.94
Ben Wilson	NERC renewables	NERC	6 months	£12,972.00
Angela Hatton	MISM	NERC	36 months	£36,623.92

SAMS RESEARCH GRANTS AND CONTRACT INCOME RECEIVED

Andrew Dale	Bell PhD	NERC	36 months	£9,963.00
Bhavani Narayanaswamy	Chivers PhD	NERC	36 months	£7,274.54
Mark Inall	Toberman PhD	NERC	36 months	£8,052.39
Angela Hatton	Clark PhD	NERC	36 months	£7,071.00
Ken Jones	Oceans 2025 control account	NERC	60 months	£2,716,819.00
Keith Jackson	Theme 8 WP 8.9 satellite communications	NERC	60 months	£56.64
John Day	CCAP NF3 CCAP	NERC	60 months	£1,173.31
Tracy Shimmield	Cruise cost	NERC	60 months	£567.92
Axel Miller	RAE - Recoverable	UHI Millennium Institute	ongoing	£912,377.00
Axel Miller	UHI teaching BSc	UHI Millennium Institute	ongoing	£159,928.88
Axel Miller	UHI PhD	UHI Millennium Institute	Ongoing	£39,833.24
Axel Miller	FE/HE articulation	UHI Millennium Institute	12 months	£6,134.00
Elaine Walton	UHI hardship allowance	UHI Millennium Institute	Ongoing	£4,750.22
Axel Miller	Wider access retention premium	UHI Millennium Institute	Ongoing	£1,737.00
Dave Gunn	RAE knowledge transfer officer	UHI Millennium Institute		£98,522.00
Axel Miller	UHI graduate school	UHI Millennium Institute	24 months	£34,403.53

SAMS RESEARCH SERVICES LTD PROJECTS AND FUNDERS

Project Leader	Title	Funding body	Duration
Ben Wilson	Islay Tidal Energy II	DP Energy	12 months
Martin Sayer	Recompression Incidents	Grampian Health Authority	ongoing
John Day	CCAP Commercial	Individuals	ongoing
Sarah Swan	FSA MONITOR	Food Standards Agency	ongoing
David Meldrum	IRIDIUM	World Meteorological Association	16 months
Leah Morrison	PSA/LOI	Scottish Salmon Company	ongoing
Ben Wilson	Islay Tidal Energy	DP Energy	14 months
Kenny Black	NNRAP II	DEFRA	2 years
Mark Inall	Remote Sensing	Scottish Government	3 months

SAMS RESEARCH SERVICES LTD PROJECTS AND FUNDERS

Mike Burrows	Weedmap	ITI Scotland	6 months
Clive Fox	EKOFISH MSC	Moody Marine	5 months
Tavis Potts	LINK	LINK	4 months
Ben Wilson	F.O.W ACOUSTIC	EMEC	2 months
John Kershaw	Seawater Tank PGS	PGS	2 months
Kenny Black	Aquaculture Chemicals	SNH	6 months
John Kershaw	Seawater Tank Hire PGS II	PGS	4 weeks
Tom Wilding	MITMAG	Scottish Power Renewables	2 weeks
Dave Hughes	Ecoguide	SNH	1 month
Andy Dale	Bumpsdeeps	SNH	1 month
Ben Wilson	SMRU Report	SNH	3 months
Martin Sayer	Technical Support - Grampian	Grampian Uni Hospital Trusts	ongoing
Rory MacKinnon	AO Printer	Individuals	ongoing
Elaine Walton	Visitor Services	Individuals	ongoing
Tracy Shimmiel	Papua New Guinea	Papua New Guinea Government	21 months
Kenny Black	Depomod Licenses	Individuals	ongoing
Ben Wilson	Tidal Flow Study	Scottish Government	2 months
Michele Stanley	AEA	AEA Technology	9 months
David Meldrum	EDF Alpine	EDF	10 months
Ray Leakey	Fugro Phytoplankton/Zoo	Fugro	2 months
Keith Jackson	SIMBA	Individuals	ongoing
Ray Leakey	Flow Cytometry	Glycomar	ongoing
Kenny Black	B&S EIA Review	Falkland Islands Government	5 months
Toby Sherwin	NWAG FSC	North West Approaches Group	9 months
Kenny Black	Monosaccharide Analysis	Glycomar	ongoing
Ben Wilson	Skerries Collision	SMRU	2 months
Ivan Ezzi	Commercial Boat Hire - <i>Calanus</i>	Individuals	ongoing
Ivan Ezzi	Commercial Boat Hire - <i>Seol Mara</i>	Individuals	ongoing
Dave Hughes	Marine Biofouling R16	BP Exploration Operating Co Ltd	7 months
Ben Wilson	Drifting Ears Repairs	Open Hydro	7 months
Tracy Shimmiel	PNG Witness	Papua New Guinea Government	12 months
Kim Last	BEEMS 2010	CEFAS	7 months
Kenny Black	KELPCUT	Scottish Enterprise	7 months
Tracy Shimmiel	Basamuk Upwelling	Mineral Resources Authority	12 months
Ray Leakey	FUGRORED	Fugro	3 months
Bhavani Narayanaswamy	SEA7 Analysis	JNCC	2 months

Financial Statements

31 March 2011

The Scottish Association for Marine Science

Annual Report and Financial Statements

31 March 2011

Registered No: SC 009292

Directors

Professor Andrew Hamnett (President)
Dr R A Scrutton (Resigned 5 November 2010)
Commodore C Stevenson
Dr K L Duff
Dr J M Rogers
G C McAllister
Dr C J Phillips
W T S Speirs
Professor M Bownes
Professor G M Henderson
Professor D Paterson
Professor P H Burkill
M Gibson (Chair of the Board to Council)
Mr Michael Robert Francis Wilkins (Appointed 27 April 2010)
Robert Ferrier
Ken Rundle
S G Cannon (Appointed 5 November 2010)

Secretary

E B Walton

Auditors

Ernst & Young LLP
Barony House
Stoneyfield Business Park
Stoneyfield
Inverness IV2 7PA

Bankers

Bank of Scotland
Station Road
Oban PA34 4LL

Solicitors

Wright, Johnston & Mackenzie
302 St Vincent Street
Glasgow G2 5RZ

Registered Office

Scottish Marine Institute
Oban
Argyll PA37 1QA

Charity Number: SC 009206

Council report

The Council, who are also Directors of the Charity for the purposes of the Companies Act, for The Scottish Association for Marine Science (SAMS) presents its report and the group financial statements for the year ended 31 March 2011.

SAMS is a company limited by guarantee governed by its Memorandum and Articles of Association. It is registered as a charity with the Office of the Scottish Charity Regulator. Anyone can become a member of SAMS and there are currently 463 including 30 corporate and 64 students (456 in 2010), each of whom agree to contribute £1 in the event of the charity winding up.

SAMS is not permitted by its Memorandum of Association to become a trade union or to distribute profits to its members.

SAMS is a Collaborative Centre of the Natural Environment Research Council and an Academic Partner of the University of the Highlands and Islands.

Principal activity

The principal activity of the group is to promote the study of marine science through research and education.

There have been no changes in principal activity since the last annual report.

Objectives and activities

SAMS mission is “To improve understanding and stewardship of the marine environment, through research, education, maintenance of facilities and technology transfer.”

Business review

Results

The results for the year are detailed on page 9 of the financial statements. The net incoming resources taken to reserves is £4,353k (2010 - £949k).

Charity accounting for capital grants will inflate net incoming resources in the years that capital grants are received as little or no charge is recorded in the same year. In managing the business SAMS considers net income from operations excluding capital grants and related funded depreciation. SAMS continues to achieve a positive result in net income from operations. £183k (2010 - £166k). Whilst net income remains slightly lower than budget which will affect investment, this result is considered to be a significant indication that the SAMS business model is working.

SAMS prepares an annual report that is made publicly available through our website. This report provides information covering the current and future activities of all areas of the organisation.

Future Plans

SAMS is committed to sustaining its status as a collaborative centre for NERC and to providing national facilities for NERC.

SAMS is an Academic Partner of the University of the Highlands and Islands.

SAMS will continue to seek grants and service contracts from new and diverse funds.

During the year SAMS completed a capital project to build a new teaching facility now named the Sheina Marshall Building. This facility, costing £6m, provides state of the art teaching labs and lecture theatres as well as a visitor and outreach centre.

Council report

Risk statement

SAMS Council has an established risk management strategy which comprises:

- an annual review of the risks which the charity may face
- the establishment of systems and procedures to mitigate those risks identified in the plan; and
- the implementation of procedures designed to minimise any potential impact on the charity should any of those risks materialise.

Revisions to the Risk Register are considered by the Council, the Board to Council and relevant Committees. The regular process of consideration and review of the appropriateness of the Register is delegated to the Executive Group which reports back to Council through the Board.

Directors

The directors, who served the charitable company as Council Members, during the year are listed on page 1.

Reserves policy

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

- Continue to meet its ongoing financial commitments within agreed terms of credit
- Deploy the required funds promptly in a planned way to react to new opportunities and strategic decisions undertaken by the Associations' Executive Group
- Ensure that the Association is not forced into short term decisions that might impact on its longer term vision and strategy because of any short term setback, whether operational or in key sources of income, such as NERC funding under Oceans 2025

The policy aims for the Association to hold, in future, in general unrestricted reserves a minimum of 3 months annualised expenditure in order to provide adequate working capital levels for the continued operation of the Association and completion of existing projects.

The accumulated reserves and available funds will be applied towards the objectives of the Association. The Trustees accept that this may involve the use of funds in excess of the income generated in one year while in other years the cycle of the Associations activities does not allow the distribution of all funding received (particularly in respect of capital grants).

A designated fund for fixed assets reflects the need to demonstrate the level of funds required to provide the assets necessary for delivering marine science research. Unrestricted undesignated funds reflect the amount of reserves freely available to spend on any of the charity's purposes, including those stated above. Whilst the total of unrestricted funds is positive, the undesignated element is negative following the creation of the designated fixed asset fund. This exists because of the loan obtained to complete the main research building at the Dunstaffnage site. SAMS will aim to achieve the policy aims stated above but in reality the existence of the long term loan will make their achievement also long term in nature. SAMS is satisfied that this does not affect the sustainability of the Group.

The Council

The members of the Council, who act as trustees and directors, are all guarantors of the company, of an amount not exceeding £1, during the period of their appointment as Council members and for a year after

Council report

resignation. The Council is appointed in accordance with the Memorandum and Articles of Association, which allows trustees to serve a maximum of two consecutive 3-year terms.

The members of the Governing Council during the year are listed on page 1.

Both the Natural Environment Research Council (NERC) and Highlands & Island Enterprise (HIE) have observer status at SAMS Council meetings.

Any member of SAMS can nominate a new trustee to serve on Council. The SAMS Director has the responsibility to outline the duties and responsibilities to potential trustees. A new trustee is nominated and seconded at the AGM.

New trustees attend a briefing meeting with the SAMS Director or Company Secretary and are provided with the relevant guidance notes from Companies House and the Office of the Scottish Charity Regulator.

SAMS Council meet quarterly with an annual retreat. A new governance structure has now been put in place and the Council is served by a Board and five sub-committees; Finance Committee, Audit Committee, Research Committee, Education Committee and Business Development Committee that now incorporates the SRSL Board. The SAMS Council, the Board and its Committees approve the Group's strategy and the implementation of the strategy is delegated to the Executive Group led by the SAMS Director.

Investment policy and performance

The Council has considered the most appropriate policy for investing funds and has found that short to medium term investment of funds should be held in a mixture of current and investment accounts to optimise interest earned.

Executive Group

Management of the Charity is delegated by the Council to the Director and the SAMS Executive Group. The members of the Executive Group during the reporting period were:

Prof Laurence Mee – Director
Dr Ken Jones - Deputy Director
Dr Michael Burrows - Head of Ecology
Dr Finlo Cottier – Head of Physics, Sea Ice and Technology
Dr Keith Davidson – Head of Microbiology and Molecular Biology
Dr John Howe – Head of Biogeochemistry and Earth Sciences
Prof Axel Miller – Head of Education
Dr Tracy Shimmield – Assistant Director, Business Development
Ian Crawford – Director of Human Resources
Fran McCloskey – Assistant Director, Corporate Strategy, Performance and Finance
Elaine Walton - Company Secretary

Equal opportunities

The company is committed to provide full opportunity for the development of individuals' talents by using criteria based on merit and job performance alone in employment related decisions. It is further committed to ensure it does not discriminate on grounds of gender, marital status, race, colour, ethnic or national origins, age, religious belief, sexual orientation or disability.

Council report

Directors' statement as to disclosure of information to auditors

The directors who are members of the Council at the time of approving the directors' report are listed on page 1. Having made enquiries of fellow directors and of the company's auditors, each of the directors confirms that:

- to the best of each director's knowledge and belief, there is no information relevant to the preparation of their report of which the company's auditors are unaware; and
- each director has taken all the steps a director might reasonably be expected to have taken to be aware of relevant audit information and to establish that the company's auditors are aware of that information.

Auditors

A resolution to reappoint Ernst & Young LLP as auditors will be put to the members at the Annual General Meeting

By order of the Council

Professor Andrew Hamnett

President

Statement of Council's responsibilities in respect of the financial statements

The Members of Council (who are directors for the purposes of company law) are responsible for preparing the Annual Report and the financial statements in accordance with applicable law and regulations.

Company law, the Charities and Trustees Investment (Scotland) Act 2005 and regulation 8 of the Charities Accounts (Scotland) Regulations 2006, requires the Members of Council to prepare financial statements for each financial year. Under that law the Members of Council have elected to prepare the financial statements in accordance with United Kingdom Generally Accepted Accounting Practice (United Kingdom Auditing Standards and applicable law). Under company law the Members of Council must not approve the financial statements unless they are satisfied that they give a true and fair view of the state of affairs of the charitable company and the group and of the surplus or deficit of income over expenditure of the group for that period. In preparing those financial statements, the Members of Council are required to:

- select suitable accounting policies and then apply them consistently;
- make judgements and estimates that are reasonable and prudent; and
- prepare the financial statements on the going concern basis unless it is inappropriate to presume that the group will continue in business.

The Members of Council are responsible for keeping proper accounting records which disclose with reasonable accuracy at any time the financial position of the group and to enable them to ensure that the financial statements comply with the Companies Act 2006, the Charities and Trustees Investment (Scotland) Act 2005 and regulation 8 of the Charities Accounts (Scotland) Regulations 2006. They are also responsible for safeguarding the assets of the group and hence for taking reasonable steps for the prevention and detection of fraud and other irregularities.

Independent Auditors Report

for the year ended 31 March 2011

We have audited the group financial statements of The Scottish Association for Marine Science for the year ended 31 March 2011 which comprise the Group Statement of Financial Activities, the Group Balance Sheet, the Balance Sheet, the Group Statement of Cash Flows and related notes 1 to 20. These financial statements have been prepared in accordance with the accounting policies set out therein.

This report is made solely to the members, as a body, in accordance with our appointment under section 44(1)(c) of the Charities and Trustee Investment (Scotland) Act 2005 and Chapter 3 of Part 16 of the Companies Act 2006. Our audit work has been undertaken so that we might state to the company's members those matters we are required to state to them in an auditors' report and for no other purpose. To the fullest extent permitted by law, we do not accept or assume responsibility to anyone other than the company and the company's members as a body, for our audit work, for this report, or for the opinions we have formed.

Respective responsibilities of Members of Council and auditors

As stated in the Statement of Directors' Responsibilities set out on page 6, the members of Council (who are also the directors of The Scottish Association for Marine Science for the purposes of company law) are responsible for the preparation of the Financial Statements in accordance with applicable law and United Kingdom Accounting Standards (United Kingdom Generally Accepted accounting Practice) and for being satisfied that the financial statements give a true and fair view.

We have been appointed auditor under section 44(1)(c) of the Charities and Trustees Investment (Scotland) Act 2005 and under the Companies Act 2006 and report to you in accordance with those Acts.

Our responsibility is to audit the financial statements in accordance with relevant legal and regulatory requirements and International Standards on Auditing (UK and Ireland).

We report to you our opinion as to whether the financial statements give a true and fair view, have been properly prepared in accordance with United Kingdom Generally Accepted Accounting Practice, and have been prepared in accordance with the Companies Act 2006, the Charities and Trustee Investment (Scotland) Act 2005 and regulation 8 of the Charities Accounts (Scotland) Regulations 2006. We also report to you whether, in our opinion, the information given in the Trustees' Annual Report is consistent with those financial statements.

We also report to you if, in our opinion, the charitable company has not kept adequate and proper accounting records, if the charitable company's financial statements are not in agreement with the accounting records and returns, if we have not received all the information and explanations we require for our audit, or if certain disclosures of trustees' remuneration specified by law are not made.

We read the Trustees' Report and consider the implications for our report if we become aware of any apparent misstatements with the financial statements.

Basis of audit opinion

We conducted our audit in accordance with International Standards on Auditing (UK and Ireland) issued by the Auditing Practices Board. An audit includes examination, on a test basis, of evidence relevant to the amounts and disclosures in the financial statements. It also includes an assessment of the significant estimates and judgements made by the directors in the preparation of the financial statements, and of whether the accounting policies are appropriate to the charitable company's circumstances, consistently applied and adequately disclosed.

We planned and performed our audit so as to obtain all information and explanations which we considered necessary in order to provide us with sufficient evidence to give reasonable assurance as to whether the financial statements are free from material misstatement, whether caused by fraud or other irregularity or error. In forming our opinion we also evaluated the overall adequacy of the presentation of information in the financial statements.

Independent Auditors Report

for the year ended 31 March 2011

Opinion

In our opinion:

- the financial statements give a true and fair view of the state of affairs of the charitable group as at 31 March 2011 and of its incoming resources and application of resources, including its income and expenditure, for the year then ended;
- the financial statements have been properly prepared in accordance with United Kingdom Generally Accepted Accounting Practice;
- the financial statements have been prepared in accordance with the Companies Act 2006, the Charities and Trustee Investment (Scotland) Act 2005 and regulation 8 of the Charities Accounts (Scotland) Regulations 2006; and
- the information given in the Council Report is consistent with the financial statements.

Eunice McAdam, Senior Statutory Auditor,
for and on behalf of Ernst & Young LLP, Statutory Auditor

Inverness

Group statement of financial activities
(incorporating the income and expenditure account)
for the year ended 31 March 2011

		2011	2011	2011	2011	2010
		Unrestricted funds				
	Notes	Undesignated £000	Designated £000	Restricted £000	Total £000	Total £000
Incoming resources						
Incoming resources from generated funds:						
Activities for generating funds		233	-	-	233	201
Investment income		-	-	-	-	2
Incoming resources from charitable activities	2	2,857	-	12,087	14,944	10,416
Total incoming resources		3,090	-	12,087	15,177	10,619
Resources expended						
Cost of generating funds	3	7	-	15	22	37
Charitable activities	4	2,734	111	7,902	10,747	9,562
Governance costs		55	-	-	55	71
Total resources expended		2,796	111	7,917	10,824	9,670
Net incoming resources before transfers	5	294	(111)	4,170	4,353	949
Fund balance brought forward at 1 April 2010		(1,036)	4,536	10,227	13,727	12,778
Total Funds carried forward at 31 March 2011		(742)	4,425	14,397	18,080	13,727

Group statement of financial activities
(incorporating the income and expenditure account)
for the year ended 31 March 2011

Statement of total recognised gains and losses

There are no recognised gains or losses other than the net incoming resources of £4,353k in the year ended 31 March 2011 and £949k in the year ended 31 March 2010.

Group balance sheet

at 31 March 2011

	<i>Notes</i>	March 2011 £000	March 2010 £000
<i>Fixed assets</i>			
Tangible assets	9	18,822	14,761
Investments	10	-	-
		<u>18,822</u>	<u>14,761</u>
<i>Current assets</i>			
Cash at bank and in hand		2,664	2,122
Debtors	11	2,502	3,280
<i>Total : Current Assets</i>		<u>5,166</u>	<u>5,402</u>
<i>Creditors: amounts falling due within one year</i>	12	<u>(4,220)</u>	<u>(4,560)</u>
<i>Net current assets (liabilities)</i>		<u>946</u>	<u>842</u>
<i>Total assets less current liabilities</i>		19,768	15,603
<i>Creditors: amounts falling due after more than one year</i>			
Loans	13	(1,688)	(1,876)
<i>Total net assets</i>		<u><u>18,080</u></u>	<u><u>13,727</u></u>
<i>Capital and reserves</i>			
Restricted Funds	14(a)	14,397	10,227
Unrestricted funds			
Undesignated		(742)	(1,036)
Designated	14(b)	4,425	4,536
<i>Total capital and reserves</i>		<u><u>18,080</u></u>	<u><u>13,727</u></u>

The financial statements were approved by Council on
authorised for issue by:

and signed on its behalf and

Chair of the Board: Michael Gibson

President of Council: Prof Andrew Hamnett

Company balance sheet

at 31 March 2011

		March 2011	March 2010
<i>Fixed assets</i>	<i>Notes</i>	£000	£000
Tangible assets	9	<u>18,777</u>	<u>14,698</u>
		<u>18,777</u>	<u>14,698</u>
<i>Current assets</i>			
Cash at bank and in hand		2,326	1,848
Debtors	11	<u>2,583</u>	<u>3,547</u>
Total : Current Assets		<u>4,909</u>	<u>5,395</u>
<i>Creditors: amounts falling due within one year</i>	12	<u>(3,917)</u>	<u>(4,506)</u>
Net current assets (liabilities)		<u>992</u>	<u>889</u>
Total assets less current liabilities		19,769	15,587
<i>Creditors: amounts falling due after more than one year</i>			
Loans	13	<u>(1,688)</u>	<u>(1,875)</u>
Total net assets		<u>18,081</u>	<u>13,712</u>
<i>Capital and reserves</i>			
Restricted Funds	14(a)	14,305	10,117
Unrestricted funds			
Undesignated		(696)	(989)
Designated	14(b)	<u>4,472</u>	<u>4,584</u>
Total capital and reserves		<u>18,081</u>	<u>13,712</u>

The financial statements were approved by Council on
authorised for issue by:

and signed on its behalf and

Chair of the Board: Michael Gibson

President of Council: Prof Andrew Hamnett

Group statement of cash flows

for the year ended 31 March 2011

	<i>Notes</i>	2011	2010
		£000	£000
Net cash inflow from operating activities	16(a)	6,504	2,457
Returns on investment and servicing of finance	16(a)	(129)	(153)
Taxation		-	-
Capital expenditure	16(a)	(5,158)	(1,705)
Financing		(675)	336
Increase in cash	16(a)	542	935

Reconciliation of net cash flow to movement in net funds

	<i>Notes</i>	2011	2010
		£000	£000
Increase in cash		542	935
Repayment of long term loans		675	(336)
		1,217	599
Net debt at 1 April		(429)	(1,028)
Net debt at 31 March	16(a)	788	(429)

Notes to the group financial statements

at 31 March 2011

1. Accounting policies

Accounting convention

The accounts are prepared under the historical cost convention modified to include the revaluation of investments, in accordance with applicable accounting standards and the Statement of Recommended Practice "Accounting by Charities" (SORP 2005) issued in December 2005 with the exception of the accounting treatment of a substantial capital grant received from NERC in March, 2007 (see note 15a on page 23).

Status

The Association is a company limited by Guarantee and not having a share capital. The liability of the members who constitute the Association is limited to £1 per member.

The affairs of the Association are managed by an elected Council of Members, who constitute Directors of the Company for Companies Act purposes. The Association is a registered charity, Scottish Charity Number SC009206, and is not liable to income tax or corporation tax on its income under the Income and Corporation Taxes Act 1988.

Basis of consolidation

The consolidated accounts incorporate the accounts of the company and its subsidiary undertakings for the year ended 31 March 2011. Unless otherwise stated, the acquisition method of accounting has been adopted. Under this method, the results of subsidiary undertakings acquired or disposed of in the year are included in the consolidated profit and loss account from the date of acquisition or up to the date of disposal.

In accordance with section 408 of the Companies Act 2006, The Scottish Association for Marine Science is exempt from the requirement to present its own profit and loss account. The result of the financial year dealt with in the financial statements of The Scottish Association for Marine Science is disclosed in note 16 to these accounts.

Fixed assets and depreciation

Individual items of capital equipment are included in the balance sheet only if their cost exceeds £5,000 (including irrecoverable value added tax where appropriate).

Depreciation is provided on all tangible fixed assets at rates calculated to write off the cost or valuation, less estimated residual value, of each asset evenly over its expected useful life, as follows:

Property	-	20 to 50 years
Vessels	-	5 to 30 years
Scientific instruments and equipment-		2 to 20 years
Computer equipment	-	5 years
Fixtures & Fittings	-	5 to 20 years

Value added tax

As the group is registered partially exempt for VAT purposes, expenditure and fixed assets are shown inclusive of irrecoverable value added tax where applicable.

Leasing

Rentals paid under operating leases are charged to income on a straight line basis over the lease term.

Notes to the group financial statements

at 31 March 2011

Accounting policies (continued)

Pensions

The Association participates in the Universities Superannuation Scheme (“USS”), a defined benefit scheme which is contracted out of the State Second Pension (“S2P”). The assets of the scheme are held in a separate trustee-administered fund. Because of the mutual nature of the scheme, the scheme’s assets are not hypothecated to individual organisations and a scheme-wide contribution rate is set. The Association is therefore exposed to actuarial risks associated with other organisations’ employees and is unable to identify its share of the underlying assets and liabilities of the scheme on a consistent and reasonable basis and therefore, as required by FRS17 “Retirement benefits”, accounts for the scheme as if it were a defined contribution scheme. As a result the amount charged to the income and expenditure account represents the contributions payable to the scheme in respect of the accounting period.

For staff that are NERC employees, pensions are fully funded and guaranteed by NERC.

Incoming resources

Income represents NERC core grants receivable in the year, other research income receivable from outside bodies and other miscellaneous income. Other funds received of a revenue nature are credited to deferred revenue income and credited to the Income and Expenditure Account as the related research costs are incurred.

Resources expended

Direct charitable expenditure represents the full cost of the research performed. It includes the cost of direct staff, consumable stocks, indirect costs and the apportioned support costs. Support costs have been apportioned to direct charitable expenditure on a percentage basis of total charitable expenditure. Fundraising and publicity expenditure represents the cost of obtaining funds for research, promoting the work of the Association and recruitment of staff. Governance costs represent the necessity of compliance with statutory and constitutional requirements.

Investments

Investments include bank balances for the Yonge Fellowship, and equity investments.

Foreign currency transactions

All foreign currency gains and losses are taken to the income and expenditure account as incurred. Monetary assets and liabilities denominated in foreign currencies are translated at the rate of exchange ruling at the balance sheet date.

Notes to the group financial statements

at 31 March 2011

2. Incoming resources from charitable activities

	Unrestricted			Total	Total
	Unrestricted	Designated	Restricted		
	2011	2011	2011		
	£000	£000	£000	2011	2010
				£000	£000
Education and Knowledge Transfer Grants	247	-	413	660	563
Research Income, National Capability and Facilities	1,910	-	11,674	13,584	9,699
Recompression	700	-	-	700	154
	<u>2,857</u>	<u>-</u>	<u>12,087</u>	<u>14,944</u>	<u>10,416</u>

3. Cost of generating funds

	Unrestricted			Total	Total
	Unrestricted	Designated	Restricted		
	2011	2011	2011		
	£000	£000	£000	£000	£000
Marketing, publications and newsletters	7	-	15	22	37
	<u>7</u>	<u>-</u>	<u>15</u>	<u>22</u>	<u>37</u>

4. Cost of charitable activities

	Unrestricted			Total	Total
	Unrestricted	Designated	Restricted		
	2011	2011	2011		
	£000	£000	£000	£000	£000
Staff Costs	1,188	-	4,692	5,880	5,711
Other Costs	1,546	111	3,210	4,867	3,851
	<u>2,734</u>	<u>111</u>	<u>7,902</u>	<u>10,747</u>	<u>9,562</u>

Notes to the group financial statements

at 31 March 2011

5. Net incoming resources

	2011	2010
	£000	£000
Net incoming resources are stated after charging:		
Auditors' remuneration – audit services	12	11
– other services	8	5
Depreciation and amortisation	1,097	859
Loss on disposal of fixed assets	-	80
Operating lease charges	24	54

6. Remuneration of the members of the Council

The non-executive Council members received £4,728 (2010 - £5,380), in the form of reimbursable expenses, in total from the Association during the year. The following directors received remuneration:

	2011	2010
	£000	£000
Michael Gibson	10	33
Gordon McAllister	3	3
Dr R A Scrutton	2	3
Charles Stevenson	3	3
Professor M Bownes	3	3
Walter Spiers	2	-

Notes to the group financial statements

at 31 March 2011

7. Staff costs

SAMS Staff	2011 £000	2010 £000
Wages and salaries	4,144	3,903
Social security costs	327	304
Other pension costs	584	516
	<u>5,055</u>	<u>4,723</u>

The average number of full-time equivalent persons employed by the group during the year was as follows:

	2011 No.	2010 No.
Scientific	91	87
Office management	37	36
	<u>128</u>	<u>123</u>

NERC Staff	2011 £000	2010 £000
Wages and salaries	618	767
Social security costs	50	62
Other pension costs	157	159
	<u>825</u>	<u>988</u>

The average number of full-time equivalent persons employed by NERC working for the group during the year was as follows:

	2011 No.	2010 No.
Scientific	10	13
Office management	5	6
	<u>15</u>	<u>19</u>

Notes to the group financial statements

at 31 March 2011

7. Staff Costs (cont'd.)

Remuneration of higher paid staff earning in excess of £50,000, excluding employer's pension contributions were in the following ranges:

	SAMS 2011 No.	NERC 2011 No.	Total 2011 No.	Total 2010 No.
£50,000 - £60,000	8	4	12	13
£60,001 - £70,000	-	-	-	4
£70,001 - £80,000	2	-	2	1
£80,000 - £90,000	-	-	-	1
£90,000 - £100,000	-	-	-	-
£100,000 - £110,000	1	-	1	1

8. Investment income

	2011 £000	2010 £000
Interest receivable	-	2

9. Tangible fixed assets

Group	Assets under Construction £000	Property £000	Vessels £000	Fittings and Equipment £000	Total £000
Cost:					
At 1 April 2010	1,443	13,749	558	7,241	22,991
Disposals	-	(40)	-	-	(40)
Additions	4,396	66	33	703	5,198
Transfers	(5,839)	5,839	-	-	-
At 31 March 2011	-	19,614	591	7,944	28,149
Depreciation:					
At 1 April 2010	-	2,359	511	5,360	8,230
Disposals	-	-	-	-	-
Charge for year	-	407	21	669	1,097
At 31 March 2011	-	2,766	532	6,029	9,327
Net book value:					
At 31 March 2011	-	16,848	59	1,915	18,822
At 31 March 2010	1,443	11,390	47	1,881	14,761

Notes to the group financial statements

at 31 March 2011

9. Tangible fixed assets (contd.)

Company	Assets under			Fittings and	Total
	Construction	Property	Vessels	Equipment	
	£000	£000	£000	£000	£000
Cost:					
At 1 April 2010	1,443	13,749	558	6,939	22,689
Disposals	-	(40)	-	-	(40)
Additions	4,396	66	33	703	5,198
Transfers	(5,839)	5,839	-	-	-
At 31 March 2011	-	19,614	591	7,642	27,847
Depreciation:					
At 1 April 2010	-	2,359	511	5,121	7,991
Disposals	-	-	-	-	-
Charge for year	-	407	21	651	1,079
At 31 March 2011	-	2,766	532	5,772	9,070
Net book value:					
At 31 March 2011	-	16,848	59	1,870	18,777
At 31 March 2010	1,443	11,390	47	1,818	14,698

10. Investments

	Group		Company	
	2011	2010	2011	2010
	£000	£000	£000	£000
Cost at 1 April 2010 and 31 March 2011	53	53	-	-
Impairment at 1 April 2010 and 31 March 2011	(53)	(53)	-	-
Net book value at 1 April 2010 and 31 March 2011	-	-	-	-

Company

Details of the investments in subsidiary undertakings held by The Scottish Association for Marine Science are as follows:

<i>Subsidiary undertakings</i>	<i>Holding</i>	<i>Proportion of voting Rights and shares held</i>	<i>Nature of Business</i>
SAMS Research Services Limited	Ordinary shares	100%	Marine and research Support services
The European Centre for Marine Biotechnology	Limited by guarantee	Sole member	Non trading
SAMS Commercial Services Limited	Ordinary shares	100%	Non trading
Scottish Marine Institute	Ordinary shares	100%	Non trading
Marine BioenergyScotland Limited	Ordinary shares	100%	Non trading
SAMS Limited	Ordinary shares	100%	Non trading

Notes to the group financial statements

at 31 March 2011

10. Investments (cont'd.)

SAMS Research Services Limited gift aid all of its taxable profits to The Scottish Association for Marine Science. A summary of the trading results is shown below:

A summary of the trading results is shown below:

SAMS Research Services Limited

	2011
	£000
Turnover	1,768
Cost of sales and administrative expenses	(1,236)
Interest receivable and other operating income	-
Interest payable	-
Net profit before Gift Aid and tax	<u>532</u>
Amount gifted to charity	<u>(541)</u>
Profit/(Loss) for the year	<u><u>(9)</u></u>
The assets and liabilities of the subsidiary at 31 March 2010 were:	
Fixed assets	45
Current assets	975
Creditors: amounts falling due within one year	<u>(1,019)</u>
Aggregate share capital and reserves	<u><u>1</u></u>

The results of The European Centre for Marine Biotechnology for the year ended 31 March 2011 are not material to the group. This company ceased trading on 31 March, 2008.

11. Debtors

	Group		Company	
	2011	2010	2011	2010
	£000	£000	£000	£000
Trade debtors	470	130	-	-
Other debtors	745	1,364	745	1,364
Prepayments and accrued income	1,287	1,786	1,121	1,422
Due from group undertakings	-	-	717	761
	<u>2,502</u>	<u>3,280</u>	<u>2,583</u>	<u>3,547</u>

Notes to the group financial statements

at 31 March 2011

12. Creditors: amounts falling due within one year

	Group		Company	
	2011 £000	2010 £000	2011 £000	2010 £000
Current instalment due on bank loan (note 14)	188	176	188	176
Other Loans	-	500	-	500
Payments received in advance	2,919	2,866	2,689	2,850
Taxation and social security	245	205	245	205
Sundry creditors and accruals	867	813	795	775
	4,220	4,560	3,917	4,506

The bank loans and overdraft facilities are secured by a bond and floating charge over the whole assets of the company and a standard security over Scottish Marine Institute, Oban in favour of the Bank of Scotland, HIE Argyll and the Islands and the University of the Highlands and Islands. Other loans include a loan from the University of the Highlands and Islands. This loan has the sole purpose of managing the cashflow requirements of the new build and will be repaid on receipt of the capital grant funding.

13. Loans

	Group		Company	
	2011 £000	2010 £000	2011 £000	2010 £000
Not wholly repayable within five years: £2,900,000 bank loan at 1.25% above LIBOR per annum, repayable in monthly instalments of £25,419 commencing 3 March 2004	1,876	2,051	1,876	2,051
Less: included in creditors: amounts falling due within one year (note 13)	188	176	188	176
	1,688	1,875	1,688	1,875
Amounts repayable:				
In one year or less, or on demand	188	176	188	176
In more than one year but not more than two years	201	188	201	188
In more than two years but not more than five years	687	646	687	646
	1,076	1,010	1,076	1,010
In more than five years	800	1,041	800	1,041
	1,876	2,051	1,876	2,051

Notes to the group financial statements

at 31 March 2011

14(a) Restricted funds

	01 Apr 2010 £000	Income £000	Expenditure £000	31 Mar 2011 £000
Group				
Fixed asset funds	10,224	5,151	(981)	14,394
Yonge Fellowship	3	-	-	3
Research Projects	-	6,936	(6,936)	-
	<u>10,227</u>	<u>12,087</u>	<u>(7,917)</u>	<u>14,397</u>

	01 Apr 2010 £000	Income £000	Expenditure £000	31 Mar 2011 £000
Company				
Fixed asset funds	10,114	5,151	(963)	14,302
Yonge Fellowship	3	-	-	3
Research Projects	-	6,864	(6,864)	-
	<u>10,117</u>	<u>12,015</u>	<u>(7,827)</u>	<u>14,305</u>

Capital grants are recognised as restricted income in the year in which they are received and the depreciation on all fixed assets funded by capital grants is recognised as an expense against the restricted fund. The only exception to this is a capital grant of £978k received from NERC in March 2007, under Oceans 2025. The individual items of capital equipment for Oceans 2025 are of a specialist nature and to date not all have been delivered by the suppliers to the Associations' scientists. For this reason the Trustees consider it more appropriate to include as income in the 2011 financial statements only the capital grant for those items delivered, commissioned and tested. The amount included in income this year is £354k. The full grant has now been recognised in income leaving a nil balance in payments received in advance in note 13 on page 22.

The Sheina Marshall Bequest is an amount left by the late Dr Sheina Marshall OBE, DSC to the Association. The sum bequested was used by the Association to purchase a dwelling property in Oban which is used to accommodate visiting researchers.

The Yonge Fellowship is to commemorate the late Professor Sir Maurice Yonge. Awards will be made from the fund to suitable marine science projects.

Notes to the group financial statements

at 31 March 2011

14(b) Designated funds

	01 Apr				31 Mar
	2010	Income	Expenditure	Transfers	2011
	£000	£000	£000	£000	£000
<i>Group</i>					
Fixed asset funds	4,536	-	(111)	-	4,425

	01 Apr				31 Mar
	2010	Income	Expenditure	Transfers	2011
	£000	£000	£000	£000	£000
<i>Company</i>					
Fixed asset funds	4,584	-	(112)	-	4,472

SAMS has designated a reserve for fixed assets. A restricted reserve already exists for fixed assets and this reflects the level of grant funding received for the assets held by SAMS. The restricted reserve does not, however, reflect the full amount of funds held in tangible fixed assets held for the charity's use. The designated fund represents the balance between the net book value of assets held and the restricted reserve.

15. Income and expenditure account

In accordance with the exemption allowed by section 408 of the Companies Act 2006 the company has not presented its own income and expenditure account or statement of financial activities. The net incoming resources for the financial period attributable to members of the parent company dealt with in the accounts was £4,369k (2010 – £987k).

Notes to the group financial statements

at 31 March 2011

16. Notes to the statement of cash flows

(a) Reconciliation of net incoming resources to net cash inflow from operating activities

	2011	2010
	£000	£000
Net incoming resources	4,353	949
Net interest paid	129	153
Depreciation and amortisation	1,096	890
Losses on disposal of fixed assets	0	81
(Increase)/decrease in debtors	778	(366)
(Decrease)/increase in creditors	148	750
Net cash inflow from operating activities	<u>6,504</u>	<u>2,457</u>
Returns on investment and servicing of finance	2011	2010
	£000	£000
Interest received	0	2
Interest paid	(129)	(155)
	<u>(129)</u>	<u>(153)</u>
Capital expenditure and financial investment	2011	2010
	£000	£000
Payments to acquire investments	0	0
Payments to acquire tangible fixed assets	(5,198)	(1,705)
Disposal of fixed assets	40	
	<u>(5,158)</u>	<u>(1,705)</u>
Financing	2011	2010
	£000	£000
Cashflow financing for new building	(500)	500
Repayment of long term loans	(175)	(164)
	<u>(675)</u>	<u>336</u>

Notes to the group financial statements

at 31 March 2011

16. Notes to the statement of cash flows (contd.)

(b) Analysis of changes in net debt

	At 1 April 2010 £000	Cash flow £000	At 31 March 2011 £000
Cash at bank and in hand	2,122	542	2,664
Debt due within one year	(676)	488	(188)
Debt due after one year	(1,875)	187	(1,688)
	<u>(429)</u>	<u>1,217</u>	<u>788</u>

17. Pension commitments to pension fund

The Association participates in the Universities Superannuation Scheme, a defined benefit scheme which is contracted out of the State Second Pension. The assets of the scheme are held in a separate fund administered by the trustee, Universities Superannuation Scheme Limited.

The appointment of directors to the board of the trustee is determined by the company's Articles of Association. Four of the directors are appointed by Universities UK; three are appointed by the University and College Union, of whom at least one must be a USS member; one is appointed by the Higher Education Funding Councils; and a minimum of two and a maximum of four are co-opted directors appointed by the board. Under the scheme trust deed and rules, the employer contribution rate is determined by the trustee, acting on actuarial advice.

The Association participates in the Universities Superannuation Scheme ("USS"), a defined benefit scheme which is contracted out of the State Second Pension ("S2P"). The assets of the scheme are held in a separate trustee-administered fund. Because of the mutual nature of the scheme, the scheme's assets are not hypothecated to individual organisations and a scheme-wide contribution rate is set. The Association is therefore exposed to actuarial risks associated with other organisations' employees and is unable to identify its share of the underlying assets and liabilities of the scheme on a consistent and reasonable basis and therefore, as required by FRS17 "Retirement benefits", accounts for the scheme as if it were a defined contribution scheme. As a result the amount charged to the income and expenditure account represents the contributions payable to the scheme in respect of the accounting period.

The latest triennial actuarial valuation of the scheme was at 31 March 2008. This was the first valuation of USS under the new scheme-specific funding regime introduced by the Pensions Act 2004, which requires schemes to adopt a statutory funding objective, which is to have sufficient and appropriate assets to cover their technical provisions. The actuary also carries out a review of the funding level each year between triennial valuations and details of his estimate of the funding level at 31 March 2011 are also included in this note.

The triennial valuation was carried out using the projected unit method. The assumptions which have the most significant effect on the result of the valuation are those relating to the rate of return on investments (ie the valuation rate of interest) and the rates of increase in salary and pensions and the assumed rates of

Notes to the group financial statements

at 31 March 2011

17. Pension commitments to pension fund (contd.)

mortality. The financial assumptions were derived from market yields prevailing at the valuation date. An inflation risk premium adjustment was also included by deducting 0.3% from the market-implied inflation on account of the historically high level of inflation implied by government bonds (particularly when compared to the Bank of England's target of 2% for CPI which corresponds broadly to 2.75% for RPI per annum).

To calculate the technical provisions, it was assumed that the valuation rate of interest would be 6.4% per annum (which includes an additional assumed investment return over gilts of 2% per annum), salary increases would be 4.3% per annum (plus an additional allowance for increases in salaries due to age and promotion reflecting historic Scheme experience, with a further cautionary reserve on top for past service liabilities) and pensions would increase by 3.3% per annum.

Standard mortality tables were used as follows:

Male members' mortality	PA92 MC YoB tables – rated down 1 yr
Female members' mortality	PA92 MC YoB tables – no age rating

Use of mortality tables reasonably reflects the actual USS experience but also provides an element of conservatism to allow for further improvements in mortality rates. The assumed life expectations on retirement at age 65 are:

Males (females) currently aged 65	22.8 (24.8) years
Males (females) currently aged 45	24.0 (25.9) years

At the valuation date, the value of the assets of the scheme was £28,842.6 million and the value of the scheme's technical provisions was £28,135.3 million indicating a surplus of £707.3 million. The assets were sufficient to cover 103% of the benefits which had accrued to members after allowing for expected future increases in earnings.

The actuary also valued the scheme on a number of other bases as at the valuation date. On the scheme's historic gilts basis, using a valuation rate of interest in respect of past service liabilities of 4.4% per annum (the expected return on gilts) the funding level was approximately 71%. Under the Pension Protection Fund regulations introduced by the Pensions Act 2004 it was 107% funded; on a buy-out basis (ie assuming the Scheme had discontinued on the valuation date) the assets would have been approximately 79% of the amount necessary to secure all the USS benefits with an insurance company; and using the FRS17 formula as if USS was a single employer scheme, using a AA bond discount rate of 6.5% per annum based on spot yields, the actuary estimated that the funding level at 31 March 2008 was 104%.

The technical provisions relate essentially to the past service liabilities and funding levels, but it is also necessary to assess the ongoing cost of newly accruing benefits. The cost of future accrual was calculated using the same assumptions as those used to calculate the technical provisions except that the valuation rate of interest assumed asset outperformance over gilts of 1.7% per annum (compared to 2% per annum for the technical provisions) giving a discount rate of 6.1% per annum; also the allowance for promotional salary increases was not as high. There is currently uncertainty in the sector regarding pay growth. Analysis has shown very variable levels of growth over and above general pay increases in recent years, and the salary growth assumption built into the cost of future accrual is based on more stable, historic, salary experience. However, when calculating the past service liabilities of the scheme, a cautionary reserve has been included, in addition, on account of the variability mentioned above.

The scheme wide contribution rate required for future service benefits alone at the date of the valuation was 16% of pensionable salaries and the trustee company, on the advice of the actuary, increased the company contribution rate to 16% of pensionable salaries from 1 October 2009.

Notes to the group financial statements

at 31 March 2011

17. Pension commitments to pension fund (contd.)

Since 31 March 2008 global investment markets have continued to fluctuate and at 31 March 2011 the market's assessment of inflation has increased slightly. The government has also announced a change to the inflation measure used in determining the "Official Pensions Index" from the Retail Prices Index to the Consumer Prices Index. The actuary has taken this all into account in his funding level estimates at 31 March 2011 by reducing the assumption for pension increases from 3.3% pa to 2.9% pa. The actuary has estimated that the funding level as at 31 March 2011 under the scheme specific funding regime had fallen from 103% to 98% (a deficit of circa £700 million). Over the past twelve months, the funding level has improved from 91% (as at 31 March 2010) to 98%. This estimate is based on the funding level at 31 March 2008, adjusted to reflect the fund's actual investment performance over the three years and changes in market conditions (market conditions affect both the valuation rate of interest and also the inflation assumption which in turn impacts on the salary and pension increase assumptions). The next formal valuation is as at 31 March 2011 and this will incorporate updated assumptions agreed by the trustee company.

With effect from 1 October 2011, new joiners to the scheme will join the new revalued benefits section rather than the existing final salary section. This change will have an impact, expected to be positive, on the future funding levels.

On the FRS17 basis, using a AA bond discount rate of 5.5% per annum based on spot yields, the actuary estimated that the funding level at 31 March 2011 was 86%. An estimate of the funding level measured on a buy-out basis at that date was approximately 54%.

Surpluses or deficits which arise at future valuations may impact on the company's future contribution commitment. A deficit may require additional funding in the form of higher contribution requirements, where a surplus could, perhaps, be used to similarly reduce requirements. The sensitivities regarding the principal assumptions used to measure the scheme liabilities are set out below:

Assumption	Change in assumption	Impact on scheme liabilities
Valuation rate of interest	Increase/decrease by 0.5%	Decrease/increase by £2.2 billion
Rate of pension increases	Increase/decrease by 0.5%	Decrease/increase by £1.5 billion
Rate of salary growth	Increase/decrease by 0.5%	Increase by £0.7 billion
Rate of mortality	More prudent assumption. Move to long cohort future improvements from the medium cohort.	Increase by £1.6 billion

USS is a "last man standing" scheme so that in the event of the insolvency of any of the participating employers in the USS, the amount of any pension funding shortfall (which cannot otherwise be recovered) in respect of that employer will be spread across the remaining participant employers and reflected in the next actuarial valuation of the scheme.

The trustee believes that over the long-term equity investment and investment in selected alternative asset classes will provide superior returns to other investment classes. The management structure and targets set are designed to give the fund a major exposure to equities through portfolios that are diversified both geographically and by sector. The trustee recognises it would be theoretically possible to select investments producing income flows broadly similar to the estimated liability cash flows. However, in order to meet the long-term funding objective within a level of contributions that it considers the employers would be willing to make, the trustee needs to take on a degree of investment risk relative to the liabilities. This taking of investment risk seeks to target a greater return than the matching assets would provide whilst maintaining a prudent approach to meeting the fund's liabilities. Before deciding what degree of investment risk to take relative to the liabilities, the trustee receives advice from its internal investment team, its investment consultant and the scheme actuary, and considers the views of the employers. The strong positive cash flow of the scheme means that it is not necessary to realise

Notes to the group financial statements

at 31 March 2011

17. Pension commitments to pension fund (contd.)

investments to meet liabilities. The trustee believes that this, together with the ongoing flow of new entrants into the scheme and the strength of covenant of the employers enables it to take a long term view of its investments. Short-term volatility of returns can be tolerated and need not feed through directly to the contribution rate although the trustee is mindful of the desirability of keeping the funding level on the scheme's technical provisions close to or above 100% thereby minimizing the risk of the introduction of deficit contributions. The actuary has confirmed that the scheme's cash flow is likely to remain positive for the next ten years or more.

The next formal triennial actuarial valuation is due as at 31 March 2011 and will incorporate allowance for scheme benefit changes and any changes the trustee makes to the underlying actuarial assumptions. The contribution rate will be reviewed as part of each valuation and may be reviewed more frequently.

At 31 March 2011, USS had over 142,000 active members and the Association had 119 active members participating in the scheme.

The total USS pension cost for the group was £584,000 (2010 - £516,000). This includes £50,000 (2010 - £47,000) outstanding contributions at the balance sheet date. The USS contribution rate payable by the company was 16% of pensionable salaries.

The total JSS pension cost for the group on behalf of NERC employees was £157,000 (2010 - £159,000). This includes £13,000 (2010 - £11,000) outstanding contributions at the balance sheet date. The JSS contribution rate payable by the company on behalf of NERC employees was 26% of pensionable salaries.

18. Capital commitments

	Group		Company	
	2011	2010	2011	2010
	£000	£000	£000	£000
Capital commitments contracted for	-	3,553	-	3,553

19. Other financial commitments

At 31 March 2011 the group had annual commitments under non-cancellable operating leases as set out below:

	Group		Company	
	2011	2010	2011	2010
	£000	£000	£000	£000
Operating lease which expire:				
within one year	8	24	8	24
within two to five years	19	-	19	-
	27	24	27	24

Notes to the group financial statements

at 31 March 2011

20. Related Party Transactions

During the year, purchases totalling £18,000, at normal market prices have been made by group companies from Muckairn Mussels Limited of which Walter Spiers is a director and controlling shareholder. £18,000 was outstanding at 31 March 2011.

During the year, purchases totalling £5,123, at normal market prices have been made by group companies from Celtic Marine Limited of which Mr Michael Robert Francis Wilkins is a director and controlling shareholder. £3,225 was outstanding at 31 March 2011.

The company has taken advantage of the exemption in FRS8 not to disclose transactions with wholly owned subsidiaries.



Innovative Independent International

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