

SOFI workshops and reports

PML's Mel Austen to undertake key marine role

In September, PML's Dr Melanie Austen was appointed to the influential, non-executive position of Chief Scientific Advisor to the Marine Management Organisation (MMO).

Dr Austen will provide a key link to the scientific community and its research, enabling the MMO to make informed decisions on the integration of marine planning, licensing, nature conservation and fisheries management.



Photo: PML

Strategic Ocean Funding Initiative (SOFI)

New Awards (value in brackets)

- Marine Glider workshop: SAMS: 11-12 Jan 2011 (£12,500)

Postponed

- -omics technologies for marine models: SAMS: (£2,920) cancelled from 30 November due to bad weather. Updates on the Oceans 2025 web-site.

Enquiries about participating in SOFI workshops should be directed to Phil Williamson in the first instance.

Recently held

- Using UK Marine Observations Southampton, 23-24 November 2010

Reports available

- Arctic Submarine-Based Science Workshop: Interim Report SAMS: 28-29 April 2010
- UK Argo Users' workshop Met Office, Exeter: 16 March 2010
- Establishing a marine protected area in the Chagos Archipelago: socio-economic considerations: Royal Holloway, London 7 January 2010

Online copies: http://www.oceans2025.org/SOFI_Workshops.php

Guidance for new applications:

www.oceans2025.org/PDFs/SOFI_workshop_guidance_March_2010.pdf

Selected programme highlights

A new page on the web-site features just some of the programme highlights, on a theme by theme basis and include recent news from BODC, CCAP and PSMSL. Pages include reference to policy links and impact pathways. The next release of highlights is in preparation. Please send your feedback and suggestions for amends, updates and additions to Jackie Pearson of the NMCO.

http://www.oceans2025.org/Oceans_2025_selected_highlights.php

Contact Details for newsletter editors

Dr Phil Williamson, Science Coordinator: p.williamson@uea.ac.uk

Jackie Pearson, National Marine Coordination Office: jfpea@noc.soton.ac.uk www.oceans2025.org

The newsletter of Oceans 2025

2025

Welcome

At NOC the new Autosub Long Range AUV and MYRTLE X, a long-term deployment instrument platform are now being tested; teams from SAMS, NOC and PML are undertaking research in the Greenland Sea and Atlantic Ocean; SMRU is studying the impacts of harmful algal blooms on seals of the Northern Isles and the MBA has revealed firm evidence

about predator hunting techniques that will help manage fish stocks. Our community continues to support national and international policy objectives that safeguard the health and sustainability of the ocean.

Phil Williamson
p.williamson@uea.ac.uk
 Oceans 2025 Science
 Coordinator

“ICECHASER II” and the Greenland Sea

Ray Leakey, SAMS

In mid-June Oceans 2025 scientists set sail on the RRS *James Clark Ross* to investigate the oceanography and biochemistry of the Greenland Sea. The seven week ICECHASER II cruise was the second of two Arctic cruises led by the Scottish Association for Marine Science (SAMS) as part of the Oceans 2025 Theme 1 topic “Arctic and Boreal Seas in a Rapidly Changing Climate”. Onboard was a multidisciplinary team of scientists from France, Germany, Greenland, Norway, Russia, and Spain, as well as UK participants from the National Oceanographic Centre (NOC) and the Universities of Aberdeen, East Anglia, Glasgow, Oxford, and St Andrews.

Next generation marine research

The objective of the cruise was to investigate how changing sea ice and water column structure influence the ecosystem dynamics and carbon export in ice-covered and open waters of the Greenland Sea. This involved working on the sea-ice, as well as on ship, including under-ice diving to deploy instruments and collect samples. The past and present variability of the North Atlantic current around western Svalbard was also studied using an autonomous underwater vehicle (AUV), turbulence vertical profiler and piston coring.

Science highlights included novel eddy correlation measurements of O₂ exchange between sea-ice, water and sediments, the investigation of a newly discovered sea-ice CO₂ pump, the collection of palaeo-records spanning 25,000 years, and the first open ocean use of the SAMS REMUS AUV. The expedition also attracted media coverage by the BBC.



Collecting samples at a sea-ice station (80°N, 5°E) in the Greenland Sea, with the RRS *James Clark Ross* in the background, during the Oceans 2025 ICECHASER II expedition, June 2010. Photo: Sian Lordsmith, SAMS

In this issue ...

Oceans 2025 News and events.....	Page 2-7
SOFI Workshops	Page 5-7
Policy updates	Page 8

A strategic marine science programme for NERC

Oceans 2025 news and events

Autosub Long Range *Steve McPhail, NOC in Southampton*

The Autosub Long Range AUV, which is scheduled for its first engineering trials on RRS *Discovery* in January 2011, is starting to take shape. The next two months will be a hectic time for Steve McPhail's team of engineers, as the components are assembled and tested. Miles Pebody is leading the development of the control software on the low power PXA270 target processor. James Perrett has designed much of the electronic hardware and is developing embedded microprocessor control software for the propulsion motor and actuators. Maaten Furlong has carried out the hydrodynamic analysis and design for the body shape, control planes, wings and propeller.

By going rather slowly (about 0.4 m/s), and with careful control of the system and sensor power, Autosub Long Range will be able to achieve exceptionally long ranges and endurances of up to 6 months. In addition it will be able to land on the seabed and hibernate for months at a time. The team plan to have the AUV ready for science missions in 2012.



Peter Stevenson, the AUV team chief mechanical engineer, with the Autosub Long Range AUV. The top half panel has been removed, revealing the two spherical pressure housings which hold the control electronics and batteries. The wings allow the AUV to cope with buoyancy changes as it dives to depths of up to 6000m. Photo: Steve McPhail, NOC

New application of the AUV risk management process

Mario Brito, NOC in Southampton

The risk management process for autonomous underwater vehicle operations devised within Oceans 2025 by Professor Gwyn Griffiths and Dr Mario Brito (NOC) is now being applied in another extreme environment. Their systematic approach to the analysis of risk, and the prediction of the likelihood of unwanted outcomes, is being used within the NERC Sub-glacial Lake Ellsworth Consortium* project. The aim is to help systematize the assessment of risk of blow out from gases or clathrates that may be in the Lake, and also to establish the critical phases for the deployment of the probe that is being built by Dr Matt Mowlem and his team at NOC in Southampton.

*Lake Ellsworth Consortium <http://www.geos.ed.ac.uk/research/ellsworth/>

MYRTLE X - NOC's deep-ocean, long-term deployment instrument platform *Robert Smith, NOC in Liverpool*

Developed from the original MYRTLE* platforms – which had many successful four-year deployments in the Southern Ocean – MYRTLE X is a new platform, using new technology and designed for deployments of up to ten years.

Data (including bottom pressure, temperature and salinity) are recorded and stored locally. Using a unique infrared transmission system, they are also simultaneously stored in twelve data capsules. The capsules can be released by a timer or acoustically from a ship. On surfacing, the capsule is designed to transmit its data back to base using Iridium satellite technology. The main unit contains acoustic telemetry; controlling capsule release, updates on battery conditions and ultimately providing another method of data recovery. At the end of the deployment period, the main unit – containing a full data set – can be recovered from the seabed.

The MYRTLE X platform uses new and innovative design features in telemetry (infrared, acoustic and satellite) and the mechanics of holding and releasing its capsules. Recent trials at the Liverpool site dock facilities tested the new infrared data telemetry to capsule, and mechanical release system. They proved successful and a valuable step towards deploying a full MYRTLE X instrument platform.

*MYRTLE – MultiYear Recoverable Tidal Level Equipment



Fully assembled MYRTLEX lander at Oceanology International, London, March 2010. Photo: Eleanor Ashton, NOC



Steve Mack with a MYRTLEX capsule in a test frame during trials at Vittoria Dock, Birkenhead.

Metabolomics facility for environmental research *Ulf Summer, Mark Viant, University of Birmingham*

A challenge facing scientists is to find ways to describe the influence of external pressures, e.g. climate change, on plants and animals. Metabolomics is the study of the small molecule biochemicals or metabolites, e.g. glucose, in a cell, tissue, biofluid, or whole organism. Changes in metabolite concentration can occur in response to a changing environment, e.g. the influence of pollutants. Traditionally, only certain subsets of the metabolome could be investigated in a targeted approach, however, it is now possible to analyze a large proportion of the metabolome at once, in an untargeted approach, using nuclear magnetic resonance (NMR) spectroscopy and FT-ICR mass spectrometry (MS) technology which is available at the new NERC-funded metabolomics facility at the University of Birmingham. The Facility is obtaining the high-quality datasets needed to identify the subtle changes in the metabolome, indicative of environmental stress. UK environmental scientists may apply to NERC to gain access to the facility. Applications to conduct small-scale pilot projects are strongly encouraged.

<http://www.biosciences-labs.bham.ac.uk/nbaf-birmingham/>

Oceans 2025 news and events

SAHFOS takes part in 'Plankton Week' Clare Buckland, SAHFOS

SAHFOS was involved in the Natural History Museum's BIOBLITZ event at Mothercombe Beach, Devon in June. The aim of the BIOBLITZ events is to find and record as many species as possible in a 24 hour period with the help of general public volunteers. This was a great outreach event with around 200 scientists and general public involved. The total number of species recorded this year was 512 with 58 of them plankton species.



Clare Buckland, Education Officer, showing young children plankton and sea shore creatures during this year's BIOBLITZ event. Photo: Rob Camp, SAHFOS

In 2010, during spring half-term, SAHFOS was also involved in

'Plankton Week' at the Living Coasts in Torquay. Live plankton presentations were given to the general public and family groups during half term and were enjoyed by all.

SAHFOS ran a schools event at the BA Festival of Science this year at Aston University, Birmingham. *Powerful Plankton* aims to inspire young people about the marine environment and show them how important the smallest organisms are to the health of our planet. The week long event will be visited by around 300 school children from the Birmingham area.

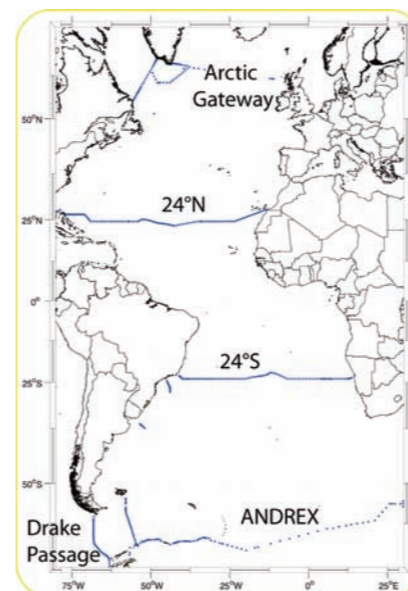
CCAP - underpinning the emerging algal biofuel sector John Day, CCAP

The Rt Hon Michael Moore MP, Secretary of State for Scotland, along with Alan Reid (MP for Argyll & Bute), toured the Culture Collection of Algae and Protozoa CCAP whilst visiting SAMS on Monday 4th October 2010. SAMS scientist John Day highlighted the value of live collections, their roles in underpinning scientific research and biotechnological potential. In addition to providing cultures, services and training to the

emerging algal biofuels sector, CCAP is an integral component of the EU funded Biomara project www.biomara.org and the Carbon Trust Algal Biofuels Challenge.

<http://www.carbontrust.co.uk/emerging-technologies/current-focus-areas/algae-biofuels-challenge/pages/algae-biofuels-challenge.aspx>

Dr John Day, CCAP; The Rt Hon Michael Moore MP, Secretary of State for Scotland; Professor Laurence Mee, SAMS Director and Alan Reid MP. Photo: Anushka Miller, SAMS



GO-SHIP cruises completed by the UK between Aug 2008 and Feb 2010. Image credit: David Hamersley, NOC

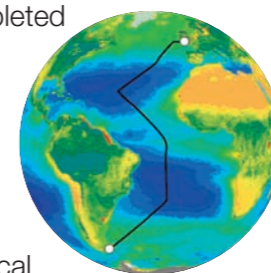
Oceans 2025 cruises contribute to 'GO-SHIP' Brian King, NOC

Between 2008 and 2010 the UK completed six sections spanning the Atlantic and Southern Oceans. The sections included east-west transects in the Atlantic sub-polar gyre, at 24°N and 24°S in the Atlantic subtropical gyres, across the entrance to the Weddell Sea, and sections in the western and eastern part of Drake Passage (Figure). The cruises were the combined efforts of NOCS (funded by Oceans 2025), BAS and the Laboratory for Global Marine and Atmospheric Chemistry at the University of East Anglia, funded under a SOFI grant. The cruises are a major contribution to the Global Ocean Ship-Based Hydrographic Investigations Program (GO-SHIP), which is the successor to WOCE and CLIVAR for the coordination of hydrographic measurements for climate science. GO-SHIP cruises are the absolute reference for measurements of ocean climate change, and provide critical underpinning for the better time and space coverage provided by Argo. GO-SHIP cruises also provide information about warming in the deep ocean, presently outside Argo's reach. Cruises are analysed by comparison with measurements made decades earlier, and groups of cruises are assembled into basin-wide syntheses.

With the transition from Oceans 2025 to the next funding model, a means has yet to be identified that will enable the UK to mount future GO-SHIP cruises and continue to be participate in this critical area of climate science.

PML scientists study changing Atlantic Dawn Ashby, Kelly-Marie Davidson PML

PML scientists have just completed a 13,500 km sampling survey between the UK and Punta Arenas, Chile, as the latest research cruise in a 15 year study investigating the biological, chemical and physical conditions of the Atlantic Ocean. The team, including colleagues from NOC and institutes in Poland, Spain, the Czech Republic, Canada and the United States, set sail on 12 October on board the RRS *James Cook*, to undertake the twentieth crossing in the series and arrived in Punta Arenas on 25 November.



and what this might mean for future human needs. During the 8,000 mile journey south, the *Cook* will stop for a few hours daily, enabling sample collection for on-board analysis. The team is researching how increasing levels of CO₂ may be affecting the communities of plankton which are critical to the health of the ocean.

Andy Rees, Co-ordinating scientist commented: "The AMT provides an exceptional opportunity for nationally and internationally driven collaborative research and is an excellent platform for multidisciplinary oceanographic studies."

Highlights : <http://www.amtblog.org.uk>
Ella Darlington, the on-board Outreach Officer can answer questions sent to: ella@etelive.org

The focus of the Atlantic Meridional Transect is to discover more about how the oceans are changing

Oceans 2025 news and events

Seals exposed to toxins from harmful algae *Ailsa Hall, SMRU*

The toxins produced by harmful algal blooms (HABs) are well recognized as causing human, bird and mammalian morbidity and mortality. Toxic HAB events have been increasing globally since the 1980s, and this phenomenon has therefore become a major public and wildlife health concern. For example, toxins such as saxitoxin (which causes paralytic shellfish poisoning in humans) and domoic acid (the cause of amnesic shellfish poisoning) are now a regular cause of mortality and reproductive failure amongst marine mammals in the US. Of the harmful algae found in UK waters, toxic phytoplankton belonging to both the *Pseudo-nitzschia* genus and the *Alexandrium* genus may therefore pose a threat to UK marine mammals.

There has been a dramatic decline in the number of harbour seals (*Phoca vitulina*) in UK waters over the past 10 years, with some regions experiencing a 50% reduction in abundance. However, the reasons for this decline have not been identified. We recently found that harbour seals around Scotland are exposed to domoic acid (Hall and Frame, 2010, <http://dx.doi.org/10.1016/j.hal.2010.03.004>). Levels in the serum, faeces and urine of live-captured animals indicated that the toxins had probably been recently consumed through the ingestion of contaminated prey.

Interestingly we are not finding large numbers of dead seals washing ashore but the uptake of biotoxins by seals at their foraging areas, some 20-40km offshore, may cause their rapid death at sea. These harmful algae are now a common part of the phytoplankton community in Scotland, particularly in Orkney and Shetland and it is these Northern Isles that have also experienced the greatest harbour seal population decline. Although our recent findings do not provide evidence that domoic acid exposure has caused the population decline, they do suggest that biotoxins, which clearly cause increased mortality and reduced reproductive success in other marine mammals, are potentially involved. These findings are being further investigated with additional funding from the Scottish Government.



Photo: Louise Cunningham, SMRU

Marine predator hunting techniques – the Lévy-flight foraging hypothesis

David Sims, MBA

By monitoring the movements of 14 species of marine predators, an international research team led by David Sims of the MBA has established firm evidence for Lévy flight behaviour, 'a movement pattern characterized by many small steps connected by longer relocations' which optimizes the chance of predators finding food as local resources become scarce.

The validity of earlier empirical research to identify Lévy behaviour was queried because of concerns about the accuracy of statistical methods used. Professor Sims' research used more robust maximum-likelihood methods to test for Lévy patterns 'in the largest animal movement data set assembled for this purpose'. Electronic tags attached to 55 study animals generated over 12 million data points; analysis found that Lévy behaviour is observed where food is scarce, whereas predators adopt a more leisurely, localized foraging behaviour akin to

Policy updates

Brownian motion when food is abundant. The results from this research are consistent with the Lévy-flight foraging hypothesis that organism search strategies have naturally evolved to exploit optimal Lévy patterns.

Professor Sims said, 'The results of our study enable predictability of movement patterns of fish under decreasing prey conditions, as might be expected with environmental changes such as fishing depletions or climate change. This knowledge should help us to manage fish stocks more efficiently in the future.' (NERC 2010).

Sources:

Humphries, N.E. *et al.* 2010 Environmental context explains Lévy and Brownian movement patterns of marine predators. **Nature** 465, 1066-1069.
NERC, 2010. *Giant steps help hungry fish to find food.* Available at: <http://www.nerc.ac.uk/press/releases/2010/24-hungry.asp>



Silky shark. Credit: Jeremy Stafford-Deistch

Round-up of policy news *Steve Hall, NMCO*

Following the passing of the Marine and Coastal Access Act 2009 and Marine (Scotland) Act 2010, a National Marine Policy Statement is being prepared, consultations on marine planning systems are complete and licensing for marine activities will soon be reality. Although exemptions for licensing for most marine scientific activities have been retained, some must be registered.

In July 'Charting Progress 2 – The State of UK seas' (CP2) was published, following five years work by researchers, including members of the Oceans 2025 community. CP2 will support the requirement by the EU Marine Strategy Framework Directive for Member States to show they are working to achieve 'Good Environmental Status' by 2020.

The UK Marine Conservation Zone (MCZ) Project, led by Natural England and the Joint Nature Conservation Committee delivers recommendations about MCZs to Government through projects covering South-West seas, the Irish Sea, North Sea and South-East seas. In 2010 the UK designated a large marine protected area in the British Indian Ocean Territory. The OSPAR Commission has established six protected areas in the North-East Atlantic which will support

commitments under the World Summit on Sustainable Development and Convention on Biological Diversity (CBD). At the November meeting of the CBD, there was pressure to call a halt to all geo-engineering research, however, a compromise means that some research will be possible.

In October the research community discussed future priorities for European marine research and explored how to better inform European marine policy over the next decade, issuing the 'Ostend Declaration' (<http://www.eurocean2010.eu/declaration>) which declares a readiness to work more closely with decision makers to provide knowledge, services and support to the EU and its Member and Associated States. Several Oceans 2025 scientists were present. Observatories such as the Porcupine Abyssal Plain site were seen as important components of a future integrated European Ocean observing system.

Europe seeks closer links between marine and maritime policy and UK administrations are searching for new ways to provide science-based decision making under tight financial constraints. The next few years will shape how we manage our seas and oceans for decades to come.