

Challenger Wave



Monthly newsletter of the Challenger Society for Marine Science (CSMS)

NEWS

Clockwork copepods: Microscopic marine creatures swim to their own rhythm

An experiment conducted in a Scottish loch has revealed how a microscopic animal, the main food source for many larger marine species, schedules its day using its own genetic clock. The 'body clock' of the copepod *Calanus finmarchicus* shapes its metabolic rhythms and movement through the water column. This in turn has an enormous influence on the entire food web in the North Atlantic and Arctic oceans where *Calanus finmarchicus* is a central plankton species.



As the site of a rare 'captive' population of the copepod *Calanus finmarchicus*, Loch Etive in Argyll was crucial to the scientific findings.

As part of the study, which has been published in the journal, *Current Biology*, scientists from the Oban-based Scottish Association for Marine Science (SAMS) carried out research in Loch Etive, Argyll, where one of the only known isolated populations of *Calanus finmarchicus* is found.

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In the world's oceans, countless zooplankton species, like copepods and krill, rise to the surface at dusk to gorge themselves on single-celled algae that can only thrive where there is sufficient sunlight. The cover of night offers the zooplankton protection from predators like fish, which need light to hunt. When dawn approaches however, they sink back into the dark depths where they can hide from their predators throughout the day; completing a cycle that likely represents the largest daily movement of biomass on the entire planet. Though this phenomenon was first discovered over a century ago, researchers are still working to decipher which signals these marine organisms use to decide when to rise and when to descend.

Along with colleagues at the Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research (AWI) and the University of Oldenburg in Germany, the SAMS team showed that *Calanus finmarchicus* possesses an internal genetic clock, also called the circadian clock, which produces a specific 24-hour rhythm that functions even without a day/night cycle. This could be important during the constantly dark polar winter and in the deep sea. Light is only needed in order to occasionally reset the clock, and work previously carried out by SAMS researchers showed zooplankton in the Arctic regulated their movements using moonlight, in the absence of sunlight, during the polar winter.

The latest paper's lead author Sören Häfker of AWI said: "We were amazed to see how precisely the genetic clock maintained its 24-hour rhythm without any external stimuli, and that we found the same rhythm under controlled laboratory conditions as we did in the natural habitat of Loch Etive."

The copepod *Calanus finmarchicus*, which can swim many tens of metres in its daily migration, builds up large fat reserves in its body, making it

an appealing source of food for many larger animals. As such, its daily migration is extremely important for the ecosystem, especially as global warming has shifted the distribution of many marine species closer to the poles.



The fatty *Calanus finmarchicus* the main food source for many larger marine species in the Arctic and North Atlantic

Dr Kim Last of SAMS, a co-author on the new study, added: “We have long looked to uncover the mysteries of zooplankton migrations and it appears that the circadian clock, much like our own, has a very important role to play in helping the animals be in the right place at the right time. Such fundamental mechanistic understanding is crucially important if we want to predict how marine ecosystems will respond to the complexities of future climate change.”

Genetic discovery is breakthrough in disease-resistant seaweed search

Research conducted into the genetic make-up of a resilient red alga has taken scientists a step closer to breeding disease-resistant seaweed. Researchers at the Scottish Association for Marine Science (SAMS) in Oban, Scotland have established the genetic code for the *Porphyra umbilicalis*, a small, but tough intertidal species that can tolerate a range of conditions and is among the world’s most valuable commercial seaweeds.

The researchers mapped the 13,125 genes in the seaweed, a human has around 20,000, to help discover what makes the intertidal species so resilient, as they aim to breed marketable seaweed that can withstand threats from common diseases. They examined the red alga’s pathogen receptors, the equivalent of antibodies that recognise diseases and alert the alga to an

attack, and found that the alga’s defences are unlike other plants. The SAMS work has contributed to a research paper, “Insights into the red algae and eukaryotic evolution from the genome of *Porphyra umbilicalis*”, published in the American journal, Proceedings of the National Academy of Sciences (PNAS).



The red alga *Porphyra umbilicalis* has proven to be tolerant to a range of environmental conditions and could be key in breeding disease resistant seaweed.

SAMS algal pathologist Dr Yacine Badis said: “Like any living organism, algae are plagued by diseases. Understanding how they detect and defend against disease is key to unlocking the future development of resistant strains. Although red algae and land-based plants are related, the typical defence mechanism found in plants was not detected in *Porphyra*. This means that *Porphyra* has original pathogen detection strategies, a finding that opens exciting avenues of research into red algal immunity and its use in modern breeding programmes. UK research on *Porphyra umbilicalis* has previously helped to shape the global seaweed industry, the British

botanist Kathleen Mary Drew-Baker unveiled the life cycle of this alga and paved the way for the industrialisation of seaweed in Japan, and we hope our work can play a part in developing this industry into the future.”

Porphyra umbilicalis, more commonly known as Laver, can adapt to conditions on different parts of the rocky shores of the UK and Ireland and is able to withstand prolonged periods of exposure to the air as well as tolerating a greater degree of wave action than most other red algae. The development of resilient and marketable seaweed would be of great benefit to the global aquaculture industry, which has developed at an unabated pace over the past six decades and is thought to be worth in excess of \$5billion. However, farmed stocks are extremely susceptible to disease.

SAMS molecular phycologist Dr Claire Gachon said: “This work is part of our long term efforts to support the development of seaweed aquaculture worldwide through a better understanding of the diseases that plague the industry.”

The work at SAMS is part of the GlobalSeaweed project, a network of scientists advising on global seaweed policy funded by the UK’s Natural Environment Research Council (NERC).

Supporting coastal communities in Southeast Asia

A group of UK researchers have been awarded funding from the Research Councils UK’s £225 million Global Challenges Research Fund (GCRF), www.rcuk.ac.uk/media/news/170721/, to help support coastal communities in East and South East (E/SE) Asia that depend on healthy and diverse marine ecosystems for food, livelihoods, their health and well-being.

The Blue Communities project, led by Plymouth Marine Laboratory in collaboration with the University of Plymouth, the University of Exeter, international partners, UK non-governmental organizations (NGOs) and local stakeholders, will help build long-term research capability for marine planning over the next 4 years in E/SE Asia and, in doing so, support local coastal communities.

Millions of people across the globe rely on marine and coastal ecosystems for food, employment and their general well-being. However, the marine

environment is under immense pressure from the multiple, and often conflicting, needs of the people that use it. In E/SE Asia, where marine activities are important contributors of Gross Domestic Product (GDP), marine spatial planning involving coordinated decision-making has been highlighted as a key requirement for a sustainable future. Through academic and stakeholder collaborations and community co-creation, Blue Communities will support the development, implementation and ongoing management of initiatives that promote the sustainable use of marine resources. One of the most important aspects of this project is effective and culturally-sensitive relationship building with the wide-ranging stakeholders to engender trust between all parties and to underpin up-take of the marine management strategies developed over the course of the project.



The Blue Communities team will focus their work on case study areas in Indonesia, the Philippines, Vietnam, China and Malaysia. These identified areas are already designated as ‘UNESCO Man and the Biosphere Reserves’, www.unesco.org/new/en/natural-sciences/environment/ecological-sciences/biosphere-reserves/, or marine parks and there will be strong links forged between them and the North Devon Biosphere Reserve. These ‘science for sustainability’ support sites provide an established, collaborative infrastructure in which initiatives can be developed and tested alongside the local stakeholders, with an aim to then promote and trial with surrounding communities.

Professor Mel Austen, Blue Communities Principal Investigator and a Head of Science at Plymouth Marine Laboratory, comments: “We are

excited to have been awarded the GCRF funding and we look forward to working and sharing knowledge with our South East Asian partners. We aim to compare the unique features, existing management strategies and local challenges for each of the case study sites, and then identify successful initiatives and best-practice that may also be beneficial in other areas.”

Professor Hoang Tri, chair of Vietnam’s National Committee for Man and Biosphere Program and Director of the Centre for Environmental Research and Education at the Hanoi National University of Education, noted: “This fund will be valuable to do research and study for global and national priorities for sustainability science, in both methodological development and good practices.”

Dr Jito Sugardjito, Blue Communities partner and Director of the Centre for Sustainable Energy and Resources Management (CSERM) at Universitas Nasional in Indonesia, remarked: “As a maritime nation, the action research to be conducted in our area will produce a great net benefit to the country’s effort in mitigating climate change and establishing community resilience towards natural and social challenges through sustainable livelihood and resources management. It will also become a springboard for continuous capacity building and knowledge exchange between researchers and practitioners in Indonesia and the United Kingdom.”

Professor Goh, Hong Ching, Blue Communities partner and senior lecturer at the University of Malaya, continued: “We look forward to a productive collaboration and effective knowledge sharing with our UK and regional counterparts. Heartfelt thanks to RCUK for granting our proposal, and to our UK research partners for initiating and leading this project.”

Professor Lora Fleming, Co-Investigator of Blue Communities and Director of the European Centre for Environment and Human Health at the University of Exeter Medical School, stated: “The scientific and policy communities are really starting to appreciate how important the health of our seas and oceans are for human health and well-being in terms of both risks and opportunities. This is a new and exciting opportunity for us to work closely with partners in South East Asia to explore these issues in a

region where so many people’s health is connected to marine ecosystems.”

Dr Sabine Pahl, Co-Investigator of Blue Communities and scientist at the University of Plymouth, concluded: “The human dimension is crucial in marine planning, in terms of decisions, perceptions and behaviours that affect the health of ecosystems and the people attached to them. Blue Communities will include behavioural science theory and methods to develop powerful communication and engagement methods and outputs.”

Global experts launch project to ensure seaweed sustainability

The seaweed industry is the fastest growing of all aquaculture sectors, transforming the lives of millions of people, but the increasing threat from disease and pests has prompted a global research group into action to protect this multi-billion dollar commodity. The industry worldwide is worth more than \$5 billion annually, growing by around 10 per cent each year, and supports millions of families in coastal communities, especially in developing nations, where 95 per cent of the world’s seaweed supply is cultivated. Seaweed is grown to be eaten and to produce substances such as agar, which has many applications, from cooking to microbiology.



A healthy seaweed farm in Zanzibar

Outbreaks of seaweed disease and pest infestations are having catastrophic socio-economic impacts on the communities reliant on seaweed production. In the Philippines alone, losses over \$100 million per year were attributed to disease, representing 15 per cent of their farmed seaweed production, and similar

reductions have been seen in Tanzania and Indonesia.



A cutting of seaweed affected by epiphytes in Zanzibar

The UK-funded ‘GlobalSeaweed*’ initiative was launched on the 21st July to improve the research capabilities and knowledge for the industry in developing nations. Scientists from seven international research institutes will drive the £5 million project with the aim of providing solutions and training in disease prevention and identification to aid the sustainable growth of this vital industry in seaweed-producing developing countries.

Dr. Elizabeth Cottier-Cook, of the Scottish Association for Marine Science (SAMS), leads the project which is part of the £225m Global Challenges Research Fund (GCRF) Research Councils UK Collective Fund. She said: “Worldwide, seaweed farming provides income to millions of families in rural coastal communities and provides a source of food. The industry has also enabled women to become economically active in areas where few opportunities exist. But, many seaweeds grown in developing countries are intentionally introduced from other parts of the world and they can bring with them a whole host of pests and disease, which go on to have wider environmental consequences. We want to train people from seaweed producing developing nations in how to identify disease, support their efforts in breeding better crops and help shape national and international legislations to improve bio-security. In turn, we hope that the exchange of information and sharing of best practices on breeding and cultivation techniques will benefit a truly global industry.”

The key ecological and socio-economic challenges hindering the sustainable economic growth of the seaweed industry were recently identified in a SAMS / United Nations University Institute for Water, Environment and Health (UNU INWEH) Policy Brief led by Dr Cottier-Cook. Two main challenges highlighted were the high vulnerability of some crops to disease outbreaks and pest infestation and the paucity of bio-security measures and legislation governing the movement of seaweeds between regions and continents.

GlobalSeaweed* is one of 37 projects in The GCRF Research Councils UK Collective Fund, which aims to build upon research knowledge in the UK, and strengthen capacity overseas, to help address challenges, informed by expressed need in the developing countries.

Jo Johnson, Minister for Universities and Science, said: “From healthcare to green energy, the successful projects receiving funding today highlight the strength of the UK’s research base and our leadership in helping developing countries tackle some of the greatest global issues of our time. At a time when the pace of scientific discovery and innovation is quickening, we are placing science and research at the heart of our Industrial Strategy to build on our strengths and maintain our status as science powerhouse.”

Dr Grant Stentiford of the UK’s Centre for Environment, Fisheries, Aquaculture Sciences (Cefas) said: “GlobalSeaweed* comes at a crucial time in the expansion of the global seaweed aquaculture industry. Whilst recognising the clear benefits that seaweed cultivation may play in food security and poverty alleviation, we must also be minded of the hurdles faced during expansion of other aquaculture sectors, particularly related to the damaging effects of emerging disease. These diseases have been particularly devastating when spread by global trading. The unique scientific team assembled under GlobalSeaweed* will link industry operatives, policy professionals and scientists to develop best practice in this growing industry and, to provide underpinning evidence to facilitate development of new policies around trading of seaweed based upon disease.”

Dr Ruth Garcia Gomez, an aquatic bio-security specialist with Pacific Community, said: “Seaweed farming is one of the few industries in Pacific Island Countries and Territories (PICTs)

that are potentially export-oriented, culturally and technologically appropriate, and able to provide substantial livelihood benefits to men and women in remote communities. Seaweed is ranked one of the highest priority commodities for aquaculture by many PICTs, such as Fiji, Kiribati, Papua New Guinea, Samoa, Solomon Islands and Tonga, among others.”

Malcolm Beveridge, Head of the Aquaculture branch at the United Nations’ (UN) Food and Agriculture Organisation (FAO), said: “It is fantastic to see seaweed, a much neglected marine resource, being given serious attention as a sustainable means of helping lift people out of poverty and hunger.”

Dr Nidhi Nagabhatla, programme officer at UNU INWEH said: “GlobalSeaweed* is all set to provide strategic direction to the long term sustainability of seaweed farming by adopting a consultative, comprehensive assessment process to bridge the data, information and knowledge gaps and needs in science-policy and science-society interfaces in this expanding nature-based enterprise.”

Internationally the project will deliver a digital Atlas of Seaweed Diseases and Pests, and a rapid response network to deal with seaweed crises as soon as they emerge. It will also establish the GCRF GlobalSeaweed* fund, which will financially support seaweed-related projects in developing nations and in the UK.

GlobalSeaweed* is a follow on from the Natural Environment Research Council (NERC) International Overseas Fund programme [GlobalSeaweed](#), led by SAMS researcher Dr Claire Gachon. This international programme has begun to influence the seaweed sector globally and has involved collaborative research, training and networking with international bodies including: the [International Society for Applied Phycology](#), the Asian Pacific Phycological Forum, the NSF-funded [Porphyra Research Collaboration Network](#), the [Federation of European Phycological Societies](#), the [British Phycological Society](#), the [International Phycological Society](#), the European Aquaculture Society, the International Union of Conservation of Nature and the UN Fisheries and Agriculture Organisation (FAO). Work through GlobalSeaweed has already led to the discovery of new algal diseases, as

presented in an earlier NEWS article in this edition of Challenger Wave.

Surfers, satellites and sea

Scientists are combining our need for detailed measurements with their passion for surfing to fill gaps in our understanding of coastal seas and how they may change. Measuring the temperature at the surface of the ocean is a crucial component to understanding its biological, physical and chemical environment. The sea surface temperature (SST) influences how gases move between the sea and the atmosphere, the distribution and feeding of marine animals such as fish, whales and seabirds, and may impact global and regional climates. Any changes in SST can have major effects on how the ocean behaves and on the life it sustains. Understanding the changing environment and the potential ramifications of climate change depends on accurate measurements and regular monitoring.

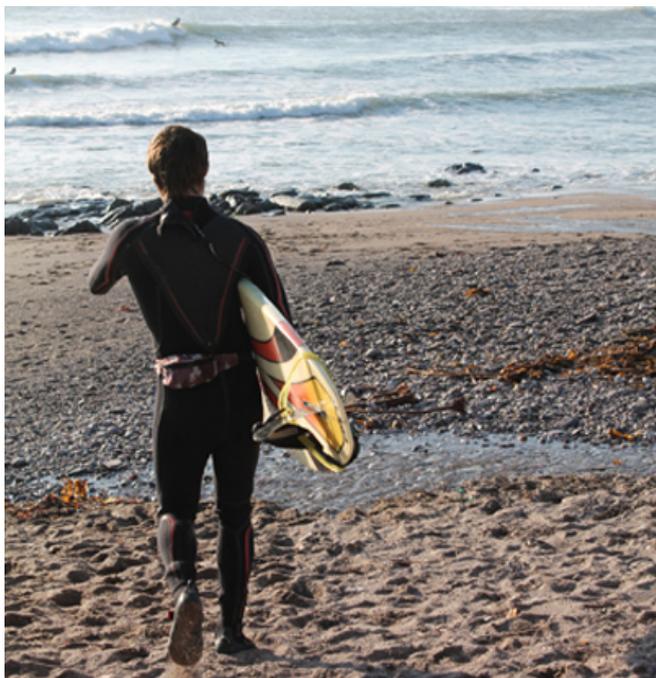
In the open ocean, satellites with specially tuned sensors are used to measure SST with coverage over large areas on a regular time frame; the reliability of these remote measurements is validated by many in situ observations from ships, autonomous sensor-bearing floats and other platforms. Perhaps surprisingly, closer to the coast the picture is less clear and due to a limited number of in situ measurements, little is known about the accuracy and precision of the satellite Earth observation (EO) data in the near shore region. Coastal seas are ecologically and economically very important but they are highly variable and that variability makes it harder to get good measurements from satellites. Plymouth Marine Laboratory has been monitoring a wide range of environmental variables for decades through its regular sampling and autonomous collecting at the L4 and E1 stations, 7km and 33km off the coast of Devon, but measurements at the coast are much less frequent.

Now Dr Bob Brewin and his colleagues have combined their science and their hobby to fill in the gaps, get more data and use it to test the satellite observations. “We have quite a lot of data from parts of our local coastal seas but there is a massive community of people using the sea on a regular basis, and if we could harness them, it could provide a wealth of measurements”, said Brewin.



Temperature sensor and GPS recorder

To test whether this approach might work, five surfers were equipped with temperature sensors and a GPS recorder, to link temperature measurements to the location of the surfers. Nearly three hundred surf trips, over three years, were conducted with the median of the readings in the water being used to represent the water temperature. In order to assess the accuracy of the satellite readings, the data from the surfers and the two autonomous buoys were compared; effectively three sets of readings taken at the same time in more-or-less the same place.



Dr Bob Brewin setting of with sensor and surfboard

The data from the offshore autonomous buoys agreed well with the satellite measurements. The data collected by the surfers matched very well with that from the autonomous buoys, allowing for the separation of the sites, however, the surfers'

data differed from the EO measurements, indicating “a significant reduction in performance” of the Advanced Very High Resolution Radiometer (AVHRR) satellite sensor when it came to retrieving SST at the coast. The hope is that measurements like these will be used to improve satellite measurements, which could improve the retrieval of temperature data around the world, dx.doi.org/10.1016/j.ecss.2017.07.011.

Brewin and his colleagues are not alone in trying to improve the quality of measurements and have begun a collaboration with Scripps Institution of Oceanography, in the US, testing a surfboard fin designed to measure temperature. So might surfers provide the link that could improve readings ?

“We have shown that there is considerable potential in ‘tagging’ recreational water users”, Brewin commented. “In the UK alone we could get around 40 million measurements of SST just from the surfing community, if all had sensors, in the US that could be as many as 350 million readings per year. When you consider that surfers often visit some of the most remote locations across the globe, locations that may be especially vulnerable to climate change and hence SST changes, the opportunity is immense. Increasing the coverage and frequency of these in situ measurements, through ‘citizen science’ participation will not only help us to refine the satellite sensors and how we interpret their readings, but will have an immediate impact on our understanding of how coastal waters may be changing”.

VIEWS

Success of the Arctic Circle-Wilson Centre forum on Russia and the United States in the Arctic

About 600 participants from the United States, Russia, other Arctic states, Europe and Asia attended the Arctic Circle-Wilson Centre Forum, which was held at the Ronald Reagan Building in Washington, June 21-22, 2017.

The Forum was opened by Ólafur Ragnar Grímsson, Chairman Arctic Circle and former President of Iceland (1996-2016), and Jane Harman, President of the Wilson Centre.

Discussions focused on the United States and Russia in the Arctic, including Arctic Coast Guard cooperation, Arctic security, scientific research collaboration, the development of maritime economies, Arctic shipping, and the constructive cooperation of Russia and the United States within the Arctic Council.



Highlights of interviews with key speakers can be found at <http://www.wilsoncenter.org>. See more photos and information on our webpage, <http://www.arcticcircle.org>.

MASTS ASM workshops

Details regarding the MASTS Annual Science Meeting Workshops are now available: [2017-workshops](#). Places on these workshops can be booked when you register online: [annual-science-meeting/registration/](#). There is still space for a couple more workshops, so please get in touch if you are interested in running a workshop.

Two day workshop (5th/6th Oct):

Auditorium A: Decommissioning and Wreck Removal (13.30-17.30 on Thursday 5th Oct and 8.45-12.45 on Friday 6th October).

One day workshop (6th Oct):

Level One Auditorium: Cumulative effects of multiple stressors (09.15-15.15).

Morning workshops (6th Oct):

Conference room 2: Scottish Microplastic Research Group Meeting (09.30-12.30).
Conference room 8: BioTIME: how to interact with a biodiversity time series (09.15-12.15).

Afternoon workshops (6th Oct):

Conference room 8: MAREMAP: A UK Marine Environmental Mapping Network (13.00-17.00).

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Call for nominations for the 2018 IMBeR Scientific Steering Committee



Integrated Marine Biosphere Research

Call for nominations for the 2018 IMBeR Scientific Steering Committee

The Integrated Marine Biosphere Research (IMBeR, www.imber.info) project invites nominations for four positions on its Scientific Steering Committee (SSC) for terms beginning on 1 January 2018.

The SSC is responsible for the development, planning and implementation of IMBeR science. The IMBeR science plan (2016-2025) is available at: [IMBeR SPIS 2016-2025](#).

SSC members serve for a period of three years, with the potential of renewing for an additional three-year term. The IMBeR SSC and sponsors, the Scientific Committee on Oceanic Research (SCOR) and Future Earth, will select the new members based on expertise, and geographic and gender balance.

More information about the SSC is available at: [IMBeR Scientific Steering Committee](#).

We seek nominations of individuals with the expertise to address the new IMBeR Science Plan and in particular, individuals with expertise in the areas of:

- Marine chemistry, carbon cycling
- Marine ecosystem structure and functioning
- Impacts of multiple stressors on marine-human systems
- Physical-biological interactions
- Socio-ecological modelling
- Marine governance
- Plankton genetics and evolutionary processes
- Ocean literacy and communication

Nominations should include the following information:

Nominated by (optional):

Name of the nominee:

Affiliation:

Contact information:

Email:

Website:

Expertise keywords:

Brief description (200 words max.) of what/how the nominee would contribute to the IMBeR science plan:

Up to ten most relevant publications:

Short, one page CV

Nominations (you are welcome to nominate yourself) should be submitted to the IMBeR International Project Office (imber@imr.no) by **Monday 4 September 2017**.

SALTS

No news from sea this month I'm afraid

I know that this is a favourite section for many readers, where we get the inside information about life at sea, its thrills and spills. So please the next time you are at sea or carrying out any fieldwork, please remember that a simple paragraph or two will get you published here. – Ed

CALENDAR

6th-7th September 2017: Advances in Marine Biogeochemistry Conference VIII

Oban, Scotland, UK

Advances in Marine Biogeochemistry Conference VIII

SAMS  

Save the date!
6 – 7 Sept 2017
at SAMS in Oban

Marine Biogeochemistry Special Interest Group of the Challenger Society



Organisers:
MBF Chair: Gary Fones, Uni. Portsmouth
AMBIO VIII Co-convenors: Kirsty Crocket and Natalie Hicks, SAMS
Photo: Emma Defew and Mark James

AMBIO meetings set the stage for Marine Biogeochemistry in the UK, connecting disciplines within the field and establishing networks for the integration of early career scientists. The AMBIO VIII meeting in September 2017 is to be hosted at the Scottish Association for Marine Science in Oban. Save the date! Registration will open in early 2017.

Info: www.challenger-society.org.uk/Marine_Biogeochemistry_Forum
Contact: kirsty.crocket@sams.ac.uk, natalie.hicks@sams.ac.uk

2nd-6th October 2017: the 5th IMBIZO
Woods Hole, MA, USA

We have extended the abstract submission deadline for IMBeR IMBIZOs!

IMBIZO means 'a gathering' in Zulu, and we will gather in Woods Hole in October to address:

Marine biosphere research for a sustainable ocean: Linking ecosystems, future states and resource management

We will follow the proven IMBIZO format of three concurrent but interacting workshops, with joint plenary and poster sessions. To optimize interactions, each workshop will be limited to 40 participants, selected on the relevance of the submitted abstracts (so you must submit an abstract to be considered).

Plenary **keynote presenters** are: Eddie Allison, Mary Ann Moran, André Punt, David van der Zwaag

The workshops themes and conveners are :

1. [Critical constraints on future projections of marine systems](#) (Laurent Bopp & Eric Galbraith)
2. [Metabolic diversity and evolution in marine biogeochemical cycling and ocean ecosystem processes](#) (Gerhard Herndl & Tatiana Rynearson)
3. [Management Strategy Evaluation: Achieving transparency in natural resource management by quantitatively bridging social and natural science uncertainties](#) (Cisco Werner & Ingrid van Putten)

Bonus hands-on **Infographics** training workshop for all IMBIZO participants on 1 October

IMBIZOs are great meetings, don't miss out - submit an abstract by 15 June 2017!

[More information on the IMBIZO 5 Website](#)

imber@imr.no

STAY CONNECTED

4th-6th October 2017: MASTS 7th Annual Science Meeting: "Sea Change – Changing Seas, Changing Times"
Glasgow, Scotland, UK

The Marine Alliance for Science and Technology for Scotland (MASTS) will hold its seventh Annual

Science Meeting (ASM) at the Technology & Innovation Centre, Glasgow. Now the largest gathering of marine scientists in the UK, this cross-disciplinary meeting will promote the latest advances in marine science, good governance and using sound science responsibly. It will revisit the vision: 'Clean, healthy, safe, productive, biologically diverse marine environments, managed to meet the needs of people and nature'

This cross-disciplinary meeting brings together members of the marine science community, with the aim of promoting and communicating research excellence and forging new scientific collaborations. The cross-disciplinary nature of the event as well as the high calibre of the selected talks means that scientists can broaden their knowledge in marine science as well as benefit from expertise and ideas gained in a range of fields other than their own.

Topical meeting sessions include:

- General Science Session
- Maximising capabilities of volunteer observing systems
- SNH session - Safeguarding Scotland's coasts and seas - perspectives and visions
- Deep Sea
- Circulation, dispersion and connectivity in Scottish Waters
- Marine Biogeochemistry

For more details about these sessions please visit <http://www.masts.ac.uk/annual-science-meeting/2017-abstract-submission/>

Science presentations and e-poster sessions will take place on the first two days, together with opportunities to network. On the third day, the venue will host a number of meetings and workshops. We also invite you to join us at the conference dinner to be held on the evening of Wednesday 4th October at the Millennium Hotel Glasgow (featuring MASTS own Prof Nick Hanley and his Hoochie Coochie Ceilidh band).

The MASTS ASM is an inclusive event and we encourage all members of the Marine Science community to attend, whether you are based in Scotland, the UK or further afield. Everyone is welcome, so please circulate this notice widely. For more general details visit <http://www.masts.ac.uk/annual-science-meeting/> or contact masts@st-andrews.ac.uk. We look forward to welcoming you at the MASTS ASM. Early bird

registration for the event opened on Monday 3rd July.

13th-15th October 2017: Fifth Arctic Circle Assembly

Reykjavik, Iceland

To be held at the Harpa Concert Hall and Conference Centre, <https://player.vimeo.com/video/152251225?autoplay=1>. The Arctic Circle Assembly provides an open, democratic forum for discussion and cooperation on Arctic Affairs. We hope to see you in Reykjavik this fall. For more information please visit Secretariat@ArcticCircle.org.

13th-15th November 2017: NOC Marine Autonomy & Technology Showcase

Southampton, UK

For more information visit conference.noc.ac.uk/matshowcase.

15th November 2017: Royal Meteorological Society meeting

London, UK

Early announcement of a Royal Meteorological Society meeting entitled 'Maritime Meteorology', to be held at Trinity House, London. Attendance at the meeting will be free but it will probably be necessary to register in advance. More information nearer the time.

19th-21st November 2017: Arctic Circle Forum

Edinburgh, Scotland, UK

SCOTLAND AND THE NEW NORTH

AN ARCTIC CIRCLE FORUM

ORGANISED IN COOPERATION WITH

THE SCOTTISH GOVERNMENT

Edinburgh, November 19 - 21, 2017

Save the date! The next Arctic Circle Forum — "Scotland and the New North" — will be held in Edinburgh, 19-21 November 2017 in cooperation with the Scottish Government. More details will be published in the coming weeks.

www.arcticcircle.org

NOC MARINE AUTONOMY & TECHNOLOGY SHOWCASE

conference.noc.ac.uk/matshowcase

Invitation to Submit Abstracts for NOC MATS2017

The NOC has been pioneering in the development of Marine Autonomous Systems for nearly 20 years now, developing platforms that have collected data from the most challenging environments, transforming our understanding of the ocean. Our world-leading thinking has also been shared with companies operating in this sector, and we continue to build an impressive portfolio of collaborative projects with industry partners that will develop the next generation of marine autonomy going forward. Please do take this opportunity to join us for what promises to be a very exciting week that will showcase world-leading platform and sensor developments, engaging many stakeholder groups from both the private and public sector, all united around the benefits that can be achieved from development and use of marine autonomy for ocean observation. **Kevin Forshaw, Associate Director Enterprise and Innovation, NOC**

New for 2017- Call for Abstracts

For the 2017 event we have engaged with our Industry partners, and as a result we are actively inviting Abstract Submissions for the 2017 showcase based on the following conference pillars:-

1. Applications - Current Reality and Aspirations
2. Enabling Technologies to enhance our understanding of the marine environment
3. "Making Systems Smarter" - the advance from Automatic to Autonomy
4. The economic, environmental and human benefits of autonomous systems
5. Upskilling and preparing the workforce for an autonomous future *this session will include a session of NEXUS student submissions.
6. Miscellaneous session led by submissions.

Please visit the MATS2017 website for further guidance on the required content for the above pillars and how to submit an abstract by [clicking here](#).

Abstract submission will open 30 June 2017 and close 1 September 2017, confirmation of acceptance will be sent out by 20 September 2017, the final decisions will be made by an expert panel.

NOC MARINE AUTONOMY & TECHNOLOGY SHOWCASE

13:11:17 - 15:11:17
NOC SOUTHAMPTON

conference.noc.ac.uk/matshowcase

11th-15th December 2017: AGU Fall Meeting

New Orleans, USA

For more information visit fallmeeting.agu.org/2017.



AGU has long been a proponent and leader in open data and open science, not only in our own publications and meetings, but also within the broader research community.

AGU is taking that commitment to the next level by introducing an Application Program Interface (API) that will open the door for scientists, developers, and others to create innovative applications that advance science and our mission. Read more about this newest element of AGU's Digital Strategy focusing on engagement, experimentation, and open data in Executive Director/CEO Chris McEntee's [From the Prow post](#). With this launch, we invite you to develop a web-based tool that adds value to an API containi data from the [AGU Fall Meeting](#) Scientific Program.

What's the Goal ?

Advance the scientific enterprise, whether it's through serendipitous discovery of relevant research, discovery of new collaboration opportunities, identification of emerging areas of science, or something we haven't thought of.

Entry Requirements and Guidelines

Individuals and teams interested in participating will need to request access to the API. Access to the data will be granted in early August.

Deadline to Request API Access: 11 September, 11:59 P.M. EDT

Submission Deadline: 2 October, 11:59 P.M. EDT

Prizes:

1st Prize: \$15,000, 2nd Prize: \$10,000, 3rd Prize: \$5,000

Each winning team will also receive up to four complimentary one-day passes to Fall Meeting to attend the award ceremony. To get more technical details about the API, [register for the Q&A webinar](#) on 21 August, 2 P.M. EDT.

13th-15th March 2018: Oceanology International

London, UK

For more information visit [OI website](#) or contact [Ellen Burgess](#).



Technical Tracks: Be a part of the conference

Whether you are a technologist seeking to describe a new development, a scientist or an engineer wishing to share a new application or a user of ocean data wanting to share your specific needs, we invite you to [submit an abstract](#) to the Oceanology International 2018 technical conference programme.

The topics for submission are:

- Unmanned Vehicles and Vessels
- Hydrography, Geophysics and Geotechnics
- Navigation & Positioning
- Underwater Imaging & Metrology
- Ocean Observation & Sensing
- Ocean Information & Communications Technology
- Monitoring Structural Integrity
- Delivery Efficiencies Across the Offshore Oil & Gas Life Cycle
- Marine Renewables
- Aquaculture
- Delivering Information & Data Needs for Coastal Engineering

The descriptions for each track and submission guidelines can be found on our [website](#). The deadline for submissions is **15 September 2017**. If you have any questions about the above technical tracks and how you can get involved as a speaker, chair or contributor, please don't hesitate to contact [Ellen Burgess](#).

The CSMS email address is info@challenger-society.org.uk. Contributions for next month's edition of Challenger Wave should be sent to: john@vectisenvironmental.com by the 31st August.

We continue to send printed copies of Challenger Wave to members of the CSMS without email addresses. However it is in everybody's interest to send your email address to Jennifer Jones, jxj@noc.ac.uk, as soon as possible

JOBS

Senior Research Associate

School of Environmental Sciences, University of East Anglia, Norwich, UK

Applications are invited for a Senior Research Associate to undertake studies of ocean biogeochemical processes on the European continental shelf using autonomous vehicles. The SRA will work with Professor Jan Kaiser and others on the NERC-funded project "AlterEco: An Alternative Framework to Assess Marine Ecosystem Functioning in Shelf Seas". The SRA will participate in the design and delivery of ocean glider campaigns in the North Sea, calibrate and analyse the resulting observations, derive relationships between them, calculate rates of relevant biogeochemical processes and disseminate the work to academic audiences, stakeholders and policymakers.

The successful candidate will have a minimum of a Ph.D in oceanography or equivalent independent research experience, and be able to fulfill all the essential elements of the person specification.

This full time post is available from 1 October 2017 for a fixed term period until 30 April 2020.

For an informal discussion please contact Professor Jan Kaiser, Professor of Biogeochemistry, on Tel: 01603 593393 or email: J.Kaiser@uea.ac.uk.

To apply for this vacancy, please follow the online instructions at:
<http://www.uea.ac.uk/hr/vacancies/research>

There are jobs on the IMBER web site

<http://www.imber.info>



Integrated Marine Biosphere Research

IMBeR e-News

Announcements and reminders

- [Deadline for funding applications for IMBIZO5 participants is 23 July 2017](#)
- [GEOTRACES Intermediate Data Product 2017 launch on 16 August at Goldschmidt2017](#)
- [New IOC-UNESCO Global Ocean Science Report has been published](#)
- [Call for comments: NASA's 2017-2027 Ocean Biology and Biogeochemistry Research Plan. Comment by 15 Aug](#)
- [Save the date! 3rd World Small-Scale Fisheries Congress, 22-26 October, Chiang Mai, Thailand](#)

Meetings, conferences, workshops and summer schools

- [Submit abstracts for IMBeR sessions at Ocean Sciences 2018 before 6 September 2017: BN002. Advances in Aquatic Respiration: New Ideas, Conceptual Models, and Recent Findings on Plankton Community Respiration](#)
- [PL003. Biophysical dynamics of boundary upwelling systems in a changing ocean: Synthesis of current knowledge and future observational and modeling approaches](#)
- [SCOR-POGO Nutrient analysis workshop for participants 5-9 Nov, Holland. Apply by 1 Aug](#)
- [Toward an integrated metocean monitoring, forecasting and service system workshop, Bali Indonesia, 23-24 Oct. Abstract deadline: 31 July 2017](#)

Jobs and opportunities

- [Senior Research Associate: Ocean biogeochemical processes. Contact: J.Kaiser@uea.ac.uk Apply by 31 Aug](#)
- [Executive Secretary Arctic Monitoring and Assessment Programme \(AMAP\). Apply by 25 August](#)
- [Open call for Postdocs, Polish Academy of Sciences, Sopot, Poland. Apply before 30 September](#)
- [Open call for PhDs, Polish Academy of Sciences, Sopot, Poland. Apply before 30 August](#)
- [Research specialist: Biogeochemical sensors, MBARI, Moss Landing, CA, USA](#)
- [Open call for PhD positions: ARC Centre of Excellence for Climate Extremes, Australia](#)
- [PhD: Climate dynamics, Depy Earth Science, Bergen, Norway. Contact Apply by 10 August](#)
- [PhD: Climate dynamics, Geophysical Institute, Bergen, Norway. Apply by 10 August](#)
- [PhD: Climate dynamics, Geophysical Institute, Bergen, Norway. Apply by 10 August](#)
- [PhD: Marine biogeochemistry, Geophysical Institute, Bergen, Norway. Apply by 10 August](#)
- [Future Earth: Executive Assistant, Montreal Canada. Apply by 7 August](#)
- [Future Earth: Early career Sustainability professionals travel grants](#)
- [PhD: Phytoplankton properties impacting zooplankton, AWI, Germany. Apply by 2 August](#)

Visit the IMBeR Website

imber@imr.no

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In a world where jobs are increasingly hard to find, we are pleased to let you know that we just started to post on our Facebook page a diversity of relevant job offers regularly brought to our attention. Follow us on [Facebook](#) now!

All the best,
the CIESM team
Mediterranean Science Commission