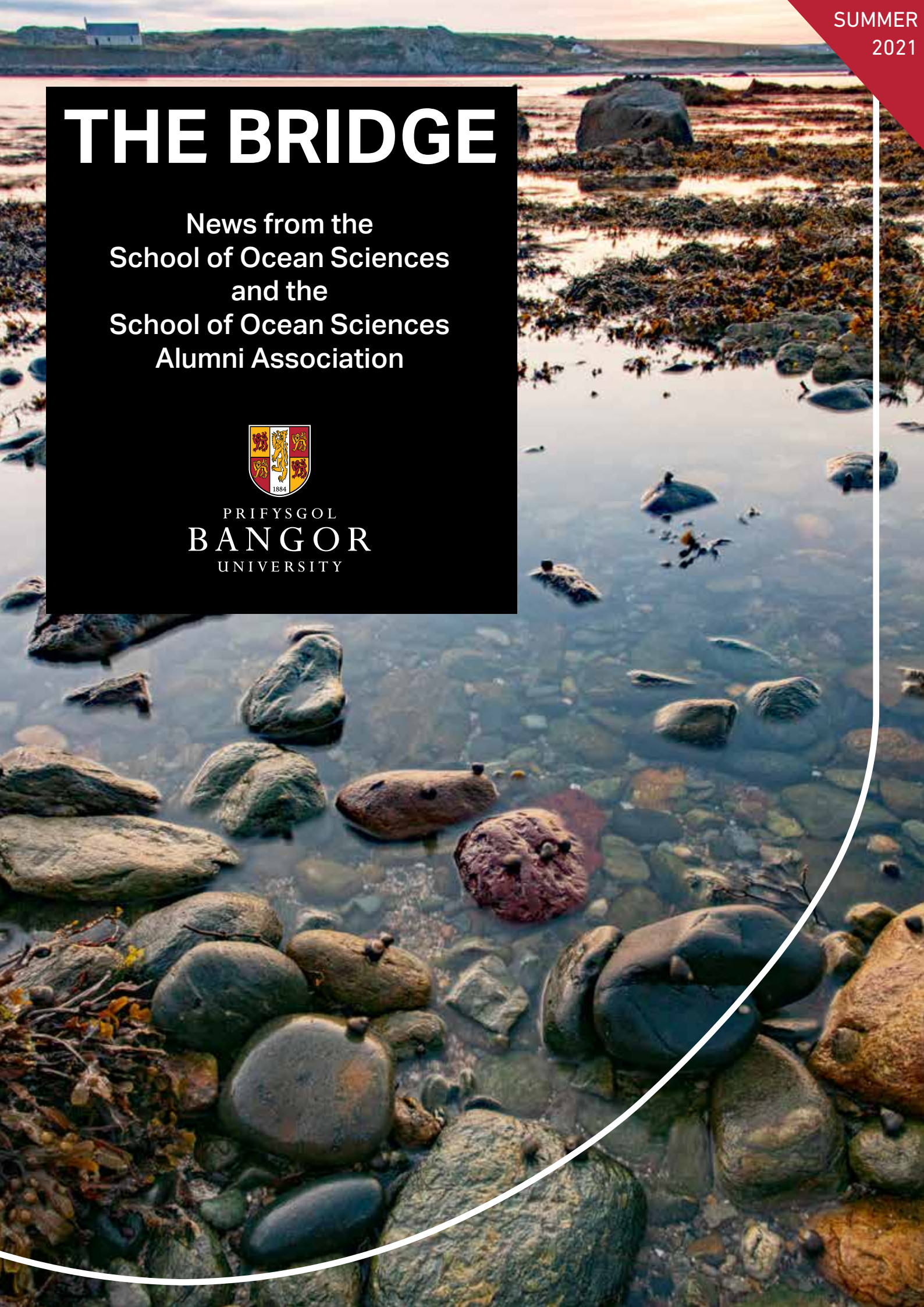
SUMMER
2021

# THE BRIDGE

News from the
School of Ocean Sciences
and the
School of Ocean Sciences
Alumni Association

PRIFYSGOL
BANGOR
UNIVERSITY



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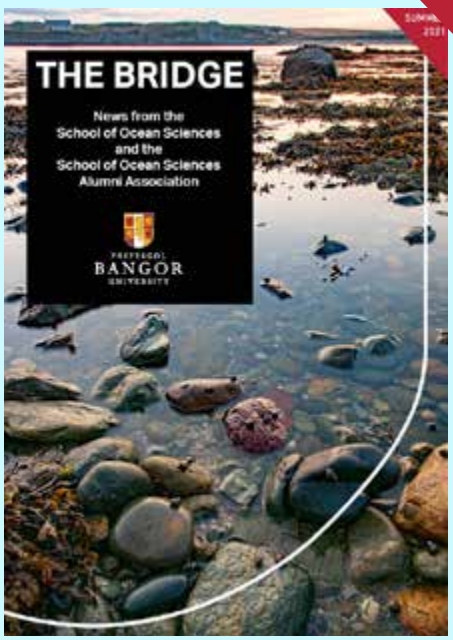
THE BRIDGE Summer 2021




Please send your School of Ocean Sciences news to:
sos-newsletter@bangor.ac.uk

Please send your School of Ocean Sciences Alumni Association (SOSA) news to:
alumni@bangor.ac.uk

## Letter from the Editor

This newsletter comes to you at the end of difficult academic year, not least due to the pandemic and the restrictions it has put on our everyday lives and the way that we have been able to work and study.

As we hopefully see the light at the end of the tunnel, our focus moves to the greater problem faced by our civilisation: climate change. To emphasis the key role of the ocean on our planet, UNESCO have recently declared the United Nations Decade of Ocean Science for Sustainable Development (2021-2030). In doing so they remind us that "The marine realm is the largest component of the Earth's system that stabilizes climate and support life on Earth and human well-being."

Here in School of Ocean Sciences we have a long tradition of working on marine climate and conservation related issues and are pleased to use this newsletter to update you on the latest work by our staff, current students, as well as our alumni.

As we approach the COP26 summit in Glasgow we will be working with alumni to raise the awareness of climate change through our 'Polar Week'.

We hope that you enjoy this edition of the Bridge, and we look forward to us all being able to catch up in person under the 'new normal'.

Best wishes,

**Tom Rippeth, Editor**

**2021**
**OPEN DAYS**

Virtual Open Days:
10 October, 31 October, 20 November

# MESSAGE FROM THE HEAD OF SCHOOL

It at last looks as though we will able to return to Menai Bridge for September. I don't think any of us imagined in March 2020 that we would be off campus for so long, or that we would change the way we work so significantly. However, it is impressive how both students and staff have adapted to new ways of teaching and learning.

Some field visits and practicals went ahead involving much complex organisation by academic and technical staff, and this was evidently really appreciated by the students that were able to engage.

It was very challenging logistically to get everyone out on the Prince Madog this year and we are very grateful to OS Energy, our new partner in operating the vessel, for their efforts to maximise what was possible. A series of research cruises have been successful over the Spring, and we look forward to the improvements in infrastructure that OS Energy are making. Indeed, July 20th marks 20 years since the 'new' Prince Madog arrived in Menai Bridge, and you can read more about this later in the Newsletter.

Under the leadership of the Teaching and Learning team, staff have been wonderfully innovative in putting on virtual field trips and holding conferences, and in some, everyone was represented by an avatar! Indeed, the School has won a Digital Teaching and Learning grant to invest in some 360 degree cameras and virtual headsets to develop such experiences.

Lectures and meetings on Teams have worked surprisingly well, despite, even after a year of practice, the frequent calls of 'you're on mute ' and occasional wifi drop outs. It has not been easy lecturing to a large student audience that you cannot see or discussing matters with colleagues lurking behind profile photos, but we have become more proficient and efficient and improved the quality of supporting materials on Blackboard. We recognise too that while online learning has worked for many students, others have found it difficult to socialise with their class mates and to engage with online lectures, and therefore the reinvigorated Blackboard Collaborate sites have been extremely valuable.

Our students have come through a difficult time but with some excellent results, and we look forward to a grand Graduation celebration next year on an unprecedented scale, for what will be by then 3 cohorts of graduates.

Recruitment for 2021/22 looks good and we look forward to welcoming new students to Ocean Sciences. As we return to what we hope will be a more normal academic year, we will all build on our experiences, and for Semester 1 at least, continue to offer a hybrid teaching programme.

It is important that we remember that while we in the UK are benefiting from a successful vaccination programme, Covid is still a very serious problem in many parts of the world, and some of our students cannot yet return to Bangor and we hope they stay safe. Covid has certainly impacted our research this year with limitations on laboratory work, restrictions on overseas travel and time necessarily spent on reorganising and delivering teaching.

We will soon begin a period of research recovery and, in line with the University's 2030 Strategy, have ambitious plans for transformative and impactful research. This is an exciting but challenging time for marine research with various international initiatives:  the UN Decade of Ocean Science for Sustainable Development 2021-2030; EU Healthy Oceans & Sustainable Blue Economies, UN Climate Change Conference COP26, Ocean Decade - Arctic Ocean Action Plan and the UK G7 Presidency,  all aimed at addressing urgent global challenges such as climate change, food and water security.

You can read about some research highlights in this Newsletter and I am sure that we will see some exciting developments in the next few years.

I therefore wish to thank all of my colleagues for the work they have put in over the past year, and students for being patient and understanding. The Covid pandemic has been devastating, but we now need to focus our efforts on research that contributes to finding solutions for biodiversity loss, climate change, water quality, food security and wellbeing and in training the next generation of scientists to tackle these issues at local, regional and global levels.

Professor John Turner

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# MESSAGE FROM THE CHAIR OF SOSA

So, it is some nine months since I penned my last Chairman's letter. I do not know about you, but it seems that for these past few months, life has felt a little like suspended animation whilst the global population wrestles with the uncertainty of the Pandemic. Luckily, here in the UK, the vaccination programme has proceeded with great alacrity and efficiency and, assuming no significant mutations develop, light is beginning to show at the end of the tunnel.

I regret to report that little has happened on the School of Ocean Sciences Alumni Association front. Hopefully, as the restrictions imposed by COVID 19 begin to ameliorate, we can begin to activate the Association again. In the meantime, I am pleased to report that alumni continue to contribute their news and articles to The Bridge for the consumption of the 'School' staff, students, and former students.

On a business front, I held my first face to face meeting for almost 18 months in June. So nice to meet people in person again. And I and several colleagues are involved in planning our first face to face seminar for nearly two years. This is under the auspices of the Society of Underwater Technology (SUT), Offshore Site Investigation & Geotechnics (OSIG) special interest group, and the one-day seminar is entitled Energy in Transition – its impact on offshore site investigation and geotechnics. This is to be held in Newcastle on 16th September 2021. https://www.sut.org/event/energy-in-transition-and-the-impacts-for-site-investigation-and-characterisation

Energy in transition is currently a hot topic in the marine environment and the 'Blue Economy' has never been more vibrant in my experience. As we seek to decarbonise and cut the use of oil and gas for energy and transport use, innovative technologies such as conventional offshore wind, floating offshore wind, tidal power, carbon capture and storage, blue and green hydrogen and decommissioning of marine infrastructure are all developing at an increasing rate. Never has there been a greater demand for marine geoscientists and marine environmentalists to drive and assist this blue/green revolution to ensure that future developments are efficiently and sustainably managed with due regard to the marine environment.

School of Ocean Sciences Alumni (SOSA) continue to contribute significantly to this changing marine-world, and I am pleased to report that I continue to regularly come across SOSA personnel who are helping to 'make a difference' to our planet.

Stay safe and keep well.

Mick Cook

Chairman School of Ocean Sciences Alumni Association (SOSA)

# 20 YEARS AT SEA:

## The new Prince Madog marks 20 years since arriving at Menai Bridge for the first time

By Tim Whitton

On a sunny July 11th 2001 a 35m research vessel made its way down the Menai Strait for the first time to her new home berth at St George's Pier; it was the new Prince Madog.

Of course, this was not the first time a vessel called Prince Madog had entered the Strait, as this new vessel was replacing the previous ship of the same name which had served the University for the preceding 33 years.

Despite the original Prince Madog's (1968-2001) capable work in the training of the seg-going scientists and leading new discoveries in the science of shelf seas, a larger more capable vessel was needed to carry on its legacy after such a long and eventful career. To secure funding for a new ship the huge role that the old Prince Madog had played in the teaching and research of marine science was made clear, but also the lack of regional class research vessels in the UK fleet in the late 90's was also a major justification for funding a new vessel.

This situation largely remains the same today, with only the Prince Madog and the ageing AFBNI RV Corystes being classed as regional class vessels currently operating in the UK. The funding was secured in 1999 for the new ship along with Vopser Thornycroft's VT marine, who would be a joint partner in the vessel. The partnership was that in addition to the vessel days used by Bangor University for teaching and research, VT Marine could charter the vessel to third parties. A new facility called the Pier Pavilion was also built as part of the new vessel to house the associated equipment.

The hull was built in Romania and the ship finished in the Netherlands by Visser Ven Helder, now known as Damen.

*Photo from the 11th February 2001 the day before the hull was launched in Romania.*

The only major change to current Prince Madog's structure during the last 20 years has been the addition of a multibeam echosounder in 2012 mounted on a retractable mount near the bow (which has been upgraded with a new system last year). This year a German company called O.S. Energy (www.os-energy.de) have taken over from P&O Maritime (who took over from VT Marine in 2011) as joint venture partners with Bangor University, to lead the Prince Madog forward for many more successful years.

*The design was originally influenced by the old vessel and the Irish Institute vessel called Celtic Voyager. However, despite Celtic Voyager and Prince Madog being almost being identical below the water line, the Prince Madog is quite different in layout and is taller and longer.*

It is important to highlight that much of the vessel's success as a teaching and research platform has been down to the skilled crews and SOS seagoing technicians that continue to keep the ship and her scientific instruments working efficiently and safely for use by academics and students.

During the COVID restrictions imposed on the country over the last year, the Prince Madog has been able to continue operating with mitigating measures in place such as restricted use of shared cabins and staggered mealtimes. As the pandemic situation improves it is hoped the scientific berths can return to full capacity as soon as possible.

On a personal note, I have a big interest, some colleagues may argue obsession, with the Prince Madog. As an undergraduate student who wanted to become a marine biologist, going to sea on the Prince Madog was a dream come true and extremely exciting. For my MSc project, with the then Environment Agency Wales, I had the chance to lead a cruise to the Dee Estuary, and as a post-doc I have had the privilege of being able to use the vessel in my research with colleagues on the SEACAMS/2 project. These sea-going opportunities (estimated ~ 3000 SOS students have been aboard in the last 20 years) are something very special that Ocean Sciences at Bangor can offer, and hopefully will continue to for more years to come through the new joint venture with O.S. Energy.

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'To mark the 20th anniversary of the second Prince Madog research vessel arriving at St George's Pier on July 11th 2001, Tim Whitton of CAMS presented a card model of the ship he had constructed to the vessel's crew. It is understood that the model will be installed on the ship itself.

The model kit was designed by David Hathaway who runs www.papershipwright.co.uk, with images and technical details to help in the design provided by Tim, and is constructed from 2 sheets of A4 card.

You can build your own accurate paper model of the Prince Madog in 1/250 scale as the card model kit will be available from www.papershipwright.co.uk this summer. All you need is a craft knife (or scalpel from your student dissection kit), a metal ruler, PVA glue and some patience.

# Other memories from researchers aboard the Prince Madog

## Professor Ed Hill CBE (MSc and PhD Physical Oceanography) Chief Executive of the National Oceanography Centre (NOC):

*"As we embark on the United Nations Decade of Ocean science this year, it is an especially fitting time to reflect on the 20 years of magnificent service to marine research, education and training provided by RV Prince Madog and to look forward to the important work yet to be done in the coming decade, - undertaking the science we need for the ocean we want – clean, healthy, safe, productive, predicted and inspiring".*

*"Mars, the Moon, and Venus are mapped in greater detail than the seafloor of our own planet. Independent assessments of the economic value of mapping the seabed around Ireland and Norway showed a return of between £4 and £6 for every pound invested. Surprisingly, only 40% of the UK's own Exclusive Economic Zone waters are well mapped with modern multi-beam echosounder methods and amongst the many and varied projects the Prince Madog has supported, the vessel has made important contributions to mapping and improving our understanding of habitats on the seafloor in the Irish Sea, especially around Wales."*

## Claire Medley (MSc Physical Oceanography 2019) Oceanographic Research Technician at Bermuda Institute of Ocean Sciences:

*" I am incredibly grateful for the opportunities that studying at Bangor has afforded me, choosing to do a MSc in physical oceanography is one of the best decisions I've ever made! I am currently working in my dream job as an oceanographic research technician in Bermuda and that would never have been possible without the skills and experience I gained whilst at the School of Ocean Sciences. In particular, getting experience aboard the Prince Madog was certainly key in helping me get where I am today"*

## Dr Bee Berx (BSc Ocean Science, 2003; MSc, 2004; and PhD Physical Oceanography) Physical Oceanographer and Climate Change lead with Marine Science Scotland:

*""I was lucky to be asked to join the RV Prince Madog while I was spending summer 2003 in Menai Bridge between my BSc and MSc degrees. The trip was to the Celtic Sea and despite being pretty sea-sick at the start, I must have left a good impression as I was asked for a few more trips in the next 12 months. The experiences on each survey were invaluable and gave me a passion for observations collected at sea. I also made connections with the turbulence and mixing research group where I ended up staying for my PhD (they were just like family!). During my PhD, the survey destinations were much less "far-flung" as the Madog was anchored between the Gazelle Hotel and Bangor Pier to collect measurements on the mussel beds."*

## Dr Charlotte Williams (MSc Physical Oceanography 2008) Research scientist at the National Oceanography Centre based in Liverpool:

*"Working on the Madog was my first proper experience of being a seagoing ocean scientist (and also from suffering with sea sickness!). I now work for the National Oceanography Centre deploying their fleet of ocean robots from small (and bumpy) vessels, but working on the Madog carrying out seawater sample analysis whilst trying to pin down our equipment is one of my favourite memories of the realities of being an observational oceanographer!"*

# A new joint venture for the Prince Madog

Bangor University have entered into a new joint venture to manage the Prince Madog Research Vessel as of 1st January 2021.

The Joint Venture, P. Madog Offshore Services Ltd (PRIMOS) is with O.S. Energy (www.os-energy.de). Based in Glückstadt, Germany and Newcastle, UK O.S. Energy are a family owned company who specialise in offshore wind industry and environmental survey work in the North and Baltic Seas, operating a fleet of vessels.

In addition to providing teaching opportunities to Bangor University students, the Prince Madog has a long pedigree of contributing to marine research in all disciplines. This is set to continue, with a renewed focus on the marine renewable energy industry, which the Prince Madog and scientists at the School of Ocean Sciences have been supporting through their research in recent years.

The Prince Madog is unique in the UK capable of taking students on multi-day teaching trips to the edge of the continental shelf and this will continue under the new joint venture.

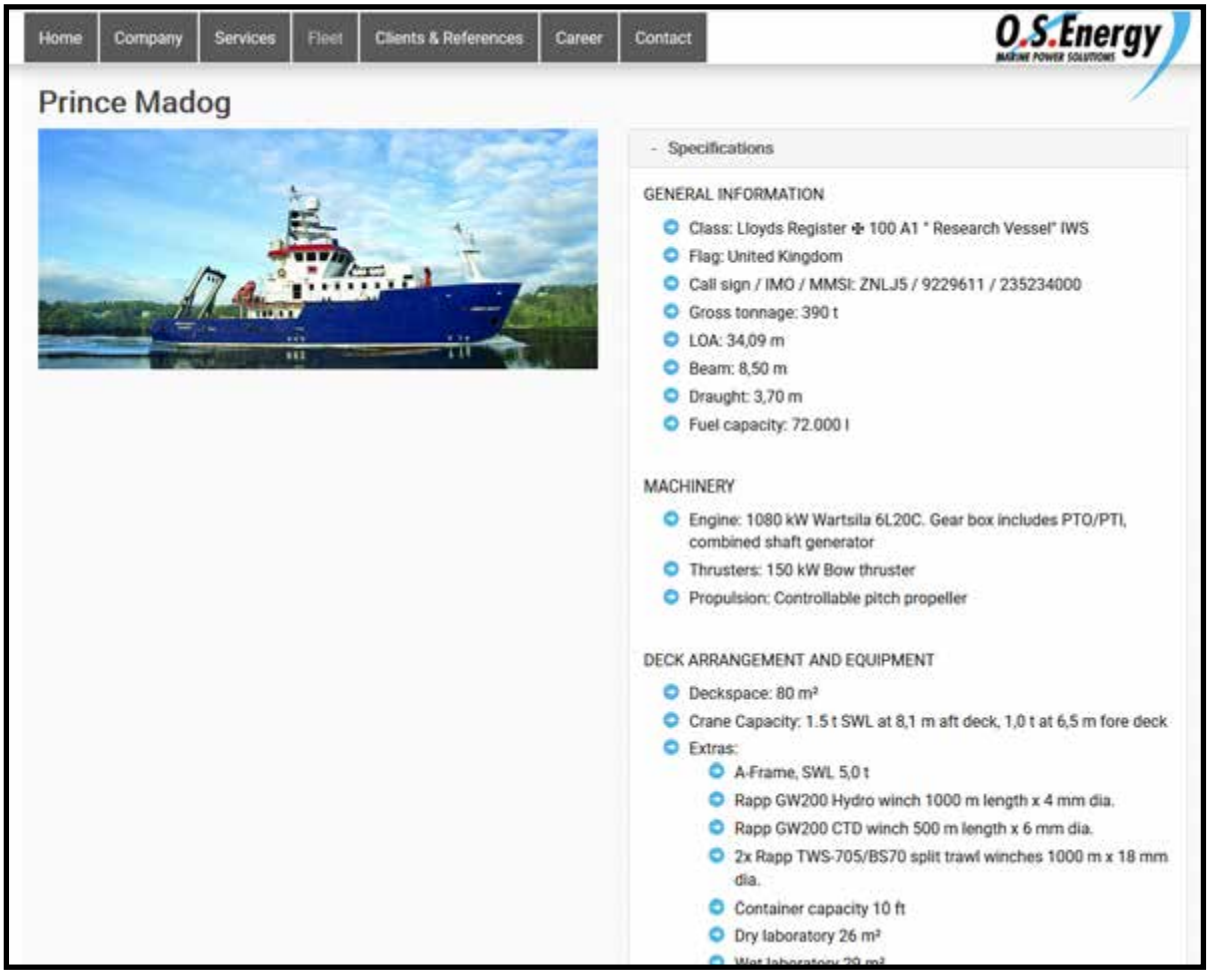
Professor John Turner, Head of the School of Ocean Sciences added:

*"The ship is vital in supporting our training of the next generation of marine scientists. All of our undergraduate and postgraduate taught students (over 250 in a normal year) benefit from the unique experience of working on a research vessel at sea, using scientific equipment to assess processes, water quality and measure the abundance and distribution of marine life, and this part of the learning experience is set to continue."*

Both parties also hope to extend their research in marine renewable energy, with the new joint venture leading to more technical work being carried out at the School of Ocean Sciences.

Vincent Nuernberg, Managing Director, O.S. Energy identified that:

*"The Prince Madog is a perfect addition to our fleet which are operating in the European offshore wind oil and gas industries. We are proud to take over P&O Maritime Services' role as manager and join and Bangor University as new partners. Additionally, this new partnership provides easy access for the University to further specialist vessels in the fleet of O.S. Energy. We are looking forward to this long-term partnership."*



# ALUMNI FOCUS

## Antonio Hoguane (BSc Physical Oceanography & Maths; PhD Physical Oceanography)

I attended my undergraduate studies as a mature student. At the time I was an employee of the National Institute for Fisheries Research, in Mozambique.

I was privileged in having two scholarships, one immediately after the other, to do undergraduate and then PhD studies in the UK. When I finished my PhD studies in 1997 I returned home where I was offered a full time position at the Eduardo Mondlane University, Department of Physics, and given a task to set up an academic unit for Marine Sciences within the University. I accepted the challenge without hesitation because I thought that was the best way I could contribute better to the development of the country, by training other Mozambique scientists and share a little of what I had gained by studying abroad.

At the University, I set up the undergraduate course in Oceanography, and then the School of Marine and Coastal Sciences, whose campus was established in Central Mozambique, 1,700km away from the main university campus. I was the first Director of the School, from its establishment in 2008 until 2017. The School provides undergraduate courses in marine Sciences, which are Oceanography, Marine Biology, Marine Chemistry and Marine Geology, and three MSc programs, which are Applied oceanography, Fisheries management and Sustainable Aquaculture. Some of the former students of the School, have concluded their PhD and are now lectures at the School. I consider this my best achievements so far.

When I ceased to be the Director of the School, I was given the task to establish the Centre for Marine Research and Technology, an action framed in the efforts to transform the university into a research university. I was then appointed the Director of the Centre, a position which I am now occupying.

My main role has been conducting research, coaching young scientists in Marine Sciences at the same time providing some advice to the decision makers on the policy and management strategies.

Dave Bowers adds: “When Antonio was a young man growing up in Mozambique, he told me that he would watch the cruise liners arriving in Maputo Harbour to take students away to the Soviet Union. At the time, the USSR was cultivating support in southern Africa by providing free university-level education. However, Antonio wasn’t keen on the idea of studying nuclear physics in Vladivostok and instead captured a rare scholarship to study anywhere he chose in the UK. He chose Bangor and physical oceanography.

His supervisor for his PhD studies was Ed Hill, a great role model. I’m sure that when Antonio finished his PhD he could have elected to go anywhere in the world but, to his great credit, he chose to go back home to use his skills for the benefit of his country. Mozambique has a long coastline and is rich in offshore resources. The country needs trained scientists who can help the nation develop its resources in a sustainable way. The School of Marine and Coastal Sciences which Antonio has established and built up fulfils that role.

In the years he has been growing the School, Antonio has been keen to maintain his links with Bangor. He has worked with Ed Hill, Mattias Green, Lewis Levay and Dave Bowers as well as others I expect I can’t remember. A lucky group of Bangor students have carried out their research projects in Mozambique and soaked up some African sunshine.

# The First Professional Female Marine Scientist Rosa Lee

## Did you know that the UK's first professional female marine scientist was a Bangor University graduate?

*Top College around 1910*

Rosa Lee (1884–1976) was born in Conwy and became the first woman to graduate in Mathematics from Bangor University, and then the first woman to be employed by the Marine Biological Association (MBA).

She was employed as a statistician initially working at the MBA's Lowestoft Laboratory but was later transferred to the Board of Agriculture and Fisheries. At that time, the board 'did not employ women scientists' however following protests by the MBA, Rosa was allowed to continue to work as a civil servant.

One of Rosa's many achievements was realising that growth rings on fish scales could be used to assess changes in fish growth rate with age. She published this discovery (to become known as the Rosa Lee Phenomenon) in Nature in 1920 and it continues to be relevant in fisheries science today.

Rosa's achievements are all the more impressive given her employment as a civil service scientist came to an end in 1919 because she got married.

# WORK EXPERIENCE.

All Ocean Sciences degree now have a work placement option. We are extremely grateful to the many alumni who have supported our students education by providing placement opportunities. Here we hear from Marine Biology undergraduate student Simon Wills about his work placement.

## The annual Isle of Man scallop survey by Simon Wills

Every year the scallop populations in the Irish sea surrounding the Isle of Man are assessed to provide data on abundance and age structure to feed into stock assessments. As an Applied Marine Biology student I have spent my 'placement year' assisting with ecological and fisheries work at SOS. Here is my account of 10 days on the Prince Madog.

As someone petrified of getting seasick but also having a great desire to experience life at sea, the potential of participating in this survey was met with contrasting feelings. With the trip being delayed a day due to rough conditions, enough to not allow a crossing from Menai Bridge to the Isle of Man, prospects for me were fearful to say the least. Traveling over on the Wednesday (7th of April) proved manageable, with the ability to just sleep proving an effective repellent to seasickness. In an incredible turn of events, once the week of work truly began, the weather turned calm like a monk on morphine. Quite astoundingly, it remained like that until the last day of the survey.

*The consistently glass like conditions aboard the MadogPhoto: Simon Wills*

*The variation within the Aequipecten opercularis (Queen scallop) species*

*Photo: Samira Anand*

There were 52 sites in total, each of which was dredged for 20 minutes using a gang of 4 dredges (2 queen scallop and 2 king scallop). Following the landing of each tow on deck, the catch was separated from the broken shells and general bycatch and then taken into the wet lab to be measured. The total abundance of queen and king scallops was recorded, weighed and in the case of king scallops, aged. For each of 11 'historic' sites, a sample of each scallop species was taken to be dissected and analysed further back in Menai Bridge. Once recorded, the scallops were returned back to the sea.

*A certain youthful, robust student sorting bycatch and scallops with an astounding view*

*Photo: Isobel Bloor*

The whole process varied greatly in difficulty. With different sediment types came different hurdles. Rocky seabeds led to great numbers of small boulders coming up, clogging the dredge and proving heavier than they looked. In quite a few cases, what could only have been a molluscan graveyard was hit by the dredge and resulted in huge numbers of dead shells being gathered. Sifting through those in an attempt to find scallops was a task indeed.

The range of bycatch was quite incredible. Having already worked with previous years bycatch data, it was very interesting to see it all in person. From octopuses to sharks, starfish to teleosts, there was a wide, fascinating range. At the 11 'historic' sites, the species were identified, counted, and weighed. The most notable was the dead mans fingers coral, Alcyonium digitatum. Their abundance was astounding, attached to every other shell a lot of the time. Much of the bycatch would survive the dredging process and be returned safely. Many species would be measured and identified immediately after being caught, then returned back to the sea to increase their chances of survival. For example, the pictured cuckoo ray was one of the regular visitors on deck, and turned out to be the most common of the rays to catch this year.

The cruise altogether proved to be an edifying experience for the other students and myself. Practical application of previously studied activities proved a strong way to effectively learn. With the amazing weather and regular, delicious meals, this survey proved to be an absolute pleasure providing a great experience of real-world marine science.

*An example of some of the bycatch caught. Crossaster papposus (the common sun star, top left), Eledone cirrhosa (the curled octopus, bottom left) and Leucoraja naevus (the cuckoo ray, right).*

*Photo: Samira Anand*

# Linking the Past with the Future: Careers opportunities in Marine Sciences highlighted

## School of Ocean Sciences holds an annual careers fair in March to highlight the huge jobs potential in one of the fastest growing sectors of the UK Economy, the Marine sector. It is open to all SOS students but is particularly aimed at second year students as part of their employability training.

It brings our future graduates closer to the job market and gives them an opportunity to reflect on the skills they likely need for various parts of the marine sector. This year, due to COVID we had to host the event online, and we are very grateful for the exhibitors, many of whom are SOS graduates, for their cooperation. They first created short videos for the students in January, and then answered the students' questions for a live audience in March. Common questions students asked the exhibitors included were "What are the qualities you look for?", "What is your favourite aspect of your job?" and "What kind of opportunities do you provide for learning and personal growth?". The various answers gave a good overview of what a job looks like in industries that support to develop the seabed to meet growing energy demands sustainably, as well as various institutions that seek to maintain the integrity of the seabed and the coastlines. Blue Health and Education was also represented, emphasising the socio-economic importance of the marine environment.

Richard Birch, EcoScope Ltd

David Gold, CGG

Nia Jones, North Wales WildLife Trust

Francesca Trotman, Love The Oceans

Rob Holland, Oil Spill Response Ltd

Liza de Kurver and Nina Jolink, Bark Europa

Andy Barwise, Ffion Davies, RWE Renewables

Alan Kavanagh, Natural England

Graham Bell, Fugro

Rhian Tomos, School of Education, Bangor University

Organiser **Dr Katrien Van Landeghem** comments:

*"Although largely out of sight, the seabed supports a wide array of interconnecting services that increasingly underpin our daily lives. The seabed is instrumental in the delivery of e.g. food, aggregates, minerals, energy, communications, recreation, genetic materials and biodiversity. The seabed also provides regulating services, including climate, nutrient cycling and flood prevention."*

*"The aim is that our careers fairs enable our students to see the diversity in job opportunities in the growing marine sector and raise the awareness that their fantastic skills as ocean scientists are transferrable to many of these sectors."*

# SCHOOL NEWS

## Celebrating outstanding contributions to teaching and learning

### Teaching Fellowships recognise the importance of exceptional teaching and learning within the University, and are awarded based on evidence of excellence within five categories: Enhancement, Innovation, Impact, Scholarship, and Leadership.

Nominations for Teaching Fellowships are made by Heads of Schools, and their evidence is reviewed by the Teaching Fellowships Panel, chaired by Professor Nicky Callow, PVC for Teaching and Learning. The Panel is composed of the College Directors of Teaching and Learning, members of the Centre for Enhancement in Learning & Teaching (CELT), and representatives from the Students' Union.

Professor Nicky Callow, PVC for Teaching and Learning said,

*"This year's Fellowship recipients embody excellence in teaching and learning within Bangor University. It is without doubt that these recipients have transformed the learning experience for individual students, cohorts of students, modules, and programmes. More than that, these award recipients have positively enhanced practice within, and in many cases, beyond our University. Whilst Bangor University Teaching Fellowships are always a special recognition of excellence, to have received this award under the circumstances of this past year, is truly exceptional."*

Amongst this year's Teaching Fellowships are two from the School of Ocean Sciences, Dr Dei Huws and Dr Sarah Zylinski

### Dr Dei Huws

### Senior Lecturer in Ocean Sciences

*Dei's leadership in Teaching and Scholarship has been long term and outstanding, and the organisational structure he has established, interventions he has put in place, skills developed and good practice disseminated have been central to the School successfully adapting to online teaching with great efficiency. Dei is passionate about the quality and excellence of teaching and has successfully passed on that passion to encourage all staff to be innovative and to design teaching around student focussed learning.*

*Dei is a highly experienced member of the University's Quality Assurance and Validation Panel, regularly undertaking audits, international partnership agreements and revalidation events across the University, including assessing programmes in situ at Changsha, China. Having originally initiated and led College Welsh Medium teaching, Dei led the Coleg Cymraeg Cenedlaethol project to attract more WM students to SOS.*

Professor John Turner, Head of School of Ocean Sciences

Dei said,

*"The best days come in various guises, but they usually involve practical classes where there's time to chat and get to know students. Whether it's in the laboratory, 'squashing mud' to find its physical properties for engineering applications or in the field, performing geophysical surveys to deduce what's under the ground without using a JCB! For the last couple of years, it's given me and the module team a lot of joy to introduce a geology field course module based solely on Anglesey – what with the island being a UN designated GeoPark. In the School, it's been great to help develop the teaching and learning aspects, based around a super team of teaching and scholarship staff that are forever finding better ways of doing things and then supporting the other, equally fantastic, staff in the School to do likewise."*

# Dr Sarah Zylinski

## Lecturer in Marine Biology

*Sarah is an outstanding member of the teaching staff whose work with students to improve their experience, and contributions to teaching development in Ocean Science, have been exceptional. Sarah receives consistent praise from both the students she teaches and those she encounters through her role as Director Student Engagement due to the extra distance she goes in her lecture presentations, supporting materials, guidance and support.*

*Sarah has led the School in improving module organisation (the most important predictor of student satisfaction). She developed a 'one-stop-shop' for information at a higher level than modules, and she has produced a series of generic skills guides pitched in student friendly language on topics which even include online etiquette. Her innovation is exemplified by a deep sea animal version of 'Top Trumps' which brings extreme marine habitat lectures to life by 'tentacle and jaw'.*

Professor John Turner, Head of School of Ocean Sciences

# Congratulations to the following staff on being nominated for the 2021 Student Led Teaching Awards:

Martyn Kurr (Teacher of the Year),

Jennifer Shepperson (Teacher of the Year),

Dei Huws (Outstanding Pastoral Support, Teacher of the Year & Postgraduate Teacher of the Year),

Martin Austin (Postgraduate Teacher of the Year),

Martin Skov (Postgraduate Teacher of the Year),

Yueng-Djern Lenn (Teacher of the Year),

Sarah Zylinksi (Award for Outstanding Pastoral Care & Dissertation Supervisor of the Year),

Gareth Williams (Teacher of the Year),

Laura Grange (Award for Outstanding Pastoral Support, Postgraduate Teacher of the Year & Teacher of the Year),

Tom Rippeth (Dissertation Supervisor of the Year).

# 2020 RAJKUMARI JONES STUDENT BURSARIES

## - Recipient reports

With thanks to the Rajkumari Jones Student Bursaries, three of the top performing students commencing their 4th year of study within the MSci Degree Programmes in 2020 were able to progress their career development. Here are short reports from each student on how receiving the bursary has helped them.

## Boosting Motivation by Rowan Rushton (MSci Physical Oceanography)

I am extremely grateful to have received the Rajkumari Jones Student Bursary for my efforts on the MSci Physical Oceanography course.

It was a struggle to stay motivated in the last year and a half of my course, as the outbreak of Covid-19 kept me stuck in front of my desk all day, every day, without the practical and interactive elements of being at university that normally break up the monotony. Receiving this bursary gave me the confidence boost I needed to be able to complete my final year to a standard I could be proud of.

This bursary also gave me financial security, as finding part time work during the pandemic was difficult. This allowed me to focus entirely on my studies and not have to worry about splitting my time between my course and a job during the most important year of my degree.

Though I am uncertain as to what the futures holds for me, the money from this bursary will help me get to job interviews and start my journey after university. For this I, and I am sure the other recipients of this bursary, am very appreciative of the generosity of the Rajkumari Jones Student Bursary sponsor.

## Focusing Interests by Ruiling Zhang (MSci Physical Oceanography)

The Rajkumari Jones Student Bursary encouraged me and recognized my efforts in my first year in Bangor and also helped me build my self-confidence.

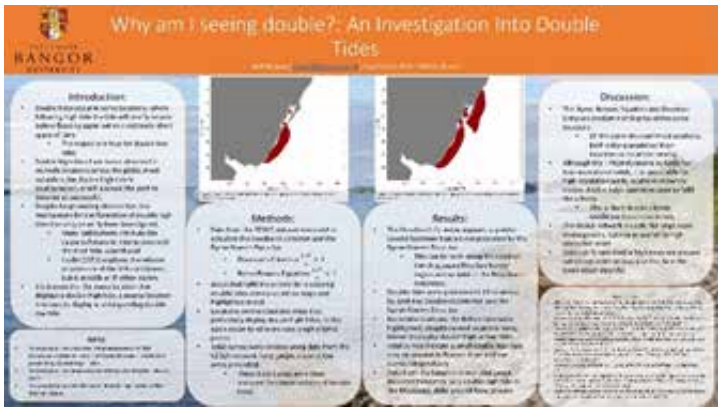
As an international student, I was worried about whether I can handle the different education system and the brand-new culture vibe when I came here. But this bursary drove away the fear of the unknown and encouraged me to focus my interest without being anxious about the marks.

Last year was also a special year due to the pandemic, although there was less place to spend money, online teaching and lockdown are both new challenges. But this bursary eased my anxiety about balancing the stress from both daily life and study, then made me able to concentrate on my project and raise my self-discipline. At the end of the MSci study, I have determined my mind to have PhD study although more detail needed to be considered. And the bursary will definitely benefit my PhD application and further study.

# Research Future
# by Will Stuart
# (MSci Physical Oceanography)

## I felt very honoured when I was informed that I had received the Rajkumari Jones Bursary earlier this year, and was very grateful to have been selected for it.

The Bursary has helped me throughout the year in many ways, the first and foremost among these being the fact that it provided me with a much greater degree of financial security and independence than I have previously experienced. This has let me concentrate on my studies this year, especially my research project, instead of worrying about trying to find part-time employment and balance the resulting workload.




Being able to concentrate on my studies has proven to be immensely useful this year, as it has allowed for the mitigation of some of the difficulties that have arisen over the past year due to the Covid-19 pandemic, and has kept my grades relatively steady throughout the academic year.

It has also given me a huge confidence boost; I have always wanted to apply for a PhD but was always anxious given the requirements placed on them. Receiving the bursary has helped to assure me that I should apply for a PhD, and the financial support from it will undoubtedly be useful during the applications and interviews that I hope to be undergoing soon.

Many thanks for this great opportunity on behalf of the MSci students, the Programme Director Dr Sarah Zylinski, the Head of School Professor John Turner, the School of Ocean Sciences, and Bangor University.

# Field Association Fisheries & Aquaculture Bursary

## The Field Association Fisheries & Aquaculture Bursaries are made possible through the generosity of Bangor alumnus and benefactor Mr Jan Hoogesteger. They have recently enabled two undergraduate Marine Biology students to undertake internships overseas.

**Elizabeth Maverley** (BSc Applied Marine Biology) undertook an internship with the Demersal Fish Research Group at the Norwegian Institute of Marine Research. She joined the group of 24 research scientist and technicians both on land and at sea during the Kysstokt survey and the ICES International Bottom Trawl survey (IBTS). This also gave Elizabeth the opportunity to work on her own research project entitled 'Spatial and Temporal dietary analysis in North-East Saithe (Pollachius virens)'.

**Olivia Maddison** (BSc Applied Marine Biology) undertook and internship with Dr Cristina Pita at the University of Aveiro in Portugal which was entitled "Adding value to seafood". The aim of this project was to investigate different types of initiatives and tools that can be used to add value to seafood products, focusing particularly on products from small-scale fisheries. These types of initiatives included ecolabels and short-value chains. The purpose of investigating these initiatives and the way they can be used to add value to seafood products, was to determine whether it is worthwhile for fishers to implement the initiatives. The project focused more on small-scale fisheries as the initiatives are relatively more expensive for small-scale fishers and so it is important that they have evidence of the added value with an initiative in place. Off the back of this work Olivia had an abstract was accepted for the International Institute of Fisheries Economics and Trade conference.

# STUDENT AWARDS AND FELLOWSHIPS

## School Awards

Darbyshire Prize for the Best Final-Year Undergraduate Student in Physical Sciences: Rhian Tait (BSc Ocean and Geophysics)

Darbyshire Prize for the Best Postgraduate in Marine Physical Science: Maddy Shankle (MSc Physical Oceanography)

Jeremy Jones Memorial Prize for Best MSc Marine Biology:  Jessica Harvey (MSc Marine Environmental Protection)

Gavin Borthwick Prize for Best First Year Student on a Marine Biological Degree: Stephanie Middleton (Applied Marine Biology)

Ray Delahunty Prize for Best First Year Student on Marine Biology and Oceanography: Emma Eddy

*Rhain Tait: Rhian, from Northumberland, graduated with a first-class honours degree in Ocean and Geophysics.*

*Bella Ormerod: Bella, from Kent, is one of the first students to graduate on our new Physical Geography and Oceanography degree, and she graduated with first-class honours.*

## University Awards

John Robert Jones Prize for Most Meritorious Student (SOS nomination): Rhian Tait (BSc Ocean and Geophysics)*

Dan Lambley (BSc Marine Biology and Oceanography) on being nominated for the Staff Choice Award in this year's Undeb Course Rep Awards.

## National Awards

British Sedimentological Research Group: Best Undergraduate Sedimentology Project Award (SOS nomination): Bella Ormerod (BSc Physical Geography and Oceanography)*

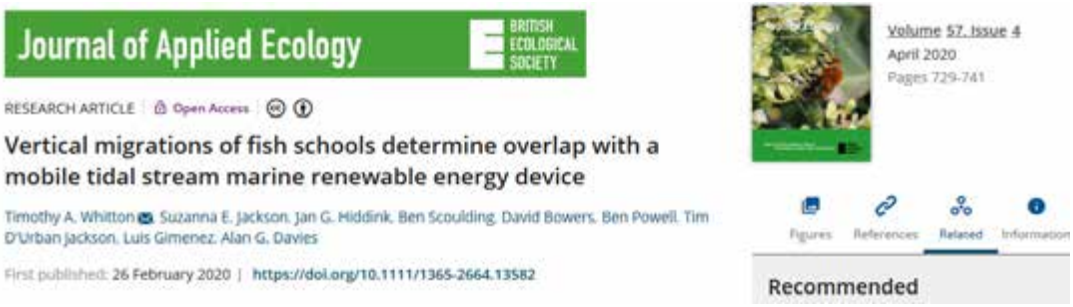
Challenger Society for Marine Science:  Best Final Year Project Student in Oceanic Research Award (SOS nomination):  Lucas King (BSc Applied Marine Biology)*

British SOCIETY FOR GEOMORPHOLOGY Marjorie Sweeting Award (SOS nomination): Rhian Tait (BSc Ocean and Geophysics)*

* successful outcomes for these prizes will be reported in the next newsletter once the judging has taken place.

# Congratulations to Tim Whitton and co-authors for winning the prize for 'Most ground-breaking research to solve an industry problem' for their presentation at the Environmental Interactions of Marine Renewables (EIMR) 2020 conference.

A link to the full paper on this work can be found below – a nice example of cross-disciplinary applied research from SEACAMS2/ CAMS/SOS team.




Whitton TA, Jackson SE, Hiddink JG, Scoulding B, Bowers D, Powell B, D'Urban Jackson T, Giminez L, Davies AG (2020) Vertical migrations of fish schools determine overlap with a mobile tidal stream marine renewable energy device. J Applied Ecology https://besjournals.onlinelibrary.wiley.com/doi/full/10.1111/1365-2664.13582

# Congratulations to Professor Karen Heywood on her election as a Fellow of the Royal Society.

Karen worked as a postdoctoral researcher in SOS in the late 1980s when she worked with Des Barton and John Simpson on the fundamental studies of 'Island mixing', based around fieldwork in the Indian Ocean around the Island of Aldabra. This research which is still widely cited today and is relevant to on-going coral reef conservation work in Chagos by John Turner and Gareth Williams.

She left Bangor to take up a lecturing position at UEA in 1989, where she has stayed, becoming the first Professor of Oceanography in the UK in 2005. She specialises in autonomous underwater gliders and still maintains connections with SOS, most recently collaborating with Natasha Lucas and Tom Rippeth in the NERC OSMOSIS consortium and acting as PhD external examiner to Jess Mead Silvester.

# Congratulations to Bangor Geological Oceanography graduate Emma Riley on winning the Cooling Prize of the British Geotechnical Association.

Emma works for CVB JV Tideway East on major construction projects such as London's Cross Rail.

*Emily Riley being presented with the Cooling Prize Certificate by BGA Vice Chair Professor David Toll*

# Congratulations to SOS graduate Emily Cunningham on winning the 2021 "Charity and not-for-profit" category of the Rising Stars awards

Bangor University Alumna, Emily Cunningham has been awarded a national Rising Star Award by WeAreTheCity together with the Royal Bank of Canada.

*The Rising Star awards are sponsored by the Royal Bank of Canada and were introduced to showcase female talent below management level and create 100 new role models across different industries and professions every year.*

The list of winners showcases remarkable women within the UK from across 20 categories representing different industries and professions. Emily is a winner in the Charity and Not-for-Profit category and was selected for her work at the intersection of ocean recovery and social equity.

Emily studied for a 4-year undergraduate-masters degree in marine biology at the School of Ocean Sciences between 2008 and 2012. After graduation, she went on to work monitoring sea turtles for the Ascension Island Government, develop pioneering marine conservation projects for The Wildlife Trusts and lecture on an international marine ecology field course in Indonesia.

Emily believes a more inclusive and effective version of marine conservation is possible and has secured over £5m funding for projects which work with underserved communities to enable them to access, enjoy and protect their local ocean. She currently leads the work of the Local Government Association's Coastal Special Interest Group, is a Trustee of the Marine Conservation Society and is co-Secretariat to the All-Party Parliamentary Group on Coastal Communities. She is an active mentor and role model for young conservationists and in 2020 was named as a global "30 under 30" for environmental education.

Follow Emily's adventures on social media, search Marine Biology Life.

# Glacier Naming Honour

In December, the UK Antarctic Place-names Committee celebrated the 200th anniversary of the discovery of Antarctica by honouring 28 scientists and explorers who have made a significant and sustained contribution to Antarctic science.

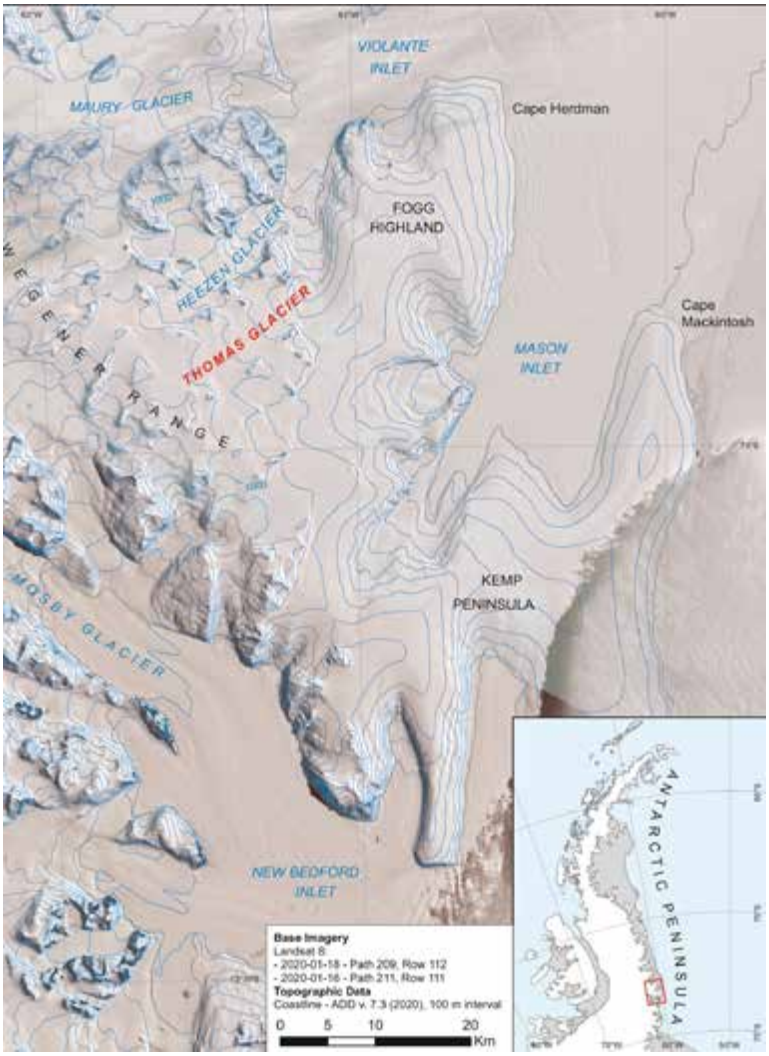
We are delighted to report that Professor David Thomas is amongst these, having a glacier named after him.

David spent much of his academic career in the School of Ocean Sciences before moving to the University of Helsinki last year and remains an honorary professor in SOS.

The name continues an established naming theme of Marine Biologists and Oceanographers in this area. Indeed, the nearby Fogg Headland is named after GE (Tony) Fogg, who held the Established Chair of Marine Biology at Bangor from 1971- 1985, a post David also held between 2006 and 2020. David did 4 of his 6 Antarctic expeditions while at Bangor in 1997, 1998, 2004/05 & 2006.

Amongst the other 28 scientists honoured in December was Karen Heywood FRS, British Antarctic oceanographer and Professor of Physical Oceanography at the University of East Anglia (UEA).

'Thomas Glacier' (72°51'S, 61°09'W) is about 23 km long and 3 km wide, flowing north from the Wegener Range, Palmer Land, between Fogg Highland and Heezen Glacier to enter Violante Inlet.



## Ocean Science's alumni welcomed back to give 'virtual' research seminars

### During the pandemic we have maintained a weekly 'virtual' research seminar series.

Earlier in the year we had great pleasure in welcoming back two Ocean Sciences alumni, **Iestyn Woolway** and **Seb Rosier**. Iestyn and Seb were classmates graduating from BSc in Ocean Science in 2010 and MSc in Physical Oceanography in 2011.

Following his time at Bangor, Seb moved to Cambridge to undertake a PhD with BAS and **Mattias Green** and now works as a glaciologist at the Northumbria University. He spoke about his recent work on the stability of the west Antarctic Icesheet.

Upon graduating, Iestyn undertook a PhD on the impacts of climate change on lakes at UCL, and was recently awarded a prestigious NERC Independent Research Fellowship to continue his climate change research at the European Space Agency. He spoke about his work on the impacts of climate change on temperate and high latitude lakes.

## RNLI in Wales teams up with Ocean Sciences to launch a new safety campaign

### With uncertainty over foreign holidays and international travel, the RNLI is predicting this summer will be the busiest ever on the Welsh coast, as Covid restrictions are eased and people choose to 'staycation', and has turned to Ocean Sciences for assistance.

Not everyone who finds themselves in trouble in the water, expected to even get wet. RNLI statistics for Wales show people enjoying a walk and getting cut off by the tide caused almost 10% of all RNLI lifeboat launches over the last decade - more than double the UK average. Lifeguards rescue hundreds more stranded people every year.

The new Bangor – Ocean Sciences partnership aims to improve people's understanding of tides and the associated risks at the coast. Commenting, Dr Martin Austin says:

'At Bangor University we research how tides interact with the coastline this work improves our ability to predict how beaches change and identify the dangers that they can present to the people using them for recreation. We are pleased to be working the RNLI on this important project because educating people about the hazards is the best way of keeping them safe on our beautiful coastline.'


## Native oysters restored to Conwy Bay

1,300 native oysters have been returned to waters in River Conwy as part of an ambitious restoration project to bring back these 'ocean superheroes' from the brink of extinction.

SOS are the local partners in The Wild Oysters Project, a partnership including ZSL (Zoological Society of London), Blue Marine Foundation (BLUE) and British Marine which aims to help restore healthy, resilient coastal waters around the UK.

Earning themselves the title 'ocean superheroes', native oysters (Ostrea edulis) provide huge benefits to coastal waters by helping to clean our seas and acting as an important habitat for marine wildlife. Declining by 95% due to human activities, native oyster populations have continued to decrease since the 1800s, meaning their benefits to the ocean have been lost.

In a bid to restore native oyster populations, and in turn see the return of health coastal waters, nurseries filled with oysters will be suspended underneath marina pontoons in Conwy Marina and Deganwy Marina on the River Conwy. The nurseries create a micro habitat acting as a maternity ward to the next generation of oysters. These oysters will begin reproducing over the next few months, releasing millions oyster larvae into the ocean.

The project, which spans the UK, has now installed 94 of 141 planned nurseries underneath marina pontoons across Wales and North East of England and is partly funded by the People's Postcode Lottery through the Dream Fund.

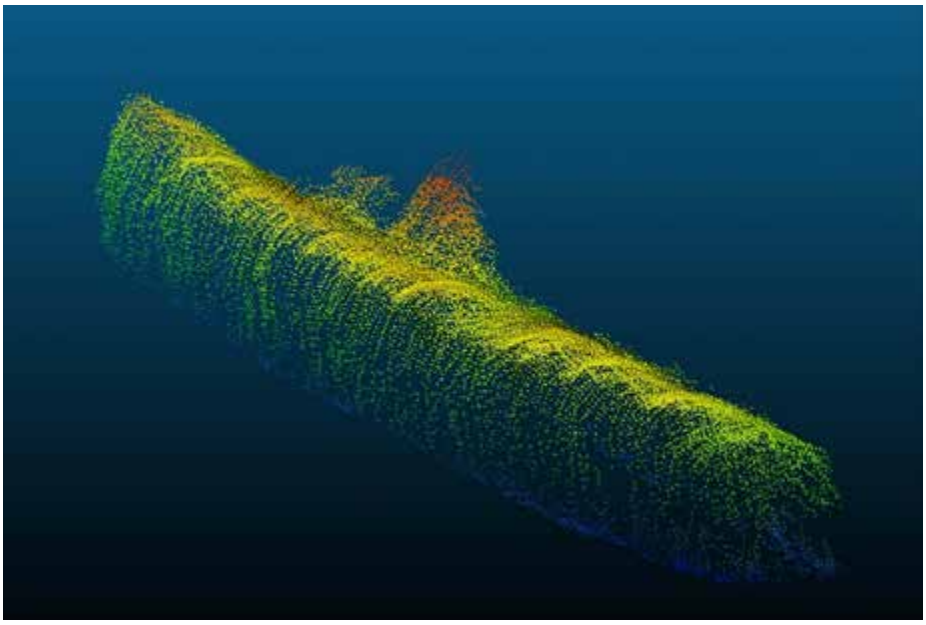
For more information visit wild-oysters.org.

## SOS Researcher Leo Clarke appeared on Breakfast TV.


Dr Leo Clarke appeared on Breakfast TV to talk about his sea turtle conservation work, specifically concerns that changing climate is resulting in the production of higher proportions of female hatchlings than males in sea turtles.

You can read more about this work in the research and impact highlights section at the end of this newsletter.

# SOS U-Boat research featured in Assassins Of The Deep TV Documentary



Survey work carried out by Bangor University's School of Ocean Science's research vessel the Prince Madog, led to the discovery of submarine U87 which was damaged and sunk on Christmas Day 1917.

The discovery was part of a joint research project with the Royal Commission on Ancient & Historic Monuments in Wales's Heritage Lottery funded project: Commemorating the Forgotten U-boat War around the Welsh Coast, 1914-18.

In the documentary Dr Mike Roberts and collaborators locate the wreck of U87 in the Irish Sea, from the University's research vessel the Prince Madog, explaining how it was sunk after being attacked by an Allied warship.

The programme is part of a ten-part series, a coproduction between National Geographic Channel, More 4, Welt 24 (Germany) and Discovery Science in the US. It was originally broadcast on More 4 with further broadcasts planned for other channels all around the world.

A team of staff from the School of Ocean Sciences led by Dr Mike Roberts have been using a multibeam sonar system and the latest imaging techniques to reveal underwater wrecks from the Great War.

Dr Mike Roberts explains why the information is so valuable:

*"While these wartime relics can provide valuable information to historians and archaeologists, they may also help lead to the birth of a new industry. The data we're collecting is providing unique insights into how these wrecks influence physical and biological processes in the marine environment. This information is being used to support the ambitions of the marine renewable energy sector."*

*"These images of wrecks reveal how the tide and currents have removed or deposited sediments and how the presence of these structures on the seabed have influenced these processes over time and what might happen when artificial structures are placed in the same or similar areas of seabed."*

# New app to help recognise sea life

## Now that we can travel around more freely, why not get some vitamin-sea and watch out for one of the 30 species of whale and dolphin that visit UK waters as you walk along our stunning coastline?

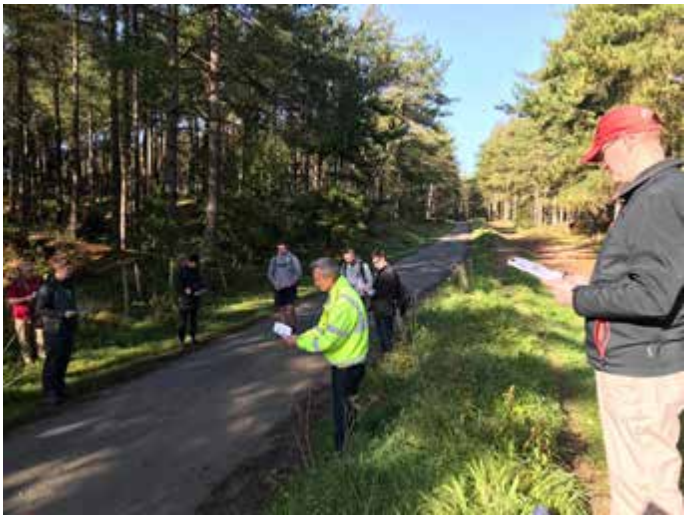
SOS researchers have teamed up with wildlife charity Sea Watch Foundation and tidal energy technology developer Nova Innovation to develop Sea Watcher, a free mobile phone app that allows anyone to recognise and register a sighting of whales, dolphins and other megafauna spotted from land or a boat in UK waters.

Launched at the end of 2020, almost 1000 sightings have already been recorded by more than 100 users of the app in their local areas over the winter. You can find out more about this app in the research and impact highlights section at the end of this newsletter.

# Socially Distanced Fieldwork

## Despite COVID restrictions we were still able to run many fieldwork sessions this year.

Bangor University's unique location offers many fieldwork opportunities. First year students undertake geology fieldwork in one of the only UNESCO Geo Parks in the UK, GeoMon (Anglesey) as well as visiting the glacially sculpted environments of Snowdonia.



# Top Sedimentological Paper

## The editorial team of the leading international peer review journal Sedimentology have chosen their favourite papers of 2020 and they include two bv SOS authors.


These include a paper written by Megan Baker as part of her PhD thesis: "Mixed sand–mud bedforms produced by transient turbulent flows in the fringe of submarine fans: Indicators of flow transformation".

## Natasha Lucas going the extra mile in chasing iceberg A68

Many will remember that huge iceberg (twice the size of Luxembourg) which broke away from Antarctica and was adrift in the South Atlantic in the spring.

Physical Oceanographer Natasha Lucas recently left Ocean Sciences to take up a position as the British Antarctic Survey, and was quickly involved in using underwater gliders to track the melting of the iceberg. This work has recently been recognised as BAS awarded Natasha a "Going the Extra Mile" award with the following citation:

*"Natasha has shown exceptional dedication to the job, going above and beyond to ensure successful delivery of data from the A68 iceberg project, strongly benefitting several members of the Polar Oceans and Ecosystems teams. In particular she very quickly gained the skills required to pilot our underwater gliders and collect high-quality scientific data; and has led the writing of new tools to incorporate satellite imagery into piloting decisions, minimizing risk of loss of vehicles and ensuring successful data delivery. Natasha has balanced multiple risks (strong currents, presence of ice, strong winds). Her efforts here go well beyond what would be expected of a Post Doctoral Research Associate, and she should therefore be recognised for her contribution to this project. "*

# Following in the footsteps of Shackleton

Regular readers may remember the report of PhD Marine Geophysics student Katie Retallick skiing trip across the Greenland ice sheet in last summers The Bridge.

In that trip Katie was following in the footsteps of the great Arctic explorer and oceanographer Fridtjof Nansen. Now she is planning to follow in the footsteps of great Antarctic explorer Earnest Shackleton by participating in the Shackleton Anniversary Expedition 2021. The expedition will conduct scientific research in Antarctica on behalf of a number of academic institutions in support of ongoing climate and microplastic research.

# BSc Physical Geography and Oceanography top rated

The recently introduced BSc in Physical Geography and Oceanography has been selected as one of the top physical geography courses in UK by Geographic magazine, the official magazine of the Royal Geographical Society.

In their citation they state:

*"You'll be hard pressed to find a better location for a university campus. Nestled between the mountains and the sea, Bangor is surrounded by beautiful natural scenery. Nearby to Snowdonia National Park and surfing hotspots, options for outdoor activities are aplenty."*

# Happy Retirement

During the course of the lockdown a number of key support staff have taken well-earned retirement.

**Chris White** has been a teaching administrator for many years and retired in the autumn. Whilst the Head of School Secretary **Judy Davies** retired in the spring, after 45 years working for the University, and 32 years in Ocean Sciences. Both are very well known to the student community particularly pre-online submissions days, as Chris and Judy were always on-hand to calm those panicking over late submissions, and to ensure work was correctly submitted.

**Gwyn Hughes** has also retired, after 32 years as an aquarium technician. Gwyn's expertise was enormously valued by researchers within the school, his help and advice resulted in numerous successful student projects over the last three decades.

# NEW BOOKS

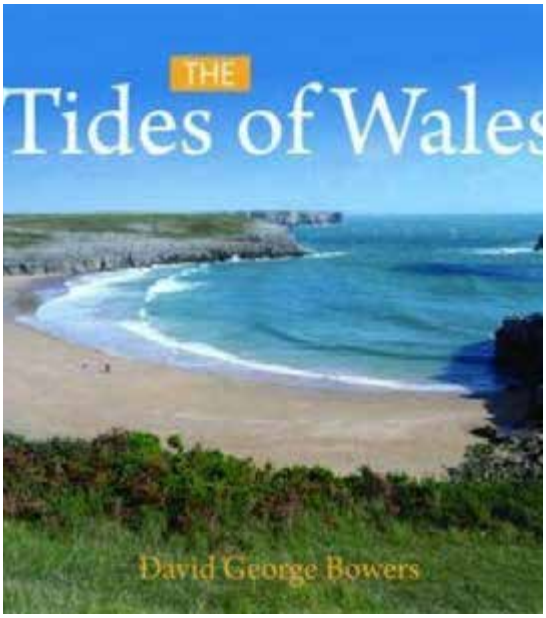
## SOS staff have been busy writing popular science books with two published over the past couple of months.


### Yueng-Djern Lenn and Mattias Green have pulled together a new book in the '30-second' series, titled the "30-second Ocean: 50 key ideas about the sea's importance to life on earth".

The book includes contributions from leading ocean scientists across the global including a number from SOS staff – Martin Austin, Line Cordes, Laura Grange, Adel Heenan, Hilary Kennedy, Tom Rippeth, Martin Skov, David Thomas, Svenja Tidau, James Waggit and Sophie Ward - and SOS alumni including Meg Baker (now at Durham University), Claire Mahaffey (now at Liverpool University) and Sebastian Rosier (now at Northumbria University).

The book not only explores the ocean, from the surface to the sea-bed and the life it supports, from microscopic plankton to blue whales, at also introduces contemporary issues such as global warming, ocean acidification and plastic pollution. It also looks beyond the planet Earth with section exploring the potential for life elsewhere in the oceans of the solar system.

The book, "The 30 Second Ocean" (Eds: Yueng-Djern Lenn and Mattias Green), is published by Ivy Press (ISBN: 978-0-7112-5266-0) and is available from all good bookshops.




### Meanwhile Dave Bowers has published his second book on tides, this time covering "The Tides of Wales".

You might think it's unusual to see a book about the tides of a single country, however along Wale's relatively short coastline you will find some of the greatest tidal phenomena on our planet. It has the largest rise and fall of the tide in the world, outside of Canada and you'll find several tidal bores (on the Dee and Severn Estuaries). Of course, Wales also hosts the School of Ocean Sciences, a world leader in many aspects of tidal research for over half a century!

Dave's book is called "The Tides of Wales" (ISBN: 978-1-84524-314-2) and published by Carrag Gwalch. It is available online as well as many bookshops around Wales or can be order directly from the publisher: www.carreg-gwalch.cymru.

# GEORGE DAVID FLOODGATE 1924-2021

George Floodgate who died on 1 March this year, aged 96, taught marine microbiology to generations of students at Menai Bridge; towards the end of his career, he co-founded, with his good friend and colleague Sinclair Buchan, the School of Ocean Science Alumni Society and produced the first editions of the Newsletter.

George was born in Fulham in London on the last day of 1924 and grew up enjoying an active life taking camping and hiking holidays in Scotland and Snowdonia. At the age of 19, he joined the Royal Navy, working on the development of RADAR for warships during the Second World War. After the war, at the suggestion of his best friend in the navy, he applied for and won a place at Emmanuel College, Cambridge where he studied Biochemistry. He liked the academic life and moved on to a PhD in microbiology at the University of Glasgow.

George was working at the Torrey Research Laboratory in Aberdeen when, in 1961, Dennis Crisp persuaded him to come to Menai Bridge. He joined a small team of just five or six staff at that time in the Department of Marine Biology. Soon afterwards, Sinclair Buchan joined the team, also travelling down from the north of Scotland. George and Sinclair formed a good partnership carrying out field and laboratory work together. Although George's principal research interests at this time were marine bacteria, he took a broader interest in marine science, using micro-organisms to trace water movement. He also developed the happy knack of recruiting the best PhD students. George was a friendly face in the School of Ocean Sciences, offering sound advice. He was a valued and well-respected colleague.

The 1970's was the decade of marine microbial ecology and the discovery of the importance of the microbial loop. With new microscopes, DNA staining and radiotracer techniques giving new insights, we were able to see that there were millions of active bacteria per ml of seawater not just the couple of hundred as previously thought. They were the engine behind recycling in the ocean, the food for many protozoa and formed microbial films on nearly everything. George was our "Man in Menai on Microbes" and many were fortunate to be his PhD students researching all sorts of aspects of this new and exciting microbial world - then in its infancy. From important decomposers of oil, drivers of carbon and nutrient recycling and prolific biofilm developers – it was a heady time!

This era at the Marine Science Laboratories, Menai Bridge produced some leading microbial scientists all of whom look back on both George and Menai as an excellent time to develop their thinking, writing and research skills.

## Here are some fond memories from his ex-students:

Madilyn Fletcher:

*"It's not exaggerating to say that I owe my entire professional career to George Floodgate. He had confidence in me and took me under his wing, when by most appearances I was a novice American graduate with none of the normal U.K. credentials. But he saw my eagerness to do microbiology research in North Wales, and he offered me inspiration, confidence, and a challenging and timely project tackling microbial biofilms. He was there to guide and encourage, but perhaps his biggest gift was his insistence that research is done with the highest level of integrity and is expressed with utmost clarity and honesty. I am sure others have felt this way, and it is a quality that is necessary not only to do good science, but also to being a worthy human being. He was truly very special and a gift to many of us."*

Karin Lochte:

*"When I arrived as a German student in Menai Bridge for a MSc Course I wanted to work with zooplankton, but it was the fascinating world of microbes to which George Floodgate introduced us that finally became my field of research. He showed us that it was microbes and not whales that are the real giants in life in the ocean. George gave me much freedom in my PhD work in the "Front Study Group" and his guidance in the microbiology seminars helped us to look beyond the narrow range of our specialized field of research. I am still fond of his saying "There are no stupid questions!" and he urged us to ask ALL questions. The time in Menai Bridge was a time of intense learning, of meeting wonderful scholars and a time that shaped my scientific life. I am very grateful for this time and to George for his advice."*

Carol Turley:

*"My time at Menai Bridge made some of my fondest memories and friends. What a wonderful place to study! George gave me the freedom to study, explore and make my own mistakes (and discoveries). I also learnt from George that it was good to speak up and admit you didn't understand something wherever you are – be it at a seminar or a UN Summit - as it was quite likely that no one else did either! It set me up to keep on learning and to enjoy every minute of it. Thank you George!"*

George enjoyed cooking (which he learnt from his mother when young), watercolour painting and gardening but most of all he enjoyed his extended family. He was the loving husband of Mary, devoted father of Elizabeth, Catherine, Charles and Kirsteen, proud grandfather of Rosie and Ben and great grandfather of Caitlin and Ruben.

Dr Carol Turley, OBE, Head of International Affairs, Plymouth Marine Laboratory, UK.

Dr. Madilyn Fletcher, Distinguished Professor Emerita, former Director of the School of the Earth, Ocean, and Environment and the Baruch Institute, University of South Carolina, USA.

Prof. Dr. Dr.h.c. Karin Lochte, former Director of the Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research, Germany.

Dr. Sinclair Buchan, former Senior Lecturer in Oceanography, School of Ocean Science, Menai Bridge, UK.

Dr. Dave Bowers, former Professor of Physical Oceanography, School of Ocean Science, Menai Bridge, UK.

## MANUEL NICOLAUS
## Marine Biology / Zoology, 2006

### Alumnus supports the Covid effort

"I am Manuel and studied Marine Biology/ Zoology between 2003 and 06. While I normally work at Cefas as a Senior Marine Biologist, I have put my marine profession aside for 3 months and joined the COVID-19 response at the Government Office for Science. I joined the SAGE delivery team and provided as much support as I could during this time to ensure all the tasks were done to very tight turnaround times. It was such a privilege to work within this dedicated team to support the Covid response."

## NURAINI ARSAD
## Marine Environmental Protection, 2004

"I'm happy to report that I'm still a contaminated land scientist with Shell, currently helping Shell's Pakistan businesses protect beneficial aquifers underlying assets, where capacity in environmental services is underdeveloped.

At the same time, I will also be helping to ensure that the management of contamination risks remain robust, even as the company shifts to deploy the energy transition in an integrated way with the pace of the different countries. It will be interesting to watch new businesses emerge and out-of-the-box transition solutions come up – from the usual suspects in new energies or data science, but even more interestingly from unlikely professions like contracts and client management!

P.S. I'm still blogging about sustainability & insightful travel on Teja on the Horizon."

*The bridge in this image is the tree canopy bridge in KL Forest Eco Park, a tiny patch of original rainforest left in the urban city centre of Kuala Lumpur and the nearest rainforest to where I live.*


*"walking the coast": Scott out walking the North Devon stretch of the SWCP*

# SCOTT GUDRICH
# Marine Environmental Protection, 2018

## Plover Rovers - the 100% volunteer-run charity that is putting on marine science communication events all around the English coast

Bangor alumni Scott Xavi Gudrich (MSc Marine Environmental Protection, 2018) set up the marine science communication charity Plover Rovers (Reg.No. 1189992) a year ago when he was furloughed from his laboratory job as a benthic taxonomist. Now, he manages 50 volunteers and has more than 20 coastal science education events scheduled this summer from Whitby to Wembury and pretty much everywhere in between! Here, he looks back on a turbulent year which has been an amazing personal and professional journey:

Relentless.
Like the beating of waves.
Like a winter storm, like a summer breeze.
Like life.

Comforting.
Like the song of the sea.
Like the music of leaves in the wind.
Like life.

Powerful.
Like an ocean drift.
Like tides, like earth.
Like life.

"Sometimes it's easier to express things in poetry rather than prose - the above poem describes my year 2020, a year very much shaped by the many amazing people I have met while setting up the charity and planning our "Talking the Coast 2021" project.

If setting up a charity sounds like a lot of work - it sure is! It's been pretty much full on for the past year and one reason that I feel I can do it is, funnily, because of my background as a rock musician: Getting stuck in a project, working creatively, navigating challenges and just generally pouring your heart and soul into it is all second nature to me and I actually found that working on the charity also triggered a very creative phase as a musician as well which actually saw us back in a recording studio for the first time in 22 years but I digress…

Our approach is unique in that we put emphasis on person-to-person interaction between marine scientists and members of coastal communities. Most of our events are low-key guided walks where a marine scientist takes a group of people out along the coast path, talking about their relevant research and how it relates to local people as well as it's place in the bigger picture. With this approach, we hope to demystify science and make it more accessible across a broad demographic. The fact that all our events are free to attend further aids the accessibility. We also work with artists across the country as well as with local conservation groups. All this feeds into our 4-level approach to enhancing ocean literacy:

1. Science Communication: Present relevant science with a focus on active dialogue between participating scientists and members of coastal communities rather than top-down knowledge transfer. We take the view that the situation around

COVID-19, which likely will not allow for large groups to congregate this summer, is an opportunity to foster a more personal connection between local citizens and scientists, bringing them together on a level playing field, in an intimate setting, enabling person-to-person conversations with potentially transformative power for both sides.

2. Art and Emotion: We collaborate with artists to provide an additional, more emotive access to the topic, making our events interesting to an audience beyond the usual bracket of the academic white middle class. We believe that art can aid science communication by providing both an active and immersive "discovering nature" experience as well as enhanced emotional connectivity to the natural world. While there still is a need to better understand the role of emotions in decision making and behaviour, a large-scale emotional re-connection with the natural world is an obvious necessity if we want to successfully work for transformative behaviour change on a societal level.

3. Activism: We collaborate with local organisations to provide people with the possibility of local engagement. We believe knowledge should not be separated from activism and we therefore want our events to double as volunteer recruitment for locally active community groups. This direct pathway from an informative setting to active engagement will help consolidate the acquired theoretical knowledge and build a sustained connection to the natural environment.

4. Heritage and Storytelling: Our person-to-person approach will allow us to collect stories from local people to explore and understand their connection to the sea, their concerns, hopes and visions, acknowledging that we need to understand how our audiences connect with a particular topic, place or issue in order to deliver science communication which can illicit behaviour change. This active listening approach is key to achieving the UN Decade's goal of "identifying and overcoming barriers to behaviour change required for a step change in humanity's relationship with the ocean".

Running a project with no budget and no paid employees creates a special kind of beauty. The absence of money frees up creativity. We invite all our volunteers to add their vision to our mission, we experiment, we value the process as much as the end result, we are learning from each other constantly and we have fun! Of course, there are challenges. I'm managing 50+ volunteers, they all have their own lives and changes in their professional circumstances can see them suddenly having to step down, leaving things to be rearranged, loose ends to be tied up, big shoes to be filled. But nothing energises me as much as meeting all these brilliant people ready to dedicate their precious time to this project, I'd take that over line managing a bunch of employees who just do their duty because they get paid for it anytime!

So, would I do it all again? In a heartbeat!

I've met so many amazing people, both among our volunteers and among our local and national partners. I've made connections which will no doubt be with me for years to come. And hopefully I've managed to create a space where young scientists can let their creativity run free, share their passion and gain valuable skills for their future, as well as an opportunity for people to connect with marine science.

Catch up with our "Talking the Coast" project at www.plover-rovers.com

If you are interested in my band The Lürxx (music for the planet): www.the-lurxx.com "

*"Plover Rovers seagrass talk Looe": Kicking off the summer with our first in-person event in Looe, talking about the importance of seagrass meadows.*

*Volunteers June 21: Big shoutout to all our awesome volunteers!*

# PAUL DRIVER
# MSc Marine Biology, 1970

*"This is the little bridge over which I have to cross to get to my holiday cottage in Lerryn, Cornwall. I am pleased to say that it sits on the tidal Upper Fowey Marine Conservation Zone (MCZ), which even includes our side creek.*

## Bridge Over Conserved Water

I did the M.Sc. Marine Biology course over the 1969/70 academic year. Following my subsequent PhD at Portsmouth, I became the Biologist of the Lancashire and Western Sea Fisheries Joint Committee (L&WSFJC), whose area ran between Barrow-in-Furness and Cardigan.

This enabled me to return to North Wales for studies of the lobster fishery, management of the mussel fishery, and surveys of coastal discharges, e.g. from Wylfa Nuclear Power Station and Associated Octel. In association with Ivor Rees, we also conducted studies of the effects of Liverpool's sludge dumping, which included 24-hour water quality surveys of the Irish Sea on our patrol / research vessel the Samuel Baxter. I eventually became the CEO of the L&WSFJC, but left in 1980 to follow a career in international environmental consultancy; that included a number of marine studies, e.g. for the management of coral reefs in Bahrain, Oman and The Maldives.

In the early 1990s, I took a 3-year break from consultancy as the Director of Conservation Services at the HQ of IUCN. I am now retired, but have recently been appointed to the Committee of the Sussex Inshore Fisheries & Conservation Authority (IFCA). The IFCAs are the successors to the old Sea Fisheries Committees, so I have finally turned full circle.

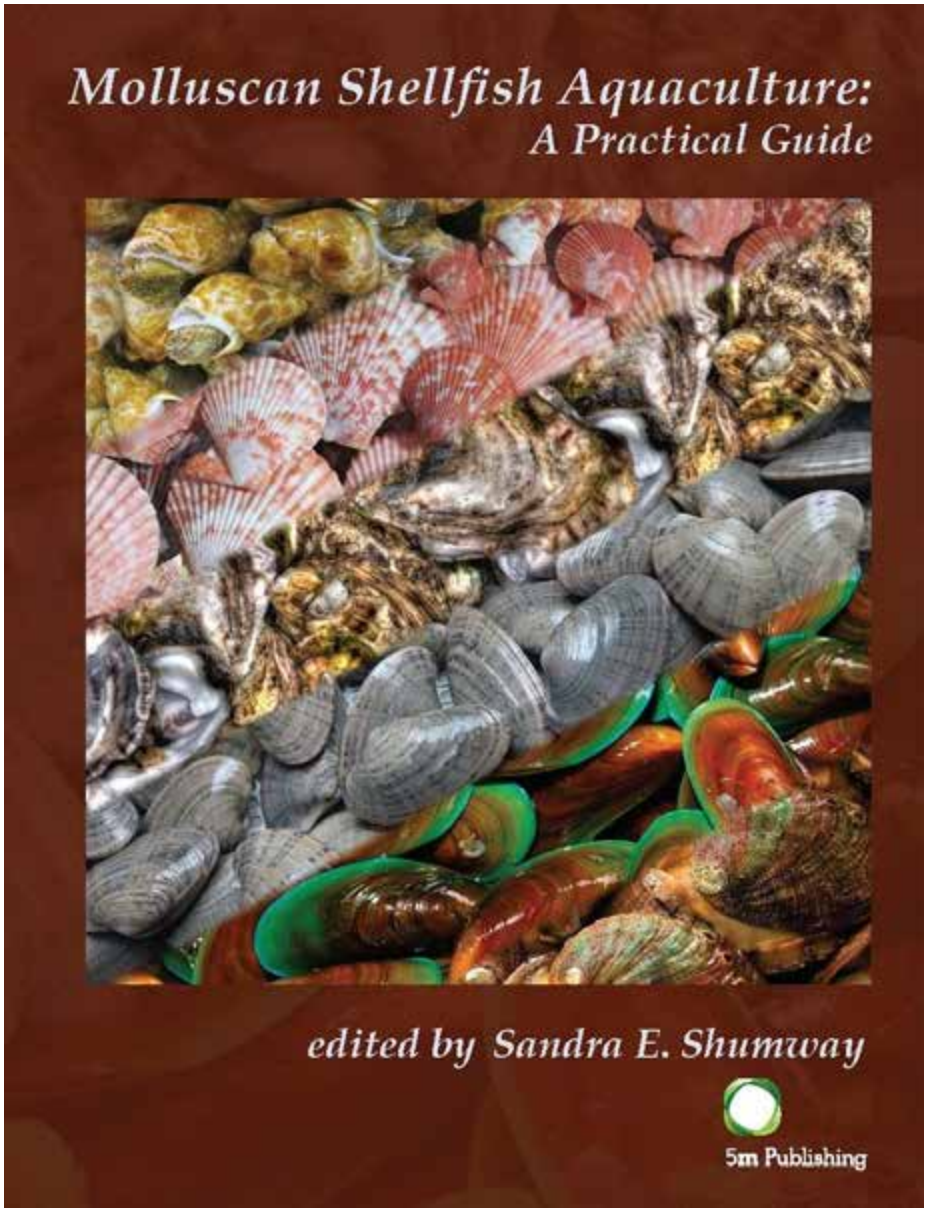
Best wishes to all my surviving classmates.....!"

## BILL REES
## Marine Biology / Oceanography, 1986

"My main news is that my book, A Late Return: Table Tennis à la carte, about playing competitive ping pong in France was published in June.


It got a nice review in Wales Arts Review: https://www.walesartsreview.org/a-late-return-table-tennis-a-la-carte-by-william-rees-books

*My photo of a bridge is in the commune of Mandagout, a village in the Cevennes to where I have just moved."*




*Publisher: 5M Books Ltd*

*ISBN-13: 9781789180107*

## SANDRA SHUMWAY

## Marine Biology PhD, 1977

### Alumna edits new book - Molluscan Shellfish Aquaculture: A Practical Guide

Molluscan Shellfish Aquaculture: A Practical Guide is a readable, useable, and comprehensive source of information for all those interested in growing shellfish.

Each group of the major cultured species of commercial importance is covered, providing cutting-edge information of practical use to all those involved in shellfish aquaculture. The editor and chapter authors are among the most widely known and respected authorities working in the industry and academia. Species covered include mussels, clams, oysters (including pearl oysters), scallops, cephalopods, abalone, and gastropods. Molluscan Shellfish Aquaculture contains a wealth of information of great use for personnel working in the industry, with chapters covering site selection, hatchery construction, disease, biofouling, best management practice, and certification.

## STEPHEN FOSTER
## Marine Biology / Zoology, 1974

### Can You Help?!

"I recently found this photo of half of the class of 1974 on the Prince Madog about to set sail on a day's on sea research. Many didn't look quite so perky on the return later that afternoon!

I'm on the left, Tony Richards second from right. Anne far right. Where are the others these days? I wish I also had one of the other half of the class, maybe someone does. It would show Carol Turley, Mary Armstrong and Richard Prickett."

Please email alumni@bangor.ac.uk if you recognize any of the faces or have a copy of the other photo!

## Starr Sams (BSc Marine Vertebrate Zoology)

I knew during my time in at university that I wanted to work with sharks after graduating, it was one of the reasons I chose Bangor and the Marine Vertebrate Zoology program.

Since graduating in July 2019, I spent some time at Bimini Sharklab (BBFS). I was involved in assisting with their current research projects and getting involved with their outreach activities, such as public tours and Google Hangouts.

My experiences at the Sharklab have led to further work in education and outreach, as I had the opportunity to work with Jillian Morris and Sharks4Kids, providing lessons about sharks and marine conservation to schoolchildren and young people around the world. I am now a Sharks4Kids Ambassador, giving regular virtual lessons to students around the world. Recently I connected with a school in Virginia, USA where I gave a lesson to 96 seven-year-olds, which was an incredible experience.

Prior to Covid, I began working at Lyme Regis Marine Aquarium as an educator and aquarist. My role primarily involves giving talks about the native marine life on the Jurassic Coast and answering any questions guests may have. Whilst the aquarium has been closed, I have been collecting data on local marine life around lockdown restrictions.

My travel plans changed as a result of Covid, so I am now working as a lab technician during term time. This has led to becoming a STEM ambassador, and I hope to return to the aquarium in peak times once restrictions are lifted.

Alongside my outreach work with Sharks4Kids, I am also a member of new conservation project team based in Egypt, the Red Sea Project. The project provides online resources, webinars and training courses for locals, tourists, divers, and dive operators, promoting sustainable practices and advocating for further protective legislation in the region.

During my time in Bimini, I began a personal outreach project @ SharksWithStarr, to enhance my scientific communication skills and share my experiences. I hope to expand this further with a new project that is currently being developed, so watch this space!

## Holly Ayres (MSc Physical Oceanography 2017)

Since graduating the MSc Physical Oceanography degree in 2017, I completed a PhD in Mathematics at the University of Exeter, titled 'The Climate Response to Antarctic Sea Ice Loss' successfully defending it in March 2021.

My thesis encapsulated both the atmospheric and oceanic response to sea-ice loss in the Southern Hemisphere, using state of the art Met Office ocean-atmosphere coupled and atmosphere-only climate models.

My new results have demonstrated that Antarctic sea-ice loss may trigger a greater and more spatially extensive response than previously estimated, much like that found for the Arctic. Atmospheric and ocean warming, in addition to changes in circulation and precipitation, were found both locally in the Southern Hemisphere and globally, reaching as far north as the Arctic. This work also helped to establish the important roles of the ocean in this response.

As of January 2021, I am now a postdoctoral researcher in the department of Meteorology at University of Reading. My work is assessing the climate response to the Weddell Sea Polynya, a deep convection drive area of open water in a area that would otherwise be sea ice. It has only appeared twice since the beginning of the satellite record 50 years ago.

## Alumni Rosemary Jagus

Congratulations to Bangor graduate Rosemary Jagus, now a professor in molecular genetics at the Institute of Marine and Environmental Technology, University of Maryland Center for Environmental Science on being awarded the annual President's Award for Excellence in Application of Science for her contributions to increasing the diversity of scientists working in the marine sciences over the past two decades.

# RESEARCH AND IMPACT HIGHLIGHTS

## The 'Heat Bombs' Destroying Arctic Sea Ice

### Unprecedented observations could revise forecasts of the demise of sea ice in the Arctic Ocean.

*Researchers deploy a Fast CTD developed at Scripps Oceanography during the 2018 SODA cruise in the Arctic Ocean.*
*Photo: San Nguyen*

A team led by physical oceanographers at Scripps Institution of Oceanography at the University of California San Diego, which includes SOS's **Yueng-Djern Lenn,** show in a new study how plumes of warm water are flowing into the Arctic Ocean from the Pacific Ocean and accelerating sea ice melt from below.

The new research published in Nature Communications describes so-called underwater "heat bombs" as one of a number of mechanisms by which global warming-driven encroachment is changing the nature of the Arctic Ocean faster than nearly any other place on Earth. It adds to a growing body of evidence that suggests that Arctic sea ice, a source of global climate stability, could disappear for larger portions of the year.

"The rate of accelerating sea ice melt in the Arctic has been hard to predict accurately, in part because of all of the complex local feedbacks between ice, ocean and atmosphere; this work showcases the large role in warming that ocean water plays as part of those feedbacks," said Jennifer MacKinnon, a physical oceanographer at Scripps, chief scientist of the expedition, and a past Kirby Laing Fellow in SOS.

### The Arctic is an unusual ocean in that it is stratified – or layered – by salinity instead of temperature.

*A SWIFT drifter developed by University of Washington researcher Jim Thomson is deployed during the 2018 SODA cruise to the Arctic Ocean.*
*Photo: San Nguyen*

Most oceans of the world have warmer, lighter water near the surface and colder, denser water below. In the Arctic, however, there is a surface layer that is cold but very fresh, influenced by river outflow and accelerating ice melt. Warm, relatively salty water enters from the Pacific Ocean through the Bering Strait and then the Barrow Canyon off Alaska's northern coast, which acts as a nozzle as the water flows through the narrow passage.

Because this water is saltier than the Arctic surface water, it is dense enough to "subduct," or dive beneath, the fresh Arctic surface layer. Its movement creates pockets of very warm water that lurk below surface waters. Scientists have been seeing these pockets of warm sub-surface water strengthen over the last decade.

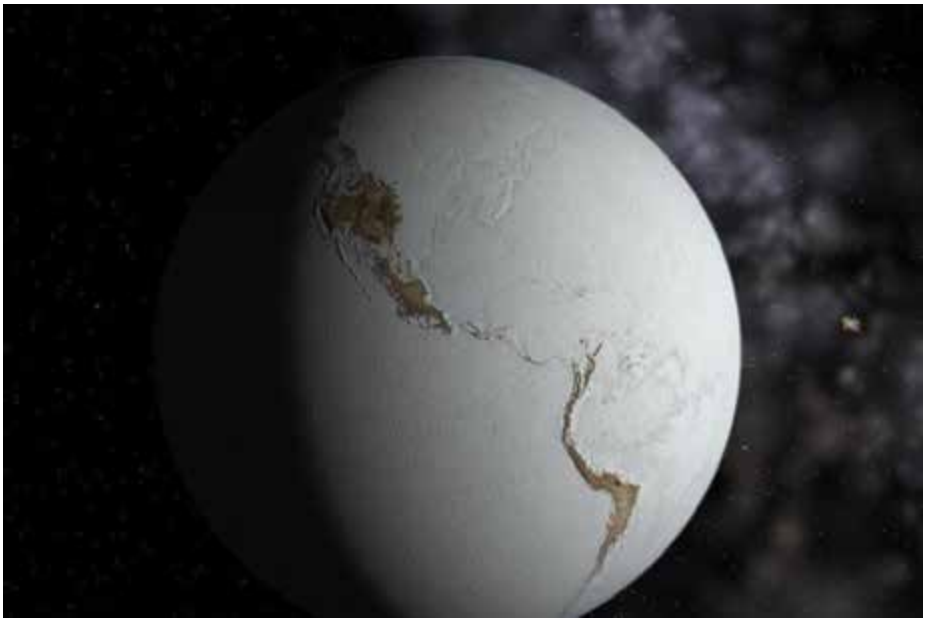
These pockets known as "heat bombs" are just stable enough to be able to last for months or years, swirling far north beneath the main ice pack near the north pole, and destabilizing that ice as the heat in them gradually diffuses upwards to melt the ice. Until now, though, the process by which the warm water subducts has neither been observed nor understood and so scientists have been unable to include this important effect in climate forecast models. Given that the influx of warm Pacific origin water has been growing over the past decade or so, this work adds to a growing body of evidence that Arctic sea ice, a source of global climate stability, could disappear for large portions of the year.

In a 2018 expedition the team for the first time caught one of these dramatic subduction events in the act. The group used a combination of novel oceanographic instruments developed by the Multiscale Ocean Dynamics group at Scripps, satellite observations, profiling float data and biological samples collected by British and German colleagues working on NERC funded Changing Arctic Ocean projects.

MacKinnon, J., et al (2021). A warm Jet in a cold ocean. Nature Communications, 12, 2418.

# Snowball Earth Due to Sluggish Tides?

## Geological evidence points to severe "Snowball Earth" glaciations, when ice sheets extended to the equator having taken place 720 to 635 million years ago (The Cryogenian).



*An imaginary 'snowball Earth'.*
*Credit: Neethis via Wiki Images*

In considering continental drift, these glaciations occurred around about the time of the breakup of one supercontinent and assembly of another.

However, this led to a puzzle as whilst the presence of extensive continental ice sheets implies a tidally energetic Snowball ocean, due to the reduced ocean depth, the supercontinent palaeogeography predicts weak tides because the surrounding ocean is too large to host tidal resonances.

In a new paper in Nature Communications, **Mattias Green** and collaborators at Universidade de Lisboa, Portugal, Oregon State University, and Northwestern University, use a global tidal model and paleogeographic reconstructions, to show that the Cryogenian ocean hosted diminished tides and associated reduced energy dissipation rates, reaching 10–50% of today's rates, during the Snowball glaciations.

Accordingly, they are able to argue that the near-absence of Cryogenian tidal processes may have been one contributor to these prolonged glaciations. These new results also constrain lunar distance and orbital evolution throughout the Cryogenian, and highlight that simulations of past oceans should include explicit tidally driven mixing processes.

Green, M., Davies, H., Duarte, J., Creveling, J. & Scotese, C (2020). Weak tides during Cryogenian glaciations. Nature Communications, 11(1), 6227.

# Ocean Scientists Use Seabed Mapping to Help Position Giant Windfarm

## Geoscientists in SOS are playing a critical role in paving the way for one of the world's biggest wind farms off the coast of North Wales.

They are working with German renewable energy giant RWE on the siting of the Awel y Môr extension which will more than double the size of the Gwynt y Môr wind farm, already the world's fifth largest.

Their expertise in 3-D mapping the seabed and the sediment layers underneath is crucial in plotting the location of the giant turbines and in helping to plan for wind farms off the coast of North Wales.

Awel y Môr - Sea Breeze in Welsh – will lie to the west of Gwynt y Môr – Sea Wind – which already has 160 turbines spread across 80 square kilometres of Liverpool Bay.

The SOS mapping of the seabed off the North Wales coast and the Irish and Celtic Seas will play a key role in the Government's green ambitions to power every home in the country with wind energy by 2030.

**Dr Katrien Van Landeghem** says:

*"Awel y Môr is a huge development. For the Government to reach its targets, we will need even more wind farms, including into deeper waters. We need to ensure these developments are cost-effective yet sustainable for the seabed and to the marine life it supports.*

*"Offshore wind is going to be vital in this accelerated schedule to provide low-cost clean power because it is tried and tested – we know the technology works.*

*"To achieve these renewable energy goals by 2030, wind energy will see major investment but I hope the investment in other options of offshore energy extraction will be increased as well.*

RWE's Awel y Môr Project Manager Tamsyn Rowe said:

*"We are really excited to see this programme start.*

*"We want to ensure our projects are developed as responsibly as possible. Offshore wind will play a crucial role in Wales' transition to a low carbon future and input from scientists at Bangor University is feeding into this."*

# Plan Some Vitamin-Sea: Download a New App to Recognise Sea-Life

## Why not begin to make plans to get some vitamin-sea and watch out for one of the 30 species of whale and dolphin that visit UK waters once travel restrictions are lifted?

Researchers here at Bangor University have teamed up with wildlife charity Sea Watch Foundation and tidal energy technology developer Nova Innovation to develop Sea Watcher, a free mobile phone app that allows anyone to register a sighting of whales, dolphins and other megafauna spotted from land or a boat in UK waters.

**Jenny Bond**, heading up the research project for SEACAMS 2 at Bangor University said:

*"Once people can travel freely again, we hope that people will enjoy spotting for whales and dolphins around the UK, offering them fresh air, and an activity where they can learn and relax at the same time. We have developed the Sea Watcher app so that anyone can contribute to marine mammal research in the UK"*

Relax and enjoy some vitamin-sea!

The best places to watch for whales and dolphins are headlands, islands and elevated clifftops where you can get a good view over a wide expanse of sea whilst calm weather conditions will help. There are many hotspots for seeing dolphins in the UK: Cardigan Bay and the Pembrokeshire islands in West Wales, Mounts Bay in Cornwall, the Northumbrian coast in NE England, the Hebrides, Northern Isles and Moray Firth in Scotland, to name just a few, but you may be lucky anywhere around the coast of Britain. If you are planning a walk along the coastal path or a relaxing watch out to sea from a clifftop, a pair of binoculars will help you, and once you have downloaded it, the Sea Watcher app will take you through the steps to log your sighting. The app has plenty of photographs and videos to help you identify the different species.

## The value of local knowledge

Dr Kate Smith, Environmental Manager for marine renewable energy company Nova Innovation and SOS alumni, is also collaborating on the project and said:

*"Making sure that our tidal turbines do not harm the marine environment is incredibly important for Nova. Environmental impact considerations, including potential effects on marine mammals and other marine life, are a key part of the consenting and design process for our renewable energy projects. We're delighted to be involved this research, to explore how local knowledge, which is often overlooked in consenting and design processes, can help assess and minimise the impacts of our projects on marine mammals."*

It is well known that being by the sea can positively contribute to our wellbeing, so next time you are near the sea, make sure you have downloaded the Sea Watcher app, grab your binoculars, and enjoy some vitamin-sea!

www.seawatchfoundation.org.uk/sea-watcher-app

# Simple, Low-Cost Tools Can Mitigate the Negative Impacts of Climate Change on Incubating Sea Turtle Clutches

The IPCC predicts increases in global mean surface temperatures of 3.7 to 4.8 °C by 2100, and while an overall loss of global biodiversity has been widely predicted, climate change is expected to have a more insidious effect on marine turtles, skewing the proportion of female and male offspring produced.

This is because sea turtles lack sex chromosomes, and instead have 'Temperature Dependent Sex Determination', where females develop at high incubation temperatures, and males at low incubation temperatures. Sex ratios of up to 90% female have been documented in many places and future projections predict almost complete feminisation in some populations with warmer temperatures, with serious implications for population viability.

High sand temperatures can also cause lower hatch success and reduce hatchling fitness. In addition to the ambient sand temperature, metabolic development of the embryos themselves can increase nest temperatures by around 1°C, termed "metabolic heating". There has been a lot of research recently on interventions to mitigate the effects of elevated nest temperatures on sea turtle reproduction, although these techniques are often resource-intensive such as watering or shading the nests. Turtle rookeries are often in remote locations in developing countries, and effective management should be simple and cheap.

**Leo Clarke** writes of his work on sea turtle reproduction in a changing climate:

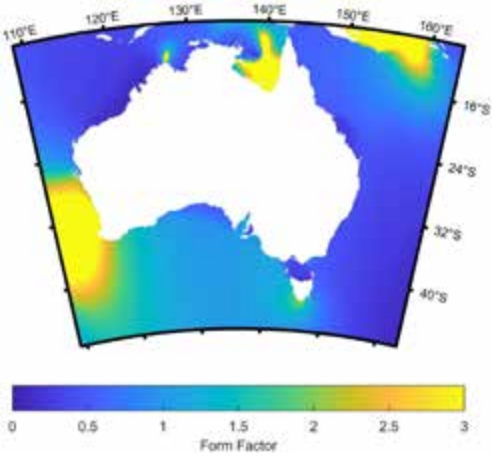
*"We tested two management tools to reduce the temperature of incubating turtle nests and mitigate the negative effects of climate change: clutch shading and a new approach of clutch "splitting", whereby we experimentally halved the number of eggs in a clutch in an attempt to reduce the amount of metabolic heat produced. We collected eggs from 60 female loggerhead Caretta caretta turtles during nesting on Boa Vista, Cape Verde, and reburied them in a protected hatchery on the beach that is part of an ongoing turtle conservation programme.*

*We shaded 20 nests with dark fabric material, "split" 20 nests in half before burying (we reburied the remaining eggs elsewhere in the hatchery), and reburied the remaining 20 nests whole as controls. We buried a temperature data logger in each nest to monitor incubation temperatures, along with six loggers throughout the hatchery to record sand temperatures. These were used to work out how much metabolic heat was being produced in the experimentally split clutches.*

*We found that nest temperatures in the nests we shaded and split in half were 1.1 °C and 0.5 °C lower than control nests on average respectively. This was enough to reduce the sex ratio (the percentage of female hatchlings produced) by 24% for split clutches and by 68% for shaded clutches. Splitting the clutches in half also reduced the metabolic heat produced by the incubating clutch itself in the later stages of incubation. Importantly, we found no difference in hatching success between our treatments, and hatchlings were the same size and mass, and could run and right themselves as quickly between treatments. These metrics are important for avoiding predators and survival after hatching.*

*Our results show that these simple tools can effectively change the thermal properties of incubating turtle nests at very little cost and investment of personnel, and could be useful in the future to mitigate the effects of climate change without compromising hatch success or the fitness of hatchlings. It's important to have a better understanding of sea turtle population dynamics before we intervene though, as sex ratio is such a fundamental life-history parameter, but as the effects of climate change accelerate, these tools may offer managers effective and easily implementable ways to support conservation of these endangered species."*

# Student Projects Help Assess the Tidal Energy Potential Around Australia




## Research undertaken by SOS students research projects have helped to characterise the potential for the generation of renewable tidal energy around Australia and has now been published in the Journal Renewable Energy.

The work, undertaken by Alana Griffiths (2020, BSc Ocean and Geophysics) and Aaron Furness (2020, MSc Marine Renewable Science), used computer models to predict the tides around Australia and to use the results to demonstrate the feasibility for the extraction of renewable energy from the potential energy associated with the tide (called the tidal range resource) from different locations around Australia.

The new research has shown that Australia has the potential to generate 2004 TWh/yr, which accounts for 22% of the global resource. This actually exceeds Australia's total energy consumption for 2018/2019 (1721 TWh/yr), implying that tidal range energy has the potential to make a substantial contribution to Australia's future electricity generation. However, the new work shows that much of the resource is concentrated away from the major centres of population, in the sparsely populated Kimberley region of Western Australia. However, the tidal range resource in this region presents a renewable energy export opportunity, connecting to markets in southeast Asia.

Neill, S., Hemer, M., Robins, P., Griffiths, A. & Furnish, A. (2021). Tidal Range Resource of Australia. Renewable Energy, 170, p. 683-692.

# The Mystery of an Irish Sea Lough

## A mysterious tale of disappearing marine sponges in a unique lough in county Cork could yet have a happy ending.

A team led by Bangor University alumni and Te Herenga Waka–Victoria University of Wellington Professor of Marine Biology, James Bell and including **Professor John Turner** from the School of Ocean Sciences has been studying the loss of possibly thousands of sponges from the underwater cliffs inside Lough Hyne (Loch Oighinn). The team secured funding from the National Parks and Wildlife Service of the Irish Government's Department of Housing, Local Government and Heritage, to study this unusual event.

While it remains unclear why so many of these sponges experienced such a strong decline in numbers between about 2010 and 2015, in the past couple of years, there have been signs of a potential natural recovery of the affected species.

In a recent paper published in Science of the Total Environment, the authors discuss the possible reasons for the drop in numbers and the implications for life in other temperate mesophotic ecosystems (TMEs), a layer of the sea floor typically extending from about 20 metres to 30m below the surface to 150m, and home for numerous invertebrates like sponges, sea fans and sea anemones.

The researchers used 30 years of scientific surveys (1990-2019) and opportunistic observations on the subtidal communities of Lough Hyne to gain insights on the long-term stability and vulnerability of those ecosystems. They then considered the possible causes of observed changes and discussed the importance of regular monitoring for TME conservation around the world.

*School of Ocean Sciences Professor John Turner first dived lough Hyne in 1981 while leading a student expedition from the University of Bristol, and returned to use video to record changes to subtidal communities throughout the 1990s during Bangor diving field courses to Lough Hyne.*

This data has been combined with other long term data collected by a team from the National Museums of Ireland, from James Bell's PhD work at University College Cork from the late 1990s (which stemmed from his undergraduate research during a Bangor field course) and recent surveys by a Wellington-Cork-Bangor co-supervised PhD student, Valerio Micaroni.

The Lough Hyne Marine Nature Reserve is the only one of its kind in Ireland and the first statutory Marine Reserve in Europe, designated 40 years ago.

Professor Turner highlights the importance of long term studies in detecting changes to generally unseen deep water communities.

*''Our study was unfortunately not continuous, but consisted of several sequences of opportunistic detailed observations by different scientists which have been combined to give a long term view of community changes on the submarine cliff faces of this unique sea lough''*

Professor Bell says long-term sponge abundance reconstruction showed the number of sponges on the cliffs had been relatively stable for at least 20 years until 2010.

*"We don't know for sure, but a range of opportunistic observations indicated that the decline in numbers occurred between 2010 and about 2015. The innermost sites were affected the most, suggesting the change originated inside the lough or that its sheltered conditions exaggerated an effect starting from the surrounding coast."*

There were several possible causes, including outbreaks of disease, increases in nutrients or heatwaves. Research is still ongoing into the cause, although changes in water chemistry remain one highly likely causes.

You can find out more from:

V Micaroni et al (2021). Vulnerability of Temperate Mesophotic Ecosystems (TMEs) to environmental impacts: Rapid ecosystem changes at Lough Hyne Marine Nature Reserve, Ireland. Science of the Total Environment, 789, 147708.

# The first comprehensive assessment of climate change impacts on coasts and seas across the UK Overseas Territories

## Bangor ocean scientists have contributed to an assessment of climate change impacts on the seas and coasts of the UK Overseas Territories.

Launched at an online event in July by the Marine Climate Change Impacts Partnership, Professor **John Turner** and Dr **Gareth Williams** of the School of Ocean Sciences were co-authors of the Indian Ocean Region Assessment which highlighted 4 priorities:

1. Changes in coral species;
2. Changes to coral reef habitats;
3. Changes to reef islands and sandy beaches and
4. Impacts on the provision of natural coastal protection and island resilience to sea-level rise.

*Coral reefs and islands of the Chagos Archipelago, Indian Ocean are vulnerable to erosion and sea level rise (Image: J.Turner)*

Over 60 scientists and managers working with all 14 UK Overseas Territories undertook similar regional reviews, which include the Polar Territories (South Georgia and the South Sandwich Islands (and the British Antarctic Territory); Territories in the South Atlantic (Ascension Island, Falkland Islands, Tristan da Cunha and St Helena Island); Caribbean & Mid Atlantic (Anguilla, Bermuda, the British Virgin Islands, the Cayman Islands, Montserrat, and the Turks and Caicos); Mediterranean (Gibraltar and Akrotiri and Dhekelia in Cyprus) and the Pitcairn Islands in the Pacific.
https://www.mccip.org.uk

Although most territory islands are small, the UK has the fifth largest total area of ocean, and the territories contain 94% of the UK's biodiversity. The UK Government has committed to establishing a 'Blue Belt' of over 4 million square kilometres of marine protected areas.

Lord Goldsmith, Minister for the International Environment and Climate, announced:

*"The impacts of climate change pose a serious threat to the vital marine ecosystems of the UK Overseas Territories and the coastal communities that depend directly on them. By undertaking research, such as the reports published today, we can close gaps in our understanding and gain valuable insights that will help us to meet the global challenge of protecting and restoring the health of our ocean."*

Professor John Turner stated:

*'As a fully protected Marine Protected Area in a remote location, the Chagos Archipelago in the Indian Ocean provides a globally important reference site for climate change impacts that can give insights into vulnerability and resilience in the absence of other anthropogenic stressors''.*

*Reef structural complexity provides habitat for other species such as fish and invertebrates on healthy reefs (Image: J.Turner)*

Internationally collaborative research funded by the Bertarelli Foundation has shown that corals are being affected by climate change, with an increase in bleaching, caused by heat stress, as well as physical damage from storms. Several coral species are already becoming rare or significantly reduced in abundance. A reduction in reef habitat quality and structural complexity because of rising temperature, physical damage and ocean acidification, all cause impacts on other organisms, such as fish. Changes in sea level, storms and waves and large-scale ocean processes could affect reef islands and beaches, especially on eroding coasts exposed to the prevailing winds. These changes may affect the provision of critical terrestrial habitat, natural coastal protection, and island maintenance.

In this crucial year of global climate action (which includes the UN Climate Change conference COP26 in November), these assessments highlight climate challenges in the UK Overseas Territories and showcase working with nature to build resilience to climate change.

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*Ctenella chagius – an endemic coral to the Chagos Archipelago which is very vulnerable coral to heat stress caused by climate change. (Image: J.Turner)*

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## 2021

**Key climate change effects on the coastal and marine environment around the Indian Ocean UK Overseas Territories.**
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