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## Global threat to seabirds

Plastic pollution is an increasing, and global, environmental issue which poses a major threat to marine biodiversity. The production of plastic continues to rise, with millions of tons entering the oceans each year. Seabirds can ingest plastic, become entangled or incorporate it into their nests causing impacts which may have negative consequences for reproduction and survival.

A new paper published by ERI highlights the threat marine plastic poses to seabirds in the north eastern Atlantic. 'Assessing the impact of marine plastic on seabirds in northern Europe and Arctic: A synthesis and recommendations for monitoring and research' was led by ERI's Dr Nina O'Hanlon, working with Dr Neil James and Dr Elizabeth Masden, and in collaboration with Dr Alex Bond (RSPB Centre for Conservation Science). The paper is published in the journal *Environmental Pollution*.

The work highlights the need to have a multi-jurisdictional and collaborative effort to gain a more comprehensive understanding of marine plastic pollution across the north eastern Atlantic.

This part of the ocean is an area of international importance for seabirds but there has been little effort to understand how marine plastic affects seabird species over time and space. We actually know very little about the prevalence of plastic ingestion and nest incorporation for many species, including several globally threatened species like the Long-tailed Duck and Atlantic Puffin.

Data was collected from all known studies reporting plastic ingestion and nest incorporation by seabirds around northern Europe, Scandinavia, Russia, Greenland, Svalbard, the Faroes and Iceland. Only 49% of the 69 seabird species that are commonly found in the region have been investigated for plastic ingestion. Of

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the 34 species that have been investigated 74% were found to have ingested plastic. However, information on nest incorporation of plastic was only found for two species in two countries - the Northern Gannet in Wales and the Black-legged Kittiwake in Denmark, despite anecdotal evidence that this is much more widespread.

The properties that make plastic desirable are the very things which make it problematic. Due to low cost approximately half of all plastic items are produced for single-use. When these items enter our oceans they break into smaller fragments that remain in the

environment. As its density varies plastic can be found throughout the water column, increasing the number of species which come into contact with it.

The work was undertaken as part of Circular Ocean, a project funded by the EU's Northern Periphery and Arctic Programme, which aims to incentivise the reuse and recycling of marine plastic litter in the region.

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**In response to the publishing of this research a motion has been lodged in the Scottish Government by Richard Lochhead MSP which “commends the work of Dr O’Hanlon and her team, and recognises the importance of this study in tackling a critical global environment issue”.**



## Congratulations - Vice Principal, UHI



The University of the Highlands and Islands (UHI) has appointed three new vice-principals to its senior management team, on a part-time basis.

Professor Stuart Gibb, Director of ERI has been appointed as vice-principal (international and external engagement). Of his appointment, Stuart said “*Internationalisation is at the heart of the University of the Highlands and Islands’ strategy and I am therefore delighted to be taking up this new role. I look forward to helping grow the number and*

*diversity of students across the partnership by bringing our distinctive curriculum to the rest of the UK, to Europe and to the rest of the world, and will be seeking to develop and establish new strategic partnerships, collaborations and models which will advance these international aspirations.*”

Professor Clive Mulholland (vice-chancellor UHI) welcomed Lydia Rohmer (West Highland), Iain Macmillan (Lews Castle College) and Stuart to their new positions saying “*We have strengthened our senior management with these excellent appointments from across our region, and I look forward to seeing the positive contributions each will make to the development of the university*”.

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# The Heart of the Flow Country

Roseanna Cunningham MSP, Cabinet Secretary for the Environment, Climate Change and Land Reform, officially opened the Flows Field Centre at Forsinard in August. A key output of the Peatland Partnership's Flows to the Future Project, the centre is situated on Forsinard Flows National Nature Reserve (RSPB).

After a tour of the centre, and a chance to meet members of the Peatlands Partnership, staff and volunteers, Ms Cunningham stated: *"I'm delighted to be here to officially open this new, state-of-the-art centre, which should allow for further research, and therefore greater understanding of how we can best preserve these vital peatlands, and ensure a sustainable future."*

*The centre will provide a much-needed base for increasing the numbers of volunteers carrying out important conservation work in this area. It has been great to visit the Partnership and meet the staff and volunteers whose enthusiasm and experience are vital to the project's aims. This new facility will allow them to build on the excellent work they already do in educating the public on the importance of these peatlands in fighting against the effects of climate change.*

*All of us have a responsibility to make sure that this fascinating land, with its rich biodiversity and traditional culture, remains healthy, actively storing carbon and providing sustainable economic benefits for local people".*

Welcoming Ms Cunningham, Partnership Chairman, Professor Stuart Gibb said *"15% of all the blanket*

*bog in the world is in Scotland. We therefore play a key role in conserving this globally rare habitat. Not only is The Flow Country important for the amount of blanket bog that can be found here, but the quality of the peatland is also world class - this amazing area is on the UK's Tentative List of possible World Heritage Sites.*



*But let us not forget that these bogs are not just important for nature and wildlife; they provide vital services for people too. They store more carbon than any other land-based ecosystem, making them a vital defence against the effects of climate change".*

The centre will serve as the reserve office and will provide accommodation for volunteers as well as visiting groups of up to 16 people. It will also support a peatland science centre of excellence at the ERI allowing students to research the role of peatlands as a carbon store as well as restoration and biodiversity. This will help develop links with universities around the world to further research and international collaboration.

In formally declaring the Flows Field Centre open, Ms Cunningham acknowledged the continuing work of the Peatlands Partnership and RSPB in protecting and restoring significant areas of The Flow Country as well as delivering sustainable economic benefits through the creation of high quality visitor facilities across Sutherland and Caithness.

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Cabinet Secretary with members of the Peatland Partnership, RSPB staff and volunteers



## New Project at ERI

Following successful application to the Northern Periphery and Arctic (NPA) programme, a new project - APP4SEA (Arctic Preparedness Platform for Oil Spill and other Environmental Accidents) has started at the ERI. Led by the University of Oulu, the project includes partners from Finland, Iceland, Norway and Scotland.

APP4SEA aims to pool best practice in oil spill response technologies, and to support coastal communities in the region to manage the risk of increased marine transport. Through transnational collaboration, APP4SEA will improve oil spill preparedness and upskill local authorities; transfer best practice; raise awareness and protect marine bird species.

Dr Elizabeth Masden and PhD student Nicola Largey attended the 4th Conference on Wind Energy and Wildlife Impacts (CWW 2017) in Portugal which focussed on the significant advances that have been made in our understanding of the impacts of wind energy on wildlife. Discussion covered the remaining challenges; methodology; technology development as well as mitigation strategies and their effectiveness.

Nicola presented a poster entitled "Birds in space - A review of methods to assess the use of the airspace by birds: Implications for evaluating the impacts of wind energy generation" whilst Elizabeth presented research undertaken in collaboration with the British Trust for Ornithology. This focused on Lesser Black-backed Gulls and the cumulative impacts of wind farms throughout their annual range.

The conference attracted over 300 participants from industry, universities and governmental agencies from more than 20 countries. It was a fantastic opportunity to discuss research with colleagues and network with new researchers from further afield, such as Japan.

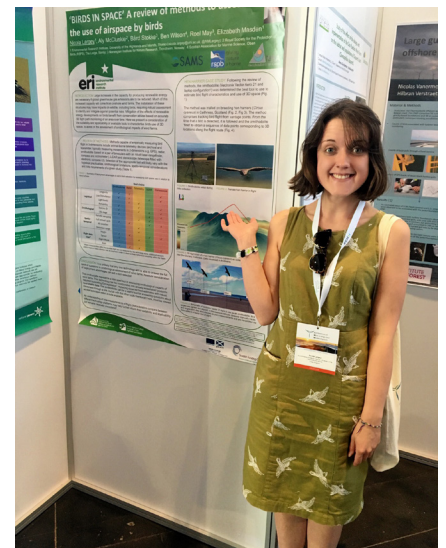
The risk of oil tanker accidents in the region is getting higher but dealing with oil spills in the arctic marine environment has not been carried out before. The north lacks both infrastructure and adequate response technologies. It also needs improvements in relevant public and organizational awareness as well as solutions in sustainable environmental management.

This project will produce an interactive, smart map to show search and rescue centres; their level of preparedness for oil spills; ecologically sensitive areas/species that can be affected and weather conditions relevant to marine transport in the Arctic seas. This application is expected to have a predictive function to advise on the most efficient response method for the place and size of spill.

Drs Neil James, Elizabeth Masden and Nina O'Hanlon are leading work on the environmental and ecological impact of oils spills, with a specific focus on seabirds. They recently organised a workshop in Inverness which brought together experts from around Europe to discuss species oil vulnerability, and take steps towards producing an advanced methodological index.

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## Wind Energy and Wildlife



At the end of the conference it was decided that CWW 2019 will be held in Scotland. Elizabeth will be a member of the organising committee, though the conference venue and finer details are still to be determined.

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# Radio Oceanography -ISSOR'17



I am grateful to Challenger Society for the travel Award 2017 which contributed to financing my attendance at the International Summer School on Radio-Oceanography (ISSOR'17) in Caen, France where I experienced the most remarkable radio-oceanography community of the world.

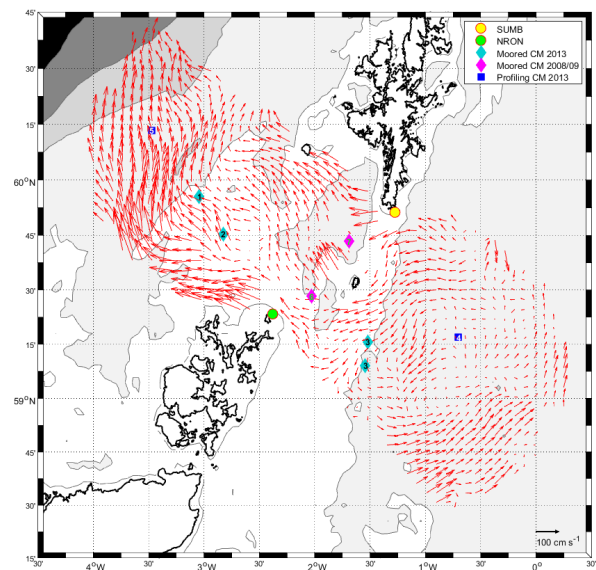
ISSOR'17 was designed for postgraduate and post doctoral scientists involved in radar applications. This 5-day summer school focused on the fundamentals of radar oceanography research, paying particular attention to the most recent developments. The programme included lectures by a diverse set of international experts. Each lecture covered a broad spectrum of problems related to radio-oceanography and different high frequency and x-band radar technologies, including analysis of sea states and upper ocean currents.

Measurement validation and data processing methods for surface currents were taught using practical exercises based on two high frequency radar case studies: the Iroise marine renewable energy system, and the American West Coast tsunami detection system. Further sessions were held on data assimilation techniques for the inclusion of numerical models and Doppler spectrum analysis.

I was delighted to be part of this extraordinary young scientist community where exchange of ideas and connections were easy to establish. The radio-oceanography community is not well known even though Sir Crombie discovered that Bragg scatter produces strong high frequency sea echo in 1955. By using radars located at different viewing angles, the total surface current velocity can be determined by summation of the processed back-scatter echo (radials). The physics behind the high frequency radar signal is simple, but further developments,

especially related to mapping the surface, are much more complex.

I am currently undertaking the second year of my PhD exploring coastal High Frequency Radar system as a novel method of monitoring tidal currents and estimating residual circulation in the Fair Isle Gap. The knowledge gained during summer school gave me a better grasp of the radar technology and provided an excellent background to refine my research questions.



Fair Isle Gap and northern North Sea showing total current velocity

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Twitter post:

Splendid experience shared with #HFR and #Xband #oceanography community at @Universite\_Caen. Thanks to @challengersoc and @ERI\_UHI

ERI offers a wide range of learning opportunities both locally and internationally. As part of this, PhD students are encouraged to undertake supervision of students and high school pupils interested in pursuing careers in environmental science.

Rebecca Grewcock, a sixth-year pupil of Dornoch Academy, spent four weeks in July 2017 at ERI working alongside Uthman Badmus and other colleagues. During this time she undertook a mini project entitled 'Antioxidant potentials of seaweed'. The Nuffield Foundation facilitates this scheme to enable high school students to gain experience and develop basic research skills.



important polyunsaturated fatty acids), vitamins, essential elements (such as magnesium and calcium) and polyphenols like flavonoids and carotenoids. The presence of this important biochemical results in antioxidant functions that are responsible for the prevention of different forms of cancers in the body.

This project is part of a more comprehensive study aimed at improving the commercialization, and usage, of seaweed as food and nutraceuticals in Scotland. The Nuffield placement allowed Rebecca to gain new skills - sampling and

laboratory techniques and scientific writing as well as data processing using statistical analysis and interpretation.

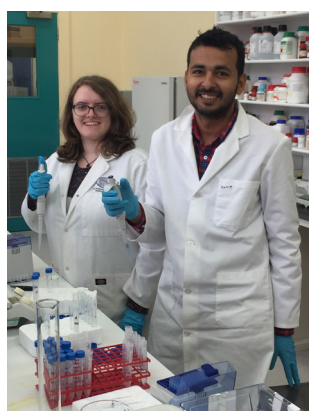


Uthman Badmus with Rebecca

The project's aim was to determine the antioxidant potentials of different seaweed species and investigate the effects of commonly used industrial techniques for the processing of harvested seaweeds. Photosynthetic macro algae are known to contain high amount of proteins and amino acids (low lipid concentration but very

Rebecca said, "I thoroughly enjoyed my time in Thurso, I gained so much. It is amazing how my sixth year of school has started and how well I am preparing for my Advanced Highers, which thankfully, include biology and chemistry. Because of my placement in ERI I am in a good place for the level of work needed for the year ahead".

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Mohit with Lisa Shearer (PhD student)

## Newton Bhabba Scholarship

Mohit Chaudhary, PhD student, from the Indian Institute of Technology Roorkee, Saharanpur Campus, recently spent 3 months working alongside researchers at the ERI through the Newton Bhabba Placement Programme for Indian scholars.

Aimed at developing individual capacity, this programme is jointly funded by the British Council India, Department of Science and Technology (DST) and

Department of Biotechnology (DBT). During placement, Mohit investigated the potential of natural organic materials (such as crab carapace) to remove anionic contaminants (fluoride and phosphorus) from waste water. The opportunity allowed him to improve his research and communication skills as well as learn to operate new equipment.

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# New faces @ ERI



## **Dr Benjamin Williamson** **Lead Scientist**

I joined the ERI in September 2017 as Lead Scientist for the 'Renewable Energy and the Environment' research theme. My background is marine engineering, sensor integration and developing novel sensor platforms for challenging environments, both above and underwater. Prior to joining the ERI, I worked at the University of

Aberdeen, researching the environmental and ecological effects of marine renewable energy devices as part of the FLOWBEC project, latterly in partnership with MeyGen Ltd. I developed seabed platforms to track the interactions of fish, seabirds and marine mammals with wave and tidal energy devices and trialled the use of drones for aerial surveys of high-energy sites. I am excited to join the ERI and I look forward to building collaborations and research areas.

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## **Lisa Shearer, PhD Student**

Hi, I am Lisa and I come from Northern Ireland. I recently started my PhD at the ERI. My research will look at how by-products, produced by local industries such as Distilleries and Shellfish processing, can be used as 'biosorbents' to remove pollutants from water and provide sustainable water treatment.

Ireland Water where I was responsible for analysing the quality of the drinking water supplies.

I was attracted to this PhD project as the research is innovative and is the ultimate in green chemistry - using waste products from industry to remove pollutants. I am also looking forward to living in Thurso for the next 3 to 4 years' as I am excited to explore the surrounding Highlands and Islands, enjoy the beautiful natural scenery and take advantage of what the area has to offer.

I was previously working as an analytical chemist for Northern

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## **Pavlina Landova, Intern**

I am a PhD student at Brno University of Technology, Faculty of Chemistry (Czech Republic) where I study Chemistry and Technology of Environmental Protection.

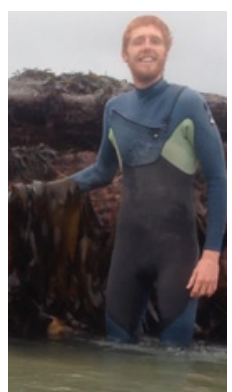
in the environment, and on alternative ways for their elimination.

I joined ERI in September for a ten-month internship. Right after my first day I knew that I had come to the right place: ERI is full of great people and I know that I will learn many new things.

During my internship, I will work on the deployment of passive samplers to monitor pharmaceuticals in surface waters and wastewaters. With this sampling we will be able to detect some that may be present in surface waters at very low concentrations -even low levels may have an adverse effect. I believe that this approach can provide us with valuable information about pharmaceutical contamination in the environment.

My research focusses on the occurrence of pharmaceuticals

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## **Sunny Bradbury, PhD Student**

After completion of a BSc in Marine and Freshwater Biology (Aberystwyth University) I took time to explore south east Asia and Australasia and witness the fantastic marine ecosystems these parts of the world have to offer.

On return to the UK, I completed a Masters by Research, also at Aberystwyth, identifying patterns of genetic structuring in the kelp *Alaria esculenta*.

I also completed an advanced diving course in the Gili Isles of Indonesia and spent several months exploring the coasts of New Zealand.

My interest in temperate marine and freshwater ecosystems, plus a desire to study in a new area of the British Isles saw me successfully apply for this PhD. Co-supervised by Dr. Eric Verspoor of the Inverness College UHI and Dr. Benjamin Williamson (ERI), my study will combine genetics and fish tracking to inform management decisions for Atlantic salmon.

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# Publications

**Andersen, R.**, Farrell, C., Graf, M. D., Muller, F., Calvar, E., Frankard, P. & Anderson, P. (2017). An overview of the progress and challenges of peatland restoration in Western Europe. *Restoration Ecology*. 25, 2, p. 271-282.

**Commin, A. N., Davidson, M. W., Largey, N., Gaffney, P., Braidwood, D. W., Gibb, S. W. & McClatchey, J.** (2017). Spatial smoothing of onshore wind: Implications for strategic development in Scotland. *Energy Policy*. 109, p. 36-48.

**Commin, A. N., McClatchey, J., Davidson, M. W. H. & Gibb, S. W.** (2017). Close-proximity tidal phasing for 'firm' electricity supply. *Renewable Energy*. 102, p. 380-389.

Creevy, A. L., **Andersen, R.**, Rowson, J. G. & Payne, R. J. (2017). Testate amoebae as functionally significant bioindicators in forest-to-bog restoration. *Ecological Indicators*. 84, p. 274-282.

Done, T., Roelfsema, C., Harvey, A., Schuller, L., Hill, J., **Schläppy, M-L.**, Lea, A., Bauer-civiello, A. & Loder, J. (2017). Reliability and utility of citizen science reef monitoring data collected by Reef Check Australia, 2002-2015. *Marine Pollution Bulletin*. 17, 1-2, p. 148-155.

**French, A. S.**, Shaw, D., **Gibb, S. W. & Taggart, M. A.** (2017). Geochemical landscapes as drivers of trace and toxic element profiles in wild red deer (*Cervus elaphus*). *Science of the Total Environment*. 601-602, p. 1606-1618.

**Gilbert, P. J.**, Cooke, D. A., Deary, M., Taylor, S. & Jeffries, M. J. (2017). Quantifying rapid spatial and temporal variations of CO<sub>2</sub> fluxes from small, lowland freshwater ponds. *Hydrobiologia*. 793, 1, p. 83-93.

**Loxton, J.**, Wood, C. A., Bishop, J. D. D., Porter, J. S., Jones, M. E. S. & **Nall, C.** (2017). Distribution of the invasive bryozoan *Schizoporella japonica* in Great Britain and Ireland and a review of its European distribution. *Biological Invasions*. 19, 8, p. 2225-2235.

**Nall, C., Schlappy, M-L.** & Guerin, A. (2017). Characterisation of the biofouling community on a floating wave energy device. *Biofouling*. 33, 5, p. 379-396.

**O'Hanlon, N. J.**, McGill, R. A. R. & Nager, R. G (2017). Increased use of intertidal resources benefits breeding success in a generalist gull species. *Marine Ecology-Progress Series*. 574, p. 193-210.

Ratcliffe, J. L., Creevy, A., **Andersen, R.**, Zarov, E., **Gaffney, P., Taggart, M. A.**, Mazei, Y., Tsyganov, A. N., Rowson, J. G., Lapshina, E. D. & Payne, R. J. (2017). Ecological and environmental transition across the forested-to-open bog ecotone in a west Siberian peatland. *Science of the Total Environment*. 607-608, p. 816-828.

Rochefort, L. & **Andersen, R.** (2017). Global peatland restoration after 30 years: where are we in this mossy world? *Restoration Ecology*. 25, 2, p. 269-270.

**Schlappy, M-L.** (2017). Making waves: marine citizen science for impact. *Frontiers in Marine Science*. 4.

Sweet, M. J., **Brown, B. E.**, Dunne, R. P., Singleton, I. & Bulling, M. T. (2017). Evidence for rapid, tide-related shifts in the microbiome of the coral *Coelastrea aspera*. *Coral Reefs*. p. 1-14.

**Tamsett, D.** (2017). Binaural Range Finding from Synthetic Aperture Computation as the Head is Turned. *Robotics*. 6, 2.

Waggitt, J. J., Robbins, A. M., Wade, H. M., **Masden, E. A.**, Furness, R. W., Jackson, A. C. & Scott, B. E. (2017). Comparative studies reveal variability in the use of tidal stream environments by seabirds. *Marine Policy*. 81, p. 143-152.



environmental research from a new perspective

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