



environmental  
research  
institute

THE NORTH  
HIGHLAND  
COLLEGE

University of the  
Highlands and Islands  
Oilthigh na Gàidhealtachd  
agus nan Eilean

Autumn 2011

# erielelements

## ERI winner at Energy North Awards



*Prof. Stuart Gibb accepting the award for Best Pioneer at the Energy North Awards*

Ian Couper, Chief Executive of Energy North, said: "Energy North is the single energy voice for the North of Scotland and Islands and our awards recognise those companies and individuals who are making an outstanding contribution to the industry. The Highlands have some of the best natural resources in the world and our members are leading the way in capitalising on these assets."

Prof. Stuart Gibb, of ERI, said: Being based in Thurso and overlooking the dynamic waters of the Pentland Firth we have a natural advantage in undertaking research into marine renewables and the environment. The Energy North award is welcome recognition for a talented team at the ERI who have successfully capitalised on this opportunity. Their research will be fundamental in informing the sustainable development of the emergent marine energy sector in Scotland. We look forward to contributing to a vibrant and energy-rich region in the 21<sup>st</sup> century'.

The ERI has been also shortlisted for two awards at the 2011 Scottish Green Energy Awards: Contribution to Skills and Training and Public Sector Initiative. The winners of the awards will be announced at a ceremony at the National Museum of Scotland on 1st December 2011.

*For further information, contact:  
Jacqueine.Black@thurso.uhi.ac.uk*

The Environmental Research Institute (ERI) was awarded Best Pioneer at the inaugural Energy North Awards 2011 at the Drumossie Hotel in Inverness on Thursday 29th September.

The Thurso based Institute, part of the new University of the Highlands and Islands, was honoured with the award for its leading role in the development of research and education in support of the marine energy sector. The award was sponsored by Scottish and Southern Energy.

The ERI has grown immensely in the last 10 years and they have recently established an international team to undertake pioneering studies of the marine renewable energy resources of the Pentland Firth.

The North of Scotland and the Islands have some outstanding natural energy resources and the awards celebrated the companies and individuals who make outstanding contributions to the success of the oil, gas and renewable energy industries in the area. The event was sponsored by Highlands and Islands Enterprise (HIE), Scottish Southern Energy, Port Services Group and Technip.

SSE

energy north

The job future is looking very very green...

...so take a close look at our courses today



MSc Sustainable Energy Solutions

MSc Developing Low Carbon Communities

Short Courses in Renewable Energy and the Environment



## Investigating Golden Eagles

ERI Postdoc Liz Masden, is demonstrating how well the distributed learning environment of the University of the Highlands and Islands can work. Liz, based at the ERI's Centre for Energy and Environment in Thurso is supervising PhD student, Derek Spencer, who lives near Lochinver. Derek is registered with the Centre for Mountain Studies at Perth College and has another supervisor based in Edinburgh with SNH.

Here's what Derek has to say about his PhD:

'In February 2011, I started my PhD research in the Foinaven Special Protection Area (SPA) and on adjoining land to study the resident golden eagle population. I will examine four key areas: Species distribution; Prey base; Human pressure and Habitat change; Long-term land uses. My aim is to propose key indicators that will contribute towards long term golden eagle conservation.

My research area covers six golden eagle territories within the Foinaven SPA and thirteen adjoining territories. After a long and gruelling fieldwork season, with over 120 days spent out in the field, I have discovered that fourteen of my research territories have resident golden eagles. Six of these produced two eggs and one produced one egg. However, due to a protracted period of poor weather in spring culminating with gales in the latter part of May, three of these eyries containing eggs were abandoned and one eyrie on the north coast was blown off the ledge on the rock face. Of the remaining three successful pairs, all eyries produced one chick. Two of these chicks were selected by Roy Dennis of the Highland Foundation for Wildlife to be satellite tagged and the data collected will be analysed for flight dispersal and behaviour patterns. These data are already being transmitted back and are showing the different ranging behaviour of the two chicks.

I am looking forward to my 2012 fieldwork season, and with the hard work put in this year in locating eyries, I am expecting a successful period of observations to obtain a definitive number of breeding golden eagles.'



Derek locating a chick on Meall Horn



**CONGRATULATIONS** to Julie Graham on successfully defending her PhD thesis 'The determination and environmental fate of emamectin benzoate as a result of fish farming' at her viva in October.

# ERI around the UK



**SOUTHAMPTON** ERI researchers Matthew Easton and Peter Bowyer were among the 500 attendees at the 2011 European Wave and Tidal Energy Conference (EWTEC). The event was organised by the Sustainable Energy Research Group at University of Southampton and included 220 paper presentations, 4 symposia and 5 workshops over the week long event during September. The bi-annual conference is a

showpiece event for the marine renewable energy research community and included a proclamation from the Governor of Hawaii and opening address from the UK's secretary of state for Energy and Climate Change, Chris Hulne.

During the conference Matthew presented a paper during a session on Marine current resource and modelling. This work detailed the relationships between the tidal currents and seabed composition of a site in the Pentland Firth. This session was very well attended and facilitated a number of interesting discussions between speakers and delegates. Later in the week, Peter presented a study on the oceanography of the Pentland Firth during a busy poster session.

Prior to the conference Matthew also attended a workshop for members of INORE (the International Network on Offshore Renewable Energy), an organisation run by early stage researchers which brings together members from around the world to meet, collaborate and share knowledge. The INORE workshop was held on the eve of the conference at the Lepe Country Park and included key-note presentations from early stage researchers in both industry and academia. This was followed by a networking dinner that was attended by 70 PhD and post-doctoral researchers.

*For further information, contact [Matthew.Easton@thurso.uhi.ac.uk](mailto:Matthew.Easton@thurso.uhi.ac.uk)*



**ABERDEEN** Angus Jackson participated in the second World Conference on Marine Biodiversity. This was hosted by the Universities of Aberdeen and St Andrews and was held at the Exhibition and Conference Centre in Aberdeen. The conference aimed to bring together scientists, practitioners and the public to discuss and advance our understanding of the issues surrounding the importance of biodiversity in the marine environment. It addressed issues of marine biodiversity across a wide range of topics, including

effects of marine renewables on marine biodiversity. This was an excellent conference and a truly international event, with 1190 abstracts accepted from 74 countries. The plenary speakers included internationally renowned scientists such as Shahid Naeem and household names such as Jean Michel Cousteau. These gave entertaining, but passionate and thought provoking seminars on topical issues in marine biodiversity. With 9 parallel sessions, the only problem faced was which theme or talk to attend.

Presenting at international events such as this provides an ideal opportunity to demonstrate the value, quality and novelty of marine renewable energy research at the ERI and UHI. I gave a talk in the themed session on marine renewables - "Foraging by great skua, in the context of marine renewable energy". This was based on some of the work in Helen Wade's PhD project and represents a collaborative project between ERI, the University of Glasgow, the British Trust for Ornithology and the University of Amsterdam. I presented data from cutting-edge biologgers that we had attached to great skuas on the Island of Hoy in Orkney. These were used to record their location and behaviour at regular intervals. Of particular interest, were large differences in length of foraging trip between males or females and between successful or failed breeders. The project reflected some of the priorities and effort from Theme 2 of the MaREE project (Environmental Impacts).

*For further information, contact [Angus.Jackson@thurso.uhi.ac.uk](mailto:Angus.Jackson@thurso.uhi.ac.uk)*

# New faces at ERI



## **Andrew French, PhD Researcher**

I am starting a PhD which will look at 'Linking habitat characteristics with red deer (*Cervus elaphus*) condition in the Scottish Highlands'. The project aims to work with geographically distinct hunting estates to investigate how factors such as trace/essential element availability influences deer health and meat quality. The work will be supervised by Dr Mark Taggart & Prof. Stuart Gibb (ERI) and Richard MacNicol (NHC). Before arriving in Thurso, I completed a BSc (Hons) Physics degree at the University of Sheffield followed by an MRes in Environmental Biology at the University of St Andrews. I carried out my Masters project with the James Hutton Institute looking at micronutrient deficiency tolerance by landrace cereals in the Machair of South Uist.

Contact: [Andrew.French@thurso.uhii.ac.uk](mailto:Andrew.French@thurso.uhii.ac.uk)



## **Chris Nall, PhD Researcher**

I am a new PhD researcher based at the ERI's Centre for Energy and Environment. I will be studying the presence of marine non-native species around the North Scottish and Orcadian coastline and will also investigate the potential for the marine renewable industry to facilitate their establishment. This project will be carried out under the supervision of Dr. Andrew Guerin at ERI and Dr. Elizabeth Cook at SAMS. My academic background has been split between an MSc in Marine Biology at Bangor University and a BSc in Zoology at the University of Edinburgh. Before coming to Thurso I was researching discard survival in a queen scallop fishery on the Isle of Man. I look forward to conducting my research here and getting to know you all.

Contact: [Christopher.Nall@thurso.uhi.ac.uk](mailto:Christopher.Nall@thurso.uhi.ac.uk)



## **Dr James Grecian, Postdoctoral Research Associate**

I've just finished my PhD at the University of Plymouth where I've been investigating the marine spatial ecology of seabirds. My research looked at the interactions between seabirds and marine renewable energy developments, the ways in which we can designate protected areas for seabirds in the marine environment, and the potential consequences of different migratory strategies within seabird populations. I focused on two species of seabird, the northern gannet *Morus bassanus* and the lesser black-backed gull *Larus fuscus*, both of which are of significant conservation interest. I use a number of techniques to answer these questions including bio-telemetry devices, stable isotope analysis, and theoretical models. Before joining the ERI, I was working on a project looking at the potential interactions between a proposed offshore windfarm development in the Moray Firth, and the seabirds that breed on the sea-cliffs of East Caithness. I have also been consulting with the RSPB on the current techniques to designate marine protected areas for seabirds in the UK.

Contact: [James.Grecian@thurso.uhi.ac.uk](mailto:James.Grecian@thurso.uhi.ac.uk)



## **Helen Campbell, Business Development Co-ordinator**

My key role is to develop commercial activities for ERI's MaREE programme, including other programmes and initiatives, knowledge exchange and consultancy activities. I am also involved in refining business processes and providing project management support to staff and students. Within the two months I've worked at the ERI, I've been introduced to a very new and diverse environment, from meetings to discuss tidal and wave energy development, to corresponding with customers who operate salmon farms and wind farms and looking at how crustacean waste (eg crab shells) and egg shells can be used commercially - it's fascinating. If you are interested in working with ERI, please contact me on 01874 889599 or [Helen.Campbell1@thurso.uhi.ac.uk](mailto:Helen.Campbell1@thurso.uhi.ac.uk)

# Lonneke successful in writing competition



**National Centre for Earth Observation**  
NATURAL ENVIRONMENT RESEARCH COUNCIL

*ERI researcher Lonneke Goddijn-Murphy was delighted to hear that she was a runner-up in a writing competition run by Blue Marble, the publication of the National Centre for Earth Observation. Here we offer an abridged version of her winning article which will appear in full in a future issue of Blue Marble, available at [www.nceo.ac.uk](http://www.nceo.ac.uk).*

As a keen surfer I like to see whitewater, the white foam on the sea surface. From my desk ERI, I can keep an eye on Dunnet Head, the most northerly tip of mainland Scotland, and the presence of whitewater where the cliffs meet the ocean is a good indicator for the possibility of a surf session later. As one can imagine, observing whitecaps from space is a more challenging business. But why would we want to use space technology to view whitecaps (other than for chasing surfing waves around the globe)?

My post-doc at the ERI is part of NCEO's global carbon cycle research. The oceans play an important role in the carbon cycle. The sea surface can emit or absorb CO<sub>2</sub> gas depending on the region and conditions, but on the whole the world's oceans take up more CO<sub>2</sub> than they produce. Here at the ERI we study the physical controls on air-sea gas exchange. This includes whitecaps because they enhance the absorption of CO<sub>2</sub>. We are interested in whitecap observations from satellites because, if we want to compute total CO<sub>2</sub> budgets, we need long term data on a global scale.

Whitecaps play an important role in various other physical processes, e.g. they are highly reflective, providing a cooling influence on the Earth's climate. They can also affect the colour of the sea surface, so whitecap removal algorithms need to be applied to the remote sensing of ocean colour. A better understanding of whitecaps is avidly sought after by wave modellers, because they relate to energy dissipation of waves, the least known process of wave evolution.

Whitecaps are presently used as a 'tuning knob' of any wave model, but what exactly are whitecaps made of? They essentially consist of bubbles and foam, a product of breaking waves that generate turbulence and capture air at the sea surface. A common quantification is the ratio of area covered by whitecaps and total sea surface area,  $W$ . Although whitecaps are known to distort remote sensing observations, it is difficult to monitor  $W$  from satellites. Because whitecaps are mainly wind driven and wind speed data are common in Earth Observation (EO), most  $W$  parameterizations are a function of wind speed. Unfortunately, the uncertainties in wind speed parameterizations are too big.

One problem was finding high quality field measurements. Our colleague Adrian Callaghan from the National University of Ireland, kindly gave us his shipboard  $W$  measurements. The  $W$  retrievals were state of the art, but the dataset set did not contain information about the sea state. EO data were needed to fill in the gaps. We obtained observations from the SeaWinds microwave scatterometer aboard NASA's QuikSCAT (Quick Scatterometer) satellite and detailed information about the sea surface from the European Centre for Medium-Range Weather Forecasts (ECMWF). Combining the data, we found that accounting for the state of the sea surface improved  $W$  surprisingly little. This was disappointing, but not totally unexpected.

One of our conclusions was that whitecapping was increased by developed waves, supporting the assumptions that  $W$  increases with wave age and height, and hence with swell. On the other hand cross-swell conditions, i.e. when the directions of wind and waves intersect, appeared to reduce whitecapping. These two counter-acting effects may explain the ongoing debate between wave modellers about whether the presence of swell does, or does not, dampen whitecapping. Interestingly, I have experienced both effects in the water while surfing; a bigger swell definitely means bigger whitewater to deal with and I have seen cross-winds blow out lovely waves. Currently we are re-examining alternative ways to measure whitecaps, or air-sea gas exchange, from space directly. But if you will excuse me now, I think I can see whitewater at the headland !



*For further information, contact: [Lonneke.Goddijn-Murphy@thurso.uhi.ac.uk](mailto:Lonneke.Goddijn-Murphy@thurso.uhi.ac.uk)*

# ERI takes part in UHI Celebrations

ERI Professors Stuart Gibb and John McClatchey were among the 800 guests at an historic event on Thursday, 25 August 2011, celebrating the creation of The University of the Highlands and Islands. An academic robing ceremony, including the presentation of the university's new mace, took place at Eden Court Theatre in Inverness. It was followed by a procession to the Town House in Inverness for a civic reception hosted by the Provost of Inverness, Councillor Gray.

During his address, James Fraser, principal and vice-chancellor, said: "Our vision is to lead a learning region. We want every community to have a learner centre that can access our education. We want to make university education accessible to students hitherto hindered by geography, social class or any other barrier.



Professors McClatchey and Gibb at the ceremony



The pipe band at the head of the procession

The chair of the governing University Court, Professor Matthew Maclver CBE, also gave a speech in which he talked about the University of the Highlands and Islands as "arguably the key institution in the regeneration of the Highlands and Islands throughout the 21st century. He went on to say "... we celebrate the fact that we now have a university in a part of Scotland that has over the centuries specialised in exporting our brightest intellectual talent to the universities of the central belt of Scotland and beyond. Today, however, students from the Highlands and Islands can study at home, can enjoy the same academic benefits as other students and can be exposed to the same intellectual rigour as any other student. They can, of course, leave, just as mine and other generations did. But they do have the option that we did not have and that is important. "

# Lauren spends the summer at ERI



Lauren Mackay

I am a fourth year student at the University of Stirling. This summer I spent two days a week at the ERI volunteering on the MaREE project. This involved doing a literature search which will provide data to be used in conducting a sensitivity analysis of seabird species to wave and tidal-stream renewable energy installations. During my time at the ERI I was lucky to accompany the technicians on a trip to Hoy to count Great Skua chicks and check on the monitoring station. This was a great experience, and has helped add to my CV, plus- all that journal reading was good practice for my dissertation this year! Thanks to everyone at the ERI for giving me this insight into renewables research, I have found it a very interesting area, in which I hope to have future career prospects.



**Environmental Research Institute**  
Castle Street, Thurso,  
Caithness, KW14 7JD, Scotland

Tel: +44 (0) 1847 889589  
Fax: +44 (0) 1847 890014

Email: [eri-info@thurso.uhi.ac.uk](mailto:eri-info@thurso.uhi.ac.uk)

**Centre for Energy & Environment,**  
North Highland College UHI, Thurso,  
Caithness, KW14 7EE, Scotland

Tel: +44 (0) 1847 889000  
Fax: +44 (0) 1847 889001

Web: [www.eri.ac.uk](http://www.eri.ac.uk)