Marine Biology of the NE Atlantic
Porcupine Annual Conference

National Museum of Scotland
March 17th-18th 2018

Abstracts

Scottish Seagrasses - Beyond the Forth Dimension

Dr Alastair Lyndon

Deputy Director, Centre for Marine Biodiversity & Biotechnology, Heriot-Watt University.
A.R.Lyndon@hw.ac.uk

Seagrasses (*Zostera* spp., both inter-tidal and sub-tidal) are an important habitat for various other marine organisms, a potential carbon store, and one of the ecological quality elements assessed by the EU Water Framework Directive. Despite this, there is little information on the historical status, current extent or fluctuations of seagrasses in Scotland. This talk aims to outline evidence for historical status in the Forth (where evidence is good) alongside current status and trends, and then look beyond this locality to the rest of Scotland, highlighting regional differences and gaps in knowledge. In doing this it will also be necessary to consider the status of intertidal *Z. angustifolia*. Finally, a comparison of Scottish trends with those seen globally for seagrass will be made, as a basis for identification of future priorities.

Inter-annual monitoring of microplastics in marine intertidal sediments of the Firth of Forth

Mark G J Hartl, Zoë Lawrence, Carla Holmes, Andrew Deery, Julian Blumenröder, Pauline Sechet, Rachel Wood, Neil Mearns, Shanna Paterson, Mégane Viguiaud, Holly Walker, Fergus Kinsley-Willis, J Decclan Mccreton

Institute of Life and Earth Sciences, Centre for Marine Biodiversity & Biotechnology, Heriot-Watt University
m.hartl@hw.ac.uk

Microplastics (MP), defined as pieces of plastic smaller <5mm are commonly found in the marine environment and originate either from consumer care products and plastic production plants or from the disintegration of larger pieces. MPs need to be monitored in order to evaluate the effectiveness of Government initiatives to reduce plastic debris in the environment. The aim of the present study, therefore, was to contribute to the development of a hitherto lacking quantitative long-term marine MP database. We present the results of a three-year pilot project in the Firth of Forth, point to innovations in sampling and contamination prevention, as well as the limitations. Sediment samples were obtained in triplicate from intertidal sites in May2014, May & Sept2015, May & Sept2016, 2017 using glass bijoux tubes as miniature cores and sealed with metal screw caps, processed using a density separation procedure and the polymer types determined using FT-IR spectroscopy. The results showed that there are high numbers of plastic particles (34-4,800 kg-1) and fibres (1,700-4,300 kg-1) along both shores of the Firth of Forth. The number of Fibres was generally higher than particles. There was no apparent pattern of spatial distribution. Although a spike in MP particles was observed in Sept2015 and May2016, there was no significant difference in MP particle concentrations between May 2014 and May 2017. There was also no significant

difference in MP fibre concentrations during the same three-year period. There was also no evidence of seasonal fluctuations in MP concentrations. The results show that, for intertidal sediments in the Firth of Forth, the MP concentration has remained stable. This is significant baseline information and will be instrumental in assessing the effectiveness of Government policy regulating industry and consumer behaviour towards the production and use of particularly single-use plastic products. However, in order to compare results between countries and laboratories, for the purpose of gaining a more global insight into the microplastics contamination issue, more standardized sampling and extraction procedures need to be developed.

Marine Conservation Society in Scotland: current projects and opportunities to get involved

Tara Proud

Marine Conservation Society
tara.proud@mcsuk.org

Since Blue Planet II was aired, concern about plastic pollution of our seas has become mainstream with almost daily media headlines about these topics and the good news is that we are already seeing positive impacts of this. This talk will be a look at a variety of the exciting projects which the Marine Conservation Society are currently undertaking in Scotland including updates and future plans.

Community powered marine conservation in Scotland – lessons learnt by the Community of Arran Seabed Trust (COAST)

Manuela de los Rios

Community of Arran Seabed Trust (COAST), Lamlash, Isle of Arran www.arrancoast.com
manuela@arrancoast.com

The Community of Arran Seabed Trust (COAST) has a unique success story to tell, having set up Scotland's first community-led marine reserve in 2008 which has now expanded into the South Arran Marine Protected Area (MPA). This larger area protects seabed diversity and valuable fish nursery areas from damaging fishing techniques (mainly dredging and bottom trawling) to sustain the local livelihoods that depend on these resources.

COAST is not the only community group that is making a difference; the Coastal Communities Network is a collaboration of 11 locally-focused community groups, guided by the belief that coastal communities across Scotland are well placed to harness long-term solutions to ensure healthy, well-managed seas.

Living or working by the sea, we are aware of the issues that affect our environment and livelihoods and we can hold our government to account in dealing with these. We bring together local knowledge, we support universities but also conduct our own research, and attract funding for marine education and sustainable marine recreation. Most importantly, we are in it for the long run and, having learnt a great deal from weak approaches in past management, we can help bring about change in marine conservation and planning.

In this talk we will present our experience and discuss the opportunities and challenges for coastal community empowerment and collaboration.

Missing native oyster (*Ostrea edulis* L.) beds in a European Marine Protected Area: should there be widespread restorative management?

Jose M. Fariñas-Franco[a,f], Bryony Pearce[a,b], James M. Mair[a], Dan B. Harries[a], Rebecca MacPherson[a], Joanne S. Porter[d], Paula J. Reimer[c] and William G. Sanderson[a]

[a] Centre for Marine Biodiversity and Biotechnology, Heriot-Watt University; [b] Pelagica Limited, Hoylake, Wirral; [c] ^{14}CHRONO, Centre for Climate, the Environment and Chronology, Queen's University Belfast; [d] International Centre for Island Technology, Heriot-Watt University, Orkney; [e] St. Abbs Marine Station; [f] School of Natural Sciences and Ryan Institute, National University of Ireland, Galway.
w.g.sanderson@hw.ac.uk

Anthropogenic pressures on the marine environment have escalated and shellfish habitats have declined substantially around the world. Recently, Marine Protected Areas (MPAs) have rapidly increased in number, but management baselines rarely account for historical conditions. Marine examples of habitat restoration are therefore unusual.

An interdisciplinary review of management baselines was undertaken for the Dornoch Firth protected area (NE Scotland) as well as three adjacent inlets and 50 km of open coastline. The protected area has low levels of industrial development, is sparsely populated, and previously achieved management objectives.

The aim of the present study was to systematically search for evidence of historical native oyster (*Ostrea edulis*) beds, a habitat now rare and of conservation importance throughout Atlantic Europe. Archaeological records, navigational charts, historical maps, museum collections, land-use records, fisheries records, public online databases and naturalists' records were searched. Intertidal and subtidal surveys were conducted and sample oyster shells radiocarbon dated.

The combined interdisciplinary sources showed that *O. edulis* occurred in the inlets and open coast areas of NE Scotland, and specifically in the protected area: Probably since the end of the last glaciation to the late 1800s when they were likely over-fished. Present environmental conditions are also suitable for oyster restoration.

Habitat restoration in protected areas is an emerging global theme. However, European oyster restoration effort is currently confined to remnant populations with a clear history of exploitation or dwindling associated fisheries. An interdisciplinary review of baselines will probably show scope for *O. edulis* restoration in many other European MPAs.

Ecology of decommissioning

Professor David M Paterson FMBA

Scottish Oceans Institute, University of St Andrews
dp1@st-andrews.ac.uk

OSPAR decision 98/3 prohibits the dumping of offshore man-made structures (MMS) and states that re-use, recycling or disposal on land is the preferred option. This approach is not universal and some countries run successful rigs to reefs programmes so what is the current status of scientific evidence in terms of the impact of MMS on the marine environment of the North Sea? The UK Administrations share a common vision of clean, healthy, safe, productive and biologically diverse oceans that provides a consistent high-level policy context for the development of marine plans. How well does OSPAR and UK marine policy sit together in terms of these high-level ambitions? This complex issue is best addressed using an ecosystem approach, bringing together the many ecological components of the marine habitats and considering the cost and benefits of MMS in space and time. There is evidence that offshore structures become part of the ecology of the regions, providing ecosystem function and services. Therefore, the ecosystem function of offshore structures requires

evaluation and the implications of decommissioning programs for these habitats locally and in the wider context of the regional seas should be considered. This presentation will discuss the optimum environmental approach.

Offshore Energy Strategic Environmental Assessment - Benthic Studies and Monitoring

John Hartley

Hartley Anderson Ltd.
jph@hartleyanderson.com

Strategic Environmental Assessment (SEA) of UK plans for marine oil & gas, renewable energy and carbon storage development was initiated in 1999 (for oil & gas) and has run continuously since then. The SEA programme has covered all UK waters and has involved significant research effort to address gaps in ecological and industrial effects understanding, identified through the assessment process and extensive stakeholder input. This research effort has included extensive mapping and sampling of the seabed to improve understanding of seabed topography, features, habitats, fauna and contaminant status. Many areas surveyed are now designated as UK or European conservation sites. The EU SEA Directive (2001) and UK implementing regulations (2004) require monitoring of the effects of plan implementation. Several regional surveys have been undertaken to document contaminant and ecological status in the main areas of offshore energy activity. Selected highlights of the SEA seabed survey effort are presented together with examples of where much remains to be discovered or understood.

20 years of recording North Sea benthos

Paul Kingston

Kingston-Ambrose Ltd., Dunfermline
p.f.kingston@k-aal.co.uk

Environmental surveys have been carried out by the UK offshore oil and gas developers since 1975, long before there was any legal requirement to do so. Their purpose was, and still is, to detect environmental impact from exploration, drilling, pipeline laying and any other development activity in the vicinity of offshore operations. Government regulations in the early 1980s made such surveys mandatory resulting in the accumulation of a huge quantity of information. Although theoretically publicly available, this information was difficult to access since there was no infrastructure to enable its dissemination.

In 1998 a joint government (DTI) / industry (UKOOA) initiative commissioned a database to document the information collected from offshore environmental surveys and for this to be open to the public.

Since then the database, *UKbenthos*, has been regularly maintained and updated. It currently contains 711 seabed survey reports with 424,000 faunal records from almost 10,000 sampling stations.

The effects of Offshore Renewable Energy Devices (OREDs) on the commercially important brown crab, *Cancer pagurus* (L.)

Kevin Scott [a, b], Petra Harsanyi [a], Alastair R. Lyndon [b]

[a] St Abbs Marine Station; [b] Centre for Marine Biodiversity & Biotechnology, Heriot Watt University.
kevin.scott@marinestation.co.uk

With the rapid increase in Offshore Renewable Energy Devices (OREDs) worldwide, there is a clear need for the implications to be properly assessed with regards to current ecological status and potential future consequences. Proposed sites and developments are based on current knowledge and assessments of the local environment, despite relatively little being known about the ecological effects of such developments on marine benthic organisms. Electromagnetic fields (EMF) originate from both anthropogenic (telecommunication cables, power cables, OREDs) and natural (Earth's natural geomagnetic field) sources. The effects of simulated EMF, emitted from sub-sea power cables, on the commercially important brown crab (*Cancer pagurus*), were assessed. Stress related parameters were measured (L-Lactate, D-Glucose, Haemocyanin and respiration rate) along with behavioural and response parameters (antennular flicking, activity level, attraction/avoidance, shelter preference and time spent resting/roaming) during 24-hours. Exposure to EMF had no effect on D-Glucose and Haemocyanin concentrations, respiration rate, activity level or antennular flicking rate. EMF exposure significantly decreased haemolymph L-Lactate levels after 24 hours, disrupting its natural circadian rhythm. Crabs showed a clear attraction to EMF exposed shelter (69%) compared to control shelter (9%) and significantly reduced their time spent roaming by 21%. These results predict that in benthic areas surrounding OREDs, where there is increased EMFs, there will be an increase in the abundance of brown crabs present due to altered behaviour resulting in an attraction to the source of the EMF emissions. This potential aggregation of crabs around benthic cables and the subsequent physiological changes in L-Lactate levels, brought about by EMF exposure, is a cause for concern. This study shows that the impact of EMF on crustaceans must be considered when planning OREDs.

The Scottish Coastal Observatory

León Diaz P., Bresnan E., Berx B., Fraser S., Machairopoulou M., Geldart M., Hindson J., Walsham P., Webster L. and Turrell W.R.

Marine Scotland Science, Marine Laboratory, Aberdeen
Pablo.Diaz@gov.scot

Sustained ecological measurements are critical to identifying and understanding change in the marine ecosystem. Since 1997, Marine Scotland Science (MSS) has been working with volunteer citizen scientists and organisations to assist with the collection of environmental data and samples from coastal areas. Initially established as a series of small temperature sensors deployed by volunteers alongside a more detailed monitoring site at Stonehaven operated by MSS, over the last 20 years the Scottish Coastal Observatory (SCObs) has evolved to become one of the most comprehensive coastal monitoring programmes in the UK. Temperature, salinity, nutrients and plankton are collected weekly at four sites with automated temperature sensors deployed and maintained at six others (more information about SCObs can be found at http://dx.doi.org/10.7489/1881-1). These data are improving, as well as challenging, our understanding of seasonal and interannual variation in the coastal environment and are being used to meet the requirements of a number of national and international policy drivers. SCObs data are also contributing to fill the knowledge gap for some environmental pressures such as ocean acidification (OA) in Scottish waters. The SCObs monitoring site at Stonehaven provides a first description of the carbonate chemistry system in Scottish coastal waters and highlights the diversity and seasonal and interannual variability of species groups potentially impacted (calcifying plankton)

by OA. This investigation illustrates how understanding OA is reliant on supporting information about the physical, chemical and biological environment.

Biological Recording at Millport Field Station - Past, Present and Future

Dr Phillip Cowie

Field Studies Council / Independent Marine Biologist
pcowie.mb@gmail.com

The field station at Millport, has a long and distinguished history with the original building being constructed in 1897 with the passionate support of David Robertson – the Cumbrae Naturalist. From the beginning, a core aim of the researchers & lecturers at the station was to establish which species are present within Firth of Clyde marine habitats and their distribution. This talk charts the history of biological recording at the centre, past-present and the future.

Shetland beneath the waves

Richard Shucksmith

CKOS Solutions Ltd., www.shetlandphototours.co.uk
rshucksmith@gmail.com

This talk explores the links between the mega fauna found using Shetland's coastal habitats and the underlaying marine communities that support such mega fauna. How we can use this mega fauna to engage and change public opinion about the not so sexy marine habitats. Or do we not do a very good job at making the none 'sexy' sexy? The use of imagery and video to tell stories.

The serpulid reefs of Loch Creran

Dan Harries

Heriot-Watt University
d.b.harries@hw.ac.uk

The reefs formed by the tube-building fan-worm *Serpula vermicularis* are well-known as a remarkable feature of Loch Creran (Argyll). They form prominent complex structures on the muddy-sand seabed and support a diverse array of associated biota. Although the species is widespread, the reefs are rare and occur at very few locations with Loch Creran supporting a far greater extent of reef than any other site. A deterioration of the Creran reefs has been documented in recent years and has generated concern over the future of the habitat. This presentation will outline the current state of knowledge of the reefs and identify the critical gaps in our understanding of serpulid reef ecology.

An expedition to the sea caves of St Kilda and North Rona

Dr Lisa Kamphausen

Scottish Natural Heritage
Lisa.kamphausen@snh.gov.uk

In August 2015 a team of divers and taxonomists from Heriot-Watt University, National Museums Scotland and Scottish Natural Heritage set off to complete the first systematic survey of sea caves in the St Kilda and North Rona SACs.

The UK has the most varied and extensive sea caves on the Atlantic coast of Europe. As access is exceptionally difficult, and weather conditions have to be near perfect to permit survey work, sea caves remain one of the least well studied inshore marine habitats in Scotland, and probably the

world. It was as if the caves desperately wanted to continue holding on to their secrets in 2015. The team had to contend with terrible weather and the boat breaking down repeatedly before tackling the fundamental challenge of actually finding the caves; being disappointed time and again by blind alcoves or shadows under rock arches mimicking cave entrances. A cave inventory had been created from all existing accounts prior to the survey, and this was updated systematically along the shores accessible in 2015. Work is planned to enable this inventory to be updated by any visiting recreational divers, allowing the production of a more comprehensive dataset over time.

Against dwindling odds, a weather window in the last week of the survey enabled the team to completed detailed physical and biological surveys of five caves on St Kilda and three on North Rona. The team discovered a new species of soft coral, and the two professional photographers on the team collected a plethora of footage, which made it onto the UNESCO website, won the British Wildlife Photographer of the Year award, and has been invaluable for ongoing outreach and engagement work.

Scottish saline lagoons and climate change – not as simple as it looks

Stewart Angus

Scottish Natural Heritage and Heriot-Watt University
Stewart.Angus@snh.gov.uk

As Relative Sea Level Rise (RSLR) progresses, lagoons might be expected to become more saline, but seasonal stratification complicates flows at sea exchanges. Lagoon specialist organisms have wide salinity tolerances and are more likely to succumb to competition from closely related marine species than to increased salinity. Though new saline lagoons will be formed by the capture of fresh waters, lagoon specialists tend to have poor dispersal powers and might be unable to colonise the analogue water body. Conservationists can meet this challenge by management of the sea exchange or by assisted colonisation (translocation). Even if translocation could be justified, there are considerable monitoring challenges associated with the identification of suitable source and destination sites. All these difficulties exist within a background of multiple (and often incompatible) habitat definitions, difficult taxonomy, and a legislative context that can in some cases obstruct new lagoon development.

Historical changes in Edinburgh's rocky intertidal macroalgae

A. Sampedro-Fernandez [a], M. Wilkinson [b]

[a] The Conservation Volunteers and Royal Botanic Garden Edinburgh., [b] Heriot-Watt University
a.sampedro-fernandez@tcv.org.uk

During the 19th century, Edinburgh was a distinguished centre for marine biology and home of several famous phycologist, including John Rattray and George William Traill. The first one was a scientist at the Scottish Marine Station at Granton while the second one was a keen amateur phycologist and cleric. Although both found interesting open coast species, earlier works in the 1880s did not cite the specific locations or seasons when they collected, making some of their collections unsuitable for current data correlation. The first detailed systematic survey was not until Traill published detailed papers on three localities in the Forth, Joppa (1886), Elie (1888) and Dunbar (1890) and his work is used as a baseline to compare present day flora. Traill described Joppa as a shore rich in seaweeds. His surveys were carried out before the first sewerage scheme in the late 1880s, with 9 crude sewage pipes discharging close to low water mark along the Edinburgh shoreline, with a massive silt deposition on shores.

We do not have further detailed descriptions including seaweeds until the second half of the 20th century, when two of the shores described by Traill where then recorded as being massively altered. At Joppa, a mussel-barnacle climax community has reduced seaweed coverage and species

presence. On the other hand, mats of polychaetes covered the rocks at Granton, with a reduction of light and less macroalgal communities able to establish.

In this project we aim to investigate whether, after more than 30 years, the new Edinburgh sewerage scheme has improved or not the species richness at both Joppa and Granton. Nowadays, Joppa remains dominated by a stable mussel-barnacle community with a recovery of species richness from Traill's surveys. Granton shows a different story. The polychaetes silt was easily removed and replaced by seaweeds, with species richness close to Traill´s. However, at present the rock surfaces at Granton show a change in dominant cover to a natural succession by a mussel-barnacle community but retaining the seaweed species richness close to that of Traill.

Porcupines in the Field – Northumberland and other recent surveys

Frances Dipper

Porcupine Marine natural History Society
frances.dipper@sustenergy.co.uk

Field trips have always been a core activity for Porcupine and recording species and habitats around the NE Atlantic fulfils one of our main aims: "To promote a wider understanding of the biology, ecology and distribution of marine organisms". We run two types of field trip - one day trips following the annual conference and longer trips of up to a week in the summer months. Since the beginning of the society in 1977, field trips have ranged from the Orkneys in Scotland to the far SW of England and over to Ireland. This presentation concentrates on the most recent field trip based at the Dove Marine Lab, covering shores and sublittoral in Northumberland and County Durham. The sublittoral element to our surveys has blossomed in the last few years by collaboration with Seasearch.

A full report of the Northumberland survey, including a species list, can be found in the PMNHS Bulletin Spring 2018, No. 9, in press and due out in time for this conference. During 5 days of survey we visited 5 shores, undertook 7 dives, hauled up 11 grabs and thereby recorded 365 species, including two new records for the area. We also learnt a lot and had a lot of fun.

New insights into the lives of British shovel head worms (Annelida: Magelonidae)

Kate Mortimer-Jones [a] & Kimberley Mills [a b]

[a] National Museum Cardiff, [b] Cardiff University, School of Biosciences
Katie.Mortimer@museumwales.ac.uk

The Magelonidae is a relatively small family of annelid worms containing 68 species in 2 genera: Magelona and Octomagelona. They are found all over the world, burrowing in muds and sands, generally at depths of less than 100 m. They are slender, beautiful worms, usually less than 10 cm long. They have a distinct flattened head, used for digging in sediments, giving the group its common name, the shovelhead worms. They possess two long feeding palps, uniquely adorned with papillae. There are currently five magelonids known to occur in British waters. The National Museum Wales has been carrying out live observations of three British species over the last six years, studying their feeding behaviour, movements, reproduction and defecation. New insights into behavioural differences between Magelona johnstoni, Magelona mirabilis and the tube-dwelling Magelona alleni have recently been discovered and will be discussed.

The NBN Atlas and Marine Data

Paula Lightfoot & Christine Johnston

NBN Strategy Working Group & NBN Secretariat
p.lightfoot@btinternet.co.uk & c.johnston@nbn.org.uk

The NBN Atlas is the UK's largest collection of shared biodiversity records, currently holding over 217 million species occurrence records supplied by 125 data partners. The Atlas was launched on the 1st April 2017 and is the replacement for the NBN Gateway, the need for which was identified during the NBN's 2014-15 strategy consultation with data users and providers.

The Atlas provides a range of functionalities for accessing, filtering, analysing and downloading records. It also provides a platform for our data partners to publicise their data collections, and contact details, and the ability to build bespoke portals, such as the NBN Atlas Scotland and the NBN Atlas Wales, that share the NBN Atlas's single database of records and other information.

We are currently in the first phase of the development of the NBN Atlas. Proposals for new functionality to improve the visualisation of data, including marine data, and tools to facilitate the understanding of, and to assist with improving data quality, are in the pipeline for future phases of development. These proposals have been developed in consultation with data users and providers in the marine community, as part of our ongoing engagement with NBN Atlas stakeholders.

The NBN Atlas is a fantastic resource for those who collect and use data on marine species. The ability to contribute to knowledge of species distributions and to see our own records in the context of others is a great motivating factor for recorders. Although marine species represent only a small proportion of the total data available through the Atlas, the volume of marine data is steadily growing. By bringing together data from multiple sources, including statutory nature conservation bodies, research institutions, conservation NGOs, national recording schemes and local environmental records centres, the NBN Atlas is a convenient 'one-stop-shop' providing access to data for research, conservation and education….and of course for general interest!

The datasets on the Atlas are quality controlled by the data providers, but naturally errors do slip through the net. The appearance of records of a marine species outside its expected distribution (or worse still, on land!) is confusing and can undermine confidence in the data. New functionality together with a proposed project involving the community of marine data users and providers could help to tackle these 'dodgy' records and improve data quality.

Christine and Paula will present the latest developments and future plans for the NBN Atlas, with a focus on the relevance to marine data providers and users. This session will include time for questions and discussion, so please come along and quiz us!

Seasearch data Opens up marine conservation to everyone

Charlotte Bolton

National Seasearch Coordinator, Marine Conservation Society
charlotte.bolton@mcsuk.org

The Seasearch datasets together comprise approximately 15% of the marine data available on the National Biodiversity Network's Atlas, and they are all freely publicly available (subject to confidential/sensitive filters for some species) under the Creative Commons Attribution licence (CC-BY). This approach to data availability was recognised by the NBN in its presentation of the John Sawyer Open Data Award at the annual conference in November 2017. With the need for robust data to underpin management, conservation and development of the marine environment, and the high costs of collecting such data, the importance of citizen science schemes such as Seasearch is presented in a number of case studies highlighting the use of the data.

30 Years of Seasearch: Where stands marine conservation in Scotland in 2018?

Natalie Hirst

Seasearch Coordinator Scotland
seasearchscotland@outlook.com

Scotland has 60% of UK coastline and seas, and so a challenge reaching all areas of the country at times to say the least. Despite that, over the years with the support of dedicated volunteers, coordinators and our partners including Marine Conservation Society and Scottish Natural Heritage, training courses have been run from St Abbs to Shetland, Fort William to Dingwall, and dive weekends and expeditions from Luce Bay to Orkney, Stonehaven to Loch Roag on the Isle of Lewis, with activity still going strong today. This brief presentation will explore a few key examples of the work carried out by Seasearch, celebrating 30 years of volunteer conservation efforts in the UK.