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Scottish Consortium
for Rural Research

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PICTURE: EUROPEAN SPACE AGENCY VIA WIKIMEDIA

Making a difference

Prof Sarah Skerratt, the new scientific director of SCRR, explains her belief that inclusivity is the key to working effectively

AS YOU WILL know, Prof Stuart Monro retired from his role as SCRR's scientific director in November 2018. Stuart's shoes are large ones to fill. I am genuinely honoured to take on the role following his retirement and thank him for all his achievements in creating such a strong network.

My passion is to make a difference by mobilising science for social, economic and environmental benefit. I am driven by the recognition of diversity in all its forms, including: geographical, geological, human, social, environmental, economic, as well as the richness of biodiversity, flora and fauna that surround us on a daily basis.

Recognising this diversity requires inclusive approaches to inquiry: in how we think; how we meet and interact with one another; how we work, by sharing thoughts openly and with curiosity across disciplines; creating links between science and practice

through new and unexpected partnerships; and forging comfortable and less comfortable alliances for the greater good of society.

An inclusive approach is also geographic, with a thirst for embracing Scotland's diversity and richness – from Shetland to Stranraer and all that sits in between: the people, landscapes, ecosystems and environments.

Being inclusive also means seeking out the invisible and making it visible; being constant in our endeavours to be rigorous, exhaustive and representative in our science, as well as making our work accessible for all.

Knowing the foundations and partnership ethos of SCRR, plus its rich and diverse membership, I am thrilled at the prospect of strengthening our inclusive approach to sharing science to make a difference. I genuinely look forward to working with you all across Scotland to support this collective endeavour.

Above: phyto-plankton bloom off the coast of Scotland, May 2008

This issue in places

Sri Lanka and southern India are home to the true cardamom plant, *Elettaria cardamomum* – **page 2**

Urdaibai biosphere reserve in northern Spain hosted experts on forests as a source of human health and wellbeing – **page 3**

Western Scotland's Marine Protected Areas will benefit from a new monitoring regime – **page 8**

The Isle of May in the Firth of Forth was where a ten-year study of seabird diets took place – **page 9**

The northern Adriatic was the location of a detailed study of dolphin behaviour – **page 9**

About SCRR

THE SCOTTISH CONSORTIUM FOR RURAL RESEARCH exists to promote sharing of ideas and techniques among a group of organisations active in research into land, freshwater, coastal and marine resources, and their uses.

Our member organisations have bases throughout Scotland and are at work all over the world: details on the back page.

Members' reports

Royal Botanic Garden Edinburgh

PICTURE: MELANURYA VIA WIKIMEDIA



Left: an example of *Elettaria cardamomum* in Kerala, India

Below: harvested cardamom pods

to include molecular methods to test if the cardamom genus, *Elettaria*, is a natural group. The ambition was to demonstrate a robust model for the analysis of the spice allegedly transported by the Vikings from the end of the Silk Road to Scandinavia. In a bid to get as many samples as possible, the seven authors, led by Axel Dalberg Poulsen of RBGE, collected specimens from sources ranging from botanic gardens to spice shops and plantations during fieldwork in SE Asia.

Samples from Sri Lanka showed the true green cardamom, but others from Malaysia and Indonesia failed to group with this. What is more, a third cluster of samples representing plants exhibited for more than 50 years in botanic gardens, thought to be cardamom because of the smell of the leaves, were found to represent an unrelated branch of the ginger family, undetected for so long because they never flowered.

The study concludes that *Elettaria* is confined to India and Sri Lanka, possibly including three species.

'The research helps make sense on some interesting quandaries,' explained Dr Poulsen. 'It had stirred our curiosity for a while that people in Malaysia and Indonesia appeared uninterested in using cardamom.'

This solves the riddle: the plants look the same, but are tasteless and unrelated.

These species will now be placed in a separate new genus, *Sulettaria*. The good news is that green cardamom remains untouched and as pleasant as ever.'

For further information, please contact Shauna Hay on 0131 248 2900 or Sandra Donnelly on 0131 248 1037.



PICTURE: RAINER ZENZ VIA WIKIMEDIA

Sorting the spice rack: the cardamom conundrum

A research collaboration involving RBGE has shown that not all varieties of cardamom are what they seem...

CARDAMOM IS PRIZED as a culinary staple around the world, and it might have been thought there was little new to say about it. Yet new molecular evidence shows that several plants that had been thought to belong in the same genus, *Elettaria*, are not really cardamom as we know it.

Aromatic and enticing, the highly appreciated green cardamom – *Elettaria cardamomum* (*Zingiberaceae*) – has been cultivated for millennia in tropical countries and used to enhance dishes as varied as Swedish buns and Indian biryanis. It is the third most

expensive spice, after saffron and vanilla, and therefore of considerable economic importance. The species is the 'type' or reference point of a genus thought until now to include 10 species distributed in India, Sri Lanka, peninsular Malaysia, Sumatra and Borneo.

MSc projects at Royal Botanic Garden Edinburgh (RBGE) and the Natural History Museum, Oslo, and later in association with Herbarium Bogoriense, Indonesia and Sarawak Forest Department, Malaysia, set out

Review of biological recording infrastructure in Scotland

THE SCOTTISH BIODIVERSITY Information Forum (SBIF) is a cross-sectoral group of stakeholders concerned with biodiversity information and biological recording in Scotland and includes both government and non-government organisations.

It has recently conducted a review of biological recording infrastructure in Scotland, commissioned following the letter of



December 14th, 2010 from the cabinet secretary to the Biodiversity Science Sub-Group in response to the issues raised in Public Petition PE1229. Full details can be found at <https://nbn.org.uk/about-us/where-we-are/in-scotland/the-sbif-review/> and the final recommendations are available in the attached report.

An effective biological recording infrastructure would

facilitate the biodiversity evidence base necessary for environmental decision-making, from land use and planning through to climate change mitigation, species and habitat protection and management of Scotland's natural capital.

The SBIF hopes that the implementation of the report's recommendations will provide data-users and decision-makers with such an evidence base.

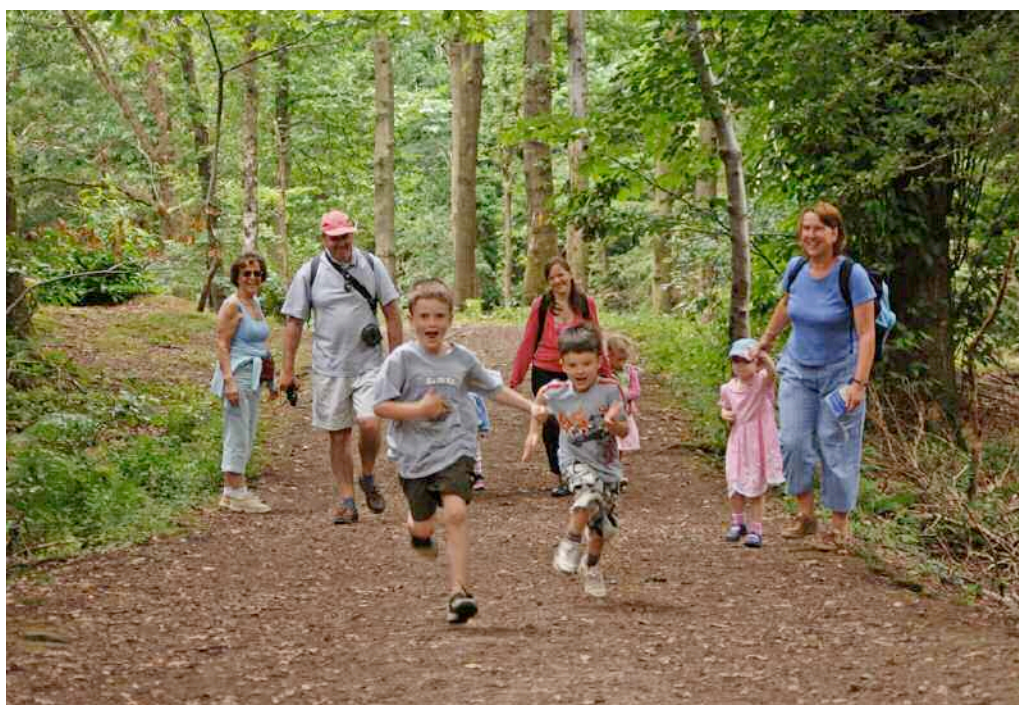
How forests contribute to our health and well-being

Forest Research has joined a European initiative that seeks to better understand the benefits of wooded spaces

SCIENTIFIC EVIDENCE SHOWS that forests can have a significant impact on human health. For example, visits to forests can lower blood pressure and pulse rates, and reduce cortisol levels. They can also improve people's mental, social and physical wellbeing. However, evidence of these benefits is scattered across many sources and is not properly understood as a whole.

Recently, Forest Research's Liz O'Brien was invited to become a member of an expert group concerned with forests, human health and wellbeing' within FOREST EUROPE. This initiative aims to shape a future where forests contribute effectively to human wellbeing, a healthy environment and economic development in Europe and across the globe.

Demographic change, modern lifestyles and increasing urbanisation make development of policies which enhance the contribution of forests to health of increasing importance. An important task of the Forests and Human Health and Wellbeing expert group is to collate and review the existing scientific evidence published in Europe on forests and their contribution to human health and wellbeing. The review will bring together evidence in research papers, project outcomes, best practices, and surveys in these fields.



A family outing in the Forest of Dean

The group's most recent meeting was in June 2018 (in the Biosphere Reserve of Urdaibai near Bilbao, Spain) and was attended by 15 experts who worked to confirm the scope and content of the review. Once complete, the knowledge, experience and best practice it uncovers will be presented

at a workshop in Vienna to FOREST EUROPE signatories and observers.

Please see: www.forestresearch.gov.uk/news/contribution-forests-human-health-and-well-being/
For more details contact Liz O'Brien, liz.obrien@forestry.gsi.gov.uk

Forest Research appoints new chief scientist

PROFESSOR CHRIS QUINE has been appointed as the new chief scientist at Forest Research (FR), Great Britain's principal organisation for forestry and tree-related research.

The chief scientist oversees strategic research at FR to ensure that it provides the scientific knowledge and expertise required by its customers, and that advice to policymakers and practitioners is based on good science and sound evidence. As a member of FR's Executive Board, Chris will share accountability for the performance of the agency and will play an active role in the continuing professional development of FR's scientific and technical staff. He will also contribute

to the formulation and implementation of the Forestry Commission's policies and objectives.

Prof Quine said: 'I am honoured to be chosen to lead FR's scientific and technical work at a time of transition and new opportunity, and to support our role as interface between the tree, woodland and forestry sector and wider academia.'

Chris remains Head of FR's Northern Research Station in Roslin and will continue to be involved in SCRR and in the Directorate of the Scottish Government's Plant Health Centre.

For details, see www.forestresearch.gov.uk/news/forest-research-appoints-new-chief-scientist/



Chris Quine with Marilyn Headley, CEO of Jamaica's Forestry Department

Members' reports

Forest Research

How payments for ecosystem services could encourage better woodland management

Liz O'Brien and Bianca Ambrose-Oji from Forest Research describe the background to a new study



THERE IS INCREASING interest in understanding, valuing and supporting the variety of ecosystem services that forests and woodlands can provide in the United Kingdom. These services include the capture and storage of carbon, the interception of rainwater, and the provision of wellbeing benefits.

Landowners and land managers can play an important role in the delivery of forest ecosystem services through active woodland management and woodland creation, so understanding the mechanisms that could be used to encourage land management activities that support this delivery is important.

In a newly published report, Liz O'Brien and Bianca Ambrose-Oji of Forest Research, along with researchers from the Sylva Foundation and the University of Oxford, explain research investigating land managers' understanding of payments for ecosystem services – that is, market mechanisms to support delivery of ecosystem services – as well as their use of formal and informal networks to

support decision-making, and the ways in which they learn from others. The research found that many land managers were not familiar with the term 'ecosystem services' or the concept of payments for ecosystem services. However, they did often recognise that their woodlands could provide a range of benefits to society.

Land managers use a range of formal and informal networks to support their decision-making.

'Many land managers are not familiar with the term ecosystem services, but recognise that their woodlands provide a range of benefits'

Important networks are those related to place (in particular, those in their immediate locality); networks related to woodland management, including associated institutions; and networks related to social and personal identity.

Learning is important in changing individual and group behaviours, whether it is on an individual basis or through others – known as 'social learning'. Social learning is an

Well-managed woodland provides services including carbon capture, flood mitigation and health benefits

important consideration in land management where new schemes, particularly those associated with payments for ecosystem services, may rely on landscape-scale and community-scale change.

The research concluded that payments for ecosystem services, networks and social learning could be helpful approaches when used to encourage greater woodland management and woodland creation and the delivery of forest ecosystem services. These could be considered independently or in varying combinations as part of a multi-faceted approach. The research emphasised the importance of understanding and engaging with land managers to involve them in the design of the mix of approaches that might be used.

Please see: www.forestresearch.gov.uk/research/exploring-land-manager-views-payments-ecosystem-services-networks-and-learning/
For more details contact Liz O'Brien, liz.obrien@forestry.gsi.gov.uk

INVASIVE NON-NATIVE SPECIES pose a threat to ecosystems, economies and in some cases human health.

The great spruce bark beetle (*Dendroctonus micans*) is a commercially significant invasive pest of Scottish spruce trees, having arrived in Scotland within the last decade. Spruce trees are present across most of Scotland, so all regions of Scotland are at some risk from the invasion.

Forestry Commission Scotland has developed a control policy which is designed to protect the economically important West of Scotland Pest Free Area, whose pest-free status is critical to continuation of the significant trade with the island of Ireland.

The control policy involves release of a predator insect that reduces losses of up to 10% to negligible levels in infested commercial spruce stands. However, the predator must be deployed into newly invaded stands to have maximum effectiveness in terms of reducing further spread.

To do this requires being one step ahead of the pest, being able to predict where it will invade next.

Right: larva of the spruce bark beetle

Below: the brown top is indicative of beetle infestation



PICTURE: GILLES SAN MARTIN VIA WIKIMEDIA

Spread patterns for invasive species can be complex. The invasion wave front can move forwards over time, but there may also be infilling behind the front and long-range jumps ahead of the front into new territory. Such patterns can be driven by landscape

heterogeneities as well as human mediated dispersal of the invader.

BioSS-led research in the Scottish Government's Strategic Research Programme has resulted in novel methods for predicting the spread of populations across heterogeneous landscapes based on reported presences of populations at given locations and times. Though these methods were initially applied to invasive plant species, work with SRUC and a pilot study funded by the newly established Plant Health Centre demonstrated the potential for the methods to be applied to data on the spread of *D. micans*.

This led Forestry Commission Scotland to fund a more comprehensive and detailed study to inform its 2018 surveillance and control programme for *D. micans* as it spreads

Predicting an invasion: the case of the great spruce bark beetle

Dr Stephen Catterall, researcher at BioSS, describes how novel methods have been developed to track non-native tree pests



'The modelling methods could be applied to other species spreading across landscapes, including pests, pathogens and plants'

northward. The resulting predictions of future spread of the pest can be used to inform more effective implementation of the Forestry Commission Scotland control policy.

The modelling methods that have been applied to *D. micans* also have the potential to be applied to other species spreading across heterogeneous landscapes including pests, pathogens and plants, and BioSS welcomes discussions regarding further applications.

Please contact Stephen Catterall, stephen@bioss.ac.uk

News from SCRR

New scientific director for the Scottish Consortium for Rural Research



Prof Skerratt with Prof Stuart Monro (left) and Prof Willie Donachie

PROFESSOR SARAH SKERRATT took up her new role as scientific director of the Scottish Consortium for Rural Research in November 2018. Prof Skerratt is SRUC's director of policy engagement and is also director of the Rural Policy Centre, which provides the Secretariat to the Cross-Party Group on Rural Policy.

This is a part-time appointment and Professor Skerratt will continue her work within SRUC.

After completing a BSc (Hons) in Geography and Geology and an MA (Econ) in Development Studies at the University of Manchester in 1987, Sarah went on to gain a PhD in Social Anthropology and Resource Management at the University of Edinburgh in 1995. Following a number of posts as a research fellow and lecturer in various UK universities, Sarah joined SRUC in 2006 as a team leader in rural society research.

Sarah was appointed as the Principal Investigator for the Scottish Government-commissioned five-year research programme Governance and Decision-Making for Rural Community Empowerment (2011-2016). In April 2016, Prof Skerratt was invited on secondment to Audit Scotland, to 'rural-proof' their audit work, and is retained as their rural adviser.

In 2017, Prof Skerratt was elected Fellow of the Royal Society of Arts (FRSA) in recognition of her work on rural policy and poverty. In 2018, in recognition of her strategic thinking

and vision, Sarah was made a director and member of SRUC's Executive Leadership Team.

Sarah is regarded as an exceptional communicator, being regularly invited to work both nationally and internationally at senior levels with governments and parliaments, universities, private, public and third sector and development agencies. Sarah was on the Board of Directors for SRUC (2015-2018), Rural Housing Scotland (2014-2018) and Scotland's Regeneration Forum (2015-2018) - being retained as policy adviser for RHS and SURF.

Professor Skerratt describes herself as passionate about connecting people, knowledge, experience, perspectives and methodologies to generate an enhanced understanding of rural issues - across geographies and disciplines. This approach has underpinned her research, as has her commitment to knowledge exchange and transdisciplinary research.

Professor Steven Yearley FRSE, chair of the SCRR Executive Committee, paid tribute to the work of Stuart Monro, the outgoing scientific director, who has served SCRR with charm and keen insight; he extended an enthusiastic welcome to Prof Skerratt who will lead the professional orientation of the consortium into policy and social sciences.

IN NOVEMBER 2018, the Coastal Forum and the Scottish Consortium for Rural Research held a one-day workshop during the annual meeting of the Marine Alliance for Science and Technology for Scotland (MASTS). The workshop brought together coastal scientists and rural researchers to provide an opportunity for new collaborations and partnerships.

Coastal areas face complex challenges and this was reflected in the breadth of workshop presentations, ranging from Scotland's upland beef farmers to climate change impacts on Vietnam's vulnerable coastal communities. The final session was a lively discussion about a coastal observatory as a potential way to provide and share data on coastal environmental change.

To view presentations and learn more, see: <https://www.masts.ac.uk/annual-science-meeting/2018-workshops/the-changing-coast-sharing-knowledge-and-practice/>

Introduction

Welcoming speakers and participants, Prof. Jim Hansom (GU) stressed that structuring the day into three sessions - 'processes', 'management' and 'future' - while necessary, was not intended to limit or restrict the exchange between disciplines. Indeed, sharing knowledge and practice between often disparate and distant disciplines is key to positioning society to cope with coastal change.

Changes & Processes

The first session, Changes & Processes, was opened by Prof Stewart Angus (SNH), who questioned the evidence about whether sea level rise is the main cause of **salt marsh erosion** - an idea at the heart of many coastal management policies. In reality, ground water forcing on the landward side of salt marsh is a major driver in some marshes, whilst others can be used to keep pace with relative sea level rise.

Dr Dmitry Aleynik (SAMS) introduced the **West Scottish Coastal Modelling System (WeStCOMS)**. This fine-scale mapping tool provides fantastic imagery that shows the detail of currents around Scotland's inland waters, an understanding that is becoming increasingly necessary in planning for marine economies, such as aquaculture and renewable energy development.

Valuable insights from the social science community were provided by

The changing coast: sharing knowledge and practice

A report on the Coastal Forum Workshop, supported by the Scottish Consortium for Rural Research, MASTS-ASM, Technology & Innovation Centre, Glasgow, 2nd November 2018



Dr Leslie Mabon (RGU), on the impact of a rapidly changing climate to **Vietnam's vulnerable coastal communities**. He pointed out that while welcome, an ecosystem-based approach also needs to consider human wellbeing and social relations. Only by considering the human cost of climate change will culturally meaningful practices in marginalised societies be adopted and maintained. Prof. Robin Pakeman (JHI) wrapped up the first session by introducing a substantial data set that shows how Scotland's coastal vegetation has changed over three decades. Arable farming and nutrient enrichment have driven substantial, negative changes in the coastal vegetation of the East coast, sharply contrasting with the West coast, where traditional grazing on dune and machair habitats is helping to protect floral diversity.

Management & Adaptation

The Management & Adaptation session began with an overview of the **Humber flood and coast strategy**. Dan Normandale (EA) summarised the Environment Agency's plans to align flood risk investment for infrastructure, with environmental improvements and economic growth. Given the size, complexity and importance of the

Humber, many lessons were on offer for Scotland.

Dr Andrew Rella followed this by demonstrating that innovative solutions in **coastal defences** are available using ECoNcrete to help reduce the ecological footprint of ports and coastal protection schemes.

Martin Laroche (UQAR) reflected on the **Coastal and Riverside Area project in Quebec and Ontario**, which is analysing the ability of adaptive governance to work with coastal municipalities to help overcome such challenges as erosion and flooding.

Mairi MacArthur (GU) provided insights into the **Hartlepool Headland project**, describing how species abundance can be improved if construction materials are designed with increased surface roughness, allowing engineering structures to better match baseline biotope conditions for several key species.

Way Forward

Dr Alistair Rennie (SNH) opened the 'Way Forward' session and brought us up to speed with the Scottish Government project '**Dynamic Coast 1 & 2**'. This path-breaking project has developed an online tool to identify past erosion and growth rates, and shows potential future changes around Scotland's coastline that are key inputs

Tidal salt marsh at Aberlady Bay NNR, East Lothian

to effective planning decisions. Phase 2 is developing this further by developing 3D models to inform adaptation planning for coastal communities together with identifying whether certain levels of society will be more heavily impacted by coastal climate change than others.

Prof David McCracken (SRUC) went on to provide greater understanding of the complex challenges facing **livestock farming around coastal Scotland**; with low productivity and falling profitability in sheep and beef farming, SRUC's Hill & Mountain Research Centre are helping to innovate and diversify into more sustainable and technology driven practices.

The **GreenShores project** was introduced by Dr Clare Maynard (St Andrews), highlighting her work with community groups and schoolchildren to harvest, propagate and plant salt marsh; in doing so increasing the flood and erosion resilience of valuable land. Clare went on to feature Ben Taylor's work, which has revealed that there may be substantial blue carbon benefits to **salt marsh restoration**.

Dr David Green (UoA) ended the session with an update on **Unmanned Aerial Vehicles**, a rapidly advancing field that is developing new and improved methods to monitor, map and model the coastal environment.

Coastal Observatory

Eileen Bresnan outlined Marine Scotland's (MS) **Coastal Observatory**, established in 1997 to provide a baseline for monitoring inshore coastal waters and help track deviations from natural variability. This led to discussion about a wider type of coastal observatory to include a wide range of coastal issues beyond the MS Coastal Observatory.

For example, Prof Stewart Angus argued there was an equally important need to monitor the terrestrial side of the coast. The coastline and its seaward and landward boundaries will change more than any other part of Scotland and an enhanced coastal observatory would build on the success of the Environmental Change Network and Dynamic Coast.

Members' reports

Scottish Association for Marine Science, Scottish Natural Heritage



Launch of project to safeguard the health and sustainability of our marine ecosystem

The Scottish Association for Marine Science (SAMS) and Scottish Natural Heritage (SNH) are taking part in a cross-border collaboration to improve monitoring of Marine Protected Areas off the west coast of Scotland

IN DECEMBER 2018, documentary filmmaker Doug Allan joined the launch event of a £6.4 million environment project to inform and improve management and monitoring of several Marine Protected Areas (MPAs) between Northern Ireland, the borders of the Republic of Ireland and Western Scotland.

Doug, of whom David Attenborough said: 'Wildlife cameramen don't come much more special than Doug,' provided an illustrated talk highlighting the beauty and connectedness of the marine environment that the project aims to conserve.

The Marine Protected Area Management and Monitoring ('MarPAMM') project includes SCRR members, the Scottish Association of Marine Science (SAMS) and Scottish Natural Heritage (SNH). It is led and coordinated by researchers from the Agri-Food and Biosciences Institute (AFBI) and involves seven leading marine research providers, forming a

cross-border collaboration network developing tools to protect vulnerable marine habitats and species.

MarPAMM is supported by the European Union's INTERREG VA Programme, managed by the Special EU Programmes Body (SEUPB) and by

Above: feeding time for a sea scorpion (Taurulus bubalis). Below: an Atlantic basking shark

the Department of Agriculture, Environment and Rural Affairs in Northern Ireland and the Department of Housing, Planning and Local Government in Ireland.

The investment will deliver models for seabirds, benthic habitats, marine mammals and coastal processes, and will culminate in the development of six MPA management plans, including four novel regional plans.

MarPAMM brings together experts from Northern Ireland, Scotland and Ireland to study a wide range of marine species and habitats, from the seabed to seabirds. The data will be used to produce plans supporting the conservation of those marine species, their habitats and the wider environment, helping to safeguard the health and sustainability of our marine ecosystem for future generations.



For further information, please contact Dr Anuschka Miller, Anuschka.Miller@sams.ac.uk or 07786 327780

PICTURE: YO-HAN CHA VIA FLOKOR

Dramatic changes found in seabirds' winter food source

Dr Richard Howells of the Centre for Ecology and Hydrology describes the findings of a new study looking at the diet of the European shag in the Firth of Forth

THE AVAILABILITY OF a key prey for seabirds has changed dramatically over the past three decades, particularly in winter, with possible consequences for population numbers. In the first long-term study of its kind, researchers looking at the diet of a North Sea seabird, the European shag, found that the bird's food sources alter substantially through the year.

The study of regurgitated pellets took place over three decades at the Isle of May, Firth of Forth. When the study started in 1988, the shag's diet comprised almost 100 per cent sand eel, but by 2014 this had fallen to just 13 per cent and the number of prey types had increased from six to 12.

Climate change may be an important driver, since ocean warming is having pronounced impacts on North Sea fish populations. Change in diet and availability of prey can both affect the survival rates of seabirds, and therefore populations, because food is a key determinant of their

biology, affecting their general health and condition and consequently the number of chicks they raise.

The study, involving the Centre for Ecology and Hydrology, Biomathematics and Statistics Scotland and the University of Liverpool, was funded by the Natural Environment Research Council and has been published in the journal *Marine Biology*. It demonstrated that the decline in sand eel frequency in the diet was more marked during winter, when the majority of seabird deaths occur. Therefore, the dietary patterns observed may have substantial implications for survival and may be an important factor contributing to the declines observed in some UK seabird populations.

While previous research had been carried out during summer, when birds are at their nests and relatively easy to access, there had been limited information regarding seabird diet during the energetically challenging winter months and how these have



European shags in the North Sea

changed over time. This study addresses key gaps in knowledge, not only in understanding of how birds are responding to the environmental impacts of climate change, but also of the factors underpinning the steep declines observed in many species. The overall picture for seabirds is a marked decline, particularly in species that have relied upon sand eels.

PICTURE: © GARY HOWELLS

Dolphins pick their friends, shows St Andrews study

DOLPHINS ARE CAREFUL about who they are friends with and shun rival groups, according to new research from an international team led by the University of St Andrews. However, rival groups still managed to cooperate by sharing the sea, taking it in turns to inhabit particular areas.

The study investigated the social networks of dolphins in the northern Adriatic Sea. It showed that dolphins form distinct social groups, and some don't like each other.

It is widely known that dolphins usually live in groups and in the case of the common bottlenose dolphin, the composition of these groups changes often, with members joining or leaving. However, these groups are not random. Rather, they form as a result of individual dolphins preferring to spend time with individuals who could be described as their 'best friends'.



The researchers, from the Morigenos Slovenian Marine Mammals Society and the Sea Mammal Research Unit (SMRU) at the University of St Andrews, studied the dolphins of the Gulf of Trieste for more than 16 years. They found that dolphin society in the region comprised three distinct groups: two large social groups with stable membership and long-lasting friendships, and a smaller third group,

nicknamed 'freelancers', with weaker bonds and no long-lasting friendships.

The two large groups tended to avoid each other but did manage to share particular areas of the sea, with each group using them at different times of the day. Such temporal partitioning has not previously been documented in whales or dolphins, nor in other mammals.

The study demonstrates how different segments of the same animal population may behave very differently. In turn they may react differently to human behaviour.

Behavioural and temporal partitioning of dolphin social groups in the northern Adriatic Sea by Tilen Genov et al, doi.org/10.1007/s00227-018-3450-8. For more information contact the Communications Office at St Andrews, proffice@st-andrews.ac.uk.

PICTURE: NASA VIA WIKIMEDIA

Members' reports

Roslin Institute; University of Edinburgh

Gene-edited (but not GM) pigs made resistant to billion dollar virus

Researchers at Roslin Institute are working to prevent a disease that is endemic in most pig-producing countries of the world



RESEARCHERS AT ROSLIN Institute have changed the genetic code of pigs to produce animals that resist one of the world's most costly animal diseases, porcine reproductive and respiratory syndrome, or PRRS. The disease is endemic in most pig-producing countries worldwide and vaccines have mostly failed to stop the spread of the virus that causes it,

Dr Christine Tait-Burkard of the Roslin Institute with gene-edited pigs

which continues to evolve rapidly. PRRS costs the pig industry around \$2.5 billion (£1.75bn) each year in lost revenue in the US and Europe alone.

The disease causes breathing problems and death in young animals, and if pregnant sows become infected it can cause them to lose their litter. The virus infects pigs using a receptor on pig cell surfaces called CD163.

Researchers used gene editing techniques to remove a small section of the CD163 gene.

The team worked in collaboration with Genus PLC, a leading global animal genetics company, to produce pigs with the specific DNA change. They found that none of the animals became ill when exposed to the virus and blood tests found no trace of the infection. The animals showed no signs that the change in their DNA has had any other impact on their health or wellbeing.

Other groups have used gene editing to create PRRS-resistant pigs by removing the whole CD163 receptor. Removing just a part of CD163 allows the receptor to retain its ordinary function in the body and reduces the risk of side effects, the researchers say.

Genetically modified animals are banned from the food chain in Europe. It is not clear what regulations would apply to gene-edited animals, however, as the approach is different. GM techniques have been controversial because they can involve introducing genes of other species into an animal. In contrast, gene editing speeds up processes that could occur naturally through breeding over many generations, without introducing genes from other species.

This interdisciplinary research, co-funded by the Biotechnology and Biological Sciences Research Council and Genus PLC, is published in the *Journal of Virology*.

For more information please contact Jen Middleton at Roslin's press and PR office, Jen.Middleton@ed.ac.uk

Gardens and allotments are havens for pollinating insects

A STUDY OF insects in urban green spaces has identified ways in which gardeners can encourage those that fertilise plants and flowers, writes *Prof Graham Stone of the School of Biological Sciences, University of Edinburgh*. Bees, flies and other pollinators are drawn to spaces such as parks and roadside verges planted with species they prefer to visit such as dandelions, thistles, and brambles. Mowing grass less frequently, allowing flowers to flourish, could enable insects to thrive.

Of the different city habitats explored in the study, urban allotments and household gardens emerged as best for pollinating insects, suggesting



that planners should consider increasing the provision of allotments in towns and cities. Cities could be important refuges for insects that face threats such as pest control on agricultural land and reductions in natural flower-rich habitats.

Results from the four-year study, carried out by the Universities of Bristol, Edinburgh, Leeds and Reading in collaboration with the University of Cardiff, are published in *Nature Ecology and Evolution*. The project is the first to examine pollinating insects across entire cities.

The UK Insect Pollinators Initiative is funded by the Biotechnology and Biological Sciences Research Council, the Department for Environment, Food and Rural Affairs, the Natural Environment Research Council, the Scottish Government and Wellcome.

For details contact Prof Graham Stone, Graham.Stone@ed.ac.uk

Impact of the loss of darkness on wildlife

A new project at the University of Glasgow will study effects in both urban and rural environments

HOW DOES THE increased light at night that occurs in urban areas throughout the world affect wildlife? A team of researchers at the University of Glasgow has been awarded a grant of more than £1m to study the impact of the loss of the night on animals.

The project, funded by the Natural Environment Research Council (NERC), totals £1.4m and has been awarded to Dr Davide Dominoni, together with Prof Pat Monaghan and Dr Simon Babayan from the University's Institute of Biodiversity, Animal Health and Comparative Medicine, as well as Prof Barbara Helm of the University of Groningen in the Netherlands.

The grant comes from a special fund to address pressing and important environmental challenges.

Animals, including ourselves, have evolved body rhythms that are synchronised to daily and seasonal cycles of light and dark. This natural pattern is increasingly compromised by the spread of night-time illumination that comes with progressive urbanisation. Across the globe, more than half of the human population now



PICTURE: NASA EARTH OBSERVATORY

Great Britain and Europe at night, a NASA satellite image

lives in cities and darkness is being lost at ever-faster rates. In humans, negative effects of disrupted day-night rhythms, such as loss of sleep and compromised health, are causing concerns, but the potential consequences for wildlife are still largely unstudied.

The work will involve different wild bird species across gradients of light pollution from urban to rural environments. Dr Dominoni said: 'We are thrilled to receive this grant from NERC.'

What we hope to achieve is a thorough understanding of the extent to which urban light pollution disrupts normal rhythms of behaviour and physiology in animals in urban environments, whether this disruption is associated with negative health consequences, and whether selected lighting strategies can mitigate adverse effects.'

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How 'Design Thinking' can help your research

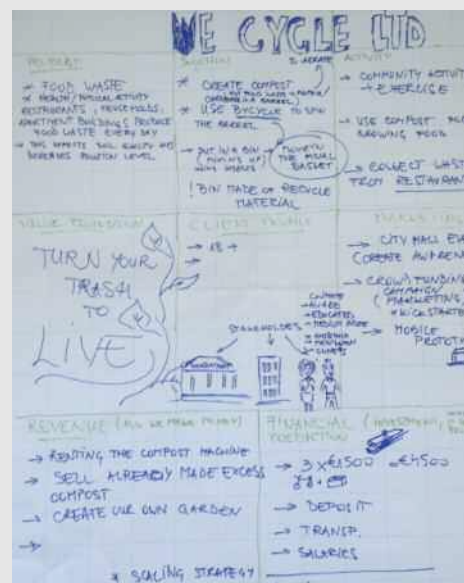
AS RESEARCH SCIENTISTS, we are constantly looking for new procedures, processes and ways to solve problems, writes Dr Kathy Velandar of Edinburgh Napier University. However, I for one must admit that I don't always look as widely as I should when thinking about new ways to develop solutions.

Enter - Design Thinking. Originated by David Kelly and Tim Brown of Stanford Business School, it is commonly used in design, architecture and business, but I have yet to see it widely used in science and technology. It has similarities to Sandpit in that it identifies problems, but instead of the goal being a research project or funding application, it produces a method, a physical item or process that addresses the issue and provides a solution. Fundamental to the process is empathy with the end user or stakeholder to ensure the problem is clearly understood when defining the challenge. Solutions are explored

(Ideate) in the widest and sometimes whackiest extent with the outcomes being developed into prototypes. These are presented to the end user and revised based on their input resulting in a final product/experience/method that is fit for purpose. But, how can it help science? I have used Design Thinking in teaching and have found it stretches the imagination and by using multi-disciplinary teams brings new ideas to the table. When these are presented to the stakeholder, even more ideas are sparked creating a solution that truly meets their needs.

For more on Design Thinking, see [youtube.com/watch?v=a7sEoEvT818](https://www.youtube.com/watch?v=a7sEoEvT818)

Interested in learning more? SCRR will be offering a half-day workshop on Design Thinking in collaboration with Edinburgh Napier University in 2019, open to researchers at all levels. See our website for details.



Design Thinking group exercise, Lahemaa, Estonia, May 2017 as part of the EU project Social Entrepreneurship for Local Change

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Please see the website for announcements.

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