

Better forests for giant pandas

Four major Scottish research organisations go to work in China

Report from RZSS and Forest Research

2

Do langoustines eat plastic?

The impact of pollution on the tastiest species in our seas

Report from University Marine Biological Station

4

Behind the scenes at the museum

Refurbished galleries attract 1 million visitors in four months

Report from National Museums Scotland

6

Scots pride in green energy

Detailed survey reveals our attitudes to cleaner electricity generation

Report from the University of Edinburgh

8

Easy climate fixes 'could save lives'

New research shows the benefits of cutting soot and methane

Report from Centre for Ecology and Hydrology

9

ecrr

Edinburgh Consortium
for Rural Research

www.ecrr.org.uk

Newsletter 73
Spring 2012

formerly The Bush Telegraph



This issue in words

Ambassadors for science, technology, engineering and maths (STEM) are volunteers who are helping to engage young people with research in entertaining ways – **page 3**

Crime-fighting is helped by scientific methods such as soil analysis, which showed that muddy shoes had been worn at a murder scene – **page 4**

Earlier by six days than it used to be, the rutting season for red deer appears to have been affected by climate change – **page 5**

Partnership is a key concept emerging from a study of ways to improve the environmental performance of Scottish estates – **page 7**

Farmer-friendly ways to reduce greenhouse gas emissions are proving a hit because they increase efficiency and save money – **page 8**

Risks posed by climate change, but also its possible benefits, are laid out in the first of a new series of UK-wide assessments – **page 10**

Engaging the public in rural science

Professor Stuart Monro, scientific director of ECRR, gives his thoughts on the recent workshop exploring ways to involve the public with research work

IN ALL AREAS OF RESEARCH

'impact' seems to be the buzz word of the moment. Research funders no longer want to know only about the science that is being done, but also how the outcomes will be communicated to stakeholders.

The stakeholder community for rural research is quite diverse; it may include the science community, policy makers, children in schools, the agricultural community, pressure groups of various sorts as well as the general public. Each of these groups will respond best to communication through different media which alongside conventional print include all the new social networking media.

The concept of science communication has also changed – away from the one-way 'filling an empty jug' to engagement, which is much more a two-way process.

These issues were the subject of a half-day workshop when representatives from across the ECRR network came together to share good practice and to explore where engagement is going in the future. Presentations from the Roslin Institute, SAMS (Scottish Marine Institute, a part of the University of the Highlands and Islands) and from the Hutton Institute illustrated a range of approaches, while breakout sessions explored the use of 'new media', engagement with press and television, and how to measure success.

Feedback from the event suggests it was of real value to ECRR members and further similar events will be in the programme in the future.

Details of this event, which took place at Our Dynamic Earth on January 19th, 2012, are at www.ecrr.org.uk/events

Above: our new website is a key tool in ECRR's efforts to engage with a wider public

About ECRR

THE EDINBURGH 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.

Further details on the back page.

Members' reports

RZSS and others



Royal
Botanic Garden
Edinburgh



Giant pandas and forest landscape restoration

Mike Smith of Forest Research welcomes a joint project by four major research institutions

AS PART OF the 10-year giant panda loan agreement, the Royal Zoological Society Scotland (RZSS) is committed to developing a 'joint laboratory' with the China Conservation and Research Center for the Giant Panda (CCRCGP) at the Wolong Nature Reserve in Sichuan Province, south-west China.

The joint laboratory has five research topics: i) field ecology; ii) genetic management; iii) artificial breeding and infant panda care; iv) veterinary management and research; and v) cognitive evolution and behavioural research.

To support the field ecology topic, RZSS signed a memorandum of understanding to 'improve the management for native forest restoration and thereby support giant panda conservation in China.' In it, the field ecology element is broken down into three components:

- Enhance capacity to monitor mountain ecosystems and their panda habitat, including the evaluation of threats, impacts, and trends including the possible impact of climate change on the animals and their habitat.
- Assist the development of a Geographic Information System (GIS) to support best management practices for panda conservation.
- Develop a co-management model for native forest restoration.

All of these components are consistent with the principles of the Global Partnership for Forest Landscape Restoration.



MIKE SMITH

In order to undertake this research, the RZSS and the Panda Mountain initiative, which works at Wolong, have coordinated a major collaboration between Royal Botanic Garden Edinburgh, Forest Research and the Global Environment and Society Academy at the University of Edinburgh.

Forest landscape in the Wolong region

Wolong is one of the most botanically rich sites of any temperate region in the world and as such provides multiple research opportunities

The aim is to harness the collective expertise of these organisations to develop and deliver a programme of forest landscape restoration.

The programme also contributes to the Scottish Government's plan for engagement with China; specifically with Objective 3 to increase joint research and development projects and programmes.

The Wolong Nature Reserve is an International Biosphere Reserve and part of a World Heritage Site. The IUCN has designated the Wolong region to be the largest and most significant remaining contiguous area of giant panda habitat in the world. It is also one of the most botanically rich sites of any temperate region in the world and as such provides multiple research opportunities and priority sites for biodiversity conservation.

The 10-year research programme in partnership with Wolong and Sichuan colleagues will begin with a development phase in the first year, which will produce a coordinated programme of research activities and an associated business plan.

For more details about Wolong, see Panda Mountain at www.uscef.org

Find out about Edinburgh Zoo's pandas at www.rzsspanda.org.uk



Male giant panda, *Ailuropoda melanoleuca* – known to visitors to Edinburgh Zoo as Yang Gueng

DAVID MCINTYRE



'Vampire Slayers'
by David McIntyre
was inspired by
work to develop a
vaccine against
*Haemonchus
contortus*, a
blood-sucking worm

Engagement and enlightenment

Dr Lee Innes explains how Moredun gets the public involved in its work

PUBLIC ENGAGEMENT is a very active area within Moredun's knowledge exchange activities and involves a wide range of staff. Innovative projects are developed to help raise awareness of the relevance of science to people's lives and to encourage schoolchildren and members of the public to take more of an interest in scientific issues.

The acclaimed ENLIGHTENMENT project involved Scottish photographer David McIntyre, who spent time with scientists at Moredun and other institutes across Scotland discussing their research. 'I wanted to produce images that would act as signifiers to the stories behind the research,' he explained. 'Some are quite abstract and show multilayered themes, while others involve a single bold concept.'

Moredun hopes that the exhibition will 'spark curiosity and debate about scientific discovery and its relevance to our everyday lives.'

Elsewhere, Moredun's education group comprises an enthusiastic group of STEM (science, technology, engineering and maths) ambassadors who volunteer their time to develop interactive and hands-on activities for schools and science festivals. Communicating important and relevant messages, plus a large helping of fun, means Moredun's educational work is a growing success, winning awards at events and attracting excellent reviews.

Moredun has recently teamed up with the Bright Business partnership to



MOREDUN PHOTO LIBRARY

work with teachers in rural areas of Scotland, with the aim of helping to support science in the classroom. The Science Sparks project covers a diversity of topics: health and wellbeing, climate change, biodiversity and renewable energy.

Debating topical scientific issues is also an important area and Moredun will host a panel debate at the Edinburgh International Science Festival. Held at the National Museum of Scotland on April 3rd, 2012, the event is entitled Feeding the 7 Billion and will discuss some of the issues surrounding food security.

ENLIGHTENMENT project:
www.moredun.org.uk/enlightenment

Edinburgh International Science Festival:
www.sciencefestival.co.uk

Working with children in an educational activity to explore the connection between drugs and bugs

NEWS

New chairman announced for RBGE

SIR MUIR RUSSELL KCB FRSE has been appointed as the new Chairman to the Board of Trustees of the Royal Botanic Garden Edinburgh (RBGE). He takes over the role from Sir George Mathewson, who had held the post since 2007.

The appointment will be for four years.

Making the announcement, Richard Lochhead, the Cabinet Secretary for Rural Affairs and the Environment, said: 'I am delighted that Sir Muir Russell has agreed to become the Chair of the Royal Botanic Garden Edinburgh. The Garden brings international visitors to Scotland and shares its expertise with many other countries of the world. I am confident that Sir Muir's expertise and extensive leadership experience at the highest levels in the public sector will ensure that the RBGE continues to make an important contribution to the current challenges facing the environment of biodiversity loss, climate change and low carbon living.'

Sir Muir commented: 'I attach particular importance to the continuing international excellence of its scientific work, as well as to its roles in education and in providing a fine experience for those who visit, from Scotland and elsewhere. There is huge potential in all these areas and I look forward to working with my Board colleagues and with the Regius Keeper and staff to help realise that potential.'



Sir Muir Russell, new chairman of RBGE

Members' reports

UMBS Millport / James Hutton Institute



Marine microplastics in the Clyde Sea

Natalie Welden of UMBS describes her findings on the effects of waste fragments

PLASTIC CAN BE FOUND everywhere you look in the modern environment. The search for cheap, durable, disposable goods has led to a material which is as ubiquitous a pollutant as it is a product. Over the past decade, marine plastic litter has become of great concern because of its aesthetic, financial and biological impacts.

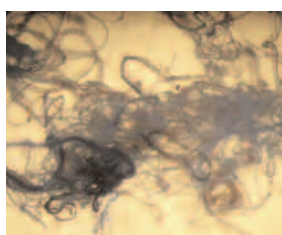
A research programme is under way at the University of London's, Marine Biological Station, Millport assessing the distribution and impact of plastics in the Clyde Sea. Much of the current knowledge regarding the effects of plastics is from research on large marine animals; however, weathering of plastic results in the creation of many small fragments, known as 'secondary microplastics', which are available to a much wider range of organisms. Little is known about the effects of these small plastic fragments, which form an ever-increasing proportion of marine debris.

Previous studies at UMBSM have identified high volumes of microplastic in the stomachs of *Nephrops norvegicus* (langoustine) from the economically important population in the Clyde Sea. The ingested plastic, mainly in the form of tangled filaments, was observed in over 87% of individuals sampled.

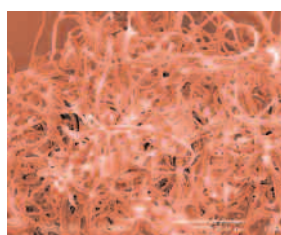
Although results indicate that langoustine may be able to expel some plastic during moulting, the impacts of filament aggregations amassed during



DR PR COVIE, UMBSM



Clockwise from above: langoustine mixed catch; scanning electron micrograph of tangled filaments (x 50); coloured filaments from a langoustine stomach; portion of beach-cast net showing tangled polyethylene or polypropylene filaments



the intermolt phase has yet to be determined. If effects are comparable to those observed in larger animals then undernourishment, reduced growth rate, and a rise in mortality may occur.

In species of high economic importance such as langoustine, reduced body size would result not only in lower prices per individual, but also in reduced reproductive capacity, because smaller individuals produce fewer eggs. Understanding the potential impact of microplastics on such species will require special consideration in order to successfully manage pressures on local stocks.

While the impacts of plastic have previously been examined in larger organisms, impacts of microplastic ingestion of animals at lower trophic levels must be considered in relation to their position in the food chain. Microplastics may be excreted by large individuals consuming contaminated prey, but their reduced nutritional value would require predators to spend greater periods foraging.

The project findings are intended to expand the current knowledge of the impacts of microplastics on invertebrates and, in doing so, to encourage research into more suitable materials and a reduction in the amounts of plastic released into the marine environment.

Natalie Welden is studying a range of aspects of microplastic pollution as part of her PhD.

If you would like more information about research at UMBSM please see www.gla.ac.uk/marinstation

Soil analysis and crime

Lorna Dawson of the James Hutton Institute on how forensic scientists help the police with their inquiries

SOIL WAS CENTRAL to the prosecution case in a recent murder trial as it was retained on a training shoe and a tracksuit. That mud, analysed by staff at the James Hutton Institute, matched the soil characteristics of the site where the body of a young girl had, unfortunately, been deposited.

The accused was found guilty on the combined basis of the soil itself, plastic material found within the soil and CCTV images.

In another case in 2011, an accused was found guilty of rape, the jury having been presented with evidence from soil mineralogy, organic sludge composition, along with matching of palm print and DNA evidence. These are just a few examples of where soil (and indeed associated material within the soil) can be used in the fight against crime.

What more important communication stream can we have



A police officer gathers evidence at a crime scene

than the forensic scientist with the police investigator – and also the scientist presenting results of a scientific analysis with the lawyers and a jury in a criminal trial? At the moment other cases have, in addition to soil, involved

fragments of vegetation, where staff at the RBGE were able to identify seeds on the sole of a shoe as coming from the scene of a burglary.



Scottish Natural Heritage
Dualchas Nàdair na h-Alba



Members' reports
Scottish Natural Heritage and University of Edinburgh

IN RECENT YEARS, studies have documented changes in phenology, the timing of natural events, in many British species. These changes have been linked to warmer springs as a result of climate change. However, until now, these studies have been mainly limited to bird or insect populations and we have had little idea how British mammals are responding to climate change.

Researchers from the University of Edinburgh (Institute of Evolutionary Biology) and Cambridge University have been studying the population of red deer at Kilmory, on the Scottish Natural Heritage National Nature Reserve of the Isle of Rum, for almost 40 years. During that time they have collected a vast quantity of data on the individual lives of these deer, following the birth, reproduction and death of around 3000 individuals.

Concentrating on data collected since 1980, researchers have identified significant changes in the timing of reproductive events in the deer study population. The results have been published in *Global Change Biology*. Calving dates have advanced almost twelve days. The rutting season has also become earlier, with hinds coming into oestrus around seven days earlier, and stags starting and finishing their rutting activities six and eleven days earlier respectively. This also means the rutting season has got longer over time. The date on which stags cast

The rutting season has become earlier, with hinds coming into oestrus around seven days earlier and stags starting and finishing rutting six and eleven days earlier

their antlers from the previous year has advanced by six days over the 28 year period studied, and the cleaning date of antlers (the date on which stags remove the velvet covering from their antlers, signalling the end of growth) has advanced by seven days.

Over the same period, the authors found that a measure of climate associated with plant growth – 'growing degree days' (GDD) – has also increased. This change in plant growth explains the changes in antler casting and cleaning dates, and the earlier start of the rut. However, although GDD is linked to oestrus dates and birth dates, the changes in GDD were not enough to explain the advances observed in these traits. Interestingly, although birth dates are changing, there has been no effect (yet) on hind reproductive performance,



MARTIN BAKER

Is climate change affecting red deer?

Katie Stopher of the University of Edinburgh weighs up the latest evidence

measured either by birth weights or offspring survival. Similarly, average stag breeding success has not increased, although antler masses are getting heavier.

The research team has now begun a new project, funded by NERC, to delve deeper into why these phenological changes are occurring, and what they mean for the deer

population. New analyses will try to understand the links between changes in weather, the vegetation on Rum and the deer. We will ask what consequences, if any, changes in climate have for the survival and breeding of different classes of the population: for example, young versus old animals, or females versus males. We will also try to understand the mechanism by which the deer are responding: are individuals adjusting their behaviour in response to the changing climate, or are the responses we see evidence of genetic change in response to climate change?

We will use this understanding, along with future climate change scenarios, to explore the likely impact of continued climate change on the future of the study population. Our hope is that this research, alongside that being carried out on other deer populations across the country, can shed light on how Scottish deer will respond to continued climate change.

More about Rum on Scotland's National Nature Reserves website, www.nnr-scotland.org.uk/rum



ALISON MORRIS

Members' reports

National Museums Scotland



Behind the scenes at the Royal Museum

Nick Fraser of NMS explains the thinking – and the research – behind the new Natural World galleries

HOW DOES THE WORLD WORK?

This is a question that has preoccupied natural scientists for centuries, and will continue to do so for generations to come. National Museums Scotland's new Natural World galleries set out to encourage others to ask the same question and, in looking for answers, to learn more about the world around us.

Our new galleries are not just for future Darwins, Einsteins or Maxwells. With this in mind, we made a deliberate effort to move completely away from the traditional museum that focuses on specific objects such as gems, birds or fossils. Instead, we chose to feature thematic designs that highlight fundamental processes such as volcanism, erosion, natural selection or animal locomotion. As a result we have some rather unexpected juxtapositions: a giraffe with the giant ground sloth, *Megatherium*, or a *T. rex* acting as a neighbour to an African elephant.

Judging by the public's response, we have got it right. We reopened the doors to the Royal Museum of Scotland building on July 29th, 2011. Even before the end of November we had welcomed our one millionth visitor. The has been overwhelming.

The Wildlife Panorama is a stunning array of swimming and flying animals that has been a magnet to the

Animal World galleries. Many visitors have marvelled at the skills of our own taxidermy department and the galleries have been greatly enhanced by some spectacular new taxidermy mounts.

We have also taken advantage of the multidisciplinary nature of the collections at NMS. The Earth in Space gallery features many instruments from science and technology, and documents how man has viewed and explored the skies and come to a better understanding of deep time and the origins of the universe. Some

The museum reopened at the end of July, and even before the end of November we had welcomed our one millionth visitor

significant new acquisitions to the collections are also featured in the galleries – these include a magnificent amethyst geode and a large polished block of orbicular granite in the Restless Earth gallery.

It is also important to remember that Natural Sciences staff members are actively involved in primary research and they are of course following in a great tradition.

Predecessors, such as James Hutton and Charles Lyell, have given Scotland an international reputation for the study of the natural world and also a

***T. rex* greets visitors to the museum's new Animal World gallery**

Facts and figures

The £47.4m redevelopment was funded by the Heritage Lottery Fund (£17.8 m) and the Scottish Government (£16m), with £13.6m from private sources.

- More than 8,000 objects, 80% of them on display for the first time
- New entrance hall at street level
- 16 new galleries
- Spacious gallery for international touring exhibitions
- Two discovery galleries for children and families
- New three-storey learning centre
- Reinstated Grand Gallery, with new 'Window on the World' display
- 50% more public space

very lofty goal to aim for. But in the coming years we hope to use a number of temporary exhibits to highlight some of the research that the museum's scientists undertake behind the scenes. One of the first of these is to go on exhibit later this month. Entitled 'Evolution's Missing Chapter', it documents a series of incredible new fossil finds made by noted Scottish palaeontologist Stan Wood in the Scottish Borders.

Others in the department are working on monitoring changes in insect diversity in localities ranging from tropical cloud forests to Scottish mountains. Such data can provide critical insights into recent environmental change. And of course we still have an incomplete understanding of species diversity. As our invertebrate zoologists continue to discover, the inventory of our own coastal waters is far from complete and new species continue to be found.

Our collections and the research carried out on them is an extremely important asset to future generations. Whether it is through the new permanent exhibits or future temporary displays we hope to inspire and excite future generations about the wonderful, vibrant and dynamic world around us.

For more about the National Museum of Scotland see www.nms.ac.uk





University of the
Highlands and Islands
Perth College

Centre for
Mountain Studies

Members' reports

Centre for Mountain Studies / Sniffer



JAYNE GLASS

Sustainable estates project highlights the importance of partnerships

Jayne Glass reports on the conclusions of a four-year study at CMS

RESEARCHERS FROM the Centre for Mountain Studies at Perth College, University of the Highlands and Islands, held three successful research feedback workshops in Braemar, Lochinver and Cairndow in October and November. The workshops were mainly funded through an ESRC Knowledge Exchange Small Grant, with other funding from the Scottish Government and Scottish Land and Estates. Participants included land-owners from a range of estate types; estate managers and land agents; academics from other institutions; staff from environmental charities and representative bodies; members of the local community; rural development professionals; and National Park staff.

The workshops focused on the need for more estates to work in partnership with communities and other organisations to deliver mutually beneficial rural projects and outcomes. In particular, the team explained that they have found that an 'open-door' policy and good visibility of estate representatives in the local community and with wider organisations are crucial.

The researchers presented a draft of a reference booklet entitled 'Working Together for Sustainable Estate Communities's. Workshop participants were asked to comment on the booklet; their feedback is being incorporated in time for the launch in spring 2012.

The team highlighted this topic because it emerged as a cross-cutting theme in the four research projects that make up the 'Sustainable Estates for the 21st Century' project, under way at the Centre for Mountain Studies since 2007. Now in its synthesis phase, the project studies sustainability in a range of different estate ownership models in upland Scotland.

Through case studies, the project looked in detail at a range of estates owned privately or by environmental or community organisations. It illustrated the impact of landowners' decisions on community resilience and highlighted the role of landowners in facilitating business and lifestyle opportunities through sustaining rural employment and supporting community-generated entrepreneurship.

To ensure the on-the-ground relevance of the research, an advisory group helped to design the project and met with the researchers once a year. The five group members represented key stakeholder groups: Scottish Land and Estates, Knoydart Foundation, Scottish Environment LINK, Cairngorms National Park Authority and the Scottish Government.

For more information, please contact jayne.glass@perth.uhi.ac.uk or visit www.perth.uhi.ac.uk/mountainstudies

Pictured above:
feedback event
at Cairndow

NEWS

Sniffer to take on new role

SNIFFER has been and will continue to be a valued and intelligent partner. To keep delivering for Scotland and with our partners we have looked at where we can add greatest value and what our offering should be in 2012.



Ruth Wolstenholme, MD of Sniffer

The external environment is changing with different funding opportunities which means we have to respond to that challenge. Our future focus is as knowledge brokers for a resilient Scotland – its people and places; knowledge for use across all sectors: public, private, third sector and academia. To bring benefits to Scotland we will ensure that we are connected nationally and internationally.

We are consolidating our work areas and can deliver an innovative partnership approach to:

- Sustainable cities and communities
 - Environment and Health
 - Climate Resilience
 - Environmental Regulation
- Our proven knowledge solutions include:
- Sharing good practice
 - Synthesising and translating evidence
 - Commissioning new studies
 - Targeted communications, guidance and training

For more information please contact Ruth Wolstenholme, ruth@sniffer.org



Members' reports

University of Edinburgh and others

British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Public perceptions of low-carbon energy technologies

Leslie Mabon of the School of GeoSciences describes an event that sought the opinions of a sample population

SCOTTISH CARBON CAPTURE AND STORAGE held a public workshop on CO₂ capture and storage (CCS) and low-carbon energy at the end of September 2011, with the aim of investigating Scottish citizens' perspectives on these issues. The study, commissioned by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) in Australia, replicates a number of large group process workshops held in Australia.

Ninety-nine workshop participants were recruited to form a representative sample of the Edinburgh and Lothians population. The workshop featured presentations by two experts on climate change and energy technologies, with a particular focus on CCS.

After the presentations, participants were given the opportunity to discuss the material in small groups of around 10, and had the chance to ask the experts questions. Before, during and after these activities the participants also completed a questionnaire on their knowledge about and attitudes towards climate change and energy technologies.

At the start of the day, participants showed a relatively high engagement with pro-environmental behaviour. More than 80% indicated that they use energy efficient light bulbs, conserve energy at home, use reusable bags when shopping, and recycle rubbish.



Offshore wind farm at Thornton Bank, near the Belgian coast

HANS HILLEMAERT VIA WIKIPEDIA CC BY-SA 3.0

Lots of people took pride in Scotland's achievements thus far in developing renewables. This was juxtaposed with frustration at the inaction of governments worldwide to address the climate problem

On average, participants had limited knowledge of climate change, energy use and energy technologies; however, self-reported knowledge of these topics increased significantly during the workshop.

Most participants agreed that climate change is an important issue for Scotland and believed that all actors – including government, industry and individuals – should be doing more to address it. Generally, support for renewable energy technologies was larger than support for non-renewable technologies. Wind, wave/tidal and solar energy received the highest levels of support both before and after the workshop. With regard to energy related behaviour and intentions, at the end of the workshop the majority of participants indicated that they were unwilling to pay more for electricity even if it would reduce greenhouse gases.

Qualitative analysis of the small group discussions helped to flesh out some of the quantitative findings, and

Farmer-friendly ways to reduce greenhouse gas emissions

DATES ARE BEING AGREED for the next series of on-farm meetings in the Scottish Government's Farming for a Better Climate initiative, run by SAC.

The project focuses on four volunteer farmers, each at the centre of a group of neighbours and researchers. Each group explores ways to reduce a farm's carbon footprint that are both practical and suited to local circumstances.

Greenhouse gas emissions from agriculture are estimated to be 20% of Scotland's total. If reduction targets are to be met, farming has to play its part. However, the groups are finding ways to reduce emissions that also improve business performance through increased efficiency.

The four farms are a dairy farm in Galloway and another in Tayside; a Blairgowrie upland beef unit; and an arable farm in the Borders.

The Butler's Stewart Tower dairy farm at Stanley, with its ice-cream parlour and shop, plays a particular role in helping consumers understand the issues. Permanent displays and organised farm walks help get the message across. At an event in October, farmer Neil Butler told visitors about herd management, his feeding regime and how he had addressed



Stewart Stevenson MSP (second from right) visits the Patons' farm at Auchencairn

energy use in ice-cream making. Later SAC specialists outlined how clover helps maintain soil health and discussed ways of supporting biodiversity in a changing climate.

The other farms focus more on messages for farmers. The most recent meeting at Upper Nisbet, near Jedburgh, explored precision farming techniques including GPS soil mapping and analysis. SAC staff and commercial speakers explained how detailed awareness of soil pH and nutrients helps avoid unfriendly and expensive leakage of fertilisers. Soil condition, grass



Centre for
Ecology & Hydrology
NATURAL ENVIRONMENT RESEARCH COUNCIL

Members' reports

SAC / CEH

suggested that engaging people in facilitated discussion about climate change and energy technologies can shift perspectives. For instance, participants justified a cautious stance towards CCS by explaining their concerns over leakage of CO₂ from geological storage sites and the possibility of funding shifting away from investment in renewable energy. Other participants did recognise the carbon mitigation potential of the technology, however, and supported continued CCS research and development.

Many participants expressed discontent at increasing energy prices, particularly as they believed that energy companies' profits are on the rise at the same time.

Lots of people did, on the other hand, take pride in Scotland's achievements thus far in developing renewables. This was juxtaposed with frustration at the seeming inaction of governments worldwide to address the climate problem.

SCCS is a collaboration between the University of Edinburgh (GeoSciences), Heriot-Watt University and British Geological Survey

Rhys Howell, Simon Shackley and Leslie Mabon (2011), Public Perceptions of Low Carbon Energy Technologies: Results from a Scottish Large Group Process, GCCSI & SCCS, Canberra & Edinburgh.

For further information on Scottish Carbon Capture and Storage visit www.sccs.org.uk

selection and slurry management also featured at Glenkilrie, Blairgowrie. Future meetings will consider renewables and, in conjunction with Forestry Commission Scotland, wood fuel from better managed woodlands.

On Torr Farm, Auchencairn, enthusiastic advocates Ross and Lee Paton have not only hosted group meetings on their organic dairy unit, but also met the press and briefed Stewart Stevenson MSP, Minister for the Environment and Climate Change. He saw the nitrous oxide monitoring chambers installed by Dr. Bob Rees of SAC's Carbon Management Centre and heard how the Patons had cut energy use and improved slurry management.

'Farming for a Better Climate', www.sac.ac.uk/climatechange/farmingforabetterclimate/

Simple controls on pollution could save lives and slow global warming

Alistair Dawson of CEH reports on an encouraging study

A STUDY PUBLISHED in *Science* has demonstrated that implementing 14 air pollution control measures could slow the rate of global warming, save millions of lives and boost agricultural production.

The study was carried out by an international consortium led by Drew Shindell from NASA's Goddard Institute for Space Studies and including Professor David Fowler of the Centre for Ecology and Hydrology, Edinburgh. It showed that implementing specific practical emissions reductions chosen to maximise climate benefits would have important simultaneous benefits for human health and agriculture.

Researchers considered about 400 emission control measures using current technology, targeting emissions of methane and black carbon. They showed that implementing just 14 of those measures could slow global mean warming by approximately 0.5C by 2050, prevent between 700,000 and 4.7 million deaths and boost global agricultural production by between 30 million and 135 million tonnes per year. These measures would influence climate more quickly than measures to reduce carbon dioxide.

Black carbon consists of pure carbon and is formed through the incomplete combustion of fossil fuels, biofuel and biomass such as wood. It is emitted in both anthropogenic and naturally occurring soot. Black carbon warms the climate in two ways. When suspended in air, it absorbs sunlight and generates heat in the atmosphere, which warms the air and can affect regional cloud formation and precipitation patterns. When deposited on snow and ice, it absorbs sunlight, again generating heat, which warms both the air above and the snow and ice below, thus accelerating melting. It also damages human health by entering the lungs and exacerbating a number of respiratory diseases.

Seven of the identified strategies target emissions of black carbon. They include installing particle filters in diesel vehicles; keeping high-emitting vehicles off the road; upgrading



Farms could limit emissions of methane from manure

Researchers considered 400 ways to control emissions of methane and black carbon, and showed that implementing just 14 of them could slow global mean warming by 0.5C

cooking stoves and heating boilers to cleaner-burning types; installing more efficient kilns for brick production; upgrading coke ovens; and banning agricultural burning.

For methane, the key strategies identified were capturing gas that would otherwise escape from coal mines and oil rigs; reducing leakage from long-distance gas pipelines; preventing methane emissions from urban landfills; updating city wastewater treatment plants; aerating rice paddies more frequently; and limiting emissions on farms from manure.

All 14 measures identified by the study have been successfully applied in different parts of the world.

Professor Fowler said, 'These control measures represent many win-win options with benefits for human health and climate as well as reducing waste. The strategy will be particularly beneficial in the rapidly developing regions of the planet.'

** Drew Shindell, et al. (2012) Simultaneously mitigating near-term climate change and improving human health and food security. Science 335, 183-189. DOI: 10.1126/science.1210026*

Climate change risk assessment

THE UK GOVERNMENT published the UK Climate Change Risk Assessment (CCRA) on January 25th 2012, the first assessment of its kind for the UK and the first in a five-year cycle. The points below are some of the outstanding features of the summary for Scotland.

The full CCRA report, the CCRA Scotland report, the CCRA Evidence Report and the CCRA Sector Reports can all be found at www.defra.gov.uk/environment/climate/government/risk-assessment/

- Drier summers may reduce water availability, affecting both the natural environment and public water supplies.

- Changes in soil conditions and other aspects of the natural environment may affect biodiversity and the ability of native Scottish species to thrive.

- Changes in climate may result in loss of species and changes in migration patterns.

- Changes in coastal evolution caused by more frequent extreme weather and by rising sea levels may impact coastal communities and habitats across Scotland.

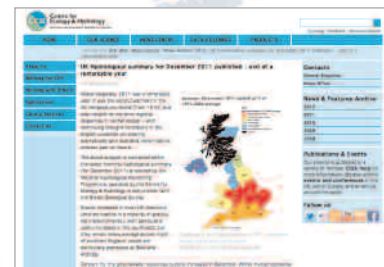
- Changes to water temperature and quality in the seas around Scotland could have a negative impact on the quality of shellfish and lead to shifts in the location of fish stocks.

- Warmer conditions may lead to an increase in forest productivity and in yields of key agricultural crops, although there is a potential for increased threats due to new or more widespread pests and diseases.

- Increased coastal and inland flooding may affect people, property, infrastructure, natural habitats and a range of animal and plant species.

- Increased temperatures are projected to lead to a substantial reduction in the number of deaths and hospital admissions in the colder months and an increase in the warmer months.

- Extreme weather events are projected to increase, which may lead to an increase in insurance losses and disruption to information and communications technology (ICT) and transport networks.



Rainfall charts, CEH website



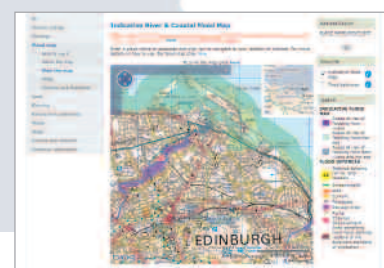
The CCRA has identified a number of gaps in the evidence and understanding needed to inform adaptation actions in Scotland. These include:

- The scale and extent of future flooding due to climate change (an assessment of present and future flood risk in Scotland is currently under way).

- Future 'range shifts' (changes in the geographic area where a species can survive), requiring a better understanding of species distributions and interactions, habitat shifts and landscape structure.

- The likely impact of climate change on food demand in Scotland and the implications for agricultural intensification and for biodiversity.

Flood risk map, Sepa website





Thinking about our daily bread

Murdo Macdonald reflects on the value and meaning of food

FOOD IS MORE than fuel for the body: a meal sustains us physically, mentally, emotionally and socially. Food is a gift: how we live and eat profoundly connects us to the rest of the world, and affects the lives of others locally and globally.

The contemporary urban consumer is distanced from aspects of the narrative that has shaped our culture. Many living in towns and cities feel insulated or alienated from the farms that provide our food. Disconnection from the land separates us from the creation in which we live, narrowing our vision and understanding.

Globally, the population will increase from seven billion today to eight billion by 2030, and probably to nine billion by 2050. Many of these people will be wealthier, creating demand for a more varied, high-quality diet leading to intensified competition for land, water and energy.

A billion people are substantially over-consuming, spawning a new public health epidemic of obesity. At the same time, 925 million people are hungry and another billion are missing important micronutrients (such as vitamins and minerals) from their diet.

Many systems of food production are unsustainable, degrading the environment and compromising the world's capacity to produce food in the future, as well as contributing to the destruction of biodiversity, soil quality and freshwater resources.

The role of the supermarkets

The four largest supermarket chains in Scotland by sales (Tesco, Asda, Morrisons and Co-Op) account for over 70% of Scottish food sales. The scale of their operations means that they can deliver a wide range of foods at low cost, can bring fresh food from around the world, and can maintain high standards of hygiene and quality.

On the negative side, the supermarkets exercise considerable power over their suppliers in Scotland and elsewhere, both in contract conditions and price, putting considerable pressure on farmers and food suppliers.

What can people do?

Many congregations and communities are responding to this challenge through practical food projects- growing food on



ISTOCKPHOTO.COM

Church among barley fields, Fife

church land, or running food co-operatives or community cafes.

While some people never lost the gardening habit, many people have little knowledge of growing food. Church projects can help people learn to grow food plants, offering fresh food in season and promoting new skills, companionship, and a healthier lifestyle. A number of successful community gardens and farms, based on a collective growing on community owned or rented ground, now exist.

Vegetable box schemes, farmers' markets or community bakeries support existing growers. The scheme 'Making Local Food Work', the Fife Diet and the development of local food charters are building a local food economy.

For the food served to children in schools, patients in hospital or to prisoners, the quality or origins of the food had often been secondary to price. The pioneering work in East Ayrshire schools to use locally sourced food in school meals shows what can be done.

Conclusion

We need to reflect upon the importance of food and agriculture and to ensure that we do not take our food for granted, but respond appropriately.

EVENT REPORT

Climate Connections forum

SNH Battleby Centre,
near Perth • May 13th, 2011

MANY ARE AWARE of the importance that changing climate poses for Scotland, whether this takes the form of increased risks such as flooding, or presents opportunities such as innovations around creating a low carbon economy and green jobs. There is a wealth of scientific endeavour and innovation within Scotland, for which we have an international reputation but in relation to climate change issues, it is spread across a range of organisations and networks.



Climate Connections: networking over lunch

The purpose of this seminar was not to look at the science of climate change, nor to hear of individual initiatives that are under way, *per se*. Rather it provided an opportunity to consider the role of knowledge networks in helping to shape the climate agenda and our collective responses in Scotland.

The seminar was designed to increase the visibility of activities and initiatives being undertaken by a range of different groups, involving researchers, knowledge brokers and research-users including the policy community.

Consideration was also given to the transfer of knowledge, from scientific research into the policy and commercial arenas, thereby enabling Scotland to become more responsive and resilient to climate change.

Details of this event can be found at www.ecrr.org.uk/events

ECRR member organisations

The University of Edinburgh	www.ed.ac.uk
Moray House School of Education	www.ed.ac.uk/schools-departments/education
Royal (Dick) School of Veterinary Studies	www.ed.ac.uk/schools-departments/vet
School of Biological Sciences	www.ed.ac.uk/schools-departments/biology
School of Engineering	www.see.ed.ac.uk
School of GeoSciences	www.ed.ac.uk/schools-departments/geosciences
School of History, Classics and Archaeology	www.shca.ed.ac.uk/Research/
School of Social and Political Studies	www.sps.ed.ac.uk
Biomathematics and Statistics Scotland	www.bioss.ac.uk
British Geological Survey, Edinburgh	www.bgs.ac.uk
Centre for Ecology & Hydrology, Edinburgh	www.ceh.ac.uk
Forest Research, Northern Research Station	www.forestresearch.gov.uk
Heriot Watt University	www.hw.ac.uk
Institute of Aquaculture, University of Stirling	www.aquaculture.stir.ac.uk
James Hutton Institute	www.hutton.ac.uk
Moredun Research Institute	www.moredun.ac.uk
Napier University, School of Life, Sport & Social Sciences	www.napier.ac.uk/fhlss/SLSSS
National Museums of Scotland	www.nms.ac.uk
Roslin Institute, University of Edinburgh	www.roslin.ed.ac.uk
Royal Botanic Garden Edinburgh	www.rbge.org.uk
Royal Society for the Protection of Birds - Scotland	www.rspb.org.uk/scotland
Royal Zoological Society of Scotland	www.rzss.org.uk
Science & Advice for Scottish Agriculture	www.sasa.gov.uk
Scottish Agricultural College	www.sac.ac.uk
Research & Development	
Education & Training	
Scottish Natural Heritage	www.snh.gov.uk
SNIFFER (Scotland & Northern Ireland Forum for Environmental Research)	www.sniffer.org.uk
Society, Religion and Technology Project	www.srtp.org.uk
University Marine Biological Station Millport	www.gla.ac.uk/marinestation
University of the Highlands and Islands (UHI)	www.uhi.ac.uk
Agronomy Institute, Orkney College	www.agronomy.uhi.ac.uk
Centre for Mountain Studies, Perth College	www.perth.uhi.ac.uk/specialistcentres/cms
Centre for Remote and Rural Studies, Inverness College	www.crrs.uhi.ac.uk
Environmental Research Institute, North Highland College	www.eri.ac.uk
Lews Castle College, Stornoway	www.lews.uhi.ac.uk/research
NAFC Marine Centre, Shetland	www.nafc.ac.uk
Scottish Association for Marine Science, Oban	www.sams.ac.uk
West Highland College, Fort William	www.whc.uhi.ac.uk

Design by mobo media www.mobomedia.co.uk

Printed in Scotland on recycled paper (100% post-consumer waste)
by The Jane Street Printing Company, Leith, Edinburgh

Members' meetings

Monday March 12, 2012

Edinburgh Napier University
Directors' lunch
Host, Kathy Velander

Monday April 16, 2012

Royal Botanic Garden Edinburgh
Executive Committee meeting
Directors' lunch, 12.30
Host, Prof Stephen Blackmore CBE FRSE

Monday May 21 (or June 4) 2012

Venue TBA
Board Meeting
Details to be confirmed
Directors' lunch, 12.30

Monday August 20, 2012

Scottish Agricultural College, Edinburgh
Directors' lunch
Host, Prof Geoff Simm

Monday October 8, 2012

Perth College,
University of the Highlands and Islands
Executive Committee meeting
Directors' lunch, 12.30
Host, Prof Martin Price

CONTACT ECRR

Scientific Director:
Professor Stuart Monro
stuart.monro@dynamicearth.co.uk

Secretary/Treasurer:
Dr Alastair A Macdonald
alastair.macdonald@ed.ac.uk

ECRR, Royal (Dick) School of Veterinary
Studies, The University of Edinburgh,
Easter Bush, Midlothian EH25 9RG

0131 650 6120

FUTURE ISSUES

Contributions to the ECRR newsletter
(formerly The Bush Telegraph) are
welcomed. All contributions, comments
and suggestions should be emailed to
the Secretary/Treasurer as above

COPY DEADLINE

Deadline for copy in the next issue is
March 30th 2012

DISTRIBUTION

For all queries about the distribution
of this newsletter, please contact the
Secretary/Treasurer as above

ON THE WEB

Back issues at www.ecrr.org.uk