

SHERKIN COMMENT

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Advances in Marking Birds for Migration Studies

Oscar Merne explains how technology has improved our knowledge of bird migration. 3

Bantry Bay's First Lady of Botany

John Akeroyd looks at the life & achievements of Ellen Hutchins, an early 19th-century botanist. 13

Extracting Water from Lakes & Rivers & its effects on their Ecology

Ciaran O'Bryne & Ciara O'Leary look at the ecological effects of meeting our water needs. 14

Conserving Irish Plant Wealth

Noleen Smyth on a new era of conservation research at the National Botanic Gardens. 20



Centre pages:

Exploring the Marine Environment

Photograph © Paul Kay: Long clawed squat Lobster

Contents

EDITORIAL: Shifting the Focus	2
<i>Matt Murphy on the need to assess our priorities.</i>	
Advances in Marking Birds for Migration Studies	3
<i>Oscar Merne explains how technology has improved our knowledge of bird migration.</i>	
Ending with a Whimper	4
<i>Alex Kirby on the importance of biodiversity.</i>	
Greening the Built Environment	5
<i>The third installment from Walter Mugdan on ways to reduce water consumption and pollution.</i>	
Wildwood Plan for Carrifran	6
<i>John Walters explains how a group are re-creating a fragment of woodland in Scotland.</i>	
What price trawling the seabed?	8
<i>Lin Baldock & Paul Kay look at a destructive fishing method.</i>	
Improved Governance of Marine Fisheries Can Recover Up to \$50 Billion Annually	9
<i>Kieran Kelleher explains why a new approach is needed for world fisheries.</i>	
To the Edge of the Southern Ocean – Tasmania	10
<i>Anthony Toole's travels take him to the most Southern part of Australia.</i>	
A Quilt of Environmental Protection	12
<i>Robert De Santo on the Structure of Environmental Law and Order in the USA.</i>	
Bantry Bay's First Lady of Botany	13
<i>John Akeroyd looks at the life and achievements of Ellen Hutchins, an early 19th-century botanist.</i>	
Extracting Water from Lakes and Rivers and its effects on their Ecology	14
<i>Ciaran O'Bryne & Ciara O'Leary look at the ecological effects of meeting our water needs.</i>	
Exploring the Marine Environment	15/16/17
<i>The photographer Paul Kay looks back on his career & tells of his love of marine wildlife.</i>	
Groundwater - All shaken up by earthquakes!	18
<i>Katie Tedd on what can be learnt from water table monitoring in the southeast of Ireland.</i>	
A Challenge for a Small Town	19
<i>Dave Crestin tells about efforts to keep a town in Cape Cod an environmentally sustainable resource.</i>	
Conserving Irish Plant Wealth	20
<i>Noleen Smyth on a new era of conservation research at the National Botanic Gardens.</i>	
The Northern Cousins	21
<i>A trip to Iceland is remembered by Daphne Mould.</i>	
Electric Rays in Irish & North-west European Waters	22
<i>Declan Quigley looks at a small order of rays.</i>	
The Burrenbeo Trust	23
<i>Brigid Barry explains the work of the Trust.</i>	
Publications of Interest	24
Is Short-term Monitoring Sufficient?	25
<i>A paper presented by the late Prof. Tony Fogg is as relevant today as it was in 2003.</i>	
Captain Cockle	26
<i>More exciting facts from John Joyce.</i>	
Making Bird Feeders & An Eye For Colour	27
<i>BirdWatch Ireland asks us to be creative!</i>	
Geological Map of Ireland	28
<i>Discover the rocks in your locality.</i>	
Water Conservation Worksheet	29
25-Year Celebrations of Gaisce the President's Award	30
Colour Me - Compass Jellyfish	31
Mississippi River Invasive Species	32
<i>Michael Ludwig on how Asian carp are taking over some rivers in the US.</i>	

Editorial

Shifting the Focus

By Matt Murphy

THIS is the 50th issue of *Sherkin Comment*. The great joy for me has been having such wonderful people contributing articles. A number have been with us from the early days. Dr. Daphne Mould has been our longest contributor since issue No. 2. She has been followed closely by Oscar Merne with his wonderful articles on birds. He has been onboard from issue No. 4. Michael Ludwig from Connecticut, USA, has kept us up to date since No. 8 with his articles on US marine matters. Tony Toole first began writing for issue No. 10 and has included many articles on science and on his travels. Other long timers have been Declan Quigley, Alex Kirby, John Joyce and Gaisce, not to forget John Akeroyd, who has so often highlighted the wonderful flora of SW Ireland with his articles. He has also guided our young botanists over the past 22 years on his annual visits to our station. To have these committed individuals, and many others, writing for our paper over the years has been a wonderful privilege for us at the Marine Station. I must mention one of our finest volunteers to come to the Station, Paul Kay, who has been so generous in providing many, many photographs for *Sherkin Comment* issues over the years. Most importantly, *Sherkin Comment* would not have survived for 50 issues without the wonderful support of our advertisers.

Sherkin Comment has a readership of over 70,000 people, which is wonderful for an environmental newspaper. My role as editor is to have articles, which are interesting and educational. I passionately believe education is the way forward in environmental care and that is why I try to bring a balance with articles from abroad, as well as from here in Ireland.

There is a huge mountain to climb now because with the demise of the Celtic Tiger funding for environmental projects will be caught in the massive cutbacks. Ireland is not alone. In the UK Natural England is set to shed 800 jobs out of a staff of 2500 over the

next four years. Half of these will go in 2011. The cut in funding will affect many nature conservation projects and also grant aid to small NGOs who do sterling work in protecting the countryside. Here in Ireland we have only a few NGOs involved in conservation. The next few years could see some of them having major financial problems as the government cuts bite and donations and membership dwindle. With less money to spend, people will be shifting their focus. Maybe this is an opportunity for NGOs to put

“The real success story of the volunteer movement, which has achieved major people participation, is the annual Tidy Towns’ competition.”

together programmes and enrol volunteers to expand their work. Up to now they have somehow failed to expand their membership throughout the country and become thoroughly national organisations. The real success story of the volunteer movement, which has achieved major people participation, is the annual Tidy Towns’ competition. It has brought such positive change and has transformed many towns and villages. The enthusiasm generated throughout the country is wonderful to see. In 2010 the Tidy Towns Competition had 764 entries from towns and villages. If we had a similar number of groups wanting to record and protect Ireland’s magnificent flora and fauna heritage, then we would see much less destruction of our natural heritage.

Tallanstown, a village in Co. Louth, won the 2010 National Tidy Towns competition. They first entered the competition over 26 years ago and in their first year came 713th in the competition. Within a decade they earned the distinction of being County Louth’s Tidiest village. This title has been retained ever since. Other awards have followed, culminating in the ultimate prize in the National Tidy Towns’ competition this year. Go to www.tallanstown.com and see the impress photographs of the village. Recently the committee completed a Wildlife Action Plan/Ecology study for

the village and have an ecology trail. We all could learn a lot from their efforts.

Something has to change in how we look at our natural heritage. Over the past 20 to 30 years we saw many acres of wetlands destroyed, the disappearance of thousands upon thousands of miles of hedgerows, as well as ringforts and historical buildings levelled - all without a whimper from any quarter. People’s obsession with wanting to make money meant nothing was sacred and town and city green areas were built on. Few

maximise the return from expensive infrastructure investment, to get the most efficient use of limited land resources and to help restore confidence by producing well located good quality developments. Excessive and unsustainable zoning of land has been a contributor to the property bubble and its aftermath.”

In recent times we have seen major flooding in towns and villages. Much of this is due to green fields and hedgerows being destroyed, which previously acted as soakaways, but have now become concrete jungles. Gardens, many of which in the past had green lawns are now concreted over to park the family car (see relevant article on page 9). So much residential and commercial properties were built on floodplains. Now we see that insurance companies are refusing to give flood cover. Added to this in certain places subsidence cover is also being refused. One must pose the question - do local authorities when they grant planning on a flood plain have the legal responsibility for the damage at a later date if such properties are flooded and the individual had been refused insurance cover? Similarly would the same issue arise on property built on certain area that are prone to subsidence?

Let us remember that we are only caretakers of this beautiful country. We must be diligent in the coming years and remember what we have learnt from the insane building boom of the Celtic Tiger. We must ensure that all of us get pride, pleasure and emotional sustenance from the beauty of our natural environment - even after 39 years on Sherkin Island, the sight of the sun setting over the Mizen Peninsula and nearby Mount Gabriel is a sight to behold. We must protect our natural environment because it is irreplaceable. It is hoped the new planning laws will go a long way to bringing about the necessary protection; if not, then the future is very bleak indeed for Ireland’s most precious heritage.

Matt Murphy, Sherkin Island Marine Station, Sherkin Island, Co. Cork.

Advances in Marking Birds for Migration Studies

By Oscar Merne

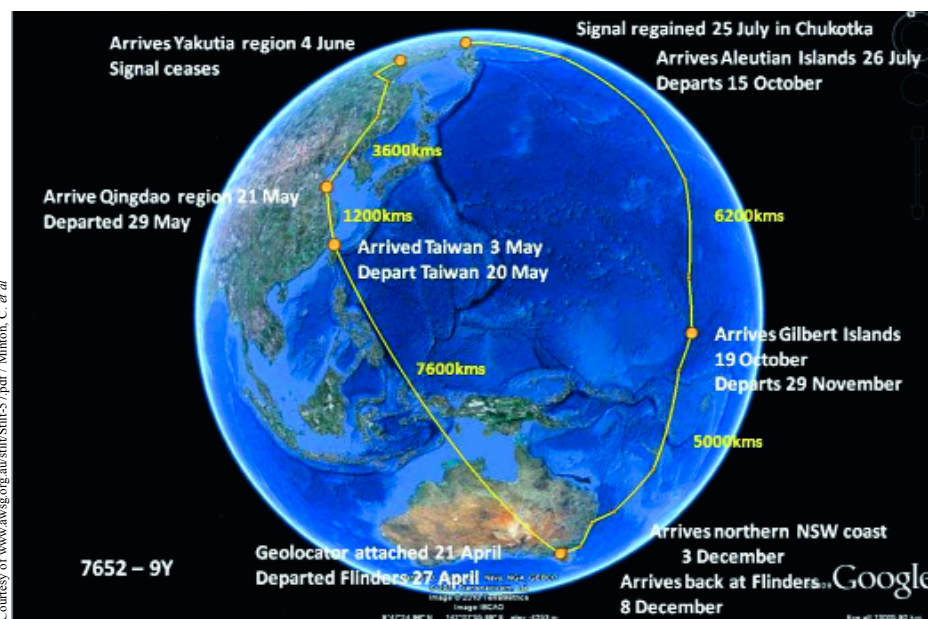
LAST year we celebrated the 100th anniversary of bird ringing in Britain and Ireland. The ringing scheme involved marking large numbers of birds (c.800,000 *per annum* in recent times) with individually numbered metal leg rings, and waiting for a small proportion of them to be reported back from various locations, from local sites and from as far away as Africa and South America. Each report was akin to a piece of a jigsaw, and when we had enough pieces the general picture of migratory flyways, staging areas and destinations began to emerge. However, for some research and conservation purposes the general picture was not entirely adequate, so ornithologists began to explore ways of refining our knowledge of the great seasonal migrations of many of our breeding and wintering bird species.

The use of field-readable colour rings, leg flags, and patagial tags, removed the necessity of recapturing ringed birds or of depending on reports of birds found dead. Multiple sightings of marked birds alive in the field enabled us to fill in many of the gaps in our knowledge of movements between the time and place of ringing and time and place of death or recapture. In Ireland these marking techniques have been used to good effect over the last 25-30 years on birds such as Cormorants, Whooper Swans, Greenland White-fronted Geese, Light-bellied Brent Geese, Hen Harriers, Mediterranean Gulls, etc.

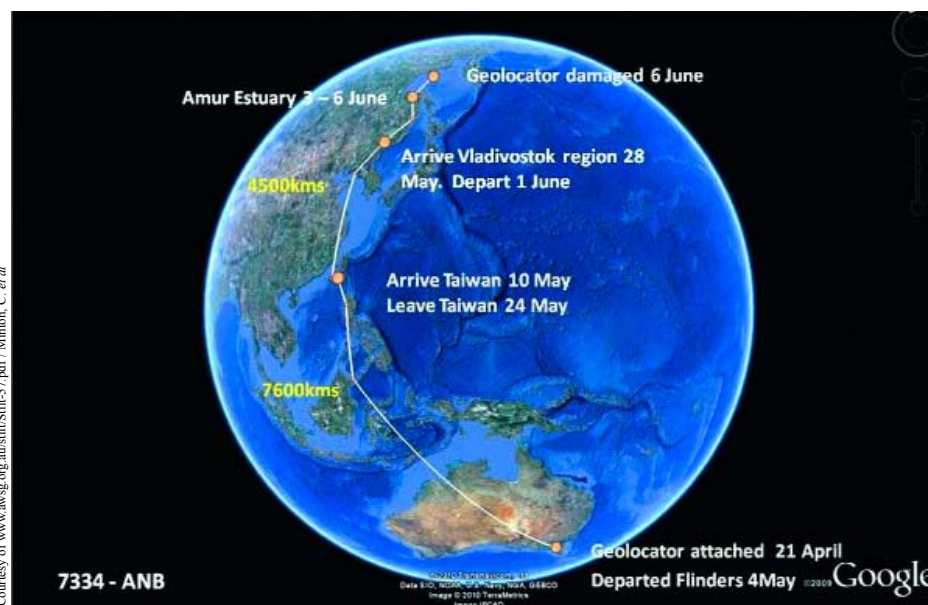
Metal rings and various colour marks are fairly "low-tech" methods for studying bird migration, but with the Russian launch of *Sputnik* in October 1957 the satellite age arrived. As a teenager, watching this first satellite pass over my garden on a winter's night, I never thought of the potential for tracking migratory birds. However, as more and more satellites were put into orbit, and satellite navigation and GPS were developed, it did not take very long for ornithologists to realise that large birds could be fitted with transmitters that would send signals up to the satellites, to be relayed back to Earth and decoded to plot the migratory flight path of the birds. The first generation transmitters were relatively large and heavy (>60 g) and were powered by lithium batteries with limited life expectancy. Therefore they could be used only in short-term studies on big strong birds such as eagles, storks, swans and cranes. However, in time, a switch to solar power and miniaturisation of the hardware brought the weight down to 12 g or less and made it possible to fit satellite transmitters onto medium sized migratory birds.

With the continuing reduction in size and weight it became possible to fit 16 Bar-tailed Godwits (a known long-distance migrant) with small, light satellite transmitters at a non-breeding site on South Island New Zealand in March 2007. The godwits were found to be using coastal estuaries in the Yellow Sea as a staging area before continuing to their breeding grounds on the tundra of eastern Siberia and Alaska. Some transmitters continued to function through the northern autumn return journey to New Zealand, and, amazingly, one bird made the journey non-stop from Alaska to New Zealand – a distance of 11,500 km in nine days. It might have done it in one or two days less were it not for its progress being impeded by strong head-winds in the South Pacific!

In Ireland, satellite telemetry has been used to great effect on a number of species in recent years. Greenland White-fronted Geese caught



Migration route recorded by geolocator for Ruddy Turnstone with leg flag 9Y. This bird departed Flinders (Victoria, Australia) 27 April, 2009 and returned 8 December, 2009, after a journey of 27,000kms.



Migration route recorded by geolocator for Ruddy Turnstone with leg flag ANB.



Ruddy Turnstone 9Y photographed in Taiwan on 11 May 2009 after departing Flinders (Victoria, Australia) on 27 April (photo: Huang Ming-Tang). Right: Closeup of geolocator with leg flag attached.



on the Wexford Slobs in winter were tracked to their breeding grounds on the tundra of western Greenland, highlighting the importance of stop-over sites in southern and western Iceland, and the ability of the geese to cross over the formidable obstacle of the Greenland icecap. A similar study was carried out on Light-bellied Brent Geese, which also rest and feed in Iceland before crossing the Greenland icecap and continuing on to their breeding grounds in the high arctic archipelago of northern Canada. This kind of information is invaluable for developing international strategies for the conservation of species throughout their range.

Following soon after the finding (by satellite telemetry) that Bar-tailed Godwits could fly non-stop between Alaska and New Zealand

came the equally exciting discovery that much smaller waders could accomplish similarly extraordinary feats of long-distance migratory flights. This time light-sensitive geolocators were fitted to six Ruddy Turnstones (the same species found commonly on Irish coasts outside the breeding season) at Flinders, Victoria, in south-east Australia in April 2009. The geolocators, weighing just 1 g, accumulated positional data until their batteries ran out, or, in one case, the geolocator was damaged. Remarkably, four of the six marked birds were recaptured back at Flinders between October 2009 and January 2010. When the accumulated data were retrieved they revealed that on the migratory journey from Flinders to the breeding grounds in Siberia the Turnstones had



Turnstones, Bray Harbour, Co Wicklow.



Bar-tailed Godwit



Ringed Brent Geese

flown non-stop to Taiwan, a distance of 7,600 km, in six days. On the return journey, one bird stopped briefly in the Aleutian Islands (Alaska), then made a non-stop four-day flight of 6,200 km to the Gilbert Islands (western central Pacific), where it made a prolonged stop-over. It continued its southerly journey on 29th November, arrived four days later 5,000 km further on in eastern Australia, and was back at Flinders on 8th December. How birds achieve this from a physiological and navigational perspective is another story!

Clearly, geolocators have enormous potential for future migration studies. They are tiny and weigh only 1 g and can be fitted to a wide range of the smaller migratory bird species. Furthermore, they are considerably less expensive than satellite transmitters (currently c.€25-30, compared with >€2,500 for satellite telemetry). The important thing is to have a high probability of recapturing the marked birds to retrieve the data from the geolocators, though sooner or later it would not surprise me if technological ingenuity enabled data to be downloaded remotely.

In the meantime, geolocators are being used in Ireland to track movements of Purple Sandpipers between a major wintering site in Co. Clare and breeding grounds in Iceland – or goodness knows where else! They are also being used on colonial seabirds to establish their breeding season foraging ranges so that the boundaries of designated Special Protection Areas can be extended to cover important feeding zones.

Oscar Merne retired from Ireland's National Parks & Wildlife Service in January 2004.

Ending with a Whimper

By Alex Kirby

IT'S a fair guess that if you asked ten people on the streets of any Irish (or British, or US) city to name the world's top environment problem, nine would tell you it was climate change. They'd be profoundly wrong – not because climate change doesn't matter (it does, more than most of us acknowledge), but because it is simply the best-known of all the converging environmental crises. Professor John Beddington, the UK Government's chief scientific adviser, has written of what he thinks is now just two decades away, the time when a "perfect storm" of food shortages, scarce water and insufficient energy resources threatens to unleash public unrest, cross-border conflicts and mass migration (*Guardian*, 18 March 2009). He could have added impoverished soil, growing pollution, and a rising global population. And he could also have mentioned one of the quietest and least-noticed crises of them all: the accelerating rush to extinction of so many of the world's species.

Few people, I'd guess, know that scientists believe species are becoming extinct between a hundred and a thousand times faster than the natural rate. Few will know why that matters – not just to the species themselves, but also to us. I wonder how many know that the UN has a specialised agency devoted to conserving other species, and could name it – the Convention on Biological Diversity (CBD).

Biodiversity is not a word that trips naturally off the tongue, and I wish we could talk instead about wildlife or something else just as scientifically imprecise but vastly more intelligible and evocative to most of us. Beyond that there's the Convention. The CBD, even by the standards of the UN, is a secret so well-kept that it seldom registers at all with most people. Whether it does good, bad or nothing at all, it does it by profound stealth. And that is a pity, because the threat it exists to avert is as serious as climate change itself. When it does lift its head above the parapet, the CBD makes some trenchant points. In May 2010 it launched the third edition of its Global Biodiversity Outlook. Its message was dire: 'The target agreed by the world's Governments in 2002, "to achieve by 2010 a significant reduction of the current rate of biodiversity loss at the global, regional and national level as a contribution to poverty alleviation and to the benefit of all life

on Earth", has not been met.'

The report does not make for more cheerful reading as you press on. Findings include:

- Nearly a quarter of plant species are estimated to be threatened with extinction. The abundance of vertebrate species... fell by nearly a third on average between 1970 and 2006, and continues to fall globally, with especially severe declines in the tropics and among freshwater species...
- Crop and livestock genetic diversity continues to decline in agricultural systems.
- The five principal pressures directly driving biodiversity loss (habitat change, overexploitation, pollution, invasive alien species and climate change) are either constant or increasing in intensity.
- The ecological footprint of humanity exceeds the biological capacity of the Earth by a wider margin than at the time the 2010 target was agreed.

The executive summary ends with this warning: 'The action taken over the next decade or two, and the direction charted under the Convention on Biological Diversity, will determine whether the relatively stable environmental conditions on which human civilization has depended for the past 10,000 years will continue beyond this century. If we fail to use this opportunity, many ecosystems on the planet will move into new, unprecedented states in which the capacity to provide for the needs of present and future generations is highly uncertain.'

Ireland? Only 10% is forested, the coasts are overexploited and polluted, and hedges are vanishing as land is cleared.

In the UK the Joint Nature Conservation Committee produces Biodiversity in Your Pocket. Its 2010 update assessed 33 conservation indicators and found that over the long term 27% showed some improvement, 30% revealed deterioration and 6% no or little change. For the remaining 37% there was not enough data to make a judgement. This echoes the experience of the Sherkin Island researchers, that reliable data collected over many years are gold dust for those who want to know what's coming.

Does all this matter to us? Yes. It's not just the prospect of the disappearance from the wild of the charismatic megafauna, the prospect that our children may never see a lion or an elephant outside a zoo. Even trees are therapeutic. Dr. Eeva Karjalainen, of the Finnish Forest

Research Institute, says forests and other natural settings can reduce stress, improve moods, reduce anger and aggression and increase overall happiness. Forest visits, she says, may strengthen our immune systems by increasing the activity and number of natural killer cells that destroy cancer cells.

And there are the cone snails, about 500 species all told. Each has its own set of toxins, some of which are thought promising for treating epilepsy, some forms of lung cancer, clinical depression, heart irregularities and incontinence. One toxin may be a thousand times more potent than morphine for treating pain. But millions of the snails are now killed annually for their shells, which are used to make jewellery, and their habitats are under pressure. An article in the journal *Science* said: 'Tropical cone snails may contain the largest

and most clinically important pharmacopoeia of any genus in Nature.' One of the authors wrote: 'If we fail to protect the cone snails, the loss to future generations would be incalculable.' And we are failing.

We owe biodiversity more than drugs alone. We rely on different species to oxygenate the atmosphere, purify drinking water, fix nitrogen, recycle nutrients and waste and pollinate crops. A few years ago, when the global gross national product stood at about \$18 trillion a year, US researchers estimated the value of the goods and services provided to the global economy by the natural world – at \$33 trillion.

Professor E O Wilson, the Harvard biologist once called 'the true heir of Darwin', has said: 'Destroying rainforest for economic gain is like burning a Renaissance painting to cook a meal.' He expanded that idea on another occasion: 'The one process now going on that will take millions of years to correct is the loss of genetic and species diversity by the destruction of natural habitats. This is the folly our descendants are least likely to forgive us.'

We are not here to exploit Nature, nor even to be its stewards (remember James Lovelock's comment that 'humans are as qualified to be stewards as goats are to be gardeners'?). The only way we shall survive is by accepting that we are part of the natural world. A group of entrepreneurs set up a plantation of Brazil nut trees, intending to gather a lucrative crop without having to trudge through the forest to the individual trees. The trouble was that the trees remained barren: they could bear fruit only as part of the forest community. We can learn from the nuts.

Alex Kirby is a former BBC environment correspondent.



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Greening the Built Environment

The Third in a Series of Articles

By Walter Mugdan¹

IN the previous editions of *Sherkin Comment* I wrote about the evolving “green construction” movement, which seeks ways to make our “built environment” more eco-friendly and sustainable. The first installment focused on the ways in which architects and engineers are working to reduce the “carbon footprint” — the total greenhouse gas (GHG) emissions associated with a building throughout its life. The second article focused on ways in which traditional air pollutants associated with construction can be minimised. This article looks at ways to reduce water consumption and pollution.

Stormwater runoff can be a significant source of water pollution, carrying large loads of sediment from construction sites; oil, grease and litter from pavements; and excess fertilizer and pesticides from landscaped or agricultural areas. Stormwater runoff also reduces the recharge of precious groundwater, hastening the depletion of aquifers. Stormwater runoff can be significantly reduced by maximising the amount of water that is permitted to seep into the ground at or near where the rain falls. This can be accomplished through a wide range of site design features, referred to collectively as “Low Impact Design” or LID. For instance, permeable or porous pavements can be used on parking lots and site roadways in place of traditional, impermeable pavement materials such as continuous concrete or asphalt. Permeable pavement dramatically reduces runoff, and though it is somewhat more expensive than traditional pavement, it can offset or eliminate other stormwater management and facility maintenance costs. Swales and bio-retention basins or cells can be incorporated into parking lot and roadway designs. Swales help conduct stormwater across an area while allowing seepage to occur in transit. Basins and cells provide multiple points at which water can percolate into the ground on site instead of moving across the ground and off site. Both swales and basins can significantly enhance the appearance of outdoor areas.

At the more elaborate end

of the spectrum of green stormwater management techniques is the green roof. A green roof is just that — a waterproof building roof that is used as an area for planting grasses, flowers, shrubs and even trees. Many commercial buildings have flat roofs that are suitable for installation of green roofs, which can dramatically reduce stormwater runoff. They have a range of other benefits, including significant reductions in energy

use, lengthening roof life by two to three times, noise reduction, and neutralising the damaging effects of acid rain. They are also aesthetically pleasing and even provide habitat for birds and butterflies. A growing number of buildings around the U.S. and the world now feature green roofs, including one of EPA’s own offices (in Denver, Colorado); the Chicago, Illinois and Atlanta, Georgia City Hall buildings; an Ikea store in

Stoughton, Massachusetts; and the Silvercup Film Studio in New York City.

Less well known is the concept of a “blue” roof. This is one that is designed and engineered to retain a large volume of water on the roof during the rain event (like a bathtub), and then let it out slowly after the rain has ended.

Stormwater can be captured on site — in a blue roof, a large underground tank, or in a surface impoundment — and can then be reused on site for landscape irrigation, toilet flushing or other non-drinking uses. For example, the Destiny Mall, an enormous shopping centre under construction in Syracuse, New York, is installing a 90,000 gallon underground tank to capture stormwater. The water will be filtered and then reused to flush toilets, reducing by over 50% the facility’s demand for water from the local utility and the volume of water sent to the local wastewater treatment plant.

Launched by EPA in 2006, WaterSense is the water efficiency analog to the Energy Star program. Water-conserv-

ing appliances such as high efficiency toilets, water saving faucets, and even landscape irrigation systems, are certified and now bear the WaterSense label. These appliances must use at least 20% less water than standard models, while also demonstrating that they perform as well as or better than the standard models. Like a number of other EPA voluntary programs, this one solicits entities to become WaterSense partners who will make commitments to use labeled products. Partners can include corporations, municipalities, utilities, water districts, trade associations and irrigation professionals, as well as appliance manufacturers and professional certifying organisations.

Reducing water use makes sense in many ways. Water resource demand and scarcity are increasing around the country, and so conservation is a compelling objective. In addition, drinking water and wastewater utilities account for 3% of total electricity consumption in the U.S., the vast majority of which is generated using fossil fuels. Any reduction in water use therefore translates quite directly into a reduction in energy use, and thus translates further into a reduction in greenhouse gases emitted.

Landscaping presents another opportunity to green

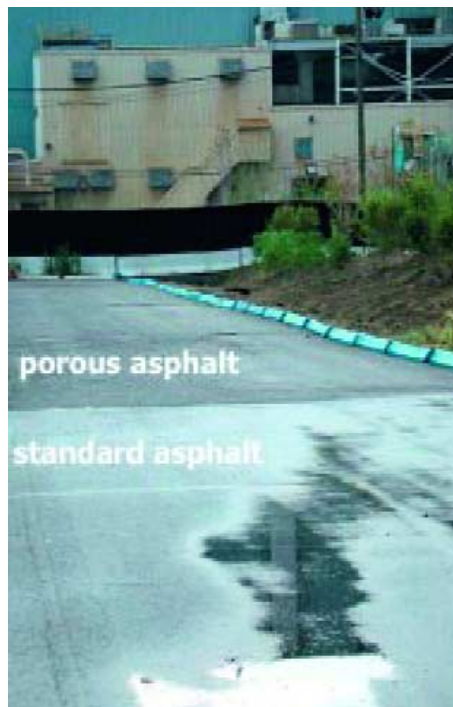


our developed areas. Large amounts of landscaping waste finds its way into U.S. landfills. And, of course, maintaining landscaping typically involves use of water for irrigation, and the use of fertilizers and pesticides, too much of which ends up in our groundwater and surface water. EPA’s Greenscapes Program offers information for both large-scale commercial landscapers and small-scale residential owners on how to reduce the environmental impact of their landscaping activities. Greenscaping can save money at the same time it helps reduce water pollution, solid wastes and GHG emissions.

In the next installment: recycling and re-using materials.

¹Any opinions expressed in this article are the author’s own, and do not necessarily reflect the position of the U.S. Environmental Protection Agency.

Walter Mugdan, Director, Emergency & Remedial Response Division, U.S. Environmental Protection Agency, Region 2, New York City. March, 2010



From top (clockwise): Biotension cells/swales in an Ikea carpark; Basins and cells provide multiple points at which water can percolate in the ground; Permeable pavement in a carpark, helping to reduce runoff; Roof water collection. A high efficiency toilet — one of the water-conserving appliances that are certified and bear the WaterSense label; Planted roofs are not only aesthetically pleasing but can dramatically reduce stormwater runoff. Comparing the porous and standard asphalt.



THIS may look like a natural landscape – but it's not. These hills would once have been covered with a rich tapestry of native woodland. So, for the past 15 years, a dedicated group of volunteers has been trying to turn the clock back.

Carrifran glen, carved by ice in the heart of the Moffat Hills.

Wildwood Plan for Carrifran

By John Walters

IN 1993 a group of friends came up with the idea of re-creating a fragment of the wildwood that originally covered the hills of southern Scotland.

They spent years searching for the right place, planning the project and negotiating over costs, before finally buying the dramatic hills around Carrifran in the northeast of Dumfries and Galloway in 2000. And, remarkably, the £400,000 costs were met without the use of any public funding – the money was raised entirely from like-minded supporters throughout Britain and overseas.

Carrifran is a magnificent ice-carved valley in the Southern Uplands between Moffat and Peebles. It covers more than 6 sq km (2.3 sq miles), rises to over 800 metres (2,625 feet) and takes several hours to walk round. Like much of upland Britain, it has lost its natural woodland cover, along with many of the wild creatures that depended on it. That loss came about through a long history of felling, burning and grazing by sheep, cattle and goats.

The large range of altitude at Carrifran offers a chance to re-create a variety of woodland, including treeline habitats around 700 metres (2,296 feet), which are rarely found in Britain today.

The friends who started the project came together as a Wildwood Group in 1995, and also helped to form the Borders Forest Trust (BFT). The trust is an environmental charity that seeks to conserve, restore and manage native woodlands for the benefit of people and wildlife.

“We were all sure that we should think big,” explained Philip Ashmole, one of the founding members of the Wildwood Group, “so we set out to create a 6,000-year-old natural environment in a single treeless valley.

“We hoped this would pay back some of our dues to the wild animals and plants that once lived there, as well as make an impact on the minds

of those who came to know about it.”

Planting begins

On Millennium Day, 1 January 2000, about 100 volunteers celebrated the purchase of Carrifran by planting the first trees. A complete plan for restoring the site had already been developed, and funding and advice from Scottish National Heritage (SNH) allowed the steering group to appoint a project officer to take forward the work.

Since then, more than 450,000 native trees and shrubs have gone into the ground. About 10% of the trees have been planted by volunteers, who have con-

tributed their time and enthusiasm to not only plant trees, but also bash bracken, repair paths, remove unnecessary fences and generally clear up.

The rest of the tree planting has been down to contractors who come back to work at Carrifran year after year, and are therefore a vital part of the Wildwood project. Both contractors and volunteers are prepared to work high up in the hills through the winter, probably meeting tougher conditions than just about any other tree planters in Britain.

Decisions about which trees to plant can be made with confidence because the Wildwood Group have identified the tree species that grew in the original wildwood at Carrifran.

They have a complete pollen record taken from a peat bog on the site and they're familiar with the conditions that each species prefers. Moreover, they gathered and grew thousands of seeds and cuttings from the Southern Uplands, so they knew the trees being used were adapted to the local climate.

Visitors to Carrifran and those who drive past now can readily see the developing woodland near the mouth of the glen, where some trees are about five metres (16 feet) high. It takes more careful searching to spot the hundreds of thousands of trees and shrubs spread over the more remote parts of the site.

“We set up the Wildwood project to show that, in a



Volunteer planting trees by Firthhope Linn.

Photos courtesy of Philip Ashmole



Newly established woodland and unplanted flushed ground beside the Carrifran Burn.



Photos courtesy of Philip Ashmore

CLOCKWISE FROM ABOVE: Start of planting at Carrifran on Millennium Day - with piper; Volunteers relaxing in the new woodland; Trees for spring planting 2008; Firth Hope planting.

world weighed down with environmental problems, we don't have to just sit back and wring our hands," added Philip. "We can take action and do something positive."

"This project proves that people have the power to reverse environmental harm, and we hope it will inspire others to come up with even bolder schemes to restore areas that have been degraded down the centuries."

New project

Given that over 95% of native woodlands have been lost in the south of Scotland, BFT have also been looking for other opportunities to support the public's enthusiasm for restoring woodlands.

And they've just announced that £700,000 has been raised to buy 640 hectares (1,580 acres) of land at Corehead, north of Moffat, which lies just over the hills from Carrifran. The hills and valleys of Corehead were historically part of the wild Ettrick Forest, and BFT plan to restore the heather moorland and native woodland that once thrived there.

The famous Devil's Beef Tub also forms part of Corehead. This is one of the most



Courtesy of Hugh Chalmers

iconic landmarks in the south of Scotland, taking the form of a cavernous hollow in the hills where the notorious Border Reivers once hid their stolen cattle.

Corehead extends to within three kilometres (1.8 miles) from Carrifran, offering the possibility of making a connection. The surrounding hills form the watershed between the Tweed and Annan river systems, so there's potential to create links across the hills and rivers.

If you'd like to read more about Carrifran, then why not buy a copy of the recently published book The Carrifran Wildwood Story: ecological restoration from the grass roots, which was also supported by Scottish Natural Heritage. All the money raised through sales



goes to support the project. To find out more about the book, you can download a preview and print off an order form at www.carrifran.org.uk or buy online at www.borders-forestrust.org

(Article reprinted with permission from "The Nature of Scotland" Winter 2009 - www.snh.gov.uk)



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What price trawling the seabed?

By Lin Baldock & Paul Kay

THIS article is written from the perspective of divers with extensive underwater survey experience in Britain and Ireland. We are familiar with the sites concerned over a long time period (over 25 years in some cases). Inevitably fishermen earning their living by trawling will have a very different view on the perceived sustainability and impact of this type of fishing.

Trawling for bottom living fish or dredging for scallops involves towing heavy fishing gear across the seabed. One type of trawl is a funnel-shaped net which is towed across the seabed. The mouth of the net is held open by a pair of otter boards, each weighing up to 100kg, with a tickler chain running from one board to the other. These boards are hauled along the seabed and the chain strung between them is intended to force fish up off the seabed and into the net behind where they are trapped. Scallop dredges are typically 1.5m across with a mesh of chain in the belly and with back netting to hold the scallop catch. Powerful boats can tow five such dredges each side covering an 8m swath across the seabed. On scallop dredges, a bar on the leading edge of the dredge has 15cm long 'teeth' which dig into the sediment forcing the scallops, which usually lie flush with the seabed surface, into the net.

With modern electronic navigation equipment and highly accurate bathymetric charts skilled skippers can work right up to the edge of rocky reefs and other obstructions, such as wrecks. With historical trawl tracks saved on the navigator it is also possible to cover 100% of the seabed of an area. Powerful boats can now tow dredges over some low reefs, which in the past provided a refuge for marine life.

To visualise the impact of towing this heavy gear through fragile, three dimensional seabed communities, imagine the effect of dragging the equivalent of an agricultural harrow through your vegetable garden. Once a year and you would only be able to

grow annual plants. Once a month and it is unlikely that you would be able to produce a crop of anything, even lettuces and radish!

Seabeds which appears flat on the sonar will actually consist of a range of sizes of pebbles, cobbles and boulders. This underwater 'landscape' provides a diversity of micro-habitats for varied communities of marine species from sponges to juvenile fish. Importantly, these communities have a three-dimensional structure which include upright colonies of seafans, sponges, sea squirts, and other creatures. Trawling rearranges these pebbles, cobbles and boulders and destroys the community structure. Often the smaller rocks are removed, leaving a flat, essentially two-dimensional habitat.

There are striking examples of this damage off the Dorset coast where anything larger than an apple has been scraped away. Constantly working the seabed also produces more mobile, less stable, less cohesive sediments and the original habitat is destroyed. Fine sediment is also released into the water column causing wide spread problems with siltation. There is some difficulty in quantifying this destruction to the satisfaction of statisticians given the great variability of natural communities. However, the damage is clearly evident to an experienced diver visiting the site. Whilst the species in an area may remain largely the same, it is significant that the STRUCTURE of the community has been destroyed.

In Lyme Bay off the Dorset coast of England an area of seabed was closed to mobile gear in July 2008. Since then static gear (pot/gillnet) fishermen have noticed an increase in the quantity of their catches. These bouldery seabed sites have been dived for many years and the destruction of the diverse benthic community is clearly evident in areas repeatedly trawled for king scallops (*Pecten maximus*). Boulders are turned over or repeatedly rolled around and there are often many gaping, still paired shells of recently killed scallops. Many live scallops also have large chips on the shell

edges indicating physical damage from trawls which are clearly impacting on the scallops but not catching them.

There is also an increase in the siltiness of the area with a dusting of mud and fine sand over all surfaces. The tragedy is that this crude fishing method, especially in these boulder reef habitats, is at best 10% effective. For each tow more scallops are damaged and killed on the seabed than are caught in the dredge. In Lyme Bay the tidal currents accumulate the broken fragments of marine life at the base of the rocky reefs where they wash around for a long time. Recent survey work on shores at the eastern limit of Lyme Bay has shown that these fragments are eventually thrown up onto the beach where recently dead seafans, dead mens' fingers, branching sponges, seafans and Parchment worm tubes can be found sometimes in large numbers on the strandline. This indicates that the trawls are causing substantial damage to both their target catch and to numerous other species.

So how long does it take for the seabed to recover once bottom trawling/dredging is stopped? Monitoring in Lyme Bay suggests that the recovery of the three-dimensional structure will be very slow indeed, even if a full recovery does take place, which is by no means a certainty. Many of the species typical of the original communities are still present, but only as small, isolated individuals or thumbnail sized colonies a few millimetres high. The dense mats of sea squirts, huge ross coral colonies up to 50cm across, tall, graceful branching sponges 30cm high, thick bunches of seafans with their complex associated communities of bryozoa, small crustaceans and polychaete worms providing food and shelter for a variety of species are still absent after three years.

It is difficult to pin down cause-and-effect to the satisfaction of the authorities who are loath to take the 'precautionary approach' and restrict or ban a particular activity because of the impact this will have on fishermen and their livelihood. Whilst this is perfectly understandable it may never-the-less prove to be a short sighted approach. How-



Undamaged marine life in Lyme Bay, Dorset with large seafans, upright branching sponges and ross coral bryozoan.



A dead shell of the king scallop showing badly damaged shell margin.



Shell of a five year old king scallop showing shell margin damage which took place in 2008 prior to the closure, followed by two further years of growth.

ever, with the decline in shell-fish stocks and increasing vessel running costs, the actual value of scalloping to local economies may not compare favourably with income derived from activities such as angling and diving.

How can such fisheries be best managed to continue to provide employment long into the future and harvest a luxury food enjoyed by many? Bottom trawling can be continued on less uneven ground, though this fishing method will radically change any type of seabed. Areas can be closed to certain methods of fishing and penalties for infringing regulations should be meaningful in terms of the reward gained by breaking the rules.

In the UK, diver caught scallops are greatly preferred by chefs in high class restaurants particularly where they are to be served in the shell. This is because dredged scallops are often gritty from sand forced into the shell so that they take longer to prepare for the table. Consumers could be more aware of the way the catch is taken and ask for diver-caught scallops for



Uprooted parchment worm tubes, branching and massive sponges, deadmens' fingers and branching bryozoans near a rocky reef in Lyme Bay, Dorset.



Colonies of deadmens' fingers on the strandline of the shore of Lyme Bay, Dorset.



Recently dead seafans tangled in discarded fishing line on the beach of Lyme Bay, Dorset.

instance. Often this comes at an additional financial cost, are people prepared to pay this premium price?

Lin Baldock is interested in the distribution of temperate marine invertebrates and has

a collection of underwater images from the UK and Ireland. Paul Kay is a marine wildlife photographer with almost 30 years of experience and has a special interest in temperate fish.

Improved Governance of Marine Fisheries Can Recover Up to \$50 Billion Annually

By Kieran Kelleher

POOR fisheries management—including overfishing and oversized fleets—means that the annual economic benefits from global marine fisheries are \$50 billion less than they could be. Over the last three decades, the cumulative loss totals over \$2.2 trillion.

The Sunken Billions: The Economic Justification for Fisheries Reform, a report produced by the World Bank and the Food and Agriculture Organization of the United Nations (FAO), argues that well-managed marine fisheries could turn most of these losses into sustainable economic benefits for millions of fishers and coastal communities.

Marine fishing operations are only part of the \$400 billion global seafood industry, but economically healthy catch operations underpin the sustainability of supply and profitability of onshore activities, which are a major source of employment in developing countries. For each person working at sea, it is estimated that another three are employed in processing, distribution, and other onshore activities. All told, such activities provide livelihoods for over 200 million people; 90 percent of these people are in developing countries and over half are women.

The Economic Losses

Increasingly over the last several decades, catching operations—the foundation of the industry—have become less economically efficient. The bulk of economic losses occur in two main ways. First, depleted fish stocks—more than 75 percent of the world's fish stocks are "underperforming assets," according to FAO—mean that there are fewer fish to catch, and therefore the cost of finding and catching them is greater than it might be (see Figure 1). Sec-

ond, fleet overcapacity means that the economic benefits of fishing are dissipated due to redundant investment and operating costs.

Other factors also play a role. For example, the loss of fishery habitat, pollution, rising sea temperatures, and the increasing acidity of the oceans are placing additional stress on already stressed ecosystems. Illegal fishing and unreported catches undermine fishery science, while subsidies continue to support unsustainable fishing practices. Growing pressures from climate change further reinforce the arguments for concerted national and international actions to rebuild fish wealth, while the heavy carbon footprint of some fisheries adds to the justification for fisheries reform.

This and previous studies highlight the massive overcapacity in the global fishing fleet: the current catch could be achieved with roughly half the current global fishing effort. These excess fleets competing for limited fish resources result in stagnant productivity and economic inefficiency (see Figure 2). In response to the decline in physical productivity, the global fleet has attempted to maintain profitability by reducing labour costs, lobbying for subsidies, and through increased investment in technology.

Right now, no one is winning. The real income levels of fishers are depressed, much of the industry is unprofitable, fish stocks are depleted, and other sectors of the economy foot the bill for an ailing fishing industry.

Recovering the Sunken Billions

The recovery of the "sunken billions" can take place through two main approaches. First, a reduction in fishing effort would increase productivity, profitability, and net

economic benefits. Second, rebuilding fish stocks would lead to increased sustainable yields and lower fishing costs.

At the same time, strengthened fishing rights can provide fishers and fishing communities with incentives to harvest responsibly and efficiently. Phasing out subsidies will improve efficiency. Greater transparency in the allocation of fish resources and greater public accountability for the health of fish stocks will help private initiatives to certify sustainable fisheries.

Reforms also will require investments in good governance, including measures to reduce illegal fishing and subsidies. In particular, subsidies for fuel and for investment in fishing vessels and fishing gear have contributed to the decline in catch-per-fisher and catch-per-vessel. Over \$10 billion in subsidies that directly impact fishing capacity and foster overfishing were provided in 2000. Close to 80 percent of the total global subsidy is provided by developed countries. Regular public reporting on the state of national fish stocks and their contribution to national wealth would also promote accountability and good governance.

Fisheries reform requires broad-based political will founded on a social consensus. Social safety nets and the creation of alternative livelihoods can be an important element of reform. These reforms can be integrated with poverty reduction programs and other instruments of economic and social development.

The alternative to reform—business as usual—is a continued decline in global fish wealth, increasingly inefficient harvest operations, growing poverty in fishery-dependent communities, increased risks of fishery stock collapses, and increasingly compromised marine ecosystems. In short, sustainable fisheries require political will to replace incentives for

overfishing with incentives for responsible stewardship. It is not just about boats and fish.

The Sunken Billions was supported by PROFISH, a World Bank partnership focused on policy initiatives for sustainable fisheries. www.worldbank.org/sunkenbillions

Kelleher (kkelleher@worldbank.org) of the Agriculture and Rural Development Department, World Bank. AGR website: www.worldbank.org/agr. It originally appeared in "Environment Matters 2009" (www.worldbank.org) and has been reprinted with permission.

This article was prepared by Kieran

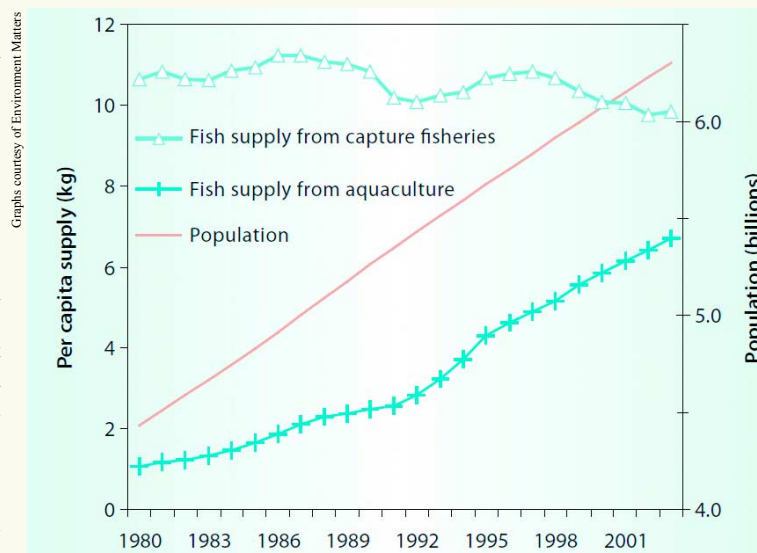


FIGURE 1 World population and global fish supply, 1970-2003 (Source: FAO FishStat Plus; World Bank 2006.)

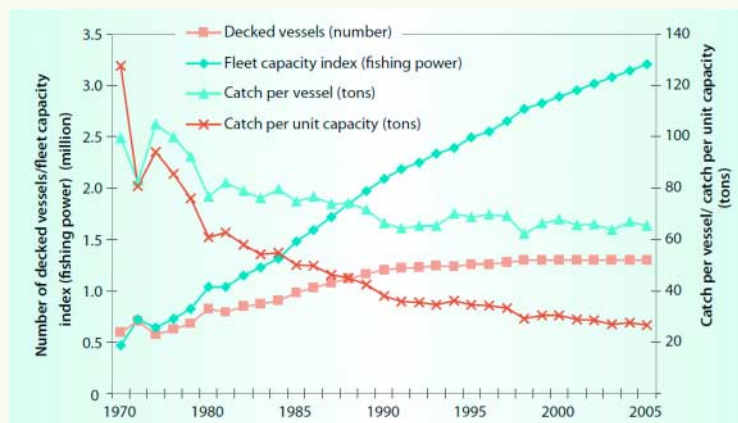


FIGURE 2 Evolution of global fleet productivity (decked vessels) (Source: Authors' calculations; Garcia and Newton 1997; FAO FishStat Plus; FAO FIEP.)

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To the Edge of the Southern Ocean

By Anthony Toole

THIS was the last day of the year, but also the hottest. With the temperature touching 38°C, even the sea wind was warm on our faces, as we bounced into it over the swell. Passing Tasman Island, we headed out toward the Southern Ocean. The next land was the Antarctic, 2500 miles away.

We had left Hobart before 8 am, and travelled to Port Arthur to board the boat that was to take us on our trip to the edge of the continental shelf. Leaving the jetty, we headed out past a gap in the trees that afforded us a first glimpse of Australia's most notorious penal colony. A short distance beyond this, our boat slowed down, perhaps to allow us to show a measure of respect as we passed the Isle of the Dead, where more than 1100 convicts, a high proportion of them Irish, lay buried in unmarked graves.

The Tasman Peninsula occupies the south-east corner of Tasmania. It is separated from the rest of the state by the Forestier Peninsula, which is itself constricted at both ends by narrow isthmuses. The narrower and more southerly of these, Eaglehawk Neck, was guarded, during penal times, by ferocious dogs that made escape from Port Arthur virtually impossible.

Though there is farmland, much of the peninsula is covered by natural vegetation, which supports more than 500 plant species, many of them rare elsewhere in Tasmania. Mammals include pademelons, Bennett's wallabies, wombats, possums and even small numbers of Tasmanian devils and eastern quolls. Some 120 species of bird have been recorded.

We moved past a line of crumbling cliffs of soft mudstones. Cormorants perched on undercut ledges, while the high trees above held the nests of white-bellied sea eagles.

Geological activity has resulted in



Tasman Island, which lies off the Tasman Peninsula on the south-east corner of Tasmania.



The Isle of the Dead, where more than 1100 convicts (a high proportion of them Irish) lay buried in unmarked graves.

a variety of landforms and a spectacular coastal scenery. Earliest are the mudstone marine sediments of the Permian era, dating back 250 million years. Then come the Triassic sandstones, and most recently the volcanic, dolerite intrusions of the Jurassic.

Erosion by the sea has significantly reduced the heights of the sedimentary cliffs, while merely smoothing off the sharp edges of the much harder igneous. In all three regions, the rocks have been undercut, in places, to leave arches, caves and stacks.

The seas around the peninsula contain common and bottlenose dolphins, pilot whales, several

varieties of seal and leatherback turtles. And there is the seasonal spectacle of humpback whales, migrating between the Antarctic and the Great Barrier Reef.

We continued across the bay, into deeper water, green with phytoplankton. The eastern cliffs, impressive from a distance, grew even more so as we approached. Tall columns of Jurassic dolerite, they rose vertically from the sea to crenellated summits. At their base were a series of caves, which did not appear too large, until one of them swallowed another cruise boat, the twin of our own.

When our turn came, we also drifted slowly into the darkness of



Australian fur seals, Tasman Island, with thick, tough fronds of bull kelp at the base of the rocks.

the cave. The wall at sea level was a vivid pink, from the coralline algae that was able to absorb the minimal sunlight that scattered into the darkest recesses. Clinging to the rocks at the cave mouth and along the base of the cliffs, were thick, tough fronds of bull kelp. Large jellyfish pulsed in the water.

We snaked around myriad rocky coves, past mini-islands and peninsulas, populated by gulls, gannets and cormorants. New Zealand fur seals basked on narrow platforms above the kelp, well out of reach of

the waves that must have lifted them there on a higher tide. For a short distance, the cliffs fell back, shrinking into the horizontally layered sediments of Triassic sandstone. Some sections had broken away from the cliffs and now stood above the water as precarious-looking stacks.

Then the dolerite again became dominant, rising to the 320-metre-high cliffs of Cape Pillar, the highest sea cliffs in Australia, and among the tallest in the southern hemisphere.

We now headed out past Tasman Island, and away from land. The boat accelerated, and began to bounce violently over the waves. Each bang brought yells of excitement from the passengers, and a splash of spray that explained why, in spite of the heat, we had all been given waterproofs to wear on boarding the boat.

We continued to where the continental shelf dropped suddenly to a depth of 1000 metres. Ahead of us, a large flock of short-tailed shearwaters, perhaps more than a hundred strong, frenetically plundered the sea's rich harvest, accompanied by a single, unhurried albatross.



Permian mudstone cliffs, made from sediment dating back 250 million years.



Permian mudstone cliffs, made from sediment dating back 250 million years.



Jurassic dolerite cliffs.

For a few moments, the sea in the midst of the shearwater flock appeared to toss and bubble. Then the spray transformed into a pod of dolphins, which came bounding toward us. They seemed to be as excited as we were. While nearly everyone on board clicked away with their cameras, the dolphins swam alongside us, leapt into the air and rode the bow wave, as if knowing that we wanted them to perform as dolphins are expected to perform. Even the two or three small children, who had been

apprehensive at the previous buffeting over the waves, became transfixed by the theatricals. After several minutes, we swung off to the west. The dolphins, seeming to lose interest in us, went away to investigate another boat.

But the wonders were not finished. Ahead of us, the flock of shearwaters thinned, giving way to around two dozen albatross, that circled calmly over the wave crests, with scarcely a wing beat. Even our guides were amazed. Neither had seen more than two or

three of these normally solitary wanderers of the open ocean on any previous occasion.

We circled back toward Tasman Island, its table-top summit supported, like Cape Pillar and the peninsula, by vertical dolerite organ pipes. On the mainland side, these were again broken into platforms, from which the tossed-off crests of the highest waves cascaded back into the sea.

Packing these ledges were herds of Australian fur seals, larger and noisier than their New



Bull Kelp.

Zealand relatives. As we passed, they called out, either to their companions or in warning to us. Occasionally, one or two plunged into the sea, and after a few moments of submersion, bobbed their heads up for a closer look at our boat. Their companions seemed content to bark insults at us from the safety of their cliff-side retreats.

We now headed back to Port Arthur. We had seen no whales, nor even the penguins that frequent the peninsula. Or perhaps they were there, but with so much else to draw our attention, we had simply missed them. With the birds, dolphins and seals, and the magnificence of the sky-scraping cliffs, we had more than sufficient to remember about this trip.

And as it was still early afternoon, we had time enough yet to explore the penal settlement before

returning to Hobart for the New Year festivities.

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Huge caves have formed at the base of the dolerite cliffs.



The Sustainable Energy Authority of Ireland supports the de
For more information log on to www.seai.ie/oceanenergy



The Sustainable Energy Authority of Ireland is funded by Ireland's EU Structural Funds Programme and is also funded by the Irish Government and the European Union.

A QUILT OF ENVIRONMENTAL PROTECTION

The Structure of Environmental Law and Order in the United States of America

By Robert S. De Santo, Ph.D

ENVIRONMENTAL protection in the US is imperfect. Note the catastrophic British Petroleum deep water oil drilling blowout disaster in the Gulf of Mexico last April. US Government estimates of 800,000 gallons and other estimates of 2,100,000 gallons of crude oil gushed into the Gulf every day. A total of about five million barrels (i.e. 210,000,000 US gallons) of oil were released during the 106 days between April and September, when the well was finally plugged. Inept, lax, and ineffective regulations and oversight existed prior to the disaster. Obviously, safety, control, correction, cleanup, and mitigation all failed, were inadequate, or were simply absent. It took months to create and implement some level of oversight that ultimately rested on an exceptional retired US Coast Guard admiral to figure out, organize, and apply a multifaceted response that may prove to be too little and was certainly too late. This one event significantly disrupted and destroyed untold environmental productivity, livelihoods dependant on that productivity, and the ecological health and stability of significant pieces of our "space ship earth" in the Gulf of Mexico. Yet, among world powers, the US remains an acknowledged leader in environmental protection. So, how can such a world power suffer its biggest man made ecological disaster in spite of its dedication to environmental stewardship? The fundamental answer is that the structure of environmental law and order in the US is so convoluted a quilt of

controls and objectives that no one person, nor any cadre of agencies is sufficiently empowered to integrate and direct this ponderous structure of law and order. When emergency environmental stewardship is called upon, as was the call to Admiral Allen, it results from impromptu reactive, not proactive, plans made at the highest level of a confused national government.

The initial charge for environmental protection in the US is embodied in the National Environmental Policy Act (NEPA)², signed into law by President Nixon in 1969. This law is the national charter by which rules and regulations promulgated in compliance with NEPA are intended to insure that environmental information for projects that receive any federal funding must be available to public officials and citizens before decisions are made and before actions are taken. Planning, science, and government regulation are the three mainstays of the environmental law of the US. So, why are there failures in spite of this massive, detailed, and multifaceted compendium of environmental laws and regulations? It is because the present structure of law and government in the US can not deal efficiently with big and immediate disasters. It does not dictate a unity of effort to manage and solve big environmental disasters.

NEPA is a law defined on 30 pages of Parts 1500 through 1508 of the Code of Federal Regulations (CFR), Title 40 (Protection of Environment) – referred to as 40 CFR. Those 30 pages influence all local, country, and state environmental laws in the country. The objectives, guidelines, and regulations of NEPA are contained in ever growing documents contained in

32 volumes of 40 CFR, first published in 1972. At that time, it contained a total of 450 pages. These 32 volumes of regulations are applicable to, and binding on, all federal government agencies that are now responsible to implement provisions of NEPA.

The 32 volumes are arranged in the following order of topics: General (parts 1 – 29), Grants (parts 30 – 49), Air (parts 50-97), Water (parts 104 – 149), Pesticides (parts 150 – 180), Radiation (parts 180 – 197), Noise (parts 201 – 211), Oceans (parts 220 – 239), Solid Waste (parts 240 – 302), Superfund (parts 303 – 305), Effluents (parts 407 – 471), Sludge (parts 501 – 503), Energy (parts 600 – 610), Toxics (parts 700 – 1400), and the Council on Environmental Quality (CEQ) (parts 1500 – 1700).

Starting in 1972 with 450 pages of text, 40 CFR has grown to 23,305 pages in its July 1, 2009 edition. Therefore, the average annual expansion of 40 CFR between 1972 and 2009 is nearly 630 pages a year. The resulting 2009 edition is nearly 53 fold larger than was 40 CFR when it first appeared in 1972. Most jurisdictions of local, county or state, environmental statutes in the US are directly or indirectly related to the national government and its regulations in 40 CFR. The growth of 40 CFR is depicted on the accompanying graph that shows the US has an implicit concern for environmental protection shared by its people and their government regardless of party affiliation. Forty CFR now reflects the input of 37 years of different congresses under the administration of 5 Republican and 2 Democratic Presidents. The sheer volume of these environmental laws reflects its importance to the country. Its com-

plexity and lack of unity reflects its ineffectual practice in critical circumstance and its lack of unity.

Frustrating failures overshadow codification of environmental regulations in the US. Those failures reveal the practical difficulty of legislating changes in life style. That is, the US government continues to promulgate thousands of pages of regulations to protect the environment and this effort has earned a deserved reputation for the country's effort to put these words into practice. Perhaps success will come as a result of our forced dealing with climate change, and/or famine, poverty, sickness, or war. These afflictions of society are linked to the environment and to our stewardship of our planet – a home resistant to destruction, but not indestructible. Collectively, we are short sighted and lack self-discipline and understanding of our sustaining environment.

The problem of there being no one person or agency able to understand and integrate the objectives of a massive and growing body of environmental law, calls for creation of an office of a "Czar of Environmental Protection." Reaction to disaster is a last resort needed when proactive control of a country's environmental protection has failed, as was the case with the British Petroleum disaster. A Czar would function to protect the integrity of the environment itself, not only to dictate actions during a disaster, but year round. The present helter-skelter structure of the law can not be expected to overcome failure of spontaneously confused and competitive fragmentation of the patch work of laws and disparate departments of government expected to save us from environmental disasters. The mas-



Pile of books – 40 CFR contains 23,305 pages in 32 volumes that stack up to a height of 0.99 metre (i.e. 39 1/8 inches).

sive forces mustered to solve environmental disasters must be integrated – orchestrated by a single overarching authority. Successful environmental stewardship that deals with major disasters requires objective caring for, and focusing on, the whole fabric of the environment and our whole protective quilt of environmental law and order. Such oversight must be based on a unity of effort as its foremost goal. The bigger the disaster, the less likely the present US structure is to work with a unity of effort and purpose.

Robert S. De Santo, Ph.D.
Founding Director, Institute of Environmental Stewardship,
Waterford, Connecticut, USA.

¹Space ship earth, a concept first expressed in 1879 by Henry George, the American writer and political economist, and adapted by Adlai E. Stevenson, U.S. ambassador to the United Nations, in his last major speech, to the Economic and Social Council of the United Nations, Geneva, Switzerland, July 9, 1965.

²<http://www.mnrg.gov/meetings/2005cimpacts/pdfs/CEQ.pdf>

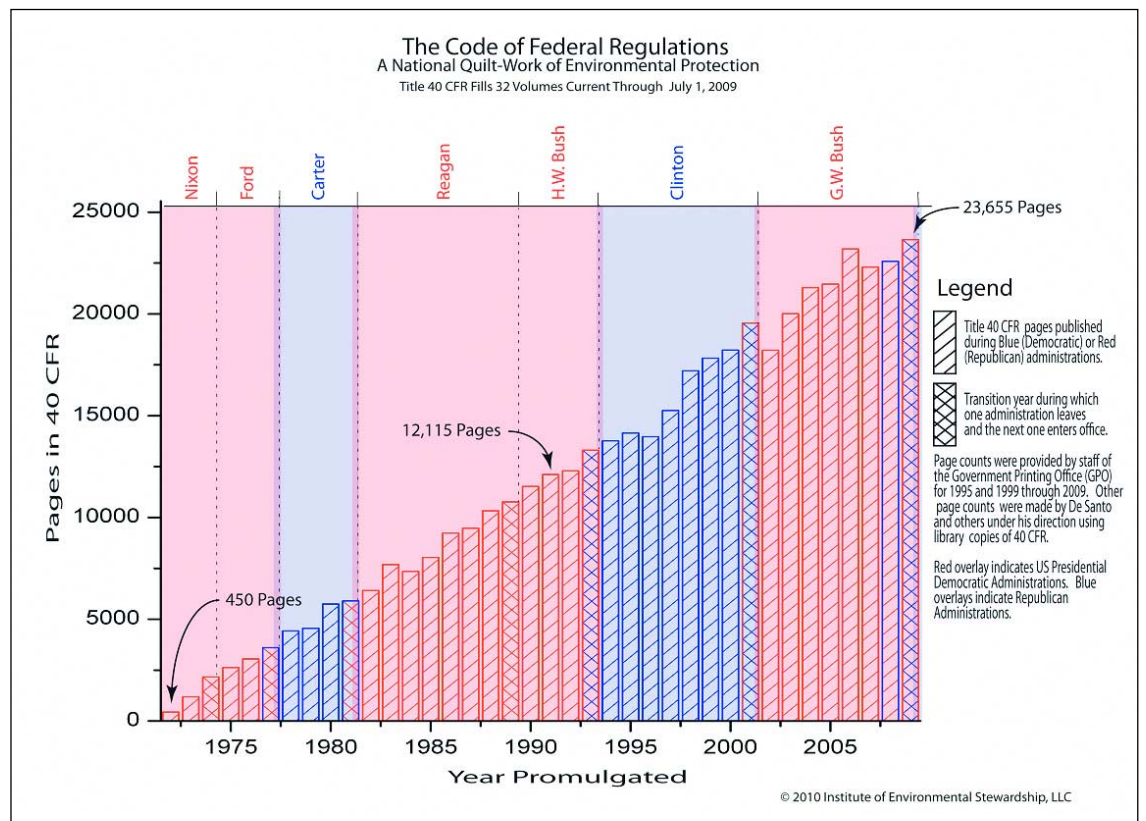
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JOHN AKEROYD looks at the life and achievements of an early 19th-century botanist.

ONE of the many pleasures of botany in West Cork is finding new and interesting plants. Another is to discover and track the work of others who've gone before: Philip O'Sullivan Beare, who lived on Durseay as a boy in the 1590s and later wrote *The Natural History of Ireland*, Charles Smith who visited West Cork in the 1750s, and the studies on Sherkin and Cape Clear by R.A. Philips in the 1890s–1900s and Oleg Polunin (who taught me at school) in the 1940s.

The most fascinating of all was Ellen Hutchins, perhaps the first woman botanist in Ireland. We know about her short life – she died just before her 30th birthday – mainly from her correspondence with English botanist Dawson Turner, a banker in Yarmouth. Born on St Patrick's Day 1785, she lived in the family home at Ballylickey, a lovely spot at the head of Bantry Bay, where life was peaceful just a decade after Wolfe Tone and the French had anchored off Bere in 1796.

Ellen's father, a Justice of the Peace, died when she was two. She was sent to Dublin to complete her schooling but fell ill. Her doctor, family friend and moss enthusiast Professor Whitley Stokes, tutored her in botany and recommended she spend time outdoors engaged in this healthy pursuit. Ellen's symptoms suggest chronic abdominal infection, perhaps peritoneal tuberculosis – a problem before pasteurized milk. One suspects too that the medicinal mercury she took may have killed rather than cured her! Sadly, her last years were also overshadowed by the death of her mother and a fierce family quarrel.

Like many 19th century naturalists, she had a microscope and clearly possessed a thorough knowledge of the algae, both larger seaweeds and tiny green and red cells that colour rocks, trees and 'pond-scum'. Microscopy is an ideal all-year and all-weather activity for an invalid, especially as Ellen was, as she said herself, short-sighted. This is probably why she concentrated on 'lower plants' – algae, lichens, mosses and liverworts, all needing close investigation of minute features. But in summer she made excursions, even into the hills, in search of flowering plants. She has left us a full annotated list of some 360 flowering plant species that she recorded, all near the head of Bantry Bay from seashore to hilltop – a first

BANTRY BAY'S *First Lady of Botany*



Bantry Bay, where Ellen Hutchins spent much of her short life studying the flora.



Photos courtesy of Robbie Murphy

Ellen Hutchins made good use of a family yacht to visit nearby islands, such as Whiddy Island (above).

Flora of West Cork.

Some of her records are tantalizing, even plants not recorded in Ireland. I've long realized it's foolish to dismiss anything from a scientist this good, and we may yet find she was right! Other finds are familiar but significant: coralline algae near Whiddy, Arbutus (still in Béara), and Juniper up on Hungry Hill. Having closely studied liverworts, plants requiring moist frost-free conditions, she appreciated the importance of Bantry Bay's Atlantic-Mediterranean flora. She well knew these special plants, especially the insectivorous butterworts (*Pinguicula*) and Bladderworts (*Utricularia*). Her radius of exploration was small but she made good use of a family yacht to visit nearby islands, including Whiddy, then owned by the Whites of Bantry House – this island has since attracted almost no botanists! Yet the Dwarf Elder (*Sambucus ebulus*) she found near Whiddy's O'Sullivan castle is still there. Other rarities, such as Pellitory-of-the-Wall on the castle walls and Wild Radish on disturbed ground, persist today, although nobody's seen Henbane for over a century.

But we remember her chiefly for her work on lower

plants. Her specimens were used by top botanists, including James Mackay in Dublin, and in England William Borrer, William Hooker and Dawson Turner himself. Her cousin Thomas Taylor, a doctor who lived near Kenmare,

was also interested in mosses and lichens, and with Hooker wrote *British Jungermannia* (1816), a treatise on leafy liverworts that included Ellen's records. Her collections are now in the herbaria at Kew Gardens and the Natural His-

tory Museum in London.

An enthusiast for books as well as botany, Ellen's letters reveal her familiarity with a range of authors, including Dante, Byron and the then poet and best-selling novelist Walter Scott. Homebound, she talks of how "I like travel". Had she lived, no doubt she would have appreciated Charles Darwin's work – like him, she was born into wealth yet was active and busy enough to be highly regarded for her science. And like Darwin, she was concerned with social issues, in her case the poor of Bantry.

Evicted from the family home by her oldest brother Emanuel, she moved to Bandon with her mother, who died in 1814. Ellen herself died in 1815 on the estate of another brother, Arthur, at Ardnag-



Butterwort

gashel near Ballylickey, where he had an arboretum. She was buried in the graveyard of Bantry's Church of Ireland, where there is a memorial. Several species of alga, lichen and leafy liverwort carry the name *hutchinsiae*, as does *Hutchinsia petraea*, a tiny annual flowering plant of limestone rocks. This is now called *Hornungia petraea*, but *Hutchinsia* is the recognized English name! The arboretum at Ardnagashel survives and its many fine trees, including a Cork Oak planted by Arthur, are themselves a fitting tribute to a remarkable botanist.

Dr John Akeroyd, who has studied the Irish flora for 30 years, edited The Wild Plants of Sherkin, Cape Clear and adjacent islands of West Cork (1996) and is author of A Beginner's Guide to Ireland's Wild Flowers (2008).

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Extracting Water from Lakes and Rivers and its effects on their Ecology

By Dr Ciaran Byrne
& Dr Ciara O'Leary

Economic Changes and Challenge

We all acknowledge that Ireland has been going through a period of rapid growth over the last 15 to 20 years. Our population has increased from 3.5 million in 1991 to 4.2 in 2006 (Central Statistics Office, 2006 census Report.) This population growth has not been evenly spread around the country; a significant proportion of it has been in the Greater Dublin Area (GDA). In 2006 the population of the GDA was 1.6 million people and the average daily demand for water was 515 Million litres/day (GDWSA Report 2006). We must ask where does all of this water come from?

In Ireland we have 74,000 km of rivers of which approximately 77% (56,980 km) are 1st and 2nd order streams (stream widths ranging from 0.8 to 2.57m) and approximately 12,026 lakes the majority of which are <1ha. So while we have a large wetted area it is spread out around the country in small tributaries and lakes. Yet these surface waters supply 83% of the population with water; the remainder coming from groundwater (boreholes 11% and springs 6%; Page et al. 2007 EPA Report). The highest demand for water comes from the urban areas on the east coast of Ireland; however it is the west coast that sees the higher percentage of rainfall throughout the year (1,000 to 1,250 mm/year compared with 750 to 1,000mm/year in the east; Met Eireann). This creates a dilemma, the demand for water is in the east and is set to increase, however the majority of the rainfall is located in the west.

The Community Climate Change Consortium (C4I) predicts that Ireland will have warmer wetter winters and warmer drier summers (McGrath et al. 2008). The average temperature in the year 2021 – 2060 will be 1 to 1.5 °C higher compared to the years 1960 to 2000. They are predicting a 10 – 20% increase in precipitation in winter and 10 – 20% decrease in precipitation in summer. While we may receive 750mm to 1,000mm of rain per year currently it is spread out over approximately 150 days, a change in rainfall patterns could see an increase in flash flooding and the distribution of average annual rainfall over a shorter time period. This predicted change in how and when we receive our water may have an effect on the ability to extract water. Can our water infrastructure cope

with increased amounts of rainfall in a monsoon style flood? If there is a concentration of rain in fewer days are we likely to witness an increase in drought conditions at other times of the year?

Extraction

For centuries human habitation has been clustered around the presence of freshwater (lakes and rivers) because it provides a source of water for drinking and bathing, provides food and was vital for transportation. Increases in population and recent developments have meant that the providers of water infrastructure, local authorities, must extract water from a greater range and number of sites to satisfy this increasing demand. The close proximity of humans to freshwater has in many cases had a negative impact on this important resource. 'Freshwater ecosystems have lost a greater proportion of their species and habitat than terrestrial or marine ecosystems making them arguably the most threatened of ecosystem types on Earth' (McAllister et al 1997). The effect this demand for water has on our lakes and rivers include, inter alia, a decrease in water levels. The euphotic zone is generally the most productive area of a lake; it is marked by the depth that sunlight can penetrate for photosynthesis. Extracting water from rivers and lakes reduces the water level and can leave plants and macro invertebrates exposed to desiccation thus reducing the amount of available productive habitat for the community. Lakes and rivers that have their water level controlled are exposed to fluctuating water levels with periods of desiccation followed by periods of submersion. This change in water conditions results in the success of less sensitive species and ultimately reduced species diversity. The less sensitive species are either tolerant of desiccation or are highly mobile to keep pace with the fluctuating water levels.

The drop in water level doesn't just impact the biology of the lake but also the topography, the exposure of plant roots to the air and the eventual die back results in increased soil erosion and possible collapse of the banks. Plants found lower down in the lake bed soon become exposed to wave action as a result of the decrease in water levels. The macrophytes found in Irish lakes are generally poor at rooting and during stormy conditions they can be easily uprooted and deposited on the lake shore, leaving the lake bed barren and interrupting the functioning of the ecosystem. A drop in water level

can also lead to the exposure and concentration of mineral salts in upper soil layers; which can negatively impact plants that require low salt concentrations.

A reduction in water levels and flow means a shallower water body is subject to greater temperature change. Increasing water temperatures in summer can result in oxygen depletion and fish kills, the other extreme is an increased risk of freezing in winter months cutting off a food supply for birds and other fauna. As a result of these variations in temperature and a general increasing trend in water temperatures we may ultimately see a shift away from cold water species like trout and salmon to more temperature tolerant species like coarse fish and pike. Downstream from these river systems the transitional waters these rivers flow into may also see an increase in saline conditions due to the reduction in freshwater reaching them. This can also result in a change in the fish community structure with an increase in fully marine species and a decrease in estuarine species.

Return of Extracted Water

While there are many problems associated with removing water from the ecosystems there are also issues with the water we return to rivers and lakes. A percentage of the water that is returned to our rivers and lakes is contaminated with chemicals such as nitrogen, phosphorus, pesticides, bacteria and synthetic chemical. Endocrine Disrupting Hormones (EDH) get into the water supply through food or the disposal of medication where they can affect the reproduction and development of species by interfering with the natural hormones present (Merritt, 2000). Many compounds used in the past such as organic chemical-based pesticides are long-lived and take many years to break down so, even though these products are no longer in use we are still affected by their contamination in the soils and leaching into the water supply. (Lungqvist & Falkenmark, 2000).

In most cases the water returned to a river has different chemical (pH, Hardness) and physical (temperature, dissolved oxygen) characteristics than the water extracted. The return of water of a different quality into a reduced-flow river means there is less water for dilution, making it a greater problem than in a normal flow river. Temperature affects the growth pattern of many fish and invertebrate species. Increasing the water temperature during the summer growth period may also result in the loss of a life stage for macro



Photo courtesy of Robbie Murphy

Ireland's surface waters supply 85% of the population with water – the remainder comes from groundwater.

invertebrates affecting the animals that feed on this life stage, this has knock on effects throughout the community affecting the strength of the year class for trout and salmon (Cowx 2000, Hughes & Morley, 2000). By ensuring the similar nature of the returned water before release into a catchment we can help mitigate this problem (Hughes & Morley, 2000).

One of the key solutions to the problem of over extraction of water is to decide how much water the river needs and when does it need the water?

A report on the Greater Dublin water supply in 2006 predicts that by approximately 2010 production from existing sources will reach environmentally sustainable limits. In 2015/16 our demand for water will exceed our supply. New supplies need to be in operation as early as 2012 and no later than 2015 if water rationing and curtailment of economic growth are to be avoided. The real threat to the ecology of Irish Rivers and lakes will be realised over the next few years as our demand for water increases and the variability associated with climate change starts to manifest itself.

The Water Framework Directive (WFD) has been incorporated into Irish Law and Inland Fisheries Ireland (IFI) are in the middle of an intensive fieldwork programme monitoring the fish stocks in rivers, lakes, canals and transitional waters. Under the WFD we are obliged to improve and maintain the quality of our waterways. Significant amounts of time and money have been spent on this task and we cannot jeopardise

all that has been done by continuing to returning sub standard water back into our water systems. While we all agree it is necessary to extract water we must strive to return the best quality of water and find a balance between the amount of water we extract and maintaining the ecological functioning of our waterways.

To best protect our rivers and lakes we also need to conserve the water we are currently taking out of the system as we can no longer afford to waste it. There is a need to improve the social awareness of the public at large to the problems facing the country in relation to water demand and to encourage efficient use of water, such as the use of grey water for the watering of plants and the use of low flow showers and toilets in homes. With the C4I prediction of wetter winters Ireland needs to store more water over the winter time without damaging the morphology of our lakes and rivers. There are various alternatives to dams being investigated and further work on environmentally friendly water storage is advised. With increasing demand for water we need to ensure that water is fairly divided between the requirements of our freshwater ecosystems and human consumption. In summary water is not a commercial product but rather a valuable heritage which must be protected, defended and treated as such.

Dr. Ciaran O'Byrne & Dr. Ciara O'Leary, Inland Fisheries Ireland, Inland Fisheries Ireland.
Website: www.fisheriesireland.ie

Exploring the Marine Environment

By Paul Kay

I DID not start out in my photographic career with any intent on shooting underwater. When I finished studying I had no involvement in the marine environment at all. And I originally came to Sherkin Island Marine Station to produce an archival record of both Sherkin and the surrounding islands. This was a loose brief, and inevitably I photographed just about everything that needed an image taking of it. Looking back it is difficult to say precisely when I realised that I was hooked on photographing marine life. There is no doubt that it was whilst I was at the Sherkin Island Marine Station in the early eighties, but I couldn't give an exact date.

The marine station offered a tremendous freedom to 'go and find out', to explore the environment surrounded by inquisitive people and an incredible resource of technical, scientific and natural history books. Matt Murphy whose vision was, and still is, to acquire information which will be useful now and in the future had somehow managed to set up the station in an ideal location both above and below water.

Then, everything was new, exciting and full of wonder. There were new worlds to explore, and it was possible to see aspects of nature which I had never even thought existed - all could be photographed. As a photographer I felt myself gradually drawn into taking more and more marine images and my initial inability to see what was below the sea inevitably meant that after my first visit to the station, I simply had to learn how to scuba dive. I have been diving ever since, almost always with a camera, and recording what I have seen.

This has meant visiting many places, some of them far off, but many more closer to home. Ireland's south and west coasts remain very special though, not simply because this is where my interest started but because these Atlantic coasts actually offer some of the most diverse, interesting and stunningly beautiful undersea areas in the world. Despite the water being cool, it teems with life and often the seabed here is totally covered in life. Rocky reefs are home to a myriad of species, many of which are brilliantly coloured and easily the equal of warmer, tropical coral reefs.

When I started taking photographs underwa-



Photo © Paul Kay

Jewel Anemones occur in vast sheets of many thousand individuals and are amazingly beautiful.

ter, it was with relatively basic equipment. Underwater photography was very difficult back in the early eighties and relied on a great deal of input from the photographer. Over the years technology has changed, not slowly but in sudden bursts, helping with the problems and things have become a great deal easier. Whilst the advent of digital photography has revolutionised photography in general, it has totally and utterly transformed underwater photography. Today taking pictures underwater is very far removed from how it was back in the early eighties.

But as photography has become easier, the need to know as much as possible about the marine environment and to be able to identify its inhabitants has become more and more important. To portray creatures properly means having some understanding of them and their habitat and this has meant learning a great deal about them, as well as observing and understanding them from an experience routeway.

So knowledge is now the key to taking underwater photographs of marine natural history subjects. My grounding at the Sherkin Island Marine Station has served me well, imbuing into me a desire to not only take photographs, but also to understand what I am trying to portray with my images. Knowledge

has also led me into avenues which I could never have anticipated, such as being co-author and publisher of a book on Welsh (and so largely British and Irish) marine fish!

And after nearly thirty years I am still enthused about the marine environment and its inhabitants. I still find myself fascinated by what I see and record and still ask questions, of others and of myself as to what exactly is going on down there? How do creatures survive in such a hostile environment? What are the interactions that I, as a scuba diver and photographer, can only catch glimpses of, in the all too short times I can fleetingly visit the undersea world.

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A Spiny Spider Crab debates whether the camera needs to be warned off - arms slightly raised in case action is needed.



A Greater Pipefish peers out from behind seaweed but still relies on blending in with the surrounding seaweed to make itself inconspicuous.



Colourful Devonshire Cup Corals are temperate hard corals but are solitary creatures, so they are not reef forming.



A male common Dragonet in breeding colours is one of the most colourful fish in our temperate seas.

Exploring the Marine Environment

Photography by Paul Kay

Sea slugs can be incredibly delicate and beautifully patterned and coloured but many do not possess a common name - this is *Janolus cristatus*.



Hermit crabs are an often seen marine inhabitant - this one is in a brittlestar bed.



A Scorpion Spider Crab which has fixed pieces of sponge to its body as camouflage (similar crabs are known in the tropics as decorator crabs).



A hydroid 'garden' - everything in this picture is animal except for the red seaweeds.

Groundwater

All shaken up by earthquakes!

By Katie Tedd

GROUNDWATER is present beneath all of our feet - in the tiny pores and cracks of rocks and sediments. An underground layer of rock or sediment that yields water is known as an aquifer. The level within an aquifer below which the ground is completely saturated is called the water table.

This article investigates what can be learnt from water table monitoring in the southeast of Ireland.

Why monitor the water table?

Groundwater provides approximately one quarter of our drinking water nationally, with many rural communities depending entirely upon groundwater sources for drinking water. In addition, many rivers,

and hence the animals and plants within them, are sustained by groundwater during dry summer months. Therefore it is important to know how the water table is changing with time.

Long term assessment (years to decades) allows the impact of changing climatic factors, or long term pumping, on groundwater levels to be assessed and thus allows groundwater resources to be managed sustainably.

How do we monitor the Water Table?

The Geological Survey of Ireland (GSI), local authorities and the Environmental Protection Agency (EPA) have been collecting data on water table levels in Ireland since the 1960s. Historically the water table was monitored either by manual measurements or via chart recorders

i.e. a float connected to a pen which recorded variations in water level onto a chart on a rotating drum (see Figure 1a). In the mid 2000s the EPA updated the national groundwater level monitoring network. Monitoring is now recorded electronically via instruments called data loggers (see Figure 1b).

RESULTS:

Water table variations

Figure 2 shows how the water table may vary in a number of different settings. The depth of the water table varies in response to rainfall, pumping of nearby wells and aquifer characteristics. In general, however, it follows an annual cycle, responding to the seasonal variation in rainfall. The water table is generally at its lowest in the summer or autumn months when rainfall has usually been low. It rises in the autumn and winter months in response to increased rainfall and reaches an annual maximum in the winter or spring.

This research showed that the water table in bedrock aquifers in the south east of Ireland tend to recharge more quickly, and reach their lowest levels earlier, than gravel aquifers (compare Figures 2 a, b and c with d). The research also showed that, for bedrock aquifers, a well's setting is the dominant factor influencing how the water table changed with time; with aquifer type and sediment properties producing only secondary effects (see Figure 2 a, b and c).

Groundwater level responses to global seismic events

After the tsunami in the Indian Ocean (on 26th December 2006) GSI staff noticed water table short, sharp fluctuations in their records coincident with the timing of the earthquake which caused the tsunami (see Figure 3). Could the groundwater in Ireland be responding to seismic events happening over 7000 miles away?

To answer this question, GSI staff reviewed their historic records to try to identify any similar events. This review identified over one hundred water table fluctuations coincident with seismic events occurring in countries all over the world.

But how is this possible? Research shows that this is a known phenomenon and has been identified elsewhere. The water table responds to the dilatation and compression of

the aquifer, and to vertical motion of the well, caused by the seismic wave passing through the earth's surface. The degree to which the water table in a well fluctuates in response to a seismic wave depends upon the dimensions of the well, the properties of the aquifer, as well as the properties of the seismic wave.

Acknowledgements

This work was undertaken as part of an EPA "Science, Technology, Research and Innovation for the Environment" (STRIVE) research programme and was carried out in conjunction with Trinity College Dublin and the GSI. For further information please see the research section of the EPA website (<http://www.epa.ie/researchandeducation/research/>).

Written by Katie Tedd, July 2010.
Katie Tedd is a research fellow based in The Trinity Centre for the Environment, TCD.

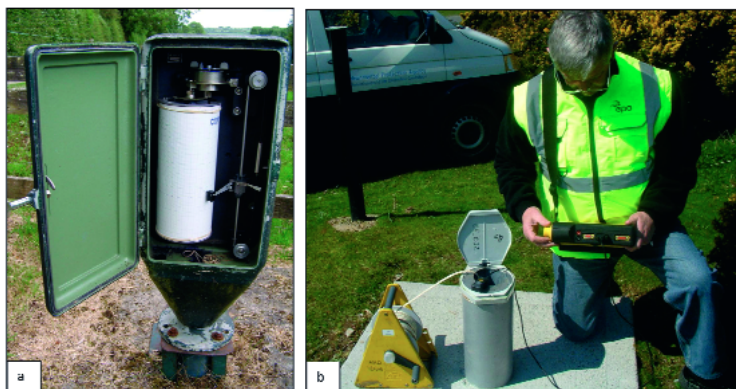


Figure 1. Groundwater level monitoring systems (a) GSI chart recorder recording groundwater levels and (b) downloading water table data from a data logger in an EPA monitoring point

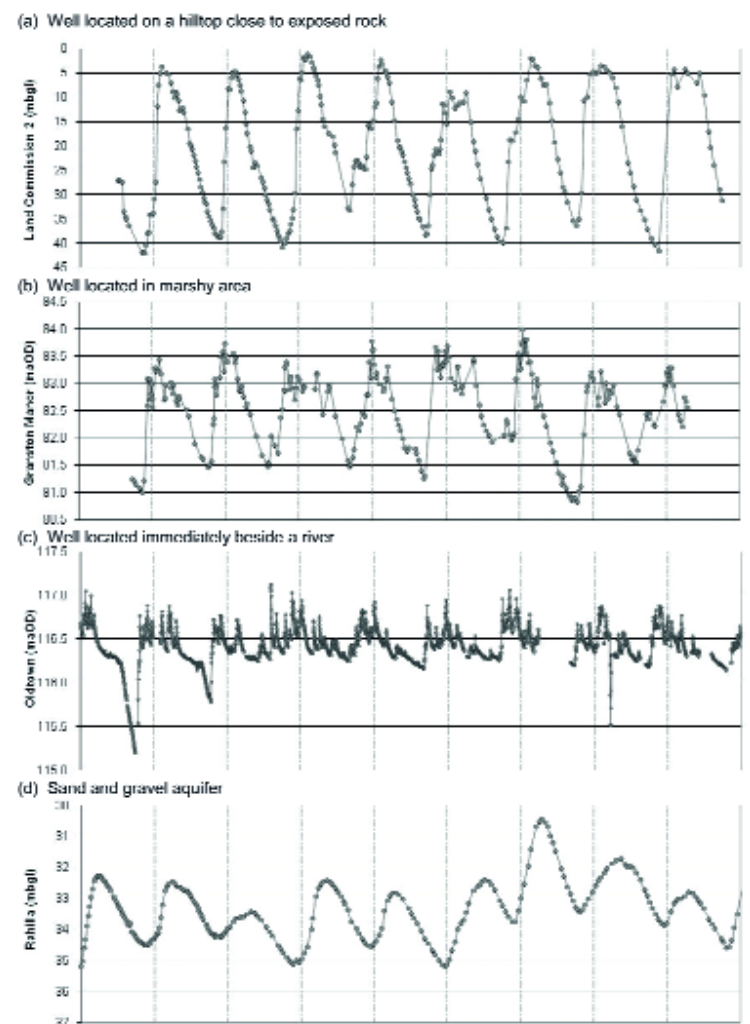


Figure 2. Water table variation differs depending upon the well's settings: (a) a well located on a hilltop close to exposed rock (Jan 1971 - 1979); (b) a well located in marshy area (Jan 1978 - 1986); (c) a well located immediately beside a river (Jan 1995 - 2003) and (d) a well located in a sand and gravel aquifer (Jan 1974 - 1982).

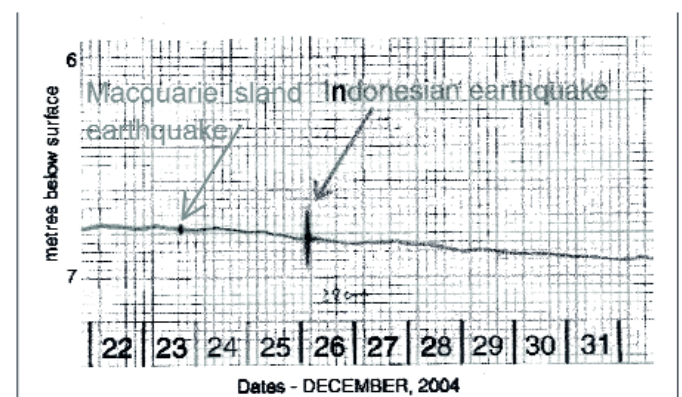
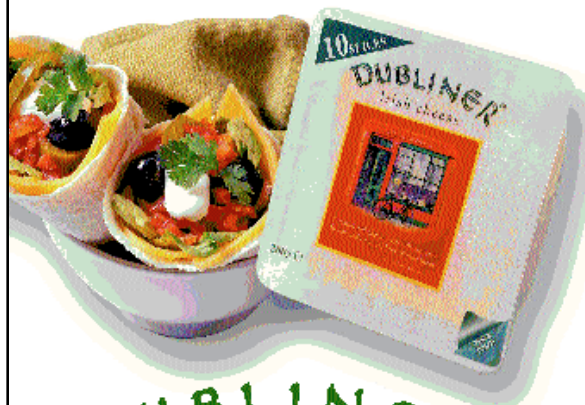


Figure 3. Groundwater level fluctuations in response to seismic events: the earthquake which caused the 2004 Indian Ocean tsunami (26th December) as well as a smaller earthquake off the Macquarie Island, Australia (23rd December).

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Method: Soften the tortillas with a little water and put in a preheated oven at 180°C (350°F) Gas Mark 4 for about 12 minutes. Spread 2-3 tablespoons of the refried beans on each tortilla. Add Dubliner Slices, chilli, lettuce, olives, salsa and cream. Fold the base of the tortilla, then fold over the 2 sides like an envelope. Serve warm with cherry tomatoes, coriander or chillies.

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A Challenge for a Small Town

By Dave Crestin

NEW England's State of Massachusetts has always played a leading role in the United States to preserve land in its natural state, thereby protecting scenic views, wildlife habitat, public drinking water supply, walking trails and many other open space values. This has been accomplished by virtue of a proactive land trust movement complemented by municipal and state land acquisition efforts that are further buttressed by environmental laws. Despite these natural resource protection initiatives, development outpaced conservation over the decades.

Following World War Two, an increase in leisure time and income levels coupled with a strong economy led to a huge home building industry. This trend increased exponentially during the 1970s and 1980s. It was a time when vacation homes became quite popular. While land protection efforts helped preserve much important habitat during the building boom along ponds and lakes, streams, rivers and the ocean, a land-use time-bomb was ticking. Impacts like coastal water quality degradation, wildlife habitat loss, and erosion of Cape Cod character started to galvanize grass roots action.

The small community still being challenged is called Harwich, and is located on the southeast coast of Massachusetts about half way seaward along Cape Cod, a narrow arm of land reaching into the ocean, beckoning countless visitors to its sandy shores. Harwich is a typical, small New England coastal community known primarily for its fishing, cranberry growing and ocean-centered tourism. Harwich has always been a prime vacation spot for thou-

sands of people from the United States, Canada and Europe.

Because a great deal of Cape Cod was set within the boundaries of the Cape Cod National Seashore, established by President John F. Kennedy in the early 1960s, the amount of land available for new home construction was significantly limited in an already geographically restricted area. New private home construction was not allowed within the boundaries of the National Seashore. As a result, the adjacent private properties, being now in such short supply, became highly sought after by real estate developers.

Citizens feared that the amenities that made Harwich and other Cape Cod towns desirable places to live or visit would be eliminated, based upon evidence of ever decreasing amounts of open space. The issue was also the disappearance of buildable land. Strong state and town laws and regulations already protected non-buildable wetland areas and their buffer zones. But something had to be done for the uplands, and soon. In 1988, when the total full-time population of Harwich was less than 10,000, but with a substantial population increase during summer months, a group of concerned citizen volunteers established the Harwich Conservation Trust (HCT). Since then the Trust has successfully helped the town to permanently protect open space, sensitive environments, important wetlands not covered under state law, and scenic vistas.

The challenge, however, was how to begin and sustain a movement to purchase land that was becoming ever more desirable and valuable. Thus, a keen need was either outright gifts of land, or cash donations by which land could be purchased. With uncommon enthusiasm, the HCT

members spoke to interested groups, visited student classrooms, made presentations to town government officials, and asked for support from Harwich citizens gathered en masse at formal town meetings to vote for annual town operating budgets. Today, the HCT raises funds through yearly paid memberships (more than 700), outright gifts of cash and land, bequests, and through the multiple services of numerous volunteers.

Although in 1988 the HCT was the youngest on Cape Cod to initiate such conservation efforts, the concept paid interest and dividends through growing support. And the same circumstances prevailed in other Cape Cod towns. Now, HCT is a leading land trust on Cape Cod.

In fact, groups in communities all over the State of Massachusetts, whether inland or along the coast, had initiated similar efforts to save open space. The potential benefits of doing so became so popular that astute politicians became active lobbyists within the legislature. Ultimate recognition for the importance of preserving open space was underpinned through legislation signed by the governor, which established a "Land Bank." The Land Bank was funded through a three percent surcharge on annual town real estate tax bills. Thus far millions of dollars have been raised and put to use to purchase open space. The best way to preserve open space is to own it.

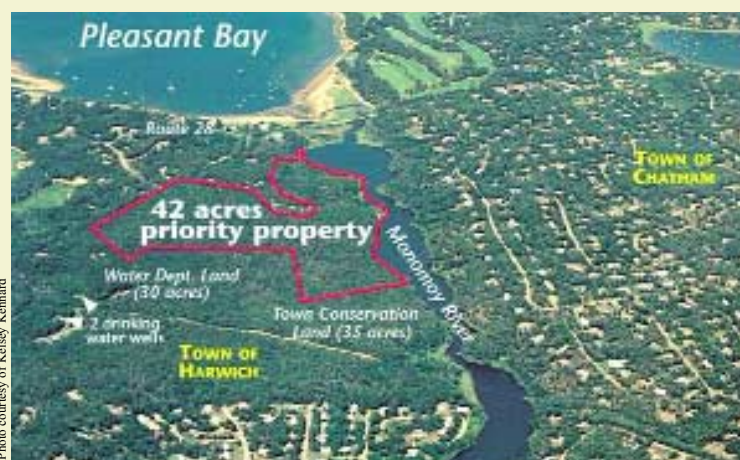
The Land Bank, while similar in theory to the goals of the HCT, is in fact a separate town-level initiative for land preservation. The HCT, being a nonprofit entity not affiliated with government, can act on its own to purchase land if it is able to do so, or to join its funds with Land Bank funds to purchase open space if approved by the town's voters. The Trust and the town often work together to acquire properties.

It is significant to note that the full-time population of Harwich in 2010 is currently 12,300, but during summer grows to almost 36,000. Human pressure on the landscape and water resources is enormous. Yet, there exists an appreciation as well as a sensitivity to the efforts made to keep Harwich as an environmentally sustainable resource. Much of the credit for such an achievement is due to the Harwich Conservation Trust, whose members met the challenge.

Dave Crestin and his wife Beth are volunteers with the Harwich Conservation Trust. Complete details concerning the HCT can be found at www.harwichconservation-trust.org. As of June 25, 2010, the HCT has assumed stewardship over nearly 400 acres, monitors and maintains nearly 14 miles of walking trails, holds 9 conservation restrictions, and enjoys the services of several hundred citizen volunteers.

Vision of the Harwich Conservation Trust

The Harwich Conservation Trust is a leader in creating public-private land conservation partnerships that sustain Harwich as a livable, vibrant community for current and future generations. Harwich's sandy beaches, windswept marshes, quiet woods, and sun-dappled waters create a fragile place that is home to residents and a destination for tourists. Overdevelopment erodes the environmental qualities that shape our sense of place. HCT seeks to preserve Harwich's quality of life by protecting priority lands because it is the smart, practical, necessary thing to do for themselves, their families, their town, their region.



The Harwich Conservation Trust helped the Town save this 42-acre priority.



Scenic Monomoy River as seen from State Highway Route 28.



HCT volunteers count American eels that migrate over a dike, thanks to HCT's innovative eel migration ramp.



A rickety wooden walking bridge over a protected tidal creek and salt marsh at Red River Beach, in Harwich, shot during both low and new-moon high tide.



Red River Beach, a highly protected area and a good example of why many vacationers desire to visit the area.

Photos courtesy of Dave Crestin

Photo courtesy of Kelsey Kemard

Photo courtesy of Stephanie Foster

Conserving Irish Plant Wealth

A new era of conservation research at the National Botanic Gardens

By Dr. Noleen Smyth

IN 1790 the Irish parliament granted funds to the Royal Dublin Society to establish a public botanic gardens. In 1795 the gardens were founded at Glasnevin on the same site where they still remain today. The original aim of the gardens was to promote a scientific approach to the study of agriculture, in the early years the gardens collections focused on plants that were useful as food and medicine. By the 1830's the garden had expanded its role to include the pursuit of botanical knowledge.

Dr. Peter Wyse Jackson was appointed Director in 2005, in his former role as Chairman of Botanic Gardens Conservation International (BGCI) he pioneered a new role for botanic gardens in plant conservation in recognition of the current extinction crisis, an estimated two-thirds of the world plants are threatened through habitat loss, population growth and climate change (Dr. Wyse Jackson is currently President of the Missouri Botanic Gardens). In 2007 three new botanical posts were created and these were filled by Dr. Colin Kelleher, Dr. Darach Lupton and Dr. Noleen Smyth with the primary aim to fulfil the plant conservation targets as outlined under "Ireland's National Strategy for Plant Conservation" (<http://www.botanicgardens.ie/gspc/inspc.htm>).

The gardens aim to ensure that all rare and threatened

Irish plant species will be accessible for education and research purposes at the gardens. A new area has been set aside in the gardens entitled "Wild Ireland" this will showcase Ireland's habitats and landscapes along with displaying some of our most critically endangered plant species. New funding and academic links between the gardens and the National Parks and Wildlife Service, Trinity College Botany Department and National University of Ireland Maynooth have brought the first post-graduate researchers to the gardens. One of the gardens PhD. research students Emer Ni Dhuill is focusing her work on conservation of the enigmatic and iconic "Killarney fern" (*Trichomanes speciosum*). Her work involves monitoring populations in the field, genetically fingerprinting populations and growing an insurance conservation collection in the gardens and in vitro at Teagasc Kinsealy Research Station, Dublin.

Christina Campbell another PhD researcher at Glasnevin is focusing her research on rare and threatened bryophytes (moss and liverwort species); in her research work to date she has discovered new populations of some critically endangered species. These cryptic species will be on display to the public at the gardens for the first time in "Wild Ireland". These new researchers have strengthened the gardens links and ensure that there is future expertise in Ireland in key areas.

Dr. Darach Lupton is working on a range of projects including conservation biology of the rare Irish species the "Kerry Lilly" (*Simethis planifolia*) and gathering knowledge on all known Irish crop wild relatives in association with the National Biodiversity Data Centre. The gardens former Director Dr. Peter Wyse Jackson is also very active in this area and has just completed a book on the uses of wild Irish plants. Dr. Colin Kelleher has teamed up



Killarney Fern House at the National Botanic Gardens.



Research and herbarium library building.



Annual display beds at the National Botanic Gardens.

with the National University of Ireland, Maynooth and is researching the biogeography of Irish arctic-alpine Caryophyllaceae with post-graduate PhD. researcher Emma Howard-Williams. Dr. Matthew Jebb, Dr. Noleen Smyth and former staff member Ms. Cristina Armstrong are involved with Invasive Species Ireland, Fingal and Mayo Co. Council and to date they have helped to develop management plans for the control of Giant rhubarb (*Gunnera tinctoria*) an invasive species from South America which is scouring the West of Ireland and the Hottentot fig (*Carpobrotus*

edulis) a South African plant invading Ireland's sea cliffs on the east coast. In order to fulfil its new role as biodiversity and conservation champions the gardens run a very popular Introduction Irish Botany course, a series of practical demonstrations and lectures relating to Irish botany and conservation.

In June 2010 the gardens hosted the 4th Global Botanic Gardens Congress "Addressing global change - a new agenda for Botanic Gardens", over 370 delegates from 53 countries participated in the congress that was a major coup for the gardens. New initiatives for botanic gardens

were proposed including the establishment of a Global Island Plant Conservation Network, a European Network of Botanic Gardens working with Cryptogams and a Cycad Collection Consortium. The gardens under the current directorship of Dr. Matthew Jebb will continue to expand the role of conservation, and safeguard Irish biodiversity into the future.

*Dr. Noleen Smyth,
Conservation Botanist,
National Botanic Gardens,
Glasnevin, Dublin 8, Ireland.
www.botanicgardens.ie*

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Cork County Council, Environmental Awareness & Research Unit. Tel: 021 4532700

The Northern Cousins

By Daphne Pochin Mould

"Whatever I can do for you, that I will do"

THE year 1963 was a time of rapid change, both for Ireland and our Icelandic cousins. In Ireland some farms still churned their own butter while a procession of horse drawn carts took the churns to the

in 1960s flew Iceland's domestic routes. We flew low, turning into the long narrow fjord that is Isafjordur. Close to one side, with wing tip close to the mountain flank, we turned smartly at the fjord head to land on the airstrip along the opposite shore of the fjord inlet.

It was then that Icelandair's agent set wheels in motion. He got the local museum open for me – a place full of old farm and fishing gear, tradi-

above the sheeps' winter quarters. The hay was far from fully dry but Iceland's great rivers supply plentiful electricity and would air dry the hay in the barn.

By ferry boat we crossed to Bildudalur and I went to stay with Dr. Einar Gudmondsson, his Danish wife Alma, and their six children. As an only child, this was my only in-depth experience of a big family. I kept in touch for

We should not blame Iceland for the ash cloud over the world's most busy airspace. The world's airlines must realise that there are erupting volcanoes along all of the world's great fracture lines – many much more powerful than the recent little one – and they must plan for them. It is world poverty and neglect of the poor, which tumbles cities and kills thousands.

Volcanoes are fascinating things and Iceland has examples of most types. No volcano erupted when I was there in 1963 but at the end of November that year, fishermen off the south coast noted a rise in the temperature of the sea and then rock sand ash breaking the surface. Radio calls went out in an hour or so, and aircraft with cameramen and geologists were soon at the scene. Undersea eruptions are not unusual but Iceland saw the birth of a new island that year and continues to keep a check on Surtsey (Surtr, the Norse god of fire). From coarse black and "ash" (which the sea could easily wash away) and massive flows of lava, new and perma-



Surtsey on November 30, 1963, 16 days after the beginning of the eruption.

Surtsey in June 2001.

local creamery and gossiped while they waited.

It was a little the same in Iceland – you could still see churns on roadside stands, waiting for collection. But Icelanders were different – they had also taken to the air like their native falcons. Technology was now the name of the game!

Iceland is a very big island, with a very small population. It was the last settled part of Europe (8th century) and the first to have a democratic parliament and government. Outlaws were not to be "fed and forwarded, helped or harboured", but others could be. There is a story of a man who built his house across a road so he might entertain all travellers.

Nowadays it is very easy to travel anywhere in Iceland, with its numerous airfields, domestic air service, good bus service and many organised tours. Visitors can also ride the beautiful Viking horses for short jaunts or a week-long journey across Iceland. But in 1963 there was no bus trip to the great cliff in the northwest fjords of Iceland – the most western point of Europe (not Sleá Head!). How was I to travel and explore the northwest and stand on the great cliff of Latnabjarg? I depended on Icelandic hospitality.

I had flown from Reykjavik to Isafjordur (Ice Fjord), in the far north west of Iceland, in that old "workhorse of the world", the DC/3 (Dakota) – that do anything, go anywhere airplane of the WWII period and which

tional dress, the "Langspiel" (a one stringed fiddle) and so forth. Iceland so lately settled has no prehistory. He directed me where to eat and to go to, especially the town's Botanic Garden with entry through the jaw bones of a whale.

He thought the doctor in the next fjord would help and rang him. He found he had a clinic in another little town and that "going home he can divert round here and pick you up". And in the evening he did just that... Up to the head of the fjord, up the hillside to the summits and down the other to Isafjordur by a long tunnel, cut through the hills we drove over. Doctors in these remote parts had to be able to deal with any medical crisis, and so had a room or two where a sick person could be treated. Or a bed to give a stranger.

The doctor had fire-red hair, which he thought might show his Irish origins. They say every Icelandic woman's genes are Celtic. Vast fishing fleets from Europe came north every year to harvest, the seas of Iceland and Newfoundland, with many Irish among the early settlers – the sea links all islands.

We went for a picnic in the next fjord by the lovely little waterfall, Mjólka (Milk water), which makes electricity for the district. I was shown around the power plant and my name is in its Visitors Book. With long handled wooden rakes I had joined a friends' family turning hay in the 24 hour summer sun, which we packed into the loft

years and once stayed with them in Reykjavik for my best Christmas ever.

And so to Patreksfjörður, where I stayed with the (Lutheran) priest. He took me fishing and I caught a trout. Transport was then organised (car and jeep) for the long rough ride down the fjord to Latrabjarg. Thousands upon thousands of sea birds nest there and now in late summer, the place stank of bird droppings.

Ever since that journey I have wondered about our much-vaunted Irish hospitality and wonder if it's that real?

In 1963, they were expecting Katla (of whom we have heard so much of late) to erupt – based on observances of previous cycles. She did not erupt then and has not since, but when she does she will do a lot of damage. Helka, thought in mediaeval times to be the gate of hell, and also thought to be long extinct, burst forth again in the 1960s. "I knew the old b**** wasn't dead" one farmer's wife said. The Atlantic Rift runs across Iceland and her volcanoes were scattered along this line of movement. In Reykjavik, a great research institution studies all these things – earthquakes, eruptions and hot springs – to see if we can predict them.

Iceland may be shaken by earthquakes, but her houses have to be built to withstand as much as possible. These days it is possible to build strong houses that will put up with a shaking.

ment life established itself on brand new land. Birds of course made use of it, "to warm their feet", Icelanders quipped. Nowadays Surtsey has a lighthouse and is a mature island.

In 1963, I was taken to Gunnarsholt, the unlucky farmer, where one Gunnar had his farm smothered deep in the black sand spewed out by Helka. Today, machines could scrape it up and sell it for construction work, but then Gunnar had just to let his farm become a desert of black sand. And in 1963, the soil scientists were confident that they could reclaim such land. Then Gunnarsholt was much black sand but crossed by lines of grass species on trial. Today it is a complex of buildings, labs etc. and heavily involved in soil research. It has a garden with trees and flowers, with lines of shelter belts protect its fields. Every time I visit, the whole country grows greener with more grass, swatches of blue Alaskan lupins (to fix nitrogen in their roots) and more and more trees. Icelandic forestry is just over a hundred years old, and roaming the world for new species to try. Woodland walks are now part of the Icelandic scene.

Cara Partners wish continued success to Matt and his team at Sherkin Island Marine Station

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ELECTRIC RAYS

(Order: *Torpediniformes*)

in Irish & North-west European Waters

By Declan T. Quigley

ELECTRIC Rays belong to a small order of rays (*Torpediniformes*) represented by a two families (*Torpedinidae* & *Narcinidae*), eleven genera and about 59 described species.

The *Torpedinidae* (Torpedo Electric Rays & Coffin Ray) are represented by two genera (*Torpedo* – 21 species & *Hypnos* – 1 species). Three species of *Torpedo* have been recorded from the NE Atlantic (Atlantic Electric Ray *T. nobiliana*, Marbled Electric Ray *T. marmorata* & Eyed Electric Ray *T. torpedo*). However, only the first two species have been recorded from NW European waters, while *T. torpedo* has only been recorded from as far north as southern Biscay. The Coffin Ray (*Hypnos monoptygius*) appears to be endemic to Australia.

The *Narcinidae* (Numbfishes) are represented by 9 genera and at least 37 species, none of which have been recorded from the NE Atlantic. Indeed, only two species of *Narcinidae* have been recorded from Atlantic, both from the western Atlantic: the Lesser Electric Ray (*Narcine bancroftii*) and the Brazilian Electric Ray (*N. brasiliensis*).

Electric Rays possess modified hyoid and branchial musculature (pectoral fins) capable of emitting an electrical discharge of up to 50 volts (and 50 amps), producing an output approaching 1kW. The electrical discharge can be used either as a defence mechanism or for stunning prey at a distance of up to 15cm away. Electric Rays normally lie on the bottom and ambush prey during daytime, but at night they swim or drift slowly in the water column. Upon encountering a potential prey, they envelope it with their pectoral fins and emit pulsed electrical outputs. The stunned prey is then pushed towards the ray's mouth

via water currents produced by undulations of the pectoral disc. Their relatively large distensible mouth enables them to consume relatively large prey (a 1.9kg salmon was found in the stomach of a UK specimen). Electric Rays differ from most other rays in that they possess a well-developed caudal fin that is used during locomotion. While most rays use their pectoral fins for locomotion, this anatomical region has been usurped for electric organ function in the *Torpediniforme*.

Electric Rays generally inhabit continental shelf waters in tropical and temperate latitudes, most commonly in relatively shallow inshore waters (<100m). However, *T. nobiliana* has been recorded at depths of 530m on deep-water cold coral reefs of *Lophelia pertusa* off the south-eastern US. Unlike most rays which lay external egg cases, Electric Rays give birth to live young (aplacental ovoviviparity).

Although Electric Rays are generally discarded by NW European fishing vessels because of their perceived low commercial value, since 1984 they have been subjected to increasing exploitation by French, Portuguese and Spanish vessels (Figure 1). Indeed, since the late 1990s there has been a substantial (and disturbing) increase in landings (103 tonnes in 2006).

Atlantic Electric Ray (*Torpedo nobiliana*)

The Atlantic Electric Ray is widely distributed in the Eastern Atlantic from Scotland (rarely from the North Sea) to South Africa, including the Mediterranean (but excluding the Black Sea) and in the Western Atlantic, from Nova Scotia to the northern coast of South America. Although the species is the more common of the two species of Electric Ray found in NW European

waters, it appears to be never abundant (or perhaps just rarely recorded).

The earliest known reference to the occurrence of *T. nobiliana* in Irish waters dates from c.1740 (off Dunganarvan, Co Waterford). Although the species was regarded as rare up until the late 1950s (there are only 49 known published records to date), it is now generally regarded as scarce and that most specimens are probably discarded at sea. 50% of the Irish records were reported from the SW coast (Cos Cork & Kerry), as well as appreciable numbers from the SE (Co Wexford), E (Co Dublin) & NE Irish Sea (Cos Louth & Antrim) – Table 1. However, it should be noted that most of the records from Co Dublin were reported during the 1800s. The species appears to be relatively rare off the W and NW coast.

Table 1. Regional distribution of Irish *Torpedo nobiliana* records

County	Number	%
Kerry	13	27.1
Cork	11	22.9
Wexford	8	16.7
Dublin	7	14.6
Antrim	4	8.3
Mayo	2	4.2
Waterford	1	2.1
Louth	1	2.1
Donegal	1	2.1
Totals	48	100.0

T. nobiliana is not a prolific species and its fecundity is rather low making it very highly vulnerable to over-exploitation. Studies of Mediterranean populations suggest that males and females mature at lengths of 55.0 and 60.0cm respectively. Litters of up to 60 neonates measuring 17-22cm are produced after a gestation period of about one year (possibly biennially). Although all of the specimens recorded in NW European waters would appear to be adults, there are conflicting reports about whether or not the species actually breeds at these northern latitudes. The length of



ABOVE: Marbled Electric Ray (*T. marmorata*)
RIGHT: Atlantic Electric Ray (*T. nobiliana*)



specimens recorded from Irish waters to date ranged from 66-107cm (mean 83.8cm; N=13).

Apart from January, February and April, *T. nobiliana* has been recorded from Irish inshore waters (16-100m; mean depth 61.4m, N=5) between March and December (Figure 2). However, the vast majority were reported during late summer and autumn, with August accounting for over 40%. It has been suggested that the species may migrate northwards into NW European waters during the summer, but the Irish data, albeit limited, suggests that at least some specimens occur in inshore waters throughout most of the year. Since juveniles are reported to be set free in offshore waters (they have not been recorded from either Irish inshore or offshore waters), perhaps the adults migrate inshore during the summer and autumn to feed (and possibly mate) before migrating offshore and/or southwards again during the winter? Elsewhere, the species has been reported to migrate over long distances.

The maximum published length for the species is 180cm. A specimen weighing c.90kg was reported from near Provincetown, Massachusetts, USA. The weight of specimens recorded from Irish waters to date ranged from 4.5-52.6kg (mean 18.9; N=14). The species was first included by the *Irish Specimen Fish Committee* (ISFC) in its list of eligible rod & line caught species in 1977 at a minimum qualifying weight of 9.072kg (20lbs). However, since then, only 4 specimens have been ratified; the largest weighing 40kg was captured off Achill, Co Mayo during August 2008. However, a larger, albeit unverified specimen, weighing 52.6kg was reported to have been captured off

Hook Head, Co Wexford during July 1986. The UK rod & line record, weighing 43.6kg was captured off Dodman Point, Cornwall during 1975.

Marbled Electric Ray (*Torpedo marmorata*)

The Marbled Electric Ray is widely distributed in Eastern Atlantic inshore waters (<100m) from the Kattegat (rarely) southwards to South Africa, including the Mediterranean (but excluding the Black Sea). *T. marmorata* is easily distinguished from *T. nobiliana* by its brown marbled markings, the presence of 6-8 large tentacles surrounding each spiracle and relatively small size (usually <60cm & <3kg). *T. marmorata* is entirely benthic and appears to prefer sandy and/or boulder-strewn ground. The species has not been reported to breed in NW European waters.

T. marmorata is the rarer of the two species of Electric Ray recorded in NW European waters. It has occasionally been reported from the western English Channel (first confirmed UK record in 1963) and southern North Sea and appears to be relatively common around Guernsey, particularly during the summer and autumn which suggests a northward migration earlier in the year. Although the species has not been recorded from Irish waters to date, single records from western Scotland (Tiree Island, 1968) and the Shetlands (1995) suggest its likely presence.

It is recommended that all specimens of Electric Ray captured in Irish waters should be critically (and carefully) examined in order to verify identification to species level.

Figure 1. Commercial Landings of Electric Rays (*Torpedo* spp.) by European Fleets (FAO: 1984-2008)

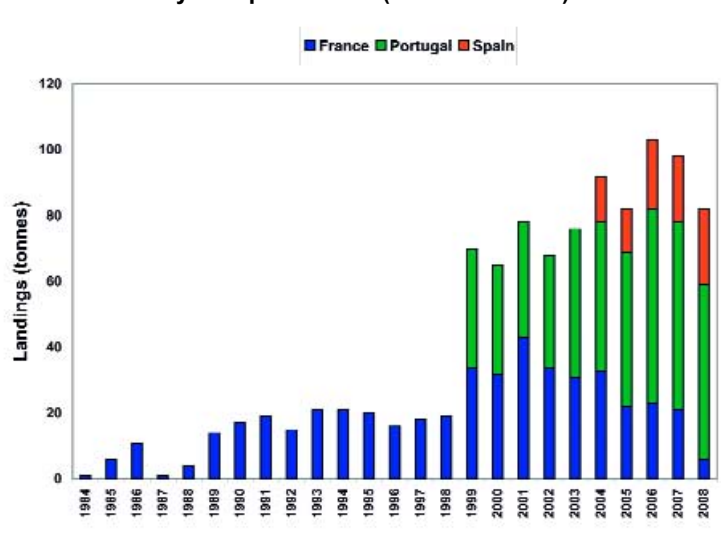
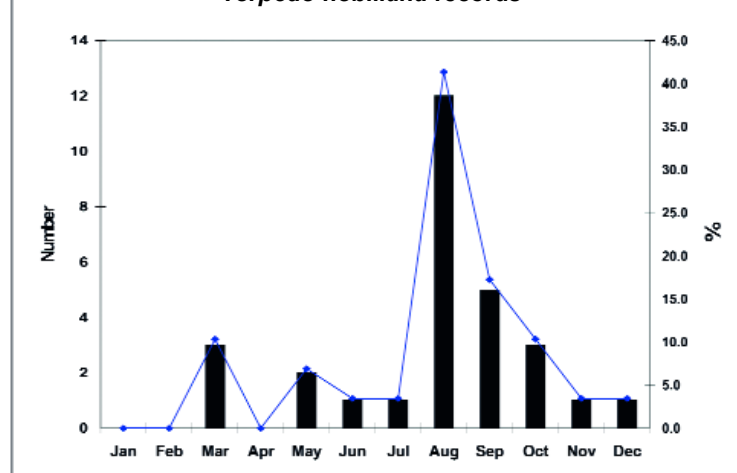


Figure 2. Monthly frequency distribution of Irish *Torpedo nobiliana* records



Declan T. Quigley, Dingle Oceanworld (Mara Beo Teo), The Wood, Dingle, Co Kerry. Mobile: 087-6458485; Email: declanquigley@eircom.net

The Burrenbeo Trust

By Brigid Barry

THE Burren region, 720km² of limestone karst located in Counties Clare and Galway, is a geological, archaeological, ecological and cultural hotspot. Sadly, this uniquely endowed region is suffering from a combination of factors: a steady decline in traditional farming practices, pressure from a growing tourism industry and a generally disjointed approach to its management.

The Burrenbeo Trust was set up in 2008 to create a greater appreciation of the Burren and to work towards the future sustainable management of this wondrous and fragile region. The work of the Trust is carried out by offering a range of education and information provision services, supporting and disseminating research, advocacy work and striving to build a new vision for the region.



The Spring Genetian; one of the first of the Spring bloomers and a important asset to the local economy.

The Burrenbeo Trust is based in Kinvara – 'The gateway to the Burren' – where it has an information centre and a 'conservation café'. The Trust is a membership charity with just under 400 members and nearly 3000 individuals that subscribe to its work. This growing regional, national and global community have signed up to be better informed and be part of conserving this national heritage treasure.

A key focus of the Trust to date has been

empowering the local community through education provision. Through the 'Ecobeo' heritage education programme, courses for both local schools and adults are carried out, covering themes such as geology, archaeology, history, flora, fauna, culture and farming traditions. The aim of this programme is to open up the Burren's vast and varied heritage to its community; the children as its future custodians; and the adults as its current protectors. To date, over 500 Burren children have graduated as 'Burren Experts' from these heritage courses.

To create an active Burren conservation community, earlier this year the Trust launched the Burrenbeo Conservation Volunteers programme. Already 75 individuals are registered with this group to carry out monthly 'action' days tackling key conservation issues across the Burren. Activities range from maintaining areas of species-rich grasslands to rebuilding stone walls, from mapping areas of prehistoric settlements to clearing rubbish. The volunteer group has been hugely successful at giving individuals the opportunity to learn about some of the key conservation issues that exist in the Burren and to actively tackle these issues.

In order to better inform the visitors and locals to the Burren, the Trust organizes regular walks and talks. Each month, the Trust organises a guided walk by a local heritage expert and a lecture that is carried out on a specific Burren subject. This highly popular series is seen as a great way to expand knowledge and to meet fellow Burren enthusiasts. Last year, over 900 individuals availed of these walks and talks. Everyone is welcome on these events so even if visiting for a weekend in the region, check out our website to see what is happening on our events list.

When visiting the Burren, the Burrenbeo Trust Resource Centre is a great place to start; there are information boards and an introductory film on the Burren. It is also a handy place to pick up leaflets, factsheet, books and maps on the region, and grab a copy of Trust's annual magazine *Burren Insight* (and other Heritage publications including *Sherkin Comment!*). This flagship, full-colour publication highlights ongoing developments in the Burren from a range of expert contributors. The centre also hosts the only conservation café in the Burren – which supports local producers where possible and all the proceeds go back into the work of the Trust. This centre is ideal place to



Burrenbeo Conservation Volunteers carrying out conservation work in the Burren.

bring groups all ages. Tailor made programmes are available for visiting groups from all school levels.

Finally, the Burrenbeo Trust is working with the Heritage Council and other local partners in building a charter for the Burren. Along with other key partners in the region; Burren IFA, Burren Connect and Burren Farming for Conservation Programme, the Trust is working on a ground-up participatory approach with different sectors (tourism, farming, businesses etc) to forge a common vision. This work aims to build better integration within and between the existing range of stakeholders and communities involved in the management of the Burren, as well as setting out future work priorities for

all stakeholders to work towards.

So don't miss out – join the Trust, be part of the Burren community and become more informed about this unique landscape. For more information on the Burren, becoming a member of the Burrenbeo Trust, subscribing to the free monthly newsletter, registering as a volunteer, or visiting our centre please look up www.burrenbeo.com, email trust@burrenbeo.com or ring 091 638096.

Brigid Barry, Trust Coordinator, Burrenbeo Trust, Main Street, Kinvara, Co. Galway, Ireland. www.burrenbeo.com



The new Environment in Focus web section on the EPA website allows easier public access to environmental data that has been gathered by the EPA and external bodies. Information is presented as a dashboard of key environmental indicators arranged under seven themes:

- climate change
- air
- water
- waste
- land
- nature and
- socio-economics.

The new web resource Environment in Focus has been designed to provide concise, up-to-date information about the Irish environment for the general public and policy makers.

Presented in an accessible format, this website is a clear advance on paper-based indicator reporting. It allows the EPA to fulfil certain EU reporting obligations in close to real-time, while providing environmental assessments to stakeholders in a format that is useable for them.

These indicators should provide valuable information for policy makers both in developing new policies and in evaluating existing ones. We also hope that they will allow for a more informed wider debate on the steps required to protect Ireland's environment. Access Environment in Focus on the EPA website by going to www.epa.ie/environmentinfo/

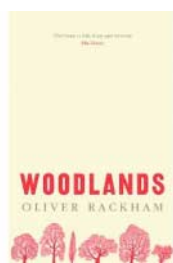


The Burren healthy future relies on the continuity of traditional farming methods.



Woodlands (New Edition)

By Oliver Rackham
www.harpercollins.co.uk
ISBN: 978-0-00-731514-7
Price: £20.00 stg/2010



This is a wonderful book on woodlands. In twenty-two chapters the author covers various topics, including: Outline of Woodland History; Archives of Woodland and How to study them; Wildwood into Woodland; Some Less Familiar Properties of Trees: Roots, Partnerships, Longevity, Tree Rings, Sap-Sucking, Fire; Some Types of Woodland: Highland Zone and Ireland; Environment, Pathology and Ecology: Damage, Disease, Defoliation. Within each chapter we learn so much. For example in Uses of Wood and Timber the author outlines what timber and wooden artefacts reveal about trees, woodland and woodland management.

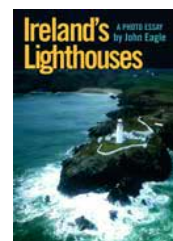
What was most interesting was the effect of diseases and pests on the world's forests and savannahs. Globalising tree planting inevitably tends to globalise tree diseases. It is impossible for customs to inspect millions of containers arriving annually. The World Trade Organisation will not let the stable door be shut on this issue until plant pathologists are quite certain that the horse has not been stolen.

There are 210 beautiful photographs with drawings within this magnificent book. The book is a must for everyone, especially schools and libraries and not least a present for a friend with an interest in nature.

Matt Murphy

Ireland's Lighthouses A Photo Essay

By John Eagle
www.collinspress.ie
ISBN: 978-1-84889-024-4
Price: €19.99/2010



Oh, what stunning photographs of Ireland's 80 lighthouses - so many taken from helicopter. My favourite is Inishtearaght Island, off Co. Kerry, with the lighthouse and buildings perched precariously on the edge of a cliff. The most unusual photograph is an overhead shot of the Fastnet Rock. Each lighthouse around Ireland is described with location, OSI discovery series, situation, how to get there and the lighthouse details: date when built, its structure, its elevation and the range that the light is visible in normal conditions.

What kept coming to my mind reading through this book, were firstly the men that built the lighthouses - mostly in the 19th century, without any of the modern machinery of today. Secondly, the great men who manned them (and their families) - they indeed were the bravest of the brave.

The gem of this book is John Eagle's introduction. He describes how his interest in lighthouses began and the wonderful encouragement he got from many people. To quote "Ten and a half years in the making, hand to mouth most of the time, bringing out six postcards [lighthouses], selling them to make a further six, and I would love to do it all again." A wonderful book, especially for anyone who loves the sea.

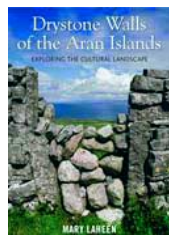
Matt Murphy

PUBLICATIONS OF INTEREST

Drystone Walls of the Aran Islands: Exploring the Cultural Landscape

By Mary Laheen
www.collinspress.ie
ISBN: 978-1-84889-025-1

Price: €19.99/2010



The Aran Islands are one of Ireland's richest cultural landscapes, with a drystone-wall field boundary system made almost entirely by man. Anyone who visits these unique islands must wonder what it took to build these walls, especially without help from modern tools to cut the individual stones. We have beautiful stone walls here on Sherkin, but it's hard to compare them to the sheer volume of stone walls on the Aran Islands.

In the book, the author explores this "cultural landscape", which has been threatened by roadmaking, the developer and industrialised farming. The book is divided into five chapters: Cultural Landscape in Ireland, The Aran Islands - Geology and Land Vision, Settlement and Landholding, A Closer Look, The Future. The author believes that there is ample evidence that a management strategy for the islands could be developed from within the community, particularly if people were to realise that serious threats to the integrity of the island landscape exist. She presents precise reasons for the protection of the characteristics of the drystone wall field boundary system of the Aran Islands. This book is especially for anyone with a love of islands.

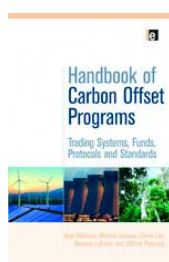
Matt Murphy

Handbook of Carbon Offset Programs: Trading Systems, Funds, Protocols and Standards

By Anja Kollmuss, Michael Lazarus, Carrie Lee, Maurice LeFranc and Clifford Polycarp

www.earthscan.co.uk
ISBN: 978-1-84407-929-2

Price: €39.99 stg (hb)/2010



Current climate change science has indicated the need for a drastic reduction in greenhouse gas (GHG) emissions in order to avoid unacceptable impacts to the future global environment and offsets have therefore for a long time been viewed as an important constituent of climate change policy.

The Handbook of Carbon Offset Programs aims to provide a comprehensive review of existing GHG offset programs, and introduces the reader to carbon offsets, the mechanisms by which they function and the successes and issues encountered by them. A wide range of programs have been covered - including mandatory and voluntary systems, and those regulated governmentally or privately.

Whilst this handbook has been produced primarily as a reference guide for regulators, policy makers and other parties with a working interest in carbon offsetting and its impact on climate change its content and structure will be of interest to anyone concerned with the future of the

global climate and the role offsetting plays in its management.

Kristina Hixon

Accounting for Sustainability: Practical Insights

Edited by Anthony Hopwood, Jeffrey Unerman and Jessica Fries
www.earthscan.co.uk

ISBN: 978-1-84971-006-4

Price: £24.99 stg/2010



Accounting for Sustainability: Practical Insights is a book that sets out to assist businesses and organisations to develop a sustainable thought-process in their approach to their everyday business objectives. This is achieved through the use of detailed case studies involving established and well-respected organisations, such as BT and EDF Energy, to show how sustainability can be integrated into an organisation's decision making framework, without impacting on performance or customer satisfaction.

The ideas presented in the book are practical and common sense, and encompass a broad range of businesses and NGOs that would benefit from an established procedure from which to implement sustainability into their organisation. The data presented in the book is significantly detailed, especially in regards to detailing the effects of accounting for sustainability on established organisations, and does not shy from stating these impacts honestly.

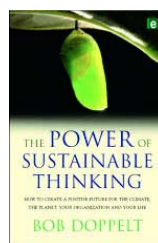
Dave Johnson

The Power of Sustainable Thinking: How to create a positive future for the climate, the planet, your organisation and your life

By Bob Doppelt

www.earthscan.co.uk
ISBN: 9781844075959

Price: £35.00 stg (hb)/2010



The author's main objective throughout this book is to educate the reader about how to shift personal thinking and behaviours away from unsustainable methods.

The initial chapters focus upon basic theory of climate change and global processes. This delivers a concise and informative insight into the environment in order to convey to the reader the importance of future actions made by themselves and society.

The author's background knowledge of psychology is also evident, describing how and why people are susceptible to short-sighted unsustainable ideology.

The author's underlying motives are to alter people's perceptions of sustainability, developing better self-management, and thereby providing greater protection for the Earth's resources. Sustainable ethics is also considered to be a fundamental moral and political force in the near future, with the author insisting upon far greater empathy towards current and subsequent generations.

Finally, and perhaps most importantly, this book aims to inspire and motivate the

reader. Humans will always eagerly pursue a goal they feel passionate about. The troubling matter of global climate change is one that concerns us all, and a goal we must all pursue until the very end.

Ian Lawrence

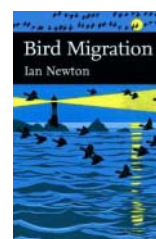
Bird Migration (Collins New Naturalist)

By Ian Newton

www.harpercollins.co.uk

ISBN: 978-0-00-730732-6

Price: £30.00 stg/2010



Bird Migration is Collins' latest edition in the highly acclaimed New Naturalist series. Printed in full colour with a multitude of descriptive figures and pictures that illustrate the highly informative narrative.

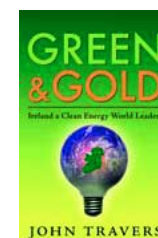
Bird Migration is clearly written with a fluidity that runs from chapter to chapter. It gives a detailed and precise account of the extraordinary natural phenomenon of bird migration and is a pleasure to read. Based on a solid foundation of information compiled by scientist and amateur alike this book answers questions such as where do birds go or come from, how do they know when and where to travel, how do they find their way and why do they migrate at all. Describing the different types of bird movements and migration patterns in depth, the book focuses on the processes of migration including the timing, energy needs, weather effects and navigation of migrant birds. The author explores the evolution and change in migratory behaviour and the geographical and ecological patterns that arise. Ian Newton provides an absorbing account of bird migration and this book is a model of scientific writing for the general reader.

Thomas Daguerre

Green & Gold Ireland a Clean Energy World Leader?

By John Travers
www.collinspress.ie
ISBN: 978-1-84889-043-5

Price: €14.99/2010



This book has five chapters: Energy is..., Fossil fuel's fatal flaws, Ireland's voracious thirst for energy, Drinking water from a fire hose: alternative energy options, and Ireland's opportunity. This final chapter highlights what can

be achieved in terms of renewable energy in the near term i.e. converting 20% of Ireland's total energy needs to renewable sources by 2020. The economic prize for this achievement is in the region of €15 billion, with the potential to create 80,000 jobs. Examples are given where Germany has 280,000 people employed in renewable energy activities and the Danish windpower sector alone employs 28,000, contributing €5.7 billion to their economy.

The author lists the incentives needed to attract companies to invest. It was fascinating to read the piece on the building of the Shannon Scheme at Ardnacrusha, which in 1925 was then the world's largest hydroelectric plant. This was an amazing achievement for Ireland, just four years after the War of Independence. Surely with all the modern technology available to us, we can repeat that first success and produce our energy needs through wind, ocean and solar power. If these can be properly developed, we could be a world leader in clean energy. The author puts his case superbly - the question that must be posed is, can Ireland deliver? This book is to be highly recommended.

Matt Murphy

SUBSCRIPTION FORM

SHERKIN COMMENT is a quarterly publication of Sherkin Island Marine Station aiming to promote the awareness of our natural resources, their use and protection.

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STAFF: Editor, Matt Murphy; Editorial Assistant, Susan Murphy Wickens; Typesetting, Susan Murphy Wickens; Publisher, Matt Murphy. ISSN 0791-2447 © 2010

Sherkin Island Marine Station website: www.sherkinmarine.ie

IS SHORT-TERM MONITORING SUFFICIENT?

This paper was presented by Prof. Tony Fogg at the workshop and conference "The Importance of the Long-term Monitoring of the Environment" held by Sherkin Island Marine Station from 14th–19th September 2003 on Sherkin Island, Co Cork, Ireland. The late Prof. Fogg was a botanist and marine biologist and a noted lecturer. For 13 years he chaired the scientific advisory committee of the British Antarctic Survey and wrote two major works of Antarctic science. The contributions of both himself and his son Timothy's work in the Antarctic was commemorated in the naming of the Fogg Highlands in Antarctica. Prof. Tony Fogg died in 2005 age 85, following a short illness, but his words are as relevant today as they were then.

By the late Prof. Tony Fogg

This is a question which scientists of the mid-nineteenth century may well have pondered on.

One of the most famous and influential scientists at that time was Baron Alexander von Humboldt. A man of considerable wealth, he went below his social status to become a scientist, an expert on geomagnetism, geology and botany and a pioneer in climatology, oceanography and biochemistry. He travelled widely in South America. He saw nature as a whole, that is, his approach was holistic and his studies extended over wide areas and long periods of time. One of his achievements was to establish a network of magnetic observatories co-ordinated to make observations at specified times over long periods. This led to important advances both in the understanding of the earth's magnetism and its practical applications in navigation. Unfortunately for Humboldt his work became overshadowed by the precision, beauty and commercial value of the burst of experimental work carried out by scientists such as Faraday. Their success with short-term reductionist science swamped the holistic approach and those who wanted to get on confined themselves to the laboratory and neglected the environment. They put aside the fact that whereas replicable results can be obtained under conditions of adjusted and controlled temperature, pressure and concentrations, out in the environment these factors may be variable and different with the particular process being studied enmeshed in a complex web of other processes, so that the outcome might be quite different. Even biologists in those times seemed to have preferred to be in the laboratory to dissect organisms and fit them into Darwin's theory of evolution. Only agriculturalists and marine and freshwater scientists had performed to carry out experiments and

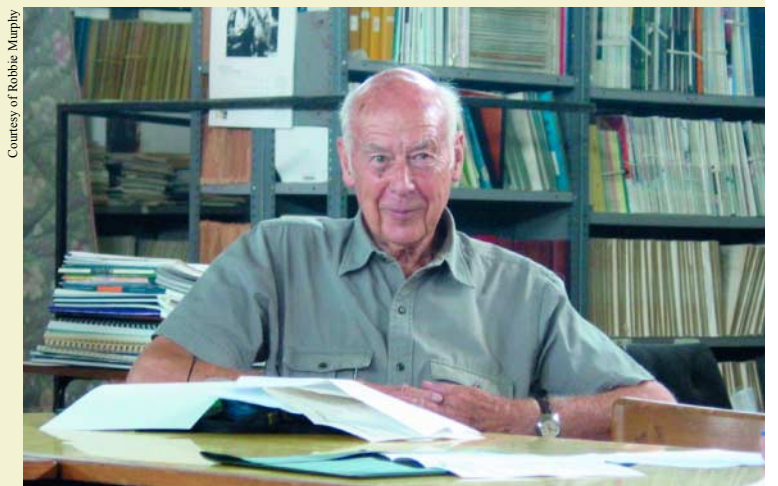
observations in the natural environment, often for long periods.

One of the most famous examples of long-term monitoring is that started in 1843 by Laws and Gilbert in the Broadbalk wheat field of what is now the Rothamsted Research Institute in Hertfordshire, UK. The aim was to establish the sources of the nutrients required in plant growth. Plots were treated with different mineral nutrients or manure and yields of wheat grain and straw, as well as exhaustion of nutrients and effects of weather, were recorded. Rothamsted had some pioneer statisticians who, using among other things the Broadbalk data, introduced valuable new methods into the treatment of agricultural data in the 1930s. The Broadbalk experiment still continues and the main results are that yields from plots supplied with artificial fertilizers and those that had farmyard manure are the same and that below the level of 21 inches of rain per year yield becomes correlated with rainfall rather than sunshine.

Outstanding long-term monitoring in the aquatic environment has been carried out at the Windermere Laboratory of the Freshwater Biological Association. This was initiated in 1945 by Dr J.W.G. Lund, who concentrated on a diatom, *Asterionella*, abundant in the English Lake District, accumulating detailed records of changes in its numbers and factors likely to affect its growth. Eventually, with the help of other workers, data extending over half a century have become available. This has not only provided a model for other studies on plankton but has supplied invaluable information which has enabled water management to be carried out with greater efficiency. Data like this, obtained for a specific purpose, may be coupled with other data from separate contemporaneous studies of different phenomena with profitable results. Dr Glen George has used Lund's data together with some from other lakes, including Lough Leane, only forty miles from Sherkin, together with meteorological records to examine the effects of regional-scale variations in atmospheric circulation on plankton. He has shown that the quasi-cyclic weather events influence the flux of nutrients and thus phytoplankton dynamics. The feature known as the North Atlantic Oscillation has the most marked effect on production in the lakes.

Turning to the sea, the most extensive long-term monitoring is that based on continuous plankton records obtained with a sampler designed by the late Sir Alister Hardy and first used in the Southern Ocean in 1926. The recorder is towed behind a ship, filtering out plankton as it moves through the water onto a moving strip of silk gauze. These recorders have been towed systematically by merchant ships and ocean weather ships in the North Atlantic.

This began in 1932 and still continues giving information, valuable particularly for fisheries, on the distribution of plankton and fish eggs. More modest marine monitoring has been carried out on shores. An example of this is the survey carried out by (the late) Dr Eifion Jones and his colleagues on the shores of Anglesey over a period of years. Semiquantitative observations of intertidal flora and fauna were made monthly and subjected to multivariate analysis. It was found that seasonal changes, affecting almost all the shore life, varied considerably from year to year. Variation between shores, even if close to each other, could be considerable and the structure of communities appeared to be by no means entirely explicable in terms of the floristic and faunistic patterns in the text books. Here the inadequacy of short-term surveys is very evident. Long-term monitoring can be expensive, often monotonous and occasionally a waste of time. If one is interested in changes in the past these disadvantages may not arise – the miscellaneous particles and materials trapped in successive layers in marine and freshwater deposits, peat bogs and ice provide records which can often be precisely dated and can yield an amazing variety of information covering thousands of years. Pollen, diatom frustules, remains of zooplankton and chemical constituents in its bottom deposits can give detailed pictures of a lake's history and this in turn can be related to changes in climate, geological catastrophe and human activities. Air bubbles trapped in polar ice can tell us how air temperatures have varied with concentrations of greenhouse gases in the atmosphere and indicate what the course of global warming may be in the future. Present changes are not so easily and precisely monitored. One attempt to short-cut is by mathematical modelling. Suppose, for example, one needs to predict the future growth and behaviour of marine plankton in a given sea area over a period of years. The growth rates and responses to temperature, water movements, nutrient supply, light intensity and its variations, predation and so forth can be determined in the laboratory and expressed in mathematical equations. These can be assembled in a model and environmental factors such as temperatures, tides, turbulence, daily and seasonal variations in light can be fed in and the computer predicts plankton behaviour under the expected conditions. This usually works reasonably well, the model producing graphs showing changes with time which match approximately records obtained directly from the environment. One such mathematical simulation was constructed in great detail for Narragansett Bay (Rhode Island, U.S.A.) and seemed satisfactory until it was tested for other regions.



The late Prof. Tony Fogg at the Long-term Monitoring Workshop and Conference on Sherkin Island, Co. Cork, Ireland, in 2003.

Adjusting annual cycles of solar radiation and temperatures to those found 19° South produced violent and meaningless oscillations in the graphs.

I will finish with a tale of long-term monitoring with which I had some connection. In 1973 there began to be worries that gaseous discharges (e.g. chlorofluorocarbons) from human activities might cause destruction of ozone in the upper atmosphere and lead to penetration of damaging amounts of ultraviolet radiation to ground level. Systematic monitoring of ozone had already been started in two of the British Antarctic Survey (BAS) stations in 1957. In 1979 BAS, like many other scientific institutions, became desperately short of money and it became necessary to charter research vessels as cargo ships and to consider closing down one or more of the Antarctic stations. Sir Vivian Fuchs, when he was Director, had set up a Scientific Advisory Committee and the problems were duly referred to it. There was one representative of the Natural Environment Research Council (NERC) and he, quite reasonably, pointed out that the atmospheric chemistry unit of BAS had found very little change over 22 years and was not doing any really exciting work. The U.S.A. had recently sent up a satellite to make measurements of concentrations of various substances, including ozone, in the upper atmosphere and were willing to pass on the data to BAS. Therefore the atmospheric chemistry unit of BAS was superfluous and could be closed down, the financial savings solving BAS's problems. Some members of the Committee were reluctant to lose scientists whom they knew to be of first class quality. Argument went on for two hours or so until I, as Chairman, felt we had to put the matter to the vote. This came out as four in favour and four against. As Chairman I had a casting vote and, fearing greatly that I was bankrupting BAS, I decided that we should keep the unit. Three things happened after this:

The Falklands War broke out and BAS was able to give the Government so much help with

information on weather and ice movements that Mrs Thatcher gave it an extra £9 million a year. We were no longer insolvent.

The BAS scientists at Halley Station in the far south, continuing to make ozone measurements with their antiquated equipment, made the startling discovery in the spring of 1984 of the 'ozone hole'. The U.S. satellite had apparently missed it. It had registered some 50 million ozone determinations but the scientists were at a loss to know where to look amongst all this for something interesting. Going over the raw data again they were chagrined to find the ozone hole there as large as life. The right people had been on the right spot at the right time and BAS long-term monitoring had been completely vindicated.

NERC decided that it was not going to tolerate this sort of thing and disbanded the Scientific Advisory Committee replacing it with a new committee made up of members appointed by headquarters.

Is short-term monitoring sufficient? The answer to the question is no.

According to Tony Fogg, he was particularly fortunate – long holidays on his grandparent's farm, family friends and teachers who were keen naturalists, at university distinguished botanists, ecologist and plant physiologists as professors and increasing links with the Antarctic where he eventually stood on Observation Hill by the cross in memory of Scott and his companions and looked down the route they had followed to the South Pole. Added to all this was a wife who loved walking in the country and going to the theatre. He managed to write a large number of scientific papers, which he said "have now, no doubt, found their way to rubbish dumps; and eight books on plankton, photosynthesis and polar matters, which had excellent reviews but didn't make my fortune!"

JUNIOR PAGES

Ocean Climate Change

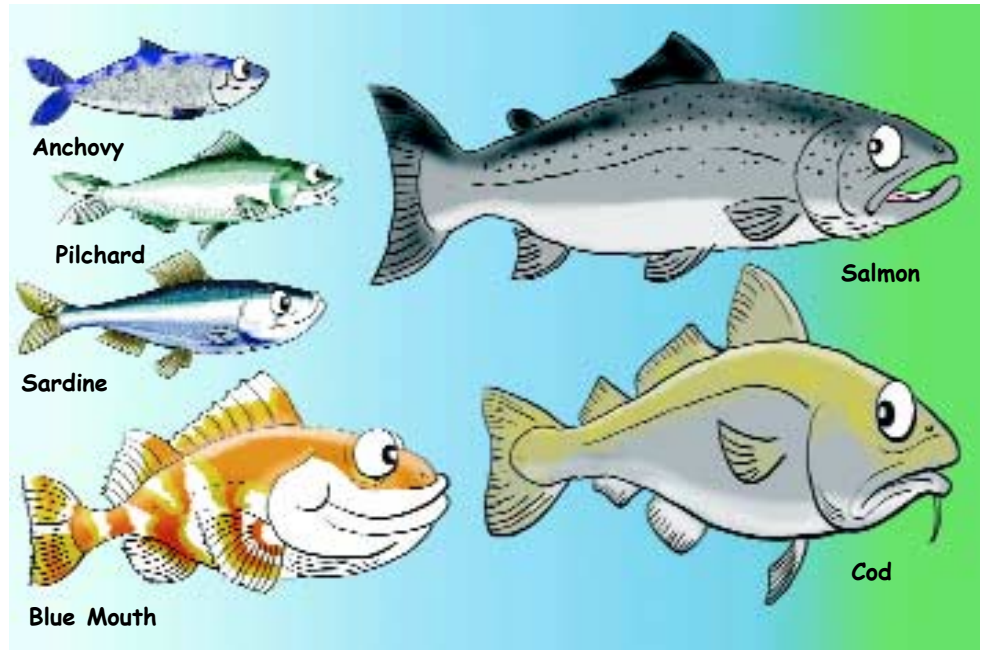
Warming Waters . . .

A recent report by the Marine Institute shows that sea surface temperature around Ireland has increased by over half a degree centigrade every ten years since 1994 and that the warmest sea temperatures over the last 150 years have been in 2005, 2006 and 2007.

Part of this recent increase can be linked to a natural rhythm in the ocean called The Atlantic Multidecadal Oscillation. But the fact that we have recently witnessed the warmest sea water temperatures in the last 150 years may mean that other factors, such as global climate change, may be at work.

Even small increases in sea temperature have an effect on the animals and plants that live there. Fish that prefer colder water (such as cod and salmon) tend to migrate northwards where the water is cooler. Meanwhile, fish such as anchovy, pilchards, sardines and blue mouth, also migrate northwards into our waters from the south.

One potentially negative effect of these migrations is that snake pipefish, which resemble sand eels but which have a tough skin and are difficult for birds to eat, are showing up in Irish waters in greater numbers. This could result in seabirds such as Puffins trying to feed them to their chicks by mistake.

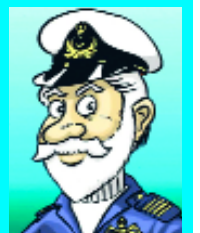


You can download the Marine Institute report "Irish Ocean Climate and Ecosystem Status Report 2009" at

<http://www.marine.ie/NR/rdonlyres/E581708D-6269-4941-836F-6B012DD7A4BD/0/IrishOceanClimateandEcosystemStatusReport2009.pdf>

Captain Cockle's Log

Copyright John Joyce 2010
Log onto www.captaincockle.com



Surf's Up!

Another effect of climate change in the oceans is the increase in significant wave height (the average height of the highest one-third of all waves) off the south-west of Ireland by as much as 0.8 metres per ten years. While this might be great for surfers, it could be dangerous for other water users.

The highest wave ever recorded anywhere in the world happened on the night of July 9th, 1958 when an earthquake at in innermost point of Lituya Bay in Alaska caused a tsunami. This monster wave then swept the entire length of the Bay, tearing away trees as high as 1,720 feet (524 metres) above sea level.

The highest natural wave ever recorded out at sea was only 112 feet (34 metres) above sea level in a Pacific hurricane on February 6th, 1933.



MAKING BIRD FEEDERS

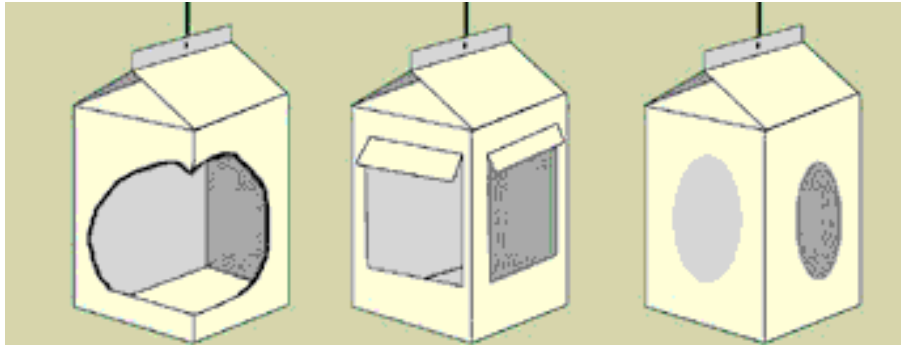
Good feeders let birds feed in ways that match their natural way of feeding. Some birds use feeders often, others hardly ever use them.

Making feeders work

You can make simple feeders from cardboard milk cartons or plastic drinks bottles. The picture below shows some ideas.

Invent your own and use them for experiments on:

- Feeder Design
- How birds see things in Project 2



The way in... (Feeder Design)

Design and make feeders which let birds reach the food in different ways. To test them fairly, the food itself must be the same in all feeders. The feeders should be the same size and colour so that it is the design (the way to the food) that is being tested.

Evaluating the feeders (Did they work?)

- Did the birds actually use your feeders?
- Do different birds like different designs?
- Is the feeder they choose like their natural way of finding food?
- Which designs seem to be best for bird feeders?

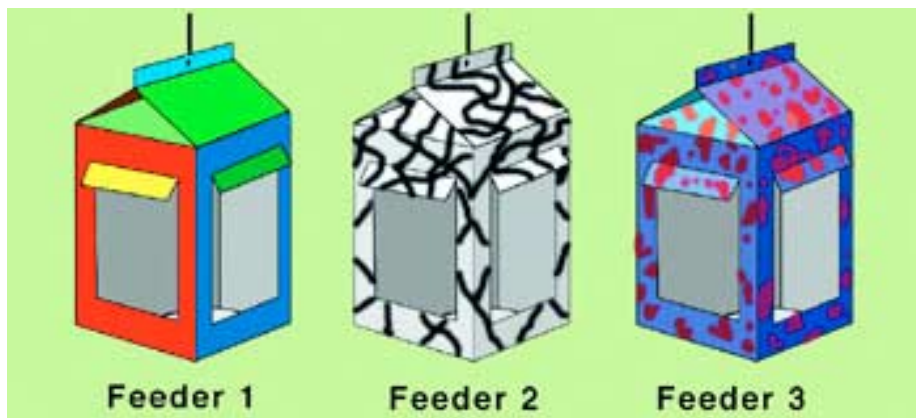


AN EYE FOR COLOUR

(How Birds see things)

Experiments with bird feeders

Design and make several feeders, all exactly the same. Paint each a different colour, or pattern of colours. To help you, think about the colours or patterns that birds might see in the wild. Set the feeders up together in a place where you know birds will come. Use the same food in each one (this is to make sure that birds choose a feeder because of its colour and not for its design or the food it offers). Note down how many birds come to each feeder. Note down which birds use each feeder. Here is an example of the patterns and colours you could use. Try and invent some of your own:



Example of visits: Feeder 1 = 5 visits; Feeder 2 = 8 visits; Feeder 3 = 11 visits

Evaluating the feeders (Did they work?)

- Were any colours or patterns more attractive to the birds?
- Can you think of a reason for this?
- Did the birds avoid any of the colours or patterns?
- How might this help them in their normal life?

Courtesy of Birdwatch Ireland. For further tips visit the Kids' Zone at www.birdwatchireland.ie

Learn about birds with BirdWatch Ireland

Feeding Wild Birds Leaflet

Download this leaflet from the Learn about Birds section on BirdWatch Ireland's website at www.birdwatchireland.ie

Learn how to identify the birds in your garden with our **Free Garden Bird Charts**. Send a SAE to: BirdWatch Ireland, P.O. Box 12, Greystones, Co. Wicklow.

BirdWatch Ireland has over 10,000 members and has branches throughout the country which organise events and outings in your area. Why not get your school to join? Write to us or visit our website for details: www.birdwatchireland.ie



BirdWatch Ireland has two educational web sites, catering for learning about birds in schools.

- Visit the Working with Birds web site to learn about watching and feeding birds

Simply go to www.birdwatchireland.ie and go to the 'learn about birds' section

BirdWatch Ireland, P.O. Box 12, Greystones, Co. Wicklow.
Tel: 01-2819878 Fax: 01-2819763
Email: info@birdwatchireland.ie

Website: www.birdwatchireland.ie

An ideal gift!

Free DVD

Discover the magic of birds with your DVD Guide to 'Common & Garden Birds' - **FREE** when you join BirdWatch Ireland

Now members will receive this superb 130 minute DVD featuring 90 different bird species; a free Garden Bird Information Pack; Wings, our quarterly magazine (only available to members); free participation in BirdWatch Ireland branch events all around the country; and a chance to take part in our popular Garden BirdWatch Survey.

BirdWatch Ireland is the largest and most active conservation organisation in Ireland, with over 10,000 members and supporters, a nationwide network of more than 20 local branches and a growing number of nature reserves around the country. Our primary objective is the conservation of Irish wild birds and their habitats.

Join now

- by post (see form below);
- by telephone - simply call 01-281 9878;
- online at www.birdwatchireland.ie

To join, simply complete and cut out this Membership Form and send it along with your membership payment of €5.

Or Please deduct the sum from MasterCard/Visa/Laser Card no:

BirdWatch Ireland DVD Offer: P.O. Box 12, Greystones, Co. Wicklow. Expiry Date:

Yes, I wish to join BirdWatch Ireland. Please send me my gift of a FREE DVD. I enclose a cheque/postal order (made payable to BirdWatch Ireland) for:

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Cardholder's Signature:

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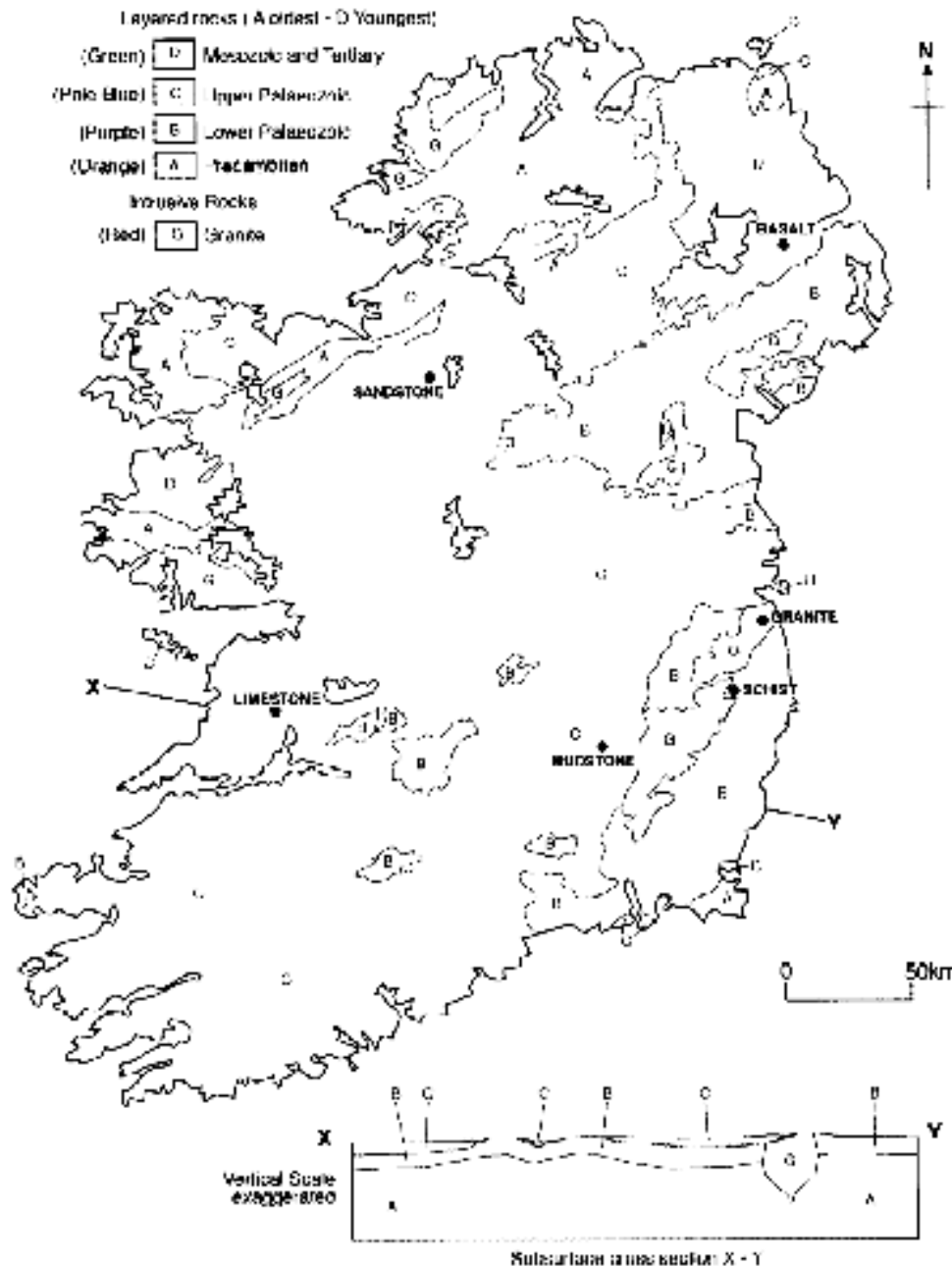
Member's Name:

Address:

The DVD only contains audio tracks.

Geological Map of Ireland

Colour in the map to produce your own geological map of Ireland and put an **X** where you live. The six rock types marked on the map are those given to every school in Ireland together with an accompanying booklet. Ask your teacher to let you and your class look at these.



Discovering the rocks in your local area

The Earth is a rocky planet, with a very hot iron core surrounded by a thick mantle, which in turn is surrounded by a thin crust. The geology we experience the most is the uppermost part of the Crust - a very thin layer that extends down less than 100km below the surface.

The pattern of rocks we see on the surface of Ireland today shows rocks of very different ages lying side by side. The map on the left is a simplified geological map of Ireland, showing the age of some of these rocks. Why not colour it in to see which time period the rocks in your locality belong? Geologists use names for packages of time in the same way that archaeologists use the terms 'Stone Age', 'Iron Age' and 'Bronze Age'. To learn more about these time periods, visit www.geoschol.com.

The geological map of Ireland can be hard to absorb in one go. Why not break it down and find out about your county's geology? In "Geology of Ireland: county by county" (see details below), you will find information on the geology of each county in Ireland - the area of the county, its geological highlights, the ages of the rocks, its geological history and more. These four-page descriptions of individual counties can also be downloaded from www.geoschol.com/ireland.html

Sherkin Island is in Co Cork and if you look at the section on Cork you will see that the rock on Sherkin is mostly Devonian sandstone, which was formed between 415-360 million years ago.



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The bimonthly marine and freshwater publication

Special Edition November 27

On sale in coastal outlets, key towns along the inland waterways network and in Easons stores (ROI & NI)

Agencies across the marine and freshwater sectors will outline their strategies for development in 2011 and beyond

Also in this issue:

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- Aquaculture
- Seafood business
- Ports and shipping
- Marine R&D
- Ocean energy
- And more

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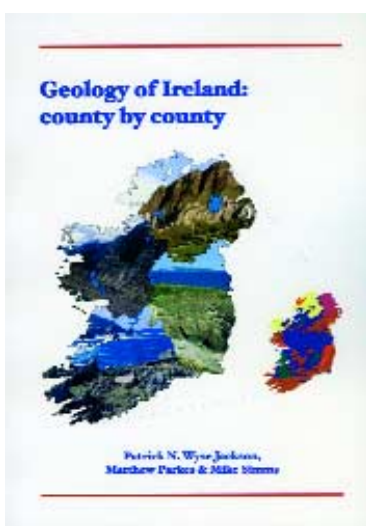


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 wall@inshoreireland.com | 144 (0) 2891 857721 / 144 (0) 2838 656180

If it's water, we write about it!

Geology of Ireland: county by county



By Patrick N. Wyse Jackson, Matthew Parkes & Mike Simms

Geoschol Books ISBN: 0-9521066-8-X

Geoschol is a grouping comprising the Geological Museum, Trinity College, Dublin; the National Museum of Ireland; and the Ulster Museum. It aims to enhance the understanding of Ireland's geological heritage through its publications and website (www.geoschol.com). Printed copies of "Geology of Ireland: county by county" are available from Dr Patrick N. Wyse Jackson, Department of Geology, Trinity College, Dublin 2, Ireland, for €10.00 (inc. p&p within Ireland).

Email: wysjcknp@tcd.ie

Water Conservation

Page 1 of 2

Water Worksheet 4

TEACHER'S SHEET

Saving Water



We all need to use water, whether for drinking, washing or cooking. We cannot avoid it. But we can all stop wasting water. This activity sheet gives children an idea of the importance of fresh, clean water to each of us, how we need to protect this water and use it wisely.
(Note: To increase the difficulty, the hints overleaf may be hidden before photocopying)

CLASS LEVEL: 1st & 2nd
 CURRICULUM LINKS:
 SESE - SCIENCE - Living things, Environmental Awareness & Care.
 GEOGRAPHY - Human Environments, Natural Environments, Environmental Awareness & Care.
 ARTS EDUCATION - Visual Arts.
 MATHEMATICS - Data.
 ENGLISH - Developing cognitive abilities through language, Emotional & imaginative development through language.
 SPHE - Myself, Myself & Others, Myself and the wider world.
 MATERIALS:
 6 plastic 1-litre bottles, toothbrush
 PREPARATION: Graphing Data

TIPS FOR SAVING WATER

- Have a 5-minute shower instead of a bath.
- Turn off the tap when brushing your teeth.
- Wash windows with a bucket and sponge instead of a hose.
- Put the plug in the sink when washing your hands, rather than running the tap.
- Fix leaks and dripping taps.
- Collect rainwater to water the garden.
- Do just one thing each day to save water.

ACTIVITY SECTION

Ask everyone to pretend to brush their teeth. Put the plug in the sink and let the tap running while they are doing this. (Turn the tap off if the sink fills before you finish!) This will demonstrate how much water is wasted each time a tap is left running while brushing your teeth. On average, waste 6 litres of water each time they brush their teeth. To help save water in future, turn off the tap while you are brushing and turn it on again to rinse, or simply fill a glass of water. Bring in 6 empty litre bottles and fill them with water. This will help the children visualise the quantity.
 Make a wordsearch using the words overleaf or the activities in "Ask your Family" or a simple crossword.



FURTHER DISCUSSION

Do you ever feel thirsty?
 Our bodies need water to survive. Your body is made up of 70% water. If we drank dirty water what could happen?
 Animals and plants also need water to survive. Name some animals that live in water.
 Have you ever seen an animal drinking water?
 Where did they get this water?
 Where does the water you drink come from?
 Where is the nearest collection of water to you? A river, a lake, the sea, a pond.

ASK YOUR FAMILY

Make a list of all the ways in which water is used at home. A list is provide below which you can also add to. Brainstorm with the children in the classroom to help add to this list. Ask the children to take it home and, on one of the days over a weekend, ask them to take a survey of what they use water for in their home. Remember, they might not use the washing machine or cook the dinner themselves, but their parents are doing it on their behalf! They do not have to record the quantity of water they use, but more the frequency. This will give them an idea of how vital water is in our every day lives.
 Repeat the survey on a regular basis, to encourage the saving of water.

ACTIVITY	NUMBER OF TIMES USED
Cooking	✓ ✓ ✓ ✓ ✓
Drinking	✓ ✓ ✓ ✓ ✓ ✓ ✓
Bath	
Shower	✓
Flushing the Toilet	✓ ✓ ✓ ✓ ✓
Brushing your Teeth	✓ ✓
Washing Machine	✓ ✓
Washing Car	✓
Watering Garden	✓ ✓
Cleaning Surfaces	✓ ✓ ✓ ✓

DATA SECTION

Use the data from the home survey in "Ask your Family". On the blackboard make columns for each activity. (list these) Unexpected activities can be put in "Others". Ask each child to put a tick in the column where they noted activity at home. Discuss the findings. Which activities did everyone tick? What are these activities so important? Was there any activity not ticked? Why not, do you think? If you were trying to save water, are there any of these activities that you could stop?




ART SECTION


Design a leaflet or poster that can be brought home, encouraging members of the family to reduce the amount of water they use in the home.
 Draw a picture of your house/school, without the front wall, showing each room. Draw all the appliances that use water.





Where it was a river or lake could you drink that water or does it need to be cleaned first?
 Is the sea fresh water or salt water?
 Can you drink salt water?
 What else do you use water for?
 Do you ever think about how much water you use?
 Are there ways you or your family can reduce the amount of water you use?
 List the problems there would be if your water supply was cut?






garden



birds


water


oil


bath


drink


teeth

Fill in the blanks with the help of the boxes above:

- A shower uses less water than a _____.
- Turn off the tap while you brush your _____.
- Do not pour _____ or paint down the drain.
- Rubbish on the beach can harm _____ and other animals.
- We need clean water to _____.
- Use rainwater to water the _____.
- We could not live without _____.

Answers: 1. bath; 2. teeth; 3. oil; 4. birds; 5. drink; 6. garden; 7. water.





25-Year Celebrations



Images courtesy of Gaisce - The President's Award

GAISCE – The President's Award, celebrates its 25th anniversary this year and has organised a range of exciting initiatives, from creating collector coins to auctioning fibre glass angels, to promote and commemorate this important milestone.

Since it was established in 1985, many young people have participated in the Award Programme in Ireland with just under 17,000 (16.9% increase on the previous year) new registrations in 2009.

John T. Murphy, Director of Development, has been involved with Gaisce since its inception. He comments:

'We felt it was really important to mark the achievement of reaching our 25th birthday and at the same time pay tribute to the thousands of young people who have contributed

and participated in The President's Award. We decided to organise a variety of activities both to celebrate how far we've come over the last 25 years but also to continue to promote the benefits of participating in the Award Programme.'

Working in partnership with the An Post, a Gaisce – The President's Award stamp was produced. A first day cover of the stamp was made available for sale which included a message from President McAleese.

'I am delighted to join with An Post in celebrating Gaisce's 25th anniversary celebrations in 2010. The launch of this stamp allows us to pay tribute to the thousands of young men and women who have completed the Gold, Silver and Bronze Awards over

the past twenty five years.

In the course of their Gaisce experience, participants from all over Ireland set themselves challenges to test their strengths, their resilience, their courage and their generosity. Their achievements include community and voluntary work, sporting and physical activities, personal skills and the excitement of an adventure journey. In the course of their challenges, they tested their limits, contributed to the fabric of their communities and embarked on a journey of determined self-discovery that enables them to be truly active young citizens. Over the past quarter of a century, youth services, educational establishments and employers have all learned to appreciate the value of a Gaisce Award and

to recognise the special qualities that the Awardees have displayed.

Gaisce's success is due to the enthusiasm and hard work of many - of the young people who present themselves for the challenge, of the President's Award leaders who oversee each participant in the challenge, and of the Chair, Council and the dedicated teams at Gaisce's offices throughout the country. I thank each of them for making Gaisce what it is today and I look forward to many years of continued Gaisce success in the future.' Mary McAleese, President of Ireland.

The initiative was a resounding success with 250,000 of the limited edition stamps sold in the first 10 days.

Following on from this success gold and silver limited

edition collector coins, showcasing the Gaisce logo, were produced in conjunction with the Central Bank and Financial Services Authority of Ireland with 12,000 coins being sold to date.

Working with the horse racing industry, Gaisce organised a race day which was held in May 2010. Alongside raising funds to support the delivery of the Award Programme, the event was also used to enable apprentice jockeys to receive their bronze awards, presented to them by Irish Jockey, Johnny Murtagh.

President and Dr McAleese hosted a Garden Party for Gaisce – The President's Award on the 1st of July where she celebrated the special anniversary and thank everyone involved with Gaisce, - PALs, participants,

supporters, funders and staff for their efforts on behalf of the Award.

After 15 years in Dublin Castle Gaisce – The President's Award moved to their new home at Ratra House in the Phoenix Park. The house has a great history. It was built in 1786 four years after the Vice Regal Lodge (Áras an Uachtaráin) and named Little Lodge. When Douglas Hyde ended his term as President of Ireland he lived in the house and renamed the lodge Ratra House. From 1950 to 2006 Ratra House was the home of the Civil Defence School. On the 6th of May that year a standing down ceremony took place to mark their departure from the house to their new headquarters in Roscrea, Co Tipperary.

Another exciting initiative that links into Gaisce's anniversary celebrations is the launch of the Angels Beacon of Hope project. 52 fibre glass angels, standing at 2.4 metres, have been created. Artists, celebrities and sports people from across Ireland have been invited to paint an angel and add a personalised message. The angels are currently on tour around Ireland with an auction planned for September 2010. Proceeds from the auction will go to three charities, one of which is Gaisce – The President's Award.

All of the above initiatives are taking place alongside Gaisce's remit of motivating, inspiring and promoting Gaisce - The President's Award across Ireland including important development work in Northern Ireland. Continued co-operation between Gaisce – The President's Award and the Duke of Edinburgh's Award means that more young people than ever on the island of Ireland can be reached through the Programme.

If you are interested in entering for a Gaisce Award please contact: Gaisce – The President's Award, Ratra House, North Road, Phoenix Park, Dublin 8. Tel: 01-617 1999 / 01-670 7063. Email: mail@gaisce.ie or check out their website: www.gaisce.ie



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Produced by Sherkin Island Marine Station



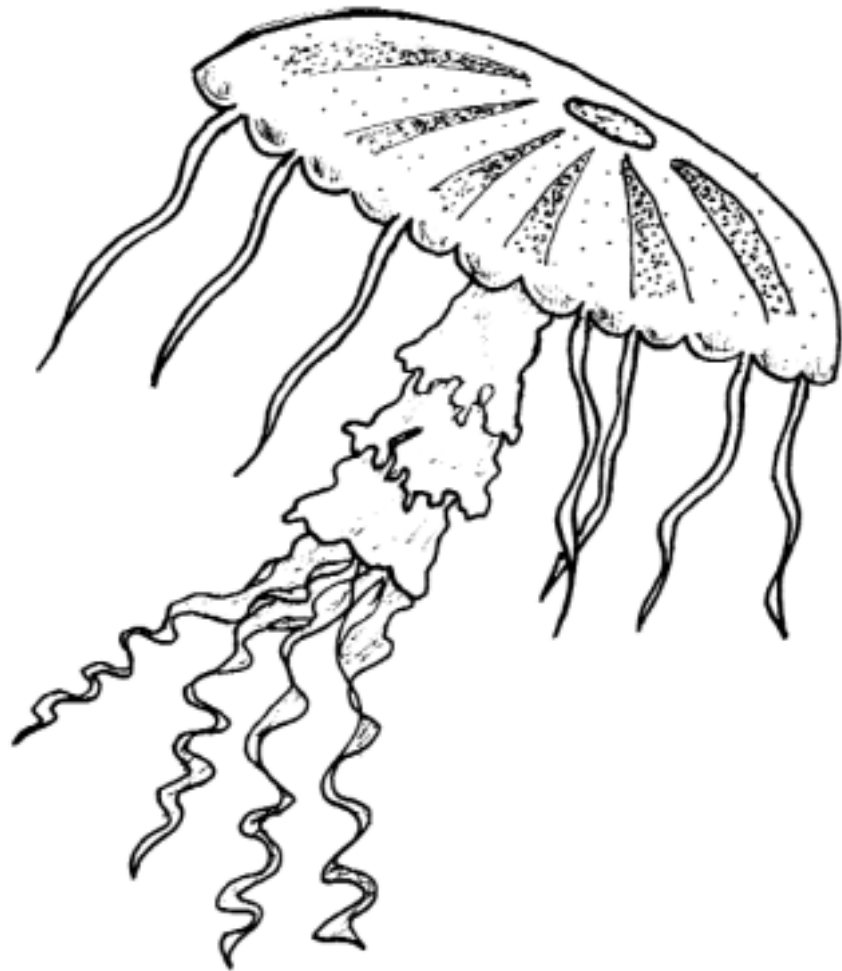
Colour Me

Compass Jellyfish

Chrysaora hysoscella
Smugairle an chompáis

The compass jellyfish can often be found washed up on beaches but care must be taken as it can sting with its 24 tentacles. There are also 4 long 'frilly' arms which make up the mouth. On the top of the umbrella-shaped body there are brown v-shaped markings. The most common time to find compass jellyfish around our coast is between July and September.

- Colour:** Creamy brown with dark brown markings.
- Size:** Up to 30 cm in diameter.
- Habitat:** Floats near the surface in shallow and deep waters.
- Diet:** Worms and smaller jellyfish.



Produced by Sherkin Island Marine Station for the DVD 'On the Water's Edge' © 2008

STAMP COLLECTORS

A unique opportunity to buy a First Day Cover with a difference!

These special First Day Covers celebrate the day of issue of the Hermit Crab stamp by An Post. The image used in the stamp was taken by the noted marine wildlife photographer Paul Kay and is from the Sherkin Island Marine Station archives.



The First Day Covers have two special arrival marks produced by Sherkin Island Marine Station. The first recognises that the First Day Cover was carried by boat from Baltimore to Sherkin Island on the day of issue and the second marks its arrival at the Station. We have marked a limited number of First Day Covers as follows:

- 500 with special marks – €6.00 each
- 250 with special marks and signed by Paul Kay, Photographer – €9.75 each
- 250 with special marks and signed by Matt Murphy, Director, Sherkin Island Marine Station – €9.75 each

Plus p&p – €2.50 for one or a set

To purchase copies of these special First Day Covers, contact:

Matt Murphy, Director,
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Sherkin Island, Co. Cork, Ireland.
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CORK CITY COUNCIL



COMHAIRLE CATHRACH CHORCAÍ

Mississippi River Invasive Species



Grass carp (*Ctenopharyngodon idella*)

Courtesy of USGS

By Michael Ludwig

IN a strange twist of events, fishing on the Mississippi, Illinois and DePlains Rivers has become unsafe for fishermen and outright dangerous for active water sports such as waterskiing or tubing. The fish are fighting back and humans are losing the fight. But the threat of bodily harm is nothing when compared to the likely and permanent destruction of the Rivers' natural ecosystems. What is the problem? Asian carp are taking over the rivers.

Beginning in 1963, Asian carp were imported into the US to control aquatic weed growth that had become a nuisance in many rivers. The aquaculture industry saw the carp as a fast growing, poten-

tial crop that was cheap to raise and could compete with catfish as a source of farm reared protein. The four species of interest were; grass carp [a.k.a. the White Amur] (*Ctenopharyngodon idella*), bighead carp (*Hypophthalmichthys nobilis*), silver carp (*Hypophthalmichthys molitrix*), and black carp (*Mylopharyngodon piceus*). Three of the four species (bighead carp, silver carp, and black carp) are becoming a threat to native species. Escaped Asian Carp are now expanding their presence throughout the Mississippi River watershed. The expansion may not be stoppable, although a major effort is underway.

Bighead carp eat plankton, consuming up to twenty per-

cent of their body weight per day. They can grow to be over 5 feet in length and 100 pounds or more in weight. Because they eat all types of plankton, larval fish and shellfish are eaten. The loss of those very young individuals reduces the numbers that might grow to adulthood. Their overall numbers are declining. Silver carp are the "flying fish" and they eat plankton as well. However, when startled or disturbed by boat motors or other loud noises, silver carp jump from the water. Boats traveling through the area run into the airborne fish causing serious injuries to humans and damage to boats. Black carp are unlike bighead carp and silver carp. They eat adult mollusks, consuming up to 10 tons of them over a lifetime. This species can grow to be seven feet long and weigh over 150 pounds. Fortunately, they do not jump out of the water. They eat other species' food! Of the three species only black carp were accidentally introduced into the waters of the US. Someone misidentified them and thought they were the more useful, grass carp. Because of their voracious appetite and rapid rate of

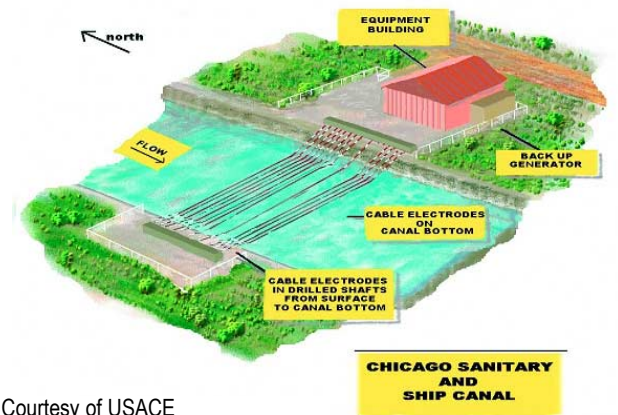
reproduction, black carp are referred to as river rabbits in Australia.

Having pretty much accepted that the carp are here to stay in the Rivers, the battle is to keep the fish out of the Great Lakes. The Great Lakes cover more than 94,000 square miles. Because Asian carp reproduce in large numbers, grow and mature quickly, and feed on plant and animal plankton and adult mollusks they could destroy the natural fisheries and environment of the Lakes. The question is "what will be the impact of Asian carp to the Lakes? The short answer today is it clearly isn't good. Aquatic invasive species are detrimental to native aquatic ecosystems. The potential impact of Asian carp in the Great Lakes can be seen within the Mississippi River basin where they have displaced native species and disrupted the natural ecosystem. It is believed that they could alter the entire ecosystem of the Great Lakes, destroying the very character of those waters and creating ecological and economic damages exceeding those caused by the sea lamprey and zebra mussel invasions.

The struggle to save the great Lakes from the carp invasion has become a biological, economic and legal battle pitting resource managers against the carp and shipping companies. The surest way of ensuring that the carp do not get into the Lakes is to disconnect the lakes from the rivers that the carp use. This has proven to be an unacceptable solution to shipping companies that rely on those connections. So the States and US Army Corps of Engineers installed electric exclusion grids in the only waterways that lead from the Mississippi River into the Great Lakes (see below). These waterways are all located around Chicago.

The electric grid idea seemed ideal as it allowed continued use of the waterways by barges but created an area where carp appeared unable or unwilling to pass. Good idea if the fish do not overcome their dislike of electricity or the grids work all the time. Unfortunately, there is Murphy's (Sods) first law: if something can go wrong, it will. Fish have been found beyond the electric grids. Watch the struggle progress at <http://www.asiancarp.org/contact.asp>.

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Courtesy of USACE

INLAND FISHERIES IRELAND ARE MONITORING FISH FOR THE WATER FRAMEWORK DIRECTIVE

Additional information from:
Inland Fisheries Ireland,
Swords Business Campus,
Swords,
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Website: www.fisheriesireland.ie

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