

SHERKIN COMMENT

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Environmental Quarterly of Sherkin Island Marine Station

2016

The Flora of Spanish Island

John Akeroyd continues his look at the islands of Roaringwater Bay, West Cork. 7

The River Suir Catchment

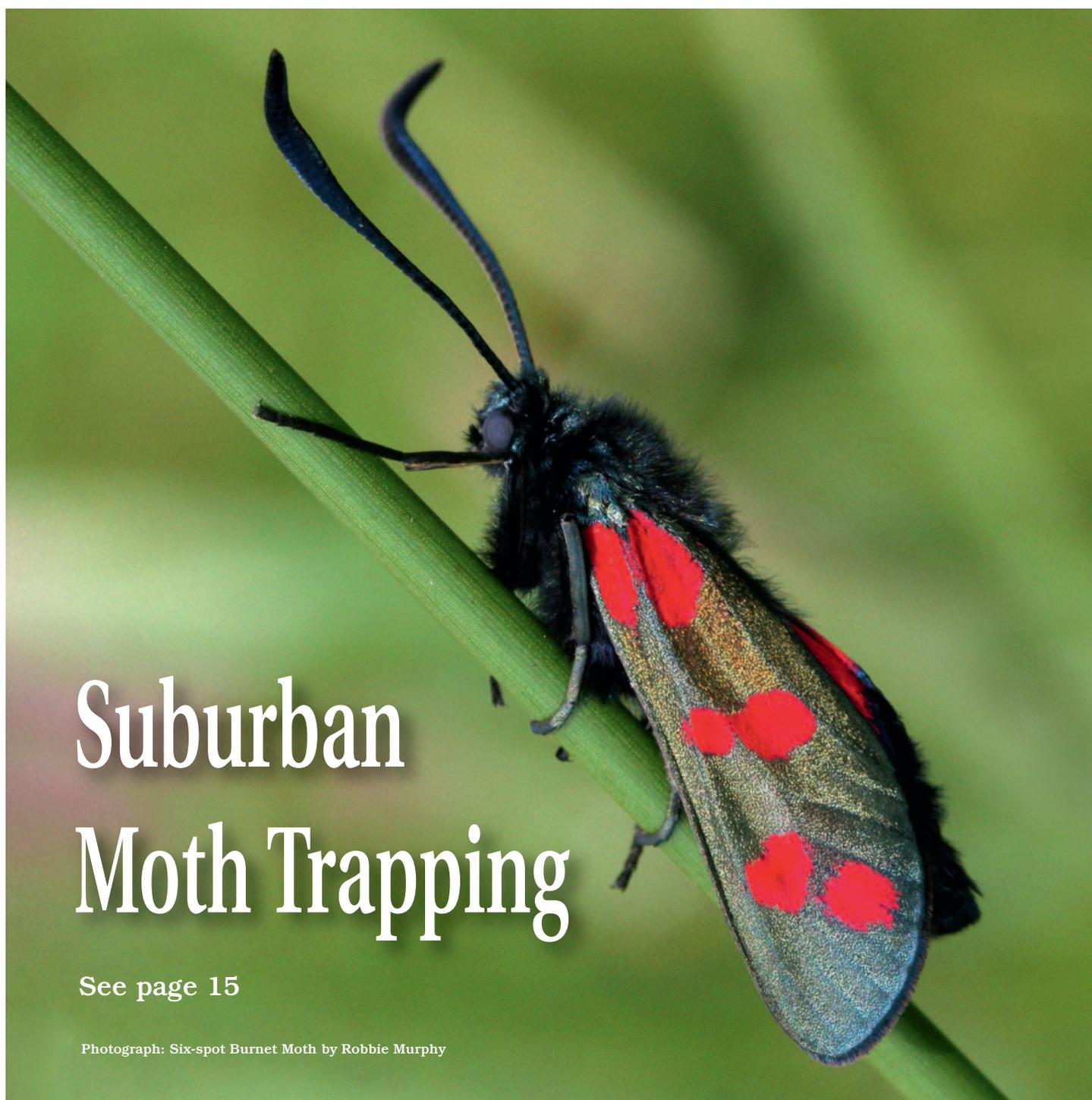
Recording information on Ireland's waterways in a new EPA water management system. 10

Coastal Rainforest of the Tasman Peninsula

Anthony Toole visits an ancient landscape in the Southern Hemisphere. 12

The Praeger Survey of Lambay

Matthew Jebb highlights an island survey that dates back to the start of the 20th century. 18



Suburban Moth Trapping

See page 15

Photograph: Six-spot Burnet Moth by Robbie Murphy

Contents

EDITORIAL: Still a Visionary at 97	2
<i>Matt Murphy speaks with Prof. Emeritus Brian McKenzie Bary, the first Professor of Oceanography at UCG.</i>	
Black-Headed Gull	3
<i>An article by the late Oscar Merne about a bird that is on the Red List of Birds of Conservation Concern.</i>	
Slowing Climate Change by Degrees?	4
<i>Alex Kirby looks at whether the annual UN climate conference in Paris can deliver.</i>	
Eco Echoes: When Cleaning Makes Things Worse	5
<i>Walter Muggan explains how past disposal practices of the waste solvent from dry-cleaning became a problem in the USA.</i>	
Beryciform Fishes in the NE Atlantic	6
<i>Declan T. Quigley describes this fish species, the vast majority of which are confined to tropical waters.</i>	
The Flora of Spanish Island	7
<i>John Akeroyd completes his look at the islands of Roaringwater Bay.</i>	
Pike & Trout in harmony on Lough Ree	8
<i>Shane O'Reilly on the findings of the fish survey of Lough Ree by Inland Fisheries Ireland.</i>	
A Dream Come True – Harnessing the Power of Water	9
<i>Michael O'Brien explains how Waterpower generates, trades and sells electricity to 25,000 customers.</i>	
The River Suir Catchment	10
<i>Information on all of Ireland's waterways is to be recorded in a new EPA water management system, the River Suir being the pilot catchment.</i>	
Coastal Rainforest of the Tasman Peninsula	12
<i>Anthony Toole visits an ancient landscape in the Southern Hemisphere.</i>	
Rachel Carson and the Birth of Environmental Consciousness	13
<i>Walter Muggan tells us about a woman whose writings have inspired future generations.</i>	
The Wild Roses of Ireland & Britain	14
<i>Tony O'Mahony describes the floral display of this species as a major highlight of the flowering season.</i>	
Suburban Moth Trapping	15/16/17
<i>Cian Merne hopes to whet the appetite and encourage more Irish moth enthusiasts.</i>	
The Praeger Survey of Lambay	18
<i>Matthew Jebb highlights an island survey that dates back to the start of the 20th century.</i>	
GPO Witness History	20
<i>Barney Whelan describes this new visitor experience in Dublin to tell the story of the 1916 rising.</i>	
Geology in 3D – Revealing the Structures Beneath our Feet	22
<i>The GSI on how 3D geological data analysis can help planners & policy makers make informed decisions.</i>	
Climate News Network	23
<i>Pertinent articles on the implications of global warming and greenhouse gases.</i>	
Publications of Interest	24
Black John the Bogus Pirate by John Joyce	26
Clouds	27
<i>Met Eireann explains the different cloud types.</i>	
Hook Lighthouse	28
<i>A guiding light for seafarers on Ireland's east coast.</i>	
Gaisce – the President's Award	30
<i>Oliver Clare's journey to Gaisce Gold.</i>	
Environmental Competition for Primary School Children in Munster 2016	31
Ocean Mining	32
<i>Michael Ludwig discusses the various environmental consequences of mining the seafloor.</i>	

Editorial

Still a Visionary at 97

By Matt Murphy

LAST summer I had the pleasure to visit Prof. Emeritus Brian McKenzie Bary at his Kerry home. He was the first Professor of Oceanography appointed at University College Galway, a role he fulfilled with distinction in the 1970s and 1980s. He is now 97 years of age and is as enthusiastic about the need for oceanographic research in Ireland as he always was. He spoke passionately of what he had hoped to achieve when appointed to the new Chair of Oceanography in December 1969, a position he took up in July 1970. Brian showed me some of the correspondence he then had with the late Prof. P. O'Ceidigh before he took up his new role in Galway. The University was very short of funds and capital grants for laboratory departments were limited. Brian had envisaged that IRE50,000 would be required to develop research facilities for his department (laboratories and equipment for sea and shore activities, ship time, staffing, etc.) but the first grant received was for IRE5,000 (It seemed that a total of approximately IRE60,000 was to be divided among fifteen departments).

In one of his letters, it was interesting to read what Brian would bring with him to Galway from Canada: "... a high-speed plankton sampler and its associated electronics (even though UCG has not yet agreed to pay transport!). It consists of a depth-flow-temperature unit, opening closing mechanism on the sampler operated by a solenoid, towing cable with a single conductor, and a portable echo sounder on which the depth of the gear can be displayed (recorded) while being towed." Brian did not waiver in the challenge that faced him and his commitment was not dampened by lack of resources and support.

We talked about his career prior to coming to Ireland. It began in New Zealand in 1941 when he taught science and agriculture in a secondary school. He then went on to demonstrate and lecture in zoology in Victoria University College, Wellington and gained a PhD in Zoology. He became a Lt. Comdr. in the Royal New Zealand Navy, doing Defence Research, which included time at the National Institute of Oceanography, Wellington and the Institute of Oceanography, in the UK. After that he became Principal Scientific Officer at Scottish Marine Biological Association, Edinburgh and then Associate Professor and subsequently Professor of Oceanography and Zoology at the University of British Columbia, Canada. Throughout those years he specialised in plankton research, specialising in the relationship of zooplankton species to ocean properties.

That summer's day I visited, we discussed in detail what we agreed was required to achieve the development of oceanography for Ireland Inc.

"I came to Ireland from an institute in Canada which had a very wide range of marine research going on. There was quite a lot of physical and chemical information being gathered along the west coast of Canada. There was an active zoology programme, zooplankton, phytoplankton and chemical programmes; an extensive workshop supported all these projects. I was also actively engaged with research vessels and the design of these in relation to the various programmes, particularly on the biological plankton side. Clearly, I had a fairly wide background of information. When I came to Ireland I was anxious to see a new institution of oceanography where a wide range of activities could be undertaken. Now this would be starting right from ground zero. There were other programmes that were being carried out for individual projects, but not with any particular national view of what the data were leading to, other than the advancement of that project.

When I came I wrote a programme of what I wished to develop, starting at ground zero and progressing over the years, for oceanography in UCG Galway and Ireland. The aim was to build up a broad database in zooplankton and phytoplankton related to oceanographic conditions, which meant physical oceanography, chemical oceanography and the relationship between changes in their properties and plankton occurrences could be determined. This required that I knew in detail the distribution of species not only at the surface but in depth, at a standard series of depths, and the relationship between the zooplankton and phytoplankton distributions and the oceanographic conditions. To back that up, workshop facilities were required to look after and design equipment if necessary, which we did do

occasionally later on. All this would require a staff able to deal with zooplankton, phytoplankton, chemical, physical oceanography as an absolute basis. To round that off I was suggesting that sometime in the future it would be desirable to have geology and hydrographic surveying, particularly the latter, because the charting of hydrographic conditions around the coast had more or less ceased except for spasmodic, occasional visits from the British Hydrographic Service of particular sites and bays in Ireland. However there was no continuous hydrographic surveying being done. Thus it was a broadly based programme that I had envisaged being developed in Ireland."

I then asked Brian if he was frustrated that he could not implement what he had hoped to; his frustration still shows even though he is now over 36 years retired. In his answer he said that he could not understand the early lack of cooperation between the scientists in the Department of Fisheries and those in some departments in NUI Galway (formally called UCG). Oceanography did engender cooperation with fisheries.

"I was more than frustrated. I got very down and depressed over the fact that I could not get things done. That resulted because I could not obtain adequate funding. There were periodic grants from UCG and I could understand this because the college was very short of money anyway. But we got only occasional response nationally. We were pushed into the situation where instead of putting all our efforts into what I was hoping to do in oceanography and in the lab, of taking on consultancy work, for which there was a demand in Ireland. This meant that fish farming in particular, which was beginning to be developed, did not have basic data of the oceanographic conditions pertaining to fish farming and the plankton occurrences on which to build any fish farms, let alone a national range of them. For example, fish lice became a major problem in fish farming and yet we had very limited knowledge on the occurrences of lice because we did not have any continuous background on population fluctuations or

CONTINUES ON PAGE 25...

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Black-Headed Gulls



The Seabird 2000 census of breeding seabirds in Britain and Ireland, centred around the Millennium, found that there were c.130,000 pairs of Black-headed Gulls in Britain, but only c.14,000 pairs in Ireland.



Ringed birds helps us to learn more about their movements.

By Oscar Merne

UNLIKE adult Mediterranean Gulls (see my article in Issue No. 52) in full breeding plumage, which have jet black heads, the so-called Black-headed Gull's head is actually dark chocolate brown in colour. This can be seen in good light and close to the birds, but in general the heads look black coming up to and including the breeding season. Just to confuse things further, there are a number of other gulls with black/blackish heads, and also a Brown-headed Gull in south Asia and a Brown-headed Gull in South America. In our part of the world, Bonaparte's, Mediterranean, Little, Sabine's, Franklin's, and Laughing Gulls all sport black heads in the breeding season – but these are scarce to rare species in Ireland. Nevertheless, do not assume that any gull with a black head is a common Black-headed Gull!

Black-headed Gulls are an Old World species, though in the 20th century there has been a tendency for them to spread westwards to North America. They started breeding in Iceland in 1911 and became regular there since c.1930. Then they bred in Greenland in 1969, and managed to establish a toehold on the North American continent in 1977, with birds breeding in Newfoundland. In winter, many move south and west to escape severe conditions in the continental interior, and they occur on the Atlantic coasts as far south as West Africa, the Niger inundation zone, and also wander out to the Canary Islands and even the Azores. In East Africa they are found in the Nile Valley as well as on the Indian Ocean coast. The world population of Black-headed Gulls is estimated by Wetlands International as 5.5-6.5 million birds.

The Seabird 2000 census of breeding seabirds in Britain and Ireland, centred around the Millennium, found that there were c.130,000 pairs of Black-headed Gulls in Britain, but only c.14,000 pairs in Ireland. There had been a >50% decline in numbers, and a >70% in breeding range, in Ireland since previous estimates. Because of this, the species has been placed on the Red List of Birds of Conservation Concern. The reasons for the decline are not fully understood, but it seems clear that in some areas at least raids of colonies by escaped feral American Mink have been responsible for wiping out large numbers of gulls and

their eggs and chicks.

Irish breeding birds seem to stay mainly in Ireland, simply dispersing from the colonies and tending to move to the coastal fringes for the winter. However, we have a couple of instances where Irish-bred gulls migrated over 1,500 km to Iberia. The (now) relatively small numbers of Irish Black-headed Gulls are joined in the winter months by very large numbers from the Continent. Ringing recoveries and field sightings of colour-ringed birds indicate that the great majority of these immigrants come from Scandinavia (Norway, Sweden and Finland) and the Baltic Sea area (particularly Poland and the Baltic States). The winters are severe in these areas and the gulls move west to the temperate coastal parts of Europe. Small numbers also come from Iceland.

Unfortunately, we do not have good data on overall numbers here in winter, mainly for three reasons. First, a large proportion of our wintering birds occur much of the time inland, foraging (on worms, insects, etc.) on short pastures, playing fields, stubbles, and following the plough – and these birds are not counted by Irish Wetland Bird Survey (I-WeBS) field-workers who concentrate on censusing waterbirds at the major wetlands. Secondly, with so many important populations of other waterbirds such as ducks, geese, swans and waders to monitor, the gulls are a second priority and often have to be left



Black-headed Gulls in winter plumage, in Bray Harbour, Co. Wicklow.

uncounted. Thirdly, at a number of major coastal wetlands the numbers of gulls present during the day can be quite

low (perhaps just a couple of thousand birds), but at sunset/dusk very large numbers arrive from inland feeding

sites to roost in the bays and estuaries. For example, in Dublin Bay there may be c.5,000 Black-headed Gulls present through the day, but this number can rise to 15,000-20,000 at dusk. Also, recent gull survey work has shown that Dublin Bay seems to act as a major staging site on the east coast for winter immigrants which are resting and feeding before setting off towards their breeding areas in Scandinavia and the Baltic in late February/early March. Peaks of 40,000 Black-headed Gulls have been recorded at this time, which equals the grand total number of Black-headed Gulls accounted for by the incomplete I-WeBS counts!

Oscar Merne retired from Ireland's National Parks & Wildlife Service in January 2004. Before he died in January 2013, Oscar wrote a number of articles for Sherkin Comment to be published in future issues.

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Slowing Climate Change by Degrees?

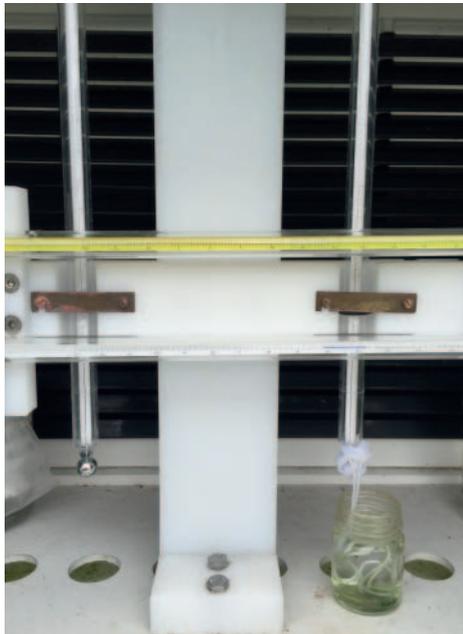
By Alex Kirby

SUDDENLY, just before Christmas 2015, it looked possible. Despite so many false starts, disappointments and outright failures, the world had finally agreed to take climate change seriously. At the annual UN climate conference, held that year in Paris, 196 countries agreed they would aim to keep global temperature rise beyond pre-industrial levels "well below" the 2°C previously agreed, and would even pursue efforts to limit the increase to 1.5°C.

As the talks ended the French president, François Hollande, proclaimed: "It is rare in any lifetime to have a chance to change the world." Er, yes, Mr President. So let's hope you were right.

But there is evidence to suggest that the Paris Agreement may offer much and deliver little. It has signified some worthwhile gains: the mood music has changed, the environment and the economy are now seen increasingly as interdependent, and there is much greater willingness from business and industry to make some hard choices. Examples are the flight from coal and the response to the rapidly falling costs of renewable energy.

There are encouraging signs too that governments have got the message, though progress towards ratifying the Agreement is measured rather than



rapid. But that is a distinct improvement on the bilious marking of time that prevailed for so long.

It's not the good faith of those with new-found energy and enthusiasm for tackling climate change that's really worrying the sceptics. It's two other concerns.

The first is the Paris Agreement itself. Put simply, it would probably have worked wonders 20 years ago: now, though, it looks as though it may offer too little, too late. A

large part of the responsibility for that lies with those who have argued - whether from conviction or from other motives - that, yes, the climate is warming, but not fast or threateningly enough to warrant any rapid response. They refuse to accept that climate change is happening now, that it is happening much faster than climatologists had expected, that much of it is caused by humans - and that our decisions in the next few decades (what sort of power

stations to build, for instance) will be crucial.

The world has already warmed by 1°C in the last century. But climate scientists say the emission abatement commitments submitted by governments before the Paris meeting imply global warming of between 2.6°C and 3.1°C. They calculate that the entire global budget for limiting global warming to below 2°C may have been emitted by 2030, so the Agreement will need to be made much more stringent (there is provision for this to happen).

If 2°C looks elusive, what about 1.5°C? One climate scientist told me: "1.5°C is a safer limit than 2°C, but 1.5°C will still have a lot of negative impacts on both natural and human systems, specifically in tropical regions and small island states. 1.5° will not make us 'safe' from negative impacts, but it will make us significantly safer overall than higher levels of warming.

"The modest amount of research done to date shows a surprisingly large difference between 1.5° and 2°C for many systems." Both targets, incidentally, are thought likely to be attainable only with the use of carbon capture and storage, a technology which has still to be proved at scale.

The other factor casting a long shadow over the Paris Agreement is climate science itself.

A growing body of evidence shows that climate risks occur at lower levels than previously thought.

In the Mediterranean region, for example, already experiencing climate change-induced drying, climate scientists believe the difference between the two Paris goals could be significant. With a global temperature increase of 1.5°C, the availability of fresh water in the region would be about 10% lower than in the late 20th century. But in a 2°C world, researchers project that this reduction would double.

In the tropics the half-a-degree difference could damage crop yields, particularly in Central America and West Africa. On average, local tropical maize and wheat yields would fall twice as much with a 2°C temperature increase as with 1.5°C. By 2100, tropical regions would also experience warm spells lasting up to 50% longer in a 2°C world than at 1.5°C.

Michael Mann, a renowned climate scientist, is director of the Earth System Science Cen-

ter at Pennsylvania State University in the US. He thinks humanity has very nearly run out of time to make Paris a reality. He writes: "We don't have a third of our total carbon budget left to expend . . . We've already expended the vast majority of the budget for remaining under 2°C. And what about 1.5°C stabilisation? We're already overdrawn."

If someone of Mann's eminence can pronounce a verdict as bleak as this, then perhaps the best we can say about the Paris Agreement is that working to reach its goals can at least help us to adapt to the now-inevitable climate change ahead. Only an out-and-out cynic, surely, could agree with George Monbiot's verdict on the Agreement the day it was achieved: "By comparison to what it could have been, it's a miracle. By comparison to what it should have been, it's a disaster."

Alex Kirby is a founder editor of the Climate News Network www.climateactionnetwork.net

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ECO ECHOES:

When Cleaning Makes Things Worse

By Walter Mugdan¹

July, 2016

THE old saying goes: "Cleanliness is next to Godliness." But not always. Far too often during the 20th century we fouled our own nest when we cleaned our fine clothes.

To clean something that is dirty, one typically needs a *solvent* to dissolve and carry away the dirt. For most of human history, and still today, the most widely used solvent to clean clothes has been water. But to clean clothes with water — even with soap or detergents — the clothes have to be washed pretty hard. They can be scrubbed against a stone in the river; they can be rubbed across an old-fashioned washboard; or they can be agitated in a modern washing machine. This works well for your blue jeans and tee shirts, cotton underpants and socks. But delicate garments can be damaged by the vigorous treatment needed when cleaning with water.

Enter dry cleaning. Which isn't really dry ... it uses a solvent other than water. The idea dates back at least to Roman times, when materials such as ammonia and lye were used. Starting in the seventeenth century, as clothing became fancier, cleaners experimented with turpentine and camphene. In 1855 a Frenchman, Jean-Baptiste Jolly, found that kerosene was a suitable solvent and he coined the term "*nettoyage à sec*" — that is, dry cleaning. Other petroleum-based solvents like gasoline were soon added to the repertoire. They worked well enough, but they had a troubling habit of causing frequent explosions and fires. Dry cleaning establishments were therefore heavily regulated and often prohibited from locating in residential areas.

Enter chlorinated solvents. After World War I, cleaners discovered this newly developed group of chemicals, which were far less flammable and — better yet — got the clothes cleaner. By the late 1930s, the cleaning industry had largely settled on one chemical in particular, known variously as tetrachloroethylene or perchloroethylene, and commonly shortened to "perc." Perc is among the most widely used solvents in the

world. It is what you smell when you enter the dry cleaner store, and the smell may linger in the wool suit or silk dress you bring home and hang in your closet. Because of the low flammability of perc, dry cleaners were now allowed to locate throughout densely populated areas, convenient to their customers.

Alas, as has often happened in human history, the solution (pun intended) to one problem became the cause of another — or many others. Perc is almost certainly a cancer-causing chemical. Workers in the industry were regularly exposed to harmful vapors; and if that wasn't bad enough, entire communities were often exposed as a consequence of the industry's casual disposal practices. The solvent would typically be discarded once it became too dirty to do its job effectively, and the easiest way to discard it was to pour it down the drain or into a convenient hole in the ground.

In the United States, the highest priority hazardous waste disposal sites are found on a list compiled by the U.S. Environmental Protection Agency (EPA) under the federal "Superfund" law, enacted in 1980. The law was a reaction to the infamous Love Canal site in Niagara Falls, New York, where the Hooker Chemical Company (predecessor to today's Occidental Petroleum Corporation) dumped thousands of tons of chemical waste from its manufacturing plant. As you would expect, EPA's Superfund list includes sites associated with many chemical manufacturers. But perhaps more unexpectedly, the list is replete with *dry cleaning* sites.

It was not until the 1970s that we started to look more carefully at what chemicals we might find in our drinking water supplies. In community after community, what we found was perc. The waste solvent, dumped by the cleaners, seeped through the soil and mixed with the groundwater below. Groundwater moves in much the same way as surface water — that is, with gravity. On the surface the direction of that movement is called "downstream;" for groundwater we call it "downgradient." As a contaminant travels with the groundwater downgradient from its point of entry, it spreads out horizontally and verti-



Sandies Dry Cleaner and Laundry, Little Chute, Wisconsin, operated from 1957 to about 2003 and had been vacant since 2006. Soil contaminated with PCE was found near the dry cleaning machine at the site and in the air next door. In addition, the Wisconsin Department of Natural Resources and Department of Health Services found PCE vapours in the indoor air of businesses and residences next door in February 2011. (www.epa.ie)



cally. This creates what is called a "plume of contamination." Such plumes can extend for miles, and can poison the water in both municipal drinking water supply wells and individual homeowners' wells.

The U.S. EPA and many states have since issued rules requiring dry cleaners to handle their wastes responsibly. Dry cleaning is now done on a "closed loop" basis, with modern equipment, which prevents discharges into the environment. (There are also an increasing number of "green" dry cleaners that use non-hazardous cleaning products.)

But the damage from past disposal practices has been done. As a result, EPA has spent hundreds of millions of dollars to clean up scores of dry cleaner sites all around the country, and states have cleaned up many more. Under U.S. law, the companies that generated and disposed of the hazardous wastes are responsible for the costs of cleanup, even if — as is common — there was nothing illegal about what they did at the time they did it. But with dry cleaners, this provision is usually a hollow one. That's because most dry cleaners have always been small, independently owned businesses. Even if the business is still operating by the time liability for a Superfund site is assigned, there are probably few or no assets to cover the cleanup costs. In that case, it's the taxpayers who pay for the cleanup.

Cleanup is expensive, but at least it's technically feasible. Perc, like other volatile organic compounds, can be "stripped" out of water by passing air through it. The contaminated water is pumped to the surface; it's then sprayed in small droplets through a column of blown air. The perc leaves the water and joins the air, from which it can in turn be captured by passing it through a column of activated carbon (similar to granulated charcoal). The water can also be passed through the activated carbon directly, or as a second "polishing" step after passing through the air stripper.

Various technologies allow the groundwater to be cleaned *in situ* — that is, underground. Air can be injected through one set of wells, and vacuumed out through another set, carrying along the perc; benign com-



Jim's Dry Cleaners, Millinocket, Maine, USA. The site consists of two neighbouring properties that operated as a dry cleaning facility and laundromat before 2007, during undetermined dates. The site was referred to EPA by the Maine Dept. of Environmental Protection due to volatile organic compounds (VOCs) detected in the indoor air. Cleanup work by contractors began Jan. 23, 2012. By Feb 22, when the cleanup up was finished, 70 gallons (265 litres) of solvents and flammable liquids and 75 lb (34 kg) of pesticides had been packed and removed. (www.epa.ie)

pounds can be injected to chemically transform the perc into a harmless compound; or heating elements can be placed underground to drive out the perc.

These technologies can provide residents with clean drinking water, which is vitally important. But a century of dry cleaning with perc has created a second, equally insidious pathway for the carcinogenic chemical to threaten people's health. Perc is a volatile compound, which means it evaporates easily. This can happen underground where either soil or groundwater is contaminated. The perc vapors work their way up through the ground. If they reach the foundation of a building, they can build up until they find their way inside through a crack or opening (e.g., where a pipe or electrical conduit passes through). This is called vapour intrusion. Once inside, the colourless, mostly odorless vapors are breathed in by the residents, presenting another risk to their health.

Endicott, New York is known as the birthplace of IBM, the computer giant. IBM was known, for many years, as a "white shirt" company, where most of the employees (who were mostly men in those days) had to wear white shirts and suits. Those suits had to be cleaned regularly. Endicott is reputed to have had the largest number of dry cleaners *per capita* anywhere in the world. In the late 1970s the groundwater under Endicott was found to contain perc (along with related chemicals such as

trichloroethylene, used widely in degreasing metals parts like those used in computer manufacturing).

Under government direction, in 1979 IBM began pumping and treating the groundwater. It has been quite successful at this task. Nearly a million pounds of contaminants have been removed, and the groundwater is below or close to levels mandated for drinking water. Until 2002 most people thought that meant the risk of vapour intrusion for the houses above the plume would also have been mitigated. Wrong. Over 400 homes were found to have significant levels of solvent vapors. The homeowners were offered vapour mitigation systems, and most accepted. These work well; but it is virtually certain that the residents were exposed to the vapors for many years prior. It is likely that the health of some of these residents — or many, or maybe even most — suffered as a consequence. It is difficult to prove causation, but we do know that quite a number of those residents died of cancer.

Sometimes cleanliness comes at too high a price.

¹ Walter Mugdan is Director of the Division of Emergency & Remedial Response, U.S. Environmental Protection Agency, Region 2, New York City, New York, U.S.A. Any opinions expressed in this article are his own, and do not necessarily reflect the views of the U.S. EPA.

By Declan T. Quigley

BERYCIFORMES represent a relatively large order of marine fishes which is represented worldwide by 7 families and 160 species, including: Fangtooths (Anoplogasteridae) [2]; Spinyfins (Diretmidae) [3]; Squirrel Fishes (Holocentridae) [83]; Flashlight Fishes (Anomalopidae) [9], Pinecone Fishes (Monocentridae) [4], Roughys (Trachichthyidae) [49], and Alfonsinos (Berycidae) [10].

Apart from the Holocentridae and Monocentridae, which are usually found in relatively shallow inshore waters (depths <200m), almost half of the known species are bathypelagic, and are generally found in deep offshore waters. These deep-water zones are relatively unexplored, and the majority of species, most of which have no commercial value, are either infrequently captured and/or rarely recorded. Hence, little is known about their biology.

Although several species have a worldwide distribution, the vast majority (c.80%) are confined to tropical waters in the Indo-Pacific region. At least 27 species (representing 6 families) have been recorded from tropical and sub-tropical waters of the North and South Atlantic, including 14 species (5 families) from the NE Atlantic, and 8 species (4 families) from temperate/boreal waters in NW Europe (Table 1).

Common Fangtooth (*Anoplogaster cornuta*)

The Common Fangtooth is a voracious sit-and-wait predator, equipped with formidably long fang-like teeth, and capable of swallowing whole prey at least a third of its size. A closely related, albeit smaller species (maximum 6cm TL), the Shorthorn Fangtooth (*A. brachycera*), is found in the western Atlantic (Gulf of Mexico to southeast USA).

Silver Spinyfin (*Diretmus argenteus*)

The Silver Spinyfin was first reported off the west coast of Ireland during 1909, and has since been recorded from as far north as Iceland.

Parin's Spinyfin (*Diretmichthys parini*)

Parin's Spinyfin, first described in 1981 from the Gulf of Guinea (W Africa), and has since been recorded, albeit rarely, from as far north as Iceland.

Orange Roughy (*Hoplostethus atlanticus*)

Orange Roughy form large seasonal feeding and spawning aggregations around submerged oceanic seamounts, cold-water coral reefs and other deep-water rocky habitats. The species is highly vulnerable to over-exploitation due to its

Beryciform Fishes

(Order: Beryciformes) in the NE Atlantic



Common Fangtooth (*Anoplogaster cornuta*)
(Photo © Rafael Banon Diaz)



Mediterranean Slimehead (*Hoplostethus mediterraneus*),
Porcupine Bank, July 2014 (Photo © Alan Pyne)



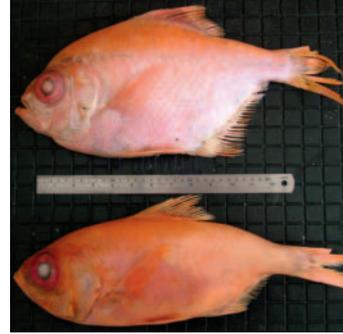
Silver Spinyfin (*Diretmus argenteus*), Madeira
(Photo © Dr Peter Wirtz)



Black Slimehead (*Hoplostethus cadenati*), Galicia, NW
Spain (Photo © Rafael Banon Diaz)



Parin's Spinyfin (*Diretmichthys parini*), 35.2 cm TL,
Asturias, Bay of Biscay (Photo © Juan Carlos Arronte)



Alfonsino (*Beryx decadactylus*) [top] & Splendid Alfonsino
(*B. splendens*) [bottom], Porcupine Bank (Photo © Declan Quigley)



Orange Roughy (*Hoplostethus atlanticus*), Porcupine Bank
(Photo © Declan Quigley)

slow growth rate, late maturity (25-30 years @ 18-32.5cm TL), low fecundity and exceptional longevity (150 years).

Since the late 1970s, this previously high-value, non-quota species has been sequentially depleted by commercial fishing fleets in the Western Pacific (New Zealand and Australia), SW Atlantic (Namibia, SW Africa), Eastern Pacific (Chile), and NW European waters (Ireland). Between 1977 and 2003, unregulated

global exploitation increased exponentially, reaching a peak of 91.5k tonnes during 1990 (Figure 1). However, since then, the combined effects of unsustainable exploitation, market over-supply, increasing vessel fuel costs, and the delayed introduction of management regimes (e.g. quotas and closed fishing areas), led to a rapid and dramatic 90% decline in global landings. Indeed, during 2014, global

landings only amounted to 9k tonnes, with New Zealand accounting for 95% of this total. The total allowable catch (TAC) in EU waters is currently zero.

Mediterranean Slimehead (*Hoplostethus mediterraneus*)

The Mediterranean Slimehead was first reported from Irish waters during 1905. Although small by-catch quantities have occasionally been landed by Spanish and Portuguese vessels, the species is generally discarded.

Black Slimehead (*Hoplostethus cadenati*)

The Black Slimehead, first described in 1974 from NW Africa, has since (1993) been recorded, albeit rarely, from as far north as NW Ireland.

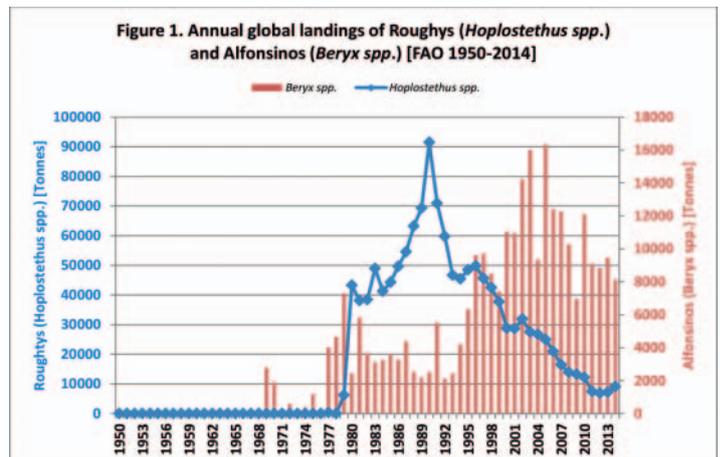
Alfonsinos (*Beryx decadactylus* & *B. splendens*)

Alfonsinos form large seasonal feeding and spawning aggregations around submerged oceanic seamounts, and other deep-water rocky habitats. Both species are commercially important locally throughout their global range. However, in several ways, the commercial exploitation of Alfonsinos typifies the historical problems associated with many other high seas deep-water fish species (c.f. Orange Roughy). Their productivity is moderate and their biological characteristics make them susceptible to over-fishing in the absence of effective management regimes. The current EU TAC for both *Beryx* species is combined at 296 tonnes.

Since the late 1960s, Alfonsinos have been exploited in the Western Pacific (Japan & New Zealand), SW Atlantic (Namibia, SW Africa), Eastern Pacific (Chile), and NE Atlantic (Azores). Since 1968, unregulated global exploitation increased exponentially, reaching a peak of 16.3k tonnes during 2005 (Figure 1). However, since then there has been a significant 50% decline in global landings. Indeed, during 2014, global landings only amounted to 8.2k tonnes, with Japan and New Zealand accounting for almost 75% of this total. Only small by-catch quantities were landed by Irish vessels during the period 2003-10 (627 tonnes in total).

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Table 1. Beryciform species recorded from the NE Atlantic			
Family, Common Name & Species	NE Atlantic Geographical Range	Depth Range (m)	Max. TL (cm)
Anoplogasteridae (Fangtooths)			
Common Fangtooth <i>Anoplogaster cornuta</i> (Valenciennes, 1833)	Iceland, including Irish waters	500-5000	18
Diretmidae (Spinyfins)			
Longwing Spinyfin <i>Diretmichthys pauciradiatus</i> (Woods, 1973)	Madeira & Morocco (rare)	>1000	37
Silver Spinyfin <i>Diretmus argenteus</i> Johnson, 1864	Iceland, including Irish waters	500-2000	28
Parin's Spinyfin <i>Diretmichthys parini</i> (Post & Quéro, 1981)	Iceland, including Irish waters (rare)	500-2000	40
Holocentridae (Squirrelfishes/Soldierfishes)			
Red Squirrel Fish <i>Sargocentron hastatum</i> (Cuvier, 1829)	Portugal (rare)	0-200	25
Redcoat <i>Sargocentron rubrum</i> (Forsk., 1775)	Eastern Mediterranean Sea (established Lessepsian immigrant)	0-84	32
Blackbar Soldierfish <i>Myripristis jacobus</i> Cuvier, 1829	Cape Verde, NW Africa	0-100	25
Spinycheek Soldierfish <i>Coryzox spinosus</i> Agassiz, 1831	Cape Verde, NW Africa	45-275	20
Trachichthyidae (Roughys/Slimeheads)			
Orange Roughy <i>Hoplostethus atlanticus</i> Collett, 1889	Iceland, including Irish waters	700-1800	75
Mediterranean Slimehead <i>Hoplostethus mediterraneus</i> Cuvier, 1829	Iceland, including Irish waters	100-1175	42
Black Slimehead <i>Hoplostethus cadenati</i> Quéro, 1974	NW Ireland (rare)	200-1300	30
Darwin's Slimehead <i>Gephyroberyx darwini</i> (Johnson, 1866)	Madeira & Mediterranean Sea (rare)	200-1200	60
Berycidae (Alfonsinos)			
Alfonsino <i>Beryx decadactylus</i> Cuvier, 1829	Iceland, including Irish waters	110-1000	100
Splendid Alfonsino <i>Beryx splendens</i> Lowe, 1834	Iceland, including Irish waters	25-1300	70



The Flora of Spanish Island



Lax-flowered Sea-lavender



Spanish Island in the foreground.

JOHN AKEROYD continues his look at the islands of Roaringwater Bay.

IN recent articles I've described the smaller and uninhabited islands of Roaringwater Bay, most of them remote and seldom visited. Spanish Island (Irish, *Inis Bheac* or Striped Island), lies close to the mainland at the mouth of the River Ilen but is largely unknown to most visitors, many of whom see this 55-ha island from the ferry to Sherkin, Cape Clear, Heir or Schull but few of whom actually land. Rising to 34 m above sea level, Spanish is relatively low-lying but sheltered by high ground on Heir and Sherkin. The sheltered position, proximity to the mainland (in fact Ringaroy Island, surrounded by the River Ilen) and recent lack of human inhabitants has caused it to become overgrown with dense scrub and low-growing trees, thus supporting several woodland species rare or elsewhere absent in Roaringwater Bay.

Geologically, Spanish, like the other Roaringwater Bay islands, is of Upper Devonian age (350 million years ago), formed of the fine-grained purplish mudstones of the Castlehaven Formation that replace the harder and slightly older slates of Sherkin Formation of Cape Clear Island and most of Sherkin. The 'stripes' of the Irish name refer to the vertical rock strata, striking in aerial photographs. The soil, derived from eroding rocks and glacial drift, is mostly thin and peaty but would have here and there been fertile enough for cultivation. Drier higher ground is dominated by coarse purple moor-grass heath, with peat-bog and pools in the depressions. Much of the island, apart from relics of damp pasture, has a dense

cover of gorse, willow, bramble and bracken (which alas shelters ticks), and larger trees such as ash, hazel, holly and oak. The presence of these tree species suggests there may even be a few fragments here of former 'Celtic' temperate rainforest, often dominated by hazel. However, most of these trees, together with sycamore and some English elm (recorded in 1982 by Lucy Wright, while at volunteer at Sherkin Island Marine Station, but not seen recently), would have been introduced.

The relatively small flora of Spanish comprises some 200 species, including 11 ferns, less than the total for each Calf island – ironically, lack of human activity has probably lowered habitat diversity, with little open ground and few weeds. As far as I know, botanists from Sherkin Island Marine Station are almost the only scientists to have explored the island, adding considerable value to their plant records. Oleg Polunin doesn't appear to have been there, although in 1952 shortly after his various visits to Sherkin, local naturalists J. Emmet O'Donovan of Union Hall and Bernard O'Regan from the Mizen gathered records on Spanish, including Twiggy Mullein (*Verbascum virgatum*), no longer there (but locally present in Bantry Bay).

Spanish holds few of the rare or local clovers and other plants of coastal heaths that are such a feature of the islands, apart from Small-fruited Prickly-sedge (*Carex muricata*); and some good patches of flower-rich rocky heath occur near the sea. However, it has the best woodland, or at least woodland edge and scrub, flora of the Bay, with a distinct assemblage of species such as Enchanter's-nightshade (*Circaea lutetiana*), Wood Avens (*Geum urbanum*), Yellow Pimpernel (*Lysimachia nemorum*), Wood Sorrel (*Oxalis acetosella*), Wood Dock (*Rumex*

sanguineus) and Hedge Woundwort (*Stachys sylvatica*). Other species have their only Roaringwater Bay records from Spanish: e.g. Creeping Soft-grass (*Holcus mollis*), Skullcap (*Scutellaria galericulata*) and Greater Chickweed (*Stellaria neglecta*). Small salt-marshes, especially on the muddy eastern shore – and on adjacent small islands – support populations of Sea Aster (*Aster tripolium*), Lax-flowered Sea-lavender (*Limonium humile*) and Glasswort (*Salicornia europaea*), all rare in Roaringwater Bay. Low rocks bound most shores – there's little or no shingle and the strand flora is limited.

Ruins of a small settlement on the eastern side are the last vestiges of human occupation. Here on the walls grow Pellitory-of-the-Wall (*Parietaria officinalis*), once a remedy for coughs and chest infections, another medicinal plant Tall Mullein (*Verbascum thapsus*), and the alien White Stonecrop (*Sedum album*), also on walls in Baltimore. Spanish, like most of Roaringwater Bay and adjacent mainland, lay within the domain of the O'Driscolls, who built a castle there to command the entrance to the River Ilen. This was destroyed in 1537 when the men of Waterford, in revenge for the capture of a trading vessel that had sought shelter in the sound, viciously laid waste Sherkin and Baltimore, burning the O'Driscoll houses, castles and friary. The name 'Spanish Island' may derive from the Spanish garrison that occupied Baltimore in 1601 during the last phase of Elizabeth I's conquest of Ireland, or perhaps from the Spanish fishermen who once came in large numbers to Roaringwater Bay. For centuries rich fish stocks created wealth for the O'Driscolls, especially the pilchards that were salted and pressed into barrels for storage. On Spanish, as elsewhere in Roaringwater Bay, there

was a fish-processing factory or 'palace', where barrels of pilchards were prepared for the lucrative export trade. An important by-product was 'train oil' (a term later mostly applied to whale oil), used in lamps and the tanning of leather. A shed built into the seaward wall of Sherkin Friary is too a remnant of a sometime fish palace, and the settlement on Heir known as Paris may derive its name from one there. Then, in the 19th century the great pilchard shoals departed and the industry moved to Cornwall, where

the last traditional fish palace closed only in 2005.

Spanish is now up for sale. Perhaps this island, isolated and deserted today, may once again become a place of activity and habitat diversity, even a community once again.

John Akeroyd, who has visited Roaringwater Bay since 1986, edited The Wild Plants of Sherkin, Cape Clear and adjacent islands of West Cork (1996) and its Supplement (2011).



Hedge Woundwort

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European Mollusc Producers' Association
International Salmon Farmers' Association

Pike & Trout in Harmony on Lough Ree



Taking a scale sample for genetic analysis.

By Shane O'Reilly

DURING the spring of 2014, Inland Fisheries Ireland (IFI) carried out an extensive fish survey on Lough Ree to establish the status quo of all fish stocks in the lake but with a particular focus on gathering information about the brown trout population. IFI have carried out similar surveys on recognised brown trout fisheries (e.g. Lough Corrib, Lough Sheelin) over the years but this was the first survey of its type to be carried out on Lough Ree and it is of particular interest as the lake is regarded as a 'mixed fishery'. A mixed fishery is one which contains stocks of trout, pike and cyprinids (commonly known as 'coarse fish') in sufficient numbers for anglers to regularly fish for these species. Lough Ree has always been regarded as an angling venue capable of producing good fishing for these three distinct types of fish and so it was expected the survey may shed light on how these species cohabit and interact within the lake.

Surveys like this are important as they give us a snapshot of the fish stocks within a lake and also may indicate any developing trends due to external impacts such as pollution, water extraction and invasive species. By regularly sampling fish stocks in a lake over a number of years, we can gain important information on how those stocks react to changing environments, which can, in turn, lead to better management of these systems.

The primary method used in performing the survey was the deployment of gill nets at various locations around the lake. The gill nets used had a range of mesh sizes allowing fish of different species and sizes to be captured. A total of 200 sampling locations were randomly selected and each net was deployed for a 24-hour period. One disadvantage with using gill nets is that there is a level of fish mortality but IFI staff made every effort to return the majority of fish captured alive. Those fish that were retained were kept for laboratory analysis where scale sampling and stomach analysis will help us to determine important information

such as the diet and genetics of the fish.

In addition to gill netting, a dredge net was also deployed at each sampling site with the aim of determining whether the invasive Asian Clam had established itself within the lake. The Asian Clam has recently been found upstream of Lough Ree and it was feared that it may have made its way into the lake where it would undoubtedly have an impact on the ecology of the lake. The good news here is that the clam was not found to be present in any of the samples taken and so the lake appears to be free of this invasive...for the moment.

The results from the fish survey are detailed below in terms of total catch, percentage of population and Catch Per Unit Effort (CPUE) data. CPUE is an indication of the relative density of each species of fish within the lake and it allows comparisons of data with similar surveys that have been carried out on other lakes. A higher CPUE value would indicate a relative abundance of a particular species whereas a CPUE of less than one could indicate a population that is under pressure.

The standout figure in terms of the fish stocks is the high proportion of roach in the sample. Roach were not present in Ireland until the late 1800's when they were introduced to the Blackwater system. It is thought they were not present in the Shannon system until the 1970's. Now the survey suggests that roach make up over 50% of the population and if you add to that 20% roach x bream hybrids we can see that roach or roach hybrids could make up over 70% of the population. So, within the space of less than 50 years this species has completely colonised the fishery. The explosion of the roach population has probably been to the detriment of the Rudd population, as it is likely that the roach out compete them for food. This should serve as an indication and a warning on how quickly an invasive species can spread and how that may negatively impact on existing species. In an interesting aside, it is likely that the roach population would actually be much higher were it not for the impact of another invasive species, the Zebra Mussel, which has established itself throughout the

Shannon system in the last 25 years and has probably curtailed the roach population on Lough Ree as has happened on other lakes with Zebra Mussel infestations.

Another interesting finding from the survey which could have implications for future fishery management is the data on brown trout and pike. Populations of both these species appear to be healthy in Lough Ree which would indicate that they are able to cohabit without pike having a serious impact on the trout population. Lough Ree is not one of the lakes that has been managed to promote trout populations and the pike stock in the lake is entirely natural. If, as it seems, that pike and trout are able to find a natural equilibrium in Lough Ree, then that might be useful information to have when IFI revises their policies for these species.

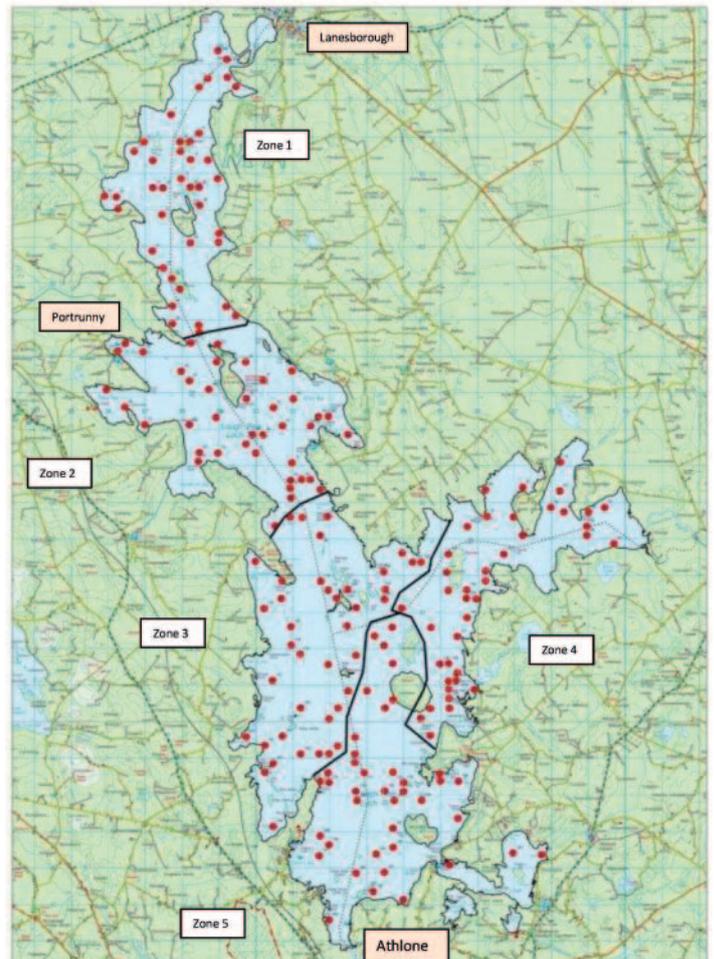
On the whole, the Lough Ree survey tells the very positive story that the majority of fish species are in good condition but there are some that will need to be carefully monitored in the future. As mentioned previously, the Rudd populations have been hampered by the colonisation of roach and we can only hope that this beautiful golden fish can carve out a niche in the ever changing environment of the lake. Of even more concern are pollan which are generally only present in deeper areas of the lake and are not targeted by anglers so are somewhat off the radar. Pollan are considered an endangered species as they are not found in any other European country and are only found in five lakes in

Ireland (L. Neagh, L. Ree, L. Derg, L. Erne, L. Allen). The CPUE of .15 for pollan is relatively low and we need to be vigilant in trying to protect this species in one of its last remaining European habitats.

So, to draw a conclusion, we now have the first comprehensive survey of Lough Ree which has shown that the majority of fish stocks in the lake are in relatively good condition and has also given us a benchmark for comparisons into the future. What will really be interesting is when we see results of future surveys on the lake. How will the lake respond to the threats of invasives (particularly Asian Clam) or the proposal of increased water abstraction from the Shannon? At the time of going to press, a huge holiday park has just been given approval for development close to the western shore of the lake. What impact will that have on the lake's ecology? We will have to wait to see but we now have a firm base that will enable future comparisons

I have presented only a brief overview of some of the main findings of the Lough Ree survey and for anybody that is interested in reading more on the subject, a full report is available for download at the following link: <http://www.fisheriesireland.ie/fisheries-research-1/652-lough-ree-final-report>

Shane O'Reilly, Angling Advisor, Inland Fisheries Ireland



Lough Ree Survey Sampling Locations.

Species	Trout	Pike	Roach	Perch	Roach x Bream	Rudd	Bream	Pollan	Tench
Total	223	280	4186	1282	1670	103	293	30	1
%	2.8%	3.5%	51.9%	15.9%	20.7%	1.3%	3.6%	0.4%	0.0%
CPUE	1.12	1.41	21.04	6.44	8.39	.52	1.47	.15	

Results from the fish survey.

A Dream Come True

HARNESSING THE POWER OF WATER



Dan Twomey, who built his first hydroelectric station near Kanturk, Co. Cork, in 1985.

By Michael O'Brien

WHEN Dan Twomey wanted a better way to heat and power his house, he decided to do it himself. A qualified electrician, Dan built his first hydroelectric station in 1985 to provide electricity, heating and hot water to his home at Banteer, near Kanturk, Co. Cork. It was that pioneering spirit of resourcefulness that drove him to start designing and building hydro stations throughout Ireland, from Belfast to Kerry. He has now established a multi-dimension electricity company *Waterpower* which generates, trades and sells electricity to its 25,000 customers nationally.

Beginnings

Dan was born and raised as a son of Duhallow, from Banteer near Kanturk in North Cork. Aged 19, having served his apprenticeship as an electrician with Avonmore Electrical in Millstreet, he set up his own electrical and pump supply and maintenance company based in Banteer. His clients included both the public and private sector. He also had a number of contracts for the maintenance of the water pumping stations with Cork County Council in the Northern Division.

His natural curiosity led him to research the possibility of generating electricity for his house, then under construction near Banteer. He utilised the fall and flow from the Lackloun River adjacent to his new dwelling by laying approximately 1000 lineal metres of 450 mm diameter water pipe to convey the water from the high point to his tur-



Dan utilised the fall and flow from the Lackloun River adjacent to his home to convey the water from the high point, through water pipes, to the turbine house.

bine house location. He constructed a fit-for-purpose turbine to generate electricity, build a turbine house, plant room and connected all to his new dwelling house, workshop, farm buildings etc. This was fully tested and commissioned in 1983. After 30 years, this facility still supplies the heating and electricity needs of the Twomey Family.

Waterpower

Having commissioned his own personal hydroelectric station, Dan continued his main job as an electrical contractor but also provided advice to many people and agencies in regard to the designing, building and operating hydro schemes. He advised the various local energy agencies in regard to all aspects of hydro.

He soon changed from the advisory role to actually physically constructing and, in some cases, managing hydro projects and to date has constructed over 25 schemes in Ireland - North and South.

In 1997 he was appointed by Cork Corporation (now Cork



In 1997 Dan was appointed by Cork Corporation (now Cork City Council) to convert the Old Water Turbines into electricity generators for supply to their many electricity accounts.

City Council) to convert the Old Water Turbines, (which in olden times pumped drinking water using the physical power of the River Lee to nearby Reservoirs) into electricity generators for supply to Cork Corporation's many electricity accounts. In effect a Public Private Partnership was established between both parties.

Such a venture encouraged him to establish a standalone company to generate and sell electricity directly from the various hydro stations to the consumer. Thus *Waterpower* was born and formally established in 2003 - based in Kanturk and licenced by the Commission for Energy Regulation (CER) to generate and supply electricity to consumers.

Waterpower's Current Status

The CER licence allows *Waterpower* to trade energy. This means that *Waterpower* can purchase electricity from other renewable electricity generators/producers on a cogeneration basis, as well as selling the electricity it produces itself to the grid and ultimately its customers

Waterpower has expanded into other areas such as providing desktop feasibility studies to interested parties with potential hydro schemes. It plans to develop and partner in renewable energy schemes such as hydro, wind, biomass etc.. the main purpose being to expand its green energy portfolio to meet future needs.

Waterpower offers conservation and bill structure advice to clients, as well as providing turnkey solutions to developers of hydroelectric schemes.

At present *Waterpower* is restoring an 18th Century waterwheel in Co. Kildare, as well as designing a 400kw plant in Co. Kerry, which will be commissioned in 2017/18. However the main focus of *Waterpower* is the sale of electricity to its customers.

Since the early days *Waterpower's* customer base has grown steadily to 25,000 customers nationally. These are domestic, farm, industrial, commercial hospitals, etc...

Current customers include Irish Oxygen, Bishopstown,



The turbine house - Dan constructed a fit-for-purpose turbine to generate electricity.

Cork; Bru Columbanus, near Cork University Hospital, Durrow Castle Hotel, and Sherkin Island Marine Station (which recently connected to *Waterpower*).

Waterpower provides an advisory service to schools on energy conservation and reduction, as well as bill profiling, to ensure each bill

matches the individual energy requirement of the consumer.

It provides a friendly, customer focused and personalised service to its customers and is only a call away from its customer service team in Kanturk.

Further details from *Waterpower* at 029 50568 www.waterpower.ie

Eli Lilly S.A. – Irish Branch Pharmaceutical Manufacturers



Eli Lilly wishes "Sherkin Comment" continued success.

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The River Suir Catchment



issues are, what are the significant pressures causing those issues, and what can be done about them. All the information is being recorded in a new EPA water management system, known as the Water Framework Directive Application, which is being made available on www.Catchments.ie

A new Local Authorities Waters and Communities Office has also been set up to help communities get involved in River Basin management Planning and looking after their local catchments - <http://watersandcommunities.ie/>



The pilot catchment for this approach is the Suir, and the June issue of the Catchments Newsletter produced by the EPA told 'The Story of The Suir'. Edited extracts are below, and the full articles are all available on Catchments.ie.



The Story of the Suir

The Suir catchment is 3500 km² in size, rising on the Devil's Bit Mountain and flowing out to the sea at Waterford Harbour. It supports a population of approximately 200,000 spread across several urban centres and the rural population. The catchment supports a wide range of livelihoods and ecosystem services, but how are the catchment's aquatic ecosystems coping with all these activities? Do we have the balance right between living and working in, and maintaining a healthy Suir catchment, and if not, what do we need to do to redress the situation?

This question is central to the Water Framework Directive river basin management planning process. Plans are made every 6 years containing actions to enhance and protect water quality and the ecosystems that depend on it. We are currently in the characterisation stage of the 2nd planning cycle which is due to culminate in our 2nd cycle plans being completed at the end of 2017, and implemented between 2018 and 2021. Characterisation of water bodies is a critical element of the work required under the Water Framework Directive, and is about understanding how our catchments work and how human activities impact on water, in order to prioritise appropriate actions that ensure that we do get that balance right.

In this 2nd cycle our philosophy is about looking for 'the right measure in the right place' to achieve the best outcome, which will build on the 'one size fits all' approach of the last cycle.

The River Suir has a Green and Blue Future

Those who live near the Suir have immediate access to a wonderful resource and there are many who regularly access the river for lifestyle and recreational purposes. Tipperary County Council engaged with these communities through two INTERREG co-funded projects, each of which had a focus on waterways. One of these projects was Green and Blue Futures: The social economy and the management of green infrastructure. This project looked at ways to combine social objectives, such as tackling unemployment and engaging disconnected youth, with environmental activities like protecting riverbanks, controlling invasive species and the productive use of green urban spaces. Social enterprise models were explored which combine a focus on positive social outcomes with a business model to generate income in order to move away from a reliance on grant funding.

Full article by Alan Walsh, Local Authorities Waters and Communities Office, is available at <https://www.catchments.ie/river-suir-green-blue-future/>



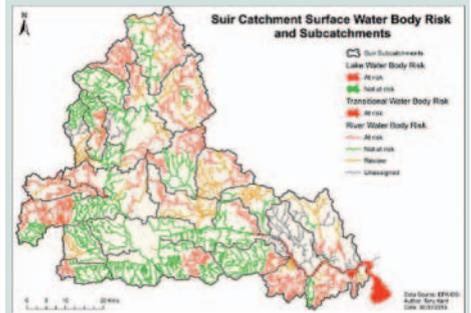
Green and Blue project partners beside the Suir

How healthy is the Suir Catchment?

In general aquatic ecosystem health in the Suir catchment is fairly good. The majority of surface water bodies were "Not at Risk" i.e. are expected to meet their Water Framework Directive objectives, meaning that no further actions are required in addition to the basic requirements of the current regulations and best practice management. Water quality trends are also generally improving across the catchment although there are some key hotspot areas where problems continue to arise. 64 (35%) surface water bodies, including the Suir estuary and 4 small groundwater bodies, were found to be At Risk and will require specific measures to achieve improved water quality outcomes. The vast majority of the water bodies containing the protected areas had also already met their objectives. The most significant water quality issue is excess phosphorus (P) from a variety of sources including human and animal wastes and fertilisers, leading to eutrophication, which is impacting on rivers, lakes and estuaries. The next step is to use the range of tools now available to us, which are described on this page, to help pin down exactly where and what the issues are in the problem areas we have highlighted and identify precisely what needs to be done to resolve them.

A collaborative, focused effort will be needed to tackle the significant pressures identified in the Suir catchment. It will need to involve multiple agencies, including staff from the new Waters and Communities office, and the local landholders. Such a collaborative approach will be essential to achieve that balance that will sustain a productive, yet healthy, Suir catchment for the long term.

Full article by Jenny Deakin, EPA Catchments Unit, is available at <https://www.catchments.ie/healthy-suir-catchment/>



Measuring how the Suir flows, from the mountain to the sea

River levels and river flows are measured on the Suir and its tributaries by the Environmental Protection Agency (EPA) in conjunction with the Local Authorities for:

- drinking water supply resource assessment,
- waste water discharge assimilative capacity calculations,
- environmental monitoring,
- conservation, and
- to enable planning and development proposals to be assessed.

The Office of Public Works also measures river levels and river flows in the catchment for drainage and flood management purposes. The hydrometric gauging station networks in the catchment are complimentary, with data shared between organisations to avoid duplication of effort. All Hydrometric Data is available at www.epa.ie/hydront

Full article by Conor Quinlan, EPA is available at <https://www.catchments.ie/measuring-suir-flows-mountains-sea/>

What's living in the Suir?

The various uses of rivers can involve conflicting interests and often such uses disrupt the ecology or health of the river. The fact that several of the more important beneficial uses of rivers such as drinking water abstraction, amenity uses like water sports, and waste water disposal are all dependent on biological processes is rarely appreciated.

Biological monitoring of Irish rivers and streams was first undertaken in the 1970's and since then has continued on a three year survey cycle. A total of 215 river sites are surveyed in the Suir catchment alone including 138 biological and 139 chemistry sites. Under the biological programme, the macroinvertebrate fauna (small animals without a backbone that can be seen with the naked eye) and the aquatic plants and algae residing in the river are examined, the species are identified, and their relative abundances are recorded. Using their known sensitivities and tolerances to pollution, biological indices can be applied to the observed data to summarise their ecological condition classifying the river site from satisfactory, that is High or Good condition, to unsatisfactory: Moderate, Poor or Bad conditions.

Full article by Catherine Bradley, EPA is available at <https://www.catchments.ie/whats-living-suir-healthy-rivers/>



Stoneflies and Mayflies (Photo: Ruth Little)



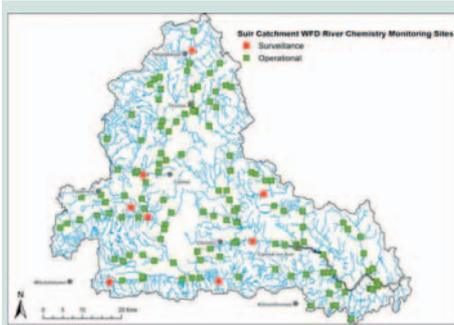
Ecdyonurus – pollution sensitive Mayfly (Photo: Wayne Trodd)

The Suir Estuary = the canary for its catchment?

As the ultimate receptors of all the inputs upstream, the estuarine and coastal areas can tell us a lot about what is happening in the overall catchment. We can use the biological communities to tell us about nutrients in the water, or chemical pollutants. Useful indicators to look at nutrient pressures are the seaweeds.

We use the presence and abundance of certain seaweeds, such as sea lettuce, to tell us about the nutrient conditions in the estuary. In areas where nitrogen inputs increase these green seaweeds can grow in huge quantities causing an environmental impact. Other indicators of nutrient pressures are the phytoplankton communities (small plants that grow suspended in the water column) which can change depending on the balance of nutrients coming downstream. In severe cases this can result in large harmful algal blooms that can affect the other marine communities, such as shellfish or the bottom dwelling animals. In the Suir we have seen some disturbances to the marine plants with elevated levels of phytoplankton in the water suggesting that the nutrient conditions are too high. We can use this information, along with the other data from our monitoring programmes, to work out what has to be done to improve the situation. By looking at the estuary and coastal areas we can develop an idea of the sort of changes that need to take place in the whole catchment for improvement across all our waters.

Full article by Robert Wilkes and Sorcha ni Longphuirt, EPA is available at <https://www.catchments.ie/suir-estuary-catchment/>



What's flowing into the Suir? Results from nutrient load apportionment modelling

Where rivers and lakes are impacted by excess nutrients, we need to understand the sources of those nutrients before mitigation measures can be selected. In these areas, modelling can be used in conjunction with knowledge from local authorities and investigative assessments to identify significant pressures that contribute excessive nutrients to surface waters. In the Suir catchment, only a relatively small proportion of the catchment requires a reduction in phosphorus emissions to achieve Good Status.

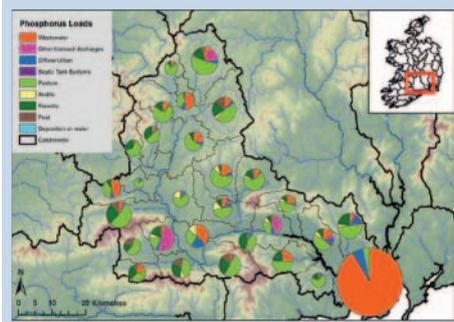
Modelling future scenarios can support catchment scientists and managers in identifying appropriate options for measures. Just as pie making isn't an exact science, modelling the sources of river nutrients can have errors and unknowns. Nonetheless, we can use these results to help support decision making and the integrated catchment management process and, ultimately, to improve our ecosystems and environment. Further information on the EPA CatchmentTools Project can be found at cwrr.ucd.ie/cmst

Full article by Eva Mockler, UCD Research Fellow, is available at <https://www.catchments.ie/whats-flowing-suir-results-nutrient-load-apportionment-modelling/>

Water Quality and Agriculture: Pollution Impact Potential Maps - A tool to guide resources into areas for further investigation

As the philosophy being followed to improve our water quality where needed is "the right measure in the right place", investigative assessments are being recommended as the means of locating the significant pressures (see next article), including from diffuse sources. To help reduce the amount of investigative assessments required and therefore the time and resources needed, a Catchment Characterisation Tool has been developed to produce Pollution Impact Potential (PIP) maps that show the potential critical source areas for agricultural diffuse nutrients in our water bodies and subcatchments. The Pollution Impact Potential maps rank the relative risk areas for diffuse phosphorus to surface water and diffuse nitrogen to surface and groundwater. These maps are now available to all public bodies on the WFD Application.

Full article by Marie Archbold, EPA, is available at <https://www.catchments.ie/water-quality-agriculture-pollution-impact-potential-maps-tool-guide-resources-areas-investigation/>

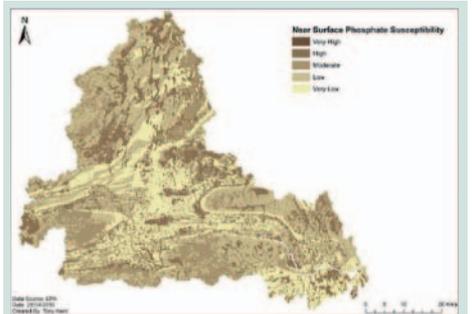


How chemical monitoring of our rivers can help us understand their story - why, what, where and when.

Water does not exist in its pure form in the natural environment, it is truly reflective of its surroundings, influenced by where it originates, what it flows over and percolates through. Under natural conditions the chemical characteristics of our water bodies originate from a variety of sources, including leaching of soils, weathering of minerals and atmospheric inputs. These chemicals, in both dissolved and particulate forms, reach the water body via a number of pathways, and in the case of surface water have resulted in a natural background level of chemical constituents in which aquatic biota have developed.

Water quality monitoring is fundamental in the management of water resources that support healthy and productive aquatic ecosystems as well as sustainable and healthy water supplies and chemistry monitoring is an integral part of any water monitoring programme. Monitoring for identified chemical compounds highlights any significant changes or trends that may be evident in water bodies over a period of time.

Full article by Kieran Gordon, EPA is available at <https://www.catchments.ie/chemical-monitoring-rivers-can-help-us-understand-story/>



"What exactly is the situation?" - Investigative Assessments can provide the answer

After all our scientific monitoring and assessment is completed, we may still not know the precise pressure type and location in order to decide on mitigation measures to improve the water quality. What do we need to do?

The answer may be simple in theory, but can be difficult in practice – we walk the stream, putting on our detective's hat, and look for clues using a variety of techniques from different relevant disciplines. We can then pin down the issue(s) of concern, and conclude on what might be done about it. It might be asked, if the answer is that simple, has it not been done before? Well, it has, but resources have not always been available to do all that was needed, using all possible techniques. Also, the background information needed – on the physical setting, hydrochemistry, land-use, etc. – was not readily available until recently with the development of the EPA Water Framework Application.

- There are two overriding principles:
- Investigative Assessments follow the Source (or pressure)-Pathway-Receptor (S-P-R) model for environmental management. (These are easy words to write down, but visualising each component, and the connections between them in a 3D landscape, is essential).
 - The level of investigation is proportional to the risk posed. Three levels of assessment are proposed:
 - Desk study, based on existing information, such as in the WFD Application, Google Earth and websites such as www.gsi.ie, www.opw.ie and <http://gis.epa.ie/Envision> and environmental data from voluntary citizen scientists.
 - Field-based assessment, mainly by local authority staff.
 - Specialist input, such as from hydrogeologists, agricultural scientists and biologists.

Full article by Donal Daly, EPA Catchments Unit, is available at <https://www.catchments.ie/exactly-situation-investigative-assessments-can-provide-answer/>

Coastal Rainforest of the Tasman Peninsula

By Anthony Toole

THE mist and drizzling rain did nothing to deter the half dozen surfers who rode the breakers, mostly with some confidence but the occasional upsets. Neither did the alarming proximity of the rocky shelf that reached some fifty metres out from the foot of the shrub-covered cliffs. We had parked our car at the top of these cliffs, and from our high viewpoint, the shelf resembled the clints and grikes of a limestone pavement. But this formation, the Tessellated Pavement, was many millions of years younger than those Carboniferous deposits, and consisted of sandstone laid down during the Permian, 270 million years ago. They lie at the southern end of the Forestier Peninsula, fifty kilometres east of Hobart, Tasmania.

The criss-cross pattern of cracks that divide the pavement is the product initially of ancient earth movements enhanced by more recent salt-water erosion. At low tide, the shelf is exposed to the sun, which evaporates the water, leaving salt crystals to form in depressions between the cracks. Over time, the crystals erode the depressions in ways characteristic of the length of exposure. Nearer the cliffs, the rocks dry out for longer periods, and the depressions deepen, creating concave 'pans', that hold water as the tides recede. In contrast, farther out, increased erosion by sand and waves at the edges of the slabs causes convex 'loaves' to form.

We crossed Eaglehawk Neck, a narrow isthmus that brought us onto the Tasman Peninsula. During the 19th century, when nearby Port Arthur was a notorious penal colony, ferocious dogs were tethered across the neck and trained to attack any prisoners who thought this might provide an escape route.

The geology continued to amaze us. The cliffs curving around Pirate's Bay consisted of stratified sandstone. Erosion by the sea of the softer sediments had created the Blowhole, a narrow basin into which the sea crashed through a rocky tunnel that channelled its energy so that it emerged in a sequence of great clouds of spray that made the drizzle irrelevant.

The nearby community of Doo Town is one of the most eccentric places in the state. Each of the thirty-or-so cottages has a name that includes

'Doo', a fashion that began when Hobart architect, Eric Round built his house, Doo-I, in 1935. Subsequent names include Doo-all, Make-doo, Didgeri-doo, Wattle-I-doo and many others, some of which demonstrate the keen imaginations of their owners.

The Tasman Arch, farther along the coast, had formed in a similar manner to the Blowhole, but on a much larger scale. Here, the roof of a cavern, hollowed out by the sea, had collapsed, leaving an enormous sink hole into which the tide continued to swirl beneath the arch that hung some fifty metres or more above it. At some time in the future, the relentless erosion will bring the arch crashing down. When that happens, the result will be a twin of the Devil's Kitchen, a huge canyon, gouged out of the cliffs a few minutes' walk away, also pounded continually by the waves.

We enjoyed a light lunch bought from the mobile kiosk that served sea-food specialties from a corner of the adjacent car park. My own preference was for a scallop pie, and while I enjoyed that, beautiful blue fairy wrens hopped around my feet, ready to scavenge any dropped crumbs, and a leaf beetle crawled around the table, perhaps on a similar quest.

We drove on to Waterfall Bay Lookout, and set off on foot along a rough track that took us steadily uphill into the rainforest. Large fungi poked through the carpet of leaf litter. Thick mosses and luxuriant lichens coated the rocks and fallen tree stumps.

The air was extremely humid, and leeches, each about two centimetres long, rested on the leaves of the trees and shrubs, ready to drop onto us if we passed close enough. Tasmania is home to around a dozen species of leech, most of which are confined to water. The creatures we encountered, as far as I could discover, went by the name of *Philaemon pungens*, and like their relatives, inject an anaesthetic and anti-coagulant into their victims, which means that the wounds can continue to bleed for several hours after they have been inflicted. We therefore had to rely on each others' vigilance to avoid becoming a source of food for these blood-sucking invertebrates. Our precautions seemed to work, as we saw no evidence of bleeding after the leeches were removed.

The forest on this part of the peninsula consists largely of



Tessellated Pavement



Tessellated Pavement



Devil's Kitchen.



The Blowhole.



Masked lapwing on the Tessellated Pavement.



Cliffs of Waterfall Bluff.



Tasman Arch.



Victorian Christmas bush flower.



Leech (*Philaemon pungens*).

Photos courtesy of Anthony Toole

stringy bark eucalyptus, Tasmanian blue gum and mountain ash, with an understorey of musk, dogwood, tree ferns and sassafras. Though the forest area comprises less than one per cent of Tasmania's total, it provides an environment in which about one-third of the state's plant species can thrive, including sixty threatened species. Amid the thick shrubbery were numerous small but distinctive flowers, many of them endemic to this part of the world, and some with quite lyrical names: everlasting, melaleuca honey myrtle, Victorian Christmas bush.

The nectar of the pink tubu-

lar flowers of common heath are food for honeyeater birds. That of the white flowers of the Manuka tea tree, named by Captain James Cook because he made tea from its leaves, is a source of a fashionably expensive honey. Trigger plants are so called because of the sensitive mechanism with which their reproductive organs snap onto insects and cover them with pollen.

In less than an hour, we reached our high point, Waterfall Bluff. The waterfall itself began quietly as a small cataract, splashing through the trees. Escaping its confines, it then plunged for 175 metres,

with little to alter its course, into the sea. From a promontory, we looked down cliffs that fell in a series of bare, vertical faces, across which were scattered crevices and tiny ledges to which clung sprigs of vegetation, and where the faces were marginally less than vertical, the trees had gathered into miniature jungles, each possibly guarding its own secret ecosystem.

By the time we returned to the Lookout car park, the day had begun to brighten. The sandstone cliffs of Waterfall Bay were now much sharper, and beyond the bay lay the Jurassic dolerite cliffs, some

of the highest in Australia, that had formed during the breakup of the giant continent, Gondwana, 180 million years ago. (See *Sherkin Comment* No. 50). Even through the residual haze, we could pick out the cliffs of Cape Hauy and the sea stacks, Totem Pole and Candlestick, ten kilometres to the south.

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Rachel Carson and the Birth of Environmental Consciousness

By Walter Muggdan¹

July, 2016

IN 1962, a 55-year old marine biologist named Rachel Carson published *Silent Spring*, a book that would spark the modern environmental movement and permanently change the way in which people thought about nature's capacity to absorb the punishment that humanity was inflicting.

Born in 1907, Carson was a respected marine biologist who had written a number of earlier books including, in 1951, *The Sea Around Us*. Described as a "biography of the ocean," it became an international best seller.

But it is for *Silent Spring* that Carson will forever be remembered and honoured. The title refers to a springtime, in the then not-too-distant future, which would be silent because birdsong, and the chirp and trill of insects, would have been stilled by the insidious effects of the chemicals – particularly the pesticides – being wantonly dispersed across the face of the earth.

Although the industrial Revolution started in the late 1700s, it was in the 20th century, and especially in the years after World War II, that chemists began creating a host of new compounds, unknown in nature. Among these were many whose job it was to kill – to kill organisms that people have classified as pests because they interfere with our production of food, or because they spread disease, or because we find them otherwise troublesome. Insects, rodents, plants,



Wildlife artist Bob Hines and Rachel Carson spent many hours along the Atlantic coast visiting refuges and gathering material for many of the agency's pamphlets and technical publications.

bacteria, fungi – almost any kind of organism, if found in the "wrong" place, can be classified as a pest. And modern chemistry eagerly rose to the challenge of eliminating these pests.

The word "pesticide" means to kill a pest, so it is no surprise that the pesticides delivered by the chemical industry did just that. But it turned out to be remarkably difficult to design a product that will kill *only* the organisms you want to get rid of, and *only* when those organisms occur in an undesirable location.

Perhaps the best known and most widely used pesticide of Carson's time, and the one she therefore focused on, was DDT. It was once hailed as a chemical that would save mankind from malaria, typhus, yellow fever and dozens of other insect-borne diseases; it would pre-

vent the attacks of termites on wooden structures the world over; and it would liberate farmers across the globe from the insect predation that has plagued them since time immemorial. But like many other pesticides of that era, DDT was an indiscriminate killer. Bad bugs might fall victim, but so would bees and other pollinators essential to agriculture. And not just insects, but many birds, especially those at the top of the food chain like eagles and ospreys which eat other animals that eat insects. The DDT building up in these birds' bodies caused the shells of their eggs to become so weak that they broke during incubation; in consequence, their populations plummeted worldwide. DDT has since been classified as a probable human carcinogen, and a likely endocrine disruptor.

In *Silent Spring* Carson issued an eloquent warning against the rampant overuse of DDT and its ilk, which were being sprayed and spread on

farm fields and forests, across marshes and bogs and fens and other wetlands (in those days all derisively called swamps), and in cities and towns and villages. The chemical industry fought back vigorously, but Carson's book caught the imagination of the American people. A broad, grassroots movement emerged that concerned itself not only with pesticides, but with all forms of environmental pollution: discharges of industrial waste and sewage into our waterways, smoke spewing into the air from factories and motor vehicles, and a wide variety of dangerous chemicals in ubiquitous use including PCBs, lead, asbestos, chlorinated solvents and many more.

Carson's book arrived at a time of civil unrest and social progress, spurred by the civil rights movement, the anti-Vietnam war movement, the women's liberation movement, and the gay rights movement. The environmental movement, moreover, transcended the distinctions of race, colour, gender, age or even political affiliation that typified many of the other movements. And Rachel Carson was, rightly, its patron saint.

With broad, bi-partisan political consensus the U.S. Congress began in 1970 to pass an impressive array of environmental laws which fundamentally changed the way in which American business did business, and how society viewed its rights and responsibilities with respect to the natural world. On December 2, 1970 President Richard Nixon created the U.S. Environmental Protection Agency by Executive Order. EPA immediately took on DDT, holding seven months of hearings starting in 1971. In the summer of 1972 EPA banned almost all uses of DDT, an action that was upheld by the U.S. Supreme Court the following year.



Rachel Carson



In *Silent Spring* Rachel Carson opened the eyes of society to the dangers of indiscriminate use of the pesticide DDT.

Rachel Carson did not live to see the extraordinary impact *Silent Spring* would have, and the changes it would inspire. She died in 1964. In 1980, President Jimmy Carter awarded her, posthumously, the Presidential Medal of Freedom, the nation's highest civilian award.

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The Wild Roses of Ireland & Britain

By Tony O'Mahony

BETWEEN the months of June and July of each year, the hedgerows and hedgerows of Ireland and Britain are awash with the beautiful, evanescent, white or pink flowers of our native rose species and hybrids. Although of short duration (some 4-5 weeks), this delightful and spectacular floral display is a major highlight of the flowering season. Of the approximately twelve native wild rose species that occur in these islands, only two are genetically-balanced taxa, bearing perfect pollen, namely: Burnet Rose (*Rosa spinosissima*) and Field Rose (*R. arvensis*). Interestingly, these are also our two most visually and morphologically distinctive rose species. For example, the squat-bushed, densely bristly-armoured Burnet Rose (especially characteristic of coastal heaths) is our *only* species to display purplish-black (rather

than red) mature hips, while the Field Rose (our latest-flowering rose), is our only *trailing-stemmed* species, its purple-flushed stems characteristically weaving through the tangle of hedgerow vegetation. The Field Rose has two other distinctive features: (1) the mature hips are topped with a central, rigid, needle-like column of *fused* styles and (2) I have found that the tiny, stalked-glands on the flower-pedicels frequently emit a *sweetgum-like* odour on crushing – a delightful feature *unique* to this species among our native roses, yet apparently not commented on previously, in the vast rose literature.

THE WILD DOG-ROSES

All of our remaining rose taxa are known to the layperson as 'Dog-roses' – a bewilderingly complex group of genetically-unbalanced taxa, all of which produce a high percentage of

aborted pollen grains. Consequently, the accurate naming of these taxa is a job for the rose specialist/rhodologist – and even here there is *still* no consensus as to the true number of distinctive dog-rose species that occur in Europe. This group had its origins in the distant past, during major geological upheavals – chaotic Earth events that catalysed promiscuous interspecific hybridisation between the then-existing rose species, resulting in a motley crew of hybrid progeny. Since that distant time-period, many of these dog-roses have stabilised to some extent. *Yet all* are capable of crossing with each other, further blurring the morphological boundaries between the various species – hence our current taxonomic predicament!

Nevertheless, we can bring some order to this chaos, by recognising the following groups:

1. Sweetbriars (*Rosa rubiginosa* group) – consisting of

three species in Ireland and Britain, all of which bear minute, *sticky, apple-scented* glands on the under-surface of their leaflets. This exquisite scent is unique to the Sweetbriar roses, and can be detected at a distance from the bushes themselves. The included photograph is of Sweetbriar (*R. rubiginosa* s.st.), the most widespread of the three species.

2. Resin-Roses/Downy-Roses (*R. tomentosa* group) – also consisting of three species, all of which bear tiny, stalked glands on the under-surface of their leaflets, these emitting a distinctive, *sour, resin-like* scent on crushing. (The included photograph is of the widespread Sherard's downy-rose (*R. sherardii*), a squat bush, flaunting beautiful, deep-pink flowers.)

3. Dog-Roses (*R. canina* group) – a complex of superficially similar species and interspecific hybrids, which causes enormous identification problems for the general botanist. The leaflets of this group lack a scent, even when stalked glands are present. (My illustration is of the widespread and locally abundant Common Dog-rose (*R. canina*), whose arching, clambering stems reach to 4m in height.) Intriguingly, some of the species within this group display very different distribution patterns in these islands, being much rarer, and of very localised occurrence, on the island of Ireland. Into this category fall such species as Round-leaved Dog-rose (*R. obtusifolia*) and Northern Dog-rose (*R. caesia* s.l.).

After their very brief flowering period, our wild roses seem to disappear from view in their hedgerow/hedgerow habitat, until their bottle-like false-fruits (hips) fully mature and take on a fiery red colouration in the August-September period, when they attract the eye once again. (Note: In Britain during the 2nd World War (1939-1945), the main source of Vitamin C for the nation, was obtained from native rosehips, of which vast quantities were collected and processed.)

In more recent decades, a range of genetically pure rose species have become locally established in the wild, of which the two most successfully naturalised are the Asian species, Japanese Rose (*R. rugosa*) and Many-flowered Rose (*R. multiflora*).

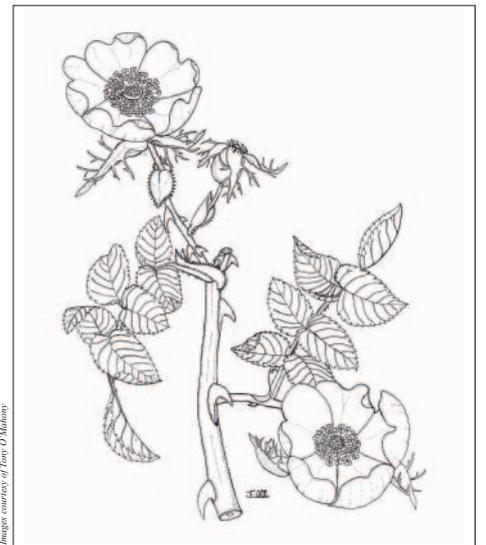
To end on a *personal* note: the identification of Irish wild rose taxa has captivated my attention over the past forty-three years (i.e. 1973-2016). In its pursuit, I have surveyed countless miles/km of hedgerows in Munster, and examined vast quantities of



Sherard's Downy-rose (*R. sherardii*)



Sweetbriar (*R. rubiginosa*)



Dog-rose (*R. canina*)

sample rose material, in order to accurately determine the distribution patterns of individual species and hybrids in this region of Ireland. In this regard, the aesthetically beautiful, tiered hedgerows that occur on the limestone and base-rich soils of County Cork and County Limerick, have proved the most productive hunting grounds for me to-date. It is *these* hedgerows (including their abutting ditch and grass-margin habitats) that now act as refuges for wildlife biodiversity over the greater part of Munster, as the adjacent pasturelands (given over to large-scale dairy herds since the 1970s) are now envi-

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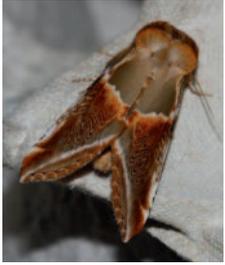
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Suburban Moth Trapping

An Introduction



A Buff Arches - the moth that sparked my interest.

By Cian Merne

MOTH trapping and recording is increasing in popularity in Ireland and the aim of this article is to provide a brief introduction to this fascinating hobby. Moths can be found just about anywhere, almost all year round. Suburbia is home to a huge number of moth species, so living in a town or city needn't deter you from becoming involved. You don't need to be an expert in Lepidoptera or invest large sums of money in specialist equipment; it is a hobby that anyone can enjoy. Most moths are attracted to bright lights and the use of specialist lamps is the most effective method of trapping. Non-lethal light traps suitable for use in the average suburban garden can be purchased for as little as €150; or you can build your own trap to cut cost further. Invest in a guide book or two and you are all set to explore the captivating world of moths.

Moths play a very important role in our ecosystem. They and their larvae provide a valuable food source for many species such as songbirds (according to estimates in the UK, Blue Tits alone eat 35 billion caterpillars per annum, the vast majority being moth caterpillars). Moths are an indicator of a healthy natural environment and affect many other types of wildlife. Sadly, and like much of the rest of our biodiversity, they are experiencing a serious decline. For this reason, ongoing moth recording helps to provide valuable data. The 'hobbyist' moth trapper has an important role to play here.

Nearly 1,500 species of moth have been recorded in Ireland. These are divided into two groups; Macro Moths and Micro Moths. Macro Moths, generally the larger species, are the ones that newcomers to moth trapping should concentrate on first. They are usually

easier to identify and are limited to about 570 species. Later, as you become more experienced at moth identification, you may venture into the somewhat daunting area of Micro Moths!

While I have always had a passing interest in moths and insects in general, my involvement in trapping really began about 6 years ago when an exotic looking moth flew in through the kitchen window on a hot summer night. After an appeal for help online, it was quickly identified as a Buff Arches (*Habrosyne pyritoides*) and I was hooked. Within a week I had built a Skinner Trap from some old plywood and purchased a set of electrics from the UK. Since then I have recorded in excess of 250 moth species in my small north Dublin city garden, including a number of real rarities.

So what do you need to start moth trapping? If you live in suburbia, firing up a massive mercury vapour lamp will make you very unpopular with your neighbours – the light is very bright and intense. An actinic light is a much better option. These commonly come in a range of wattages, from 6W to 40W. I have found that a 15W lamp is perfect for the average garden. Then you have a choice of trap designs on which to mount your lamp. I mainly use homemade Skinner traps fitted with either a 15W or 40W light. There is a wealth of information available online to help you decide which trap best suits your needs. I recommend a visit to the Moths Ireland website (www.mothsireland.com). Follow the various links for all you need to know about moth trapping.

You will also need a good guide book to identify your moths. For the Macro Moths, I recommend the *Field Guide to the Moths of Great Britain & Ireland* (2nd Edition) by Paul Waring and Martin Townsend.

Once you have your trap and field guide, what next? When and where to trap? Light traps are most effective on dark overcast nights when the lamp is not competing with bright moonlight to attract the moths. Also, it's best not to run your trap in very wet weather – electricity and water don't mix very well, however some actinic lamps systems are fully waterproof. If you do run a trap in inclement weather, do ensure that there are drainage holes in

the bottom of the trap to avoid it filling with water and drowning the moths. I try to locate my trap in a sheltered part of the garden where it won't be too exposed to wind and rain. You can leave your trap unsupervised throughout the night and check your catch the next morning. Many moths will be attracted to the light but might not enter the trap, so remember to also check around the outside of the trap. The two rarest moths I have recorded were both found outside the trap.

If you don't want to get up at the crack of dawn to process your catch, try to locate the trap where it will not be in direct morning sunlight – the moths can quickly bake inside an exposed trap. You can trap all year round although winter months can be rather unproductive. In my garden, the period from April to September is the most productive. But be aware that different moth species have different flight seasons, so trapping all year round can produce many species you wouldn't otherwise see if you restrict yourself to the summer months. You also need to consider the welfare of the moths. Trapping every night can adversely impact on them. They will be unable to feed or reproduce if they spending every night inside your trap. Two or three nights a week trapping is plenty.

The Moths Ireland website is where you can submit your records and seek help with

those hard to identify moths. Joining the Moths Ireland Facebook page will also put you in touch with other moth enthusiasts who can provide advice and assistance. You can also take part in the Garden Moth Scheme which runs all year round in the UK and Ireland (www.gardenmoths.org.uk).

Once you have processed your catch you need to release the moths safely. I always release them into thick undergrowth in a shady part of the garden close to where the trap was positioned. A word of warning; Robins can be very quick to spot a regular free breakfast so avoid releasing the moths in the same place too often.

You never know what moths you might find in your moth trap. While some species are quite distinctive and easily identified, many others can be difficult to tell apart. However, you may be surprised at how quickly you become adept at moth identification. Moths are under recorded in Ireland and right from when you first start moth trapping you will be able to add valuable data to our knowledge of moths. I hope this short piece and the accompanying photos will whet your appetite and you'll consider joining the growing number of Irish moth enthusiasts.

Cian Merne is Senior Technical Officer, School of Mechanical & Manufacturing Engineering, Dublin City University.



Two types of trap, Skinner (l) and Heath (r); both are suitable for the garden.



The Drinker is typical of the thickset Eggar moth family.



The Swallow-tailed Moth is a large moth that can often be seen at dusk.



A Burnished Brass.



A Black Rustic.

Geological Survey of Ireland

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The once common Garden Tiger is becoming scarce



The exotically coloured Elephant Hawkmoth



Not all moths are nocturnal; the Six-spot Burnet is a day flying species



The Chinese Character camouflages itself as a bird dropping!



A Map-winged Swift

Suburban Moth Trapping: *an Introduction*

Photography by Cian Merne (see article on page 15)



The aptly named Eyed Hawkmoth



The colourful Canary-shouldered Thorn



The Green Arches is a member of the largest moth family, the Noctuids



The Angle Shades can be recorded in every month of the year



A Swallow Prominent



A Buff-tip resembles a broken twig

The Praeger Survey of Lambay

By Matthew Jebb

LAMBAY is an island of just over 240 hectares (600 acres) lying some five kilometres (3 miles) off the east coast of county Dublin. The Island was purchased in the spring of 1904 by Cecil Baring after he saw an advertisement in *The Field* magazine – “Island in the Irish sea for sale”. Baring was a member of the eponymous banking family, and whilst this was a profession, his passion was natural history. When Baring first saw Lambay in the winter of 1903, he was captivated by its Homeric simplicity and ecological isolation, an enchanted island both for the romantic and naturalist. He recognised the guano-encrusted cliff ledges as evidence of the vast seabird colonies that would inhabit the cliffs in summer. He had accompanied Professor Hans Gadov (curator of the Stricklandian Collections at Cambridge University and Reader on the morphology of vertebrates) on a number of scientific collecting expeditions to Mexico during the 1880s. In the 1890s he also had the opportunity to visit the Selvagen islands (today a World Heritage Site) situated midway between the Canaries and Azores.

Baring determined to discover all he could about the island and its wildlife, and

this led to an early introduction to Robert Lloyd Praeger. From this meeting the idea of undertaking a complete survey of the island’s flora and fauna was born. A specimen of *Juncus subnodulosus* in the National Botanic Garden’s Herbarium indicates that Praeger was on the island on 21st August 1904. During the fieldwork and collecting trips in 1905 and 1906, Praeger with a team of 7-10 amateur naturalists on each occasion, ‘ransacked the island’ for specimens (Praeger, 1937), while staying as guests of the Barings.

The first fieldwork took place in June 1905, when Praeger was accompanied by nine colleagues: Henry Seymour (Geology), Robert Patterson (Birds), Robert Scharff (Land Molluscs), Arthur Stelfox (Land Molluscs), William de Vismes Kane (Lepidoptera), James Halbert (other Insects), Walter Rankin (Crustacea), David McArdle (Cryptogams) and George Low (Photographer).

Three visits were organised in 1906, when Praeger was accompanied at Easter by Nathaniel Colgan (Marine Molluscs), Albert Nichols (Bryozoans & Echinoderms), Hugo Buchanan-Wollaston (Tunicates & Hydrozoa), Edward Batters (Algae), John de Witt Hinch (Glacial Geology), Nevin Foster (Birds),



A vegetation map of Lambay Island, by R. Lloyd Praeger, in the *Irish Naturalist*, Vol. XVI.

Robert Patterson and Walter Rankin; in June 1906, when he was joined by Robert Welch one of Ireland’s most esteemed landscape photographers, along with Robert Southern (Worms), Matilda Knowles (Flowering plants), George Low and James Halbert; and lastly in October 1906, when Robert Scharff, James Halbert, David McArdle, Henry Seymour, George Low, John de Witt Hinch, and Praeger returned and were joined by the first timer Denis

Robert Pack-Beresford (Arachnida, Isopoda). As with so many of Praeger’s projects the publications were swiftly edited and printed in a special double issue of the *Irish Naturalist* in January of 1907.

One of the chief collaborators was Robert Scharff, Keeper of Natural History at the Museum in Dublin. Although Scharff contributed only a short paper on fishes to the survey publication, he no doubt assisted in the editing and fieldwork of other contri-

butions. Whilst Praeger had embarked upon the survey in hopes of adding to the knowledge of the local distribution of species, the results surpassed all expectations, revealing 90 species new to Ireland, 15 species new to the British Isles, and a remarkable five species new to science, two of which received suitably proud and patriotic epithets (a bristle-tail, *Praemachilis hibernica*; a mite, *Trachyuropoda celtica*; and three earthworms). So struck were Scharff and Praeger by the results of the first season’s fieldwork they had already begun discussing a larger project of more ambitious scale. Thus Lambay became the catalyst to one of the most significant pieces of biological surveying ever carried out

in Europe – the Clare Island Survey – conducted from 1909 to 1911.

Praeger’s contribution on the vascular flora comprised a description of the six plant associations he identified on the island – maritime, grassland, bracken and heather associations, and two rather minor associations he termed sedum desert and rush. This is amongst the earliest phytosociological maps of Irish vegetation - a science of which Praeger was one of the most influential early proponents in these islands.

Whilst Praeger also presented a listing of additions to the vascular flora enumerated by Henry Chichester Hart, this appears to have been less thorough than his normal field recording. A possible explanation is provided in his

The advertisement for Johnson & Johnson Campus Ireland features the company logo at the top in a large, red, cursive font. Below the logo is a circular graphic with the words 'CONNECT', 'SHAPE', 'DELIVER', and 'LEAD' around the perimeter, surrounding a map of Ireland with several locations marked. To the right of the graphic, text states: 'Johnson & Johnson Ireland has over \$2bn invested in manufacturing and development activities in Ireland. In operation since 1935, we currently employ over 2,000 people in manufacturing and related activities. <http://careers.jnj.com/>'. At the bottom, there is a red banner with the 'Campus Ireland' logo and several partner logos including tibotec, janssen, and DePay.

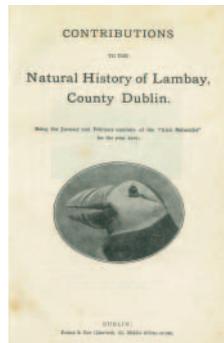


Hillside above Mason’s cottage, Lambay. Left photograph by R. Welch, June 1906: the dark vegetation in the background is *Erica* and *Calluna*, Bracken dominates the middle ground and in the foreground is a rabbit-grazed grassland turf. Right photograph by M. Jebb, June 2006: Heath has disappeared and replaced with grassland with wood sage (*Teucrium scorodonia*), Rubus thickets in the middle ground and cattle-grazed grassland dominated by *Holcus* and thistles.



Photograph taken on Lambay June 1905, George Low: Back row (L to R): W.Rankin, J.Halbert, A. Stelfox, R.Patterson. Seated (L to R): W. de Kane, C. Baring, R. Scharff, D.McArdle, R.LI.Praeger, H.Seymour. Lying on the ground is G. Low the photographer.

Images courtesy of National Botanic Gardens



Contributions to the Natural History of Lambay, County Dublin (1907)

somewhat awkward relationship with Hart at the time. Praeger records in his book *Some Irish Naturalists*, that he failed to respond to a postscript in one of Hart's letters which caused a reply of "such eloquence", that "... our correspondence ceased abruptly and for ever" (1949, p.35). It seems that Praeger would have been more than anxious to avoid 'correcting' his fellow botanist.

Lambay has changed radically since Praeger's survey. Grassland improvement, and the presence of grazing stock have all compounded to reduce the remaining associations. Between September 1904 and December 1906, 24,000 rabbits were recorded as being killed with little appreciable impact on their number. The rabbit population was entirely destroyed by *Myxomatosis* in 1954, which allowed the grazing of farm stock on what had formerly been almost 400 acres of unproductive farmland. Grassland areas on the east side of the island were ploughed and reseeded. At this point heather plants became restricted to the thinnest soils on the hills and escarpments, a feature clearly seen in aerial photographs from this period. These plants became tall and straggling, and their decline during the 1960s was probably due to the rising fertility from the presence of farm stock which prevented regeneration. Heathland, which

covered over 100 acres in Praeger's map, has now completely disappeared.

Over the past 20 years I have been recording the flora of the island in great detail. Of 953 taxa of vascular plant recorded for County Dublin (Doogue *et al.*, 1998), an historical total of 387 have been noted on Lambay. Eighty taxa have not been re-recorded during recent surveys. The intensification of grazing, as well as liming and sub-soiling of the eastern half of the island, has led to the loss of both the heathland and the rush association and general grassland improvement. *Succisa pratensis*, *Viola canina*, and *Dactylorhiza maculata* are plants that have disappeared with the heather association. *Calluna vulgaris* and *Erica cinerea* were once more or less co-dominant in this association. Today the former is extinct, while the latter is represented by just 5 individual plants surviving on the sheer rock faces of the central escarpment. *Juncus*

subnodulosus was recorded by Praeger as the most common rush in the extensive rush associations. This species of rush is now absent, and *Juncus* spp. are nowhere abundant. *Polygala vulgaris*, *Carlina vulgaris*, *Carex caryophyllea* and *Nardus stricta* all of which were frequent in Hart's day, are typical of infertile, well-grazed swards, a habitat that is today absent. The reduction in tillage is no doubt the cause of the disappearance of 16 taxa, including *Spergula arvensis*, *Odontites verna* and *Papaver rhoeas*, all of which were once recorded as frequent.

Loss of habitat is a ready explanation for some disappearances. Restricted habitats coupled with small population size, will always be a major constraint to the long-term presence of taxa on islands. Previous records for twenty-two taxa refer to only a single site, and their durability would have therefore been precarious. The current absences of *Anthyllis vulneraria*, *Fragaria vesca* and *Centaurea nigra*, on the other hand, are difficult to explain. They are all species with a wide tolerance of habitats and conditions, for which ample suitable sites are present, and yet from

being frequent 100 years ago, they are now absent.

On the positive side, fifty-three taxa have been recorded from Lambay for the first time during recent years. Whilst the failure to relocate 80 taxa may seem a dramatic loss, the present day flora is still very similar to the size it was in Hart and Praeger's day (306/329 = 93%). Rather than a simple decline in diversity, there has been a 25% turn over in species composition. This is similar to results from the flora of Aran (Webb, 1980 & 1982) and Inishbofin (Webb & Hodgson, 1968).

Praeger had a special fondness of islands, revealed by his book *Beyond Soundings* (1930). In his lifetime he published flora lists for some dozen Irish islands. The importance of studying island floras is that they are more sensitive than mainland plant assemblages to the vagaries of extinction, immigration and ecological status. The impact of changes in land-use, and its biological consequences, have more rapid and explicit effects on islands. Such changes are buffered in mainland situations. Thus islands give an insight of the likely long-term ecological consequences that modern-day practices, driven

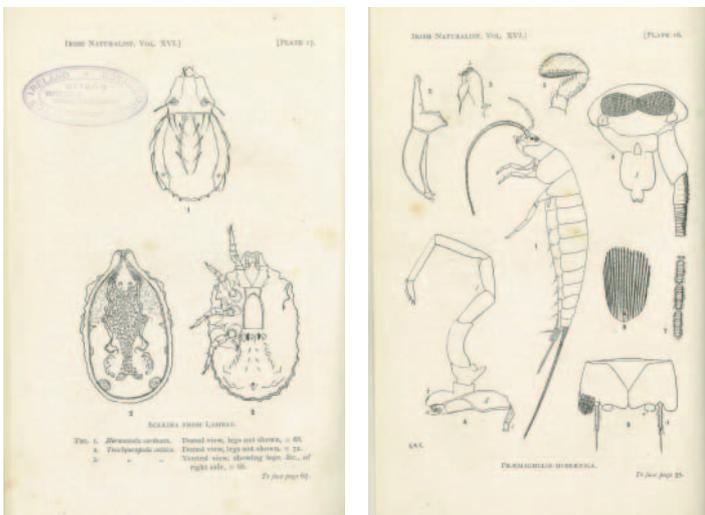
by subsidies and biodiversity measures, may have.

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



Other images from Praeger, R.L.I. (Ed.) 1907. Contributions to the Natural History of Lambay, County Dublin. Irish Naturalist 16: 1-112.

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GPO Witness History

By Barney Whelan

THE GPO Witness History is a new visitor experience for Dublin, created by An Post with State support, which presents an interactive and immersive exhibition which tells the story of the 1916 Easter Rising and its aftermath.

The GPO is the oldest purpose-built still functioning General Post Office in the world. Completed in 1818, it is the corporate headquarters, retail office and operations hub for An Post on a 1.7 acre site facing on to Dublin's main thoroughfare, O'Connell St has always been a place of protest, pageant and parade, and the GPO the focal point. No time more so than in 1916, when a group of revolutionaries occupied the building and set up their headquarters from which to direct a Rising. Over the course of a week almost 500 people were killed – rebels, British Military and Police, civilian adults and children – before the eventual surrender and execution of sixteen rebel leaders, and the arrest of over 3,000 suspects, that was the catalyst that eventually led to the birth of an independent Irish Republic.

It's a history that is much contested and one that is still being written. With, for instance, the role of women coming to the fore in 2016 and new research confirming the loss of 40 children's lives.

GPO Witness History is, in effect, the result of a defensive strategy on the part of An Post. By 2012, with the Decade of Commemorations in our midst and the weight of history bearing down, we were hearing lots of ideas floating around both in the media, and at State level, about what could and what should be done with the GPO in 2016. We were alarmed that none of them included An Post! In an effort to ensure that we didn't lose our headquarters and central office to something ill-advised or overtly political, we developed a landmark proposal ourselves for a visitor experience that would deliver on a number of cultural, historical and business objectives. That proposal had three strands:

- Retaining the integrity of the GPO Public Office and its unique original features, build a stylish unit of architectural significance in the Eastern Courtyard
- Fill the centre with history and complete with interpretations of that history by artists
- Design and set up a commercially viable business to run the centre to cater for approximately 275,000 visitors annually, without ongoing State subsidy after the build

The barriers and complications were many, not least securing the finance for a large capital project. But one barrier was immovable – we had a 'no-pressure' deadline of Easter Weekend 2016!

The Background to Development

Having developed the outline concept and business plan they were presented to the All Party Commemoration Committee in November 2012. It was received well, and the Committee confirmed that as yet there were no other fully formed proposals for the GPO on the table. There followed 12 months of intense lobbying. This intensive advocacy campaign ranged across Government, opposition, Local Authority, the business community, historians, archivists, the numerous Relatives groupings and other interest groups, staff, broader An Post stakeholders etc. It was vital that everyone understood what An Post was doing, and what was planned, so that they could discuss it



The GPO, O'Connell Street, Dublin.



The entrance to the GPO Witness History Centre.



Artefact displays and electronic touch screens, video, audio visual booths and sound, the visitor gets a unique view of what happened on the exact site of 1916.

armed with knowledge, should it come in front of them for decisions that could help.

In 2013, the Taoiseach visited the GPO, and the opportunity was taken to walk him through the building and discuss the plan. A State capi-

tal investment of €7million via the Department of Arts was announced in the Budget in November 2013, and An Post committed €3million to complete the build, the enabling work and the fit out of the Museum.

The GPO Witness History Centre

GPO Witness History was ready on time, and within budget and managed internally by An Post. The exhibition and interpretation was designed and created by Martello Media with the support of a number of historical consultants, and Shannon Heritage were appointed to manage and run the centre, given their expertise in running projects such as Bunratty Castle, Malahide Castle and Bunratty Folk Park.

An Post's Objectives in creating GPO Witness History

- Sensitive acknowledge and honour the events of 1916 and reflect the role of the Mail, the GPO and Communications heritage have in the history of the State
- Create a world class visitor experience
- Give the public greater access to the GPO site, and create an opportunity for real public engagement
- Maximise exhibition space
- Create something unique, accessible and interesting across audiences, from school children, families, to scholars
- Create a legacy that does not end on 31 December 2016, but continues to engage
- Reconnect An Post employees with that important history, and recognise their pride in it
- And (most crucially), that An Post continue to operate its business as at present in the GPO

Through artefact displays and electronic touch screens, video, audio visual booths and sound, the visitor gets a unique view of what happened on the exact site of 1916. The centre also includes a newly created courtyard area, which offers a fresh vantage point of the building, which has had extensive reconditioning and cleaning, uncovering beautiful and elaborate brickwork which had been covered by decades of grime. The courtyard features a specially commissioned memorial created by the renowned artist Barbara Knezevic. The haunting piece commemorates the 40 children known to have died by gunfire during Easter Week. The ground-level piece has been created using a base of polished steel, on which each child is represented by a piece of black limestone salvaged from the ruined foundations of Jacob's Biscuit Factory, which was a key rebel-held site that week. The courtyard also offers a unique and up-close view of the Spire.

Walter Paget's iconic painting 'Birth of the Irish Republic' which was painted entirely from witness testimony, forms the genesis of the GPO Witness History story, and much of the interpretative content pays homage to it, fitting given that the rebels came from artistic backgrounds. The first image that visitors see on reaching the ticket desk is Robert Ballagh's homage to it.

Alongside An Post's copy of The Proclamation itself, a central feature of the visitor centre is an immersive audio-visual experience 'Fire and Steel' also inspired by Walter Paget's 'Birth of the Irish Republic'. The film plays on a 180 degree screen and swoops over key events and transports visitors back to Easter Week 1916 when the GPO was the headquarters of the Provisional Government. An eight day film shoot took place in October 2015 in a 'blue box' studio, when a cast of actors and events were filmed against blue backdrops, and were subsequently digitally transposed into a computer generated 3-D CGI recreation of both the GPO, and Dublin, as they were in 1916. The film which covers key events throughout the city, culminates in the moment portrayed in the



The role of two Irelands in the 1900s: a timeline of what each grouping active in Ireland at the time were doing and how their involvement evolved.

Paget tableau, when the rebels decide to evacuate the blazing GPO.

The hallway illustrates a few of the major events of celebration, remembrance and protest that have happened at the GPO, such as the Funeral of Charles Stuart Parnell, attended by 200,000, and the Centenary of Daniel O'Connell. There is also a large scale image of O'Connell Street, taken the week before the Rebellion began. This begins the setting of the context of the early 1900s and the Cultural Revival. We see Unionist, Home Ruler, Suffragette, Republican and Socialist agitators, and the social backdrop via streets lined with posters which would have been a key communication tool of the day. We get to see and understand the European context at that time, along with a timeline and what each grouping active in Ireland at the time were doing and how their involvement evolved.

Paget's Birth of the Taoiseach Liam Cosgrave and Taoiseach Enda Kenny TD recreate the image in 2016 at the opening

Activation, Community Engagement and Leveraging Heritage Assets

A key part of the activation and launch communications for GPO Witness History has seen us leverage the heritage assets of An Post. With 'Project Red' we identified 10 historic Posting boxes which 'saw' action during Easter Week. We painted them the Royal Mail Red that they would have been at the time, instantly creating incongruity for people walking by. Each post box was marked with a free-text code, that when dialled brought the user to video content showing what happened on that street in 1916. This video content was integrated into the film assets with GPO Witness History, to tell another facet or layer of the story told there. Each viewer is then offered an opportunity to purchase tickets for GPO Witness History.

The GPO Witness History centre is integrated across the Post Office network with information about it displayed on digital screens around the country. Also, each one of the 80 million stamps in the 1916 series also carries a code that when scanned brings you to historical resources about the subject of the stamp and how they tie into the GPO Witness History story.

We've also facilitated a lot of creative engagement with the communities around us – the school visits to see the exhibition are a key part of that, but we've also facilitated schools who wanted to role-play and recreate the storming of the GPO, which garnered some alarmed reactions from customers!

A very important point of activation for the project was the negotiation with RTÉ to make a landmark TV series about the GPO and preparations for 2016. 'Inside the GPO' features staff

from across the business and has been a superb public and staff engagement piece.

The Opening of GPO Witness History

Easter Week was a busy one on O'Connell St with a series of official Commemoration events.

The Official Opening on Good Friday 25 March was attended by former Taoiseach Liam Cosgrave, who, along with Taoiseach Enda Kenny TD, recreated the famous photograph of his father WT Cosgrave re-opening the GPO in 1929 after its rebuild and refurbishment after the damage wrought in 1916. WT Cosgrave fought in The Rising at the South Dublin Union. A great moment was recreated featuring three generations of Fine Gael Taoisigh!

The following day we opened to the public, and that night Fishamble Theatre began a two-week run of their site-specific play 'Inside the GPO', having done all their rehearsals the previous week.

On Easter Monday, the Centre hosted a gathering of 200 Relatives of the GPO Garrison, mostly first generation. The families laid two wreaths at a plinth in the Eastern Courtyard, accompanied by the Communication Workers Union Band, which include three direct descendants of Pádraig Pearse.

The exhibit is most poignant when it counts the cost – human, property and careers. But it also traces beyond the immediate aftermath in the struggle for a Republic through the Civil War and beyond. A dual timeline leading out of the exhibition begins at the point that Ireland was partitioned and traces major events in both the North and the South to the current time.

The tour guides have all remarked on the level of knowledge and preparation of visiting school groups, the catalyst for some great moments at GPO Witness History in its first few weeks.

The Future

A sinking fund has been set aside to ensure a regular refresh of the GPO Witness History exhibition spaces and the technology, which is key. There is also an intention to continue the public art commissioning process every three years, moving on from the successful commissioning of a series of works to mark the Centenary and opening in 2016.

GPO Witness History has created 30 cultural tourism jobs. The events of Easter Week 1916 shaped this country's history and the GPO was at the centre of it all. An Post is proud to open this unique and timely visitor experience to the public in this Centenary year.

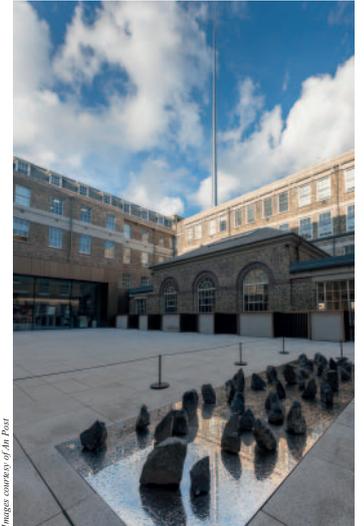
The An Post Culture & Heritage Portfolio

An Post's €3million investment in GPO Witness History sits within a series of cultural projects

and investments over 2015 & 2016 that fulfil a range of objectives and engage a wide range of audiences here and around the world in the activities and projects of An Post. Not least, many of the projects and programmes are specifically designed to acknowledge, celebrate and commemorate the role that the GPO had in the 1916 Rising and it's role since in the life of the State and its citizens.

GPO Witness History is open seven days a week, since opening to the Public on March 29th, approximately 78,000 visitors have paid to see the exhibition. What's the reaction to the centre?

- 96% of visitors would recommend GPO Witness History to family and friends
- 91% stated that it presented good value for money
- 91% satisfied with the general tone of the exhibition; 90% satisfied with the



The courtyard features a specially commissioned memorial created by the renowned artist Barbara Knezevic, commemorating the 40 children known to have died by gunfire during Easter Week.

- interactive displays; 89% satisfied with the level of detail covered in the exhibition
 - 85% said it catered for all age groups
 - 72% of visitors would return
- The feedback and engagement from staff has been overwhelming, with 'pride' being the key emotion expressed, time and again.

Barney Whelan, Director of Communications & Corporate Affairs, An Post, GPO, Dublin 1, D01 75P2. www.anpost.ie



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Geology in 3D

Revealing the Structures Beneath our Feet

By Beatriz Mozo,
Ted McCormack,
Eddie McMonagle,
Cathal Jordan
& Koen Verbruggen

THE geology beneath our feet is three dimensional but, until recently, geological mapping has been limited to two dimensional maps and cross sections. Interestingly geologists have always had to be able to think in 3D in order to “understand the underground” and historically have employed everything from “fences” of 2D cross sections, to wireframe models, complex sketches and even etched glass blocks to visualise the subsurface. Today we have the software and hardware to build 3D models that illustrate the true geological structures. These models allow users to visualise and analyse the surface and subsurface geology in new ways.

Analysis of 3D geological data allows geologists answer specific questions about shape, orientation and volume of rock types in the subsurface, which in turn can help planners and policy makers make informed decisions. Visualisation can also be powerful tool for education, as well as a means of producing eye catching material for public communication.

Geological Survey of Ireland has been investigating these technologies as part of their ongoing work and an informal 3D Working Group meets to discuss techniques and opportunities, as individual programmes and projects within GSI, such as Land Mapping, Groundwater, Seabed (INFOMAR) and Cartography all work in 3D.

The Groundwater Unit has found that through a combination of 3D geological modelling and groundwater investigations, it is possible to develop complex 3D models showing how water flows through permeable rock underground (Fig 1). These ‘aquifer’ models reflect the hydrogeological properties of the bedrock and allow for the

delineation of groundwater flow pathways in three dimensions.

Since 2014, the GSI groundwater geologists have been involved in an Irish Research Council funded project in collaboration with Trinity College Dublin and the Swiss Institute of Speleology and Karst Studies (SISKA). The aim of this project is to trial 3D modelling techniques developed by SISKA in two Irish catchments where traditional karst techniques have thus far proven inconclusive. The modelling approach involves the development of a three dimensional model of the carbonate aquifer geometry (i.e limestone hosted groundwater) coupled with a series of fundamental principles of karst hydraulics. The resulting 3D conceptual model is thus a hypothesis to test, and improve, by further investigation. The catchments chosen were Bell Harbour in Western Ireland and North Cork. Thus far, the study has shown the benefits of modelling based on structural geology with the addition of hydrological concepts, rather than defining a karst system based on spring hydrographs alone. This study marks the first time such a modelling technique has been used in low-lying and coastal karst such as that found in Ireland. Opportunistically, this year with record rainfall, the groundwater team are now looking at how the same studies can be used to help understand flooding, particularly in turloughs (temporary lakes) and are developing a project, with both monitoring and 3D modelling, to assist OPW and the relevant local authorities in this regard.

The Land Mapping Unit is working on the creation of 3D geological models of the bedrock and Quaternary geology of Ireland (Fig 2). These models allow new insights into the nature and distribution of the geological units in the country. These models vary from a large scale model of the deep geology of Ireland, with cross sections linking across the Irish Sea to Britain, down to detailed subsurface

models of Dublin and Cork, based on painstaking digital entry of over a thousand boreholes from the National Geotechnical Database. The engineering area, including geotechnical engineering, is one of the leading users of 3D data, particularly in “Building Information Models” (BIM), which provide the modern blueprints for complex construction and development. GSI data can feed into these complex and detailed models, which are often of vital use for engineers and construction companies, and GSI data is also shared with the scientific community and the general public using free viewers and 3D pdf files. In this way, the user can interact with the geological model; view it in any orientation and scale, or if interested in more scientific information create a synthetic borehole or draw a synthetic cross section. Models are available to download for free from the GSI web page.

The Seabed Unit, which along with The Marine Institute delivers Ireland’s national seabed mapping programme, INFOMAR, has utilised 3D primarily to visualise and promote awareness of their Bathymetric (seafloor) data. 3D visualisations developed include images and video to share on Twitter, @followtheboats, and Facebook. INFOMAR has produced interactive models of shipwrecks and seafloor (Fig3) which can be viewed online. Real world 3D prints of shipwrecks and an augmented reality sandbox have been a big hit at conferences and exhibitions, such as the BT Young Scientist. Use of 3D as an analysis tool will include creating a 3D workspace to adjust our seabed geology map to match bathymetry and seismic data.

The Cartography Unit led the way in adopting 3D technology for Geology with all Ireland geological visualisations and animations to be displayed at geoheritage sites such as the Copper Coast in Waterford (Fig 4). Project work in 3D facilitated GSI work in Geotourism and Mine Heritage programmes,

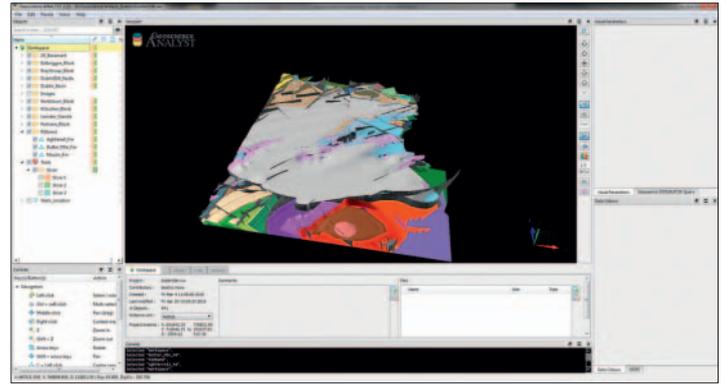


Fig 1 Bedrock 3D Viewer

permitting creation and 3D visualisations of disappearing historic mine landscapes. The real power is in the capacity to provide a virtual seamless tour integrating 3D Geological models with 2D geological seamless datasets from GSI Land and Seabed mapping. “User Interactivity” in 3D is key. Geological models output in 3D pdf and future introduction of 3D client web viewers will permit end users to navigate easily through, learn and understand what traditionally is a complex science in 2D.

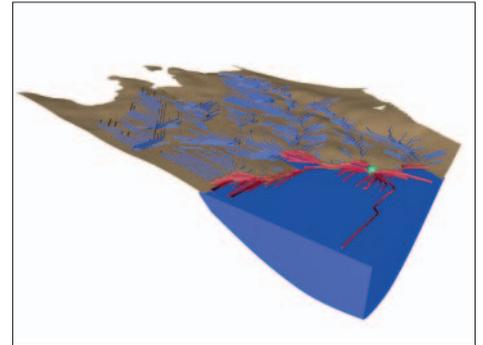


Fig 2 Burren Groundwater Model

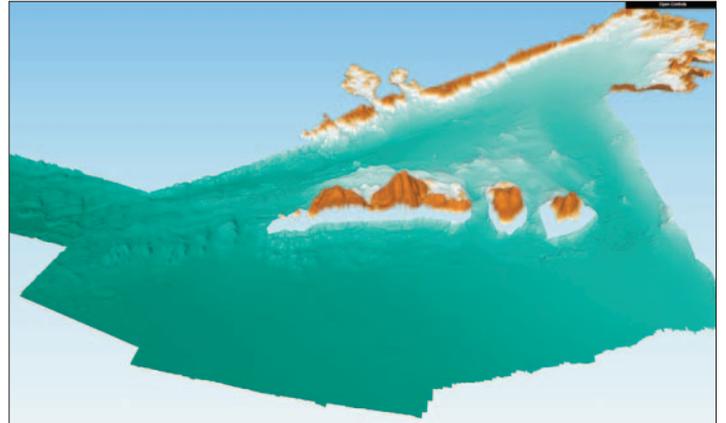


Fig 3 Galway Bay Seabed Model

GSI are now working towards more integrated 3D models. Initially this model will be solely for visualisation and will act as a test for the exchange of data between different software, projections and scales. The first integrated 3D model will likely be for a 1km square coastal area and should be both challenging and exciting as it looks to combine multiple data types from different sources and applications. Ultimately we live in a 3D world and this needs to be reflected in how we work and present our findings.

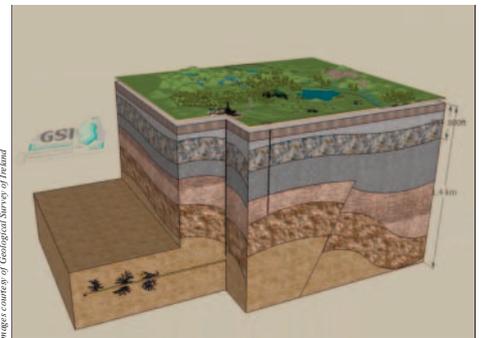


Fig 4 Copper Coast Model

For information on all Geological Survey of Ireland activities see : www.gsi.ie The Land Mapping Units 3D work can be accessed at : <http://www.gsi.ie/Programmes/Quaternary+Geotechnical/Projects/Quaternary+3D+models+of+Dublin+and+Cork+cities.htm>
For Groundwater news follow: <https://twitter.com/gsigroundwater>
Updates on INFOMAR surveys and data can be found at: <http://www.infomar.ie>

Record losses as global warming worsens

While governments continue to negotiate on climate change, meteorological scientists warn that the global warming situation is rapidly deteriorating.

By Paul Brown

AS summers get hotter, seas get warmer and extreme wind and rainstorms inflict ever-greater loss of human life and property, the World Meteorological Organisation (WMO) is trying to develop an early warning system for vulnerable countries and regions.

In a recent report to governments at the UN's COP22 climate talks in Marrakesh, Morocco, the WMO said that 2016 was almost certain to be the warmest year on record, and detailed the "considerable socio-economic losses in all regions of the world" that has resulted.

The deadliest event so far in 2016 has been Hurricane Matthew, which was Haiti's worst humanitarian disaster since the 2010 earthquake, killing 546 people and injuring 438.

Petteri Taalas, the WMO secretary-general, said: "Another year, another record. The high temperatures we saw in 2015 are set to be beaten in 2016."

Continued global warming

"The extra heat from the powerful El Niño event has disappeared, but the heat from global warming will continue."

"In parts of Arctic Russia, temperatures were 6°C to 7°C above the long-term average. Many other Arctic and sub-Arctic regions in Russia,

Alaska and northwest Canada were at least 3°C above average. We are used to measuring temperature records in fractions of a degree, and so this is different.

"Because of climate change, the occurrence and impact of extreme events has risen. 'Once in a generation' heatwaves and flooding are becoming more regular. Sea level rise has increased exposure to storm surges associated with tropical cyclones."

Taalas added: "The WMO is working to improve monitoring of greenhouse gas emissions to help countries reduce them. Better climate predictions over timescales of weeks to decades will help key sectors such as agriculture, water management, health and energy plan for and adapt to the future."

"More impact-based weather forecasts and early warning systems will save lives both now and in the years ahead. There is a great need to strengthen the disaster early warning and climate service capabilities, especially of developing countries. This is a powerful way to adapt to climate change."

It is ironic that just days after the US chose the extreme climate change sceptic Donald Trump – who has described climate change as a Chinese hoax as president-elect, the WMO chose to quote the Bulletin of the American Meteorological Society to show how bad the effects of global warming are.

The report said that of 79 studies published

more than half found that human-induced climate change contributed to the extreme event in question. The probability of extreme heat caused by global warming increased tenfold or more.

For the first time, the WMO included the consequences of climate change fed in from other UN agencies, including the UN High Commission for Refugees.

This data shows that in 2015 – the latest year for which figures are available – there were 19.2 million people displaced because of weather, water, climate and physical hazard in 113 countries. This was more than twice as many as displaced by conflict and violence.

Of these, weather-related hazards triggered the movement of 14.7 million people. South and East Asia dominated in terms of the highest absolute figures, but no region of the world was unaffected.

The report shows that global temperatures for January to September 2016 were 1.2°C above pre-industrial levels. Temperatures were above the 1961-90 average over the vast majority of land areas. In parts of Arctic Russia, around the Ob River estuary and Novaya Zemlya, they were 6°C to 7°C above average.

Many other Arctic and sub-Arctic regions in Russia, Alaska and northwest Canada were at least 3°C above average. More than 90% of Northern Hemisphere land areas outside the tropics were at least 1°C above average.

There were a number of major heatwaves during 2016. The year started with extreme heat in southern Africa, exacerbated by the ongoing drought. Many stations set all-time records,

including 42.7°C at Pretoria and 38.9°C at Johannesburg, South Africa, on 7 January.

Record temperatures

By April, Thailand had seen a national record of 44.6°C, and a new record for India of 51.0°C was recorded in Phalodi, Rajasthan, on 19 May.

Record or near-record temperatures occurred in parts of the Middle East. Mitrabah, in Kuwait, recorded 54°C on July 21, which, subject to ratification through standard WMO procedures, will be the highest temperature on record for Asia. The following day, 53.9°C was recorded at Basra, Iraq, and 53°C at Delhoran, Iran.

Temperatures were above normal over most ocean areas. This contributed to significant coral bleaching and disruption of marine ecosystems in some tropical waters, including the Great Barrier Reef off the east coast of Australia, and Pacific island countries such as Fiji and Kiribati. Coral mortality of up to 50% was reported in parts of the Great Barrier Reef.

Remarkably, global sea level rose by 15 millimetres between November 2014 and February 2016 as a result of El Niño. This is a record high, well above the post-1993 trend of 3-3.5 mm per year.

Arctic sea ice is currently well below normal after a near record shrinkage in the summer. Melting of the Greenland ice cap was well above average, with the worst being recorded in July. – *Climate News Network*

Amazon land rights face greatest threat

Policymakers in the Amazon region are failing to protect indigenous land rights that safeguard forests and reduce greenhouse gas emissions.

By Jan Rocha

FROM São Paulo – Ensuring forest people's land rights in the Amazon region is a cheap and effective way of cutting both carbon emissions and deforestation, researchers say – but the obstacles are formidable.

A report from the World Resources Institute (WRI) offers new evidence that the modest investments needed to secure these rights will generate billions of dollars in returns – economically, socially and environmentally – for governments, investors and communities.

The report, *Climate Benefits, Tenure Costs*, quantifies the economic value of securing land rights for the indigenous communities who live in and protect forests, with a focus on Colombia, Brazil and Bolivia in South America, and implications for the rest of the world.

Previous WRI research has found that when indigenous peoples and communities have secure rights to land, deforestation rates and carbon emissions are often significantly reduced.

In the new report, matching analysis data shows that the average annual deforestation rates in Bolivia, Brazil and Colombia were significantly lower in tenure-secure

indigenous forests than in similar areas without secure tenure: 35% lower in Bolivia, 40% lower in Brazil, and 50% lower in Colombia. All three countries have large portions of the Amazon forest within their borders.

Yet although protecting indigenous land rights can help meet national emissions reduction commitments to the Paris Agreement on climate change, only 21 of 197 intended nationally determined contributions (INDCs) mention community-based land tenure, and only one sets a measurable target for the expansion of secure tenure rights.

Land grabbers

In Brazil itself, there is mounting pressure from ranchers, loggers and land grabbers who are invading indigenous areas, whether they are officially recognised or not.

Based on satellite images from Brazil's National Institute for Space Research (INPE), which monitors the Amazon region, the National Indian Foundation (FUNAI) has just issued a warning on the website of the Socio-Environmental Institute (ISA) that, as a result of that pressure, deforestation inside indigenous reserves is rising.

The images show that between January and September this year, an area of 188,000 sq km was cleared – the equivalent of around 25,000 football fields. This is almost three times the 67,000 sq km deforested in the whole of 2015.

Together, the 419 indigenous areas located within the Brazilian Amazon region cover more than 1 million sq km. So far, what has been cleared amounts to only 2% of the total, but non-governmental organisations fear that the barrier to the advance of agriculture, logging and land grabbers, which is formed by the existence of this mosaic of indigenous areas and conservation areas, is beginning to collapse.

Large-scale government dam building projects have also contributed to higher rates of deforestation. Cachoira Seca, the most deforested of all the indigenous areas, is near the recently built Belo Monte hydro-electric dam.

Yet the WRI report shows that the modest investments needed to secure land rights for indigenous peoples in the Amazon could generate billions of dollars in economic, social and environmental returns for governments, investors and communities.

The total estimated benefits of securing indigenous lands in Brazil are US\$523bn–\$1,165tn, in Bolivia \$54–\$119bn, and in Colombia \$123–\$277bn over the next 20 years, after factoring in global carbon benefits and ecosystem conservation.

"We now know that there is a clear

economic case to be made for ensuring that indigenous peoples have secure rights to their land," says Andrew Steer, president and CEO of WRI. "Not only is securing land tenure the right thing to do, it's one of the world's most cost-effective climate mitigation strategies."

"National governments should take note – and move quickly – to secure indigenous lands and incorporate land rights into their climate change strategies and commitments to the Paris Agreement."

Securing land rights

The WRI reckons that the cost of securing indigenous land rights in the Amazon is just a few dollars per hectare of forest per year – less than 1% of the total economic benefits. The report also finds that securing indigenous and community lands is cost-effective when compared with other climate mitigation options such as carbon capture and storage (CCS).

Analysis shows that using CCS to reduce emissions costs 5-29 times more in coal-fired power plants and 7-42 times more in natural gas-fired

power plants than achieving the same emissions reductions through securing indigenous forestland tenure. And CCS technology has yet to be proved workable at scale.

"Indigenous peoples and local communities have a long history of using natural resources wisely and adapting to the changing climate in an integrated and sustainable manner," says Naoko Ishii, CEO and chair of the Global Environment Facility (GEF).

"Protecting and enhancing the land rights of indigenous peoples is a necessary step towards greater economic prosperity and safeguarding our global commons."

Unfortunately, policymakers in Brazil continue to ignore the benefits of preserving indigenous lands, even when they are so clearly spelled out.

Instead, FUNAI's funding – and therefore its ability to protect indigenous areas – has been drastically cut under the recent tough austerity measures introduced by the federal government to tackle economic recession. And if the WRI report is right, this is in every sense a false economy. – *Climate News Network*

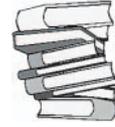
Climate News Network is a free and objective service publishing a daily news story on climate and energy issues.

www.climate-news-network.net

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Publications of Interest



Straw, Hay & Rushes in Irish Folk Tradition

By Anne O'Dowd

Irish Academic Press in association with the National Museum of Ireland

www.museum.ie

ISBN: 978-07165-3274-3

€45.00/2015

Straw, hay and rushes were utilised throughout the centuries in Ireland for a myriad of practical uses and rituals. Over fourteen chapters, this book explains how these organic materials of straw and, to a lesser extent, rushes and hay were put to use.



In the first chapter, Spreading Rushes in Folklore and History, we learn that rushes or straw were spread or strewn on the ground for different purposes – household cleanliness, disease prevention and as a respect and welcome. Other uses including the making of mattresses, seats and containers, horse collars and harness, tethers for cattle and sheep and nests for hens to lay and hatch out eggs. At the end of each chapter there is a catalogue describing objects made from straw, hay and rushes and a range of other organic materials that are held in the National Museum of Ireland's Irish Folklife Collection in Castlebar, Co. Mayo. Interspersed with images, the catalogues list each specimen, along with its reference number, area grown, description of material e.g. straw, hay or rushes and the maker of the item (if available).

One custom that utilises rushes and one which many of us will be familiar with is the making of "St Brigid's Crosses" for St. Brigid's Day on the 1st February. In chapter two, we learn there are a number of types of the St. Brigid's Cross, depending on the part of the country.

Today the best known and loved folk customs include Wren Boys, Biddy Boys, Straw Boys and Mummers and in the chapter on Folk Drama, Making and Straw, the origins of these customs are explained. The author describes "Folk Drama... is the only phrase descriptive of a range of popular activities, looked on in recent times as entertainment, but which originated in ritual".

Another old custom is described in "The last sheaf, the first sheaf and harvest knots", that of bringing home the last sheaf (of straw or corn) and hanging in the home until the following year's harvest to bring good luck. Like many customs, they evolved in different ways from place to place. We learn there is a good assortment of decorative harvest knots in the Museum's collection, with a listing of 88 complete knots in the catalogue. Photographs of some of these are shown and the specimens are superb.

Sleeping arrangements and condition explains how the manufacture of mattresses from straw was considered a special craft and the skill was carefully passed from father to son. The author discusses the various methods used throughout the country. However, part of this chapter was most distressing to read. Examples were given of the vast poverty in Ireland in the 18th and 19th century, when families had just a straw mattress to sleep on and were without even a blanket to cover themselves. There are some harrowing examples of evidence given to the commissioners who inquired into condition of the poor in Ireland in the mid 1800s.

The other chapters in the book are so informative. A great variety of seating could be made from straw, hay and rushes,

with chairs and stools constructed from coils and plaiting. This reminded me of the time in my youth when on holidays in north Cork, I helped my cousin replace the seating of a sugar chair with twisted hay. These natural materials were so versatile. They were used as containers for hens, for catching fish, in everyday clothing, as animal restrictions, for carrying loads and produce by road and track, building work shelters and homes – the list goes on. Thankfully these traditions have been documented in this wonderfully informative book. The author Anne O'Dowd, for many years, worked as a Curator in the National Museum of Ireland. When the noted Director of the National Museum of Ireland A.T. Lucas, retired in 1976, he knew he would not get around to writing the book. He asked Ms. O'Dowd to take on the work and she has delivered that request in spades. Bless her achievements.

Matt Murphy

The Rainforests of Britain and Ireland – A Traveller's Guide

By Clifton Bain

Sandstone Press Ltd

www.sandstonepress.com

ISBN: 978-1-910124-26-0

€24.99/2015

When one hears the word 'rainforest' one automatically thinks of the Amazon. It was a pleasant surprise to receive "The Rainforests of Britain and Ireland – A Traveller's Guide".



Along the west coasts of Scotland, England, Wales and Ireland mixed forests of oak, hazel, birch, ash and many more species survive and thrive in the wet conditions that blow in from the Atlantic. They are home to a wide variety of birds, animals, plants and fungi.

The author in having journeyed around "The Ancient Pinewoods of Scotland" in his previous book thought it an obvious choice to follow up with the Atlantic rainforest. He embarked on another year of public transport, walking and cycling to fantastic places with the most special of landscapes, from vast wilderness to rich pastures.

The rainforests of Britain and Ireland belong to an ecological group known as Coastal Temperate Rainforests which is confined mainly to small areas in eight regions of the world. The common climate feature of these forests is the high rainfall with over 1500mm a year and more than two-thirds of the years consisting of rainy days. Indeed Britain's west coasts have figures that exceed 4,000 mm in places, which is more than many tropical rainforests.

We learn soil plays a major role in determining what tree species will grow in any location. Generally the oak woods grow on acidic soils that are poor in nutrients. Where soils are more alkali such as limestone outcrops, abundant in Western Ireland. Ash and hazel grow best. Apart from trees themselves the character of the woods is defined above all by the mosses and liverworts and lichens.

The author addresses 20th and 21st century conservation and the losses to the Atlantic woods. He points out that after the Land Act of 1903, which was designed to pass rural land from the departing landowners, the new owners felled more timber to recoup the purchase price of the land. Ireland's impoverished woodlands were reduced to cover a mere 0.5% of the island.

In Britain in 1919 The Forestry Com-

mission was formed with authority over all afforestation in the UK. It had little interest in the "poor quality" broadleaved woods and gave priority to plant fast growing conifer species. The chapter on "The Challenges for our Atlantic Rainforests" is the most important reading for anyone interested in the future of Atlantic Rainforests.

As the title of this book indicates, it is a traveller's guide. With this in mind, it features thirty eight sites of Atlantic Rainforest, sites which can be accessed by everyone. He has chosen fifteen sites in Scotland, six in England, eight in Wales, four in Northern Ireland and five in the Republic of Ireland. Every site is introduced and described, with an excellent map in each case drawn by Paul Britten. Illustrated throughout with photographs of woodlands and landscapes, two highlights are the Cascades at Cladagh Glen, Enniskillen, Co. Fermanagh and the Fallen Oak, with Mouselt Moss and the Common Polypody Fern, in Glentworth, Scotland.

Though the final pages outline the Scottish Outdoor Access Code – Safety and Access, its advice would apply to visits to the rainforests in any of the other three countries featured.

This book bears the imprint of a person who has a wonderful affection for woodland many hundreds, if not thousands of years old. Highly recommended.

Matt Murphy

The Serengeti Rules

By Sean B Carroll

Princeton University Press

www.press.princeton.edu

ISBN 978-0-691-16742-8

€16.95/\$24.95/€24.99/2016

While visiting Serengeti National Park in Tanzania, the author is prompted to ask several questions. Why is there such an abundance of life there? Why so many species? Why are there



vast numbers of some animals, but small numbers of others? What regulates these numbers within certain, often well-defined limits? How is the balance maintained? In searching for answers, Professor Carroll tells us the fascinating stories of the scientists whose painstaking investigations and experiments gradually led to an understanding of the rules of life. These range from studies of fish stocks in a lake in Wisconsin, baboons in Ghana, wolves in Yellowstone, algal blooms in Lake Erie and others, to an on-going but so far successful attempt to re-establish a thriving wildlife park in a war-devastated region of Mozambique.

What emerges is a realisation that the imbalances that can disrupt a wild ecology obey the same rules as those that can lead to human ailments like diabetes, heart disease and cancer. Each short chapter is self-contained, but with links to the others, and celebrates the work of a particular scientist or group of scientists, who should all be better known. The writing is excellent and holds the interest throughout.

The final optimistic chapter states that now that we understand the rules, we can and should apply them to the eradication of killer diseases and the renewal of the environment. It also quotes with approval the pleas of Pope Francis for us to work together toward these goals and concludes with the inspiring story of the last human to have suffered from the once dreaded disease of smallpox.

Anthony Toole

The Churches of Cork City An Illustrated History

By Antóin O'Callaghan

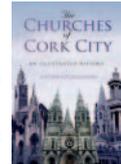
The History Press Ireland

www.thehistorypress.ie

ISBN: 978 1 84588 893 0

Price: €17.99/2016

This book is a wonderful guide for visitors to the city, as well as for locals and historians. Not only does it focus on the churches, chapels and meetings houses in the city, but also bringing in a wider history of Cork.



It gives a fascinating insight into the history of the Churches of Cork for over 1400 years, from the arrival of St. Finbarr to the present day. We learn of how these churches were changed or altered, destroyed and rebuilt according to the ebbs and flows of history.

The Chapter "The Established and Dissenting Faith" brought back memories of my younger years growing up in Cork of the 1940s. I would have regularly passed many of the Churches mentioned but being a Catholic I never ventured in. Though I wanted to, then it was not the "done thing" for Catholics to go into non-Catholic churches or meeting houses! The history of the Quakers meeting house goes back to the 1600s. It was originally situated at Grattan Street in the city centre, until a new house was built at Summerhill South. The Grattan Street premises is now a health centre administered by the Health Service Executive (HSE). The Quakers were always small in numbers but they had a huge influence on the commercial life of Cork.

Churches I passed more or less daily were the Baptist Meeting House on McCurtain Street and the Wesleyan Church on St. Patrick Street. The Trinity Presbyterian Church at Summerhill North always stood out because of the slightly misshapen 140ft tower. There are many buildings for different faiths in the city and the book gives a captivating account of the origins of each.

Of course the gem is St. Finbarr's Cathedral. A decision to replace the old Cathedral was made in 1862 but major difficulties arose between the architect William Burges and the builder awarded the contract - the latter was replaced. Burges also had many battles over the design with some of the clergy and some members of the general committee. But for his determination and dedication, this magnificent building would be very different today. The author's short history of the Cathedral makes fascinating reading.

The chapter on The Eighteenth and Nineteenth Centuries include St. Mary's Pope's Quay, the foundation stone of which was laid in 1839. One outstanding feature is the magnificence of the ceiling. The famous Cork sculptor Seamus Murphy once said "Sure the plasterers have cricks in their necks from looking up at the ceiling of St. Mary's.... gaping at the masterpiece of their craft."

The final Chapter "Twenty Century Churches" included the Christ the King Turner's Cross this was the first time pre-cast concrete was used for any major church project in Ireland. The Church was opened in 1931. The Honan Chapel at University College Cork is considered a museum of the greatest Irish arts and crafts of the 20th century. The majority of the stained glass windows are by the famous Harry Clarke of Dublin. The Church

of the Annunciation in Blackpool must be mentioned. It was the gift of William Dwyer, owner of Sunbeam Wolsey and a major employer a short distance from the Church. Locals said it was his gateway to Heaven. The Church was designed by Cork's famous sculptor Seamus Murphy and for it he carved many items for the church including the altars and the baptismal and holy water fonts. St. Vincent's, Sunday's Well (now permanently closed) also has a sculpture by Seamus Murphy, known as Our Lady of the Globe.

Though the book has not covered every church, chapel and meeting house in the city, the author has brought together the stories of many of the spiritual homes in the city and the book will be an excellent starting point for further study. In the final chapter, the author states: "But perhaps the most important story to be gleaned from the history of Cork's churches is that of the ordinary people: how they suffered and died, paid and prayed for their faiths. To them the churches belong."

Matt Murphy

Too Beautiful for Thieves and Pickpockets A History of the Victorian Convict Prison on Spike Island

By Cal McCarthy

& Barra O'Donnabhain

Cork County Council/Lettertec

www.corkcoco.ie

www.lettertecbooks.com

ISBN: 978-0-9929970-1-1

€13.99/2016

Spike Island is situated in Cork Harbour, next to Haulbowline Island (the present home of the Irish Naval Service) and covers an area of 104 acres. This book is the story of almost four decades of the Victorian prison on Spike Island, when it was home to Ireland's most serious and notorious criminals. We learn of the establishment and evolution of the prison, as well as the lives of prisoners' and staff. It was recognised as a remote and dangerous posting for its staff and it was hell for those convicted to serve time behind its walls.



The idea of converting Spike Island's fort into a convict depot was first suggested in February 1847 by the Surveyor General of Convict Prisons in Britain. By July 1847 all parties in Britain were in agreement and the 82nd Regiment, then deployed on the island, were ordered back to Britain to make room for prisoners. Within a few years the island hosted the largest convict prison in either Ireland or Britain, housing over 2,300 prisoners by the early 1850s. The location was secure and convenient as a point of embarkation for the transportation of convicts to the Australian penal colonies in Van Diemen's Land and Swan River, as well as to Gibraltar and Bermuda.

The first convicts arrived by sea to the island in October 1847 on the small paddle steamer called Minerva. Beneath the steamer's decks 109 men were locked away, including some young offenders. One of these was Thomas O'Neill, a 15 years old Dublin youth, committed on suspicion of stealing three brides and some other items. He was sentenced to seven years transportation. In the 36 years of the prisons operation, just over 1200 convicts were to die on the island. The names of about 80% of these are known. Young O'Neill's name does not appear on this list or any release of prisoners. It is assumed he served his time and was released.

The most famous inmate of the prison was John Mitchell a leader of the mid-19th century nationalist Young Ireland movement. He was 32 years old at the time of his captivity on Spike Island. Mitchell only

spent four nights on the island before being transported to Bermuda aboard HMS Scourge. When he was arrested in 1848 he was convicted for "Treason Felony" and sentenced to 14 years transportation. Mitchel, in his famous Jail Journal, gave an account of his time on the island.

The prison was the only convict depot equipped with a hospital in Ireland. Early in its establishment "600 prisoners are either in hospital or convalescent wards, chronic patients aged and infirm."

It is interesting that one of many who would enter the annals of American history as one of its most famous generals was Patrick Ronayne Cleburne from Ovens in Co. Cork, who was part of the island's military garrison from the spring of 1849 to November. He served as a private and then a corporal before purchasing his discharge from the British Army. He immigrated to the US and settled in Arkansas where he fought for the Confederacy, rising to the rank of Major General. He eventually earned the Nom de Guerre 'Stonewall of the West'. He died leading a charge at the Battle of Franklin on 30th November 1864.

The staffing of the prison was difficult for the authorities. The first two choices refused the position of Deputy Governor. Eventually The person appointed, George Downes, was later accused of 'frauds, drunkenness, etc.' by the Head Tum Key (Prison Officer) – the latter was dismissed and his replacement was in time removed after being absent without leave to go drinking in Queenstown (Cobh). It seemed the staff of the prison frequently lived by their own rules.

Although Spike Island's position in Cork Harbour made it ideal for use as a prison, this is not a Cork story, but rather an Irish story, based in Cork, and one with a significant international dimension. Spike Island was the point where individual stories from all over Ireland were woven together. Its ripples were felt well beyond the shores of Ireland, as it formed part of a penal system that sent convicts right around the world. The story told in this book is one that is, in turn, dramatic, shocking, touching and humorous. The life of the prison was vibrant, peopled by the unfortunate of society alongside those who committed serious, sometimes gruesome, crimes.

Too Reptil for Thieves and Pick-pockets provides a comprehensive overview of the lives and times of an infamous penal institution established during one of the worst famines in global history. It became the largest prison in what was then the United Kingdom and a beacon of penal reform, influencing modern correctional systems in countries as far apart as the USA and Germany.

Cal McCarthy and Barra O'Donnabhain are to be congratulated for bringing together such detailed information on the Victorian Convict Prison on Spike Island.

Matt Murphy

Cork - Then & Now

By Tom Cronin

The History Press Ireland

www.historypress.ie

ISBN: 978 1 84588 725 4

€16.99/2012

In this book we get a glimpse of the changing faces and buildings of Cork City and its surrounds. For each of forty five archive images is a contrasting full-colour modern photograph, together with a brief history of the landmark. It begins with the Opera House where we see the original building, including its steel steps to the "Gods" on the outside of the building. Also included is the burnt out shell after the fires on 13th December 1955 and then the modern replacement. The nearby School of Art has changed little, except that the tree growing in the front has increased in height!

It features three banks on the South Mall - now only one functions as such (the AIB, which was originally the Munster and Leinster). The original front entrance of the Hibernian's Bank was remodelled in 1945. The Provincial Bank, completed in 1865, has not changed. There are many external carvings on the upper levels of the façade including the coat of arms of various Irish cities. The Munster and Leinster Bank building was built as the Head Office of the then new bank. In 1908, a competition was held to find a design for the building and the winning design was selected from eleven competitors (all Irish).

The monument on the Grand Parade – which commemorates the rebellions of 1798, 1803, 1848 and 1867 – has changed little. Nearby is the Cork City Club, which dates back to the early 1800s, was once a post office but became a club for gentlemen for many decades until 1952 when it was bought by the Legion of Mary. It was vacated in later years and went on to house the ICC Bank and the Bank of Scotland.

The General Post Office in Oliver Plunkett Street was originally an old theatre called the Theatre Royal. The theatre was built in 1853 on the site of the original

Theatre Royal, which was destroyed by a fire in 1840. Sold in 1875 to the postal service, the GPO opened in 1877. Again there is no change in its façade.

Many of these landmarks and buildings we pass without giving them a second thought. To name but a few: Mangan's clock on St Patrick's Street, the Chetwynd Viaduct, which looks no different from the original photo, except for the train passing over when the West Cork Railway was a reality and the City Hall, the most striking change, having being destroyed in 1922 by British Troops and rebuilt in the 1930s.

This book is a treat. It gives a small glimpse into times gone by and reminds us how the city's landmarks weave a thread through the many generations.

Matt Murphy



Ring of Kerry The Postcard Collection

By Kieran McCarthy

Amberley Publishing

www.amberley-books.com

ISBN: 978-1-4456-48927

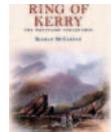
€17.00/2015

In the 19th and early 20th century, postcards of the Irish landscape were sent as souvenirs to family and friends or kept as a reminder of a memorable holiday. Before the advent of television, glossy brochures and pocket cameras, these postcards were a means of promoting areas of beauty around the country. Ring of Kerry – The Postcard Collection brings together a selection of these postcards from one of the most famous and popular road circuits for tourists in the south west of Ireland. Most of the postcards featured are from the author's personal collection.

Divided into four sections, the book features Kenmare and its surround, Killarney and its tourism heart, the Lake District and a spin around the c180km Ring of Kerry. Descriptive text with each postcard gives an excellent insight into the over 160 postcards illustrated in the book. Scattered throughout the book, the author has also put in his own artistic responses to the landscape in the form of poems.

The book brings the reader along the coast, through scenic landscapes and picturesque towns such as Sneem, Caherdaniel, Waterville and Killarney, taking in the beauty of Kerry as tourists would have done over a hundred years ago.

Matt Murphy



...CONTINUES FROM PAGE 2

variations or where they occurred.

So altogether, although we had a broad vision of what could be done (and should be done) in Ireland, in the time I was in oceanography in Galway, we were not adequately funded by the government to carry out much of this work. The result was that 90% of our research was carried out in Galway Bay. This was convenient and it didn't cost a great deal of money. At best we were able to make the occasional extra cruises up and down the west coast."

Then I asked him if UCG had access to a suitable research vessel. His reply was emphatic. "No, our research vessel for several years was a launch called the Queen of Aran which was a 36ft passenger launch that worked primarily between Rossaveal and the islands. We designed and built the bare minimum of adequate sampling equipment for her. We had a small petrol motor that was used to drive a hydraulic pump to operate a winch, necessary for sampling water and plankton. We hired the launch monthly, when we would get out for about 3 or 4 days. We could pack up to four or five people on board, as required, and we would sleep on board. Usually we pulled into harbour at night unless we were doing night sampling which meant we were up all night. We used to sleep on board. The design of this boat had been built with sports fishing in mind and it had tables and seating that could be converted into bunks. She did a first class job for us within the limits of Galway Bay and the odd runs outside the Bay. She was very well equipped in the end by us for our purposes."

Brian then talked of when he retired from Galway and the large collection of preserved zooplankton and oceanographic data, which were gathered on the many cruises undertaken during his time. Together with these were the student theses on the results of the identification and counts of zooplankton undertaken in the laboratory. He wondered if the samples and data are still available at NUI Galway. He claimed they would be important today as a base-line, especially for research in fisheries and climate change. I then asked him to elaborate further on the sampling programmes undertaken in his time as Professor of Oceanography.

"It was imperative that the plankton side and the relationship between the plankton and oceanographic conditions were recorded. These were data we did not have in Ireland, at least not long-term or consecutive observations of data where we could see variations or make comparisons over any period. In effect I was looking at data from a point of their possible relevance to fisheries (not that I was working on fisheries). I wished to build up a background of data in Ireland of planktonic variations in relations to fisheries research that other people could or might be doing. We aimed to have a periodic survey about once a month the first few years in Galway Bay. I think it was about 10 years of sampling there. It was less frequent and much more opportunist between Galway Bay and the Shannon - fairly regularly at internals in the Shannon estuary and occasionally between the Shannon, Kenmare and Bantry. All those data, all the plankton samples, were backed up in the sampling procedure by temperatures, salinity, oxygen and at some stage nitrogen data, were collected regularly. The quantitative plankton samples were taken serially between the surface to near the bottom."

My time with Brian raised many more issues that he felt strongly about. We spoke for so long that I had to ask him if he wanted to rest. He gave an emphatic no! During our stimulating discussion on that day I could not avoid thinking about what data was still available, what data the Marine Institute had - did they have the plankton data from Brian's time at Galway? Secondly, has the Marine Institute been continually collecting plankton data with the help of its two magnificently equipped research vessels - especially zooplankton - to add to the now priceless data of the Brian Bary era? Indeed one must ask, what zooplankton data have they also collected on the major bays around our coast? Brian mentioned if he had annually received one tenth of one percent of the Marine Institute's current budget he could have worked wonders. We must remember that plankton is the start of the food chain - without those data one cannot possibly begin to understand the ecology of the waters around our coast. It would be interesting to know if the country's data based on zooplankton of our coast and bays has progressed much since his retirement. More fundamentally - is the significance, importance and relevance of plankton data appreciated by those in authority? Unfortunately I fear not, a view that Brian would no doubt agree with.

Brian Bary has been a visionary from the time he came to Ireland in 1970 and still is. As a nation we failed to adequately support his efforts at NUI Galway when he ran Ireland's first Oceanography Department on a mere shoestring.

It was so refreshing to again meet my wonderful friend at his home in Kerry. It would be a lifetime experience for young people studying the marine environment today to hear of his vision and observe his enthusiasm. It would be an experience that would remain with them throughout their careers.

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



Dubliner Cheesy Chicken and Spinach Sweet Potatoes

Dubliner Cheesy Chicken and Spinach Sweet Potatoes

Serves 4

Ingredients:

- 3 sweet potatoes, washed
- 2 chicken fillets
- 4 tbsp olive oil
- Juice from 1 lime
- 4 garlic cloves, crushed
- 1 tsp cumin
- 1 tsp chilli flakes
- Salt and black pepper
- 150g frozen spinach, thawed
- 120g Dubliner Vintage Cheese, grated

Method:

1. Preheat the oven to 180°C/180°C/gas mark 4.
2. Prick each sweet potato a few times with a fork. Place them on a baking tray and bake for an hour, or until tender. When ready, cut them in half and allow to cool.
3. When the potatoes are halfway through cooking, place the chicken fillets in a baking dish. Rub them with olive oil and season with salt and pepper. Add them to the oven for 30 minutes or until fully cooked, then use two forks to shred them. Cover with tin foil and set aside.
4. In a small bowl, combine the olive oil, lime juice, garlic, cumin, chilli flakes, salt and pepper. Set aside.
5. Put the spinach in a strainer and use clean hands to squeeze out all the excess water.
6. Turn the oven up to 200°C/180°C/gas mark 6. Use a spoon to scoop out the flesh of the sweet potatoes, leaving a ½cm layer intact so that the skins keep their shape.
7. In a bowl, mix the spinach, chicken, the lime and garlic oil and two-thirds of the Dubliner Cheese. Stuff the sweet potato skins with the chicken mixture. Top them with the remaining Dubliner Cheese and bake for 15 minutes or until the cheese has melted and the skins are hot and crisp. Serve with a green salad.



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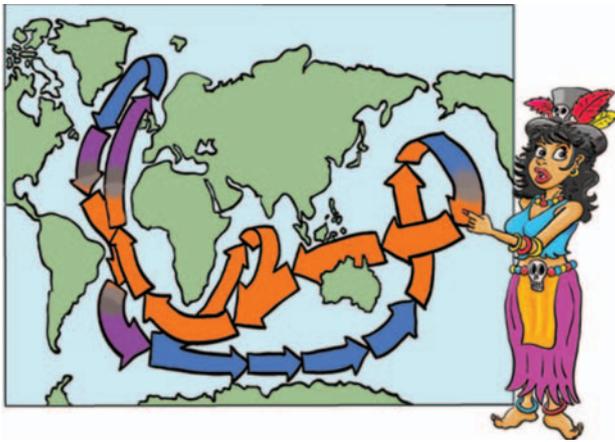
JUNIOR PAGES

Black John the Bogus Pirate

Avast there, Mateys! Today I'm going to hand over to an important member of my crew - Zelda the trainee Voodoo witch to talk about the Third Principle of Ocean Literacy which says that "The Ocean is a major influence on weather and climate" . . . and here's how

Third Principle of Ocean Literacy

By John Joyce



Because the Ocean covers over 70% of planet Earth's surface, its waters absorb most of the radiated heat reaching Earth from the Sun. This heated water is less dense than colder water and rises to the surface, moving north and south from the Equator as ocean currents.

At the North and South Poles seawater becomes very cold. Cold water is denser than warmer water and sinks to the bottom of the Ocean at the Poles, to be replaced by warmer water moving in from the Equator. The cold water then flows back to the Equator as a deep ocean current, where it warms and rises again.

The Ocean also releases heat back into the atmosphere as water vapour, which falls back as rain upon the land and the Ocean. Heat released from the Ocean also drives the circulation of air as winds and even tropical storms.



We can do this by burning less 'fossil fuels' – such as coal, gas, petrol and diesel – by switching off lights, taking public transport, walking or cycling to work – and by using 'renewable' sources of electricity – such as wind and solar power, as well as hydroelectric generators. We can even harness the Ocean itself to create electricity using wave and tidal power, or as a site for offshore wind energy farms.

The overall climate of the world is influenced by the amount of carbon dioxide in the atmosphere. This is because carbon dioxide absorbs heat from the Sun, so the more carbon dioxide there is in the air, the hotter Earth will become, leading to rapid climate change. This is why carbon dioxide is called a 'Greenhouse Gas'. The Ocean is vitally important in protecting us against rapid climate change because of the tiny, tiny plants (called 'phytoplankton') that live there. These tiny plants absorb about half of the carbon dioxide in the atmosphere and convert it to oxygen. This is why it is so vitally important to protect the Ocean against pollution because, if these tiny phytoplankton stop absorbing carbon dioxide, then life on Earth could become unbearable.



Tropical storms can occur when seawater temperatures rise above 27 °C. This causes seawater to evaporate into water vapour which rises into the air, cools (releasing heat) and condenses into enormous cumulonimbus clouds. Inside these clouds, the water droplets collide with each other and eventually fall as rain. The rising water vapour at the centre of the cloud creates an area of low atmospheric pressure which also pulls in air at sea level, creating high wind speeds. This process keeps feeding on itself to create a towering tropical storm around a central calm area (the 'eye' of the storm) and spun by the gravitational forces north and south of the Equator (known as the 'Coriolis Force'). Storms like this lose their power and die out when they reach land and cannot suck up any more water vapour.

Join me – 'Black John the Bogus Pirate'- on Facebook at <https://www.facebook.com/BlackJohntheBogusPirate/>





CIRROCUMULUS: Thin sheets of ice that form into small blobs or ripples. These clouds often signal unsettled weather.



CIRRUS: High ice clouds that look like wispy curls of hair.



CIRROSTRATUS: Thin sheet of ice. Sometimes these clouds make a halo effect around the sun. When you see this effect it means that rain is approaching.



ALTOCUMULUS: Thin sheet of white or grey cloud, broken into blobs, rolls, waves or bands.



ALTOSTRATUS: Layer of thin, grey cloud, through which sunlight is often visible. If the cloud thickens then rain is likely.



NIMBOSTRATUS: Thick grey sheets of cloud. They make rain and snow. "Nimbus" is the Latin word for rain.

How clouds are made: Clouds form when moist air rises high up in the sky, cools and saturates. Moist water vapour condenses into tiny water droplets to form a cloud. Different clouds form depending on how the moist air rises.

There are usually quite a few clouds in the sky above Ireland. Some are small and some are big. Some are even fluffy.

Clouds come in many different colours. They can be white, grey, black or even red. Normally we can tell whether or not it's about to rain depending on the colour of the sky. If we didn't have any clouds there would be no rain, hail, sleet or snow!

The information on this page is from Met Éireann's Primary School Resources page on www.met.ie/education, where parents, teachers and children will find resources on weather-related topics that have been designed for use in primary schools in Ireland.



STRATOCUMULUS: Layer of low cloud broken into rolls or patches. These types of clouds often form a regular pattern.



STRATUS: Low, grey blankets of cloud which sometimes produce light rain and drizzle.



CUMULUS: Fluffy clouds with a flat base. The tops look like cotton wool. These are often seen on sunny days.



CUMULONIMBUS: Towering cumulus clouds often indicate a thunderstorm is on the way!

Images courtesy of Met Éireann

Hook Lighthouse



Images courtesy of Hook Heritage

Guarding the seas along Ireland's southeast coast is Hook Lighthouse, which stands on the end of the Hook Peninsula in Co. Wexford. In daylight hours, seafarers are guided by its striking black and white-striped tower and at night its guiding light can be seen more than 24 km away.

The light, originally a coal fire first tended by monks over 800 years ago, was eventually replaced by various lanterns over the centuries. Powered by different types of fuels throughout the years, the lighthouse was finally converted to electricity in 1972. Lighthouse keepers also replaced the monks and, along with their families, they lived and worked at Hook Lighthouse until 1996 when the lighthouse was automated.

Since the 1800s, the lighthouse has been under the control of the Commissioners of Irish Lights and it is they who are responsible for its provision and maintenance.

Visiting

Hook Lighthouse offers guided tours of the lighthouse tower all year round and is one of the top things to do in Wexford and Waterford. Climb the 115 steps to the spectacular view from the balcony. The visitor centre is located in the former keepers houses where there is a first class gift shop and café. Friendly staff are happy to help with any tourist information you require.

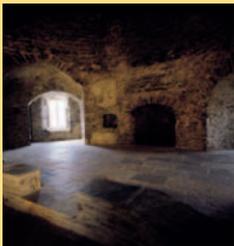
www.hookheritage.ie

Built to Last

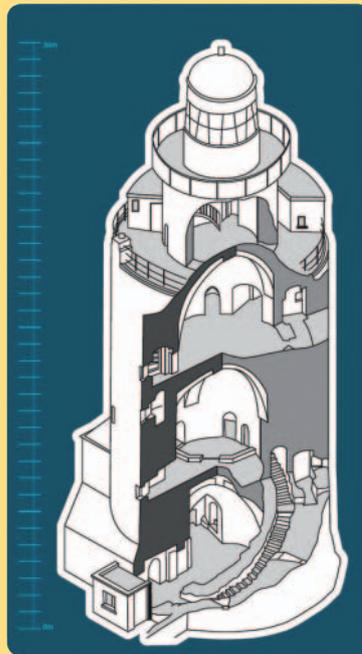
The tower is a unique example of an almost intact medieval lighthouse. It was built in the early 13th century and it is believed to be the oldest operational lighthouse in Ireland and Britain and one of the oldest in the world. It was constructed from local limestone and the original buildings survives almost intact.

At four storeys and 36m high, the tower walls are up to 4 m thick. It has two tiers - the bottom tier is 13m in diameter and is made up of three floors. The top tier, which houses the lantern, is 6m in diameter. The tiers are linked by a mural (within the wall) stairway of 115 steps.

The monks lived in the tower, which served as a monastery as well as a lighthouse. Traces of their chapel which projected to east of the building still survive. The design of the tower was based on the cylindrical castles (known as Keeps) which were popular in France where Marshal, who had the tower constructed in the early 1200s, spent many years.



Inside: The first floor of the tower.



One of the Great Lighthouses of Ireland

Hook Lighthouse is one of the *Great Lighthouses of Ireland*. Twelve of Ireland's most spectacular working lighthouses are being showcased to celebrate and protect the history, tradition and heritage of lighthouses in Ireland and to show people what these lighthouses are still doing today.

www.greatlighthouses.com



The seas along the southeast coast of Ireland can be treacherous.

A Timeline of Hook Lighthouse

- 500-1000AD (Early Christian Period):** Monastery founded by St. Dubhan at Churchtown. The monks kept a warning beacon to warn sailors of the dangers of shipwreck on the rocky headland.
- 1169-70:** The Anglo-Normans land in south Wexford and quickly took over much of the south and east of Ireland. Richard de Clare, Earl of Pembroke (Strongbow) became Lord of Leinster.
- 1189:** Strongbow's daughter Isabella married the powerful knight William Marshal who succeeded Strongbow as Earl of Pembroke and Lord of Leinster. He founded the town of Ross as the port of Leinster. In the early 13th Century, Marshal began to develop Leinster by bringing in many English tenants, founding towns and building castles.
- 1210-1230:** The tower of Hook was built by Marshal as a landmark and light tower to guide shipping to his port of Ross. The light was provided by a coal fire beacon.
- 1240's:** Monks from Churchtown were installed as custodians (light keepers) and presumably continued as custodians for

several centuries, probably until the dissolution of the monasteries by Henry VIII in 1540. By the 17th Century, the light was no longer tended and numerous shipwrecks led to calls for sailors and merchants for the light to be restored.

- 1670's:** Hook tower (along with five others around the coast) was restored by Robert Readinge. He erected the first glass lantern to protect the coal fire beacon from the elements. Further improvements were carried out in the early 1700's.
- 1706:** In the late 1600's, the tower passed into the possession of the Loftus family. In 1706, Henry Loftus leased the tower to the authorities for £11 per annum. The ground floor was used as a coal store but later in the century it was used by the military as a magazine for storing gunpowder.
- 1791:** Following repeated complaints from mariners about the poor condition of the light, the coal fire was eventually replaced in 1791 by a lamp burning whale oil.
- 1810:** In this year the tower was handed over to the Corporation for Preserving & Improving the Port of Dublin and £4,280 was spent on a new apparatus.
- 1860's:** The lantern was given its present shape. Three dwellings

were built for the light keepers & their families. Three red bands were painted on the tower, these were later changed to black and the bands reduced to two.

- 1867:** The body in charge of lighthouses became known as the Commissioners of Irish Lights.
- 1871:** New gas lights were installed in this year, powered by gas manufactured in the gas yard. Paraffin oil subsequently became the source of power.
- 1911:** A clockwork mechanism was installed to change the beacon from a fixed to a flashing light. The mechanism had to be wound up every 25 minutes.
- 1972:** The light switched over to electricity.
- 1996:** The Lighthouse was automated and the light keepers departed after almost 800 years. As well as the light a fog signal is operated at the lighthouse. For centuries a cannon gun was fired off the edge of the cliff during fog. This was replaced by a hooter, which in turn was replaced by rockets. In 1972 a foghorn worked by compressed air was installed.
- 2011:** The foghorn was decommissioned in January.



Hook Lighthouse Quiz

1. Which is nearer to Hook Lighthouse – Ballyhack or Fethard-on-Sea?
2. Is Hook Lighthouse on the southwest or southeast coast of Ireland?
3. Hook Lighthouse had three black stripes. True or false?
4. Did the monks live on the ground floor or the top floor?
5. Hook Lighthouse overlooks the harbour into which the Rivers Barrow, Noir and Suir flow. Name the harbour?
6. Are there still lighthouse keepers at Hook Lighthouse?
7. Who keeps the light working at the lighthouse?
8. Is Hook Lighthouse on the Wild Atlantic Way or part of Ireland's Ancient East?
9. How many metres high is the lighthouse?
10. Which famous abbey is near Hook Lighthouse?
11. Over which sea does Hook Lighthouse stand guard - the North Sea or the Celtic Sea?
12. Name the peninsula on which Hook Lighthouse stands.
13. How many steps would you have to climb to reach the top of the lighthouse tower?
14. What is the diameter, in metres, of the bottom tier of the tower?

Hook Lighthouse

In the wordsearch below, find the words on the right, which are connected to Hook Lighthouse and its surrounds.

L	A	L	B	E	X	E	S	U	O	H	T	H	G	I	L
D	N	A	L	E	R	I	W	E	X	F	O	R	D	P	D
W	A	T	E	R	F	O	R	D	H	O	O	K	V	A	R
S	E	N	R	E	T	N	I	T	Y	E	B	B	A	S	A
K	C	A	H	Y	L	L	A	B	D	Y	A	B	N	S	H
N	L	S	S	P	O	P	E	N	I	N	S	U	L	A	T
O	G	E	Q	T	S	A	E	H	T	U	O	S	C	G	E
M	H	A	R	B	O	U	R	B	A	N	N	O	W	E	F

Ballyhack
Bannow Bay
Fethard on Sea
Hook Lighthouse

Monks
Passage East
Peninsula
Southeast Ireland
Tintern Abbey
Waterford Harbour
Wexford



(Answers on page 30)



GAISCE – *the President's Award*

A Marathon Challenge: *Oliver's Journey to Gaisce Gold*



Images courtesy of Gaisce – The President's Award

The highlight of Oliver Clare's Gaisce journey was his physical recreation challenge, which centred around running.

WHEN Louth's Oliver Clare decided to try something new and take up running, he would never have believed it would lead him on a journey across Ireland to complete over 20 marathons in one year.

Oliver had signed up to take part in Gaisce – The President's Award, a self-development programme that encourages young people to dream big and realise their potential through

personal, physical and community challenges. Over 20,000 young people each year take part in Gaisce – The President's Award.

Oliver, who lives in Dunleer, had always been aware of Gaisce and been interested in taking part, "It was always something I had in the back of my mind, but when I turned 25, I realised it was the final year I could take part. I was thinking...it's now or never."

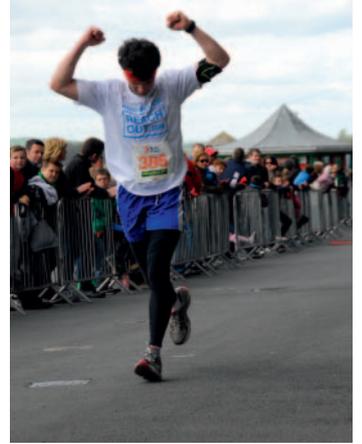
Oliver got in touch with Gaisce – The President's Award and began his challenge with the support of his President's Award Leader (PAL) Catherine. Oliver said "Catherine was a really important help throughout – she really pushed me to finish the challenges I set."

There are five 'challenge areas' Gaisce participants must complete to achieve a Gold Award; community involvement, personal skill, physical recreation, an adventure journey and a residential project. Oliver's activities for Gaisce were eclectic – reflecting the diverse nature of his interests and hobbies.

From joining his local chamber choir in Malahide, to embarking on an epic 80km hike through the Wicklow Mountains, Oliver had the opportunity to try new activities and dedicate more time to existing interests. The highlight of his Gaisce journey was his physical recreation challenge.

Oliver was interested in supporting mental health charity Reachout.com, initially setting a challenge of running every marathon in Ireland within one year. Soon realising that this was logistically impossible, Oliver settled on a more modest 20-marathon challenge (!). Oliver was keen to spread the word about youth mental health issues and Reachout.com.

Having never taken part in a marathon before and with no previous training, the task ahead



Oliver raised over €5,000 for Reachout.com after successfully running 20 marathons.

meet Gaisce's Patron, President Higgins. The highlight of the day was my Granny, who having just discovered the iPad, seized the moment and took a selfie with the President and the ceremony host, Maria Walsh!"

Oliver recently embarked on a new Gaisce journey, becoming a President's Award Leader (PAL) to support young people to take part in Gaisce. Oliver said, "I decided to become a PAL as I wanted to stay involved and help more young people to achieve a Gaisce Award. I also joined the Gaisce Alumni network, an organisation comprised of voluntary members that have achieved Bronze, Silver or Gold Gaisce Awards."

Oliver feels that taking part in Gaisce-The



President Michael D. Higgins presenting Oliver with his Gaisce gold medal.

seemed daunting. Oliver joined Drogheda District AC just four months before his first marathon. "Drogheda District AC definitely helped to whip me into shape and gave me the confidence to go for it" Oliver said. Miraculously managing to avoid injuries for the year, Oliver successfully finished 20 marathons and raised over €5,000.

Oliver's Gaisce challenge provided so many amazing memories, though one marathon in particular sticks out. "I ran an ultra-marathon in Connemara, a 100 mile race. Every runner had to bring a crew with them to support them throughout the race. My crew was my dad, auntie and physiotherapist. They followed me around in a support vehicle throughout the 28 and half hours I was running. Definitely not something I will forget." Oliver burned an incredible 10,000 calories during the race.

Another highpoint of Oliver's Gaisce Gold Award journey, was the Gold Award Ceremony, which took place in Dublin Castle. "The ceremony was so special. It was so great to get to



Oliver, with Maria Walsh and his Granny at the award ceremony.

President's Award has had a big impact on his life, "I've gained experience, self-confidence and skills that I wouldn't otherwise have had, as well as meeting a lot of interesting people along the way. Finishing the Award was a uniquely challenging experience and it definitely wasn't all smooth sailing, but I would say it was 100% worth the effort, and I'm very happy I did it."

Fancy rising to the Gaisce challenge? Or do you work with an organisation that could support young people to take part in Gaisce – The President's Award? Visit www.gaisce.ie to see how you can get involved.

Answers to The Hook Lighthouse Quiz (page 29):

1. Fethard-on-Sea; 2. The southeast coast; 3. False. It has two black stripes; 4. The monks lived on the ground floor; 5. Waterford Harbour; 6. No; 7. The Commissioners of Irish Lights; 8. Ireland's Ancient East; 9. 36m; 10. Tintern Abbey; 11. The Celtic Sea; 12. Hook Peninsula; 13. 115 steps; 14. 13m.

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Ocean Mining

By Michael Ludwig

APPROXIMATELY 70 percent of the Earth's surface is covered with water. Because we use so many of earth's natural upland mineral resources, it is only logical to seek some of them from beneath those vast waters. Those efforts are usually called "Seafloor Mining." What is Seafloor Mining? The ocean is home to a complex combination of physical, chemical, biological, and geological processes that result in the production or concentration of a commercially useful, wide range of minerals. This is particularly true in areas around hydrothermal vents, where hot, chemical-rich fluids pour up from beneath the seafloor producing potentially valuable deposits currently in short supply. Few efforts to mine such seabed deposits have succeeded, primarily because they have not overcome the technical challenges involved in extracting the necessary volume of minerals needed to obtain a profit from locations tens to thousands of meters beneath the surface. Looking at the successful mining that has already occurred two facts are apparent; 1) mining the nearshore is easier than in deeper waters and 2) the deeper the deposit, the more costly it is to recover. Our experience to date is that it takes a lot of money to successfully mine the seafloor and there have been few efforts that have proven successful using the currently available technology. One success has been diamonds. That success was built on a series of efforts that began in the late 1950's.

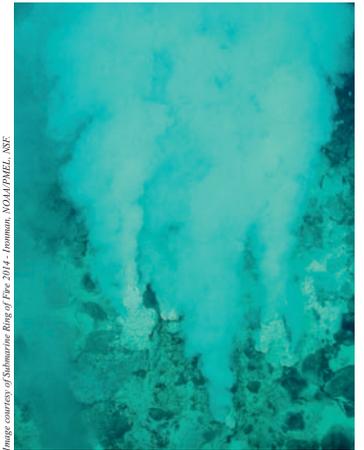
The Marine Diamond Corporation working in relatively shallow waters of about 20 to 100 meters, discovered how diamonds deposited in river outwash shoals could be harvested mechanically. They recovered nearly 400 thousand carats of diamonds off the coast of Namibia in the early 1960s. Today, the Diamond Company, de Beers, obtains much of their total diamond production from the southern Africa continental shelf from similar shoals. They do this in waters typically less than 300 meters deep. Conversely, mining efforts in deeper waters for less valuable minerals have failed to return a profit and so scared off potential investors. Forty years ago ocean miners began harvesting potato-sized manganese nodules clustered in some areas of the ocean floor. After spending nearly a half billion dollars (US) they couldn't make their efforts profitable. Since those failures the mining industry has been developing all manner of specialized dredgers, pumps, seabed crawlers, drills, platforms, cutters and corers, many of them robotic and all designed to work in the brutal conditions of the deep ocean.

Now, that landbased mineral deposits are being exhausted causing significant increases in the value of minerals such as copper, and in combination with the rising demand of national economies, such ventures are becoming more economically feasible if not practical. Recent discoveries of seafloor mineral deposits and those advances in recovery technology are reawakening interest in seafloor mining. The list of possible recoveries now includes iron

sands, manganese concretions rich in cobalt, along with more diamonds, calcium phosphate (phosphorite) nodules and those still desirable deepwater, manganese nodules. Added to the list are the extremely important and increasing scarce rare earth elements and the possibility of obtaining them from seafloor sources.

Most attractive of all for the mining industry are the potential riches at deep-sea hydrothermal vents. Known for their unique geothermal communities of exotic life, the vents also can be sources of high-grade minerals. When the heated, chemical-rich discharges from the seabed vents meet the cold water and high pressures the dissolved minerals solidify and settle to the seabed or can be incorporated into the chimney shaped discharge structures seen in news reports and scientific papers. Researchers believe that many of the sulfide deposits on land were formed by such subsea discharges and later raised above the sea surface during tectonic activity over millions of years. Cyprus is one such example. It holds at least 30 major deposits of sulfide. But because obtaining access to landbased deposits is so complicated and usually costly, the mining industry's interest in seabed sulfides is focusing mostly on vent fields in the western South Pacific. With those seabed deposits within Island nation's territorial sea and money is short supply some of those Nations are interested in exploring offshore development rights at greatly reduced prices. And, large tracts of hundreds of thousands of square miles of their seabed have been leased for exploration. Unfortunately, it is the cost of technology that continues to restrain successes.

Whichever way progress moves there are potential risks. We do not fully understand the impacts of deep sea mining because we have little experience and even less that has been monitored. Environmental concerns abound: Deep sea habitats are usually thought to be sensitive to change and frequently unique to a specific site. The idea of altering them by min-



Champagne vent, NW Eifuku seamount in the Marianas region.

ing and the use of water from the deep to transport sediment to the surface in hydraulic lifts means rapid pressure changes that we know are normally lethal to deepwater species. Then there are the resuspended sediment concerns that may further cause habitat and species impacts and add the physical loss of seabed habitat at the removal site and there is the potential for wide spread adverse impacts. Set these concerns in the framework of the limited number of species in any area of the deep seabed causes concerns regarding species diversity and habitat functions and ecological values losses. Clearly a balanced and monitored advancement of deepsea mining is needed.

Michael Ludwig, COWI North America, 35 Corporate Drive, Trumbull, Connecticut, 06611 USA

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