

# SHERKIN COMMENT

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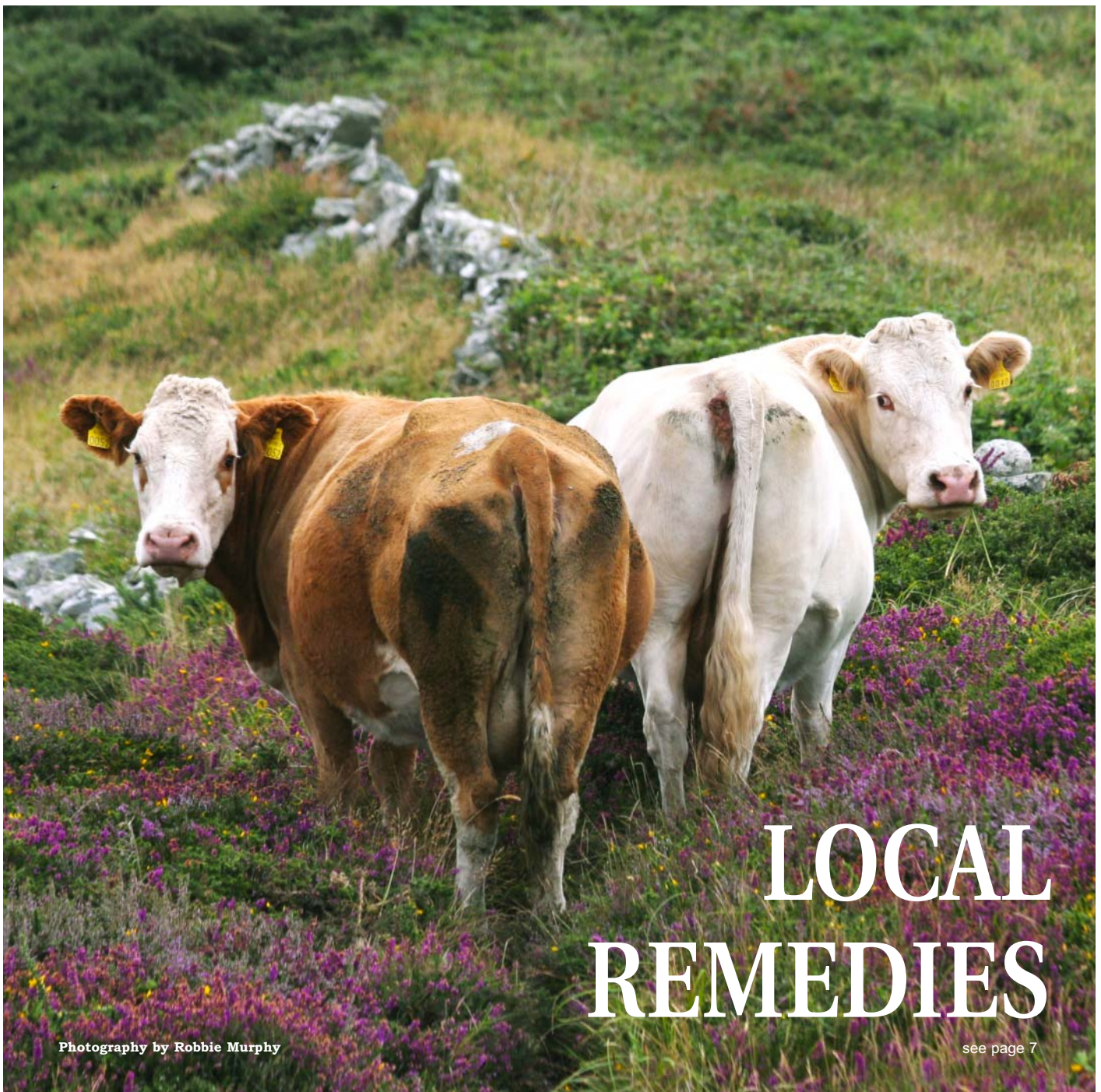
2019

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Brendan Keane explains why we need to use less plastic and in a more sustainable way. 6

**Ethnoveterinary Medicine – Can you help?**  
William Milliken is looking for information on plants that were used to treat livestock. 7

**Lessons to Learn from Pristine Palau**  
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**Managed realignment in the UK**  
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Photography by Robbie Murphy

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## Editorial

# "We all have a part to play"

By Matt Murphy

IT has taken a 16 year old from Sweden to do something few have been able to do in the last ten years – wake us up to the biggest crisis facing the world, climate change. She put it very simply in her speech at the National Assembly in Parish in July 2019, "The science is clear and all we children are doing is communicating and acting on that united science." She said political leaders in some countries are starting to talk and to declare climate emergencies and announce dates for so-called climate neutrality. She pointed out that these vague distant dates give the impression that things are being done but that the real danger is when companies and politicians make it look like real action is happening when in fact almost nothing is being done, apart from clever accounting and creative PR.

It seems unreal that a person of her age, indeed any age, could be invited to address such high-level forums on climate change. In many ways she has been entering the lion's den, as many of these people are just paying lip service within their countries, calling for immediate changes and practical action to combat climate change.

Her speeches have drawn fire from some. She has been accused of having mental health problems, which she addressed: "I was 11 when I was ill. I fell into depression. I stopped talking and I stopped eating. In 2 months I lost about 10 kilos of weight. Later I was diagnosed with Asperger's Syndrome OCD and selective mutism. That basically means I only speak when I think it is necessary. Now is one of those moments." Oh, what honesty! I would hope that her family and team around her will be there to help her pull back from the world stage if she needs to.

There is no doubt Greta's crusade is disturbing some people. No other individual speaking out on climate change has received such abuse or criticism as this young teenager. On the positive side it shows some of her critics are indeed worried. Especially as they see the success of her call to school children across the globe to protest outside their parliaments to demand climate action. They did this in their millions and the exposure it has given them to the negative impacts we are having on our planet, is immeasurable. However, these young people must follow up on these protests by making changes in their own homes, such as energy saving, reducing food waste, recycling, not using bottled water. The list is endless. To each it might be little but add the little things

together and they become a snow ball travelling downhill.

Recently, when speaking at the 2019 Michael Sweetman Memorial Lecture in Dublin, former President of Ireland, Mary Robinson, referred to renowned climate change activist Greta Thunberg's address to the recent Climate Action Summit, which she attended. "Listening to the anger in her voice, I was moved to tears. Because Greta is right to be angry. The climate crisis is worse than we think, and it is getting worse more quickly than scientists had thought would happen."

She went on to encourage her audience to "get angry with those who have more power and therefore more responsibility". She continued to say that "we need a climate justice movement – speaking up for people who have the least capacity to protect themselves, their families, their homes and their incomes from the impacts of climate change, and indeed climate action policies that are not grounded in human rights...We must prioritise the furthest behind first."

While some movements are helping to create a greater awareness of the climate crisis facing the world, care must also be taken. At a recent meeting in Armenia, Dr Robinson spoke out in support of the Extinction Rebellion, a group whose strategy is one of non-violent, disruptive civil disobedience to compel governments to act on climate change. Dr. Robinson went on to say "I hope they will be very smart about their tactics because if they alienate the public that will put us a step backwards".

On a personal level I hope that politicians and groups that make proposals on the protection of the environment would take a little time to bring various stakeholders with them. Many people want to change their actions when it comes to the environment but unfortunately in so many cases people are stretched to near breaking point, whether it is trying to find their rent or mortgage payments or feed their families.

Returning to Greta Thunberg, she has shown wisdom and maturity beyond her years. She mentions that the Paris agreement clearly states everywhere about the aspect of equity. That means that rich countries like hers (Sweden) need to get down to zero emissions within 6-12 years with today's emission speed, so that people in poorer countries can heighten their standard of living by building some of the infrastructure that we have already built, such as hospitals, electricity and clean drinking water.

"Some people say I should be in school instead and I should study to be a climate

scientist so that I can solve the "climate crisis". But the climate crisis has already been solved. We already have all the facts and solutions." She questions why she should study for the future that soon may be no more when no one is doing anything to save that future. "What is the point of learning facts when the most important facts clearly mean nothing to our society?"

Her address to the World Economic Forum in January, remember this teenager is addressing some of the richest companies, decision makers and individuals in the world. They control so many lives, many to fulfill their own greed.

"Here in Davos, just like everywhere else, everyone is talking about money. It seems that money and growth are our only main concerns. And since the climate crisis is a crisis that has never once been treated as a crisis, people are simply not aware of the full consequences of our everyday life."

Greta mentions "people keeping doing what they do because the vast majority don't have a clue about the actual consequences of our everyday life. And they don't know that rapid change is required. We all think we know and we all think everybody knows. But we don't because how could we? If there really was a crisis and if this crisis was caused by our emission, you would at least see some signs. Not just flooded cities, tens of thousands of dead people and whole nations levelled to piles of torn down buildings. You would see some restrictions. But no. And no one talks about it. There are no emergency meetings, no headlines, no breaking news. No one is acting as if it were in a crisis."

She has not let the climate scientists or green politicians off the hook. She said even they keep on flying around the world.

She moved forward to the year 2078 and when she will have celebrated her 75th birthday. If she has children and grandchildren maybe they will spend that day with her. Maybe they will ask why the people back in 2018 didn't do anything whilst this was still the time to act. Challenging people she says "you love your children above all else and yet you are stealing their future in front of their very eyes. Until you start focusing on what needs to be done rather than is politically possible there is no hope."

"Adults keep saying we owe it to the young people to give them hope. But I don't want your hope, I don't want you to be hopeful. I want you to panic, I want you to feel the fear I feel every day. And then I want you to act. I want you to act as if you would in a crisis. I want you to act as if the house was on fire, because it is."

Greta Thunberg has been very brave to speak up but her wise words should be a catalyst and she should not be exploited or left to fight alone. We all have a part to play.

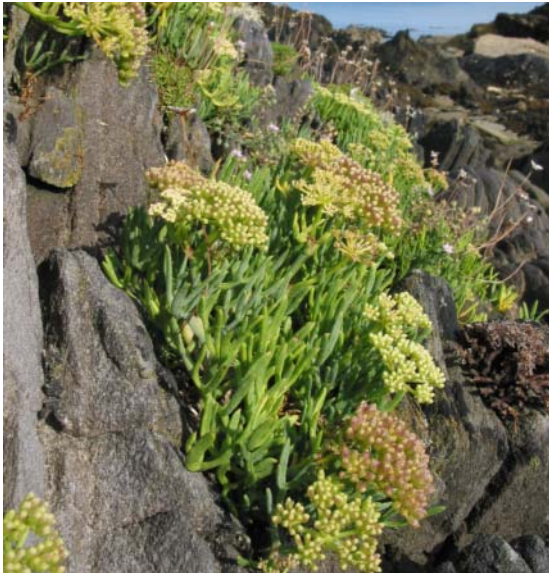
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SHERKIN COMMENT is an environmental publication of Sherkin Island Marine Station, aiming to promote the awareness of our natural resources, their use and protection. *Sherkin Comment* can be downloaded for FREE at <http://www.sherkinmarine.ie/sherkincomment.htm>

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# ENJOYING A WILD HARVEST



Rock Samphire (*Crithmum maritimum*), a coastal plant eaten with fish.

By John Akeroyd

FORAGING for wild foods has become fashionable. I don't style myself a 'forager', although I've long eaten edible weeds alongside the conventional fruits and vegetables in my garden and allotment, and sought out wild foods from the countryside, especially by the sea where so many crop relatives and other delicious edible plants grow. I rarely leave the house without a polybag or two for greens, berries, nuts, edible fungi or other treasures.

I discovered wild foods in student days, inspired by Richard Mabey's *Food for Free*, foraging's first modern field guide, published in 1973. Since then the ecological, self-sufficiency and foraging communities have grown and matured, and foraging is now almost mainstream – with books and articles, TV appearances by the likes of food guru Hugh Fearnley-Whittingstall and survivalist Ray Mears, and a host of celebrity chefs, hoteliers and specialist suppliers such as Kent-based Forager Ltd. Miles Irvine, who in 2003 founded Forager and is the author of *The Forager Handbook* (2009), writes and talks eloquently about how gathering, cooking and eating a wide range of wild foods

can not only yield a variety of flavours but also benefit health, well-being and sheer pleasure. Wild foods have the flavours, vitamins, roughage and chemical complexity bred out of commercial fruits and vegetables in exchange for a longer shelf life and visual appeal. Gathering involves mostly local use and non-intensive harvest, analogous to predation by wild animals rather than wholesale pillage, and they are for the most part widespread weeds. As conservationists warn of the limited number of crops in commerce, and of threats to crop survival from climate change and overpopulation, using a wider range of foods takes on a new significance, while supporting old and new links between people and places.

We should also remember that, while foraging may seem new, in southern Europe and the Mediterranean region it is a traditional and significant part of the rural economy. In Greece and other countries, as I described some years ago in *Sherkin Comment* 25, wild greens remain important in the late winter and spring diet: salads and cooked greens or *horta*, along with wild asparagus shoots, grape-hyacinth bulbs, and wild fennel, carrot tops and leeks for flavouring. Later in the season local people gather weedy amaranths and

purslane from vegetable patches, and marjoram or oregano, sage and other kitchen herbs from the hillsides. But perhaps we're all foragers. Even in this era of supermarkets many of us still gather hedgerow and woodland fruits such as blackberries, elderberries, sloes and wild strawberries. In moorland and mountain districts the bilberry, whortleberry or *fraochán*, a wild crop impossible to cultivate, was once important enough to lend its name to Frochin Sunday, the last Sunday in July. Foraged greens add a whole new dimension to food, especially during the difficult 'hunger gap' at winter's end when little is available on the vegetable plot. In spring, nettle tops for soup are increasingly gathered, also ramsoms and three-cornered garlic, along with leaf rosettes of vigorous weeds such as wild corn-salad or lamb's-lettuce, hairy bitter-cress, and dandelion, the last best blanched under a pot. All are packed with nutrients, even if sometimes strongly flavoured, aromatic, bitter or astringent – but one gets used to this.

Wild greens are out there in our gardens, on walks or days by the sea: chickweed, fat hen, assorted wild garlics, hop shoots, plantains (on bit on the tough side), salad burnet (cucumber-flavoured), sea aster (well washed, one of best of all greens), samphire, sea beet (but do avoid big clumps that attract dogs), oxe-eye daisy, mallow, sea purslane, sorrel, wood sorrel, and yarrow – a precious and often neglected plant resource. Some plant families provide a number of wild foods. Daisy-



Blackberry picking is a popular pastime for many in late summer.

and groundsel-like plants can be unpalatable or poisonous, but many dandelions and their relatives (Compositae or Asteraceae family) make excellent eating. Common sow-thistle, its rosettes of jagged-cut leaves steamed or lightly stewed and then dressed with oil and lemon juice as in Greece, is particularly good. Crucifers (Brassicaceae) are another rich source, notably *Brassica*, the cabbages, cresses, mustards and rockets of tilled ground, hedge-banks, riversides and wasteland. Some umbels (Apiaceae) are poisonous but Alexanders, like a robust aromatic celery, is well worth a try. Locally common near the sea, in early spring its glossy leaves appear in hedges and about old ruins as a garden relic. The pungent black seeds make a condiment akin to pepper, once a rare costly spice, perhaps why Alexanders was introduced from the Mediterranean during the Crusades. Native hogweed too is surprisingly good, especially gently cooked

young shoots or flower buds in their inflated sheath. Popular in the Middle East, the seeds can add a citrus spice to puddings. Fennel is a well-established alien on coasts and the leaves have a stronger flavour than those grown in gardens. The flowers and seeds are also edible but often ignored. My own most recent culinary discovery was another umbel, fleshy aromatic Rock Samphire (*Crithmum maritimum*) of coastal cliffs and rocks, blanched, mixed with capers and added to fish. The potential list of edibles, cooked or as salads, is endless and these days there is plenty of information online. Good hunting!

*Dr John Akeroyd is a botanist, conservationist and writer with a special interest in weeds and the interaction of plants and people. He has been a regular visitor to Sherkin Island since 1986.*



## 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/160°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.




www.dublinercheese.ie




For more details on the Dubliner or Carbery Cheese range, contact Carbery today; Phone: (023) 8822200 | Email: [dublinercheese@carbery.com](mailto:dublinercheese@carbery.com)

**WARNING!** When foraging, make sure you are completely confident about the identity of a plant before picking or eating it. If in doubt, leave it. Only pick plants that are growing abundantly.

# The Galloping Disappearance of Wild Species

By Alex Kirby

POSSIBLY the most devastating physical threat to human wellbeing – survival, even – is climate change. But there’s another candidate, which receives much less attention: the galloping disappearance of wild species.

We know what we need to do to slow the human contribution to climate change so that it leaves us a planet we can still call home, even though it’s far from certain that we’ll act fast enough. In that strictly qualified sense, climate is the easy part of surviving the 21st century.

Much harder is working out how to cope with the loss of species and their habitats. It’s harder for one simple reason: extinction is forever. Thankfully, the Earth is not (or at least not yet) a planetary Jurassic Park. But once we’ve lost

an animal or a forest we are very unlikely to get them back on any realistic human timescale. And we’re now losing them faster than ever.

In the dying days of March 2019 came news that one-third of British wild bees and hoverflies are in decline. Some species will be lost from the UK completely, on current trends..

The 353 affected species, which pollinate food crops and other plants, have been lost from a quarter of the places where they were found in 1980, and the researchers, from the Centre for Ecology and Hydrology in Oxfordshire, say their loss could cause havoc, including devastating our ability to grow food crops, 75% of which rely on insects to pollinate them.

Earlier in March there’d been a more wide-ranging announcement, looking at creatures beyond insects. It said one British wild species in ten faced extinction.



“Once we have lost species, we are unlikely to get them back on any realistic human timescale.”

That report was the work of the official advisers to the UK government and devolved administrations, the Joint Nature Conservation Committee (the JNCC), and it said the UK will miss almost all its 2020 nature targets. One NGO said the report showed the government had left nature in “deep crisis”.

The targets were set in 2010 by the global Convention on Biological Diversity (CBD) and the report from the JNCC found insufficient progress was being made on 14 of the 19 targets.

The CBD targets also require the UK government to make the public aware of the value of biodiversity, but the JNCC found “more than half of the UK public report no awareness of the threats to biodiversity ... and there has been no significant increase since 2009.”

The plight of British wildlife and wild places is neither uniquely bad nor even distinctly worse than most comparable countries. It would be hard for it to be: there’s not that much left in the UK that can be called wild, thanks to centuries of depredation. In 2016 the State of Nature report from the Royal Society for the Protection of Birds described the UK as “among the most nature-depleted countries in the world”.

Wilderness has been built on, or flooded, or tamed with conifer plantations that stretch beyond the horizon, looking like “bathmats on hillsides”, as an experienced ecologist once described them. Species formerly abundant are now vanishingly rare if they survive at all, and have to battle to be granted the fragile privilege of attempts at re-introduction.

Many of the creatures which maintain a tenuous hold in the UK do so in the teeth of hunting for “sport”, or destruction by Big Agriculture, or simply to make more room for us. And why not? It is after all the Age of the Anthropocene (one recently introduced way of asserting our supremacy is to shroud trees and buildings in nets to trap the small birds which otherwise might nest there and delay the building of homes for us.)

It’s not all doom and gloom, though – or not quite, yet. Predictably, technology is providing some answers. One recent development is a new mapping tool, called #WildEye, built by the Oxpickers Center for Investigative Environmental Journalism, an African non-profit NGO, with funding from the Earth Journalism Network’s project on investigating wildlife trafficking in Europe.

#WildEye charts seizures, arrests, prosecu-

tions and convictions across the continent. It’s established already that there are many more seizures reported than arrests and convictions; and there are many more of those, or at least more data on enforcement, in western Europe than in the east.

With a focus that’s not confined to one continent but which aims to change things globally is IPBES, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Set up in 2012, IPBES aims (deep breath) “to strengthen the science-policy interface for biodiversity and ecosystem services for the conservation and sustainable use of biodiversity, long-term human well-being and sustainable development.”

So it’s another player on the international conference-cum-junket circuit then, a well-meaning talking shop unlikely ever to deliver anything significant? Well ... perhaps not. Its birth was attended by suggestions that it might do for biodiversity and the natural world what the Intergovernmental Panel on Climate Change, the IPCC, has been trying to do in its sphere for 30 years. The IPCC, through no fault of its own, is yet to see its efforts crowned with success – and time is terrifyingly short, for both nature and the climate.

But don’t despair of IPBES. For a start, it’s chaired by Sir Robert Watson, the British scientist and former highly effective chair of the IPCC. So IPBES could yet surprise and hearten all who want to stave off the gathering threat of extinction.

Given the JNCC’s warning (above) that more than half of Britons don’t realise that nature is threatened anyway, perhaps we should start with ourselves. Up to a point, we should. But there are limits to what individuals can achieve, and we shall need more than cajoling. James Lovelock, who developed the Gaia Hypothesis of the planet as a self-regulating organism, was once asked whether humans weren’t meant to be stewards of the Earth. He replied: “Humans are as qualified to be stewards as goats are to be gardeners.”

Perhaps the vanishing insects point the way ahead. The late US entomologist Thomas Eisner said: “Bugs are not going to inherit the Earth. They own it now. So we might as well make peace with the landlord.” That sounds like a quote whose time has come.

Alex Kirby is a joint editor of the Climate News Network. <https://climatenewsnetwork.net/>

## POCKET-SIZED NATURE GUIDES FOR BEGINNERS

### A Beginner’s Guide to Ireland’s Wild Flowers

showing colour photographs of each flower is available for €8.50 (including p&p within Ireland)

and

### A Beginner’s Guide to Ireland’s Seashore

showing colour photographs of each animal or seaweed, is available for €8.00 (including p&p within Ireland)

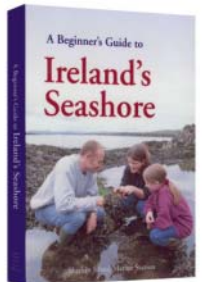
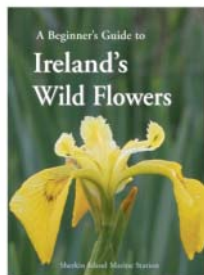
Both books have 204 pages.

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By Declan T.G. Quigley

# Citizen Scientists

*The contribution of recreational anglers to Irish fisheries research*

ALTHOUGH the term 'Citizen Scientist' first appeared in print during 1979, the concept was only recently defined in the *Oxford English Dictionary* during June 2014 as: 'scientific work undertaken by members of the general public, often in collaboration with or under the direction of professional scientists and scientific institutions.' However, 'Citizen Scientists' have clearly been around for a very long time, albeit under various other guises, but their valuable contribution to professional scientific research has rarely been acknowledged. Indeed, when it comes to fisheries research, recreational anglers, commercial fishers and even people with no specific interest in fish, have been assisting fisheries scientists for decades, either knowingly or unwittingly.

Ireland's freshwater and marine resources are spatially immense. They include at least 4,000 lakes (>200,000 ha), >26,000 km of rivers, a maritime coastline of 7,524 km, and an EEZ sea area of 880,000 km<sup>2</sup>, equivalent to more than 10 times the land mass of Ireland. Although only 24 species of freshwater fish are currently known to occur in Ireland, at least 567 marine fish species have been recorded to date. However, apart from a few species which are important both recreationally and/or commercially, relatively little is known about the basic biology of the vast majority of Ireland's fish fauna. Considering that there are relatively few full-time professional scientists engaged in fisheries research in Ireland, the potential contribution of anglers as 'Citizen Scientists' becomes clear. *Citizen Science* offers a potential cost-effective way for researchers to obtain large data sets over large spatial scales.



Above left: Shortfin Mako Shark (*Isurus oxyrinchus*), c.53.3 kg, captured by Henry Kelly (centre) off the Old Head of Kinsale, Co. Cork, 15.07.2017.



Above right: Sand Smelt (*Atherina presbyter*), 22g, captured on rod & line by Cathal McNaughton at Cushendall, Co Antrim. Top right: Dolphin-Fish (*Coryphaena hippurus*) stranded alive on Garretstown Strand, Courtmacsherry Bay, Co Cork, 29.09.2014.

## Recreational Anglers as 'Citizen Scientists'

During 2004, it was estimated that 11.5% (c.743 million) of the world's total population (6.46 billion) participated in recreational angling and that they caught 47 billion fish. During 2012, it was estimated that 406,000 individuals took part in recreational angling in the Republic of Ireland (ROI), and that 252,000 (62%) of these were Irish adults. Based on ROI census data, the latter figure suggests that at least 7% of the Irish population regularly engage in recreational angling. Although recreational angler's catches clearly represent an enormous reservoir of potential 'Citizen Science' data, relatively little of it is recorded, and even less utilized. For example, only 1.3% of the 3.9 million biodiversity records on the *National Biodiversity Data Centre's* website relate to fish (<http://www.biodiversityireland.ie/>).

## The Irish Specimen Fish Committee (ISFC) - An Angler's 'Citizen Science' Database

Since its establishment in 1955, the Irish Specimen Fish Committee (ISFC) has ratified a total of 26,932 exceptionally large trophy-size fish records submitted by recreational anglers over the last 63 years; an annual average of 427 specimens; c.74% captured by Irish anglers. ISFC's extensive database represents a unique and valuable national resource of 'Citizen Science' angling information. Apart from details on weight (and more recently, length), the ISFC data provides specifics on where, when, how and who caught each individual specimen. The data can be used, *inter alia*, to monitor long-term spatial and temporal trends for a wide range of both marine and freshwater fish species, and provides a reliable indication on both the upper range and maximum size that individual species can naturally attain. During the 1960s and 1970s, some former ISFC Board Members, including Arthur Went, Michael Kennedy, and Eileen Twomey, published

detailed reviews on specific species which were included as appendices in the *ISFC Annual Reports*. Since the early 1980s, the current author has published many reviews on individual ISFC species.

The biological material (scales and tissue samples), including the morphological, meristic and metric data that recreational anglers provide in support of their ISFC claims, has also contributed to detailed scientific studies on the biology of individual species, including some vulnerable species such as Shad. Anglers can also contribute important real-time information on the occurrence of non-native, and potentially invasive species, which facilitates a more rapid and effective eradication response.

IFI's *Marine Sport Fish Tagging Programme*, which is co-ordinated by ISFC, but largely undertaken by individual anglers and charter vessel skippers, continues to provide important information about the migratory habits and growth rates of a wide range of marine fish species. Since 1970, at least 40,000 fish have been tagged. The tagging and recapture data has been used in several detailed scientific studies on the spatial and temporal movements of various species, particularly sharks and rays.

Over the years, anglers have also submitted some rarely recorded species. During the 1960s and 1970s, lists of these unusual records were published as appendices in the *ISFC Annual Reports*. Although generally not included in the ISFC's list of eligible species, these interesting records nevertheless provide valuable information about the distribution and biodiversity of Ireland's fish fauna. Recording the occurrence of unusual species is important as they may be indicative of long-term changing climatic and/or oceanographical conditions. For example, some species which were previously regarded as rare are now known to be not uncommon, and some have since been added to

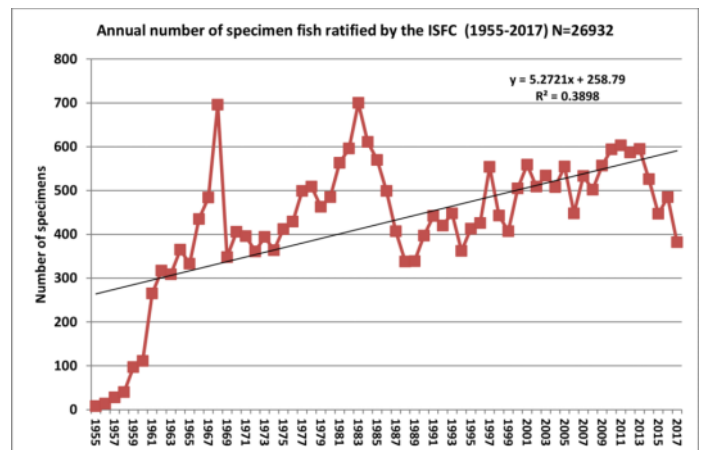
the ISFC's list of eligible species (e.g. Trigger Fish, Black Sea Bream, Gilthead Sea Bream, Albacore, and Bluemouth).

## Every Fish Counts

All categories of anglers, whether specialists, specimen hunters, match anglers or leisure anglers, are in a unique position to contribute to fisheries research and development as 'Citizen Scientists'. The ISFC data and IFI's tagging data only represents a very small fraction of the total number of fish that are captured by anglers in Irish waters each year; the vast majority of fish are not officially recorded. However, data on every rod-caught fish, no matter what size, is equally important, especially in contributing to the current information gaps on the distribution of many species. Anglers are encouraged to submit these records to the National Biodiversity Data Centre.

Declan Quigley is a biologist, currently employed as Senior Port Office with the Sea Fisheries Protection Authority in Howth, Co Dublin. He is a founding Director of Dingle Oceanworld, Co Kerry, a Director of the Irish Naturalists' Journal, and a Board Member of the National Biodiversity Data Centre.

Declan has published over 350 scientific papers on the fauna and flora of Ireland, including numerous articles on angling, many of them based on ISFC data ([https://www.researchgate.net/profile/Declan\\_Quigley](https://www.researchgate.net/profile/Declan_Quigley)). Over the years, Declan even managed to catch a few specimens, and received an ISFC 10-pin Badge, albeit many years ago!



# Plastic Packaging

## A resource gone rogue

By Brendan Keane

IN 1907 Leo Bakeland produced the first commercially viable plastic – Bakelite. 110 years later, in 2017, the world production of all plastics exceeded 345 million tonnes, with Europe alone producing 64 million tonnes. Almost 50% of plastic production is designated for single use (www.plasticoceans.org) and approximately 40% of all plastic is utilised for packaging. For its first 100 years, plastic's life cycle has been linear i.e. manufacture – use – dispose. But in the last ten years the circular economy and sustainable use has been the order of all new environmental guidance and regulation. We, or at least most of us, understand that we can no longer treat non-renewable resources in such a cavalier fashion. We are now starting to truly focus on collecting resources after their primary use and re-engineering them back into useful products in a circular production chain. With over 7 billion people, and growing, we can no longer continue to use resources at current rates. We must use less and in a sustainable fashion, and this to simply ensure our children have a future – we only have one Earth.

**Bottled Water** – the process of creating a plastic bottle for water requires 6 times more water than what is contained in the bottle! This means that it requires 3 litres of water just to make the plastic bottle that holds 0.5 litre for you to drink. And then you throw it away?

Apart from wasting a very important oil and energy resource, the mindless dumping of plastic is creating an ever more burdensome impact on our environment. If we keep expanding the plastic market at current rates and only recycling the same percentage as present, it is predicted that by 2030 there will be 1 tonne of plastic in the oceans for every 3 tonnes of fish and by 2050 there will be more plastic in the oceans than fish by weight. Current estimates are that there are approximately 150 million tonnes of plastic waste in our oceans (see Eunomia Info Graphic). Every year an additional 8-9 million tonnes of plastic 'leaks' into our oceans from land-based sources i.e. 1 full truck load per minute, increasing to 2 truckloads per minute in 2030 and 4 per minute by 2050 (Ref. Ellen McArthur Foundation – New Plastics Economy Report 2016). By physically breaking down into smaller and smaller parti-

cles, that do not chemically degrade, we are creating microplastics in all food chains. In February 2019, the UK has reported that they have now found microplastics in its most pristine freshwater reserves. And if they have, you can assume we will also find it when we look.

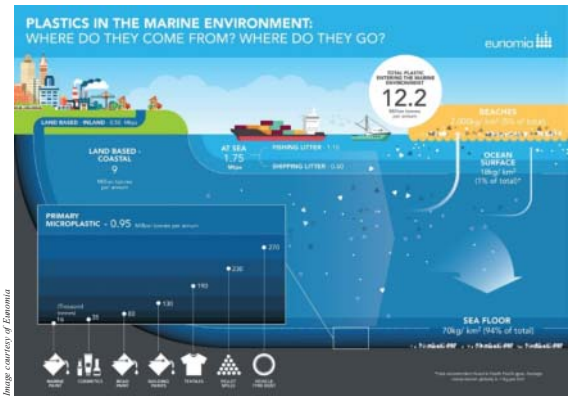
**Ireland's current** 36% plastic recycling rate has predominantly been achieved by regulation, funding from retailers via Repak compliance scheme, waste industry collection / sorting and some level of change in public attitude. The next phase of targets can only be achieved by all stakeholders being more engaged and involved. It will also necessitate further financial input.....

So, what is the solution? In reality, for such a complex issue, there is no single solution. There are hundreds of plastics utilised in thousands of different ways and combinations, so no single recycling system works effectively. Additionally, as many plastics are inexpensive it means that their recovery and reuse is frequently not financially viable so there is nearly always a significant cost to recycling or reusing these materials. This, coupled with a high cost of collecting it from highly dispersed locations, makes it expensive to manage in an environmentally sound manner. There are also many different stakeholders in the chain, from its initial production through its use to final disposal / reuse. All of these stakeholders have significant influence in the chain. Involving all of these stakeholders is critical to the provision of an effective solution:

- The public / consumer is at the end of the chain and frequently has the most choice in terms of what happens plastic packaging when they are finished with it. We need to 'help' them to make the best decision. The influence of public opinion on all other stakeholders should not be underestimated.
- The retailer / shop is mid chain and has significant input in that they can influence the original supplier, especially in terms of the packaging used and also has the capacity to influence the consumer depending on the product offering and pricing systems in place.
- Supplier – this is generally the original supplier of the product, who makes a choice on what packaging to use. They are often heavily influenced by the retailer as they are required to meet

certain specifications etc.

- Packaging supplier / filler – this is where the most direct innovation can occur in terms of offering new packaging options for markets. Due to the very high standards applied in this sector, new systems do not arise overnight but innovation at this level is key to changing what turns up for sale on retailers' shelves or used by industry for one-off use. They are heavily influenced by market trends and cost factors.
  - Waste contractors are key to collection, sorting and resupplying waste plastic packaging back into the reuse and recovery markets. Cost reduction is a key driver in this market.
  - Compliance schemes, such as Repak and Irish Farm Film Producers Group (IFFPG) in Ireland, are key to delivering change by transferring 'taxes' paid on packaging to the sectors that they believe can bring the best level of change. This is generally directed across all of the stakeholders referred above. (Note IFFPG only targets plastic film on farms e.g. silage wrap)
  - Regulation enforcement; it is well-known that many entities and people want to do the right thing, but there is a significant number that will not and this group need to feel the 'cost' of non-compliance. Enforcement is key to gaining compliance. In Ireland, this is the EPA, local authorities and the Garda.
  - Legislators; key to delivering change in any market is the influence of regulators who create new laws that influence markets. In Ireland's case these are government departments and the European Commission. In the case of food, it will also include food safety authorities at national and international level.
- To date, in Ireland, we have made significant progress changing our habits. In 2002, we led the way in implementing an innovative plastic bag tax that brought about a significant public change in this highly visible (but relatively small tonnage source of pollution). In 1997 we were only recycling approximately 10% of packaging. By 2016 we are one of the best in the world at 36% for plastic packaging. But we need to take cognisance that this is 36% of a market that grows every year and currently equates to approximately 5,000 x 40ft container loads or 98,000 tonnes of plastic per annum. This means that almost two thirds of our national arising is still not being recycled and is ending up either in the environment or landfilled / incinerated – not our best attribute!
- A 2018 survey of Irish household waste bins by the EPA found that 19% of the waste in our black (residual) bin was defined as plastic. Other sources suggest that up to a third of the PET drink bottles purchased in Ireland still end up discarded as waste as opposed to being recycled. On the positive side, as Ireland predominantly now ships plastic waste for recycling to facilities within the EU, we no longer add to the vast amounts of plastic that 'leak' into the Pacific Ocean. But we



Above: Eunomia Info Graphic.

Left: 2018 EPA Survey – Content of general waste bins from households.

are part of a global community and must reduce our use of non-recyclable plastics while increasing the amount of material we make available for reuse and recycling.

Under the European Strategy for Plastics in a Circular Economy the EU has now set significantly higher targets that must be achieved by member states. By 2025 we must reuse and recycle 50% of all plastic packaging and by 2030 this number becomes 55%. This is coupled with the fact that by 2030 all plastic on the market must be recyclable. This means that in Ireland by 2030, we must be collecting and recycling approximately 176,000 tonnes of plastic packaging i.e. almost double what we currently achieve.

For certain single use plastics the targets are even more onerous and as laid down in EU2019/904, by 2025 we must collect 77% of PET bottles that are placed on a market and by 2029 this grows to 90% of these items. This is a serious increase from where we are today with approximately 60% of these items being collected in Ireland for recycling.

Realising these demanding new targets will not be easy and requires a significant change in our current habits.

Taking the points and stakeholders outlined above and considering these locally, we need to:

- 1 Reduce the amount of packaging we use both nationally and globally.
- 2 'Assist' the plastic industry to change its focus via innovation and eco design;
  - a) plastics utilised in the Business to Business sector should be built for reuse across a variety of uses while;
  - b) plastics utilised in the Business to Consumer area or single-use plastics should be compostable or readily suitable for recycling and of a financially positive value which assists recycling
- 3 Producers and Retailers must

ensure that they clearly define what can and should happen to each type of material they place on the market, and ensure that the cost of sustainability is factored into the product being sold.

- 4 Waste contractors need to develop programmes to inform both their business customers and consumers how to present these items for both composting or recycling. And then ensure it finds its way to these respective routes.

- 5 All consumers need to be informed and clearly understand what they must do in this chain.

- 6 Regulators must set measurable attainable goals that pressurise the market to deliver the defined change. Furthermore, any of the parties that do not deliver i.e. from initial producer to consumer, need to have appropriate sanctions placed on them for non-delivery. This means proper enforcement at both industrial and consumer level.

Currently, I believe that Ireland has the structures to deliver on these new targets, however they need 'adjustment' to ensure they do deliver;

- Irish consumers need more education on what to do in terms of segregation and reducing contamination and non-compliance needs to see enforcement applied if they choose not to segregate or continue to contaminate their bins. The message needs also to be brought to a much wider audience, many of whom currently really don't care about the sector and the impact that their waste choices have on the world. Additionally, if a householder is making efforts to improve, they need feedback from their waste contractors to know when they are making improvements. As all household waste is now collected by weight systems, this feedback is possible to give.



# ETHNOVETERINARY MEDICINE

## Can you help?



Yarrow (*Achillea millefolium*) is used to treat diarrhoea in rabbits in Norfolk. Credit RBG Kew/William Milliken.



Gorse (*Ulex europaeus*) was excellent food for horses and sheep and are said to increase the milk yield of cattle. Credit RBG Kew/William Milliken.

By William Milliken

In Ireland, local farmers and vets used to use plants to treat their livestock. Information was passed from one generation to the next, and often was not written down. How much of the knowledge now remains in the population?

In Cork, the Male Fern (*Dryopteris filix-mas*) was used to cure flukes and intestinal

**If you have any information about ethnoveterinary medicines, feed supplements or other information relating to plants/fungi and animal health from Ireland, please contribute by sending an email to [ethnovet@kew.org](mailto:ethnovet@kew.org). Or alternatively, write to William Milliken, Royal Botanic Gardens Kew, Wakehurst Place, Ardingly, RH17 6TN, UK.**

worms in cattle, Sorrel (*Rumex acetosa*) for horses with gripe, and Ivy (*Hedera helix*) for dogs with sore eyes. Elsewhere in Ireland, Ivy was used as a medicine to treat warts in cattle (Kildare), Tansy (*Tanacetum vulgare*) to treat worms in horses (Galway), and Comfrey (*Symphytum officinale*) to treat swollen udders of cows (Meath). The use of wild or cultivated plants as animal medicines (Ethnoveterinary Use) is common across the world. For many years, scientists have collected information from farmers in India, Ethiopia and Uganda, for example, and have studied the effect on treating animals with these plants.

The Ethnoveterinary Medicine Project, established by the Royal Botanic Gardens, Kew, aims to record the remaining knowledge, from Ireland and the United Kingdom, before it disappears. Some data have already been collected in the past, but we are now interviewing rural people for EXISTING

knowledge. One of the contributors, from Clonakilty in Cork, said: "I am from a farm and I studied Veterinary Medicine in UCD. I am interested in herbal/plants to treat sick animals, e.g. a cow with e-coli mastitis, very ill and not eating, I find will eat ivy and get their systems operating again."

Other data from elsewhere – in the United Kingdom – included Duncan Matheson, from the Kyle of Lochalsh, who explained that Rosebay Willowherb (*Chamaenerion angustifolium*), which used to be rare, is now extremely common. "The root is very valuable if you boil it down, particularly for healing wounds on horses. Horses are extremely delicate: cuts and saddle burs are very difficult to correct. But this stuff is particularly good for it."

Similarly, wild plants used as feeds were thought to influence the health, behaviour or flavour of the meat or milk. Tufted vetch (*Vicia cracca*) was used in the past as a fodder plant in South Uist, and it was said that a cow that ate well on this plant would 'take the bull' more easily, and earlier in the season. On the Isle of Colonsay, Sea plantain (*Plantago maritima*) was thought to improve the cream and butter yield of cows and was also gathered as food for domestic rabbits. Kate Anne MacLellen, from North Uist, explained that in the past they would boil Cow tang (*Pelvetia canaliculata*), a seaweed, in large pots with potatoes, ears of corn and sometimes oatmeal. "If you had a cow that calved, it would leave the milk rich and more abundant as well. They also used to give it to the young beasts, and they would get this lovely sheen off their coats."

During the project we will be collecting data through websites, letters to local newspapers, agricultural and veterinary communications and subsequent interviews of knowledgeable people. We need to record this information, which forms part of the traditional rural culture, before it is lost.

This knowledge could also be used practi-

cally in animal management (livestock, pets) to improve their health and the economy. Over-use of antibiotics in veterinary use, for example, can generate antibiotic resistance in bacteria. Finding new plant-based treatments could also help support Soil Association Organic Standards, which restrict the use of antibiotics and some veterinary medicinal products for preventive treatments. Some companies in Britain are already supplying plant-based treatments for animals, including Nettle (*Urtica dioica*), Plantain (*Plantago major*), Eyebright (*Euphrasia officinalis*), Elderflower (*Sambucus nigra*) and Thyme (*Thymus spp.*).

William Milliken, Royal Botanic Gardens Kew, Wakehurst Place, Ardingly, RH17 6TN, UK.



Bog-bean (*Menyanthes trifoliata*) is used in the Hebrides (Scotland) to unblock calves' stomachs. Credit RBG Kew/William Milliken.

- Retailers must offer more and better options for consumers who choose to purchase goods with no packaging. Shops need better information on packaging. Don't just advertise the 2 for 1 deal, inform the customer about impacts and choices they can make to achieve a positive environmental impact.
- Packaging producers must continue to innovate in terms of the packaging they choose to use so that it is reduced to a minimum and is compostable or easily recyclable.
- Repak, the Irish packaging waste compliance scheme, must focus even more funds to target specific types of plastic so that the maximum amount is recycled. It may also adapt its members charge rates to place even higher

financial burdens on non-recyclable or products with excessive packaging. In addition, the farm plastic recycling scheme (silage wrap etc.) needs to also invest additional funds to ensure they maximise compliance and ensure the highest standards in recycling are sustainable and continuously achieved.

- Irish waste contractors need to work more closely with their industrial and household customers to obtain better segregation at source and police collections to reduce contamination. They need to invest in more efficient sorting and segregation technologies to generate purer materials for recycling markets.
- Regulators need to enforce existing legislation. Fine

consumers who cannot prove they manage their waste properly. Radically improve policing, and properly prosecute illegal dumping. The EPA should be properly resourced to handle all aspects of the waste sector including licensing and permitting of all facilities (this may include absorbing local authority personnel and local know-how).

- Legislators must ensure that laws and regulations are well targeted to deliver the desired outcomes. And if they are not working, adapt them promptly. This will also see the application of carbon taxes to help change unsustainable behaviours.

We must also take cognisance that plastic is not only a feature of packaging but also a key element of many products that we use every

day, so focusing on packaging is just one aspect of our love affair with plastic that needs to be considered into the future.

It has taken us 100 years to get to where we are with plastic. It is a marvellous diverse product that has helped us live longer and better lives. But we now need to be more mature about our utilisation of this very valuable resource. Working in effective teams we can find solutions, but it then takes all of us to implement the changes at a household level.

*Brendan Keane BSc, HDip Ed, is a member of the Chartered Institute of Waste Management and has worked in the sector since 1986, in many cases implementing new standards and technologies. He now works as an independent consultant in the*

*waste management area and is a member of the Irish Waste Management Association.*

**Useful sites and reference material:**  
[www.oceanconservancy.org](http://www.oceanconservancy.org)

In particular for schools  
<https://oceanconservancy.org/trash-free-seas/outreach-education/>  
<https://safety4sea.com/how-plastic-pollution-harms-marine-life/>  
<https://www.nceas.ucsb.edu/news/new-science-first-estimate-quantifies-plastics-flowing-ocean>  
<http://epa.ie/nationalwastestatistics/packaging/>  
<https://repak.ie/for-home/>

Check out the video here:  
<https://voiceireland.org/recycling-ambassadors-programme/>  
New Irish National Waste site  
<https://www.mywaste.ie/> in particular the link <https://www.mywaste.ie/what-to-do-with-my-recycling/>

By Walter Mugdan<sup>1</sup>

LEAD is a remarkable metal – and remarkably useful. Easily extracted from its naturally occurring ores, it has been used by people since prehistoric times. Unlike many other metals, lead is not shiny, but has a dull, lusterless appearance. Nevertheless, it has a distinctly bright side that has put it into wide use throughout history. But it also has a troubling dark side: it is highly toxic in almost all its forms.

### The Bright Side of Lead

Lead is relatively un-reactive, so it remains stable under typical conditions. Soft and malleable, with a low melting temperature, it can easily be formed into any number of useful items, from bullets to toy soldiers, and from fishing sinkers to water pipes. Indeed, its Latin name *plumbum* gives us its chemical symbol Pb, and the word *plumbing* which we now apply to all types of water piping, as well as the *plumber* who installs those pipes.

Lead is exceptionally dense and heavy, and has therefore been used for *plumb bobs* to hang on the bottom of *plumb lines*, which allow builders to determine with great accuracy whether a structure stands perfectly straight or *plumb*. We also *plumb the depths* of a matter when we are deeply focused; and we act with *aplomb* when we are uprightly self-confident.

Lead pellets or beads dating back to 7000 BCE have been found, the earliest evidence of metal smelting activities. Ancient Egyptians used lead in cosmetics, and the ancient Greeks used lead pellets for shot in slings. Medieval alchemists spent centuries trying to transform lead into silver and gold; they failed, of course, but learned much about real chemistry along the way.

Lead has been used for millennia for writing — think lead pencils. Because of its durability it has been used to line coffins in cultures that seek to preserve the body of the deceased. Because of its easy workability, it was used to assemble small pieces of glass into larger windows, both for clear glass in homes and for the magnificent stained glass installations in cathedrals. The finest crystal glass is itself made with lead. And today, because of its density, lead is used as shielding from exposure to harmful radiation like X-rays.

Various lead compounds have distinctive colours and have been used since ancient times to make paint. Lead chromate makes a bright yellow pigment. Lead oxide or “red lead” makes a vibrant red/orange colour. And, most common, lead carbonate — a compound of lead, carbon and oxygen — makes “white lead,” used since at least the 4th century B.C.E. for its own pure white colour and as a base for making many other colours. The lead in paint also accelerates drying time, improves its durability and resists corrosion.

The Romans — master hydraulic engineers — used lead pipes to bring water from their famous aqueducts into homes, public baths and public fountains. Indeed, it was not until the Industrial Revolution that worldwide production of lead reached levels comparable to the time of Augustus Caesar.

As indoor plumbing became a hallmark of modern industrial society, lead pipes were again widely used, primarily for the service lines that bring water from the well in the backyard, or the water main in the street, into the home itself. In the United States alone, an estimated ten million homes have lead service lines. And in many more millions of homes, copper pipes are joined together with lead solder.

In addition to paint and plumbing, modern society has used vast amounts of lead in two other ways, both associated with the internal combustion engine. First, it is a key component in lead acid batteries, found in nearly every motor vehicle for over a century. Second, start-

# ECO ECHOES: Plumbing the Depths of a Heavy Metal



Examples of lead piping. Though lead is remarkably useful, it is also highly toxic.



Images courtesy of USEPA

ing in the 1920s a compound called tetraethyl lead was used as a gasoline additive to raise octane levels, eliminate engine knock, and reduce wear on valve seats (though it increased fouling of spark plugs).

### The Dark Side of Lead

Like a considerable number of other materials for which humans have found good use, lead has a dark side: it is highly toxic. It adversely affects a wide range of organs and bodily functions, particularly the nervous system. Among its most insidious effects, it inhibits or disturbs the proper development of a child's brain, reducing the child's intellectual capacity (in common parlance, the child's IQ), and contributes to serious behavioural problems.

The dangers of lead exposure have long been recognized. The famous Roman architect and engineer Vitruvius urged that lead not be used for water pipes; his advice was ignored, and such use has continued into modern times.

Today, public health authorities have determined that no amount of exposure to lead is safe.

### Lead Exposure Pathways

People are exposed to lead through a variety of pathways. Chief among these are (1) ingestion, from lead leaching out of drinking water plumbing, or by ingesting the dust from lead paint and lead-contaminated soil; and (2) inhalation of air polluted by the burning of leaded gasoline in motor vehicles, or inhaling lead paint dust.

Localized air pollution was typical near lead smelters, which were often built in densely populated urban areas. Far more widespread was air pollution from the burning of leaded gaso-

line in motor vehicles. In both cases, lead pollution in the air settled onto the soils near the smelters and the roadways, contributing to ubiquitous soil contamination in many older cities. (The U.S. Environmental Protection Agency spends millions each year cleaning up residential soil contaminated with lead that can be linked to former smelting operations.)

Other sources of lead exposure also persist. Impoverished people (often children) in third world countries eke out meager livings by recycling electronics from first world countries; they often reclaim the lead and other metals by melting them on cooking stoves, inhaling the dangerous vapors. And it is not just humans that are at risk. Lead is still the most common metal used in shot and other ammunition, and for fishing sinkers. Even when not killed outright by hunting or fishing, many forms of wildlife suffer from lead exposure to spent shot and lost sinkers.

### Getting the Lead Out

One of the single greatest public health improvement actions ever taken by the United States was to ban lead in gasoline. Between 1970 and 2011, lead emissions in the U.S. decreased by an extraordinary 99.6 percent (220,000 tons), mostly due to elimination of lead from gasoline. The U.S. phase-out of leaded gasoline was completed in 1995. Most other countries around the world have followed suit, but in some countries (including Algeria, Iraq, Yemen, Myanmar, North Korea and Afghanistan) leaded gasoline continues to be used. (Unleaded gasoline was required to be sold in the U.S. starting in 1975 to protect the newly adopted catalytic converters that dramatically reduced other forms of automotive air pollution; leaded fuel destroys the catalysts.)

Another critically important public health

improvement action in the U.S. was the 1978 ban on consumer and residential use of lead-based paint. Again, many other countries eventually did the same, but lead paint is still used in some 45 countries, and various industrial uses are still allowed almost everywhere.

U.S. housing stock built before 1978 most likely has lead-based paint which, like all paint, wears away and turns to dust, or flakes off into small chips, both inside the homes and outside. Inhalation and ingestion of lead paint residue is today the most common source of lead exposure and poisoning, particularly in children (the most vulnerable part of the population). The U.S. Environmental Protection Agency adopted rules intended to reduce exposure to lead paint. One such rule requires that firms performing renovation, repair, and painting projects that disturb lead-based paint in homes, child care facilities and pre-schools built before 1978, must be certified by EPA or an authorized state, and must use certified renovators trained by EPA-approved instructors, and follow specified safe work practices. EPA rules also require that sellers of pre-1978 homes, and landlords renting such homes, must provide pamphlets to buyers or renters informing them of the dangers of exposure to lead, and steps they can take to protect their families.

### Lead Water Pipes – Still With Us

Though lead water pipes are no longer installed in new construction, they remain in wide use. And regrettably, the durability and corrosion resistance that made lead a good candidate for manufacture of water pipes is not absolute. When exposed to water that is acidic or alkaline (i.e., with a pH lower or higher than neutral 7.0), corrosion will occur, and lead will leach from the pipes into the water. In fact, some historians have suggested that exposure to toxic lead from water pipes contributed to the decline and fall of the Roman Empire (most scholars now disagree).

Chloride (salt) in water can also cause corrosion. This is what happened in the infamous Flint, Michigan crisis. In 2014, that city changed the source of its water from the Detroit River to the Flint River, which had a high chloride content. The municipality failed to treat the water from the new source to reduce its corrosivity. Much of Flint's old housing stock has lead service lines, and for several years the unsuspecting residents were exposed to dangerously high levels of lead in their drinking water.

Though Flint was an extreme situation, the problem is by no means unique to Flint; rather, it is commonplace in older communities where lead service lines are widespread. If the drinking water is not properly treated to provide corrosion protection, lead will leach from the pipes into the water. The obvious solution is to replace lead service lines; this is effective and eminently sensible, but not inexpensive.

Humankind has been ingenious in putting lead to work in myriad useful ways. But as has often been the case, our ingenuity has been a source of grave damage to ourselves and the other living creatures with whom we share the earth. *Plumbum* — among the heaviest of metals — has left us with among the heaviest of burdens.

March 2019

<sup>1</sup> Walter Mugdan is currently serving as Deputy Regional Administrator for Region 2 of the U.S. Environmental Protection Agency, New York City, NY, USA. Any opinions expressed in this article are his own, and do not necessarily reflect the views of the EPA.



# RIVER BARRIERS

“salmon were not designed to jump barriers...they are just forced to try when they encounter them...”

By Ciaran O’Byrne

IN Ireland we have several migratory fish species, those that spend part of their life at sea and part in freshwater. The best known are probably the Atlantic salmon and the European eel. However, we also have the river and sea lamprey and the Allis and Twaite shads. All of these species are capable of extended migrations into freshwater for up to hundreds of kilometres. The more widely the adult fish disperse into freshwater the larger the catchment area available to their offspring.

Barriers in river pose an immediate difficulty for migratory fish, either impeding or slowing their migration or completely stopping it. The record from construction of large dams, for hydroelectric power or for potable water supply, and their impact on migratory fish is a recurring theme of blockage whether the works be in Europe, North America or Asia.

In the early noughties, IFI compiled an inventory of known barriers to Atlantic salmon when it developed its “wetted area” study, an examination of the extent of freshwater habitat available to Atlantic salmon. Our on-going work with other species of conservation importance, such as the shads and lamprey, identified the potential of smaller structures to impede the migration of these species in rivers. The Mulkear LIFE project, led by IFI, was successful in garnering EU funding to examine a range of issues relevant to the fish species listed in the Habitats Directive present in the Mulkear catchment, including that of barriers and fish passage issues for sea lamprey. In 2013, our Barriers Working Group identified the value of generating a national GIS layer of barriers. This would be of value for fisheries and conservation but also for national infrastructure development. This group generated a basic survey form to geo-reference barriers, take photos and measurements and store the data digitally on-site.

Such groundwork left IFI in a position when the 2nd cycle of Water Framework Directive (WFD) got underway around 2015. This second cycle recognised the importance of hydromorphology, a composite term to encapsulate the idea of the physical habitat in which organisms live. In the case of rivers, hydromorphology incorporates the quantity of the flowing water, the instream and riparian zone and the role of continuity or connectivity, the ability of the river to overspill onto its floodplain as well as its ability to flow downstream to the sea unimpeded. So, barriers came to the fore in a more national context!

Being an EU Directive, the WFD 2nd cycle was not confined to Ireland and the EU has facilitated a number of research projects that have identified the relevance of hydromorphology to freshwater habitat, and the relevance of barriers within hydromorphology, as in the AMBER project. IFI is a partner in the Horizon 2020 research programme AMBER – the Adaptive Management of Barriers in European Rivers, with its emphasis on cutting edge technologies, such as remote digital imagery and molecular genetics, to examine barrier impacts and to mitigate for sediment transport and up and downstream movement of biota.

AMBER is keen to promote longitudinal



Surveying structures around the country. Above: Kells Blackwater Boyne; Top right to bottom: Cahir Castle; Impassable Boyle Weir, Shannon; Galey River Bridge, Kerry; St Mullins Weir, Barrow; Bennettsbridge, Nore; Impassable Bridge Apron; Milltown Weir, Barrow; Impassable Bridge Apron, Slaney River; Dalligan, Waterford.

connectivity of rivers with barrier removal as a first preference and mitigation as a second one. AMBER is mindful of the many benefits accruing to society from the presence of barriers such as hydropower, potable water, navigation, leisure pursuits. As such the project approach to barrier mitigation or removal is one of “adaptive management”, looking at sites on a case by case basis. IFI has been examining barriers in some of our large Irish rivers within the context of the AMBER project an ad produced recent peer-review publication identifying that many of the fish pass installations in existing weirs are not functional or can constitute barriers in themselves. The IFI AMBER study on one of our largest catchments, the River Barrow, recorded over 270 barriers in the system, among them being 132 bridge aprons, 62 culverts and 55 weirs.

In the overall process of advancing the 2nd WFD cycle, the Department of Housing, Planning and Local Government (DHPLG) tasked

AMBER is anxious to facilitate citizen science involvement and has developed an easy-to-use mobile phone app, the AMBER barrier tacker app. The app is available in the google play store to download. The app geolocates the site, takes a photo and allows the user to answer some simple questions – then press “ENTER” and the information is uploaded onto a rapidly filing map of Europe. Currently, Ireland is faring well with a high level of “dots on maps”.

IFI to undertake a series of actions in regard to barriers, building on the expertise developed by IFI’s R&D and Operations staff in working together on barrier detection and survey and also our expertise in undertaking barrier mitigation or working with other public authorities such as the OPW, Transport Infrastructure Ireland and County Councils. The IFI work, the National Barriers Programme, will run to 2021 and provide a platform in regard to barrier surveying, the technology of data collection, prioritisation of structures for mitigation and of mitigation strategies. To date IFI have surveyed 12,541 structures out of a possible national total of 72,560 potential barriers.

IFI’s long-term studies with OPW on arterially drained channels are also feeding into the barriers mitigation area with active mapping of barriers by IFI in OPW’s drainage network and OPW examining the scope for mitigations within its channel maintenance programme.

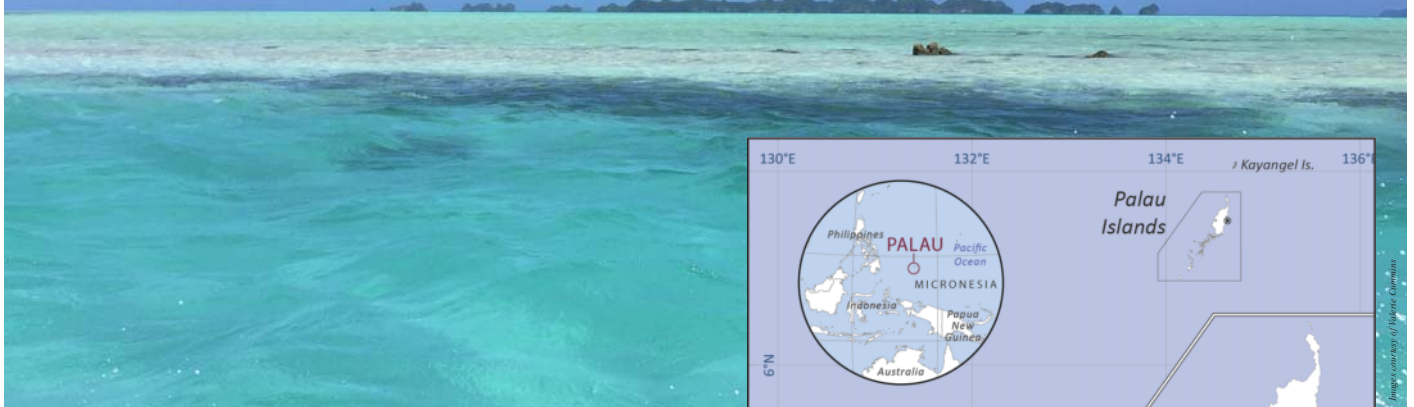
So there are many strands to IFI barriers work from; impacts on river-resident but migratory species like bream, brown trout types and pike; impacts on Habitats Directive species such as salmon, shads and lamprey; finding out where all the barriers are and prioritising and mitigating their impacts. Happily there are also many partners interested in developing solutions. To paraphrase a recent Taoiseach “a lot done, a lot still to be done” and IFI is playing a key role through its work with the DHPLG initiative and is helped by its networks with a wide range of other public authorities.

For further information on this topic please contact Dr Jimmy King ([Jimmy.King@fisheriesireland.ie](mailto:Jimmy.King@fisheriesireland.ie)) or Mr Brian Coughlan ([Brian.Coughlan@fisheriesireland.ie](mailto:Brian.Coughlan@fisheriesireland.ie)) of Inland Fisheries Ireland.

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# Lessons to learn from Pristine Palau...



By Val Cummins

THIS June, Cork City Hall was the venue for an impressive line-up of international speakers, for the annual, national *Harnessing Our Ocean Wealth Summit*. The keynote speech from former US senator, Mr John Kerry, was a call to action, to urgently set in train, the management measures needed to respond to the global climate and biodiversity crisis. Such measures include the designation of more Marine Protected Areas, regulations to deal with overfishing, and development of marine renewable energy to facilitate the decarbonisation of the economy. This was followed by contributions from high-level representatives of small island nations, from as far away as the Caribbean and the Pacific Ocean. Often referred to as Small Island Developing States (SIDS), these countries are at the cold face of the fight against sea level rise, coral reef protection, and the need to adapt to climate change. (At the time of writing, the IPCC has published its oceans and cryosphere report, indicating a 1m sea level rise scenario by the end of the century, which emphasises the enormity of the challenges faced by these vulnerable states).

Notwithstanding the fact that the presence of so many ambassadors was motivated by the Government's interest in winning votes for a seat at the UN General Assembly, their participation at our annual ocean conference, was

credible and of value, on multiple levels. Ireland is also a small island state, although we have arguably paid scant regard to our island status, as indicated by a lack of investment in our coastal and marine sectors and communities. In contrast to most of the SIDS, we enjoy the benefits of a relatively well developed economy. Nevertheless, we have much to learn from the way that these nations understand the vital relationship between people and the sea, and the way in which their



Former US senator, Mr John Kerry, keynote speaker at the *Harnessing Our Ocean Wealth Summit*, held in Cork City earlier this year.

political leaders are driving visionary agendas for ocean conservation to underpin thriving marine communities.

One such leader is President Remengesau, who has positioned the small island nation of Palau to the forefront of international best practice in ocean affairs. Palau is remote, situated in the Western Pacific Ocean. It has a population of 20,000 people distributed across twelve inhabited islands. Known as 'Pristine Palau', it boasts a marine environment of outstanding natural beauty. A barrier and fringing

reef complex surround the archipelago, creating a vast lagoon shoreward, resulting in what are regarded as some of the best dive-spots in the world. Sharks, protected in Palau under the auspices of the shark sanctuary established in 2005, are a major attraction for divers. Tourism, which accounts for 40% of employment, is a vital component of the economy. The government is focused on attracting 'high-end' eco-tourists, to the point that measures have been taken to deter package tourists, for example from China, from visiting in large numbers and putting too much pressure on natural resources. It is expected that the short-term economic impact of a decline in tourist numbers, from a peak of circa 160,000 visitors in 2015, will be offset by returns from investment in ecotourism infrastructure, products and services in the long-term. The reef fishery provides for subsistence fishing among the local population. However, the reefs are coming under increasing pressure from overfishing, exacerbated by seafood consumption within the tourist sector. Offshore, the domestic pelagic fisheries, including tuna, have been targeted by international fleets, facilitated with bilateral fisheries agreements with donor countries such as the United States, China and Japan.

On the surface of it, there may be little in common between Palau and Ireland, but in fact, we have much to learn from the people of Palau. We share the challenge of sustain-

ably developing a vast ocean territory. Palau's land mass is a mere 500 square kilometres. However, its marine jurisdiction extends to almost 700,000 square kilometres. Ireland's marine territory also extends far beyond our coastline, and includes 880,000 square kilometres of ocean estate. A key differentiator is the scale of Palau's ambition when it comes to protecting the ocean resources upon which it depends.

Ambassador Ulodong, Permanent Representative of Palau to the United Nations, spoke passionately in Cork City Hall about progress in the designation of the Palau National Marine Sanctuary. This is one of the world's most significant ocean conservation initiatives, aimed not only at protecting Palau's marine resource, but also protecting the world's tuna stocks. Landmark legislation has provided for a no-take Marine Sanctuary, covering approximately 500,000 square kilometres, which equates to circa 80% of Palau's Exclusive Economic Zone (EEZ), in which no fishing, mining or extractive activities will be permitted. It

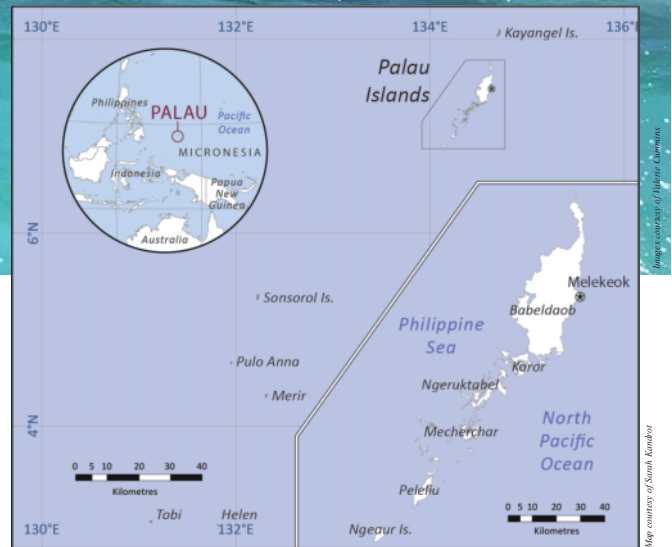
also creates a Domestic Fishing Zone (DFZ), covering circa 20% of the EEZ, where traditional and domestic fishing activities will be permitted. The marine sanctuary will take effect on January 1, 2020.

This radical policy development is underpinned by three factors. The first is political leadership, which has endured local opposition and pressure from the vested interests of donor countries. Pressure to amend the legislation led to changes this summer, concerning the original plan for fish landings to be targeted exclusively for the domestic market. An amendment to the legislation now allows for commercial exports of fish within the DFZ to ensure economic viability of fish caught in the area, including fish caught with long line-fishing. Changes also provide for pole and line fisheries to fish closer to shore than previously specified, and for a corridor to the high seas. The second factor relates to the norms and values at the heart of Palau culture, which is deeply connected to the ocean; a culture which appreciates the importance of

sound ocean stewardship.

The third factor concerns the role of science to develop meaningful policy outcomes. Through my participation in a scientific working group convened by the Government of Palau, I have gained insights to the complexity of the issues that underpin what is happening in ocean governance there. Funded by the National Centre for Ecological Synthesis (NCES), and the Future Earth programme, led by the Oceans Solutions Team in Stanford University, the work brings together an international team of scientists from disciplines spanning ecology, social science, sustainability science, fisheries and climate science, - together with economists, geographers and lawyers. Working in partnership with the Palau International Coral Reef Centre (PICRIC), and policy makers from relevant government departments and agencies, the working group has been synthesising research on how the marine sanctuary closures will impact on food security and marine resource sustainability.

Food security is a major concern to decision-makers





in Palau. Food security issues relate to availability and affordability of food, and the opportunity to derive energy from a balanced diet. Obesity, leading to non-communicable diseases, such as diabetes and heart failure, is a serious concern. Over-reliance on cheap imported foodstuffs, mainly from the US, is a major driver of this problem. Part of the solution is linked to the development of the domestic pelagic fishery, though the Marine Sanctuary legislation, to provide a source of high-quality protein from relatively abundant stocks. In theory, this will alleviate pressure on the reef fisheries, create new forms of employment and income, and lead to improved diets and outcomes for health. In practice, a dedicated awareness-raising campaign is needed to promote healthy eating, and to encourage behavioural shifts away from eating reef fish in favour of pelagics which, up until now, have been inaccessible and costly for the average citizen. Willingness to pay also needs to be determined within the tourist sector. The development of a Pelagic fishery may have benefits, but it is not a panacea. The people of Palau do not have a legacy of commercial fishing and seldom fish in deep water beyond the reefs. As a result, skills, fleet capacity, critical infrastructure, (including ports and retail market spaces), and opportunities for deployment of Fish Aggregation Devices (FADs) need to be developed. Natural oceanic fluctua-

tions in the Pacific are linked to the El Nino Southern Oscillation, a recurring climate pattern, involving changes in water temperatures within the waters of Palau, every three to seven years. This has implications for the migration patterns of key target species such as tuna. Further complexity arises when climate change is entered into the mix, with fish stocks impacted by variables such as sea surface temperature, primary productivity, ocean currents, ocean acidification, deoxygenation and cyclones. Increasingly, marine heatwaves, associated with widespread mortality in marine ecosystems, have been known to shut down fisheries and kill coral reefs in the western Pacific. More work needs to be done at local and regional levels to model the implications of this relatively new, and as yet, little understood climate phenomenon.

Ultimately, there is a high degree of uncertainty in what is known about the impact of the Marine Sanctuary on the development of a Domestic Pelagic Fishery, and the assumptions of downstream implications for food security and societal wellbeing. Scientists are working on models to give further insights to the implications of climate change, as well as developing capability to assess the responsiveness of integrated social-ecological systems to forces of change and disruption. Yet, the Marine Sanctuary policy has been progressed, irrespective of



The Palau International Coral Reef Centre.

scientific certainty, and without waiting for gaps in data and knowledge to be addressed. This is because of the perceived urgency of the need to protect Palau's vulnerable marine ecosystems, and in doing so, to realise benefits for nature (thriving ecosystem), as well as society (population health) and the economy (tourism – protecting 'Pristine Palau').

It would be wrong to think that commonalities between Ireland and Palau begin and end with our shared small island status and our considerable ocean resources. While the implications of climate change will have different manifestations for Ireland, given our relative resilience and geographic location in the temperate belt, we need to be acting with greater urgency to mitigate against impacts such as shifts in migration patterns of key commercial fish stocks. Like Palau, we should also be taking a holistic view of the dynamic relationships between natural, social and

economic systems. This has been shown to be a complex endeavour, characterised by uncertainty. However, pathways towards sustainability are inevitably based on trade-offs. In Palau, the stakes around the Marine Sanctuary were high, as it risked jeopardising finance from donor countries in the region.

The question is whether Ireland is prepared to set an agenda for the development of our maritime economy, but underpinned by the protection of the resource upon which that development is based. With Marine Spatial Planning currently in its infancy here, we have an opportunity to engage in scenario-building to designate areas for future use, including Marine Protected Areas (MPAs). Our track record in this regard has been poor to date. Progress in this area may require consideration of complex co-location opportunities. One potential solution is the co-location of MPAs together with offshore wind farms. Offshore wind farms have the potential to act as *de-*



Tour boats visiting Jelly Fish Lake – one of the most popular locations to visit in Palau.



Val Cummins with colleagues in Palau.

facto MPAs as commercial fishing gear may be constrained in the confined space between turbines. The co-location of MPAs with offshore wind has the potential to offer a win-win situation to stakeholders, if the sites can meet the twin objectives of both nature conservation and socio-economic needs. Engagement with all stakeholders, including the fishing community, in planning for the optimisation of our marine space, will be

critical to unlocking this potential. As in Palau, the stakes are high, the situation is urgent, and we have everything to win or lose.

*Val Cummins, Senior Lecturer School of Biological, Earth and Environmental Sciences, University College Cork & co-chair of Future Earth Coasts Global Research Project.*

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# The Fern-Flora of Ireland



Maidenhair Fern (*Adiantum capillus-veneris*)



Tunbridge Filmy-fern (*Hymenophyllum tunbrigense*)



Irish Spleenwort (*Asplenium onopteris*)

## By Tony O'Mahony

THE small island of Ireland is situated at the western extremity of Europe, bordering the Atlantic Ocean. Consequently, the climate of Ireland is greatly influenced by its *geographical* location, which yields a predominantly wet, windy and cloudy environment – a weather feature scenario that is a constant source of annoyance, moans, and fruitless complaints from Irish residents – though visitors to our shores unfailingly comment positively on our verdant green pastures! One delightful upside to this oceanic influence however, is the fact that many fern species (Pteridophyta) thrive in this humid, frequently cloud-covered environment and, over much of the country (particularly the west), spectacularly and luxuriantly deck woodlands, rock-outcrops, walls, bridges, and grassy roadside margins. Indeed, our fern-flora (approximately 40 native species out of an indigenous flora of around 950 species) *commands a visual profile* out of all proportion to its size, and plays a major role in the aesthetic adornment of the Irish countryside. This situation is all the more remarkable, given the fact that only some *twelve* fern species are truly widespread and common in Ireland, though these latter, *lowland* species are usually present in some abundance in their chosen habitats. Chief among these in visual prominence and physical dominance, is Bracken (*Pteridium aquilinum*), a tall, rhizomatous, rampantly spreading fern that forms dense colonies in suitable habitats, such as moors, heaths, acidic woodlands on dry soils, and on sand-dunes. (**Caution:** Apart from harbouring large colonies of **Ticks**, scientific research in recent decades has established that Bracken is a virulent carcinogenic species, and thus a threat to human and animal health. Consequently, its fronds should never be used as bedding for domestic animals.)

## The Distributions and Ecological Habitats of Irish Fern Species

While the native Irish fern-flora occupies a wide range of ecological, edaphic and topographical habitats, only *one* species is truly

*aquatic* – Pillwort (*Pilularia globulifera*), a small, inconspicuous fern bearing tufts of threadlike, cylindrical, subtranslucent leaves only 1-2mm in diameter, and initially coiled like a watch-spring, before opening. Pillwort is widely scattered and of scarce occurrence at the margins of pools, lakes and slow-flowing rivers throughout Ireland and Britain, while it only occurs very locally in mainland Europe, and is in decline there. However, our most abundant fern species mainly occur in lowland terrestrial sites. For example, **wall and bridge sites** (particularly where mortar has been employed in their construction) are avidly exploited by small-statured species, such as members of the *Asplenium* genus, namely: Wall-rue (*A. rutamuraria*), Rustyback (*A. ceterach*), Black Spleenwort (*A. adiantum-nigrum*) and Maidenhair Spleenwort (*A. trichomanes*). Our three Polypody species (*Polypodium* genus) also occur commonly in these habitats, but are equally at home on the boles and branches of woodland trees.

**In lowland deciduous woodlands** (and adjoining hedgebanks) on acid or base-rich substrates, the *dominant* large fern species include: Lady-fern (*Athyrium filix-femina*), Broad Buckler-fern (*Dryopteris dilatata*), Male-Fern (*Dryopteris filix-mas*), Scaly Male-fern (*Dryopteris affinis*) and Soft Shield-fern (*Polystichum setiferum*), together with the more localised Hay-scented Buckler-fern (*Dryopteris aemula*) – the blades of this latter species being covered on their lower surface with minute glands that emit a very distinctive coumarin or hay-like scent as the fronds dry. Smaller fern species associated with these, include the visually distinctive Hard-fern (*Blechnum spicant*) and Hart's-tongue (*Asplenium scolopendrium*).

**Bogs and their associated drainage ditches** provide an ideal home for the tall, singularly distinctive Royal Fern (*Osmunda regalis*) – a spectacular, eye-catching species that also occurs on the seepage-zones of coastal cliffs. While Royal Fern colonies are thankfully still of locally frequent occurrence in Ireland, the rare Marsh Fern (*Thelypteris palustris*) is in more serious decline in its small number of widely-scattered **calcareous fen habitats** in both Ireland and Britain.

**Montane habitats** (particularly calcareous or base-rich sites) are home to small popula-


tions of the nationally rare Holly-fern (*Polystichum lonchitis*) and the more frequent Hard Shield-fern (*Polystichum aculeatum*), Brittle Bladder-fern (*Cystopteris fragilis*), Beech Fern (*Phegopteris connectilis*) and Green Spleenwort (*Asplenium viride*). Sheltered rocky fissures provide microhabitats for Wilson's Filmy-fern (*Hymenophyllum wilsoii*) and the

rarer Tunbridge Filmy-fern (*Hymenophyllum tunbrigense*) – these delicate-fronded little ferns also occurring in acidic, humid, woodland habitats at both high and low elevations. By contrast, the distribution and frequency of Mountain Male-fern (*Dryopteris oreades*) in its **acidic upland sites** remains uncertain: it is currently only known from a very few disjunct locations in Ireland, but is most likely an under-recorded species.

## Iconic Fern Species in the Irish Flora



Although the Irish fern-flora is depauperate by European (or even British) standards, it nevertheless holds a small suite of rare and beautiful species that are of special interest. This certainly applies to Killarney Fern (*Trichomanes speciosum*), its translucent fronds initially lettuce-green when young, but turning a sombre, blackish-green colour on maturity. Once abundant in the Killarney region of County Kerry (hence its vernacular name), its populations were pushed to the point of extinction in that area in the nineteenth century by collectors', during the so-called Victorian Fern Craze. Today, Killarney Fern is very rare and of extremely local occurrence in its remaining Irish stations. The equally distinctive Maidenhair Fern (*Adiantum capillus-veneris*) (with its fan-shaped frond-segments borne on threadlike, liquorice-black stalks) occurs on limestone cliffs and grykes on parts of the west coast (Clare to Leitrim) and occasionally escapes from cultivation elsewhere in Ireland. Another exquisite species is Irish Spleenwort (*Asplenium onopteris*), which holds the unique distinction of being Ireland's only native fern that is *not* known to occur in Britain.


Tony O'Mahony, 6 Glenthorn Way, Dublin Hill, Cork.




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# GREATER SPOTTED DOGFISH

## *Scyliorhinus stellaris* (L.) in Irish Waters

By Declan Quigley

THE Greater Spotted Dogfish (GSD) *Scyliorhinus stellaris*, also known colloquially as Bullhuss or Nursehound, ranges from southern Norway (North Sea) to southern Portugal (and possibly NW Africa), as well as the Mediterranean Sea. However, despite its widespread distribution, relatively little is known about its biology compared with its smaller relative, the Lesser Spotted Dogfish (LSD) *S. canicula* (see Quigley 2018, *Sherkin Comment* 65: 8).

The GSD is the largest species of catshark (Scyliorhinidae) in the NE Atlantic, with a maximum recorded total length (TL) and weight of 190 cm and 10.801 kg respectively. GSD are generally found in relatively shallow coastal rocky habitats with algal canopy cover, at depths of 1-60 m (but possibly down to 800 m), and appear to occur in small aggregations. The species can acclimatize to relatively low salinities and is occasionally found in estuarine waters. Acoustic tagging studies indicate that GSD use different habitats within a small home range, moving between different rock refuges between nocturnal and diurnal cycles. GSD are generalist predators that feed on a wide range of invertebrates and fish.

Although the dorsal colouration of GSD is normally sandy-brown or greyish-brown with sparsely distributed large rounded dark blotches, colouration is very variable, most likely reflecting cryptic adaptation to local environments. Exceptionally black melanistic specimens are occasionally recorded.

Male and female GSD reach maturity at a TL of 77-79 cm. The oviparous females lay a single egg capsule ("Mermaid's Purses") at a time per oviduct (possibly 9-41 egg capsules are laid throughout the year), either attached to macro-algae in the subtidal or extreme lower intertidal, or on sessile invertebrates in deeper water. Fully formed juveniles hatch from the egg capsules after 9-12 months at a TL of 10-18 cm. The maximum reported age for GSD is 19 years.

Due to their low commercial value, GSD are generally discarded at sea (most likely with a relatively high survival rate), or landed and used as whelk bait. Unknown quantities are also utilized either fresh or dried-salted for human consumption.

### Angling for GSD in Irish Waters

Although not specifically targeted, GSD are not infrequently captured and are now generally released alive by increasingly conservation-minded recreational anglers. Following its establishment in 1955, the *Irish Specimen Fish Committee* (ISFC) set a minimum qualifying weight of 12 lbs (5.44 kg) for rod-caught specimen GSD. However, shortly afterwards, the minimum qualifying weight was increased to 16 lbs (6.36 kg) during 1959, and to 16 lbs (7.257 kg) during 1962, a target specimen weight that has since remained unchanged. In the interests of promoting the species conservation, an alternative minimum qualifying TL of 125 cm (along with photographic evidence) was introduced by the ISFC from 2016.

Over the last 60 years (1958-2018, the ISFC has ratified a total of 571 specimen GSD, 93% of them weighing  $\geq 7.257$  kg (Figure 1). The reasons for the large fluctuations in the annual number of specimens recorded are unclear; they may be related to either angling effort, commercial and/or recreational angling over-exploitation of local populations, the discovery of previously unexploited populations, natural cycles of abundance, or a combination of factors.



Left: Melanistic Greater Spotted Dogfish, Valentia, Co Kerry, 02.09.2017 (Photo Rosemary Hill)

Above: Specimen Greater Spotted Dogfish, 7.82 kg, captured by Peter Schiffer off Wicklow, July 2013 (Photo Kitt Dunne, www.wicklowboatcharters.ie)

The current ISFC GSD record, weighing 10.801 kg, was captured at Minehead, Somerset (Bristol Channel) during 1986.

Although there is no recognized World Record GSD listed by the *International Game Fish Association* (IGFA), the current ISFC record weighing 10.801 kg, would appear to represent the largest recorded GSD to date. However, it is interesting to note that IGFA currently list a World Record weight for an LSD weighing 5.28 kg,

which was caught at Guerande (Brittany, NW France) during May 2002, significantly larger than the currently recognized Irish (1.93 kg) and UK (2.244 kg) records.

About 74% of the ISFC specimens weighed between 5 and 8 kg, with only 3% weighing  $>9$  kg. The average TL of the ISFC specimens was 118 cm (range 99-150 cm; N=84), but there was significant variation in weight at any given TL (Figure 2), which may be related to fluctuations in body condition factor (e.g. feeding activity and/or reproductive state). Indeed, the condition factor was significantly

higher during the summer and autumn (Figure 3).

Although GSD specimens were recorded throughout the year, almost 97% were captured during the summer and autumn, particularly between June and September (84%), a monthly distribution pattern that may simply reflect seasonal angling effort in inshore waters.

GSD specimens were captured on a wide variety of natural baits, including fish (mackerel, herring, smelt, whiting, coalfish, pollack, cod & sand-eel), molluscs (squid & razor clam), and crustaceans (shrimp & crab), 92% were taken on mackerel.

Although GSD specimens were captured from all around the coast (Table 1), over 73% were recorded from the south-west (Cork & Kerry), particularly from Valentia (25%) and Kenmare Bay (24%).

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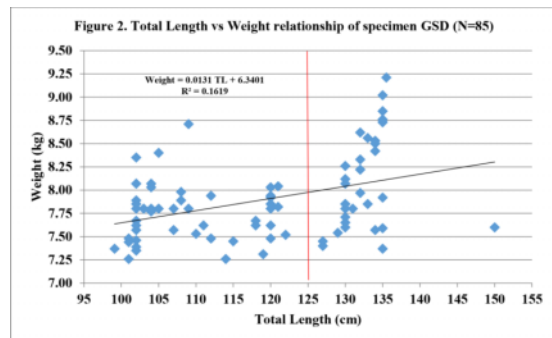
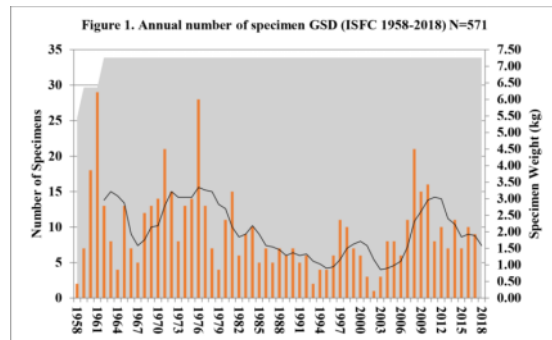
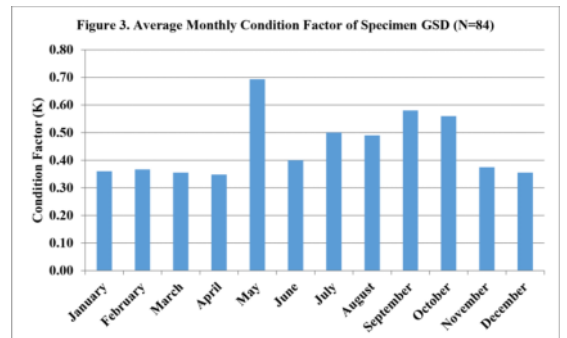


Table 1. Specimen GSD County Distribution

| County    | Number | %     |
|-----------|--------|-------|
| Kerry     | 327    | 57.3  |
| Cork      | 90     | 15.8  |
| Antrim    | 53     | 9.3   |
| Mayo      | 40     | 7.0   |
| Wexford   | 21     | 3.7   |
| Dublin    | 11     | 1.9   |
| Wicklow   | 10     | 1.8   |
| Waterford | 9      | 1.6   |
| Donegal   | 7      | 1.2   |
| Clare     | 1      | 0.2   |
| Down      | 1      | 0.2   |
| Louth     | 1      | 0.2   |
| Totals    | 571    | 100.0 |





View of Korbu Raya and Korbu Peak from Bukit Chuban



Gunung Korbu expedition start (1 July)



Kem Seroja (1 July)

## By Ian Boler

FIRST a bit of background. After graduating in Zoology in 1985, I spent seven months as a biologist at Sherkin Island Marine Station in Co. Cork, Ireland studying Lepidoptera (butterflies and moths) on the islands. Subsequently I worked for the International Institute of Entomology at the UK Natural History Museum Entomology Department for seven years before being made redundant when the Institute was, sadly, closed. I then retrained as a teacher in SE

England before moving abroad. I have now been resident in Malaysia for 13 years and teaching A Level Biology plus Duke of Edinburgh International Award at Kolej Yayasan UEM in northern Selangor State. During my time here I have maintained my interest in Entomology, particularly butterflies and moths, and forged contacts with entomologists at Universiti Kebangsaan Malaysia (UKM) and through the Malaysian Nature Society. Having joined a previous scientific expedition (to Mount Tebu in Terengganu State in



Ian and guides at Last Waterpoint (3 July)



Sunset on Korbu summit (4 July)

# MALAYSIA'S MOUNT KORBU SCIENTIFIC EXPEDITION 1-7 July 2019

2012 through UKM), I was therefore fortunate again to be accepted on the Malaysian Mount Korbu Scientific Expedition which was run by the Minerals and Geoscience Department (JMG) of Perak State. This was to occur from 1 to 7 July 2019 with the aim of inventorying the fauna, flora, geology and hydrology of Mount Korbu in order to gather evidence for application for the area to be designated a Geopark. There was to be a team of 135 prominent Malaysian Professors and Scientists from various Universities and Government Science Departments, plus assistants and students... and me – the only Englishman (and indeed, only non-Malaysian). My role was to sample and survey the Lepidoptera (butterflies and moths) as part of 'Team Insect' with Dr Ng, Dr Choong and Dr Wee from UKM. My aim was to sample at different altitudes: base camp (Kem Seroja) at 1000m, Bukit Botak (a subpeak of Mount Korbu) at 1800 m and on the summit of Korbu itself at 2183 m and assess the biodiversity and change in species composition.

Mount Korbu is the second highest mountain in Peninsular Malaysia and is heavily forested with primary forest over a wide area and water catchment feeding the important Kinta Dam and reservoir supplying Ipoh city. Two preparatory meetings were held, firstly in Putrajaya and secondly in Ipoh, Perak, hosted by the Director of JMG Dato' IR. Ahmad Zukni Bin Ahmad Khalil. As both meetings were in Malay language I took a Malay colleague from our English Department along with me to act as interpreter! Then, on Sunday 30 June I drove up to Ipoh in the early evening for an

opening ceremony and dinner held at an army barracks near the access to the Kinta Dam and Mount Korbu. The opening ceremony began with introduction, then a speech, mostly welcoming various science groups I think, by the Chairman of JMG, then food was served/eaten. This was typical but good Malaysian food – beef rendang, chicken curry and veg, but also some glutinous rice mixed with durian, which was delicious! After food, everyone pretty much dispersed with a little chatting. Unfortunately, when I headed home at 10 pm I hit the holiday traffic heading back to Kuala Lumpur, to get home at midnight. I had to be up at 4am for the expedition the next day!

### Monday 1 July

Up at 4.30 am (I gave myself an extra half hour), I drove to KKB to pick up Adi (my friend and jungle expert I hired as my porter), then I drove up to Ipoh to Pintu Rimba (mountain trail entrance) arriving 7:20 am. Many cars and people were there and a big marquee with fried noodles for breakfast. The mountain was closed to the public for the duration of the expedition so all were expedition people, wearing the expedition t-shirt. I met up with Alex (Dr Ng), Dr Choong and met Dr Wee of the insect team. I caught a skipper butterfly – sampling already! There was a little speech and big photo session then we were all ready to go about 8:45 am. We were sent off with a big hooter blast. I headed off in the vanguard with very, very heavy bags, accompanied by Adi, Alex, Choong and Wee. We soon lost the others and trudged along an easyish steep trail first, then alongside the river, crossing the river on really hard trails. Tiring fast, we stopped at an open area



in the river with many butterflies. Male Rajah Brookes Birdwings, Helens, Great Mormon, Cruiser, Common Bluebottle, Tailed/other Jays and others were too high or fast to catch. I caught some Chocolate Albatross, Grass Yellows and small blues. We headed off again after one hour, past a lovely waterfall with a big log vertically down it, then up tough, tough trails with the heavy load. Slow, tiring going, but eventually reached base camp, Kem Seroja, at about 3:30 pm. Here we met Alex first who indicated an empty tent next to his, so we claimed it. It was a big camp with many tents, and many people arrived in dribs and drabs. Many large bees plagued us here settling on us and our bags to drink the sweat! Food was provided at Kem Seroja which was of a typically Malaysian fare of Nasi Lemak (coconut rice) for breakfast and fried chicken or fish and rice for lunch and dinner, with teh tarik (hot, sweet, milky tea) and sometimes kopi (hot, sweet coffee made with condensed milk). All very delicious.

We settled in and rested, then bathed in the river and changed. I set up the butterfly trap but no fruit was available from the dining area for bait! I used sugar water and jellies instead, but to no success. I next found an open spot in the jungle for the

light trap and set it up. Then dinner was provided at 8 pm. I collected at the light trap for a couple of hours catching mainly small moths, some large Geometrids and medium Erebid but nothing fancy. Here I caught around 80 moths and was visited by cicadas, crickets and a small, mottled-brown praying mantis. In the morning the light had gone out (the small battery has a shorter duration, maybe 10 hours) but several more moths remained around and in the trap. Also present was a large, green praying mantis (with tell-tale moth wings below it!). When I picked it up to remove it, it grabbed my hand with its sharp forearms and wouldn't let go. Eventually I had to squeeze its neck to get it to let go and released it onto some leaves.

### Tuesday 2 July

We spent the Tuesday around Kem Seroja, venturing downhill a short way and uphill a short way to sample butterflies. Again we saw Rajah Brooke Birdwing butterflies, including females, downhill from the camp, but couldn't catch any. There were some Archdukes too and I caught a gorgeous male. I chatted to many of the local staff (guides, porters and cooks) and scientists in partial English at times, all were very



friendly. I got to know Choong and Wee better and made plans for our trip up to the peak. No trapping that night since I needed to save two charged batteries for trapping on the peaks and could only charge the used one between 7 pm and 10pm that night (when the generator was running)!

**Wednesday 3 July**

On Wednesday we set off up the mountain as Team Insect, with Alex, Choong, Wee, her PhD assistant Muen and Alex's two students. We trekked up to Kem Kijang together, collecting on the way, including a hind wing of a Rajah Brookes male, then collected butterflies at Kem Kijang. From there we said goodbye to the others and Adi, our guide Hallim and myself continued up via the Last Waterpoint (final water source of a small stream before the peak so we must fill up several containers) and on to Bukit Botak. As we ascended, others, including young students, were descending after camping at Korbu's summit. They were heading back to Kem Seroja but the last of them would probably not get back until midnight they were so late, tired and slow! We rested at the Last Waterpoint for an hour and filled up all our water bottles for use on the peaks. Several more small groups of people – scientists, students and guides, stopped, chatted and passed. I learnt of their studies of geology, hydrology and botany at the peaks. The ascent was very tough, but okay, and I had reduced weight having left things behind and Adi carried the trap and Hallim carried the tent. We arrived up at Bukit Botak (1800 m) about 4 pm to set up camp and have dinner (Adi brought food and cooked – mostly noodles) before putting up the light trap. It was cool and cloudy so there were no butterflies, only a couple of tiny moths, which I caught. The peak is very small – room for only a few tents, but we were the only ones camping there. The light trap started slowly at first, with some crickets, cicadas and stick insects too, but then got busier and busier! I had trouble keeping up in terms of filling killing jars, giving the moths time to die, then re-using them – even with eight jars! Between 10 and 12 pm came the Sphingids which I caught in the giant jar I brought – two huge hawk moths and two medium ones. Eventually we settled in for the night, all three of us in my little tent. But it was so cold – even with jumper and coat on, that I slept little.

**Thursday 4 July**

I got up at 6 am on Thursday 4th to check the light trap. The light was still on since I used the larger battery with a longer

duration, and the moths were everywhere, including in the trap. It took me two hours to collect the moths around the white sheets first, then with Adi's help with the net, those in the trap. There were two more hawk moths in the trap and also some very large Erebids. Fab! But no Saturniids! (Saturniids are a family which contains some of the largest species of moths in the world.) Due to the excess collecting (maybe 300-400 moths) I left many behind in the giant jar, along with one net and a few other items, ready for the mega-challenging ascent of Chuban! (Chuban, 2000m, is the second sub-peak of Korbu but is incredibly steep!)

We headed up Chuban about 11 am and this was the toughest climb I've ever attempted. Super steep (for a trail rather than a rock climb) on roots and boulders and with 17 ladders and many ropes to aid you (two ladders were joined together at one point). If you fell, the drop was a thousand metres..... but... we made it! It took about two hours, which was pretty quick going really. The summit on Chuban is really tiny, only enough for one small tent, so we didn't stay long. Again it was cool and cloudy with no butterflies.

We carried on up the easy trail to Korbu Raya (a third sub-peak) and on to Korbu's summit itself. Some of this stretch was also quite tough, with three ladders and ropes to help. And at about 2 pm we reached the summit! We settled in, pitched camp, and tried to sample butterflies. There were few butterflies since it was mainly cool and cloudy but with brief sunny spells, and light rain. Some skippers were flying about rapidly, two types of Awls, but I couldn't catch them, and a few larger butterflies were flying above the small trees too far away... A Blue Admiral settled on my tent briefly but was too quick to catch, and, at last, here were some Jezebels... flying too fast and too high to catch. One settled on a bush, a Malayan Jezebel, but I missed my catch, boo! Eventually, by watching the flight paths of the skippers, I effectively held up my net in the right spot and they simply flew in! I caught two purple Awls this way, hurrah! The best I could do for the Jezebels was video them wheeling around in groups just beyond the edge of the peak, and watch the spectacular sunset! Then it was time to set up the light trap.

The light trap was again slow at first, then getting busier, but not as productive as Bukit Botak. I caught a couple of medium Sphingids again but not as big as on Botak, and again no Saturniids! Moths were mostly small to medium with a few larger geometrids and largish Erebids only. I col-

lected for a couple of hours before retiring. It was not as cold as Botak, and I was much more tired, but this night was regularly punctuated with a tummy bug from the river water I drank earlier (near Kem Seroja), which has me up half the night. The bonus was that I could collect moths each time, including one of the Sphingids!

**Friday 5 July**

In the morning, on Friday 5th, after collecting the remaining moths at the trap (the light had gone out again since I used the smaller battery) and breakfast, my tummy finally began settling down but was still uncomfortable. The sun shone in the morning and the Jezebels, about 20 of one species (black, white and orange) and 10 of the Malay Jezebels (yellow, white, orange and black) were wheeling about. So, one more sampling session ensued. Using the same trick as the night before, I caught another skipper, a brown Hasora mus I believe, but chased the Jezebels, and Blue Admiral, in vain. So, we dried our gear in the sun and eventually packed everything up ready to go... One last try I said and... I caught a Black Jezebel... then a Malay Jezebel... and then Adi caught another Malay Jezebel! Success at last, hurrah!

Time to descend... I was really tired and drained from the tummy bug but gallantly headed down (not a choice really). The descent from Chuban was incredibly tough in my drained and tired state, but eventually I made it to Botak and relief, counting down the ladders as we went. Hallim then went ahead with the tent (which he left at Kem Kijang) and my moth jars (which he left at Kem Seroja) and then returned home. We caught up with him at the Last WaterPoint but didn't see him again after that. He was a great help as porter and guide. As we descended, then others were again ascending to the peak of Korbu, and either camping there or returning. We continued down slowly, I still very tired and in discomfort, to Kem Kijang where I pitched camp and slept for several hours! I awoke about 10 pm for some dinner and then crashed again at midnight.

**Saturday 6 July**

On the morning of Saturday 6th, we sampled some butterflies at Kijang, getting several regular species but missing the Cruisers and other big ones. A few Helens flew here but no Rajah Brookes. We struck camp and headed down to Kem Seroja, slowly since we were collecting along the way and caught several Red, Banded and Malay Harlequins. We also came upon a spot where fallen fruit lay and sev-

eral Archdukes and Horsfield Barons had gathered. Here Adi caught, first a female, then a male, Archduke – fantastic! We continued down to Kem Seroja and I took some fruit to use as bait in the butterfly trap. At basecamp I exchanged some insects with the other insect teams members (although Alex had already gone home) – a damselfly from near Kem Kijang for Choong and some flies (one a big, red-eyed tabanid) from the peak of Korbu for Wee in exchange for a butterfly (Pallid Faun) from Choong and... a huge Indian Moon Moth (Saturniidae) that had been found near death and rescued from ants, via Wee! At last, a Saturniid! Once I'd set up the butterfly trap at basecamp, however, the threatened rain came at last and it poured down all afternoon! After the rain, I set up the light trap further up the river on a high spot in a very open area hoping to attract some large Sphingids again and... Saturniids this time.... Hopefully.

We returned to the trap after dinner and waited until 11pm... But caught only the normal small to medium moths... One Sphingid did visit briefly but didn't settle and couldn't be caught, so the last sampling yielded no 'specials' as of yet. Once back at camp, the scientists had gathered for a debriefing on the various samplings over the week. So, we joined them and I gave a summary of my sampling and trekking and camping, in simple-ish English, too, before retiring.

**Sunday 7 July**

Sunday 7th dawned bright and sunny and we packed everything, gathered together as Team Insect again, and headed down around 10 am. As we went, we sampled still, when we could, and the terrain was very tough. Again, we went slowly, I was still very tired and my knees were very sore. We stopped for an hour's rest and sampling again just below the waterfall on the river and caught some interesting butterflies, including a Green Dragontail. I also caught a Malay Cruiser but it was so strong it escaped before I could pot it! Present also were Rajah Brookes and Helens again, but uncatchable. We carried on along the treacherous riverside trail and eventually reached the easier forest trails, passed a spot with many Common and Forest Grass Yellows, Chocolate Albattross and Straight Pierrots and eventually out of the forest! At last! It took so long, I was so exhausted, we reached Pintu Rimba about 3.30 pm! Here were Choong and Wee and Muen so we were able to say our final goodbyes, start the car and head back ourselves.



Adi and Ian on the summit of Korbu



Light trap at Kem Seroja (1 July)



Light trap on Korbu summit (4 July)



Science Report session at Kem Seroja last night (6 July)



Waterfall on way down from Kem Seroja

A long drive home followed, although I was very tired, I managed, and I took Adi to KKB and dropped him off there. I then popped into the 99 shop to get supplies before going back home. Heading back to the car, I suddenly realised what I looked like – shabby, dirty, blood stained legs (leeches, thorns, tree trunk wounds), sweaty smelly clothes (Gunung Korbu Expedition t-shirt), thick beard (no shaving on the peaks) and wild, tousled hair. But to cap it all, my trainers were taped up to keep the soles on (since they had disintegrated on the mountain). I looked like a wild man just

come back out of the jungles on a mountain – which I was!

After driving back home to unpack, wash clothes, water plants, repack, have a refreshing drink, I headed off on a plane to Ireland on a 28 hour journey the very next day!!!! The expedition was the toughest but greatest adventure I have ever taken! Now for years of preparation and identification of collect samples, and writing of scientific papers...

Ian Boler, Kolej Yayasan UEM, Malaysia.

(See pages 16 & 17)





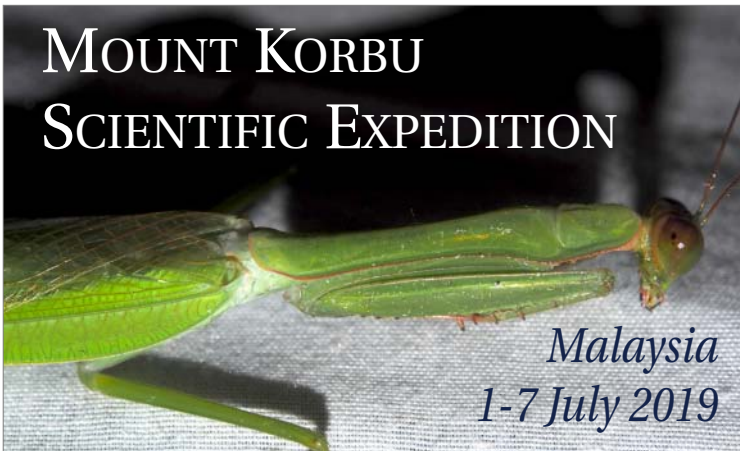
Malay Cruiser Butterfly – Kem Seroja (2 July)



View of Korbū Raya and Korbū Peak from Bukit Chuban



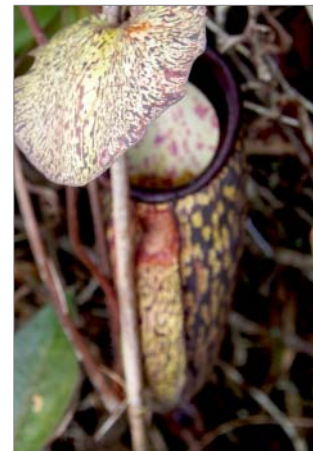
Waterfall on way down from Kem Seroja



Praying mantis – at Kem Seroja (2 July)



Stick insect – on Korbū summit (5 July)



Pitcher plant – on Bukit Chuban (4 July)



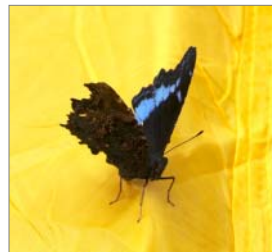
Chaffinch babbler – on Korbū summit (4 July)



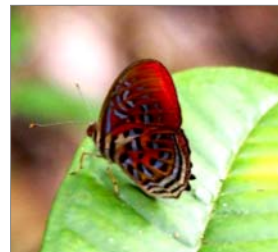
Gomphid dragonfly – at Kem Seroja (2 July)



Commander Butterfly – Kem Seroja (1 July)



Blue Admiral butterfly – on tent on Korbū summit (4 July)



Red Harlequin butterfly – heading down from Kem Kijang (6 July)



Chocolate Albatross, Forest and Common Grass Yellows and Straight Pierrot butterflies – on way out of forest (7 July)



Giant Katydid – at light near Kem Seroja (6 July)



Red Palm Weevil – at Kem Seroja (2 July)



# Cetaceans in the Farne Deep



By Anthony Toole

AS we approached the mouth of the River Tyne (in North East England), the boat began to rock, but Martin assured us that the water was often rough here but should be calmer out at sea. Beyond the lighthouse, we met quite a heavy swell, though this eased the farther we moved from the shore.

Fifteen minutes earlier, at 6 pm, we had embarked on the *JFK TWO* at the Royal Quays Marina, North Shields, for what was to be a four-hour evening Pelagic trip along the Northumberland coast. Our number consisted of Martin Kitching, the director of Northern Experience Wildlife Tours, his skipper and eight participants, all hoping to see something of the aquatic bird and mammal life of the offshore waters.

We took a diagonal line away from the land, to a distance of about three miles, then turned parallel to the coast. We passed outside the *Nor Atlantis*, an offshore and diving supply vessel that was probably moored here to await a call for support from a North Sea oil rig. Just beyond that stood a very tall anemometer that tested the wind for the possible setting up of a wind farm.

Two or three kittiwakes and a similar number of black-headed gulls accompanied us past rafts of guillemots and the occasional puffin that rode the waves. Small flocks of gannets, a fulmar and a Manx shearwater flew past. Somebody spotted a harbour porpoise, but by the time the rest of us turned to look, it had disappeared.

At around 8 pm, we reached the limit of our trip and moved closer to the shore for our return. The sun tried to break through the heavy clouds but only succeeded in casting a lurid glow over the water and brightening the fog that hung over the coastal dunes and softened the outline of the Lynemouth chimneys. The overall impression was of a Turner seascape in monochrome.

Out at sea, a shower was brewing,

and a quarter rainbow materialised above the horizon and kept pace with the boat as we sailed south. The waves seemed to increase in size. We passed a pair of wind turbines that provided convenient roosting perches for a couple of dozen cormorants.

The sky had darkened noticeably by the time we drew level with St Mary's Island, and the house lights of Whitley Bay began to flicker on. Gulls flew back and forth over the stern of the boat, sometimes dropping to within a few feet of us. By the time we re-entered the Tyne, night had almost completely fallen. A second boat followed us upriver, gradually catching up with us. But just as it was about to pass us, we turned into the marina. It was 10.15 pm.

But this was only a taster, leaving me with a desire to undertake a 10-hour trip to the Farne Deep.

In mid-September, I again joined Martin and eight others at the marina at 8 am. We detoured to South Shields to pick up two more passengers, then headed out to sea, passing a seal that was swimming upriver. It soon became clear that we were to venture into deeper water, much farther from land than on the previous trip.

After an hour, we were ten miles out and the coast was just discernible as a thin line on the horizon. The day was overcast but clear, and the Cheviot hills quite distinct, though a cap of cloud hung over the Cheviot itself. Most of us gathered on the starboard side, which was more sheltered from the strong offshore breeze, and when the sun finally broke through the clouds, it became comfortably warm.

We were accompanied by black-backed and herring gulls, many of which were juveniles. The number of guillemots remained low, consisting mainly of pairs bobbing on the swell, while we saw only a single puffin. As we progressed, the number of gannets increased, sometimes in small groups but often singly. They banked over the waves, their backs catching the sun and dazzling against the grey of the sea, outshining even the white

**Cormorants roosting on a wind turbine, Adult black-backed gull, White-beaked dolphin - first sighting, Photographing the dolphins, Anemometer, Minke Whale, Tynemouth from the sea,**



splashes of the wave crests. Five meadow pipits flew toward the coast, followed by a dozen pink-footed geese, perhaps vanguards of the autumn migrants from Scandinavia.

At around 11 o'clock, we slowed down to approach a large flock of gannets, diving alarmingly from many metres above the waves, feeding on what must have been a dense shoal of fish. A solitary sooty shearwater circled around the periphery of the flock. Then a large dorsal fin appeared about fifty metres from the boat. We crowded near the bow, just in time to glimpse the huge back of a minke whale break the surface. The sighting only lasted a few seconds, but it left an atmosphere of intense excitement that remained for very much longer, softening into an air of expectancy.

An hour later, we again slowed down and steered toward a patch of turbulence that transformed suddenly into a pod of white-beaked dolphins. They drew alongside us, their blue and white forms racing just below the surface, swinging back and forth about a metre or two from the side of

the boat. Then in ones, twos and threes, they cleared the surface, riding the bow wave, diving beneath the boat to emerge on the other side. I and the other passengers ran from side to side, eager to grab the best views and photographs. We need not have bothered. Wherever we stood, we could not fail. We pointed cameras over the side and clicked the shutters whenever a dolphin appeared. Sometimes we just caught a piece of swirling froth, but equally often, we captured a lovely image of one or more of the beautiful cetaceans. One person even used his mobile phone to take a 'selfie' with the leaping dolphins.

White-beaked dolphins are a cold water species, confined largely to the continental shelf areas of the North Atlantic, around the British Isles, the Faroes, Iceland and Norway, with a smaller concentration off Canada. Worldwide, their numbers are tiny compared with those of the better known bottle-nosed dolphins. However, in the North Sea, and Farne Deep in particular, they are the more abundant.

After half-an-hour, the pod peeled away, to be replaced almost immediately by another, that performed the same antics for a similar length of time. By the end of an hour, we were becoming blasé, and when the second pod swam away, further sightings brought far less excitement.

By now, we were about 25 miles from the coast, and it was time to begin our journey back. The early start, fresh air and excitement were having their effect, and several passengers fell into a doze. We again sailed through concentrations of gannets, and as they thinned out, they were replaced once more by the gulls, that accompanied us back into the Tyne. We arrived at the marina at 6 o'clock. Some of us were already hinting at a possible future trip.

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# MAGIC AND MEDICINE

## *Women and the history of healing plants in Ireland*

By Charlotte Salter-Townshend

WOMEN healers and their folk knowledge of local flora were a mainstay of Irish health for generations. However, wise women were frequently painted as witches through the biases of the age. Their use of plants is an important part of Ireland's cultural heritage which has largely been forgotten. Remnants are found in the oral tradition and some written sources, most notable the records of the Irish Folklore Commission.

One of the widespread medicinal plants known in Ireland and in other temperate regions is Sphagnum moss. This bryophyte (non-flowering plant) is a biological engineer that is the very fabric of our raised bogs. Its power of absorption allow it to hold up to twenty two times its own weight in liquid. This remarkable sponge-like quality comes from its cellular structure – 90% of its cells are larger, hollow, and dead. It is also antiseptic, containing bacteria and fungi such as penicillin. Humans learned to take advantage of this capacity, using it to soak up blood, pus, and other bodily fluids. In Native American societies it was used to line cradles, acting as a natural diaper. In Viking Age Dublin it was used as toilet paper. It is said that after the Battle of Clontarf in 1014, the armies used it to staunch their wounds. More recently, during World War One, it was again employed on the fronts. Both sides collected the moss and made extensive use of it. Nurses then began using it themselves during menstruation. Thus Sphagnum is an example of a plant whose properties were noted and utilised independently by different people.

Unlike many other plants with powerful medical properties, Sphag-

num is not dangerous. Much more chemically potent and therefore potentially deadly plants were often used for magic and medicine in Ireland. The myth of witches can be traced back to Viking society, which shaped Ireland from about the 11th century. Women who could 'see the future', known as *völva*, had an esteemed place in society, as evinced by the Viking burial sites and mythology. The *völva* practised a kind of ecstasy magic known as *seid*. Their visions were induced through the use of hallucinogenic herbs, particularly those of the nightshade (Solanaceae) family. A rare plant nowadays, henbane (*Hyoscyamus niger*) is mostly found around archaeological sites in Dublin. Highly toxic, it is suggested that *völva* may have applied the herb and relatives such as deadly nightshade (*Atropa belladonna*) typically so that the chemicals were more safely absorbed. These two nightshades are also ingredients of the infamous 'flying ointment' which is reported as inducing a sensation of flying.

*Atropa belladonna* was important herb employed by the witch healers as it inhibits uterine contractions when miscarriage threatens. *Hyoscyamus niger* for its part was used in anaesthetic potions and brews.

Foxglove (*Digitalis purpurea*) is a more widespread example of a herb well-known to witch healers. It was used as a cure for dropsy and other heart related ailments. The precise mechanisms of how it worked were mysterious to medical administrators until an English physician, William Withering, investigated its affects. His attention was drawn to *Digitalis* and its properties in the first place when a wise woman cured his patient of dropsy with a tea made of it. The heart drug digitalin was later extracted from *Digitalis*. Digitalin increases the

action of the heart and makes it more regular.

Hawthorn (*Crataegus monogyna*) also has a long tradition as natural medicine for the heart and circulation. The berries primarily were used in Ireland as a treatment for heart conditions. Again, the mechanisms were not properly comprehended yet it was noted as an effective treatment. The process of trial and error established its curative properties.

Elder (*Sambucus nigra*) has been called "the medicine chest of the country people" as it can boost immunity and act as an anti-inflammatory. Despite these positive attributes, curiously it often has a negative role in folklore. It is said that to burn it will cause the devil to appear and that if you use its wood to make a cradle it is an invitation to the fairies to steal your baby and replace it with a changeling. Perhaps these stories are a testament to its medicinal properties which were perceived as magical.

Perhaps the most infamous of Irish witch healers was Biddy Early (c.1798-1874). Many fascinating stories are told of her powers. It is notable that Early did not guarantee a cure to those who sought it. She occasionally refused to see patients if she felt that they were predestined to die. Sometimes she gave anxious relatives a potion in a bottle to placate them. According to legend, this bottle would inevitably break before the potion was used if death was indeed predestined. It may be that Early was able to make some prognoses and knew when she did not have the skills to save a potential patient. Refusing to treat those she could not cure was a way to ensure a higher success rate but it also spared false hope. In 1865, Early was accused of witchcraft and was to be tried at court in Ennis. How-



The Viking House in summer at the National Botanic Gardens.



*Digitalis purpurea* in bloom.

ever, the case was thrown out after witnesses withdrew. Perhaps they were intimidated as some suggest, or perhaps they withdrew because Early was an important figure who benefitted the community.

Witch healers and herbalists were crucial to the survival of members of poor and rural communities in particular. Their herbal tradition was an important forerunner to modern medicine. Although there was no clear divide between magic and medicine, an impressive amount of knowledge was accumulated and passed on. Many plant properties and healers are now forgotten but examples remain in archives such as

that of the Irish Folklore Commission, which may be accessed and searched by term on the Dúchas website. More than 50,000 schoolchildren from 5,000 schools in the 26 counties of the Irish Free State recorded their stories in 1937-8. These are an invaluable resource that provides ample material to be investigated.

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<http://botanicgardens.ie/>



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& A Beginner's Guide to Ireland's Wild Flowers – @ €7.50 (plus p&p €1.00) – see page 4 for details.







The Natural History Museum, Dublin.

# THE NATURAL HISTORY MUSEUM

*An essential key to understanding  
Ireland's biodiversity*

By Matt Murphy



Children at an Inland Fisheries Ireland event hosted in the Natural History Museum.



The Natural History Museum staff 100 years ago, five scientific staff (front row: James Halbert, Albert Nicholls, Robert Scharff, George Carpenter, Robert Pride).

IN 2005 the Royal Irish Academy published a major report on "The Natural History Museum in Dublin - Present status and future needs", authored by the highly respected Christopher Moriarty, Alan Myers, Tony Andrew, Tom Bolger, John Breen and Matthew Parkes. The primary aim of the report was "to bring to the attention of the relevant authorities the significance to the nation of a natural history museum and to initiate an urgent plea for funding support."

Chronic understaffing has prevented the Museum from attaining the status enjoyed by comparable institutions in European countries of a similar size and economy to Ireland. Fourteen years on little or nothing has changed with regard to the general principles of the report and the resources of the museum are still well below any international comparison.

In recent years, there is a realisation that animals and plants are a central component of our environment. The study of taxonomy and the ability to accurately record those species that occupy ecosystems is central to our understanding of biodiversity. The collections within museums and the research work these museums undertake are essential in this understanding.

The Natural History Museum in Dublin contains an irreplaceable collection and exhibition of the nation's fauna and geology. It is the custodian of a vast collection of organisms – estimated to total some 2,000,000 – a half of which are insects. It is important to understand that it is the only institution in the state which has a commitment to the permanent preservation of individual specimens. Universities and research laboratories frequently change their topics of study and there is no guarantee of continuity of any particular field of taxonomy.

All specimens deposited in the museum must be entered in the accessions catalogue on receipt. Each specimen must have a name, collector, identifier, collection site, date and ecological data. This requires highly qualified specialists who have the necessary skill and understanding. Due to the lack of staff and

resources in the museum, many of the 2,000,000 specimens in the museum are recorded only as "lots" and though individually labelled, in many cases no detailed list exists of what is in these lots. To give an idea of the scale of a single lot, the Griffith collection, inherited from the Royal Dublin Society contains 4,500 fossils including type specimens of 522 species and 22 genera, yet it only has a two line entry in the museum's manuscript accessions catalogue. The exact nature of many of the collections is unknown and won't be until they are examined and entered in the manuscript catalogue and subsequently transferred to computer.

While the old-fashioned appearance of the museum itself is now a treasure in itself, it is only the public face of the museum. As is general practice, the greater parts of its collections are housed away from view of the general public, much of them in secure quarters in Beggars Bush, or in a new Collections Resource Centre (CRC) at Swords, both in Dublin. The CRC has significantly improved conditions for most collections. All of the holdings are accessible to research workers by appointment, providing one of the key resources for work on biodiversity in Ireland. Published catalogues of the collections of only a small number of taxonomic groups are available however. It is vital that a full electronic database of the collections be available for access worldwide and a project to develop the software to achieve this has been funded and is due to commence in 2020. These collections are becoming increasingly important in the light of progress in genetic and environmental knowledge. Likewise, the significance the curatorial work of the museum's staff has also increased over time. A databasing programme started in 2008 and five staff, under contract, spent over five years building a register of all collections that has revolutionised the work of curators. A documentation officer maintains this database and manages the collections information for the natural history collections. It must be stressed that many of the specimens in the collections have not been individually identified.

The most important role of a natural history museum is to have a programme that ensures



that the condition of all specimens is checked on a regular basis and remedial action taken when required.

An equally important role for museums is education. In Ireland thousands of school children and adults visit the Natural History Museum in Dublin every week. In so many cases that visit is the first time they get a glimpse of the wealth of Ireland's native fauna and flora.

The report from 2005, recommended that the minimum staffing level required if the Museum is to attain an acceptable status as the national collection of animals was as follows:

- Keeper
- Curators – seven curators for various taxonomic groups
- Technical Staff – four staff minimum
- Collections and database manager
- Education officer
- Display manager
- Biological records officer
- Supporting skills

At the time there were five permanent staff in all, with a nominal share of central services for the museum but no secretarial support. In 2019, the size of the staff for the Natural History Museum has not changed dramatically. The manager, whose official title is Keeper, along with his managerial position, is still doing many normal curatorial tasks. He and three curators, who no longer have technicians for support, have to work in various buildings - two large stores, in addition to the old museum - and are attempting to safeguard the 2,000,000 specimens. In addition to this, they are expected to know all about the Irish fauna, geology and fossils, which is an impossible task. An Education Officer and an education assistant deliver the tours, public events and work in the main building - with the numbers visiting, this is also an impossible task. There are also people who staff the shop and supervise the display area.

If a comparison is made with comparable museums of countries we are not at the races. In 2005, The natural history departments across Europe were compared: Ulster Museum had a graduate staff of over 20 people; Oslo Museum had over 25; Denmark's Aarhus had 9 graduates, supported by 20 technicians and Belgium a total staff of over 130. These numbers have not changed significantly since then.

The size of the staff for the Natural History Museum beggars belief. The excellence and dedication of the current staff is not in question but how can they adequately fulfil all that needs to be done to safeguard the two million specimens in their current work conditions, carry out much needed research and educate the public?

The world is entering a period of unparalleled change and yet, even as one of the most developed nations at the start of the 21st Century we don't even know what we have preserved in our museum collections. Function-



Left and above: New insect storage at the Collections Resource Centre, Swords, Co. Dublin.

ing ecosystems are vital to our future health and well-being. These ecosystems are built from the myriad tiny creatures and plants around us that make up the biodiversity of Ireland. The services that these ecosystems perform, for free, every single day, from purifying water to pollinating crops not to mention the army of innumerable tiny beaks that control pest outbreaks are overlooked at our peril.

The Museum's real importance needs to be recognised, so that it receives the resources it needs and deserves. The Natural History Museum in Dublin is not just a museum; it is a treasure-trove which contains a key to understanding much of Ireland's natural history. These specimens need to be preserved and documented and the museum needs to be given the means to do so. If not, many of these collections, often fragile, may perish as the years progress and we will have lost so much information that we need to know about. What value are we putting on our natural environment when we are not supporting this wealth of information?

*The 2015 Royal Irish Academy report "The Natural History Museum in Dublin - Present status and future needs", was referenced for this article and is available from:*

[https://www.researchgate.net/publication/281035140\\_The\\_Natural\\_History\\_Museum\\_-\\_Present\\_status\\_and\\_future\\_needs\\_Royal\\_Irish\\_Academy\\_Dublin\\_28pp](https://www.researchgate.net/publication/281035140_The_Natural_History_Museum_-_Present_status_and_future_needs_Royal_Irish_Academy_Dublin_28pp)

Link to the Natural History Museum:  
<https://www.museum.ie/Natural-History>



Research space at the new Collections Resource Centre includes microscopes for visitor use.



Documentation assistants databasing some of the 20,000 birds in the collections.

## What's the quality of my environment

Find out on **My Local Environment** *Timpeall an Tí*

Environmental Protection Agency  
An tAidmhearcán na n-Éireann

The Environmental Protection Agency has developed a new website called **My Local Environment**.

Type in where you live and, at the touch of a button, you can access a whole range of information on environmental topics in your area.

Log on to: <http://gis.epa.ie/myenvironment#/search> to find out more.

- Air Quality
- Water Features
- EPA Regulated Activities
- Historic Mines
- Radiation Monitoring Stations Radon Map
- Radon Map
- Soil Type
- Coal Restriction Status
- River Catchment
- Aquifer type

<http://gis.epa.ie/myenvironment#/search>



# Managed Realignment in the UK

By Colin Scott

THE term 'Management Realignment' refers to the process of allowing controlled tidal flooding across low-lying coastal areas that are, in the absence of any such managed intervention, vulnerable to uncontrolled and damaging coastal flood events. It is now 28 years since the first official managed realignment project was carried out in the UK. This was a small-scale (0.8 ha) scheme implemented in 1991 by the National Trust, and its partners, on their land at Northey Island in the Blackwater Estuary, Essex. At this site, the fronting marsh had narrowed and the sea wall was being undermined. Therefore, there was a clear need to intervene. This proved to be a useful trial of the realignment concept which helped to understand how such sites perform physically and respond ecologically.

At that time, in the early 1990s, managed realignment was viewed as a concept whose time had come and, indeed, was very long overdue. It had been recognised during the middle of the last century that it did not make sense to continue building up existing sea walls in many areas, in the face of rising seas and diminishing coastal habitats. Instead, in many areas, it was better, and more cost-efficient, to 'retreat' the defence line in a way that would improve the standard of the defences, reduce the cost of their maintenance and increase the extent of declining and important coastal habitats.

Over the nearly three decades which have followed, a total of 75 realignments have been carried out in the UK alone (as well as a further 48 in rest of Europe). The details and lessons from these projects are collated in a website we set up, and is being managed, by ABPmer ([www.omreg.net](http://www.omreg.net)). From this wealth of real-world project experience, there are two key aspects that are particularly noteworthy.

The first aspect to highlight is the sheer variety of the different techniques that have now been adopted. There are schemes with different locations (sheltered, exposed, estuarine or coastal), with different landside morphologies, varying numbers and styles of seawall breaches, different tidal control structures and differing levels of ongoing management. This variety reflects the need to tailor schemes to site-specific conditions and, also, to meet the needs and expectations of local communities and key stakeholders.

Many projects in the UK (45 in total) have involved introducing open breaches in an existing sea wall to allow tidal waters to be freely exchanged over the hinterland. This breaching occurs in defences that are vulnerable to a future unmanaged

breach event and here there is a low-lying hinterland which is susceptible to tidal flooding. Often this is land that was claimed from the sea historically and its elevation has been reduced though compaction and a lack of marine sediment supply. Due to the nature of this land for, before any breaching can take place, it is necessary to build a new counter-wall at the back of the site to control the extent of the newly-introduced tidal incursions.

Many projects instead use sluices, culverts or weirs, rather than breaches, to control the tidal exchange volumes and the extent of hinterland flooding. These 'regulated tidal exchange' (RTE) techniques are employed where there are concerns about the tolerances of the neighbouring waterbody to hydrodynamic change and/or in order to achieve particular flood protection and ecological goals. Potential advantages of RTE schemes are that they do not always need to have new counter walls and, also, they can provide a valuable flood accommodation function at high water on surge tides.

For RTE schemes too, a variety of approaches have been tried and tested. The control structures range from simple tidal gates with gaps to allow a finite amount of tidal water through to more complex structures with articulating panels, buoys, and counterweights that can be used to exert greater control over the timing of tidal exchange (e.g. to ensure that saline waters are extracted from an adjacent tidal river which has a freshwater/marine salt wedge feature).

There have also been many different approaches taken to pre-breach land-forming of sites, from modest interventions where the existing landform is not altered greatly to projects that have required major pre-breach landscaping works and, in some instances, have imported large volumes of sediments for landscape-scale adjustments. Also, the post-breach management levels can vary from almost non-existent to regular active intervention depending upon the objective of the scheme.

Aside from this variety, the second aspect to note is how projects have become increasingly ambitious and innovative over the years, as confidence in the approach has increased. In 2013 for example the 470 ha Steart (Somerset) and the 450 ha Medmerry (West Sussex) were both completed which exchange initial volumes of around 500,000 to 700,000 m<sup>3</sup> respectively. The former site is also in an area with the largest tidal range in the UK (at around 12 m) and the latter involved the first ever managed breach through a mobile shingle barrier on an exposed open coast.

Last year (2018) saw the completion of the 760 ha area Wallasea Island Wild Coast Project. Com-



Wallasea Island Wild Coast (taken 4th July 2019).

pleted over 15 years and in six phases this includes a 165 ha large open breach realignment, the largest ever landscaping initiative (2 million m<sup>3</sup> imported and translocated) and a range of small and large-scale RTE structures which include a highly innovative concept that will create around 132 ha of new lagoonal habitat. These new lagoonal habitats have been designed based on lessons from major international RTE schemes such as Veta la Palma fish farm in Southern Spain and the Mai Po marshes in Hong Kong. They will be dynamic and controllable and will mimic the food rich small-tide marshes that are typical of the northern Mediterranean. This will deliver habitat that is suitable for southern bird species that are increasingly likely to use UK wetlands in response to climate change.

Collectively, therefore, there is now a comprehensive evidence base providing a practical foundation for future schemes; and the main message from this accumulated experience is that these initiatives are effective. They have created or preserved around 2,300 ha of coastal wetland habitat in the UK and, from Northey Island onwards it has been consistently shown that the restored wetlands develop rapidly. Mobile invertebrates and fish can colonise within a few days and weeks while some slower colonising species can take months to a few years. Plants also establish within the first year and then flourish over a few years (from seeds already dormant in the landscape or imported to the site by tides, winds or birds) so that a visibly vibrant and diverse wetland can be achieved within 3 to 4 years. Also, the majority of sites are stable and accrete with sediments (at rates which vary depending on the estuary suspended sediment load and the elevation of the intertidal habi-

tats inside the site), making them sustainable and able to cope with sea-level rise in the long-term. Furthermore, these sites can become important recreational sites for locals and tourists.

Implementing such projects, however, often requires a lot of preparatory analysis, consultation, planning and assessment work and they can be costly, especially at a large scale. A cost of £40,000 to £50,000 per hectare is seen as typical for large schemes. However, there are lessons too about these challenges and how to deal with them. To avoid unnecessary conflicts, it is important to have an active and participatory engagement process which ensures that local residents and visitors are informed of, and can engage with, the project. To avoid any adverse physical effects it is also crucial to identify site locations and develop designs in a logical, sequential manner and, particularly, to understand at the earliest opportunity how the tidal volumes will be accommodated by the site and will interact with the prevailing hydrodynamic regime of adjacent waterbody. It is also now well understood that introducing physical/morphological complexity in the landform of a site is important to enhance biodiversity.

Notwithstanding the large evidence base upon which we can now draw, the future remains somewhat uncertain. The impetus for the majority of what has been achieved in the UK, comes from the need to compensate (under the Habitats Regulations) for habitat losses as a result of coastal developments or the effects of coastal squeeze prompted by maintaining sea walls). It is unclear whether this primary driver will remain. Also, because this only deals with habitats that are lost from recent development there has been no equivalent drive to address the broader damage to coastal habitats

that continues to occur, chiefly related to sea level rise. To address this, more innovative thinking and more effort on the protection of existing habitats is likely to be required. Also, new policy drivers such as the need to achieve Net Gain, rather than only offsetting anticipated and recorded damage, will become crucial.

Future projects are likely to still be constrained by multiple factors, such as lack of allocated funding and landowner reluctance. Land prices are increasing, which will only make these kinds of initiatives more costly in the future. There is also an ongoing debate, and a lack of a clear consensus, on aspects such as: the value of these schemes, the importance of habitat quality against habitat quantity and about what constitutes 'success' in ecological, social and economic terms. While past projects have been shown to achieve a range of cost savings and ecosystem services to ensure they are cost-effective in the longer term, there will be a need for further evidence and transparency about these benefits going forward.

Increasing clarity and social consensus will therefore be needed if we are to continue to build on past successes and achieve more projects in the future. This is crucial because in many ways the past projects have been undertaken in the easiest areas where there are the least challenges and where there is usually no need to deal with existing infrastructure. Future projects will be in more difficult areas and will need to face these challenges with a clear understanding about the lessons from the past.

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# EPA report on Urban Waste Water Treatment in 2018

By David Shannon

THE objective of waste water treatment is to collect the waste water generated within communities, remove polluting material, and then release the treated water safely back into the environment. Without such treatment, the waste water we produce would pollute our waters and create a health risk.

The EPA's latest report on Urban Waste Water Treatment found that:

- In 2018, waste water treatment at 21 of Ireland's 169 large towns and cities failed to meet European Union standards set to protect the environment.
- Raw sewage from the equivalent of 77,000 people in 36 towns and villages is released into coastal waters and rivers every day without treatment.

## Waste water treatment at large towns and cities

Most (92%) of Ireland's urban waste water is generated in "large urban areas". These are defined as towns and cities with a population equivalent to at least 10,000 or, in inland areas, at least 2,000. The European Union's *Urban Waste Water Treatment Directive* sets mandatory standards for treating waste water from

such large urban areas. These are set to protect the environment from the adverse effects of waste water discharges. In 2018 there were 169 large urban areas in Ireland. 148 areas met the standards but the remaining 21 failed to treat waste water to the required standards. Figure 1 shows the 21 areas that failed the standards.

Dublin and Cork, which together generate approximately half of all urban waste water in Ireland, are among the areas that failed to meet the mandatory standards in 2018. In many cases the underlying cause of the failure is a lack of adequate treatment infrastructure, for example:

- Some areas are served by old, outdated treatment plants that were designed and built for a time when the population and volume of waste water needing treatment was smaller.
- The overloaded treatment plant at Ringsend in Dublin is not large enough to adequately treat all the waste water it receives.
- There is no treatment plant serving some large towns such as Cobh and Arklow.

Fixing such problems requires significant investment in new or upgraded treatment infrastructure.

However, not all the failures are due to deficiencies in treatment infrastructure. At some towns such as Dunmanway and Kinnegad the necessary infrastructure is already in place, but in 2018 the treatment plants did not always per-



Figure 1: Large urban areas that failed to meet the European Union's treatment standards in 2018



Figure 2: Areas discharging untreated waste water (raw sewage)

form as well they should. Such problems can be solved without capital investment. Improving how the treatment plants are managed and maintained will minimise breakdowns, get the best from the plants and help ensure waste water from these areas is always properly treated.

In 2019 the Court of Justice of the European Union declared that Ireland has failed to fulfil its obligations to collect and treat waste water properly. Investing now to fix the problems at areas with inadequate treatment will help protect our environment and public health and reduce the risk of financial penalties in the future.

### Raw sewage

The EPA's assessment of treatment at all urban areas, including those below the size thresholds for large urban areas, identified that raw sewage from the equivalent of 77,000 people in 36 towns and villages is still released into the environment every day. This happens because there are no treatment plants serving these areas. Figure 2 shows the 36 towns and villages releasing raw sewage every day. These areas generate approximately 2% of all urban waste water in Ireland. This means that 98% of urban waste water receives some form of treatment.

The number of areas discharging raw sewage is down from 50 at the end of 2013 to 36 in October 2019. However, there have been repeated delays in carrying out the essential works needed to eliminate raw sewage from some areas. For example, in 2018 Irish Water reported that it would connect 31 of the 36 areas to treatment between 2019 and 2021. It has now revised this down to just 23 areas. This means that 13 towns and villages will continue discharging raw sewage after 2021.

### Risks to the environment

Untreated or poorly treated waste water can be contaminated with harmful bacteria and viruses and can pose a health risk to people who come into contact with infected water. It can damage aquatic ecosystems by decreasing the level of

oxygen in the water and by releasing nutrients that can lead to excessive and unwanted growth of algae and aquatic plants.

The EPA's report highlights the following priority areas where improvements in waste water treatment are needed to prevent environmental harm:

- 57 areas where waste water is the sole threat to water bodies at risk of pollution.
- 3 beaches, where waste water contributed to poor quality bathing waters.
- 15 areas where improvements are needed to protect critically endangered freshwater pearl mussels or to safeguard shellfish habitats.

### Environmental priorities

There are deficiencies in many treatment plants and public sewers due to a legacy of underinvestment. It will take substantial investment over several years to bring treatment at all these areas up to the required standards. It is not possible to fix all the problems in the short term and therefore the EPA report identifies the priority areas where Irish Water should target its resources to bring improvements where they are most urgently needed. The priorities are:

- Collect and treat waste water from all large urban to European Union standards.
- Eliminate discharges of raw sewage.
- Improve treatment where waste water is the sole threat to waters at risk of pollution or where waste water contributes to poor quality bathing waters.
- Improve treatment to protect freshwater pearl mussels and shellfish waters.

David Shannon, EPA Inspector, Environmental Protection Agency, PO Box 3000, Johnstown Castle Estate, Wexford, Y35 W821. [www.epa.ie](http://www.epa.ie)

You can find more information about waste water treatment and read the latest *Urban Waste Water Treatment report on the EPA website at <http://www.epa.ie/pubs/reports/water/wastewater/uuwureport2018.html>*

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

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## Terrestrial Mammals

National Biodiversity Data Centre  
ISBN: 978-1-911172-06-2  
www.biodiversityireland.ie  
Price: €6.00



The National Biodiversity Data Centre has produced a range of identification field guides featuring different aspects of Ireland's wildlife. The most recent guide is of Ireland's 27 resident terrestrial mammals and, like the other guides, is produced in swatch format to make it easy and effective for identifying in the wild. The guide is split into five Groups; the groups relate to species of similar morphological characteristics. Each page details the key identification features, behavioural characteristics and likely places to find each mammal. A photograph of each mammal is also included, as is a map of known distribution for each throughout Ireland. Some of the mammals included are otter, Irish stoat, Irish hare and hedgehog.

This is a real gem, full of information and beautifully produced. Not only are the pages laminated on both sides to protect it from the elements, it fits easily into a pocket and can be kept open on a particular swatch without falling closed. Above all the format is accessible and useful for young and old. Highly recommended.

Matt Murphy

### To the Ends of the Earth Ireland's Place in Bird Migration

By Anthony McGeehan

www.gillbooks.ie

ISBN: 978-1848893528

Price: €29.99/2018

Anthony McGeehan has devoted his life to birds and the environment and this, his third book, is as enjoyable as it is informative. Published by The Collins Press (now part of Gill Books), the book is split into three main sections:

Part One: Time to Fly explores the influences on birds to embark on a migra-

tion, including the triggers, the psychology and the drive of instinct, amongst many others;

Part Two: Mechanisms of Navigation looks at the role of biological and physical sciences in bird behaviour;

Part Three: Days of Wonder deals mainly with the impact of bird migration in human terms.

The book is sprinkled throughout with historical anecdotes and the memories of the author and others, which makes the text flow like a good conversation. With a photograph on nearly every page and an engaging style of writing, this book will appeal to a wide range of readers and should help to explain and clarify some of the complexities of bird migration.

Finally, this is a beautifully produced book, with a look and feel of quality which really supports the well written and researched text and the quality photographs.



Terry Farnell

### Far from Land

Michael Brooke

Princeton University Press (2018)

\$34.95/€24.95

ISBN 978-0-691-17418-1

Visit any large sea cliff in springtime and you will see tens of thousands of sea birds noisily jostling for position on myriad tiny ledges. Return six months later and you will be lucky to see a single bird. Where have they all gone? That is a question that, until very recently, was answered largely by guesswork and speculation, supported by casual and often accidental observation. Even the breeding sites, incubation periods and fledging times were unknown for many species, as



were the distances travelled by parent birds in search of food.

This has changed dramatically with the development of tiny, highly sophisticated, electronic tracking devices that can be attached to the birds, to log data such as distance flown, location of feeding sites, depth at which food is caught and times spent diving, feeding and resting.

The author recounts the thousands of miles travelled by juveniles and the pre-breeding journeys of mature birds. The patterns of discovery, which differ not only between species, but between individuals within a species, frequently influence the often enormous trips undertaken by adults during and out of the breeding season.

The various foraging methods are described, as are the ways the birds cope with, and sometimes benefit from the waves, ocean currents and prevailing winds. The findings and conclusions are all backed by excellent science, which is described with humour and a light touch.

There is much more to be discovered, so this compelling book can only stand as an interim report, yet as such it will be read enthusiastically by anyone with even just a passing interest in birds.

Anthony Toole

### Irish Specimen Fish 2018

Available for free download at  
www.irish-trophy-fish.com

The report for 2018 has, as always, interesting information on specimen fish caught during the year. The Chairman mentions that "The heatwave of the first half of the summer affected fish and angling in many ways. Freshwater fisheries suffered for a number of weeks." Sea angling had a much better specimen season. Four new marine fish records were ratified during the year: Black Bream, Golden, Grey Mullet and Tope. All records for Carp, bar one, were caught at the Lough in Cork. With the major fish disease on the Lough, fishing is now stopped so no records of the fish will be

from there in 2019.

Young anglers are to the fore. John Patrick Chew, Dublin, caught a 5.9 kg Smooth-hound. The young Cork girl Amy O'Neill, as in 2017, showed her expertise. She featured with catches of six species: Carp, Mullet, Painted Ray, Twaite Shad, Smooth Hound and Roach.

In all the ISFC processed 420 claims: 393 were ratified. Only 11 were rejected and 16 are being queried further. I look forward to this report each year, especially the photographs of some of the proud anglers, with their specimen fish. It is good to see that the committee's finances improved in 2018. However I am still surprised that Discover Ireland is not giving a grant – not even the crumbs from the table. Angling is a most important part of Ireland's tourism industry and the ISFC should be supported.

There is an excellent article on p70-72 on Citizen Scientists by Declan Quigley. The contribution of recreational anglers to fish fisheries research with the editor's permission we have published it in full in this issue of Sherkín Comment. The author of the article, Declan Quigley, points out that every angler is in a unique position to contribute to fisheries research and development as citizen scientists, even if the fish they catch are not specimen fish.



Matt Murphy

### The Great Irish Weather Book

By Joanna Donnelly

Illustrated by Fuchsia MacAree

www.gillbooks.com

ISBN: 978-0-7171-8093-6

Price: €24.99 (hb)/2018

We are told this book is aimed at children but really it is for all ages. There is so much to learn about the weather and this large format book, beautifully illustrated

Fuchsia Macaree, explains just what weather is and how it happens. We learn about cold fronts and climate change, satellites and scientists, forecasting and broadcasting – and even discover how storms get their names!

There are five sections in the book: Meteorology; Climate; Forecasting; Extreme Weather; and People & Weather. Each is explained in simple, understandable language and includes sub-sections on such topics as rainbows, weather fronts, climate change and humans, weather charts, the ash cloud, the beast from the East, and jobs and the weather. The folklore pages explain how sayings were a way for people to pass on useful information about the weather before there were written records. Sayings such as "red sky at night, sailor's delight, red sky in the morning sailor's warning" "cows be down when it's about to rain" "rain before seven, fine by eleven", are explained.

Reader might also be surprised to read that a number of Irish scientists have helped to improve the science of meteorology. Did you know Francis Beaufort was born in Navan in 1774? He developed the Beaufort Scale for describing wind speed and it is still widely used today. The sunshine recorder Campbell-Stokes, which is also used today, was refined by George Gabriel Stokes brown in 1819 in Sligo.

It is difficult to pick out my favourite part of the book but I particularly liked the nine simple steps on how to protect yourself in any weather, which is important information for anyone.

The weather is something we get an awful lot of in Ireland – and it's something we love to talk about. If you read this book, you'll hopefully have all the answers! Yes this book is a gem and a wonderful present for young and old.

Matt Murphy



### Dublin Bay City by the Sea

By Seán & Niamh Kennedy

www.obrien.ie

ISBN: 978-1-84717-923-4

Price: €24.99/2017

For those of us who live outside Dublin, we may be familiar with the city itself but less so about the coastal communities that live all along its coast – places such as Howth, Portmarnock, Dollymount Strand, Dun Laoghaire and Dalkey.



Dublin Bay runs for 30km from Howth Head in the north to Dalkey Island in the south of Ireland's east coast. Through the photographs of Seán Kennedy, a well-known Dublin photographer with a particular interest in street and landscape photography, and through the words of his daughter Niamh, we get a real glimpse of these coastal communities, as well as the Docklands, where the River Liffey flows into Dublin Bay.

Sandy beaches, rocky shorelines, dramatic cliffs, island retreats, salt marshes and mud flat are some of the diverse habitats that make up Dublin Bay - all are represented in this book. It is a real gem and gives a real sense of place. It is a book you would want to dip into, wanting to discover an area.

Seán Kennedy has a wonderful eye and I enjoyed each picture. These are beautifully accompanied by his daughter Niamh's enlightening words.

Matt Murphy

# TRAVEL THROUGH IRELAND

### The River Shannon Ireland's Majestic Waterway

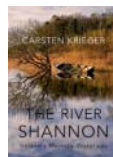
By Carsten Krieger

www.obrien.ie

ISBN: 9781847179081

Price: €24.99 (HB)/2018

The River Shannon flows through the heart of Ireland for over 360km. From its source, a small pool known as the Shannon Pot at the foot of Cuilcagh Mountains, photographer Carsten Krieger takes us on a journey through the tranquil countryside, towns and villages. This beautiful photographic book is divided into three chapters – "From the Shannon Pot to Lough Ree", "From Athlone to Limerick", and "The Shannon Estuary". It has nearly 300 photographs, accompanied by insights from the author and quotes from writings and stories of the past to complement the images. From the splendour of the Marble Arch Caves, along the lush green banks of the Erne, to the calm waters on the Shannon Estuary, the book meanders down the River telling us about the rich history and legends links to ancient castles, abbeys and monasteries. It shows how the river ties together landscape, people, heritage and wildlife. Carsten Krieger was eager to explore this often forgotten and undervalued part of Ireland and over a period of sixteen months he travelled up and down the Shannon, taking more than a few detours to the lakes along the way. The re-



sult of this study is a book that gives a wonderful insight into the beauty and splendour of Ireland's longest river.

Matt Murphy

### From The Air Ireland's Wild Atlantic Way

By Raymond Fogarty

www.obrien.ie

ISBN: 978-1-78849-019-1

Price: €9.99 (pb)/2019

In 2014, the Irish Tourist Board began promoting of "The Wild Atlantic Way" as a touring route and since then it has brought wonderful economic benefits to many villages and towns along the south west and west coasts of Ireland. Stretching through bays and peninsulas for 2500 kilometres, from Kinsale in County Cork to the Inishowen Peninsula in County Donegal, the route has an incredible variety of landscape.

In his book, Raymond Fogarty takes us on an aerial journey of this glorious coastline - one he took not in an aircraft but using his drone. To quote him "Drones show us a view of our world from never-seen-before angles, places where aircraft cannot go." Raymond is a professional drone pilot, videographer and photographer based in the south of Ire-



land. Drone photography brings a thrilling new perspective to one of the world's longest coastal touring routes.

His journey begins in Co Cork, from Kinsale to Bantry, and includes views of Inchydoney, Lough Hyne – Ireland's first Marine Nature Reserve, the glowing sunset over Sherkín Island, and the hidden gem of Knockdrum Stone Fort near Castletownshend. The Stone Fort does not get many visitors but is really a must see. It is 29m in diameter and has walls 3m thick.

Heading up along the Southern Peninsulas from West Cork to Kerry, we pass over Hungry Hill and the rugged coastline of Beara, catch super views of cliffs along the County Kerry coast and cliffs, and the beautiful sandy beaches of Rossbeigh, Ballybunion and others.

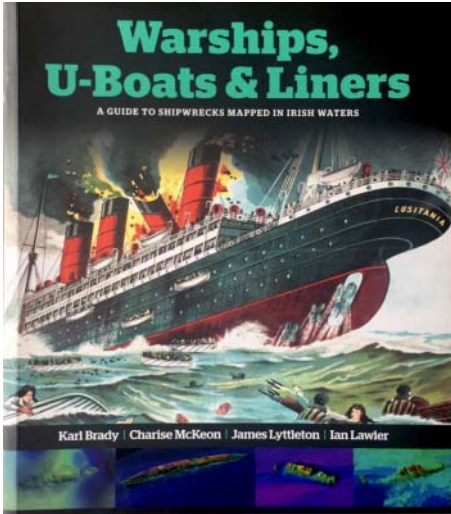
Continuing northwards along the coast the book has wonderful photographs of dramatic cliffs and landscape of the Burren, Co. Clare, the ancient Fort Dún Eoghannaichta on Inis Mór - the largest of the Aran Islands, and the surfing coast of Co. Mayo.

Finally we reach Donegal's remote wild and rugged beauty, stretching from Killybegs to Malin Head. To me the two page spread of Inishbinn Island - just 300 acres - has to be my favourite photograph in the book. This book gives a real flavour of the landscape along Ireland's west coast. Its tiny size makes it ideal for someone visiting the Wild Atlantic Way or as a souvenir of a visit.

Matt Murphy

# Warships, U-Boats & Liners

## A Guide to Shipwrecks Mapped in Irish Waters



### Warships, U-Boats & Liners A Guide to Shipwrecks Mapped in Irish Waters

By Karl Brady, Charise McKeon,  
James Lyttleton, Ian Lawler

www.gsi.ie

ISBN: 9781406427035

Price: €25/2012

### A review by Matt Murphy

THE book "Warship, U-Boats & Liners" will appeal to anyone with a general interest in the maritime his-

tory of Ireland and the history of the two World Wars from a maritime perspective.

Since 1999, Ireland's offshore waters and coastal seas have been subject to one of the largest seabed surveys in the world, commenced by the Geological Survey of Ireland

(GSI) and now being completed as a joint venture with the Marine Institute. The survey has resulted in thousands of seabed features being mapped and investigated. Amongst those were c. 300 shipwrecks that have also been mapped as part of this work.

In the course of this survey, working in conjunction with the Underwater Archaeology Unit of the national Monuments Service, a database of over 300 shipwrecks has been compiled. In an illustrated and accessible format, the book highlights 60 of the most important shipwrecks mapped during the seabed survey mapping projects. Each contains detailed information regarding the wreck's condition on the seafloor, its extent, dimensions and water depth, along with a short background history and the reason for its loss.

The first two chapters of the book give an overview of the work of the organisations involved: the Irish National Seabed Survey (INSS) and the INFOMAR programme (INtegrated Mapping FOR the Sustainable Development of Ireland's MARine Resource), as well as The Underwater Archaeology Unit, who also outline the regulations that

protect Ireland's shipwrecks.

The various types of wreck are divided into four chapters, listing wrecks chronologically according to date of loss. These are titled: Historic Wrecks of the 16th, 18th, 19th and early 20th centuries; World War I wrecks; World War II wrecks; Post-war wrecks. Within the chapters, each wreck has dedicated pages.

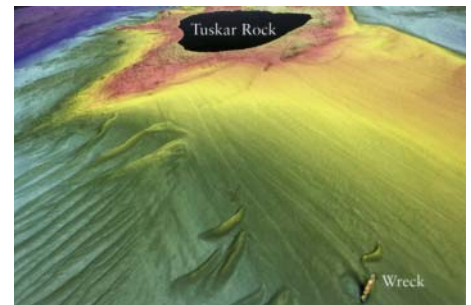
The multibeam data that the survey collects provides highly accurate information regarding the full extent of each wreck, including its debris zone and associates scour holes, which may also contain wreck material. This information increases our understanding of seabed dynamics at wreck sites, as well as providing other information that will contribute to long-term management strategies for this important and fragile cultural resource.

The book is wonderfully informative. It is intriguing to read the various back stories of some of the wrecks. Considering we are a maritime nation, shipwrecks are a huge part of Ireland's maritime history. The seabed surveys have brought a new dimension to the exploration of wrecks and give us all an opportunity to explore from the comfort of our homes.



Images from "Warships, U-Boats & Liners"

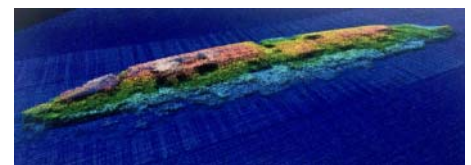
The Shipwreck inventory comprises a database of all recorded wrecks in Irish territorial waters and in areas of the Continental Shelf designated under the Continental Shelf Act 1968 and also within Ireland's Exclusive Economic Zone (EEZ). At present, the database contains over 12,000 wrecks. Of these, approximately 3,000 have recorded positions, which are displayed in the map shown here.



3D imagery of an unknown shipwreck (lying NE-SW on the seabed) located to the N of Tuskar Rock, off the Wexford coast.



The 30,396-ton liner, the SS Lusitania, was considered to be not only the most luxurious ship of its time but also the largest. It made 202 transatlantic crossings during its eight years in service. The sinking of the Lusitania by UB-123, with the loss of 1,198 lives, was one of the worst maritime tragedies of WWI. (Ian Lawler Collection)



The multibeam view of the once magnificent liner lying on its starboard side, slowly collapsing in on itself. The detail of the multibeam is such that it can tell that the vessel, which once stood 20 m high, now has a maximum height of 14.7 m above the seabed. This is the result of natural decay, salvage operations and depth-charging having taken their toll. It measures 241 m long, 46 m at its widest and has an average height of 9.9 m.

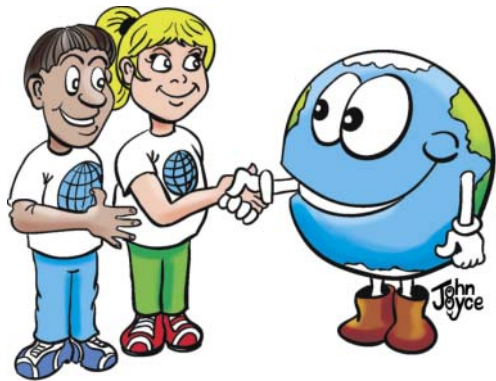
Thank you to all authorised skippers who took part in Tuna CHART (Catch and Release Tagging), a pilot Bluefin Tuna Data Collection Programme.

www.fisheriesireland.ie/bluefin

iascach Infire Éireann  
Inland Fisheries Ireland



# JUNIOR PAGES



## The Ocean & Humans are Totally Interconnected

Avast there, Mateys! Today we come to possibly the most important of the Seven Principles of Ocean Literacy, which states that the oceans and humans are totally interconnected. In simple terms, this means that actions we take on the land have an effect on the Ocean which, in turn, can have an effect on us.

While many of us know that caring for the Ocean is a 'good thing' to do, most of us don't know just how vital it is to keep the Ocean healthy. This is because the Ocean is our 'life support system' here on 'Spaceship Earth' and, if that life support system were to fail, life on Earth as we know it would cease to exist.

The Ocean provides us with food – in the form of fish and shellfish. It also helps us transport goods and passengers all around the world by way of ships. The Ocean is a source of recreation and enjoyment – from tourism, beach-combing and sunbathing, to more active pursuits like sailing, swimming, surfing and SCUBA diving. Many medicines come from animals and plants that live in the Ocean, which is also a limitless source of ideas and inspiration for artists, writers, musicians, filmmakers and storytellers of all kinds. The Ocean is also a source of energy – be it from offshore drilling for oil and gas below the seabed, to the harnessing of tidal and wave power to generate electricity.

On a much larger scale, ocean currents help regulate our climate by transporting warm water from the Equator to the North and South poles and cooler water back again to the Equator. Seawater also evaporates to form rainclouds, which then transport freshwater far inland to fill rivers and water crops.

Importantly, the Ocean is home to trillions upon trillions of microscopic plants called 'phytoplankton' which – like plants on land - absorb carbon dioxide from the atmosphere and give off oxygen – enough for every second breath that you take!

The problem is, that we humans often forget or ignore the facts that the Ocean is not limitless and that our activities on land and at sea can effect its ability to support life on Earth.

Unregulated industrial fishing not only reduces the populations of commercial fish species such as cod, herring and mackerel – sometimes to dangerously low levels - but also other fish species trapped in fishing gear as 'by-catch'. Untreated sewage and other industrial wastes pumped into the Ocean can not only poison marine life with toxic chemical, but also in breaking down, use up the oxygen in seawater, making it impossible for marine life to flourish.

## Black John the Bogus Pirate

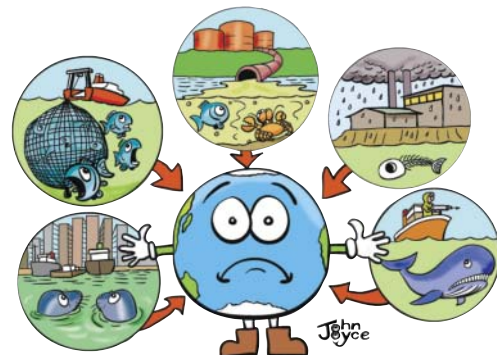


### Our Actions on Land Effect our Oceans

Large quantities of carbon dioxide, released into the atmosphere from burning oil, coal and wood combine with rainwater to create carbonic acid which, in turn, flows into the Ocean – increasing its acidity and reducing its ability to support life.

Humankind has also killed off most of the larger animals in the Ocean through unrestricted whaling and fishing, while human developments on shore have changed beaches where marine birds and mammals come ashore to breed. In short, we are being careless with our planet's 'life support system'.

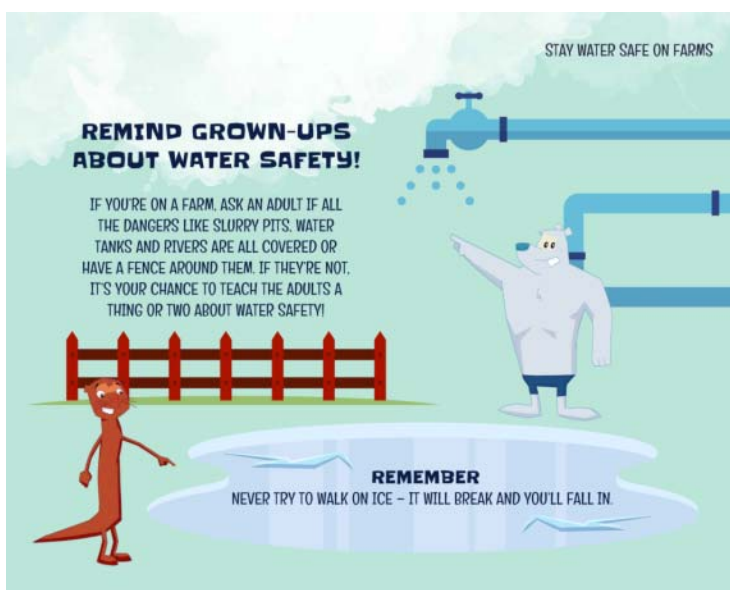
And like astronauts whose life support system has failed, we could find ourselves in serious trouble aboard 'Spaceship Earth'! Unless we change our ways, become 'Ocean Literate' and realise the true interconnectedness between ourselves and the Ocean, we could be in serious trouble in years to come.



Images & text copyright John Joyce

#### USEFUL LINKS:

[www.explorers.ie](http://www.explorers.ie) – The Marine Institute's Education page for schools.  
[http://oceanliteracy.wp2.coexploration.org/?page\\_id=164](http://oceanliteracy.wp2.coexploration.org/?page_id=164) – Great ocean literacy site with lots of resources and information  
<http://www.emsea.eu/> - Home of the European Marine Educators Association.



# STAY WATER SAFE ON FARMS

**KNOW THE RISKS**

## PAWS (Primary Aquatics Water Safety)



WATER SAFETY IRELAND has created an educational resource for primary schools called PAWS (Primary Aquatics Water Safety). PAWS outlines life-saving guidelines for children of every age and is available digitally to every school in the country.

PAWS teaches children how to be safe around water in homes, farms, pools, beaches and on our waterways, and is written and designed for different age groups.

With beautiful illustrations, a wealth of tips and advice, and all sorts of interactive games and puzzles to reinforce lessons learned, PAWS incorporates all aspects of the physical education aquatics strand of the primary school curriculum.

The PAWS programme has been developed in partnership with The Educational Company of Ireland. Their platform is already used daily by many teachers all over the country. English and Irish digital lesson books are available for each class band with interactive puzzles to match. The lessons can be delivered in just a few hours of class time and on completion each class can receive a Water Safety Ireland PAWS Certificate.



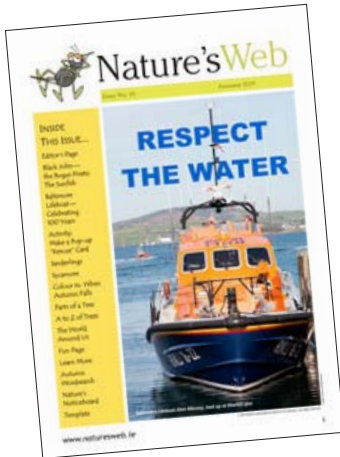
**Now every child can learn basic water safety skills in the classroom!**  
<http://www.watersafety.ie/primary-school/>

THE main drowning threats on the farm which are unguarded watercourses such as rivers, ponds and lakes, rainwater collection tanks and slurry pits. Whilst it is vital for all the family to know where these risk areas are it is important that measures are taken to protect children from them. Young children are lost every year on farms to drowning so please take all reasonable steps to secure rainwater collection tanks and slurry pits. Fence off watercourses where children are at risk or grow strong hedges around them to prevent children gaining access to them. For more detailed information click on <http://www.watersafety.ie/home-farm.1/> to safeguard your family and friends when they visit your farm.





# Nature's Web



Download a free and exciting newsletter for children, featuring interesting and informative news on nature and the environment.

[www.naturesweb.ie](http://www.naturesweb.ie)

Produced by Sherkin Island Marine Station

## SHOWCASING A TRULY CAPTIVATING WORLD

### Ireland's Hidden Depths

Explore, with nature photographer and author Paul Kay, the beautiful, intriguing and fascinating creatures that can be found in the shallow waters around Ireland's coast. Available for €13.50 (inc. p&p within Ireland).

Softback · 277 x 227 mm · 160 pp · 200 colour photographs



It can be purchased from:  
**Matt Murphy, Sherkin Island Marine Station,  
 Sherkin Island, Co Cork.**

Website: [www.sherkinmarine.ie](http://www.sherkinmarine.ie)

Email: [info@sherkinmarine.ie](mailto:info@sherkinmarine.ie)

Payment can be arranged via Paypal by sending an email to [info@sherkinmarine.ie](mailto:info@sherkinmarine.ie)

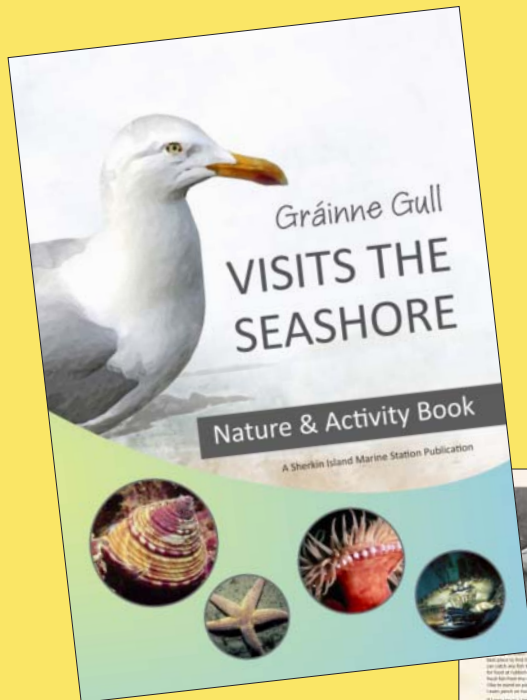
ANSWERS TO 'SEA CLIFF WORDSEARCH' page 29: (Over/Down/Direction) Bird droppings (1,1,E); Birds (2,6,5,E); Colony (9,12,W); Exposed (4,2,5,E); Freshy leaves (1,3,5,E); Fox (3,4, NE); Fulmar (11,7,N,W); Gannet (1,9,N); Gulls (12,5,S); Kidney Vertch (15,13,W); Linear leaves (14,1,S); Low-growing (11,11,N,W); Nest (15,11,W); Otter (7,2,W); Plants (6,11,NE); Predators (1,10,NE); Rock Samphire (13,2,S,W); Sea cliffs (4,14,E); Shag (11,5,W); Strong root (15,10,N); Sun (11,10,E); Thrift (6,15,E); Weather (8,5,S,W); Wind (1,14,N).

## A NEW PUBLICATION:

# Gráinne Gull

## VISITS THE SEASHORE

Nature & Activity Book



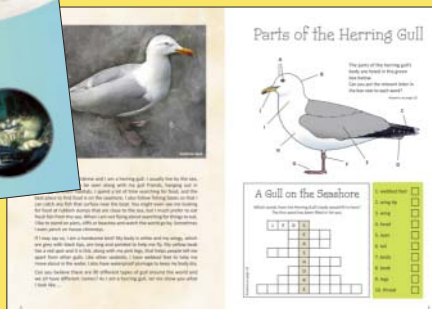
Published by  
**Sherkin Island  
 Marine Station**

In this Nature and Activity Book, join Gráinne Gull as she visits the seashore, and meet some of her friends along the way. Help Gráinne unravel the puzzles that will reveal details about life on the seashore.

Size: 22 cm x 14.5 cm (softback) 32pp. Full colour. ISBN: 978-1-870492-78-2

Available from select bookshops or directly from: Sherkin Island Marine Station, Sherkin Island, Co Cork.. [www.sherkinmarine.ie/publications.htm](http://www.sherkinmarine.ie/publications.htm)

Price: €3.95 plus €2.00 p&p



# Sea Cliffs

SEA CLIFFS are a harsh environment. Subject to pounding waves, high winds and are largely inaccessible. They provide a habitat for only the toughest of animals and plants.

## Plants on Sea Cliffs

Some plants, for example Thrift, are ideally suited for growing on cliff faces. They must be tough enough to withstand the drying out affects of the sun and wind and have a strong root system to hold the plant in place during bad weather. Most plants are low growing to reduce exposure. Some plants can thrive on these cliffs due to the nutrients from the bird droppings. If droppings land on soil they provide the perfect base for new seeds to grow.

## Birds on Sea Cliffs

Cliffs provide a habitat for many birds such as gulls, shags, gannets, auks, fulmars and landbased birds such as ravens and choughs. For seabirds, being this close to the sea means they have a feeding area nearby at all times. Seabirds often form a large group or colony on a cliff face in order to breed. A colony could be made up of anything from five pairs of birds to thousands of pairs. The advantage of being in a large group or colony means that there are many eyes looking out for predators. Steep cliffs will keep away predators like foxes and otters and will also give the birds a good height from which to take off. Being part of a large colony however can be tough as there is added competition for food and space. Unfortunately young birds may also die in these exposed places, either by falling from the nest or by being blown off in bad weather.



## Sea Cliff Wordsearch

Answers on page 28

Find the following words in the wordsearch:

- Bird droppings
- Birds
- Colony
- Exposed
- Fleshy leaves
- Fox
- Fulmar
- Gannet
- Gulls
- Kidney Vetch
- Linear leaves
- Low-growing
- Nest
- Otter
- Plants
- Predators
- Rock Samphire
- Sea cliffs
- Shag
- Strong root
- Sun
- Thrift
- Weather
- Wind

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



Shags, like other seabirds, build their nests on sea cliffs.



Gannets nest on cliffs and rocks in a colony called a gannetry.



When Fulmars are not nesting on the sea cliffs, they are out at sea.



Thrift, or Sea Pink, has a roundish button flower head and small, fleshy linear leaves.



Rock Samphire grows in any rocky crevice. It was once eaten as a vegetable, cooked or pickled.



Like other plants that grow on cliffs, Kidney Vetch is low-growing.



For many reasons cliffs can be very dangerous. They are constantly being worn away by wind, rain and waves and so parts of them may collapse at anytime. You should not climb them, go near the edge, throw things over or sit at the bottom of a cliff.





**A Selection of Winning Entries**

*Sherkin Island Marine Station's*  
**Environmental Competition for Primary School Children in Munster 2019**





# An Insect Hotel

By Jennifer Care

If you have a garden, you have probably noticed lots of different creepy crawlies. Some are pests, such as aphids (e.g. greenfly, which suck sap from plants), but some are useful for your garden. For example, lacewing larvae and ladybirds eat aphids, while all kinds of bees and butterflies help to pollinate plants. Some of these useful critters hibernate over winter and need somewhere suitable to do so. Try and keep them in your garden by building them an "Insect Hotel"! Ask an adult to help.

**You will need ....** A thick wooden box (no lid needed) drilled with holes of various sizes, to allow the insects access to different parts of the box. Alternatively, you could use an old drawer or small wooden pallets stacked on top of each other.

1. Put each of your materials into different compartments of your box, separating them with wooden boards if needed. Pack everything tightly so the insects stay snug. The different materials will attract different insects.
2. Put your insect hotel somewhere sheltered from the wind and rain and off the ground. To keep out the damp, it is enough to stand it on old bricks.
3. Be happy that good garden insects can live in luxury in your "Insect Hotel" for the winter!












These are some of the insects that may take up residence in the "hotel"...

**MATERIALS:**

Twigs, sticks, blocks of wood, a brick with holes in, straw, corrugated cardboard, bamboo canes, dry leaves, bark and more....!

|  |   |   |
|--|---|---|
| <br><b>tree bark</b>  | <br><b>egg boxes</b>         | <br><b>dried leaves</b>            |
| <br><b>pine cones</b> | <br><b>bricks</b>            | <br><b>logs drilled with holes</b> |
| <br><b>twigs</b>      | <br><b>rolled newspapers</b> | <br><b>bamboo</b>                  |
| <br><b>cardboard</b>  | <br><b>straw</b>             |   |

|   |   |   |
|---|---|---|
| <br><b>Earwigs</b><br>Earwigs do not like cold weather and so hide in the soil over winter to stay warm.            | <br><b>Butterflies &amp; Moths</b><br>Most adult butterflies and moths feed on nectar, honeydew or sap.                              | <br><b>Ladybirds</b><br>Ladybirds are flying beetles and are very beneficial to humans because they feed on the greenfly that attack our plants. |
| <br><b>Garden Snails</b><br>The garden snail spends the day resting with other snails, coming out at night to feed. | <br><b>Grasshoppers</b><br>Grasshoppers have very long back legs to help them jump great distances.                                  | <br><b>Spiders</b><br>The spider uses its web to trap flies and other small insects, and then eats them!   |
| <br><b>Centipedes</b><br>The centipede hides in dark places during the day and comes out at night to hunt prey.      | <br><b>Beetles</b><br>Beetles are the largest group of species in the animal kingdom, estimated at around 350,000 species worldwide. | <br><b>Lacewings</b><br>Ladybirds are good to have in the garden as they eat troublesome pests.  |



# Consequence of Global Climate Change

By Grace O'Malley & Michael Ludwig

ONE of the concerns regarding Global Climate Change is that the changing environment will allow a dispersal or increases in diseases currently in the environment. In the late 1990s, a collapse of the American lobster (*Homarus americanus*) led to reducing or even eliminating their market value population in the waters south of Cape Cod; this is related to a major change in range and increase in the occurrence of shell eating bacteria. Although the disease had been reported for decades in chitin shelled species as a relatively minor problem, in lobsters, it rapidly spread from epicentres in Narragansett Bay and Long Island Sound. The disease disfigures the individuals, irritates them, and reduces reproductive success. (Egg bearing females hold their eggs on the shell. Shedding an infected shell abandons those eggs and the "hatch" is lost.)

We have been looking at the consequences of warming oceans temperatures and the occurrence of

shell disease in the American lobster. In the last several decades, there has been a northward shift in the population centre in response to increasing water temperatures and a significant increase in the presence of shell disease in the population that exists in the waters South of Cape Cod. In an attempt to better understand the nature of the disease, a study was designed to track the development and rate of disease spread over the American lobster's shell in a natural setting.

Epizootic Shell Disease is caused by a number of different types of bacteria that infiltrate the American lobster shell, effectually eating it away layer by layer. There are different degrees of severity ranging from mild surface erosion to large holes in the shell. Although a lobster cannot die directly from the disease itself, it can weaken the lobster to the point of exhaustion, ultimately leading to death. This is a large and growing problem for both the underwater ecosystem and for the fishing industry. Lobsters with Shell Disease are usually put back into the ocean, not put up for sale. In recent years, it has become difficult to satisfy the con-

sumer demand for seafood while also maintaining a healthy lobster population. It is crucial to understand that as time has gone by, less and less areas contain the same number, if any, American lobster. Historically, they have lived on the East Coast stretching from Maine all the way down to Southern New Jersey and the Carolinas; however, we now know that the population is shifting. As time continues, the American lobsters are occurring South of Cape Cod in response to rising ocean temperatures. Throughout their range, however, lobsters face a new threat: disease. We believe that the increase in Shell Disease is directly correlated with the warmer environment. Bacteria are able to thrive, making host organisms more susceptible to infection. So, as the American lobster population decreases, it is important that we understand the mechanisms through which the various bacteria behave. To identify these issues, we conducted research to calculate Shell Disease's rate of growth. Our investigation took place in Long Island Sound, where the infection is extremely prevalent. We collected a group of seven lobsters, all infected with Shell Disease, and placed them in a controlled environment. The purpose of the controlled environment being to recreate their natural habitat conditions so that we would not influence the bacteria's growth. It



Above: American lobster (*Homarus americanus*).

Right: Shell disease on an American lobster.



included running sea water from the Sound, which provided a slight current and a new cycle of water approximately 24 times per day. Each day, we recorded salinity, temperature, and dissolved oxygen levels in the tank to make sure that our data was consistent with natural conditions. Four sections of the flowing water tank were provided with shelter for each individual, and food was provided once every other day. Over the course of seven weeks, we collected measurements from two diseased spots per lobster, measuring the growth twice per week. The results were stunning. We found that each spot grew a hundredths of an inch per week (approximately 0.0111in<sup>2</sup> per day). One of our cases was so severe that it caused its mortality at the end of the experiment. These results go to show that Shell Disease bacteria grow quickly and seriously impact the American lobster population. From all seven lobsters, we received a linear growth

pattern, which revealed the speed and severity with which it occurs. The purpose of our investigation was to watch the bacteria consume the shell in the same manner as would normally occur in Long Island Sound; this would reveal the conditions under which Shell Disease was most abundant. In our conclusions, we recognize the consequences of changing environment, and disease; the problems that the marine ecosystem and the fishing industry face. The rising ocean temperatures have imposed a serious problem on the American lobster population and other chitin shelled species as well.

Grace O'Malley and Michael Ludwig, COWI, NA, Milford, CT, USA.



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