SHERKIN COMMENT

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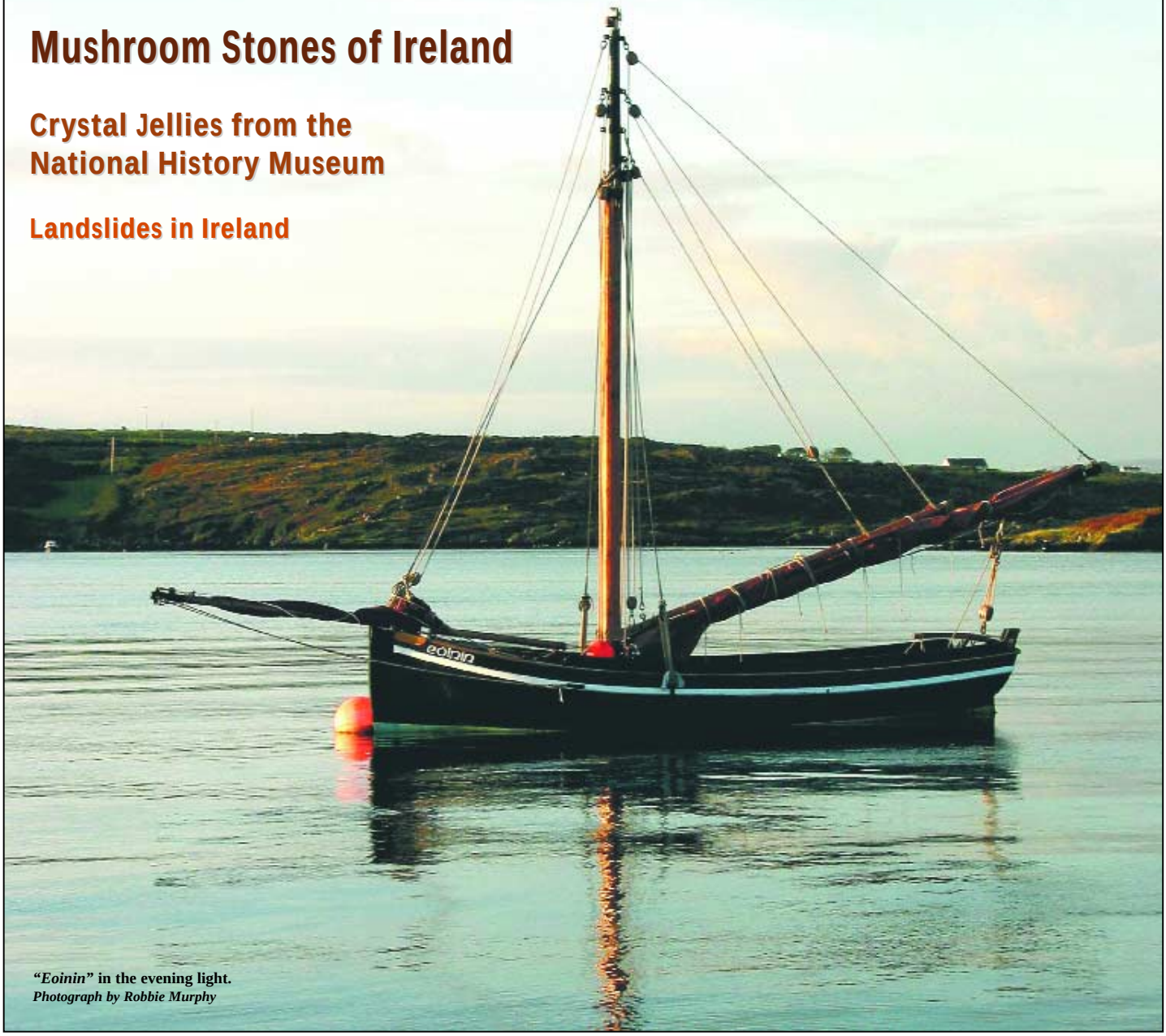
INSIDE



***"Eoinin"* in the evening light.**
Photograph by Robbie Murphy

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A Pastime for Life

By Matt Murphy

DAILY we hear of the heavy drinking and drug taking of young people from an early age. Although adults continue to condemn the conduct, few if any give a solution and the problems continue to get worse. It is not enough to condemn unless positive solutions can be put forward to replace these horrendous "pastimes" of teenagers. I want to put forward positive avenues to which young people could be guided, avenues which would give them a lifetime of enjoyment. I suggest that much of the causes are due to boredom from their main recreation of television and the computer. The human body needs more. It must have exercise. What better than an outdoor hobby.

Let us also not forget the appalling educational system where "points" reign for examinations. So many young people have become slaves to a system which has little or no relevance to their personal development.

Growing up in Cork City I was so fortunate that nature was so close to us, the thousands of mullet in the River Lee at Patrick's Bridge, the hundreds of majestic swans, the Mardyke walk and its beautiful trees and open streams, the Lough where we fished with bent pin and twine. These are but a few of the seeds that blossomed into my love of the outdoors. They were simple days - no computer games, no teenage drinking or drugs, no peer pressures, no junk food! Then we had to walk or cycle to most places. There was no such thing as asking your parents "Will you drive me here or there"? We had to entertain ourselves. Green fields were within a mile of Patrick's Street, north, south, east or west. We got an appreciation of nature because of that simplicity. But where can the children of today get such an appreciation of nature? Cork City, like so many towns and cities, has sprawled into vast areas of countryside. In most cases there is no provision made for the development of parkland. Instead in these modern estates we see open barren green areas, put there to fulfil the planning conditions. City children's exposure to nature is now limited to zoos, aquaria and television programmes. How can our children expect to get an appreciation of the natural world when they are faced with this sort of exposure?

Photos: © Robbie Murphy

Children of today need to be provided with access to peaceful settings such as walks in woodlands, hills, mountains and by rivers.

There must be major change in our thinking on open spaces in these huge developments that are taking place in our towns and cities.

We need parklands where children can walk, play and enjoy nature. By doing this we can give them an appreciation of nature, which in time could become their life long hobby. Much more emphasis must be put on nature in both primary and secondary levels. Of course many will say the cost of such changes will be costly. My question to that is: what will be the healthcare cost of the major problems, such as obesity and stress, which are now facing so many people? There is nothing more soothing than to be at one with nature. Future generations will spend millions of euro unless action is taken to promote the outdoors for recreation. We must provide peaceful settings such as walks in woodlands, hills, mountains and by rivers.

On a personal level, I cannot remember any of my school friends taking alcoholic drink. We seemingly did not need props to enjoy ourselves. We must change the present culture and get teenagers to take to outdoor activities, which would cost a fraction of the outlay for alcohol.

There are many outdoor volunteer organisations that organise events such as birdwatch, hill walking, caving, sailing to name but a few, who with a little financial support could begin the change for the good. We must begin before it is too late. The present problems are vast and will continue to grow unless action is taken.

My final suggestion is that we need more national parks in the country. At present we have four: Killarney, Mayo, Glenveagh in Donegal and Wicklow. Coillte have vast forests. Maybe as a few of these reach maturity and the trees are felled the State, through National Parks and Wildlife, would step in and purchase the land and develop them as places for people to visit and enjoy.

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Little Brosna Callows

By Oscar Merne

MOST of the articles which I have written for *Sherkin Comment* over the years have dealt with birds which are found on Ireland's coast, and with coastal sites important for these species. For a change I have decided to move inland in this article, to the heart of the country, and to one of Ireland's most important wetlands – the Little Brosna Callows. The Little Brosna River, not to be confused with the River Brosna which flows into the River Shannon at Shannon Harbour to the north, is a relatively small river which rises in the low hills west of Shinrone in Co. Offaly. From there it flows south-eastwards towards Roscrea and then makes a dramatic turn northwards to Birr, some 20 kilometres further on. From there it flows north-westwards to meet the River Shannon between Banagher and Portumna. For the last eight kilometres of its course, downstream of New Bridge, the Little Brosna slows down and meanders through a flood plain between eskers and bogs on the north and south sides. This flood plain is known as the Little Brosna Callows, and in winter the area becomes progressively inundated as the Shannon itself floods and backs up into the Little Brosna. The large extent of this flood plain, the relative inaccessibility of large parts of it, and the mix of extensive shallow waters and wet grasslands, make the Callows a magnet for huge numbers of wetland birds. Most of these are migratory species which fly down to Ireland for the winter from their breeding grounds in Greenland, Iceland, Scandinavia and Russia. Our relatively mild winter climate means that even our inland freshwater wetlands seldom freeze over for very long, if at all, and therefore the flocks of waterbirds have continual access to good winter food resources from autumn through to the following spring. Herbivorous and grazing species have an abundance of grasses, water plants and their seeds to feed on, while waders are able to probe the waterlogged soils for worms and other invertebrates.

Three waterbird species regularly occur in winter on the Little Brosna Callows in internationally important numbers, that is in numbers greater than 1% of the entire flyway populations of the species. Up to 500 Greenland White-fronted Geese graze on the callow grasslands and use the adjacent raised bogs as a refuge when disturbed. This flock is one of the largest in Ireland outside the Wexford Slobs (which support one-third of the world population). The species breeds on the tundra in western Greenland and flies to Ireland, via Iceland, for the winter months – from mid-October to mid-April. From Iceland come large flocks of Golden Plover and Black-tailed Godwits – up to 11,000 of the former and up to 3,000 of the latter. Golden Plovers frequently take flight in huge dense clouds, and spend some time whirling and twisting in the sky before dropping down to feed again in the wet grasslands. On the ground the Black-tailed Godwits are rather drab in their brown winter plumage, but when they take flight they display their dramatic black tails and white rumps and their black and white wing patterns.

Nationally important flocks (i.e. with numbers more than 1% of the Irish population) of five additional waterbird species also occur regularly on the Little Brosna Callows. The most numerous of these are Lapwing and Wigeon. In recent years averages of 6,000 of the former and 10,000 of the latter have been recorded, though larger numbers have been recorded in the past. I recall carrying out an aerial census of the site in the 1970s, during a winter when severe conditions in Britain and the Continent had forced exceptional numbers of Lapwings to move west in search of milder conditions here. The count of Lapwings reached the amazing total of 26,000 birds – along with 12,000 Wigeon and 10,000 Golden Plover. Teal, Pintail and Shoveler also occur nowadays in nationally important numbers. Numbers of the last two species seem quite small at 140 and 275 respectively, but nevertheless are more than 1% of the national totals for these species. Many other species of waterbirds also occur at the Little Brosna Callows, including Mute, Whooper and Bewick's Swans, Mallard, Tufted Duck, Dunlin, Snipe, Curlew and Redshank.

When the callows dry out in the spring, and the winter migrants depart, the area has its quiet season. Nevertheless, the west grasslands provide suitable habitat for breeding Lapwing, Snipe, Curlew and Redshank. They also provide a summer home for the now globally threatened Corncrake, which has been virtually exterminated over huge areas of its former range, due to modern intensive agriculture. Places like the Little Brosna Callows, and the nearby Shannon and Suck Callows, continue to be managed in the traditional way and therefore provide a last refuge for these birds.

Because the Little Brosna Callows are so important for birds they have been designated as a Special Protection Area for birds under the EU Birds Directive, and to ensure that the wintering waterfowl are not over-exploited by wildfowlers a major part of the callows are also a statutory wildfowl sanctuary.

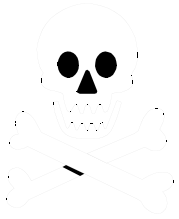
Internationally important numbers of Black tailed Godwits (above) and Golden Plover (below) occur in winter on the Little Brosna Callows.

Photos: © Oscar Merne

One of Ireland's most important wetlands: The Little Brosna River, a relatively small river which rises in the low hills west of Shinrone in Co. Offaly.

Oscar Merne recently retired from the National Parks & Wildlife Service of the Department of the Environment, Heritage and Local Government.

Essential Poisons



By Anthony Toole

OF the 92 naturally occurring chemical elements, less than one-quarter are necessary in our diet. The bulk constituents of our food, carbohydrates and fats, which we eat to provide us with energy, are made up of carbon, hydrogen and oxygen. In addition to these three elements, nitrogen is present in the proteins used to build up the muscle and collagen from which our bodies are constructed.

Calcium and phosphorus are also needed in fairly large quantities, as they are the principal elements in the structures of bones and teeth. The main function of sodium and potassium is in the transmission, along the nerves, of electrical signals from the brain.

Metals such as iron, zinc and magnesium are required in much smaller amounts, and though we need only a few milligrams of these each day, our requirements are still large enough for our diets, sometimes, to be deficient in them.

At the lower end of the scale are a handful of elements that are needed in such tiny amounts that we are never likely to be short of them. Indeed the opposite problem can occur. These elements may be essential for the correct functioning of our bodies, yet if we eat them to even slight excess, they become quite poisonous.

Selenium belongs to the same group, or family, of elements as oxygen, though it bears a stronger resemblance to another family member, sulphur. Discovered in 1817, it is named from the Greek word for the moon.

Our daily requirement of selenium is probably as little as 10 micrograms (millionths of a gram), while a balanced diet, containing reasonable helpings of fish, liver, nuts and bran, probably contains five or six times that amount. In addition, a large reservoir is available in our bones, hair and kidneys, that can be drawn upon in the unlikely event of a shortage in the diet.

Selenium performs several jobs in the body. It provides a measure of protection against high blood pressure, anaemia, arthritis and some forms of cancer. It is a reducing agent, or antioxidant, and as such, helps in the removal of some of the dangerous free radicals formed during the metabolism of food. It also appears to be important in the formation of hormones in the thyroid gland, and may ease some of the effects of iodine deficiency. In addition, it helps protect the body against highly toxic metals like mercury, cadmium, arsenic and lead.

If the daily intake of selenium rises above 450 micrograms, then its toxic nature becomes apparent in symptoms such as hair loss, nerve damage and digestive disorders. A single intake of 5 milligrams would be dangerous and 50 milligrams probably fatal.

Certain plants, like vetches can absorb high concentrations of selenium from the soil. Animals fed on these show erratic behaviour, known as staggers, as a result of selenium poisoning.

If the body does contain excess selenium, then this is excreted through the breath and skin as a foul-smelling methyl selenium compound.

Cobalt is a metal that is essential for the formation of vitamin B12, the lack of which causes pernicious anaemia, in which there are insufficient red blood cells to carry oxygen around the body. As plants have no need for cobalt, animals usually have to eat at least some animal products to obtain enough in their diet. Liver, eggs and oily fish are rich in vitamin B12, though a balanced diet contains more than enough to fulfil requirements. Only vegans, who eat no animal products, are likely to suffer from cobalt deficiency.

Cobalt salts cause dermatitis if applied to the skin, while excess in the diet can cause cancers, as well as damage the heart and thyroid.

Anyone who has seen the film 'Erin Brocovitch' will be aware of the toxic nature of chromium compounds. As well as causing cancers, these can also lead to ulcers on the skin and in the stomach. Yet traces of chromium are needed for the efficient metabolism of glucose, and a lack of the metal can lead to diabetes.

The amount of chromium in the body decreases with age, but food supplements are usually unnecessary, as it is present in common foods such as eggs, nuts, beans and apples. Root vegetables, like potatoes and carrots are able to absorb chromium from the soil.

In terms of the structure of its atoms, molybdenum is a close relative of chromium. It is found in bones, skin, liver and kidneys and can be obtained by eating pork, lamb, eggs and green beans. Fruit contains very little molybdenum. Though the daily requirement may be as low as 50 micrograms, it is present in no fewer than twenty enzymes.

Bacteria in plant roots that convert atmospheric nitrogen into ammonia do so using the enzyme nitrogenase. In animals, another molybdenum-containing enzyme helps in the conversion of nitrogen compounds into uric acid prior to their excretion in urine.

The breakdown of alcohol in the body requires a molybdenum enzyme. People with low levels of this are very easily intoxicated.

Molybdenum begins to become toxic at about 400 micrograms and sustained intake above this level can lead to convulsions and mental retardation and deformities in unborn children.

The purpose of manganese in the body is unclear at present, though it is involved somehow in the operation of vitamin B1 and in the metabolism of glucose. It may also be present in an enzyme that helps prevent the damage to cells caused by free radicals. As manganese is widespread in the soil, and is the 12th most abundant element in the earth's crust, it is unlikely to be lacking in the diet. It becomes toxic at intake levels above 20 milligrams.

Our daily requirements of these trace elements are so tiny that a balanced diet is very unlikely to be deficient in any of them. Dietary supplements rarely do any good, as the excess is generally excreted as surplus to our bodies' needs.

Recently, concern has been expressed that the increasing level of carbon dioxide in the air may have an unforeseen effect. While this could accelerate the growth of plants, and hence increase the quantity of food available, the concentrations of trace elements in this food might correspondingly decrease. This could lead to the anomalous situation where our diet may provide too many calories, but too few minerals, resulting in malnutrition in the midst of plenty.

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Crystal Jellies

Animal models in glass by Leopold and Rudolf Blaschka

By Nigel Monaghan

AS any beachcomber knows, the animals you come across on a beach may be far from attractive out of water – a dried out jellyfish, or a rather aromatic crab. Live animals are much more appealing but how can you bring them into a museum and make them look lifelike? This was the challenge facing Victorian natural history museums. Curators could pick a crab clean and present a dried specimen, but when they popped a soft-bodied animal like a jellyfish into a jar of alcohol, colours quickly faded and the animal flopped to the bottom of the jar in an ungainly heap.

They realised that what you need for many invertebrate animals is a model. Early models in wax were not quite true to life and could not show fine detail. The answer lay in glass. The Museum opened in 1857 as a celebration of the treasures amassed by the Royal Dublin Society during the first century of its activities. It was taken over by the state in 1877 and with the advantage of proper funding, the curators set about improving exhibitions and glass models were high on their list.

Photographer: Noreen O'Callaghan © National Museum of Ireland

White spotted octopus ***Polypus macropus***
Distribution: Atlantic and Pacific

Sea cucumber ***Psolus phantopus***
Distribution: North Sea

Radiolarian ***Aulosphaera elegantissima***
Distribution: Atlantic

They wanted to display a continuum of living things from the mightiest whale to the lowliest plankton. The curators turned to two remarkable model makers – Leopold and Rudolf Blaschka. Leopold Blaschka (1822-1895) came from a family of glass craftsmen who could trace their origins to 15th century Venice. His first models were made while apprenticed to his father in Bohemia. Moving to Dresden in 1863 brought Leopold in contact with the Director of the local natural history museum where he was persuaded to start a sideline from the main work of manufacturing jewellery, scientific apparatus and glass eyes from which the family earned their living. Over the next few years Leopold built a repertoire of over 700 animals in glass that could be chosen from his catalogue, each piece being manufactured only on receipt of an order. He was later joined in the business by his son Rudolf (1857-1939).

The curators of the Natural History Division in what later became known as the National Museum of Ireland ordered their first models in 1878. They were sufficiently impressed to place five orders over the next decade, as and when funding was available. In all some 530 models were purchased, including animals as diverse as jellyfish, slugs, snails, sponges, bivalve shellfish and octopus. Included in these were models of microscopic animals such as the radiolarians, surely among the most complex and masterful of the creations to emerge from the Blaschka workshops.

> *"The value to the zoological curators of this collection derives from the accuracy of the models, in terms of scientific detail, colour and scale."*

The value to the zoological curators of this collection derives from the accuracy of the models, in terms of scientific detail, colour and scale. Leopold and Rudolf achieved this through trial and error, both in the way they researched the animals upon which they based the models and in the manufacturing techniques that were applied.

In Victorian times, only animals of the shallow water beach or rock pool could be watched going about their business. It was to be a century before Jacques Cousteau brought the undersea world to an enraptured audience through the medium of film and his own development of diving using bottled air.

Leopold and Rupert followed the Victorian craze for seashore animals, starting with models based on illustrations in textbooks. This caused the occasional hiccup as when they interpreted a bird's eye view of an anemone as a drawing of the complete animal and manufactured a flat disc instead of a stumpy pillar. Quick to learn, they corrected these early mistakes and started to work directly from animals preserved in alcohol, sent to their inland city from the research station at Naples. Soon afterwards a seawater aquarium was installed in the Blaschka studio and they were able to watch live animals in full colour.

In addition to their scientific accuracy, the Blaschka models are also highly regarded in glass-making circles for their technical skill. Modern glass craftsmen working to create complex laboratory apparatus have described the models as 'supreme examples of glass-making art', praise indeed from those who realise first hand the challenges involved. The museum has the largest Blaschka collection of marine animal models in the world.

Work in the National Museum of Ireland is slowly returning the Blaschka models to their former glory. The collection is being cleaned and researched at present. The project will lead to a complete catalogue and stable collection ready to face another century of public gaze, a fitting tribute to the Blaschkas' art.

Nigel Monaghan, Keeper, Natural History Division, National Museum of Ireland, Merrion Street, Dubin 2.

Anemone ***Evactis artemisia***
Distribution: North Pacific Ocean

Jellyfish ***Lymnorea proboscidea***
Distribution: Atlantic

Slug ***Limax maximus***
Distribution: Ireland

Landslides in Ireland, a soft problem?

By Koenraad Verbruggen

Photos: © ???

The landslide in the Glengad to Pollatomish area on the coast of northwest Mayo.

IRELAND is a geologically very stable country without a serious geohazard problem such as earthquakes, volcanoes, subsidence and landslides. However landslides do occur occasionally and in September and October 2003 two separate landslide events occurred which resulted in structural damage, evacuation of buildings and pollution of watercourses, and attracted national media attention.

The first event occurred in the Glengad to Pollatomish area on the coast of northwest Mayo, on the night of Friday 19th of September. Over 80mm (3 inches) of rain fell in a two-hour period and led to more than 40 individual failures that night on the steep slopes, along more than 5km of ridges. The speed and volume of peat and debris rich water flowing from the hills resulted in extensive damage, as a result of which some 40 families had to be evacuated, at least temporarily, from their homes.

The second event occurred near Derrybrien Co. Galway in the Sliabh Aughty area, one month later on October 16th. This bog slide was quite different in that it was a single flow, initially moving quite slowly, but had a further more accelerated period of movement after heavy rainfall on the 29th. While no families had to be evacuated, peat getting into the streams led to a fish kill and concerns over pollution to fisheries and public water supplies. In both cases the very rarity of such events led to understandable heightened fear among residents of the areas affected.

Both events were a particular type of landslide called a debris flow, specifically resulting from movement of soft water-rich peat material, as bog slides, bog flows or bog bursts. Among the many groups and individuals approached for comment and input at the time of these events was, not reasonably, the Geological Survey of Ireland (GSI). However this same rarity of events means that GSI have no particular expertise in this area and critically no comprehensive national database of such events exists at GSI or anywhere else. Nevertheless expertise in this area exists in Ireland, although it is scattered between different groups and organisations.

> *"The speed and volume of peat and debris rich water flowing from the hills resulted in extensive damage, as a result of which some 40 families had to be evacuated, at least temporarily, from their homes."*

As a response to this the GSI, formed the Irish Landslide Group in January 2004, made up of academic and government experts drawn from the areas of geology, geomorphology, geotechnical engineering, soil science, GIS (Geographic Information Systems) and planning. The aim of the group is; i) to compile a national database of past landslides, ii) to produce a report on Irish landslides, and iii) to examine the feasibility of landslide hazard mapping in Ireland. Since meeting the group has taken on the additional roles of trying to co-ordinate research in this area, as it has been discovered that seven different Institutes of Technology and Universities are now working on Irish landslides. The group will also examine where any findings can be best put to use. Population of the database has come principally from research of literature, media sources and public contact. This has been supplemented by the creation of a web form on the GSI website (www.gsi.ie) in conjunction with NUIG, where people can pass on information they may have on landslides. While setting up a database may sound like an overly scientific response, no recommendations in relation to the issue can be made if one does not know the potential size of the problem!

Although the group has only recently been formed, information has been input to date on 65 landslide localities, some of which have seen up to 18 landslides over time, others such as Glengad with more than 40 failures at one time. In all the database is giving data on over 100 events.

To date the majority of events recorded are bog failures, which is not surprising given our extensive bog cover in upland areas and the nature of bogs, which may be up to 97% water and can flow under certain conditions on relatively shallow slopes. As a result of this when people have asked me if the study of landslides in Ireland is going to be a hard problem the correct answer might be that it is more of a "soft problem".

For further information an excellent reference is the fine book on *The Bogs of Ireland* by John Feehan and Grace O'Donovan, published by UCD Environmental Institute in 1996, which documents over 40 bog bursts recorded in the last hundred years or so. Additional references and information as well as details on the Landslide Group are available at www.gsi.ie.

Koenraad Verbruggen, Geological Survey of Ireland, Beggars Bush, Haddington Road, Dublin 4, Ireland.

Scenes from the landslide which occurred in the Sliabh Aughty area, near Derrybrien, Co. Galway.

Lead and other heavy metals in the Tynagh Mines area, County Galway

By Jane Brogan

"The objective of the investigation was to delineate the extent of the area where elevated heavy metal concentrations exist and to make recommendations, where relevant in relation to the analytical results obtained."

THE Office of Environmental Enforcement Report on the presence of lead and other heavy metals in the Tynagh Mines area, County Galway was published by the Environmental Protection Agency on 17 December 2003. The report presents the finding of the joint investigation of the site by the EPA and Galway County Council, which was conducted in June 2003. The objective of the investigation was to delineate the extent of the area where elevated heavy metal concentrations exist and to make recommendations, where relevant in relation to the analytical results obtained. It is important to note that this report does not deal with the long-term remediation and rehabilitation of the site. The EPA has made a number of recommendations in relation to the site and surrounding area. These recommendations relate to current and future development activities on site, the protection of human health, animal health and the environment.

Background

The Tynagh mine site is located 1.5 km north of the village of Tynagh, Co. Galway. The former mine site covers an area of approximately 115 hectares which is broken up into different sections with the tailings management facility (TMF) covering an area of approximately 48.5 ha. A mining lease was issued in July 1963 and production commenced in 1965 from the open pit and continued from this source until 1972. The production of ore from underground sources commenced from the bottom of the open pit in the early 1970's. Mining ceased in 1982 and the mining lease expired in November 1983.

In response to local human health and environmental concerns and recent sited developments, Galway County Council established the Tynagh Mines Liaison Group to deal with concerns in relation to the entire 115 ha site. The purpose of the group is to facilitate the exchange of information and the promotion of best practice in the Tynagh area, which has high levels of naturally occurring metals and a previous mining history and to apply this information and best practice to protect human health, animal health and the environment. Galway County Council chair the group and is responsible for enforcing environmental legislation within its functional area. The EPA's role is to participate in the Liaison Group and to provide technical assistance to the local authority.

As part of the work of the Tynagh Mines Liaison Group and in light of the need to obtain additional baseline environmental information on the site, the EPA and Galway County Council gave a commitment to undertake an investigation of the site and surrounding area.

Site investigation

This investigation was carried out in June 2003 in consultation with local representatives. Twenty surface water samples, eighteen stream sediment samples, twelve mine waste and twenty two soil samples were taken and analysed for a range of parameters including heavy metals. In addition, the EPA carried out an evaluation of the site in relation to the proposed establishment of a dust deposition-monitoring programme.

Following on from the field sampling and investigation, the EPA undertook a detailed evaluation of the analytical results from the mine site and surrounding area. Having assessed the results, conclusions were drawn and a series of recommendations in relation to the site, the surrounding area, and the protection of human and animal health and the environment were made.

Main conclusions

The main conclusions from the investigation are that the Tynagh mines site is heavily contaminated with heavy metals and in particular lead and zinc. Wastes arising from mining activities are heterogeneous in nature, which makes an assessment of their properties (i.e. mineralogical or leachability) and how they will react to disturbance is very difficult to predict. Proposals for future development of the site should take account of the history of mining activity on the site, the presence of mine wastes and dangerous substances and the potential negative impacts that disturbances to these wastes could have on human and animal health and the environment.

In general surface water quality in the area, as determined during the investigation, particularly at the control sites and downstream of the site is satisfactory and is unlikely to represent a risk to livestock in the area. However, the discharge from the rock waste dump at the south-west boundary of the site had elevated cadmium and zinc concentrations. The stream sediment samples taken during the investigation indicate that the concentration of lead and other relevant metals taken from the control site and downstream of the mine site, other than the Barnacullia stream, are unlikely to pose a risk to livestock who gain access to these watercourses for drinking water purposes. The soil sampling undertaken indicates that while agricultural soils in the Tynagh mine area have heavy metal concentrations greater than normal background concentrations in Ireland, it is unlikely that toxicity problems from lead or other metals will occur in livestock.

Main recommendations

The main recommendations of the report are that unplanned and unauthorised disturbance of mine waste should not take place on the site and Galway County Council must strictly enforce that planning conditions associated with current and future developments at the site. In relation to the protection of human health the report recommends that unauthorised access to the site by the public, and in particular children should be prevented. The report states that where local residents express concerns in relation to potential exposure to lead, the Western Health Board should consider the provision of voluntary screening of blood for lead in children and adults. In relation to the protection of animal health, the report recommends that animal access to the site and sections of the Barnacullia stream should be prevented. Fences surrounding the perimeter of the mine should be stock proof and regularly maintained. Where herdowners in the area express concern in relation to animal health the relevant authorities should offer appropriate testing of animal health. In addition, dredged sediments that have a lead concentration greater than 1000 mg/kgDW should not be spread onto adjacent agricultural land. An alternative safe waste management disposal option will have to be found for these sediments. Finally the report recommends that existing guidance, which is already available on lead and other relevant metals, should be adopted in the Tynagh mines area where relevant.

Photos: © EPA

Photographs of the Tynagh mine site, which is located 1.5 km north of the village of Tynagh, Co. Galway.

Final note

As already stated this report did not deal with the issue of the long-term remediation and rehabilitation of the Tynagh mines site. However, sites such as the Tynagh mine site and other historic mine sites in Ireland which were not rehabilitated when mining operations ceased have the potential to cause on-going damage to the environment including risk to human and animal health in the surrounding areas. There is also the potential that the risks posed by these sites increase with time as large abandoned tailings dumps, rock dumps and underground workings can gradually deteriorate in the absence of remediation and management plans. There is therefore a need to develop a systematic and consistent approach to the investigation and ultimate remediation and rehabilitation of historic mine sites in Ireland so that they will not represent a risk to future generations.

Jane Brogan, Office of Environmental Enforcement, EPA, Johnstown Castle Estate, Wexford.
The report is available for downloading in pdf format from the EPA web site at www.epa.ie.

Beware the Alien Invader along your Watercouse

Photos: © Oscar Merne

The lily pad is one of the flowering plants that make up the majority of the 800 alien plants that have been recorded in Ireland over the past 200 years.

The free-floating fern *Azolla* has the potential to pose a threat to the biota and general utilisation of watercourses, as recently witnessed on the River Barrow Navigation, where it completely carpeted the water surface in a number of canal cuts.

By Joe Caffrey

ACCORDING to Reynolds (2002), alien plants are those that have been introduced into Ireland as a consequence of human activity, whether deliberately or accidentally, and that now grow in the wild. Of the 800 alien plants that have been recorded in Ireland over the past 200 years, the majority are flowering plants. Approximately one third of these aliens are regarded as part of the established Irish flora and are listed in the "Census Catalogue of the Flora of Ireland" (Scannell & Synnott 1987) (Reynolds 2002).

Ireland is replete with watercourses, possessing some 16,000km of main river channel, over 200,000ha of standing water and more than 400km of navigable canal. Many of these watercourses provide ideal conditions for the establishment, growth and proliferation of invasive alien plant species. Of the alien invaders present in Ireland today only a minority are aquatic or riparian plants and, of these, only a small number pose a serious threat to our natural indigenous flora, to amenity use of the waterways or to human health.

Invasive aliens present on our watercourses may be separated into two categories: truly aquatic and riparian. The aquatic species that currently pose a threat, or that are most likely to in the future, include: *Azolla filiculoides* (Water Fern), *Lemna minuta* (Lesser Duckweed), *Myriophyllum aquaticum* (Parrot Feather), *Lagarosiphon major* (Curly Waterweed), *Nymphoides peltata* (Fringed Water Lily), *Elodea nuttallia* (Nutall's Waterweed) and *Crassula helmsii* (New Zealand Pygmyweed). The principal riparian aliens currently invading our watercourse are *Heracleum mantegazzianum* (Giant Hogweed), *Fallopia japonica* (Japanese Knotweed) and *Impatiens glandulifera* (Himalayan Balsam).

What is the current status of these alien plant species in Irish watercourses? It is true to say that the three riparian species listed above are firmly established, are widespread within the country, and are continuing to spread. These could be considered to represent a problem at a national level, as is the case with all three species in the U.K. (Dawson & Holland 1999). Do they pose a threat to our natural biodiversity, plant community integrity, recreational and amenity exploitation, flood defence and even human health? Emphatically, yes! The case study for Giant Hogweed, presented below, will illustrate this point.

In respect of aquatic alien plants, it appears to be a case of – "invasion in progress, watch this space". Few of the species listed above are currently widespread in Irish watercourses, although most have the potential to spread rapidly. In the past few years the free-floating fern *Azolla* has been recorded from a large number of geographically isolated locations in Ireland. Being a free-floating plant, it is easily distributed throughout networked watercourses by flow or wind, without any human or other intervention. An indication of its potential to pose a threat to the biota and general utilisation of watercourses was recently witnessed on the River Barrow Navigation, where *Azolla* completely

carpeted the water surface in a number of canal cuts (see photographs). While the growth in this instance was not sufficient to impede navigation, the complete surface coverage over a period of weeks probably adversely impacted living conditions for submerged plants, associated macro-invertebrates, and fish. The other aquatic species listed above similarly have the potential to destabilise biotic communities and to impact everyday usage of the waterway.

Many of the successful invasive alien plants are opportunists with life cycle traits that enable them to readily colonise new habitats and to rapidly establish large, often mono-dominant stands. The large biomass produced by these aggressive aliens overgrows and, commonly, competitively excludes the resident indigenous flora. One distinct advantage that these successful aliens have over many of our native species is the variety of dispersal mechanisms available to them. Many spread by seeds or spores, producing very large numbers of propagules that are easily dispersed and are often long-lived. More of these species spread by fragmentation, where even very small stem or root segments are viable and capable of producing new colonies. Others are small and free-floating plants that are easily moved from one waterbody to another by birds, animals or humans (e.g. anglers, boating enthusiasts, during waterways maintenance operations). It is clear that the extensive network of river and canal corridors in Ireland provides a ready passage for seeds and propagules, ensuring their widespread distribution within catchments.

Once established at a site these aggressive aliens can present significant problems for the native biota and for general water use. Potential problems include:

- reduced biodiversity among the less robust indigenous flora;
- reduced biodiversity among macroinvertebrate/insect species commonly associated with this flora;
- altered aquatic habitat that may impact on fish spawning and fry survival;
- potential fish kills where plants totally overgrow/carpet waterways (e.g. *Azolla*);
- increased bankside erosion where native herbaceous flora is eliminated;
- impacted amenity use where watercourse is clogged with weed or where banksides are totally overgrown;
- impacted waterways management and reduced flood control;
- threat to human health (e.g. Giant Hogweed).

Most of the invasive alien plants currently inhabiting our aquatic and riparian habitats originated in garden centres. A small number were brought into the country as ornamentals (e.g. Giant Hogweed). Many of the aquatic aliens are actively (and irresponsibly) sold, as oxygenators or attractive extras, to people with garden ponds or aquaria. When these plants overgrow their new, restricted habitat they are often removed and 'dumped' into the nearest watercourse (pond, ditch, river, canal or lake). Here, if conditions suit, the alien will establish and spread. Ignorance or lack of awareness of the potentially devastating ecological, social and economic implications of importing and selling such potentially invasive alien plant species must be redressed. The introduction of an inspection protocol at airports and ports, in addition to the implementation of a strict code of practice for commercial garden centres, is strongly recommended. Furthermore, there is a need for permanent legislative control to limit the sale of invasive plant species from garden centres.

Giant Hogweed

Giant Hogweed is an invasive perennial plant that has significantly increased its geographical range in Ireland in recent years. The plant is easily recognised by its enormous size: its large leaves are up to 2m wide and its flowering stem can reach heights of over 4m. It was introduced as an ornamental during the late 19th century and is now well established in many river catchments.

The uncontrolled spread of this invasive alien in Ireland, and throughout Continental Europe, poses a serious threat to human health and to the ecology of infested habitats. The plant produces a phototoxic sap, which causes painful blistering (see photograph) when it comes in contact with the skin, particularly in the presence of sunlight. The sap can permanently impair the skin's ability to protect itself against harmful UV radiation. In addition to the human health hazard, dense populations of the tall, leafy plant can suppress and ultimately exclude indigenous herbaceous plant species. This reduces biodiversity and can destabilise the riverbanks.

Giant Hogweed reproduces entirely by seed and each plant can produce up to 60,000 viable seeds (Caffrey 2001). Control measures applied before flowering and seed set will limit recruitment to subsequent generations and ultimately deplete the seed reserve. Results from exhaustive trials conducted in Ireland and Europe have demonstrated the plants susceptibility to the herbicide glyphosate (cleared for use in or near watercourses). Using the information gathered from extensive research with Giant Hogweed the author developed a protocol, using glyphosate, for the long-term control of the plant (Caffrey 1999). This was tested by the Office of Public Works on the Mulkear River catchment, with excellent results. Its broader application to Giant Hogweed populations in other river catchments is strongly urged.

Giant Hogweed is an invasive perennial plant and its uncontrolled spread in Ireland poses a serious threat to human health as the plant produces a phototoxic sap which cases painful blistering when it comes in contact with the skin.

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Seafood Availability

By Michael Ludwig

WE try to sustain the desired number of fish by balancing harvest rate with reproduction rate. Many times the full extent of that relationship goes unnoticed or isn't fully appreciated because it has both negative and positive aspects and is influenced by human and natural events. In some places, the disruption of any event or even the loss of a member of a food web community has caused unexpected results and events. The harvesting of the American or northern lobster (*Homarus americanus*) is such a case. Its story could fill, easily, this space but the last three decades of harvesting of them from the western portion of Long Island Sound (LIS), bear special attention.

Beginning in the mid-1970s, American lobster landings from LIS began to change. As the number of traps being used increased, the average size of the lobsters decreased, as expected, but the number of harvestable individuals increased, unexpectedly. Resource managers were confounded by this situation. How could more harvesting stimulate more lobsters? There is no definitive answer, but one of the most interesting explanations is that increasing the number of lobster traps created more shelter opportunities by the space beneath each trap (habitat) and the bait in each trap (food) supported their proliferation. (Video of lobster activity at traps reveals they enter and exit at will and only about six percent of the individuals entering a trap are actually caught!) Whatever the cause for the increase in lobster population, the trend continued into the late 1990's.

In mid August of 1999 the good times ended. Rumours of lobster problems started, first in the Connecticut portion of western LIS but quickly spreading to include New York waters. The rumour was that the number of dead lobsters in the traps was unusually high and increasing and the live lobsters taken from the traps did not "travel" well. In fact, they were dying before they could be brought ashore, well before they reached the marketplace. By September, lobster dealers refused to purchase western LIS lobsters.

Lobsters must shed their shell to accommodate growth. By the time they reach legal size they have been shedding two or more times a year for five to ten years. (A "legal" sized lobster is five to ten years old.) The shedding process is stressful and some lobsters die during the event. Mid August through mid October is one shedding period for the LIS population and we expect to see dead lobsters in traps. But this dieoff was virtually total, continued into the fall and expanded to affect more than half of LIS. Landings crashed from a high for all of LIS of more than 11 million pounds (lbs.) in 1997 to less than 2.5 million lbs. today. A typical fisherman who caught about 23 pounds of saleable lobsters per trap per year in 1985-1986, today, after almost a 50 percent reduction in the number of traps being used, may catch 7 or 8 pounds per trap per year. That is almost a 90 percent reduction in the catch!

Why did the dieoff occur? While everything from oxygen depletion to pesticides and an infectious disease of lobsters are under investigation in more than 24 coordinated research efforts, there is no obvious smoking gun cause. The 2003 harvestable population is less than ten percent what it was in 1998 but the number of small lobsters seems to be slowly increasing.

Lobsters are doing their part to recover by mating in somewhat higher numbers. And, the prognosis for recovery is positive. However, the very things that made those LIS lobsters a special group are now conspiring, to limit their rate of recovery. This may be caused by a genetic characteristic that in good times was a good trait. We expect that populations expand to fill available habitat (think of it as urban "sprawl".) Unfortunately, the LIS lobsters do not appear to be sprawling or migrating from more populated areas into the empty habitat of western LIS. Lobsters are cannibals (they will eat each other). Limiting movement, contact and predation opportunities increases the chances of survival for individuals. But, a lack of migration restricts the influx of individuals and makes it difficult for males to find females. And fewer lobster traps means less food and shelter.

There are some continuing water quality, habitat and food availability issues, but the fact that the lowly lobster takes five to ten years to grow to harvestable size seems to be the biggest problem. IF recovery started in 2000, we may see some improvement in harvests starting in 2007. But if you are a fisherman waiting for the recovery, eight years is a long time. Payments on the boat and gear, the home and even the cable television are not going to wait. For those who don't rely on the sea, the next time you have a seafood meal think about the variables that influence the likelihood that what you want will be on the menu.

Michael Ludwig, NOAA/NMFS, Milford, Connecticut 06460-6499, USA.

Botanical Relics of an Older Community Life

By John Akeroyd

Photos: © Robbie Murphy

Franciscan Abbey, Sherkin Island, Co Cork: Old ruins often support an interesting flora of medicinal and other useful plants.

I'VE always been interested in weeds, those opportunists that thrive on or around cultivation and other human activity. An important group of these plants of open or disturbed ground is ruderals, literally rubbish plants (Latin: *ruderalis* = 'among rubbish'). Most of these are not as hardy or aggressive as the weeds of cultivated land, and a number have decreased over the last century or so. A pity, for ruderals are a living history of medicinal and other valuable plants. Their worst enemy is improved road-verges and general tidiness – and so I fear for their survival in modern Ireland!

Ruderals, including old medicinal plants, are still a feature of the islands of Roaringwater Bay, one reason why the area's flora is so important. For example, Elecampane (*Inula helenium*), a handsome reminder of our herbal past, is locally a feature of roadsides and ruins. A robust, hairy, rather stately plant with spear-shaped basal leaves, it has erect leafy stems up to nearly 2 m tall topped by loose clusters of striking yellow daisy-flowers 5–8 cm across. It is a native of SE Europe to Central Asia that has been widely introduced elsewhere as a remedy for coughs and chest complaints, also skin diseases in people and animals. Elecampane was mentioned in the work of Dioscorides, a Greek doctor and herbalist who served in the 1st century Roman army, and Ibn Bassal, who tended the Sultan of Toledo's garden in 11th century Arab-ruled Spain.

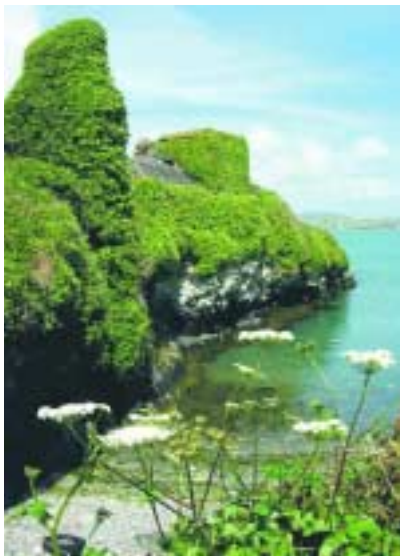
Marsh Mallow (*Althaea officinalis*), another remedy for coughs and sore throats (Latin: *officinalis* = 'from the druggist's shop') is even more striking, and rarer. Growing to 1.5 m tall, it forms patches conspicuous at a distance by the softly hairy leaves and clusters of pale pink flowers, like a miniature hollyhock. The plant occurs here and there on Cape Clear and has long been known on Sherkin. In the 1990s we thought we had lost it from Sherkin, but two vigorous stands have turned up – and are spreading – near to the sandy isthmus at Silver Strand. The roots, rich in starch, sugar, oil and mucilage, a mix which sets as a gel when added to water, were the source of the original marshmallow sweet (now made commercially from starch, sugar and gelatine). The mucilage in the roots and leaves helps soothe a bad throat, but the plant was regarded as something of a cure-all.

Two other ruderals, both associated with medieval ruins on Sherkin, are both medicinal and culinary. Parsley (*Petroselinum crispum*) – the flat-leaved wild form made popular by Mediterranean cooking – was introduced to Britain and Ireland in the 16th century. The flavorsome leaves are said to alleviate indigestion, wind and water-retention. It was recorded on the walls of Sherkin Castle by R.A. Phillips, a talented amateur botanist from Cork, during the 1890s; and Oleg Polunin recorded it in the early 1950s. It still thrives there. Nearby, and beside the Friary ruins, grows a larger member of the same family (parsley, carrots and hogweed), Alexanders (*Smyrnium olusatrum*), reputedly brought from the Mediterranean by returning medieval Crusaders. The shiny compound leaves and domed heads of yellow flowers are unmistakable in spring, but most visitors see only branched dead stems and black fruits. In West Cork it usually grows around older ruins. Parsley in Ireland is also most often associated with ruins: there is a good growth of it on the sides of the Rock of Cashel in Tipperary.

It's been said that almost any plant associated with human habitation, from medicinal herbs to nettles, has some history of use, often hard to imagine today. In Romania, plants such as Elecampane and Marsh Mallow belong within a characteristic assemblage of village weeds dominated by burdocks. Villagers traditionally wrapped spiky burdock fruit-clusters or 'burs' around the hempen strings on which they suspended cured hams. Burdock (*Arctium minus*) is common enough around old buildings in Roaringwater Bay – perhaps it was employed here in the same way. So give ruderals a thought: who knows why some of them are there!

Dr John Akeroyd has been working on botanical surveys at Sherkin Island Marine Station since 1990.

Alexanders (*Smyrnium olusatrum*), which was reputedly brought from the Mediterranean by returning medieval Crusaders.



Hogweed (*Heracleum sphondylium*) growing near Dun na Long Castle on Sherkin Island, Co. Cork.

Parsley (*Petroselinum crispum*) - the flat-leaved wild form made popular by Mediterranean cooking - is said to alleviate indigestion, wind and water-retention.

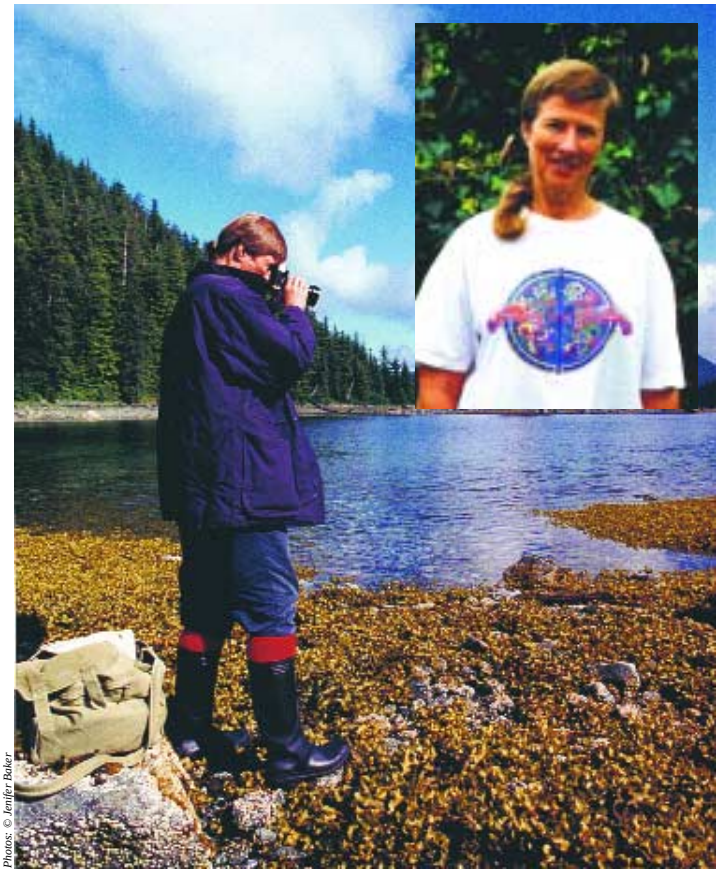
Learning to Read Nature

By Jenifer Baker

AS a contributor to *Sherkin Comment*, and having enjoyed many visits to Sherkin Island Marine Station between 1975 and the present, Matt Murphy has now asked me to say something about myself.

I was a country child, roaming around freely, climbing trees, and learning the names of plants from my mother. Later, I went on field courses organised by my secondary school, joined the local Naturalists' Society and started learning how to read Nature. Specifically, as a teenager I helped with a number of surveys which opened my eyes to what plants can tell us about soil conditions such as acidity, nutrients and drainage. This influenced my choice of degree course (botany with subsidiary geology and chemistry) at Bristol University. After graduating, and following two and a half years as a volunteer biology teacher with International Voluntary Service in Botswana, I did a research degree (University College, Swansea) on oil pollution effects and clean-up methods. This was in the wake of the "Torrey Canyon" – first of the supertanker accidents, and it led to a career dealing with oil-industry related problems. Not that this was the original intention, but it just so happened that problems with ships, or pipelines, or refinery effluents, kept turning up. Twenty years of this experience was with the UK Field Studies Council, and ten years was as a self-employed consultant, based in Shropshire where I continue to live. During this professional career I worked all over the world, not least in Bantry Bay on several occasions. That was how I first came to meet the Murphy family, and discover with Matt a common interest in learning to read Nature in the context of shore life.

Much of my work has involved surveys and advice following oil spills. A particularly interesting case was the well-publicised 'Exxon Valdez' spill in Prince William Sound, Alaska (see *Sherkin Comment* number 31). Then there has been long-term monitoring. Sometimes this is to assess ecological recovery rates of spill sites, so that we have a better idea of how long natural recovery will take in a wide range of different conditions. This knowledge is necessary if we are to make informed predictions in the aftermath of a new spill, in order to judge whether intervention in the form of clean-up and rehabilitation is necessary. Spill sites may recover naturally in time scales ranging from less than 1 to 30+ years depending upon circumstances (neither I nor anyone else has so far been around long enough to see what natural recovery times are for the worst cases). One of the slowest-recovering sites I have been involved with is a salt-marsh in the Strait of Magellan in southernmost Chile (see *Sherkin Comment* number 30). A second type of long-term monitoring is to check on effluent discharge areas, to make sure that agreed environmental quality standards are being maintained. A third type is measuring long-term natural fluctuations and trends in the abundance and distribution of species, to provide a framework for interpreting whether perceived industrial effects are significant or not. Sherkin Island Marine Station has of course been the base for a great deal of this type of monitoring – it's another way of learning to read Nature. Finally, my work has included field experiments to assess clean-up methods; rehabilitation of spill sites; sensitivity mapping for oil spill contingency planning; and environmental impact assessments for new developments.



Photos: © Jenifer Baker

Jenifer Baker on a field trip in Prince William Sound, Alaska. (Inset photograph courtesy of Marjorie Climo)

Learning to read Nature has now taken another turn. Having lived for many years with a growing feeling that concern and responsibility for the environment is a manifestation of something wider and deeper, I'm now a theological student on a multi-faith degree programme. Complementing revelation (the traditional foundation for knowledge of God), there is 'natural theology', which may be defined as searching for knowledge of God by the exercise of reason and the observation of the world. In marine biology, as in numerous other disciplines, we encounter rationality and beauty. C.S. Lewis said that 'unless all that we take to be knowledge is an illusion, we must hold that in thinking we are not reading rationality into an irrational universe, but responding to a rationality with which the universe has always been saturated'. Paul Dirac, one of the founding fathers of quantum theory, spent his life looking for beautiful equations because, time and time again, they turned out to be the ones that describe the physical world. In other words, learning to read Nature is a response to the beauty and the rationality of the creation.

"I was a country child, roaming around freely, climbing trees, and learning the names of plants from my mother."

Dr Jenifer Baker has worked all round the world as an environmental scientist specialising in oil spill response, and is currently a theological student.

Oil Pollution and Seabirds

Environment Canada scientists indicate that in the vicinity of 300,000 seabirds die each year on Canada's Atlantic Coast from oil releases.

Photos: © Environment Canada

Oil destroys a bird's "raincoat" by clogging the barbs and barbules, allowing cold water to soak into the insulating down and reach the skin.

OIL and birds do not mix. The wrecked super-tanker, spewing a black tide of oil, has become a powerful symbol of ocean pollution, and of our destruction of the natural environment. So have the seabirds that strand on the beach, black with oil.

Oil kills birds in many ways. Its first effect is to break down the birds' waterproofing. Water runs off a seabird's back because the bird is protected by a layer of feathers, overlapping like the tiles on a roof. The fine structure of the feathers makes them waterproof. The separate strands, or barbs, in each feather are bound together by rows of tiny hooks, or barbules, into a tight weave, like a raincoat of Gortex™ cloth that water cannot penetrate. Underneath is a layer of insulating downy feathers that allows the bird's skin to stay warm and dry. But it takes very little to disturb these intricate arrangements. A bird spends much of its leisure nibbling at its feathers, cleaning off any specks of dirt and re-hooking the barbules. This preening keeps the feathers supple and waterproof.

More oil enters the oceans from ships that deliberately release oily wastes than from the well-publicised accidents.

Oil destroys a bird's "raincoat" by clogging the barbs and barbules, allowing cold water to soak into the insulating down and reach the skin. If a seabird comes in contact with even a small amount of oil the damage to its protective plumage can be sufficient to kill it. The bird's immediate response is to preen itself, trying to restore the feathers' waterproofing. As it preens, it inhales and swallows toxic compounds in the oil that damage its liver, lungs, kidneys, intestines, and other internal organs. This poisoning can kill a seabird, but it is slower to take effect, and in the cold waters around the coasts of Canada hypothermia is usually the cause of death.

Oil spills may result from accidental ship collisions or groundings. These are newsworthy events that can release large volumes of oil into the environment, and these releases may result in the deaths of large numbers of water-birds. For instance, when the Exxon Valdez went aground in Alaska in 1989 more than 30,000 dead birds were recovered, though it is estimated that the spill actually killed more than 300,000 birds. But more oil enters the oceans from ships that deliberately release oily wastes than from the well-publicised accidents. It is illegal, but many ships release waste oils from their bilges to save the cost of pumping this oily waste in tanks on shore when they reach port. This is referred to as chronic oil pollution. Environment Canada scientists indicate that in the vicinity of 300,000 seabirds die each year on Canada's Atlantic Coast from oil releases.

We are aware of this intentional pollution because some of the birds killed by bilge oil discharges wash ashore. Studies have shown that 74% of the dead birds recovered from the beaches of southern Newfoundland between 1994 and 1999 had been killed by oil.

One obvious solution is to bring the polluter to court and make the guilty parties pay for the damage. But this is not as simple as it sounds. The Canadian government searches for illegal oil dumpers with pollution patrol aircraft on both the Pacific and Atlantic coasts, but the area of Canada's Exclusive Economic Zone (EEZ) which extends to 200 nautical miles off our coasts, is huge, and is very costly to patrol. In the past, even when ships were caught releasing oily waste, fines were small and didn't provide a sufficient deterrent. Today, fines imposed by the courts have increased greatly, but it is still difficult to catch ships in the act of illegally releasing oily wastes. To catch these ships Canada is investigating the use of satellite technology. RADARSAT, a satellite which uses radar to detect oil on the water, can view a large ocean surface. If a sea surface anomaly is detected and the interpretation officer suspects it to be oil, a patrol aircraft may be dispatched to confirm the presence of oil on the water and to determine what ships are in the area.

In an effort to reduce chronic oil pollution Environment Canada, the Canadian Coast-Guard, and Transport Canada launched several programs to try to educate ships' crews to the damage done by oil releases. Ships crews are given a multilingual brochure, showing where seabirds are most vulnerable, and emphasises that every oil spill, however small, is a potential hazard. However, many of the ships that are responsible for chronic oil pollution of Canada's seas do not even enter our ports, they are passing through our waters on the way from one foreign port to another.

Environment Canada will continue to work with its partners in Canadian Coast Guard, and Transport Canada and with international partners to reduce illegal oil releases in Canadian Waters.

In an effort to reduce chronic oil pollution Environment Canada, the Canadian Coast-Guard, and Transport Canada launched several programs to try to educate ships' crews to the damage done by oil releases.

Visit the marine pollution site for Environment Canada at www.marinepollution.gc.ca

In Steam and On the Move

All Ready to go! Line up of traction engines.

By Daphne Pochin Mould

"COME in and buy what your grandmother threw out" is a sign in an antique shop window. But it goes further: seek out and buy what grandad left to rust or sold cheap for scrap. Clean, repair, restore, grease, paint and then light the boiler fire. Watch steam pressure build, and then, with a piercing whistle, move ponderously off to parade your beloved at the Steam Rally and compare and discuss the engines. It used to be said that all boys wanted to be engine drivers and command the great, sleek beasts that hauled the fast passenger trains. Today, diesel railway engines have lost that appeal as boys of all ages, and some girls as well, have again fallen under the spell of live steam. There is a "Queen of Steam" title to win!

Surviving old engines are found and got going again, and the interest seems world wide. Portable steam engines, road rollers, traction engines, steam lorries and some of the very few ever made steam private cars, gather for rallies and road runs. Or appear, one or more, at local agricultural shows, old time threshing displays – for which they provide the power – and at various vintage displays and so on. Another world from today's high tech, computerised car engines with their power assisted controls and the new style tractors with enclosed cabs and all weather comfort. The old 19th and early 20th century steam engines are heavy, massive, dirty and open to all weather. With no power assisted or "drive by wire" steering, the little steering wheel hauls on a massive chain attached to the front axle. You do an endless (or so it seems) number of turns to get the machine to change course, and you do it with muscle power alone. Working these engines day in, day out, was hard work.

In Ireland, the first National Steam Traction Engine Rally was held at Stradbally, Co. Laois. It was a small but very representative line up of engines. On August 6th 1967, Noel Purcell, the well-known actor performed the opening ceremony from a 1920 Foster traction engine. There were portables – two Marshalls – from 1897 and 1895, a Sentinel steamwagon of 1932 and a Fowler compound traction engine, Pride of Kilkenny, dating from 1936. Also attending was a big road roller that had come all the way from Killumney in Co. Cork, and which was owned by the late (and much missed) Jimmy Walsh. He had earlier restored a very early Titan tractor. Since that day, Stradbally has been an annual August weekend event. Soon after, the Rosminian Fathers in Upton, Co. Cork near Innishannon, started a steam rally and this too became an annual event and, like Stradbally, grew ever bigger. When the Rosminians gave up the Rally, it was taken over by a very active local committee, who have raised it to new heights and a new location – still close to Innishannon. Each June weekend they raise a very considerable amount of money for cancer research and treatment.

There are not only steam engines at these events now. Included are long lines of vintage tractors, cars, veteran, vintage, classic, military vehicles, old fire engines, small oil engines that once generated electricity or pumped water, and tools, horse gear, and a fun fair. Stradbally has a miniature steam railway, which runs at various times during the year.

This year Innishannon Steam Rally was on June 6th and 7th, with Stradbally on 1st and 2nd August – the Irish Steam Preservation Society is the organiser.

Portable steam engines are simply a steam engine mounted on wheels and hauled by a team of horses to wherever its power is needed. By way of a belt drive, it could power a threshing machine, a wood saw, or whatever. A.G. Street in his book on English farming before and after World War I ("Farmers' Glory", 1932) told how the "hideous tractor" was replacing the horse and how he bought one such to replace their old portable steam engine. The men laughed at the mere idea that this "little pooper", looking like a toy against the massive iron monster, could ever do its work. But the "little pooper" ran that threshing machine faster than it had ever gone before, and the men were very hard pressed to keep up with it.

" It used to be said that all boys wanted to be engine drivers and command the great, sleek beasts that hauled the fast passenger trains. Today, diesel railway engines have lost that appeal as boys of all ages, and some girls as well, have again fallen under the spell of live steam."

The steam traction engine was self-propelled and, albeit slowly, travelled the roads. It could haul heavy loads, provide power via belt drive where needed. Some had a winch and cable fitted underneath. Steam traction engines even ploughed, and in England today there is a Steam Plough Club where they arrange demonstrations to keep the memory and the method alive. You have two powerful traction engines, each with a winch and an extra long steel cable, parked on opposite sides of the field to be ploughed. A special plough outfit is attached to the cables and hauled back and forth across the ground. It is much quicker than horse ploughing but easily outpaced by the modern tractor! Many traction engines have been given names: two steam ploughing ones that still exist in England are called "Giant Panther" and "Giant Tiger". Some have regional names, the "Owenbue Rambler" of Ballinhassig in the valley of that river in Co. Cork. Another carried the name "Lily" (perhaps a girlfriend, wife, daughter?). A 1910 Clayton and Shuttleworth engine carried Noreen Lynch to win the first Queen of Steam title in 1970, and is named "Betty's Pride". It appeared in the film "Ryan's Daughter", and was on show at Upton's first rally in 1970.

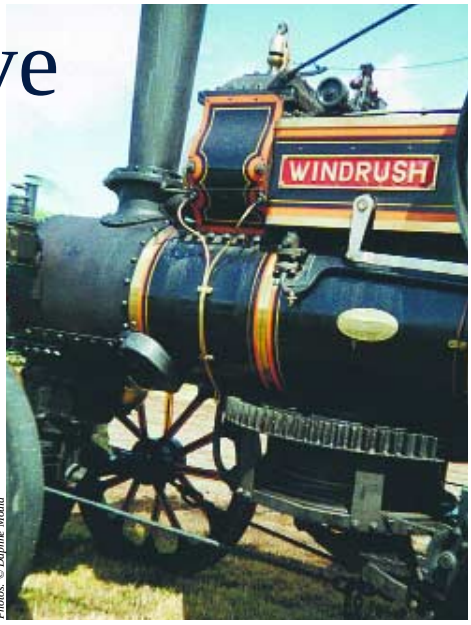
Then there are the mighty steam rollers that made our roads smooth, whose crushing power has passed into ordinary speech, to "steam roll" over some one or thing. Once they were at work on every road, and then suddenly as it always seemed to me, they were gone and a little diesel was doing their work.

In Iceland, Reykjavik in the 1900's was very small (today it is gleaming, smoke free – all energy is geothermal including home heating – and adorned with flowers and trees). The little town streets needed urgent attention so a steam roller was bought. It was made by Averling & Porter in England and arrived in Iceland in 1912. Like all steam rollers, it worked on and on for years and years, and was called "Briet" after a lady. Still in working order, it is carefully preserved in the transport section of Iceland's great folk museum, Arbaer, in Reykjavik.

But the glamour girl of all these old engines is the huge, gaily painted, all gleaming brass, Showman's engine, which hauled a train of amusements from town to town. It powered them on site, generating electricity from its dynamo. For me, as a child in England, the big event of the year was the agricultural show and the ride on the "Gallopers" – the roundabout. They were wonderful prancing wooden horses, going round and round and up and down, whilst centrally little figures made believe to bang drums, clash cymbals, blow trumpets, and the steam organ poured out its glorious music. Was there ever such sound anywhere else outside of heaven? I recall too when that great blare and bellow was replaced by records and amplifiers – a miserable whine. Happily, some gallopers survive and are being cared for, others have been rescued and restored.

And steam organs too can be seen and heard again today at steam rallies. The perforated sheets from which they play their music have been found, restored and recut. Listen and love!

Over in Britain, interest in steam is very considerable and there are steam events taking place at many places all through the year. In West Cork last year, I met enthusiasts who had been to the Great Dorset Steam Fair (1st to 5th September 2004) which is held near Blandford in Dorset. They planned to go again (you'd need to allow several days to it). Last year, the Great Dorest had 230 steam engines on parade and 250 old tractors as well as cars, trucks, fairground rides, heavy horses, and 130 organs. Live steam, these days, is very much alive.



Photos: © Daphne Mould

Traction engine with a winch fitted.

A showman's engine passes a fine example of a portable engine.

Steam on the road: Traction engine towing trailer and worker's green living van, in Kilgarvan, Co. Cork.

Two engines over from England for the Innishannon Steam Rally in 2003.

The Flow Country of Scotland

Rosie Solbé

THE Flow Country is an area of blanket bog covering most of Caithness and Sutherland in Northern Scotland. It is the largest area of blanket bog in Europe, possibly in the world. At first sight it appears rather desolate, windswept and somewhat barren, but this is a conservation area of international importance. In 1971 conservationists from all over the world met in Ramsar in Iran to consider the problem of loss of wetlands throughout the world as these are drained to provide farmland. A wetland is defined as:

"An area of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary with water that is static or flowing, fresh, brackish or salt, the depth of which at low tide does not exceed 6m".

At the end of the conference a list was compiled including eight criteria for plants and birds on wetlands. If a site satisfied any one of these criteria it would be considered to be of International Conservation Importance. Uniquely in the world, the Flow Country satisfied all eight criteria.

The Flow Country has a cool, wet climate so when plants die they decay very slowly as the temperatures are too low to allow rapid bacterial action. This results in the gradual build-up of peat, and a landscape which has remained virtually unchanged for at least the last 4 000 years. The Flow Country escaped the removal of the peat deposits seen in Ireland where the peat was cut for fuel or on the Somerset Levels where it has been marketed for horticulture. The financial return on horticultural peat, and the distance from the market made the commercial exploitation of peat from the Flow Country uneconomic. There is limited use of the peat by the individual scattered households for domestic fuel and by distillery companies who cut small quantities to smoke the malting barley to give whisky its smoky finish. Although the distillery companies cut infrequently, the scars left by their activity remain for many years as the rate of regeneration of the peat is very low.

The Flow Country consists of interconnected bodies of water called *lochans* with areas of drier, but still very boggy land in between. This made it impossible to farm the land. A few sheep and cattle graze the higher ground but most of the area was used for shooting red deer and grouse and for salmon fishing. This remained the case until the invention of the boat plough. As a result of this it has been possible, for the first time, to work the land. First the Forestry Commission then private forestry companies, such as Fountain Forestry, started a programme of tree planting in the 1980s. The UK imports £5 billion worth of timber each year and the highlands need jobs. Forestry – either in planting and harvesting the trees or work in the sawmills – has provided 5000 new jobs in the area. In the 1980s the UK government gave tax incentives to people who were willing to invest in what, on the face of it, was a valuable project. However the Royal Society for the Protection of Birds (RSPB) soon noticed an alarming decrease in the bird population in the planted areas. They alerted the (then) Nature Conservancy Council who carried out an extensive survey and found that damage was being done. Tax incentives therefore are no longer given for tree planting in the Flow Country.

The Forestry companies say that they have only planted on 15% of the Flows – but the lochans are interconnected so drainage in one area will lower the water level throughout. They claim that they are adding new habitats and increasing the diversity of species – but the incoming birds are garden species, and these are not a substitute for the wetland birds typical of the area. The forestry companies suggest that trees grow naturally here; that is not so, at least for the flat areas of the Flows, although there is evidence of tree growth in the 1st millennium A.D when the climate was warmer and drier than it is now. Scots pine (*Pinus sylvestris*) grows, but on the well-drained slopes and this is a native tree. Plantations are of lodge-pole pine (*Pinus contorta*), Sitka spruce (*Picea sitchensis*) and Douglas fir (*Pseudotsuga menzieseii*) which are not native species. These plantations are of densely packed trees through which light cannot penetrate. The soil dries and becomes acid and no plant can grow beneath the trees. High wire fences have to be erected to keep out red deer which can damage the plantations by eating the leaves and the bark of the trees. The caterpillars of the pine beauty moth (*Pannolis flammea*) can also do extensive damage in these closely packed, monoculture plantations, completely defoliating and killing young trees. Where trees are planted in less-well drained area the roots rot or the trees, having little anchorage, are thrown by wind. These hazards make forestry, even with tax allowances, a risky investment.

Despite all the hazards trees do get to harvestable age within 40 – 50 years. However, clear felling does further damage as the ground is compressed by machinery. The trees dry the land and make it acid. It is extremely difficult to rehydrate dried peat thus the acid-loving bog plants cannot readily re-colonise the area and the plants typical of drier ground cannot tolerate the acidity. What does tend to colonise the cleared areas is bracken (*Pteridium aquilinum*) which is invasive, persistent and undesirable.

Photo: © Rosie Solbé

The Flow Country is an area of blanket bog covering most of Caithness and Sutherland in Northern Scotland which uniquely satisfies criteria for it to be considered of International Conservation Importance.

The bog-plants which are typical of the Flows are not rare but contribute to the ecosystem by providing food for bog animals. Removal of some of the constituents of an ecosystem could upset the whole area. These plants include, among many others, bog-bean (*Menyanthes trifoliata*), cotton grass (*Eriophorum vaginatum*), long-leaved sundew (*Drosera longifolia*), butterwort (*Pinguicula lusitanica*), bog asphodel (*Narthecium ossifragum*), cross-leaved heath (*Erica tetralix*) and Sphagnum moss.

The birds include curlew (*Numenius arquata*), common scoter (*Melanitta nigra*) which, despite its name, is by no means common, and which comes here to breed, as do dunlin (*Calidris alpina*) the second most abundant breeding bird in the flows. The great skua (*Catharacta skua*) occurs, and greenshank (*Tringa nebularia*) nest on the drier slopes, collecting food for their brood in the lochans. There are only 10 breeding pairs of wood sandpiper (*T. glareola*) in the whole of the UK and they all breed here. Golden plover (*Pluvialis apricarius*) are the most abundant breeding bird in the Flow Country and 20% of Europe's golden plover breed here. Merlin (*Falcus columbarius*) are facing increased competition from foxes which have colonised the new tree plantations. Hen harrier (*Circus cyaneus*) have increased in the area in the last 50 years after disappearing from mainland Scotland – this increase must be sustained.

Black throated diver (*Gavia arctica*), red throated diver (*G. stellata*) and many others are resident, over-winter or come here to breed.

The RSPB have done much to advertise the threat to the Flow Country and members have contributed not only to the purchase, but also to the upkeep of the 17,600 acre Forsinard estate. The RSPB are currently felling the trees in the plantations which were on the estate before they purchased it. The UK has signed the Ramsar Agreement on the conservation of wetlands and this is a world class site which must be protected.

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Dr. Rosie Solbé, St Asaph, Denbighshire, UK.

Underwater Photography

By Paul Kay

UNDERWATER photography is perhaps the best tool we have to enable those who are unable to visit the undersea environment for themselves, to see what it is that exists beneath the waves. Although I studied scientific photography, the underwater side of photography was not an area that I had much knowledge about and was certainly not one that I had thought of undertaking – until that is, I worked at Sherkin Island Marine Station.

I came to the island to document Roaringwater Bay and the creatures it contained – above the waves that is. But the first glimpses of the strange, fascinating, and even bizarre creatures I was introduced to by marine biologists at the Marine Station had me hooked. During the winter I worked in London to make some money and by the next season I was a qualified scuba diver and had an underwater camera.

The next two summers saw me back in Sherkin and with Matt Murphy's 'blessing' I started trying to document what I could now see in the environment below the waters surrounding Sherkin. I doubt that he realised what he had started!

My first attempts were not up to the standards that I had anticipated. The temperate underwater world is a difficult one in which to operate and the waters around Sherkin are subject to tides, currents and the weather! I persevered and finally started to take photographs that were at least sharp and correctly exposed.

My days at Sherkin remain a fond memory. I now appreciate the incredible freedom that was given at a time when, as an ex-student with no money (and in those days no debts) and few responsibilities, there was a whole world to explore. Despite some trials and tribulations, Sherkin was an incredibly special time which enabled me to determine where my career path would start to take me.

Since then I have remained obsessed (I think that that is the correct term) by the wondrous underwater marine life I continue to see and photograph. As a professional photographer, I have now been fortunate enough to dive in many places including some tropical and some far away, but I still find that the Atlantic seaboard of Ireland calls me back. It has good memories, but more than this it remains one of the most exciting and diverse places to dive. The marine creature found here make wonderful subjects and it is impossible to predict just what may be seen before diving.

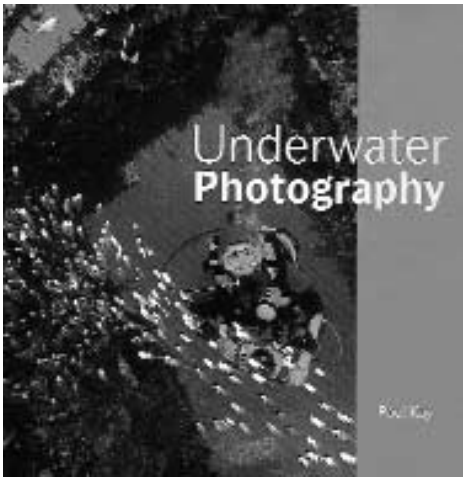
Technology has improved things immensely, and is continuing to make underwater photography easier for more people to attempt, but it is the sea itself which remains the obstacle to overcome. Conditions are everything. There are few days in each year when the water is calm, clear and well sunlit. Such days are to be treasured, as they are the best days to spend underwater photographing the creatures in their full glory.

Despite trying to take them for the last twenty years, images that truly convey the beauty and ambience of the temperate undersea world, remain elusive and incredibly difficult to capture.

Occasionally though, it is possible to produce a picture which does more than merely record the undersea scene. Then, all the cold hours of scuba diving and its seemingly unending faff and messing about, the waste of innumerable rolls of film as well as the constant frustrations integral with operating and maintaining cameras used in a hostile and corrosive environment become worthwhile.

I still aim to take photographs that interpret the marine environment. I also still feel incredibly privileged to be able to see for myself a part of the world which the vast majority will never be able to visit.

I wrote the book in order to try to produce a straightforward guide to the photographic techniques used underwater. It is intended to show how these techniques are applied, both in the murkier temperate regions and in clear tropic seas. Rather than being a glossy 'coffee table' publication it is one of a series of books on photography and as such illustrates techniques described rather than simply showing off my own photography. As I take most of my pictures in temperate waters there are many photographs from the waters around the British and Irish coasts, and I have been surprised at how much interest this has aroused - amongst non-photographers! Many people want to be able to record the scenery and creatures that they see when scuba diving, I hope that my book will demystify the techniques and enable more divers to promote the marine environment through their underwater photographs. I think that Matt Murphy would agree that this is the greatest goal to have – one which will help the marine environment to remain in good condition – by aiming to enthral others who will then want to see that no harm befalls it.



Paul Kay BSc FRPS is a professional photographer, specialising in marine wildlife photography and the sale of underwater photographic equipment. Stock Underwater Photography www.marinewildlife.co.uk. Suppliers of Seacam Silver Underwater Photo Equipment www.underseacameras.co. Tel. 01248 681361 or 07702 411614. "Underwater Photography" ISBN 1-86108-322-X

Sea anthias are frequently found on Red Sea reefs, and photographs of these fish are common. This example is slightly different as it isolates one fish from the rest by using differential focus and fill-flash.
Subal-housed Nikon F100 and 60mm micro-Nikkor, with a Nikon SB105 flash unit. 1/60s at f/5.6 on Fuji Velvia 50 ISO.

This image remains one of my most satisfying. It captures the essence of diving in the kelp forest surrounding Staffa in the Inner Hebrides, Scotland. I love temperate diving, and to me this sums up the movement, colour and beauty to be found off the west coast of Scotland.
Subal-housed Nikon F100 and 17-35mm lens set at 17mm, with two diffused Nikon SB105 flash units. 1/8s at f/11 on Fuji Provia 100 ISO.

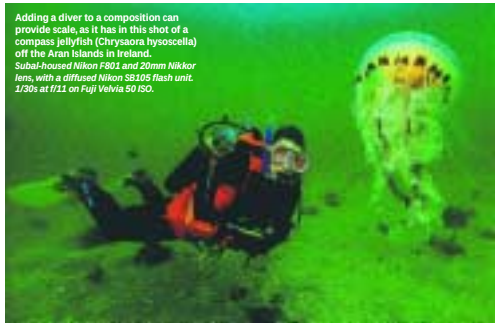
Underwater **Photography**

Photographer: Paul Kay

Photos: © Paul Kay

Scottish sea lochs are challenging marine environments photographically. Dark, often with poor visibility, and containing much particulate matter, they are also crammed with life. Some back scatter is almost inevitable.
Subal-housed Nikon F100 and 17-35mm lens set at 17mm, with two diffused Nikon SB105 flash units. 1/8s at f/16 on Fuji Provia 100 ISO.

These two starfish look almost as though they are dancing partners. The shot was taken as seen and would be difficult to set up, as starfish tend to raise their arm tips when placed on a new surface.
Subal-housed Nikon F801 and 600mm micro-Nikkor lens, with a Nikon SB105 flash unit. 1/60s at f/16 on Fuji Velvia 50 ISO.



Adding a diver to a composition can provide scale, as it has in this shot of a compass jellyfish (Chrysaora hysoscella) off the Aran Islands in Ireland.
Subal-housed Nikon F801 and 20mm Nikkor lens, with a diffused Nikon SB105 flash unit. 1/30s at f/11 on Fuji Velvia 50 ISO.

"Underwater Photography" is published by GMC Publications
ISBN 1-86108-322-X

Mud may not appeal to many underwater photographers as a hunting ground, but does compensate by providing some whacky creatures, like this mud-runner crab (*Goneplax rhomboids*).
Subal-housed Nikon F100 and 60mm micro lens, with a Nikon SB105 flash unit. 1/60s at f/16 on Fuji Velvia 50 ISO.

Divers rarely see Beadlet anemones (*Actinia equina*), as they are generally shore or rockpool dwellers. This picture illustrates that working in shallow water at high tide can be rewarding in terms of finding unusual compositions.
Subal-housed Nikon F100 and 60mm micro-Nikkor lens. 1/60s at f/16 on Fuji Velvia 50 ISO.

Biological Diversity

What is Biological Diversity?

Biological diversity (or biodiversity) is the variety of all life forms on Earth – plants, animals and microorganisms. It refers to species (species diversity), variation within species (genetic diversity) and interdependence within species (ecosystem diversity). Conserving biodiversity means maintaining the variety of species and genetic resources, as well as the environment in which different species coexist and are interlinked. Conservation of biodiversity is therefore a total approach towards conserving Earth's rich but depleting variety of life forms and ecosystems.

Species Diversity

Species are the basic units of biological classification, and hence the normal measure of biological diversity. The world total is estimated at 5-10 million (or possibly more than 30 million). Only 1.4 million are named scientifically so far. Examples of major groups, with number of species named:

Microorganisms e.g. Bacteria: 3,060 spp.; 'Blue-green algae': 2,000 spp.[9].

Fungi – 47,000 spp. named[9], but up to 250,000 spp. in total[1]. Decomposers; important in medicine, e.g. Penicillin, Streptomyces food and brewing, e.g. yeasts.

Plants: Number of species named so far in major groups:

- **Algae** – 27,000 spp.[9], mostly microscopic; important for oxygen balance
- **Bryophytes –** mosses and liverworts; 17,000 spp.[3]. Role in soil formation.
- **Pteridophytes – ferns:** 13,000 spp.; especially abundant in moist tropics[6].
- **Gymnosperms –** 750 spp., of which 550 are conifers[6]; widely planted for timber, pulp, paper; also provide turpentine, resins.
- **Angiosperms** – flowering plants; 235,000 spp.[6]. Include all the major economic plants. Examples: 9,000 grasses (e.g. cereals, bamboos, pastures for grazing animals); 17,000 legumes (e.g. protein-rich pulses, forage crops); 18,000 orchids (horticulturally important).

Animals: Number of species named so far in major groups:

- **Protozoa** – 40,000 spp. (e.g. amoeba, paramecium)[9].
- **Insects** – 750,000 spp. named[9]; possibly 30 million spp. in total[2], Major importance in recycling nutrients, maintaining soil structure, pollination, natural pest control agents (e.g. coconut leaf-mining beetles (Prometheca) controlled by eulophid wasps); silk industry (saturniid moths).
- **Crustaceans** – 38,000 spp.[9]. Economically important, e.g. shrimps, crabs, lobsters; krill is the basis of Antarctic food chains culminating in whales, seals and seabirds.
- **Cnidarians** – 9,000 spp. (e.g. corals, jellyfish, sea anemones, sea fans)[9]. Corals form one of the most productive and diverse ecosystems (see below).
- **Molluscs** – 50,000 spp. named[9]; more than 100,000 spp. in total. Major food source in many places (e.g. oysters, mussels, clams, snails); some prized for their shells.
- **Fish** – 19,000 spp.[9]. Supply most of the animal protein for island nations and much of SE Asia.
- **Amphibians** – 4,184 spp. (e.g. frogs, newts)[9].
- **Reptiles** – 6,300 spp. (e.g. crocodiles, tortoises)[9].
- **Birds** – 9,040 spp. named[9], probably representing 98% of all birds.
- **Mammals** – 4,000 spp. named[9], probably representing 95% of all mammals. Largest groups: rodents (over 1,500 spp.), bats (over 950 spp.), insectivores (ca 350 spp.).

The tropics are the richest areas for species. Tropical forests contain over half of the world's species in just 7% of the land area. Brazil, Indonesia and Madagascar have 55% of the world's mammal species. One hectare of Peruvian forest can yield 41,000 spp. of insects[10]. Tropical America has ca 85,000 flowering plant species (Colombia alone has 45,000), tropical and subtropical Asia has more than 50,000, tropical and subtropical Africa has 35,000[6]. By contrast, the whole of Europe has 11,300 vascular plants.

Oceanic islands are particularly rich in endemics, their floras and faunas having evolved in isolation from neighbouring land masses (e.g. 91% of Hawaii's flowering plants are found nowhere else).

Genetic Diversity

This refers to the variability within species, as measured by the variation in genes within a particular variety, subspecies or breed. Genes are the chemical units of hereditary information that can be passed on from one generation to another. They are arranged on thread-like chromosomes, which consist of strands of DNA, within each cell nucleus. The number of genes found in individual species ranges from ca 1,000 in bacteria to ca 100,000 in mammals and over 400,000 in many flowering plants.

As a result of genetic diversity, virtually no two individuals of a species are identical. At another level, wide-ranging species consist of many breeding populations that may exhibit geographic variation. Genetic diversity is highly important in breeding and selecting improved varieties of crops, timber trees and domesticated animals to overcome, for example, problems associated with pests and diseases, or adverse environmental conditions.

Examples:

- A single population of Indian wild rice Oryza nivara was used to produce the cultivar IR 36 which is resistant to Grassy Stunt Virus; IR 36 heralded the "Green Revolution"[4].
- Wild barley Hordeum spontaneum, from the eastern Mediterranean and central Asia, has been used in Europe as a source of resistance to powdery mildew, probably the most important fungal disease of cultivated barley. H. spontaneum also shows promise for increasing grain yield[5].
- Manihot glaziovii from Brazil has contributed genes for drought resistance in cassava[5].
- Solanum acaule from Peru, Bolivia and northwest Argentina is widely used in potato breeding programmes for frost resistance[4].

Ecosystem Diversity

Ecosystems comprise the whole complex of living and nonliving components in any given area, which interact with each other and through which energy and nutrients flow.

Examples:

- Tropical Moist Forests ca 2,970 million ha (all types); of this 40% is closed broadleaved forest. Distribution of tropical closed broadleaved forest: tropical America 57%, Asia 25%, Africa 18%. Brazil, Indonesia and Zaire have 48% of the world total[8]. TMFs contain ca half of the world's species, including 80% of insects and 90% of primates. 700 spp. of birds are known from the Amazon basin.
- Wetlands include lakes, mangroves, bogs, marshes, fens and marine ecosystems with depth of water not exceeding 6 m at low tide. Important spawning grounds for fish and attract huge numbers of waders and migratory seabirds. One-fifth of all the world's freshwater is in Lake Baikal, in Russia, and is the home to over 2,000 spp. of plants and animals. The Sunderbans (6,000 sq. km of mangroves) are the last remaining habitat of the Bengal tiger in Bangladesh.
- Grasslands cover ca 1,300 million ha (20% of the land surface). Include the savannas of Africa, steppes of Eurasia and prairies of North America. Some have naturally evolved as a result of climate, soil conditions or other factors, such as grazing and rue; others have resulted from man's clearance of forests.
- Coral Reefs. The most productive marine ecosystems, occurring in shallow tropical waters. Cover 60 million ha. Distribution: 30% around Asian coasts; 30% in Indian Ocean, Arabian Gulf and Red Sea; 13% in South Pacific[7]. Many people depend on coral reefs for food (fish, molluscs, crustaceans etc.), prevention of coastal erosion, tourism.

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The Relevance of the Walkerton Pollution Incident (2000) to Ireland

By Donal Daly

THE microbiological contamination of groundwater can have severe implications for public health, particularly for people using private well supplies, which are not disinfected, and for public or group scheme supplies where problems arise with the disinfection systems. While the main illnesses associated with contaminated drinking water are gastro-intestinal in nature, some pathogens are capable of causing life-threatening illnesses.

A pollution incident that occurred in Canada in 2000 is relevant because of the similarity of the situation there with many areas in Ireland.

Walkerton is a small town (population <5,000) in Ontario, Canada, which uses groundwater as a source of water supply. In May 2000, many residents started to fall sick. By July 26th, seven people had died and 2,300 were seriously ill (some needing kidney transplants). Water testing showed faecal bacteria in the water, and *E. coli* 0157:H7 and *Camphylobacter Jejuenii* were determined to be the primary cause of disease. The chlorination plant was not functioning properly. DNA typing techniques showed that farm manure from a cattle farm was the main *E. coli* source. So, how did this happen?

In late April, cattle manure was spread on land to within 80 m of the water supply well that is mainly implicated with the problem. It was applied at a rate of 12 tons per hectare. Fresh manure can contain between 10^6 and 10^9 fecal coliforms per gram dry weight. The farm was following "best management practices" and the subsequent Enquiry completely exonerated the farmer. However, heavy rainfall occurred between May 1st and May 12th – a cumulative total of 138 mm. In this area, the geology consists mainly of till (a 'stony, sandy silt to silt till'), with some sand/gravel overlying limestones. The soil and subsoil varies in depth from 2.4 to > 10 m (it is 2.4 m deep in the vicinity of the main implicated well.) The limestone is karstified, with rapid groundwater flow rates – up to hundreds of metres per day (similar to the karst limestones in the west of Ireland).

"Walkerton is a small town (population <5,000) in Ontario, Canada, which uses groundwater as a source of water supply. In May 2000, many residents started to fall sick."

The precise route for movement of the microbial pathogens has not been proven. However, hydrogeologists who have studied the situation believe that preferential flow has enabled the pathogens to bypass the protection provided by the subsoil. According to one of the hydrogeologists giving evidence at an Enquiry, some of the water would be travelling slowly through pores in the subsoil, taking in the order of a year to reach bedrock, whereas some flow would be in days or less through preferential flowpaths. Other authors undertook tracer experiments, in a similar hydrogeological setting in Ontario, to measure downward travel times through about two metres of sandy till above a cave. They found that the dye took less than an hour for breakthrough, thus confirming the potential role of bypass flow. Once the pathogens get through the soil and subsoil, they can be transmitted rapidly through the karstic limestone to the wells

Implications for Ireland

The hydrogeological setting in many areas in Ireland is very similar to that at Walkerton – relatively shallow subsoil over karst limestone. Bypass flow through preferential flowpaths is likely to be occurring in many of our soils, although probably not to the same degree as in Ontario. Just as in Ontario, rainfall intensities sufficient to generate bypass flow occur in Ireland. The hazards are similar – grazing animals and slurry spreading.

While landspreading of manure and slurry may pose a threat to the aquatic environment in certain circumstances in Ireland, particularly if a sensitive receptor is nearby, the main concern, in my view, is to human health.

Should we be considering ways of minimising the loading of microbial pathogens in manure and slurry as a means of reducing the risk in areas of shallow subsoils ('extremely' vulnerable areas) overlying karstic bedrock? Would longer storage times in slurry tanks reduce the risk? Should we be encouraging farmers in extremely vulnerable areas to locate areas of deeper soil/subsoil on their farm, so that as far as practicable landspreading can be concentrated in these areas.

Donal Daly, Geological Survey of Ireland, Beggar's Bush, Haddington Road, Dublin 4. www.gsi.ie

A Lesson in Environmental Education from India

Open Day: Fr. K.M. Matthew demonstrates how a *Vanda* (orchid) becomes established in the conservatory.

By Matt Murphy

Institutes' publications – sold at a quarter of the market price to enable any interested user, including students, to own a personal copy.

IN the southern Indian State of Tamil Nadu lives an inspirational Jesuit priest, Fr. Koyapillil Matthew, SJ, a renowned botanist and conservationist. He is described by his peers in Europe as the "most productive Indian plant taxonomist ever". He is the Director of two unique institutions – The Rapinat Herbarium at St. Joseph's College at Tiruchirapalli and the Anglade Institute of Natural History Shembaganaur.

Now 74 years old he has spent a lifetime recording the plants of the region. Dr. Matthew's mission is twofold. The first is research and the other, which to him is the most important, is environmental education. The latter has seen the establishment of a unique natural history base in the State Nature Sanctuary of the Palni Hills (2000m). This is a 40-hectare campus in which he has done much to improve and expand a museum, orchidarium, fernery, arboretum and gardens – all ideally suited for environmental education.

A massive programme of environmental education for students (the decision-makers of tomorrow) and villagers (the custodians of the environment today) has seen up to 62,500 trainees at the Institute since 1984 on its 3-day, year-round awareness programme. The programme has been free of charge to participants for the last nineteen and a half years. That the demand is still only growing after so many years shows that the programme is answering a real need. The trainees have responded generously by implementing eco-restoration programmes in their own localities as determined by the Institute's staff during impact assessment visits. The 453 centres from where the trainees hailed have become centres of environmental sensitivity across the region. Leadership programmes for the already-initiated are highly regarded for their multiplier effect on society. Six zonal coordinators across the State of Tamil Nadu take care of quality participation in these programmes.

Photos: © Fr. Koyapillil Matthew, SJ

Lissy (staff member) demonstrating Herbarium processing.

Field Day: Pambar Shoal (Evergreen forest).

In situ Conservation: *Sonerila pulnevensis*, a threatened species now doing well in the Conservatory, and ready for release back to nature.

Conservation research at the Institute, so vitally important today with the massive extinction of species, has resulted in extensive original field data on plants which equips the participants with vital information on regional conservation priorities.

Fr. Matthew's annual day to day budget for his Anglade Institute is €21,000 (this is not a typing error). The breakdown is: Food (50%); Salaries (25%); Library (5%); Vehicle maintenance (5%); Contingencies (5%); Expendables (2.5%); Travel (2.5%); Honoraria to resource persons (2.5%); and Publication of Shola – the Institute's newsletter (2.5%).

Fr. Matthew is finding that obtaining funding from agencies that have supported them is now getting difficult as they seem more interested in short-term research but feels that one must take the long-term view. He quotes the Chinese proverb:

"If you are thinking a year ahead, plant seeds,

If you are thinking 10 years ahead, plant a tree,

If you are thinking 100 years ahead, educate the people".

The herbarium at St. Joseph's College, in the lowlands 200 km south from Anglade, is Fr. Matthew's other institute. It is a widely used research base with a collection of over 125,000 plant specimens.

"A massive programme of environmental education for students (the decision-makers of tomorrow) and villagers (the custodians of the environment today) has seen up to 62,500 trainees at the Institute since 1984 on its 3-day, year-round awareness programme."

The library has an excellent collection of botany reference books and over 90 periodicals, including key international ones. A conservatory for living collections of local plants is another feature. Besides researchers and students, people from applied fields like agriculture and forestry are regular visitors. They have also a number of outreach programmes like the annual open days, when biology students of the town (both university and secondary school) are shown round the Institute. Available in the Consultation Herbarium are one or two specimens of each of the 3,000 species in the region. Related services are consultancy, descriptions of new taxa, reviewing of papers for national and international periodicals, etc.

An enduring value of the collections in the herbarium is that they are the source material for future research on local plants, especially plant diversity, not available anywhere else, truly the take-off base for applied work.

Fr. Matthew, in addition to being Director of the two Institutions, has found time to write many floras of the area, including The Flora of the Tamil Nadu Carnatic (1983), The Flora of the Palni Hills both in three volumes, fully illustrated and in English, with Tamiil names. He is now working on a six-volume Flora of North Tamil Nadu due to be published in 2006. The Institutes' publications are sold at a quarter of the market price to enable any interested user, including students, to own a personal copy. This is part of their "lab-to-land" motto of work.

He is a firm believer in involving the community in any conservation effort and points out that conservation and development must go hand in hand. Conservation is not merely spending money: it involves empowering people by giving them the required skills.

Dr. Matthew is optimistic of the efforts of environmentalists. "Twenty-five years ago, many people said India would not be left with any forest by 2000. It has not happened. Awareness has increased in recent years, thanks to the good work of the activists and the media. It is a positive development. With a little more planning, they could achieve better results. The country has the knowledge and infrastructure to protect its resources," he said.

We in the western world have much to learn from this unique and humble Jesuit priest on how to approach environmental education of the people.

Fr. Koyapillil Matthew, SJ, The Anglade Institute of Natural History, Scared Heart College, Shembaganur, Kodaikanal 624, India.

Fish Farmers go Green with ECOPACT

Environmental Code of Practice for Irish Aquaculture Companies and Traders

By Mo Mathies

ECOPACT is a new initiative developed to ensure the widespread introduction of environmental management systems in the Irish aquaculture industry. The aim of the document is to promote the responsible development of the Irish aquaculture industry. It serves to assist industry members in working to the highest standards, while enabling them to produce in a viable, efficient manner, optimising farm husbandry, maintenance and the interactions of farm related activities with the surrounding environment.

Committing to ECOPACT requires industry members to implement environmentally sustainable operations to a standard beyond that which they are legally required to. However, more than just an environmental code of practice, ECOPACT is also a marketing tool for the Irish aquaculture industry. It aims to establish the Irish industry as environmentally superior to its overseas counterparts.

Based on the two main international environmental management standards ISO 14001 and the European Union Eco-Management and Audit Scheme (EMAS), ECOPACT is designed to provide a solid basis for Irish fish farmers to implement their own tailor-made, highly effective environmental management system. The manual provides specific recommendations on a variety of environmental aspects linked to the day-to-day running of a fish farm. In total, fifteen aspects have been identified, ranging from management and organisation, noise and odour, to visual impact and waste management. Each aspect has a key objective detailing the target certified companies are working to achieve. Additionally for each aspect, a short background description is included as well as a brief overview of legislative requirements.

One of the environmental aspects identified in ECOPACT is concerned with Waste Management with the key objective 'to minimise the amount of waste produced by farming operations and to dispose of all unavoidable waste in an environmentally sound manner.' At a time when waste management has become a pressing issue not only within industry but also for all private households, aquaculturists in Ireland must contribute to the Government's strategy of increasing re-use, reduction and recycling of waste materials. Participants in the scheme have to develop a company specific waste management plan and consider buying long-life materials or such made from recycled materials. Emergency procedures have to be established for unexpected high volumes of waste. Each company has to ensure the proper disposal of all waste materials generated on site and where possible establish a recycling scheme.

Another of the environmental aspects relates to site management with the key objective 'to maintain tidy and orderly sites.' Recommended actions against which the company is audited include that all shore and on shore facilities are kept tidy at all times, that all equipment, vessels and vehicles are properly maintained, and that any damaged equipment be removed and repaired promptly. Since fish farmers operate in a common resource, the sea and foreshore, it is in their own interest to operate in the best possible manner to ensure the sustainability of their operations.

The document includes a comprehensive series of annexes including pictures and ecological descriptions for species in Ireland that are protected under the EU Birds and Habitats Directives as an aid to identification. This is the first time a thorough pictorial guide to our protected species has been published in Ireland and will be a valuable reference for many outside the aquaculture industry as well.

Companies who wish to join the scheme have to carry out an initial environmental assessment analysing their operations against the recommendations provided by ECOPACT. Each company has to develop and implement a company specific environmental policy as well as a detailed environmental management programme. Specific targets are set by the company including a deadline by which they intend to achieve it. Once the company has established all required documentation and feel they are ready for certification, a full environmental audit is carried out by BIM. If during this audit no non-conformances are found the company will receive certification and be re-audited on an annual basis.

Launched in July 2003 by Minister of State at the Department of Communications, Marine and Natural Resources, Mr. John Browne TD, the first certificate under ECOPACT was presented to Marine Harvest Ireland Ltd. by the Minister who congratulated them on their exemplary environmental management systems and general commitment to the highest standards of sustainable development. Speaking at the launch the Minister said, "I would further like to commend the Irish Shellfish Association (ISA) and the Irish Salmon Growers Association (ISGA) for their wholehearted commitment to implementing this initiative for the greater good. Well-practiced aquaculture is a genuinely sustainable activity with many benefits for Ireland's economy; however there is no room for complacency, poor operators or low standards. ECOPACT is a forward thinking initiative which can set the Irish aquaculture industry apart and ahead of its overseas competition".

Echoing the Minister's statement BIM Chief Executive Pat Keogh said, "There is already a very high level of environmental awareness among Irish fish and shellfish farmers, which is not surprising as their very livelihood depends on a clean, unpolluted natural environment. ECOPACT is designed to capitalise on this awareness and ensure that pro-active care of the environment is at the heart of all Irish aquaculture operations and future development".

To date three companies are fully certified to ECOPACT with a further three envisaged to follow in the first half of 2004.

Photos: © BIM

A dive harvest of scallops.

Photo: Roy Anderson

Photo: Duk NL EHS

The ECOPACT document includes a comprehensive series of annexes including pictures and ecological descriptions for species in Ireland that are protected under the EU Birds and Habitats Directives, as an aid to identification.
Top: Marsh Fritillary Butterfly
Bottom: Whooper Swan

Well-practiced aquaculture is a genuinely sustainable activity with many benefits for Ireland's economy.

Mo Mathies, Environmental Officer, Bord Iascaigh Mhara (Irish Sea Fisheries Board), P.O. Box 12, Crofton Road, Dun Laoghaire, Co. Dublin. Tel: +353 (0) 1 2144 286 Fax: +353 (0) 1 2144 119 Web: www.bim.ie

Mushroom Stones of Ireland

How mushroom stones are formed

1-2. As the glaciers melt at the end of the Ice Age, rock debris (till) is left behind. This sometimes contains large boulders (erratics) stranded by the melting ice.

3-5. Extensive deposits of glacial debris disrupted surface drainage in the postglacial landscape. Moreover, the earth's crust had not yet recovered from the depressing burden of glacial ice under which it had lain for such a long time. For these two reasons the water table was higher relative to today. The landscape was studded with lakes and ponds. Glacial erratics sometimes find themselves standing partly-submerged in shallow water on the margins of these lakes.

6. Long-continued wave action corrodes the limestone below the water more rapidly than above the water.
7. A sudden drop in lake level exposes the wave-eroded lip of the boulder.
8. The process is repeated with lake level now at a lower level, and a second lip is formed below the first.

9-10. A second sudden drop in the water table results in retreat of the lake margin, exposing the entire boulder to the atmosphere.
11-12. Mushroom stones form convenient perches for birds, which enrich the surface with their droppings. This encourages the growth of lichens that are favoured by these high-nutrient conditions.

What are mushroom stones?

At the end of the Ice Age, the water table was considerably higher than it is today, with the result that many lakes covered a larger area than they do at the present time. It is important for us to know where these ancient shorelines lay, because this is where the first people to come to Ireland after the Ice Age hunted and fished. Knowing where the boundary between land and water lay at that time can help us to look in the most likely places for evidence of their presence.

We are most fortunate that 'milestones' marking the position of lake shorelines in the early post-glacial period still survive. These take the form of solitary sentinels of limestone which still bear the unmistakable marks of long-continued erosion by lapping waves at the edge of lakes which have since vanished or retreated. Some of these stone sentinels are shaped like mushrooms; others have an overhang facing in just one direction, but all are notched and undercut in such a fashion as to suggest prolonged exposure to standing water at some time in the past. The mushroom-shapes are produced where the notching forms a fairly even circle around the stone. The wavestones are always of limestone: generally isolated boulders which are often glacial erratics, or (much more rarely) exposed outcrop.

Wave stones were first recorded in 1865 by F.J. Foot along the shores of Lough Ree, during the course of field work for the first systematic geological survey of Ireland. He made an attractive (but somewhat diagrammatic) drawing of these water-worn limestone blocks 'eroded up to a certain height by the solvent action of former lake water, showing the level at which Lough Ree once stood – 10 to 15 feet higher than the present summer height: the lake shore, moreover, is now some 300 yards distant.'

In 1937, Robert Lloyd Praeger described wavestones on the shores of Lough Corrib in County Galway in his inspiring book *The Way That I Went*, repeating the idea that their odd shape resulted from the solution of the limestone by lake water. According to Praeger *"…evidence of this higher level is gained from the presence in these flat areas, often far from the present lake, of 'mushroom rocks' – large blocks of limestone now shaped like a toadstool. The top is umbrella-like, convex above, flat and horizontal below and rests on a much narrower pillar of the same rock. The flat underside marks the former lake-level, above which the solution of the limestone did not take place."*

At some point later in prehistory the level of Lough Corrib fell substantially below the present-day level. This is known from the depth at which peat occurs on the lake bottom. About 4,000 BC, the level of the lake began to rise again. Proof of this can be found by looking at the different deposits in the lake, particularly the differences in the levels at which organic deposits are found. Then, about 2000 years ago, there was a change from swampy conditions to sphagnum peat, which suggests a further lowering of the lake water level.

Not all mushroom stones are situated close to modern lakes. Many mark the shores of lakes which have vanished altogether, becoming filled in with reedswamp, fen and bog vegetation in the course of time. A remarkable example is located near Crancreagh Bridge in County Offaly, which marks the position of what must have been the north-western edge of ancient Lough Boora, on whose shores the first people of the Irish midlands camped in Mesolithic times 8,500 or so years ago. This ancient lake disappeared long ago, swamped by the growing expanse of bog, which buried not only the lake itself, but preserved the campsites of the early midlanders.

Surveying the Stones

During 1998 a survey was carried out to record all wavestones known to us at that time. A number of others have been reported to us subsequently, and these were all duly visited. To date, wavestones have been recorded in Counties Offaly, Tipperary, Galway, Clare, Cork, Roscommon and Westmeath. Lough Leane in Kerry was visited because of the reported similarities in the morphology to wavestone erosion in the limestone around the lake edge.

Crossard stone, Inchiquin Lough, Co. Clare.

Photos: © "Ireland's Mushroom Stones – Relics of a Vanished Lakeland"

This magnificent stone at Cornaseer, west of Ballybay in Co. Roscommon, can be regarded as a sort of 'type specimen' for all mushroom stones.

However, the erosion around Lough Leane was much rougher and more jagged than the smooth erosion characteristic of the wavestones and thus not really comparable.

The location of the stones recorded during the survey was determined using GPS, and plotted on six-inch maps. Global Positioning enabled accurate location of the stones on a map.

Where the more accurate GPS was used it allowed the level of the 'notch height' (i.e. the limit of ancient wave action) to be determined approximately. It is important to discover if all the notch heights are at the same level. If they are, it shows that the change in lake level was due to a drop in the water table. If not, it may have been due to other causes, such as uplift of the land surface, which might affect different areas to different degrees.

How the stones were formed

All mushroom stones are composed of limestone, which is a soft rock that weathers easily, and is particularly susceptible to the action of rain, surface water and groundwater.

Limestone accounts for nearly half of the framework of which the land of Ireland is made. Where it breaks through the envelope of soil and other materials which usually cover the rock beneath, it forms some of the most dramatic landscapes in the country. There are very few parts of Ireland where limestone so dominates the landscape as in the baronies of Burren in Clare and Kiltartan in Galway. Here the grey limestone attains a thickness of 780 metres, exposed over an area of more than 250 square kilometres.

The story of the limestone begins about 350 million years ago, at the very end of the Devonian period of earth history, when Ireland was still part of the Old Red Sandstone continent. At around this time the sea – which up to this had lain to the south – began to advance northwards over Ireland, ushering in the Lower Carboniferous period of earth history. A thick sequence of lime-rich (carbonate) sediments was deposited in the warm, shallow sea as the millennia passed. This thick blanket of sediment was later compacted and hardened to become limestone rock.

Although there is an abundant fauna of corals and brachiopods in the limestone, fossils are seldom seen clearly on the surface of the rock. Large productid brachiopods (gigantoproductids) often

catch the eye where the stone has been used for building. Other fossils which are particularly abundant include corals and crinoids or sea-lilies.

Weathering of limestone

Limestone is composed almost entirely of a single chemical substance, calcium carbonate (CaCO3), which is derived from the skeletons of the animals that lived in the Carboniferous sea. Once the rock comes to the surface it is quickly eaten away by the elements. For limestone the most corrosive agent of erosion is rainwater, because it is a dilute solution of carbonic acid, which simply dissolves the carbonate of which the limestone is composed.

Solution of the surface limestone concentrates along the ready-made lines of weakness provided by fissures (often vertical) in the rock; this is the main reason why limestone is so permeable. Water falling on the surface is simply swallowed up by the open fissures, but down below the surface it continues its work of solution, hollowing out caves and passages in the limestone. In limestone landscapes, therefore, water can only flow above ground for a short time before it disappears into the limestone to follow a hidden course through fissures and caverns in the rock, reappearing at the surface somewhere further on.

The special kind of landscape which results from the solution of limestone and underground water circulation is called karst, after the region in Dalmatia and Istria (in what was formerly Yugoslavia) where it is most classically developed. The Burren is Ireland's finest and most famous karst area, and one of the best remaining areas of relatively intact lowland karst in Western Europe.

Killawillin stone, Fermoy, Co. Cork.

Where a limestone boulder stands at the edge of a lake so that it is partly covered by water, the underwater part weathers more rapidly then the part above water because it is subject to more constant corrosion by water, accentuated by the abrasive lapping action of waves. If this continues for a long time the upper part will be undercut, and the stone will assume a very distinctive form which is frequently mushroom-like. Much more rarely the same process can be seen in limestone bedrock. Many mushroom stones have a second minor 'lip' below the main one, suggesting that the drop in water level which isolated the stones from the lake's edge took place in two stages.

The importance of mushroom stones

Wavestones are an important feature of landscape heritage, as important as features of archaeological, historical or ecological interest. They have stood their ground for 10,000 years, silently carrying their coded message about times past.

They are important geomorphological features because of the information they embody about past landscapes and landscape change.

They are important archaeological markers because they help us to reconstruct the landscape as it was when the first people moved into it after the Ice Age. They are important in their own right, for the extraordinary and often aesthetically beautiful things they are.

And they are important for the ancient lichen communities which live on many of them.

In spite of their importance, mushroom stones enjoy no formal protection. They are very fragile features, easily disturbed and in many cases easy to remove – as no doubt many have been in the past. Many of those that still remain were probably left in place just because they look so unusual and interesting. It is our hope that we can draw attention to the importance of these special stones, all of which need to be recognised for what they are. In particular it may help to alert the local communities which are the natural guardians of the stones.

Photos: © "Ireland's Mushroom Stones – Relics of a Vanished Lakeland"

Location of stones recorded to date.

Mushroom stones (especially the smaller ones) are easily overlooked, and many await identification. If enough new information comes to light, a second edition of *Ireland's Mushroom Stones* may be called for in the years to come. If you know of any mushroom stones not already catalogued, we would love to hear from you (write to Louise Dunne at University College Dublin, Richview, Dublin 14 or **louise.dunne@ucd.ie**).

"Ireland's Mushroom Stones – Relics of a Vanished Lakeland" By Louise Dunne and John Feehan ISBN 1-902277-79-1 Price: €10.00 www.ucd.ie/envinst/envstud/mushroomstones

Publications of Interest

The Irish Mackerel Fishery and the Making of an Industry

By John Molloy

Available from the Marine Institute, Galway Technology Park, Parkmore, Galway

www.marine.ie

or Killybegs Fishermens' Organisation, Bruach na Mara, St. Catherine's Road, Killybegs, Co. Donegal.

ISBN: 1-902895-23-1

Price: €25.99 / 2004-03-22

For over 40 years the author was Ireland's mackerel scientist. For most of that time he ploughed a lonely furrow. When he first joined the Department of Lands (who had Ireland's fisheries under its wing) as an Assistant Fisheries Officer in 1965, he recalls that he was told to start work on mackerel. When he enquired at the library for anything on mackerel the man in charge went looking. After a considerable time he returned and shaking his head muttered that he could find nothing. So began John Molloy's study of what was to become Ireland's most important fishery and which brought immense wealth to fishermen in the northwest. For most of his time at the Department of Fisheries laboratory at Abbotstown, John, like others, was the lone scientist researching the species for which he was responsible. For close on 30 years this scenario continued until the establishment of the Marine Institute in 1990. The author over the years was able to breakdown the almost insurmountable distrust fishermen had for scientists. He won their trust and because of that he was able to get essential data from them, such as distribution and location of shoals, which proved invaluable in studying the changes in the distribution of the mackerel stocks. There is no doubt that but for John Molloy Ireland would not have developed the sustainable mackerel industry that we have today. His like will not come again.

In his book he describes the biology of mackerel in very readable terms. Shoals, spawning, larvae, age and growth. Section 3 has the development of the Irish industry from catches in 1892. The Cleggan disaster, where 47 fishermen fishing for mackerel in small boats were lost in a freak storm. The depressed fifties and sixties and then the revival. Section 4 – Research on Mackerel: early research from 1920.

The section on egg surveys and future scientific investigations is the most important section for the scientist and the manager. The accounts of the annual mackerel working group at the International Council for the Exploration of Ses (ICES) in Denmark make fascinating reading. He gives an account and outcome of each meeting from 1974-2003. What comes through from this book is the necessity for similar information and research on the white fish around our coast. If we had this today we would have a thriving white fish section. To fishermen, scientist and manager – read this book. It will help you understand what is necessary and what must be done for each of our fisheries – inshore and offshore.

After the Celtic Tiger – Challenges Ahead

Peter Clinch, Frank Convery, Brendan Walsh

The O'Brien Press Ltd., 20 Victoria Road, Dublin 6. www.obrien.ie

ISBN: 0-86278-767-X

Price: €15.00 / 2002

When Frank Convery's name appears as an author one must sit up and take notice. He is one of Ireland's leading conservationists, who is always practical on environmental issues. The first eight chapters are on economic matters. To quote the former Irish Prime Minister Garret Fitzgerald: "This is an authoritative, readily accessible, and often entertaining account of the Celtic Tiger, including how best to keep it at least purring in the years ahead. It is full of common sense rather than the jargon economists sometimes use."

My interest is in the chapters dealing with our environment. In the chapter on accommodation, one-off houses are discussed and what will surprise many are the author's conclusions. Cluster development is discussed, as is energy efficiency in housing. The chapter on the true cost of road congestion is essential reading. Other chapters include climate change and energy and quality of life. This is an easy book to read and gives much food for thought.

The Status of Natural Resources on the High-Seas

WWF & IUCN

Available from IUCN, 219c Huntingdon Road, Cambridge CB2 ODL, UK. www.iucn.org / bookstore

ISBN: 2-88085-250-1

Price: £12.00stg / 2001

Approximately 50% of the Earth's surface is occupied by High-Seas areas – open ocean and deep-sea environments lying beyond the 200 nautical mile limit of the Exclusive Economic Zones of coastal states. These high-seas areas are open-access common resources, and as such may be particularly susceptible to over-exploitation. Until relatively recently there was little perceived threat to these areas. However, in recent years there has been a rapid expansion in two industries (demersal fishing and oil production). These operations pose a potential threat to the deep-sea environment of high-seas areas.

This report identifies these areas of interest, reviews their significant characteristics, assesses existing or potential threats to them, and their potential value as High-Seas Marine Protected Areas (HSMPAs).

Dolphins, Whales and Porpoises
2002–2010 Conservation Action Plan for the World's Cetaceans

Compiled by Randall R. Reeves, Brian D. Smith, Enrique A. Crespo & Giuseppe Notarbartolo di Sciara

IUCN, 219c Huntingdon Road, Cambridge CB2 ODL, UK. www.iucn.org / bookstore

ISBN: 2-8317-0656-4

Price: £15.00stg / 2003

Some of the world's top specialists on whales, dolphins and porpoises have produced a conservation action plan for the species. The group states that conservation biologists must take in the real world of interactions between society and wildlife. Social, economic and political factors will determine what we have left in a few years and we need to understand and address these factors. If not then there is no hope for continued abundance and diversity of whales, dolphins and porpoises. The six chapters in the book describe world status, threats faced by cetaceans, possible solutions, individual status, recommended research, education and conservation action. The ideal book for anyone with an interest in the future of cetaceans.

Turning the Tide: The Eradication of Invasive Species

Proceedings of the International Conference on Eradication of Island Invasives

Edited by C.R. Veitch and M.N. Clout

IUCN, 219c Huntingdon Road, Cambridge CB2 ODL, UK. www.iucn.org / bookstore

ISBN: 2-8317-0682-3

Price: £24.50stg / 2002

Reading the papers presented at this international conference on the Eradication of Invasive Species of Small Islands, mostly in the Southern Hemisphere, highlights how the damage they have created has had major economic and ecological consequences. Most of the papers are case studies of animals – rats, cats, pigs, rabbits and goats, with a few papers on the control and eradication of plants and insects. In New Zealand they have succeeded in eradicating Norway rats from islands upto 11,000 ha in area.

It is fortunate that invasive animals are among the easier species to eradicate because they do the most ecological damage. The keynote address by Dr. Simberloff is an excellent introduction to this intriguing book. It is an invaluable read on the subject – highly recommended.

The Quality of Drinking Water in Ireland

A Report for the Year 2002 with a Review of the Period 2000–2002

Office of Environment Enforcement, Environmental Protection Agency, PO Box 3000, Johnstown Castle, Co. Wexford. www.epa.ie

ISBN:1-84095-126-5

Price: €26.00 / 2003

The main conclusions of this report are that: the overall quality of public water supplies remains satisfactory while the quality of drinking water produced by group water schemes remains unsatisfactory. The compliance rate for faecal coliforms improved in both supplies. Water supplied by sanitary authorities is safer to drink than water supplied by group schemes in particular the "private" group water schemes. The report states there were 45 serious incidents of faecal contamination in 40 public water supplies in 2002. In nine of these cases there was no evidence of retesting of drinking water quality within seven days of the incident being detected. This report highlights the need for constant monitoring of drinking water, especially those that have their own water supply which must be tested regularly.

Phosphorus Regulations

National Implementation Report, 2003

Office of Environment Enforcement, Environmental Protection Agency ,PO Box 3000, Johnstown Castle, Co. Wexford. www.epa.ie

ISBN:1-84095-130-3

Price: €20.00 / 2003

The report has been prepared from information and water quality data submitted by local authorities in their Implementation Reports and from water quality data collected by the Agency (EPA).

The Phosphorus Regulations require that water quality be maintained or improved by reference to the baseline biological quality rating (rivers) or trophic status (lakes) assigned by the Agency.

Current monitoring indicates that, in the case of rivers, the water quality at 61.8% of the monitoring stations nationally is compliant with the Regulations i.e., the water quality at these stations meets the biological and/or the phosphorus targets in the Regulations. This represents an increase of 1.1% in compliance from the previous reporting period. A total of 56.8% of river stations meet the biological targets of the Regulations. This represents a decline of 1.4% in the number of stations meeting the biological targets of the Regulations from the previous reporting period (1998-2000).

Landfill Manuals

Landfill Monitoring, 2nd Edition

Office of Environment Enforcement, Environmental Protection Agency, PO Box 3000, Johnstown Castle, Co. Wexford. www.epa.ie

ISBN:1-84095-127-3

Price: €20.00 / 2003

This manual, along with the others in the series, is designed to assist landfill operators to conform to the standards required, including the BAT (Best Available Techniques) principle, and to ensure that the long-term environmental risks posed by landfills (including closed landfills) are minimised through effective monitoring control.

There are many potential environmental problems associated with the landfilling of waste. These problems include possible contamination of the groundwater and surface water regimes, the uncontrolled migration of landfill gases and the generation of odour, noise, dust and other nuisances.

This manual is an update of the original.

Urban Waste Water Discharges in Ireland

A Report for the Years 2000/2001

Office of Environment Enforcement, Environmental Protection Agency, PO Box 3000, Johnstown Castle, Co. Wexford. www.epa.ie

ISBN:1-84095-129-X

Price: €20.00 / 2003

This is the fourth biennial report by the EPA on the quality of urban waste water discharges. The report concludes that 23% of waste water arising received no treatment, 7% preliminary, 41% received primary, 21% secondary and 8% received nutrient reduction in addition to secondary. A key recommendation of the report is that all local authorities should review the operation, maintenance and management of urban waste water treatment plants and prepare corrective action programmes for plants that are in breach of standards.

Irish Indoor Insects A Popular Guide

James P. O'Connor & Patrick Ashe

Town House & Country House Ltd., Trinity House, Charleston Road, Ranelagh, Dublin 6. www.townhouse.ie

ISBN: 1-86059-095-0

Price: €21.57 / 2000

Have you ever wondered what insects are making themselves comfortable in your home? With this guide you will be able to discover the identity of these impostors. Some species are well known to everyone, such as fleas and cockroaches, but you might find Deaths Head Hawk Moths that have flown from Africa or scale insects that have hitchhiked on household plants from Asia. The guide includes wonderful illustrations by Sean Milne and advice on how to get rid of harmful insects. The authors have included Irish names for some pest insects. The glossary is most helpful and the reference section is ideal for the researcher. The guide is for all ages but would be a wonderful present for the curious youngsters in the family.

Hedgerow Survey Handbook

A Standard Procedure for Local Surveys in the UK

By Catherine J. Brickmore

Steering Group for the UK Biodiversity Action Plan for Ancient and / or Species-rich Hedgerows, Defra, Conservation Management Division, Area 4D, Ergon House, 17 Smith Square, London SW1P 3JR, UK.

The document can be downloaded from www.english-nature.org.uk

ISBN: 1-86169-108-4

Price: Free / 2002

This book gives detailed information on how to undertake a hedgerow survey. Preparation, survey materials, health & safety for fieldwork and field survey, and quality control. The timing of such a survey is essential before hedges are cut which would make identification more difficult. The details contained in this handbook leave nothing to chance. No such survey has been undertaken in Ireland - it is indeed time a beginning was made. It might help to stop the often savage cutting of hedgerows by some local authorities in Ireland.

Ocean Treasure

Commercial Fishing in Alaska

By Terry Johnson

Edited by Kurt Byers

Alaska Sea Grant Program, University of Alaska Fairbanks, P.O. Box 755040, Fairbanks, AK 99775-5040, USA. www.uaf.edu / seagrant

ISBN: 1-56612-080-2

Price: $25.00 / 2003

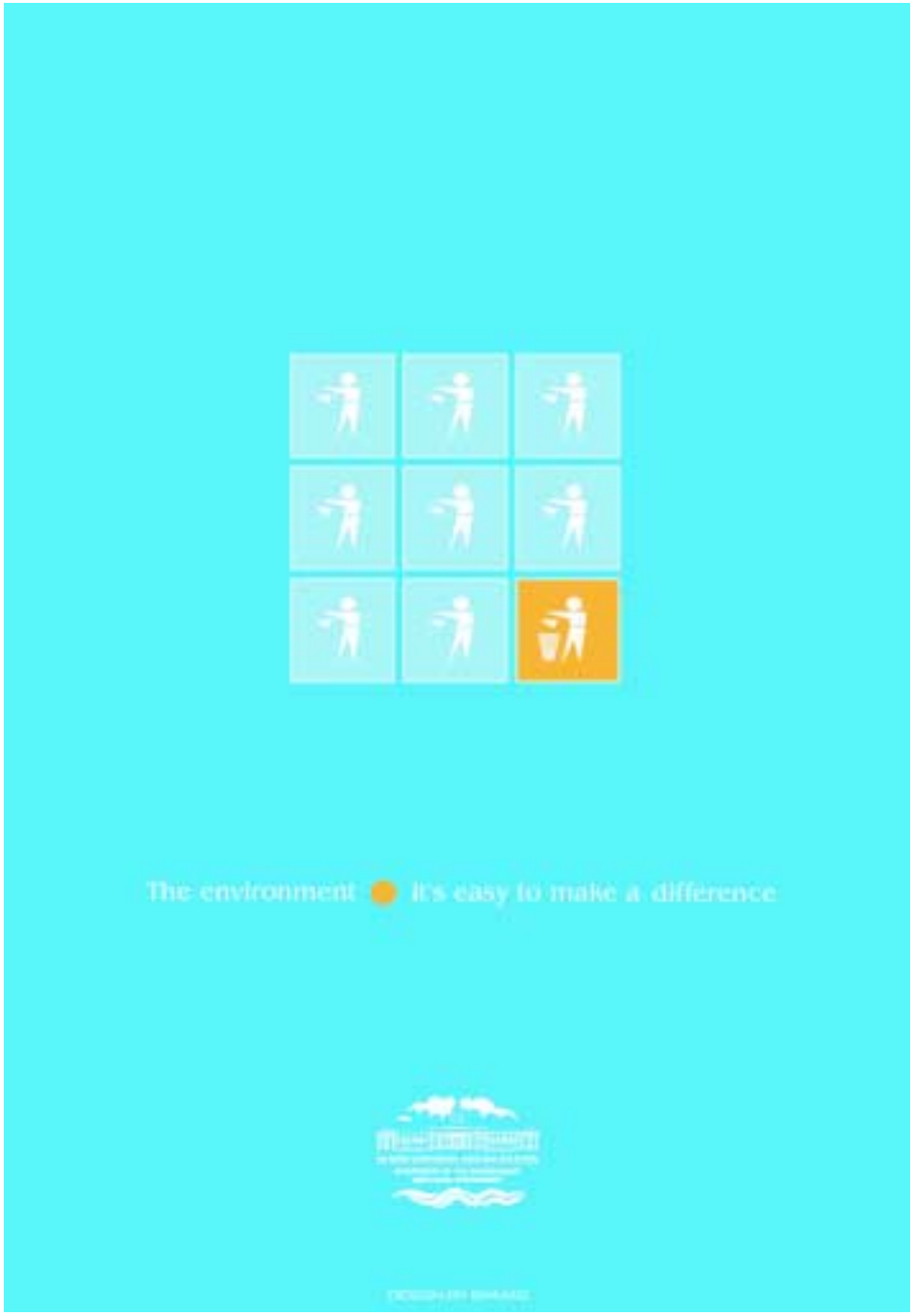
This is a book about America's most important fishing state - Alaska. The seafood industry is Alaska's largest private industry employer, providing full and part time jobs for some 70,000 people. Unlike fisheries in other countries around the world it is properly managed. The book gives one an overview of the commercially important fish and shellfish that thrive in Alaskan waters and an insight into the tools, techniques and management structures used to harvest this vast ocean bounty. The dockside value is $1.4 billion. The text is easy to read and is an A to Z of anything to do with fish in Alaska. Full of colour photographs of marine life and fishermen at work, this book is a must for any one associated with the fishing industry.

Wolf-fishes in Irish Waters

By Declan T. Quigley

WOLF-FISHES, which are also known as cat-fishes, are large relatives of the small blennies. They are normally confined to the temperate and boreal seas of the northern hemisphere. At the southern limit of their European distribution in Irish waters, they are usually found in deep water whereas in the far northern parts of their range they can be found close inshore. Wolf-fishes are essentially bottom-living, feeding on hard-shelled benthic invertebrates such as brittle stars, crabs, mussels, whelks, scallops and sea urchins, which they can easily crush with their formidable dog-like teeth. However, despite their frightening appearance, wolf-fishes are gregarious and attentive parents. Adults pair off before spawning and fertilisation is thought to be internal. The large eggs are deposited and formed into regular balls by the female, which are then guarded by the male. After hatching, the larvae stay on the bottom until their yolk reserves are used up and then briefly migrate into mid-surface waters where they are dispersed prior to adopting a benthic habit again at a length of 5-6cm. Two species of wolf-fishes have been recorded from Irish waters, and only one of these is relatively frequent in its occurrence. A third species may also occur, but so far, it has only been recorded from northern UK waters.

Wolf-fish ***Anarhichas lupus*** **L.**



Wolf-fish

Anarhichas lupus **L.**

Although *A. lupus* (Fig. 1) is regarded as scarce (<10 records) in Irish inshore waters (depths <200m), it appears to be more frequent in its occurrence, albeit localised, in deeper waters (>200m), particularly off the north-west coast where it is occasionally taken as a by-catch by deep-water trawlers. About 3.25 tonnes was landed into Irish ports from this area in 2002. The species is economically important in the northern parts of its range and its aquaculture potential is currently at an advanced stage of development in Norway. Specimens measuring up to 150cm (Lt) and weighing 23.6kg have been recorded. The largest specimen recorded in Irish waters (measuring 90.5cm Lt and weighing 8.51kg) was captured by a trawler on 7 December 1990 at a depth of 183m, W Slyne Head, Co Galway. Several specimens have been captured by anglers in English and Scottish waters; the current UK rod and line record, weighing 10.971kg, was taken off Whitby, Yorkshire, in August 1980. The International Game Fish Association (IGFA) world record stands at 23.58kg for a specimen captured on the Georges Bank, off Massachusetts, USA, on 11 June 1986.

Photos: © Declan T. Quigley

Jellycat ***Anarhichas denticulatus*** **Kroyer**

Jellycat

Anarhichas denticulatus **Kroyer**

Only two specimens of the jellycat (Fig. 2) have been recorded from Irish waters to date; both from deep water off the west coast (Porcupine Bank, August 1986 and off Slyne Head, Co Galway on 8 June 1992). Since the species' flesh is soft and watery, it has no economic importance, and this fact may explain why it is rarely landed or recorded. Specimens measuring up to 180cm (Lt) and weighing 20kg have been recorded. The largest specimen recorded from Irish waters (off Slyne Head) measured 104cm (Lt) and weighed 9.5kg. The IGFA rod and line world record, which weighed 17kg, was captured off Holsteinsborg, Greenland on 19 August 1982.

Spotted Wolf-fish ***Anarhichas minor*** **(Olafsen, 1772)**

Spotted Wolf-fish *Anarhichas minor* (Olafsen, 1772)

Although the spotted wolf-fish (Fig. 3) has not been recorded from Irish waters to date, it is unlikely to go unnoticed because of its very distinctive spotted colouration. The species is known to occur, albeit very rarely off the north coast of Scotland, which suggests that it may also occur off the NW coast of Ireland. The spotted wolf-fish is more economically important than A. lupus in the northern parts of its range. Apart from its culinary importance, its skin is also used as an exclusive source of leather, examples of which can be seen adorning chairs in the Norwegian Embassy in Dublin. The IGFA rod and line world record, which measured 180cm (Lt) and weighed 27.9kg, was captured off Vannoy, Trohs Fylke, Norway on 29 May 2000.

Declan T. Quigley, Carrigadrohid Smolts Ltd., Macroom, Co Cork.
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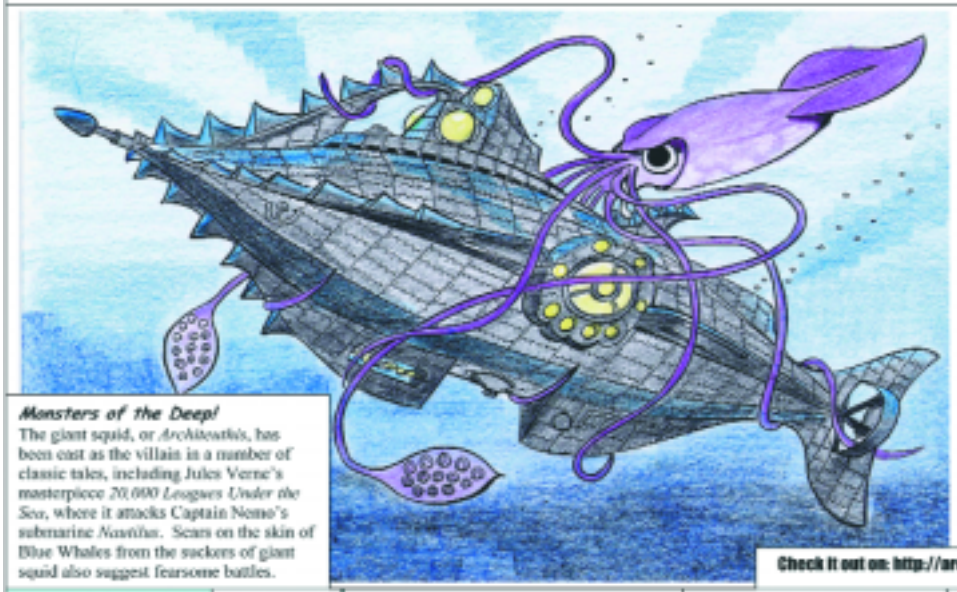
Junior Pages Junior Pages

Giant Squid and Submarines . . .



Monsters of the Deep!

The giant squid, or *Architeuthis*, has been cast as the villain in a number of classic tales, including Jules Verne's masterpiece *20,000 Leagues Under the Sea*, where it attacks Captain Nemo's submarine *Nautilus*. Scars on the skin of Blue Whales from the suckers of giant squid also suggest fearsome battles.

Stop Press

Tasmanian squid scientist Steve O'Shea has researched a "Colossal squid" - *Mesonychoteuthis* – larger, stronger and more heavily armed that the giant squid.

First described by scientists in 1925, it was only sixty year later before a complete juvenile specimen was trawled up from the depths.

O'Shea thinks that colossal squid can have bodies up to four metres long with tentacles reaching out as far 15 metres.

A **REAL** monster of the deep!!!

Check it out on: http://archive.newscientist.com

Captain Cockle's Log

Welcome aboard shipmates! Together, we'll be taking a look at the world's greatest natural resource -- the sea!

Words & pictures by John Joyce
www.cockle.com © John Joyce 2004

Big Softy . . . or . . . .

New evidence suggests that giant squid are too soft and weedy to be real monsters. Instead, they just hang out in the darkness hoping the bump into a meal and that the real villain is . . .

Super-Squid!

The 'Colossal Squid' has a powerful, muscular fin and rotating hooks along its tentacles.

While scientists have attached cameras to the bodies of whales, hoping to film giant and colossal squid, no adult has ever been filmed alive!

The Man from Clare . .

The father of the modern submarine is generally recognised as an Irishman from Clare, John Phillip Holland (1841-1914). He emigrated to the USA in 1873 and, after working as a schoolteacher in Paterson, New Jersey, began designing submarines. After a number of failures, he succeeded with the Holland I, a tiny two-ton, petrol driven sub in 1877. From there he moved to bigger and better boats that formed the first fleets of the US, British, Japanese and Dutch navies. He died only a few months before the first ever sinking of a warship by a submarine with a torpedo at the onening of the first World War.

Into the Abyss . . .

The deepest point in the ocean is Challenger Deep in the Mariana Trench in the Pacific, it is 11,000m deep. On January 23rd 1960 scientists Jacques Piccard and Donald Walsh made the deepest ever dive there to 10,911m in the US Navy submersible, the bathyscape *Trieste*.

But most of the action in the ocean takes place in the shallow seas around the coast where sunlight can penetrate and give life. Darkness in the oceans usually starts at around 200 meters and no normal photosynthetic plants grow beyond this depth.

50 meters is the limit for sports diving with aqualungs, although the world record for free-diving without air tanks stands at 160 meters.

Submarines generally operate at around 250 meters deep, although special scientific vessels with thick pressure hulls can reach almost anywhere in the ocean.

Sperm whales regularly dive into the darkness of the deep oceans down to 400 – 600 meters, bringing them into contact with the giant and colossal squids that love the cool darkness of these great depths.

How a Submarine Dives

Submarines are made by building a watertight 'pressure hull', where the crew live and work, inside a free-flooding 'outer casing' with holes, or "vents', at the top and bottom.

To dive – the crew open the upper vents allowing water to flow into the outer casing and the sub sinks.

To surface - the crew closes the upper vents and blows the water out of the bottom vents with compressed air.

Submarines work best at 'neutral buoyancy' – when they neither rise or sink in the water. At this point they can be 'flown' underwater with 'diving planes' which work just like the flaps on the wings of an aircraft.

In fact, the controls of a modern atomic submarine look very similar to those of a plane, with a big 'joystick' to 'fly' the sub through the ocean depths.

Check out these cool websites:

Giant squid: http://nrm.museum.state.pa.us/squid.htm
http://seawifs.gsfc.nasa.gov/squid.html
http://dsc.discovery.com/convergence/giantsquid/giantsquid.html

John Holland and Submarines
http://allaboutirish.com/library/people/holland.shtm

Summer Migrants


Swallow

NOW that spring is upon us we can, amongst other things, look forward to our summer migrants. Our best known migrant is undoubtedly the Swallow, but there are many other birds that make the long journey to Africa and back.

One of the earliest birds to arrive here is the Wheatear. This is a small bird, quite like a Robin in shape, with a black mask on its face and a distinctive white rump visible when they fly. The males usually arrive first and are a lovely sight with their slate grey backs, peach coloured under-parts and black face mask. When they have refuelled after their long journey, they fly on to their mountain breeding grounds and set up territory before the females arrive.

The Swallow usually arrives here in Ireland in the first few weeks of April, however there are often early individuals which are seen in February or March. There are even sightings in December. The well known saying "One Swallow doesn't make a Summer" is certainly a very correct one! Other members of the swallow family also arrive about this time, namely the Sand Martin and the House Martin. The Sand Martin is usually the first of the summer migrants to arrive in Ireland with the first birds arriving in mid-March, with the main arrival in early April. The House Martin arrives a little later than both birds usually in late April or early May. All three species winter in Southern Africa and will stay here in Ireland until September when they fly south.

Early April sees large numbers of migrant warblers arriving. These small insect eating birds are often hard to see due to their secretive nature but often give themselves away during May with their wonderfully varied songs. The highly similar Willow Warbler and Chiffchaff are best told apart by song. The Chiffchaff usually arrives in mid-March, several weeks ahead of the Willow Warbler. One of our most attractive Warblers, the Blackcap, arrives in mid to late April and its rich and varied song can be heard throughout Irish woodlands during May. Its song is often likened to that of the Nightingale which is only a very rare vagrant to these shores. The male is a lovely shade of grey with a neat black cap, the female is slightly browner with a reddish brown cap. However it is more often heard than seen!

Aside from the swallow the one migrant we all look forward to each year is the Cuckoo. No summer migrant has captured the minds of people more than this bird. Sadly in recent years it has declined and is now absent from many of its former haunts and is now most numerous west of the Shannon. The adult Cuckoo arrives in April and leaves in July and early August, the young birds leave a little later in August. It flies south and spends the winter south of the Sahara. A popular rhyme about the cuckoo tells about his lifestyle:

In April, come he will
In May he sings all day
In June he changes his tune
In July away he'll fly
In August go he must


Cuckoo

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

www.birdwatchireland.ie

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

Visit the **Migration** website to learn about the fascination of bird migration

Visit the **Working with Birds** website to learn about watching and feeding birds

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

BirdWatch Ireland
Rockingham House
Newcastle
Co. Wicklow
Tel: 01-2819878
Fax: 01-2819763
Email: info@birdwatchireland.org
Website: www.birdwatchireland.ie

Bird Quiz

Why do some birds spend the winter in Africa and other birds stay in Ireland all year round.

The first five correct answers drawn will each receive a copy of 'The Usborne Spotter's Guide to Birds'

Answers on a postcard to "Sherkin Comment", Sherkin Island, Co. Cork.

Dawn Chorus

By Niall Hatch

NATIONAL Dawn Chorus Day is a day when wildlife enthusiasts the length and breadth of Ireland set their alarm clocks a little earlier than usual and go out to enjoy a morning of beautiful birdsong. Of course, that isn't the only day on which you can experience the marvel of the dawn chorus; the birds will be in full voice throughout late spring and early summer, and the best time to hear them is in the twilight period just before the sun comes up. We call this natural phenomenon a chorus because, to our ears, all the different species of birds singing their different songs at the same time sounds like a beautiful choir. As in a choir, it seems to us that each bird has its own part to play and its own melody to contribute, and it perfectly represents the harmony and balance of nature and the joys of spring.

The birds themselves, however, don't see it this way at all. The male birds (and in most species it is the male who does the singing) are singing to advertise that they are defending a certain patch of territory from other birds and to attract a mate by showing that they are fit and healthy and able to provide well for chicks. In fact, as far as we can tell they are completely oblivious to the sounds of the other birds around them, and what we perceive as beautiful singing is really just them shouting at the top of their voices: "Hey, look at me. This tree belongs to me, and the rest of you males better keep away. By the way, ladies, aren't I in good condition? Look at all the nice territory I own. Wouldn't I make a great dad?"

So what is so special about the dawn chorus anyway? Woodland and garden birds sing throughout the day, so why not just listen to them then? Well, that is certainly a very worthwhile thing to do, but the most amazing thing about the period just before dawn is the sheer number of birds that are singing and the high volume of their songs. People who have never before experienced a full dawn chorus in a woodland park or even a well-wooded garden are often astonished by how many birds seem to be involved. You might think that you have a lot of birds in your garden or local park, but until you hear the dawn chorus you honestly have no idea how many are there. So why are the birds so busy at this seemingly unsociable hour, and why does the chorus stop once the sun has risen? Well, the most important thing to every bird is to make sure it has enough food to eat. Very early in the morning, before the sun is out, the insects and other creepy-crawlies that they like to eat are not up and about yet, and it is too dark for the birds to go looking for food anyway. They need to advertise themselves and their territories on a daily basis, so it is thought that they just get most of it over and done with at a period when it won't use up valuable feeding time. They can then use the rest of the day for foraging, perhaps with a bit of singing thrown in every now and again for good measure, just to remind everyone who's boss.

We are learning new things about the dawn chorus all the time. For example, it has long been noticed that some species of birds, such as Robins, Song Thrushes and Blackbirds, start to sing much earlier in the morning than others. In fact, it might take up to an hour and a half for birds like Blue Tits and Chaffinches to join in the chorus, but until recently no-one knew why this was the case. A couple of years ago, however, scientists realised that it was the species of birds that had the biggest eyes that start to sing the earliest, and their research indicates that this is the case with songbirds all over the world. Bigger eyes mean better eyesight in the low pre-dawn light, meaning that birds with big eyes can be on the lookout for predators and other dangers when they are loudly giving their location away to any creature that is in earshot. The birds with small eyes have to wait longer until they can see well enough to know it is safe for them to sing. Makes sense when you think about it like that, doesn't it?

Certain very common species, such as Wrens and Dunnocks, are often overlooked in parks and gardens, as their secretive habits make them difficult to see. These birds have very distinctive songs, however, and when they participate in the dawn chorus it gives us a chance to locate them and check just how many of them there are. It is also often the case that the bird species with the dullest, drabbest plumage have the most complicated and musical songs. Brightly coloured and conspicuous birds, such as Great Tits and Blue Tits, can demonstrate how fit and healthy they are by showing off the condition of their feathers, so their songs are often quite simple and basic, serving just to identify their territory. The dull, shy birds, such as the Wren, can't do this, so they convey all this information in their complex and vigorous songs, and that is why they sound so pleasant to us humans. Perhaps the most famous songbird of all is the Nightingale, a bird that is only a very rare accidental visitor to Ireland but that is widespread in parts of Britain and continental Europe. To look at it is nothing special, just a small plain brown bird that likes to hide in thick bushes, but when it opens its beak to sing it produces a song so exquisite that it has inspired poets and authors for centuries. The most celebrated songster amongst Irish birds is probably the Blackcap, a drab member of the warbler family that, because of its beautiful song, has sometimes been called the 'Irish Nightingale'.

To find out details of birding events near you just visit the BirdWatch Ireland website at www.birdwatchireland.ie, give them a call at 01-2819878, e-mail them at info@birdwatchireland.org, or write to them at BirdWatch Ireland, Rockingham House, Newcastle, Co. Wicklow. If you are a member of BirdWatch Ireland you can also find full details of all events in the summer edition of 'Wings' magazine.

Previous winners of "The Usborne Spotter's Guide to Birds".....

1. Agnes Carthy, Woodside, Roselevan, Ennis, Co. Clare.
2. Aidan O'Connell, Darney Heights, Bruckless, Co. Donegal.
3. Una O'Connor, Clonmacnois, Shannonbridge, Co. Offaly.
4. Andrew O'Donoghue, Eastham Village, Bettystown, Co. Meath.
5. Laurena O'Donoghue, Eastham Village, Bettystown, Co. Meath.

Lighthouses

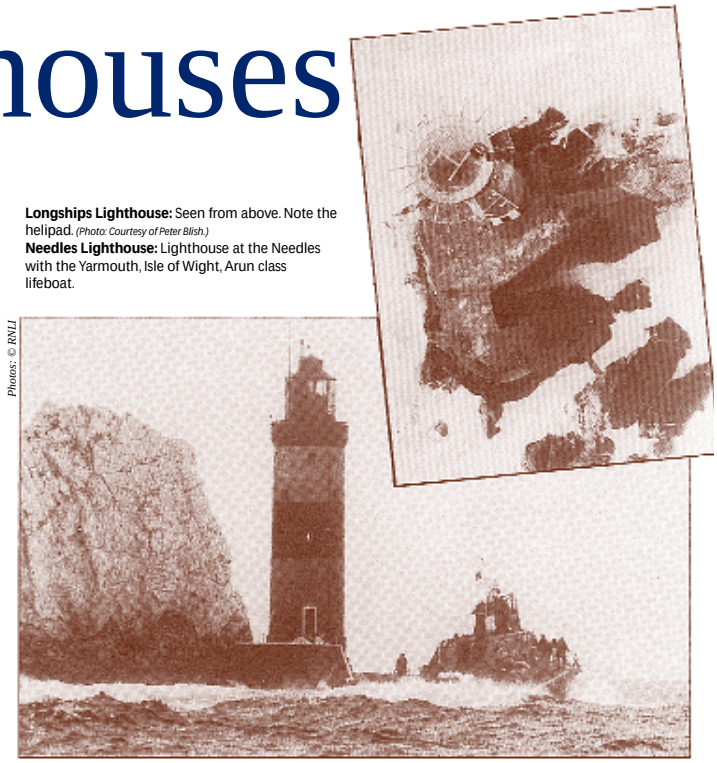
ON a dark stormy night, without stars, a ship crashed onto fearsome rocks and sank killing all its passengers and crew. As it sank, the Captain cried "Why didn't someone warn us that the rocks were there?" The darkness hid the scene.

"What we need is a light to warn ships to keep away," the man said, looking at the wreckage of the ship sunk the night before. "Let's light a fire on the cliff every night and it will tell the ships where the land is."

That's an imaginary story of how lighthouses started. But the first lights were cliff top bonfires and coal burning grates. Anything bright to guide the sailors into port or away from reefs and rocks.

Some people were not so kind. They set up fires in the wrong places so that ships were wrecked and they could steal the cargo and rob the bodies as they were washed ashore. These evil people were called "wreckers".

In 1514 King Henry VIII granted a Royal Charter to an organisation called Trinity House. Trinity House took charge of providing lights all round the coast of England, Wales, the Channel Islands and Gibraltar. Lighthouses were built – fragile wooden towers with lights at the top.



Longships Lighthouse: Seen from above. Note the helipad. *(Photo: Courtesy of Peter Blish.)*
Needles Lighthouse: Lighthouse at the Needles with the Yarmouth, Isle of Wight, Arun class lifeboat.

Photos: © RNLI

The first light was from hundreds of candles reflected off pieces of moving glass called a lens. The movement of the lens caused the light to flash. Candles were replaced by the oil lamp, then electricity, but the power of the lamps is still measured in "candlepower".

Each lighthouse has a different "flash". Each flash, or group of flashes, are divided by a different amount of time. Every one is marked on sailors' charts so that the ships know exactly where they are. Some lighthouses also have fog horns for when light cannot be seen. The noise of each horn is different too.

Apart from lighthouses, there are floating balls of steel, anchored to the sea bed. These are called "buoys". They are different colours and some have lights on top. All are marked on charts so that the sailor can see where he is and what buoys to follow so that he stays in deep water.

Where there are sandbanks or reefs and it is impossible to build a lighthouse, Trinity House establish a light ship. This is a ship with a mini-lighthouse on board. The ship is anchored where it is needed and the light flashes just the same a normal lighthouse.

Men who work on lighthouses and lightships are called "keepers". Many lighthouses are now operated by computer and have no men working on them. Several lightships have been replaced by "Large Automatic Navigation Buoys" (LANBYS). These are great big plate-shaped buoys with automatic light and fog signals.

Trinity House also has a helicopter which it uses to transfer keepers to the lighthouses built on islands out in the sea and on board lightships. All these now have a flat landing place built on top of the light, called a "helipad" or "helideck".

For further information about Trinity House write to: Information Unit, Trinity House, Tower Hill, London, EC2N 4DH, U.K. www.trinityhouse.co.uk.

Lighthouses in Scotland are run by the Commissioners of Northern Lighthouses and they are at 84 George Street, Edinburgh, EH2 3DA, U.K, www.nlb.org.uk.

Irish Lighthouses (all of Ireland) are run by the Commissioners of Irish Lights and can be contacted at Commissioners of Irish Lights, 16 Lower Pembroke Street, Dublin 2. www.cil.ie

Reprinted from "Storm Force News", the magazine of the RNLI (Royal National Lifeboat Institution)

Photo: © Robbie Murphy

In Ireland lighthouses are cared for by the Commissioners of Irish Lights. The Fastnet Lighthouse, off the southwest coast, is one of around 60 lighthouses in their care.

Gifts from Nature

In our environment we have air, water and land. We need clear air to breathe. We need clean water to drink. We need to keep our land clean too.

Natural resources are things we get from nature. Water is a natural resource. The sun is another natural resource. Trees and minerals are natural resources too. These resources give us energy and power and we also use them to make the many things we use everyday.

Some of those things that we use everyday include paper, glass and tin cans. They are all made from the natural resources that are around us. For example, paper is made from wood cut from the forests; glass is made from sand, which has been melted and mixed with baking soda and chalk; tin cans are made from melted metal, which has been dug from the ground. We use these items in many different ways: newspaper, aluminium cans, tins for food, drinks bottles, cardboard packaging, milk cartons, printer paper. Can you think of other uses?

To make these products we also need natural resources to provide the energy to run the machines that make them. So not only are we using up natural resources in the items themselves but also in making the energy to create them. Many of our natural resources are not renewable – once we use them up, they are gone forever. Oil, a non-renewable resource, is not only used to make plastics and synthetic fabrics, and to fuel our various modes of transportation, but we also need oil to generate the energy required to manufacture and distribute the products we use and throw away.

Now that we have become very good at making items from these natural resources we are finding that we are not only making more than we need but are finding it difficult to dispose of the items when we no longer need them. Our rubbish piles are getting bigger and it is getting harder to find a place to put all our waste.

Many of the items we make we can either re-use, recycle or better still, we can reduce what we use.

There is more we can do with solid waste than throwing it away. Many things we toss into the bin can be reused for the original or another purpose. Margarine tubs, milk cartons and shoe boxes can be reused as containers for odds and ends; a torn shirt can become a cleaning rag; and items that we no longer want, such as clothing, toys and books, can be given to charities for reuse.

All our "throw aways" don't have to go to the landfill. Refuse is rich in materials that can be reprocessed and made into new items that we can use again. By recycling newspapers, corrugated cardboard, glass bottles, aluminium cans and paper bags, we reduce waste enormously. Most paper can be recycled – broken down, the ink taken out and made into new paper. Aluminium cans are melted down in smelting plants and made into new sheets of aluminium. Glass containers can be re-melted and formed into new bottles and jars.

When we recycle waste, we not only slow down the depletion of natural resources, but we also conserve energy. Saving energy is important, as energy becomes increasingly scarce and expensive.

One of the easiest ways of cutting down on the waste we produce is by reducing the amount of materials that we use. We can do this by buying products that do not have extra packaging; using a recycled bag instead of buying a new one; using reusable products instead of disposable ones, like plastic spoons and cups. We can also help to reduce the energy we use by turning off lights when we are not using them; walking instead of driving and turning off the television when we are not watching it.

Natural Mix-up

(Answers on page 31)

Fix the word in each sentence to:

1. Most paper is made from **doow**.
2. The pages of your book were once a **eret**.
3. **Nasd** is used to make glass.
4. Plastic is made from **iol**.
5. Minerals give us many **matles**.
6. We need to **vesa** our natural resources.
7. We should be careful not to **teaws** them.

Natural Or Not?

(Answers on page 31)

Natural resources are "gifts from nature" that have not been altered by human hands. Examples are fresh water, timber and minerals. See if you can work out which are natural resources by writing "yes" or "no" after each question?

1. Is a river a natural resource? ____
2. Is sunlight a natural resource? ____
3. Is a plastic cup a natural resource? ____
4. Is wood natural resource? ____
5. Is a book a natural resource? ____
6. Is gold a natural resource? ____

3 Air Can Oil

4 Salt Sand Soil

5 Chalk Glass Metal Paper Reuse River Trees Waste Water

6 Forest Reduce Silver

7 Beaches Bottles Plastic Recycle

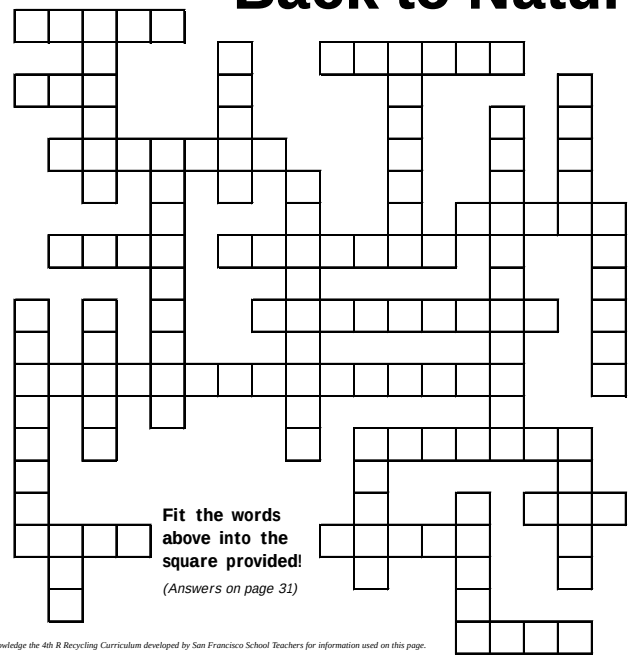
8 Minerals

9 Cardboard Mountains Petroleum

11 Environment

15 Natural resource

Back to Nature



Fit the words above into the square provided!

(Answers on page 31)

We acknowledge the 4th R Recycling Curriculum developed by San Francisco School Teachers for information used on this page.

Life on the Beach

the President's Award

Photo: © Stephen Peers

Ray McMenamin in Costa Rica, as part of The President's Award.

By Ray McMenamin

THANKS to an arrangement The President's Award has with Raleigh International in the UK, where a number of part-funded places are offered every year, I spent ten weeks on expedition in Central America with 162 other people from 12 countries. Trekking in the Amistad National Park in Costa Rica to assess its future suitability for eco-tourism, labouring in Jinotpe in Nicaragua to build a workshop for people with learning disabilities and then back to Costa Rica and Curú.

Curú is a private eighty-four hectare wildlife refuge at the southeastern tip of the Nicoya peninsula on the pacific coast. The project involved working in support of a local marine conservation NGO (INRECOSMAR) to deliver a programme of research, environmental protection and education.

Three weeks living in a hammock on a beach, SCUBA diving three times a day, powering our way in RIBs to dive sites near beautiful island paradises sounded almost too good to be true, but there was serious work to be done not least in bringing my diving skills up to the necessary standard.

A diving qualification in the bag, it was then 'back to school' to study marine species identification under the tutelage of two marine scientists – it was important I knew my vertebrates from my invertebrates, my soldierfish from my surgeonfish. Given that my previous knowledge of fish didn't extend beyond one 'n' ones in Burdocks, this was a difficult task to say the least!

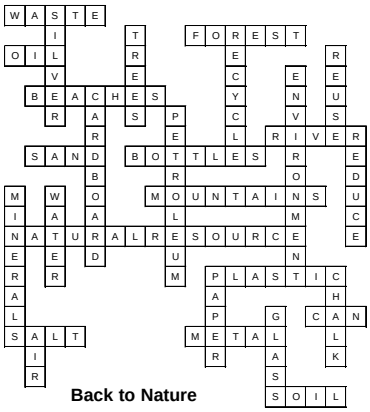
Drift dives, species abundance and distribution surveys (on natural and artificial reefs), surveys of depth, substrate, algae and fish populations soon filled my days, and sometimes my nights too – the all important 24 hour surveys a vital part of the research (any excuse for a night dive!)

The information collected by the group during the 1,366 dives completed over the ten weeks will be a starting point for environmental monitoring in the hope that the bay will be given official protection as a reserve by the Costa Rican Government.

All in all a fantastic experience made possible through my involvement in The President's Award.

For further information about the awards contact Mr. John Murphy, Chief Executive, The President's Award – Gaisce, Dublin Castle, Dublin 2. Tel: 01-4758746 Email@p-award.net or Website: www.p-award.net

ANSWERS FROM PAGE 29



Natural Mix-up

1. wood; 2. tree;
3. sand; 4. oil;
5. metals; 6. save;
7. waste.

Natural Or Not?

1. YES, a river is a natural resource;
2. YES, sunlight is a natural resource;
3. NO, a plastic cup is not a natural resource;
4. YES, wood is a natural resource;
5. NO, a book is not a natural resource;
6. YES, gold is a natural resource.

Prawns

lightly spiced in Yoghurt & Mint

with Stir-Fry Greens & Noodles

Ingredients

- 32 large Dublin Bay prawn tails (shelled)
  or 450g / 1 lb frozen prawns – defrosted
- 225g / 8 oz mushrooms — cut into quarters
- 200g / 7 oz pok choi or spinach leaves — cut into 2cm / ¾"
- 6 Chinese leaves or white cabbage — cut into 1cm / ½"
- 4 spring onions — cut into 1cm / ½"
- 225g / 8 oz egg noodles
- 275ml / ½ pt natural yoghurt
- 6 sprigs of mint
- 75ml / 2½ fl oz olive oil

Marinade

- 2 tablespoons tandoori paste
- Juice of 1 lime
- 75ml / 2½ fl oz white wine

BIM Bord Iascaigh Mhara Irish Sea Fisheries Board

Method

Mix the tandoori paste, juice of lime and white wine together. Pour over prawns and marinate in fridge for 10 minutes.
Heat a wok or frying pan and add oil.
When hot stir-fry all vegetables quickly.
Cook the noodles in boiling water for 4 minutes. Drain and toss in a little oil.
Remove prawns from marinade and stir fry for 2 minutes.
Remove – add tandoori marinade and yoghurt to wok. Simmer for 2 minutes. Add prawns and chopped mint and heat through.
Serve noodles in twists with prawns on top. Pour sauce over prawns. Garnish with mint and chives.
Serves 4.

Fish alternatives – shrimp, clams, cockles, monkfish or any firm fleshed fish.

Photo: © BIM

Irish Specimen Fish

Coalfish 15.1kg for Roger Barham (UK), taken off Castletownshend, Co. Cork on 30th August.

THE Irish Specimen Fish Committee (ISFC) consists of representatives of the Irish Angling Federations and the Government Departments and official organisations interested in angling. Its objective is to verify, record and publicise the capture of large fish on rod and line in Irish waters. A list of Specimen Fish is published annually by the Committee. Only fish which can be fully vouched for as to weight and species can be accepted and listed by the Committee.

The "Report of the Irish Specimen Fish Committee for 2003" shows that it has received 582 claims of which 521 were ratified. Three new Irish records were accepted.

"Fair Angling" means any legitimate method of angling with rod and reel which is recognised as a fair and sporting method. A fish must be hooked in or in the immediate vicinity of the mouth when it has taken the bait or lure; fish which have been foul-hooked, even accidentally, are not eligible. A fish in respect of which a claim is made must be hooked, played and brought to gaff or net by the angler UNAIDED, though the fish may be gaffed or netted by another, and it is permissible for the person using the gaff to take hold of the trace or doubled line (in the case of big game fishing) to steady the fish when it has been played out and brought within reach. If a fixed rod holder is in use while boat fishing, and a fish strikes, the rod must be removed from the holder as quickly as possible. This is to ensure that the angler hooks and plays the fish with rod in hand. Where a fighting chair is employed, it must not have any mechanically driven device which aids the angler in playing a fish. Body harnesses (which atttach the rod to the body) are permissible, but must not be fixed to the chair. Gimbals must be free swinging including those which move in the vertical plane. Gimbals which permit the angler to rest or reduce strain while playing a fish are prohibited. Breakage of rod, reel or line, or alternation or substitution of tackle, while a fish is being played, disqualify it for claim or record purposes. A fish may not be shot, lanced, clubbed or harpooned before landing. Claims for fish caught during the statutory close season for the species (where this applies) cannot be accepted.

Fish must be weighed in the presence of independent, reliable witnesses on a properly certified scales, e.g., a shop scales or an official club scales which is covered by a certificate from the Weights and Measures Officer. Claims cannot be accepted in respect of fish weighed on scales inappropriate to the size of the fish, e.g., fish in the 1 to 3 kg range weighed on balances weighing up to 50 kg or over and graduated in large division. Claims cannot be accepted in the case of fish which have been weighed on board a boat.

The identification of a fish must be fully documented where there is a possibility of its confusion with any other (and particularly larger) species. For this reason, the Committee, in respect of some species, insists that scales from the fish, close up photographs or the actual body must be forwarded as actual proof of identification, before it will be considered.

For further rules regarding limitation of number of claims, sending fish to the Committee and awards write to: Central Fisheries Board, Balnagowan House, Mobhi Boreen, Mobhi Road, Glasnevin, Dublin 9. 01-8842600.

The website for the ISFC is ***www.irish-trophy-fish.com***

Photos: © ISFC

Terry Jackson with a superb Common Skate prior to its return to the water in 2003. In 1976 the Committee, in the interests of conservation of the species, decided to remove the Common Skate from the list of eligible fishes.

Eileen Coulter of Portadown, Co. Armagh, with one of the two specimen of Roach/Bream Hybrid she caught on the River Bann on 30th March. She received a special award from the committee as she has now caught more than 10 specimen fish over the years.

Albacore 16.66kg taken by Alan Glanville, Elsinore, Dunmore East, Co. Waterford fishing SW of the Blasket Islands on 28th September 2003.