SHERKIN COMMENT

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The Grey Heron.

From the book: *"Ireland's Bird Life. A World of Beauty"*

Photographer: Richard Mills

One rule for Moorepark - Another for Cape Clear

EDITORIAL

By Matt Murphy

TWO major achievements in the development of fish farming in Europe have taken place on Cape Clear, one of Ireland's offshore islands off the south west corner. The projects for farming turbot and halibut could be significant for local coastal communities on the mainland and islands in the provision of sustainable industries and lead to the development of others.

Ireland's commercial fishing is slowly coming to an end with the pressure from Spanish, French and British flag of convenience vessels raping our waters with the encouragement of Brussels. Regrettably Irish fishermen have failed to get involved in fish farming development. They are mostly negative to it. Yet at the same time they are the first to admit that few if any of their children will be able to fish for a livelihood. So what will their children do if they wish to fish?

World-wide we are seeing species like cod, halibut, turbot, salmon and sole being farmed in the sea and onshore. The tonnage of fish species farmed is increasing at an enormous rate annually. But in Ireland our tonnage of farmed fish is rising at a snail's pace. Tonnage on farmed salmon is 15,000 annually, yet the Shetland Islands, off northern Scotland, produce over 50,000 tonnes in a very small area.

In 1991 the island co-op on Cape Clear made proposals to Udaras na Gaeltachta to pioneer turbot farming on the island with a research facility. Udaras took up the challenge and a partnership was established with the co-op to evaluate the technical feasibility of growing turbot in Irish waters for the first time.

It was anticipated that the project would upscale to commercial size if all went well. Udaras also decided that this facility could be used to undertake research on other species as technical "know how" was developed. Udaras realised that if this R&D project was successful then the technology could be used to set up commercial fish farming projects in particular on the west coast. It must be pointed out that there were many sceptics both on and off the island.

To put everything in perspective - let it be understood that an island group undertaking such a mammoth project start with certain disadvantages:

- The island is 9 miles offshore from the fishing village of Baltimore.
- The island ferry operates once daily for 10 months of the year.
- Most of the services that would be needed such as construction, fitters, plumbers, etc.. would in reality have to be from within the island.
- Professional advise on fish problems would have to be on a common-sense approach as it would not be possible to have a fish vet on call.
- The site, just yards from the sea was fully exposed to the north west gales, so all work would be carried out in whatever weather conditions nature brings.

Thus there was a realisation from the start of this project by the two founding members Michéal O'Ceadagain and Concubhar O'Drisceoill that they would have to use all their ingenuity to achieve success. They also knew that they could not call on anyone in Ireland or Britain to advise them on the growing of turbot to saleable size or advise them on construction problems. The islanders built the fish farm themselves from scratch.

Their faith in themselves was fully justified. In the period of the 6-year turbot project, losses were under 2% - an incredible achievement. Even better than turbot farms in France and Spain.

Michéal O'Ceadagain summed it up when he said that "we as islanders have always battled with one hand tied behind our backs because of living on an island, but we have yet to fail to rise to a challenge".

By 1996 the farm produced 33 tonnes of high quality turbot. As a result it was proposed to expand to full commercial scale and also to begin on-growing trials on halibut which was proven to be immediately successful.

Udaras' goals on research were totally fulfilled and the results and technology developed were placed in the public domain. They were receiving applications from potential new entrants to turbot farming. A private company is now farming turbot in Connemara, Co. Galway, as a result of the research done on Cape and other projects are currently being negotiated.

In 1997 the Cape project was hit by an outbreak of VHS (Viral Haemorrhogic Septicaemia). VHS is endemic in wild fish. Tests carried out showed that the strain of VHS in the Cape fish was a marine strain. According to a European scientific source, over 80 strains of VHS from wild marine fish have been isolated at various laboratories in Europe, including the Fisheries Research Institute in Aarhus, Denmark. Tests by them to date show that any marine strains, when exposed to salmon and trout, do not produce disease. These marine strains are different to the freshwater strain as defined in the EU regulations. However, EU Regulations stipulate a cull of fish is necessary once a VHS outbreak occurs in order to regain disease-free status, irrespective of what VHS strain is involved. They do not differentiate between the marine and freshwater strains.

Although the presence of VHS was not in itself a major problem, as the mortalities on Cape were low at 7%, the farm was instructed by the Dept. of the Marine to kill their stock of 60,000 turbot. The halibut, which were on a trial programme, were also included in the cull although there were no mortalities and even though scientists knew VHS does not effect halibut.

The Dept. of the Marine must be vigorous in pursuing a change to the EU regulations on VHS. Our sources in Europe tell us that the EU have many other issues to deal with and "unless you Irish put on the pressure, there will be no change." we were told.

The total cost of this kill to the Cape turbot farm was over £450,000. Although compensation was looked for to restart the project, the Department of the Marine refused, making the case that as it was government monies in the first place there should be no compensation. Yet the Dept. of the Marine compensated shellfish farmers for losses in a red tide outbreak in 1998. Should this have been the case when some of the recipients had been capital grant aided by BIM previously - again Government monies?

However, a much more important precedent had been set around the same time by the Dept. of Agriculture in its dealing with the slaughter of Moorepark's (Ireland's premier agriculture research institute) dairy cow herd because of BSE (Mad Cow Disease). The overall losses were well over £1M and the State fully funded these which was correct and proper. Maybe it is time that fish farming should come under the umbrella of the Dept. of Agriculture, as it is a farming activity, because other kills may be necessary in fish farming in the future.

If the Dept. of the Marine is serious about farming flat fish such as turbot and halibut then it must encourage and not discourage developments like Cape Clear. The technology learned on Cape Clear has clearly shown that it is light years ahead in its "know how" for flat fish development. The sterilisation period on Cape Clear is complete - since March 1998. This vital facility for fish farming must not be left to rot away in the severe marine environment.

It is interesting to note that the Norwegian government have invested over £55 million on halibut research. Yet they still have only produced a few hundred tonnes for the markets. Compare this investment with £60,000 that has been invested in the Cape Clear halibut project. Cape had already sold halibut to the market. At the 1998 launch of the Cape grown halibut in Dun Laoghaire Dr. Michael Woods, T.D., was very enthusiastic for the future of farmed halibut. He said: "The pioneering trials by Eileabo Teo Oileán Chléire (Halibut Teo Cape Clear) have demonstrated the technical feasibility of farming halibut in Irish waters - it is now vital to investigate its economic viability". "There are strong world markets for quality seafood such as halibut and the hope must be that Irish farmed halibut will soon be available to consumers in Europe and further afield".

Yes, it is vital that the Cape Clear turbot and halibut farm enterprise be fully compensated. The decision of the Department of the Marine not to do so is seriously flawed and must be reviewed. There were 4 full-time jobs and a number of part-time jobs involved. One job on an island is equal to 100 in an urban situation. Cape Clear, like other S.W. offshore islands, is on an knife's edge regarding its future. The turbot/halibut farm was a major sustainable industry for its future. If the Dept. of the Marine continues to ignore its duty to the industry as a whole, maybe the solution to the problem would be if the Minister of State at the Dept. of Arts, Heritage, Gaeltacht and the Islands, Mr. Eamon Ó Cuiv, T.D., could make additional funding available to Údarás na Gaeltachta to address this issue.

What is very encouraging is that turbot from the turbot farm in Connemara is now making over £7 per kilo, compared to under £4 per kilo for salmon. This shows that turbot farming is highly profitable.

The Department of the Marine cannot look at the Cape Clear situation in isolation and it must realise that nation-wide they are sending a very negative message to financial institutions. How can such institutions finance any fish farming in turbot and halibut when, if the VHS virus should occur, there will be no compensation to the fish farmer? Yes, the future is very bleak indeed for the farming of new fish species in Ireland.

The islanders involved in the Cape Clear fish farm have been treated shabbily. They proved that in the farming of turbot and halibut they were the best. With halibut they did on a shoestring what the Norwegian Government had to invest £55M to do. These islanders deserve justice. They have up to now been ignored, to use a charitable word. Living on Ireland's offshore islands has disadvantages when it comes to running any industry. Even so, it has been shown by these Cape Clear islanders that they can equal or surpass the major players in the aquaculture industry worldwide.

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Our sincere apologies to all for the lapse in the printing of "Sherkin Comment". We are glad to be back in print and thank you for your patience! Please note that all subscription holders will receive their outstanding issues.

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Crete's Floral Carpet

By John Akeroyd

AS Spring comes, many people travel in search of wildflowers. One of the best places in Europe to seek spring flowers, especially orchids and other exotic plants such as crocuses, mandrakes, peonies and tulips, is the island of Crete in the eastern Mediterranean. The Cretan countryside is lush and green after winter rain, splashed with flowers with vibrant birdsong.

Crete is the southernmost province of Greece. The largest Greek island some 250km long, it lies between Greece and Libya. The mostly limestone landscape is mountainous, with several peaks rising above 2000m, and has a number of long deep gorges.The rugged topography, long geological isolation and a Mediterranean climate tempered by surrounding seas has promoted the evolution and survival of a rich and special flora. Some 10% of Crete's 1650 wild plants are endemic - found nowhere else in the world. Others are shared with, Greece, Turkey and North Africa.

At the same time, the island's landscape has long been moulded by its human inhabitants. Ancient terraces, olive groves and small, stony fields are some of the best places to look for flowers, which thrive in the open habitats that people create. Some plants were perhaps even introduced by the farmers themselves, as crops or weeds. Crete was the cradle of Europe's first civilization, that of the Minoans, a cultured and mysterious people who enjoyed nearly 2000 years of peace and prosperity during the Bronze Age, some 3000 years ago.

Later came conquering Greeks, Romans, Arabs, Venetians and Turks. For nearly a millennium Crete enjoyed peace under the Byzantine Empire, when hundreds of churches were built, until the Venetians came in 1204. Venice above all, made its mark on Crete, leaving behind a legacy of rural infrastructure - bridges, drainage schemes, farmhouses, water-mills and fortifications. Like the English in Ireland the Venetians brought material benefits, and frequently intermarried and 'went native' in culture and religion, but ruled the Cretans with a foolish mixture of greed, insensitivity and, too often, cruelty. The outcome was constant rebellion, considerable expense and eventually, in 1669, surrender by a resentful and depressed population to an expanding Turkey. The island was reunited with Greece only in 1912.

The hurly-burly of history has left its mark on the vegetation of Crete. Large areas of native forest and mediterranean scrub were cleared, especially in the lowlands, and the island's larger animals hunted to extinction. Today, however, the vegetation is growing back, with fewer people now living off the land. New olive groves are poor in wildflowers, but there remain plenty of flowery waysides, scrublands, wild gorges and mountain slopes for the plant hunter. Orchids, said to number some 60 species in a good year, are widespread, and a few stony mountain fields still yield pink or red tulips. Even some coastal beaches are a sheet of floral colour in spring, the flowers visited by newly hatched Painted Lady Butterflies.

The most characteristic and spectacular flowers are those of the gorges and cliffs. Many of these have invaded walls in the villages, even the crumbling masonry of old Turkish and Venetian buildings in the towns. The commonest of the 'gorge plants' is probably Cretan Wall-lettuce (*Petramarula pinnata*), related to the bellflowers, with tall spires of blue flowers and neat compound leaves with paired, dark-green leaflets. Cretan friends who survived the 1941-45 Nazi occupation of the island recall eating the leaves as a scarce wartime salad. In western Crete this fine plant is often accompanied on walls by a yellow-flowered Aaron's-rod, or mullein, *Verbacum arcturus*. This too has its original home on rocks and cliffs.

On stony waysides one sometimes sees great patches of the weird Cretan Birthwort (*Aristolochia cretica*), each flower like a hairy purplish-black flask. It is the food-plant of the Eastern Festoon Butterfly, which too is an endemic (subspecies). Another notable endemic is the shrubby Cretan Sainfoin (*Ebenus cretica*), each bush covered with spikes of crimson-pink clover flowers from late April onwards. My own favourite is the scarce Cretan Peony (*Paeonia clusii*), a distinctly exotic white flower of Eastertime, which inhabits damp gullies in the White Mountains and elsewhere. But many of the choicest plants do not flower until summer, when it is still relatively cool in the depths of the gorges. Some like certain bulbs and shrubs, do not flower until autumn.

But perhaps the best-loved Cretan wildflowers are the common ones that colour the spring landscape. As winter ends, Crown Anemones (*Anemone coronaria*) come into flower. These can be seen in the mountains until the end of April. Slightly later, Turban Buttercup (*Ranuculus asiaticus*) is everywhere, its large white flowers with black centres looking more like an anemone. Here and there one finds patches of a lovely yellow-flowered form and some plants have pink flowers. In a few traditionally managed fields and terraces grows its rare, brilliant scarlet form.

Photo: Nick Turland

***Tulipa goulimyi* - a rare endemic tulip also found in southern Greece.**

Photo: John Akeroyd

A ruined Venetian fortified house in eastern Crete.

Various 'bee' orchids are widespread, even on roadsides and waste ground. Some, like Yellow Bee Orchid (*Ophrys lutea),* can be so abundant in dry pastures as to make it impossible to avoid stepping on them. One of the pleasures of Crete is seeing orchids that are so rare in northern Europe. For example, on Crete one frequently sees the Monkey Orchid (*Orchis simia),* absent from Ireland and restricted to two sites in England, amongst scrub and on roadside banks in the mountains. Nor does one need to go far. The slopes of Mt. Jouktas, within 10km of the island's capital Heraklion and easily accessible by road (or on foot) are covered with different orchids in April.

This display of colour and richness of plant form comprises one of the most precious components of Europe's floral heritage. Crete is now covered by European Union laws on the protection of plant and animal habitats (such as the 'Habitats Directive') although sadly the responsible authorities do not always apply them. Visitors can play their part by not picking or in any way damaging the wildflowers that they find in the countryside. Note that local people do still gather flowers from the wild to sell in markets and to decorate churches at Easter. For the most part this is a sustainable harvest that gives the flowers a value in the local economy. Tulips are especially prized. This harvest will not wipe them out, but modern farming and habitat destruction may yet do so. Nevertheless there is a small but growing conservation awareness on Crete that may emerge as a strong force amongst an environmentally aware younger generation.

Finally, to my mind the best floral display of all comes in autumn, from about mid-October. It involves fewer plants, mainly bulbs, but they are unique. The island has been baked by the summer sun, but there may have been some autumn rain; the grapes are ripe, the sea is still warm and the Cretans have a little more time to stop and talk to the visitor. Up in the hills especially, where the nights are cooler, the fortunate plant hunter may come upon the mauve autumn crocus, tiny white and yellow daffodils (*Narcissus serotinus*), sternbergia (like brilliant yellow crocus) and the strange, pinkish-yellow, flask-shaped arum (*Biarum davisii)*. There is even an autumn-flowering grape hyacinth. Now that is worth the price of an air-ticket!

Dr John Akeroyd, Editor of 'The Wild Plants of Sherkin, Cape Clear and adjacent islands of West Cork', takes botanical tours to Crete each spring.

MOLECULES OF THE LEFT AND RIGHT

By M. A. Toole

NATURE, it seems, prefers an imbalance in its structures. Most people, for example, are right-handed, with the left-handed being in a minority. Climbing plants generally twist their tendrils in one direction, with only rare exceptions. Snail shells usually show a dextral, or right-handed spiral, with very occasional individuals displaying the sinistral.

This preference for one kind of 'handedness' over its twin extends everywhere, even down to the level of one of the fundamental units of Chemistry, the molecule.

In 1848, Louis Pasteur separated two types of crystal from a solid deposit formed in wine vats during fermentation of grape juice. One crystal was found to be that of the already known tartaric acid. The other was its mirror image. The properties of the two crystals and their solutions were identical in almost all respects, so it was concluded that they differed only in the fact that the molecules from which the crystals were made were themselves mirror images of each other.

Substances like tartaric acid, which can exist as mirror image molecules, are very widespread in Nature, and are referred to as chiral. Their existence depends on the fact that carbon atoms have the capacity to bond to four other atoms or groups of atoms when forming a molecule. If no two of these groups are the same, then the possibility of mirror image molecules arises. The strange thing is that, while both forms of a chiral substance can generally be made in a chemistry laboratory, if such a compound exists in Nature, only one form is normally present.

The mirror image forms of a particular compound can be distinguished by a property known as their optical activity.

Light can be thought of as a series of waves passing through space. These waves vibrate in all directions, vertically, horizontally etc. If light is passed through certain kinds of crystal, waves vibrating in all but one direction are absorbed, and the emergent light is referred to as polarised. For example, the lenses of polarising sunglasses contain crystals which allow the transmission only of vertically polarised light. Horizontally polarised light, such as that reflected from a shiny road surface, is absorbed by the lenses.

When polarised light is shone through a solution of a chiral chemical, the direction of polarisation is rotated to the right (clockwise) or the left, depending on which mirror image form of the molecules is present. The two forms are therefore distinguished by the prefixes D- or dextro- for the right-handed rotation, and L- or laevo- for the left-handed.

15% of the mass of the average human body, muscles, skin, hair, ligaments etc., is made of proteins, as are the haemoglobin in the blood, hormones, such as insulin, the antibodies that fight disease, the enzymes and chemicals essential to the proper functioning of the body. These proteins are themselves constructed from various combinations of amino acids. There are a large number of theoretical amino acids, but only 20 are commonly found in Nature. All except glycine, the simplest of these, are chiral, and nearly all are found only in the L-form.

In a similar way, plant tissues are made of carbohydrates, which are built up from simple sugars, the most important of which is glucose. The fact that there are four carbon atoms in each glucose molecule leads to the possibility of sixteen different molecular shapes. Only three of these exist naturally, and all are of the D-form. The yeast enzyme, zymase, will convert all three into alcohol during the fermentation process, but has no effect on the synthetically prepared mirror image sugars.

The second most common simple sugar, fructose, is found in fruits and nectar and is the sweetest of all sugars. It is unusual in being the only natural sugar which exists only in the L-form.

The common, domestic sugar, sucrose, is a combination of glucose and fructose, and has a right-handed rotatory effect on polarised light. When broken down into its simple sugars, it becomes left-handed, because the effect of the fructose is greater than that of the glucose. This mixture is often referred to as invert sugar.

When sugars are broken down in the muscles, to produce energy, one of the products is lactic acid. This compound, which is responsible for fatigue, is only found in muscles in the D-form. The lactic acid found in sour milk, however, consists of an equal mixture of the D- and L- molecules.

Just as a glove will only fit the hand for which it is designed, the molecules in the body can only respond to chemicals of the correct orientation. The mirror image form of a chemical will provoke a completely different response.

The L-form of limonene, for example, is responsible for the smell of lemons, while the D-form smells of oranges and L-carvone smells of spearmint, while D-carvone of caraway. L-nicotine, the natural tobacco product, is toxic; the D-compound much less so. L-adrenaline strongly constricts the blood vessels, while its mirror image has little effect. The mirror image form of the important anti-oxidant, vitamin C, has almost no effect in the body.

Most drugs are chiral: amphetamines; the pain killer, ibuprofen; the heroin substitute, methadone. In such cases, only one form is effective. Its mirror image may do nothing at all, or it may cause unwanted side effects.

The most notorious example of the importance of chirality in drugs is seen in the thalidomide tragedy of the 1960's. D-thalidomide is a safe remedy for morning sickness in pregnant women, and where only this was present, there were no problems. Unfortunately, some samples of the drug contained a mixture of the D- and L-varieties, and it was the latter which led to deformities in thousands of babies whose mothers had taken the drug.

In an effort to avoid repeating such tragedies, the left- and right-handed forms of new drugs are now tested separately before being passed for use. Care is still needed, however, as there is evidence that one form may sometimes be changed to the other, inside the body.

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EIDERS

Oscar J. Merne

NOWADAYS synthetic materials are used extensively in the production of duvets, sleeping bags, quilted jackets and other items for keeping people warm, whether it be on cold nights at home, on mountaineering expeditions, or on visits to arctic regions. In the past "eiderdowns" preceded synthetic duvets, and sleeping bags were stuffed with down from the breasts of Elder ducks. This down is still used for the more expensive sleeping bags necessary for the extreme cold in alpine and polar explorations, for its lightness, unsurpassed thermal conservation properties, and its ability to be compressed very tightly when packed.

Elder down used for these purposes is not plucked from the breasts of shot or trapped Eiders. Rather it is collected from the nests of Eiders shortly after the ducklings have hatched and moved away to nearby seashores. Often the collection of Eider down is a small-scale cottage industry, but in some countries such as Iceland, where Eiders are particularly common, quite large Eider "farms" are developed. Eiders by nature are colonial nesters and for reasons unknown, numbers can be encouraged to breed in convenient places by stringing up colourful bunting around the nesting ground.

In the spring the female Eiders make their nests on the ground in slight hollows which are lined with grass and other available dry vegetation, and then with a large amount of very warm, fine down which the ducks pluck from their own breasts. Clutch size is very variable, ranging from just one egg up to seven or eight, with two to four being most frequent. These are incubated by the ducks for about four weeks, during which time the incubating birds leave the nests only occasionally and for short periods. Before doing so the ducks carefully cover the eggs with the nest down to keep them warm. This is essential in the more northerly parts of the breeding range where temperatures can be very low, even in summer. The ducklings hatch more or less simultaneously and their down dries quickly and fluffs up. The family soon moves to the shore where the ducklings take to the water, cared for by the mother duck. There they feed themselves by diving and catching small crustaceans. As they develop they take more and more shellfish, especially mussels. Often the ducklings from different broods come together to form creches, sometimes containing 100 or more birds.

Globally the Eider is a bird of arctic and sub-arctic regions in Canada, Alaska, Greenland, Iceland, Scandinavia and Russia. In Europe the breeding range extends southwards to the Baltic States, Denmark, the Netherlands, Scotland and northern England, and the north coast of Ireland. Some of this southwards extension has occurred in recent times, and Eiders first nested in Ireland in 1912, on Inishtrahull, off Malin Head in Co. Donegal. From there the species spread eastwards and south to the Copeland Islands and Strangford Lough in Co. Down, and westwards and south along the Donegal coast as far as Inishmurray in Co. Sligo. More recently small numbers of Elders have taken up residence in Co. Kerry. On the Continent there is also an isolated breeding outpost on the southern coast of Brittany.

In winter a few Eiders are recorded on the rest of the Irish coast, but the great majority of the birds remain close to the breeding areas. They are very gregarious and "rafts" of up to 600 birds have been seen on the Donegal coast. The total Irish population now is estimated to be about 2,200 birds. It is interesting that in spite of the warming influence of the North Atlantic Drift and the increase in global temperatures this essentially arctic species seems to be extending its range slowly southwards, rather than the opposite.

In the past Elders were often overexploited for food, but improved protection in most countries during this century has led to a population increase. Recent winter censuses in Europe have produced between 2.4 and 3.3 million Elders. If present trends continue maybe one day there will be enough Eiders here to allow "harvesting" of the valuable Elder down from used nests.

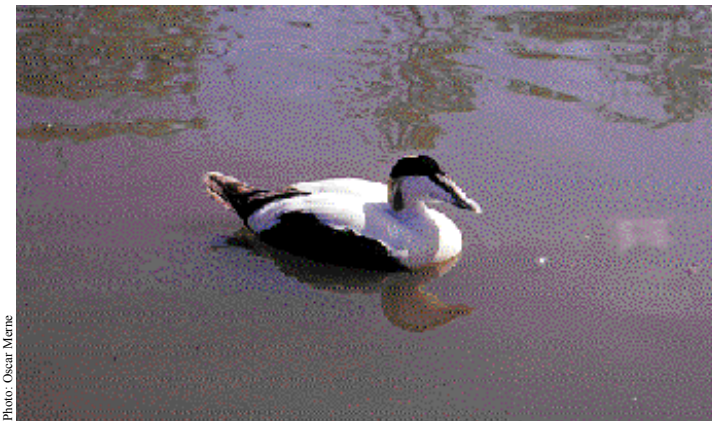


Photo: Oscar Merne

The Eider - famous for its valuable down, which has unsurpassed thermal conservation properties.

Oscar Merne heads the Bird Research Section of the National Parks & Wildlife Service of Duchas The Heritage Service, 51 St. Stephen's Green, Dublin 2.

Photo: Oscar Merne

Inishtrahull, off Malin Head in Co. Donegal, where Eiders first nested in Ireland in 1912.

The **Central Fisheries Board** is the national co-ordinating body for the management, development, protection and marketing of Ireland's Inland Fisheries Resource. The Board is also responsible for the promotion of the Marine Sport Fisheries.

Ms. Josephine Coleman has recently been appointed as Catchment Management and Environmental Co-Ordinator for the Board.

This new post will involve the implementation of the Catchment Management approach to inland fisheries as outlined in the Board's 'Strategic Development Plan for Inland Fisheries 1998-2002'. This will involve the co-ordination of the six pilot catchment management projects announced some time ago by the Minister for the Marine and Natural Resources. A pro-active approach to pollution prevention and control will also play an important role in this process.

The Catchment Management process involves the various interested parties from a geographically distinct river catchment coming together to assess their own individual needs. Such interests may include anglers, commercial fishermen, riparian owners of fisheries, local communities, local authorities, agricultural interests, tourists and any other public and private agencies interested in fisheries and environmental matters.

For further information please contact: Ms. Josephine Coleman, Central Fisheries Board, Tel: (01) 837 9206, e-mail: info@CFB.ie.

ENVIRONMENTAL ENFORCEMENT: *Beyond Penalties*

By: Walter E. Mugdan

ENVIRONMENTAL regulations don't mean much unless they are enforced. For this reason, the United States Environmental Protection Agency (EPA) has developed a vigorous enforcement program to complement its regulatory efforts.

EPA believes that a monetary penalty should ordinarily be imposed when there has been a significant violation. Such fines are among the most effective deterrents to future violations. The size of the fine should reflect the severity and duration of the violation, the violator's past compliance record, and the violator's ability to pay.

At a minimum, the penalty should eliminate any economic benefit enjoyed by the violator as a result of his violation. Economic benefit accrues to a violator when a capital or operating expenditure associated with coming into compliance is delayed beyond the required compliance date. For example, if a company delays an expenditure for pollution control equipment, it can use the money during the interim for some profit-making investment. The return on this hypothetical investment can be estimated using accepted economic models. In addition, this company will also avoid the costs of operating the pollution control equipment during the interim period. Both the return on the hypothetical investment and the avoided operating costs are economic benefits which accrue to the violator, but not to his law-abiding competitors who comply on time.

But merely recovering the economic benefits from a violator is not usually enough; after all, this only puts him back where he should have been if he had complied on time. An additional payment, sometimes called the "gravity" component, provides the deterrence. In determining the size of the gravity component EPA evaluates all the circumstances, such as the seriousness of the violation, its impact on the environment, the violator's cooperativeness upon detection, the speed with which he comes into compliance, and his past compliance history.

Pollution Prevention Projects

Penalties are important, but they are not the only approach for resolving an enforcement case. EPA has developed an innovative enforcement approach which can benefit the environment more than a mere penalty, and can even benefit the violator. EPA allows a violator to reduce the fine he would otherwise have to pay in exchange for a binding commitment to carry out an environmentally beneficial project. Such a "Supplemental Environmental Project" or SEP must be related in some way to the underlying violation; more importantly, it must go beyond what the law already requires.

Some SEPs involve pollution prevention projects, in which the violator reduces a discharge of pollutants below the required level. This can be done by adding more pollution control equipment or, better yet, changing the manufacturing process so that less pollution is generated in the first place. Other SEPs involve protection of environmentally sensitive areas.

EPA calculates the after-tax cost of such a project; that cost is used to offset the "gravity" component of the penalty. (The economic benefit portion cannot usually be offset by SEPs.)

SEPs can have great benefits for the environment, and often to the regulated entity as well. The following are examples of some of the most successful SEPs we have negotiated:

* In 1991, E.I. DuPont De Nemours settled an enforcement case involving its 76-year old plant in New Jersey, one of the largest chemical plants in America. DuPont agreed to pay $1.85 million in penalties, and also to study 15 chemical manufacturing processes. The results surprised even the company itself: wastes from these processes were reduced by 48%, while saving the company nearly $15 million a year! Improvements included reduced used of chemical solvents; reductions in by-products and, in one case, packaging materials in reusable containers instead of 55-gallon drums that were decontaminated and discarded. The 15 projects had a one-time total capital cost of $6 million, and are saving DuPont $15 million annually. Best of all, DuPont's study is publicly available so that these technologies can be shared with other companies and other industries.
* Chemical Waste Management, Inc. (CWM) is the world's largest waste management company. In a 1993 enforcement settlement, CWM agreed to purchase emergency response vehicles and other related equipment for Niagara County, New York (where the violations occurred), and to provide training in their use for County personnel. CWM also implemented a County-wide household hazardous waste collection and disposal project, including outreach to community groups and development and production of promotional and educational materials. The value of this SEP was estimated at $730,000.
* In 1994 the Eastman Kodak Company settled an enforcement case involving its Rochester, New York plant — one of the oldest and largest manufacturing facilities in the world, employing over 20,000 workers in 400 buildings. Kodak agreed to pay a penalty of $5 million dollars and also upgrade the 31 miles of industrial sewers in the facility, from which hazardous chemicals were leaking. In addition, Kodak agreed to implement $12 million worth of SEPs. By the year 2001, these SEPs are expected to reduce pollution discharges by 2.3 million pounds more than what is otherwise required by law.
* In 1991 the Exxon Corporation (known as Esso in Ireland) settled several lawsuits arising from a 1990 spill of 560,000 gallons of oil into the Arthur Kill, the marine waterway that separates New York City's Staten Island from New Jersey. The spill happened when an underwater pipeline running from an Exxon refinery to a nearby storage terminal ruptured. Pipeline operators had ignored warning signals designed to alert them to a spill; these warning systems had been malfunctioning for an extended period without having been repaired. Exxon carried out the required spill cleanup operations. Under the enforcement settlements, the company paid a $3.5 million fine and provided a further $11.5 million for purposes such as purchasing conservation areas in the New York City Harbor vicinity. Among the areas purchased are portions of one of New York City's least known environmental treasures, the Harbor Herons Wildlife Refuge, home to New York State's largest colony of herons. The refuge is home to some 1,200 nesting pairs of herons, egrets and ibises.

  This thriving colony of herons and other wildlife tells a separate, even more important story. The refuge lies in the middle of heavily industrialized areas which had, until recently, been so severely polluted that they were considered little better than open sewers. But pollution controls first established under U.S. environmental laws during the 1970's worked: water quality improved, the natural food chain was reestablished, and the birds returned.

These are just a few of the hundreds of SEPs negotiated by EPA over the past few years. More detailed information about the wide range of SEPs used in EPA enforcement cases can be found on the Internet at: http://es.inel.gov/oeca/sep

Most of EPA's enforcement policies, including its policy on what kinds of SEPs are appropriate to use in settlement of enforcement cases, can be found at:

http://es.inel.gov/oeca/epapolguid.htm

Walter E. Mugdan, Regional Counsel, U.S. Environmental Protection Agency, Region II, Jacob K. Javite Federal Building, New York, New York 10278, USA.

THE HOWTH PENINSULA

A Guide to it's Wildlife Habitats

Howth Peninsula has been described as a microcosm of the Island of Ireland.

THE Howth Peninsula lies at the north eastern edge of Dublin Bay. In 1990 a Community Development Group emerged on the Howth Peninsula. The two main centres of commerce on this peninsula are Howth, a well known fishing port, and Sutton, the main banking and shopping centre. The group called itself Howth/Sutton 2000 (referring to the coming millennium). The County Development Plan is renewed every five years so members of the group set about preparing their own local development plan, part of which they hoped to have included in the 1991 County Development Plan. They succeeded in their objective and most particularly with regard to planning development and environmental matters including the protection of open spaces, deemed to be of high amenity value.

The Howth Peninsula - A Guide to it's Wildlife Habitats resulted from a FAS Training and Employment Authority project sponsored by Howth/Sutton 2000 as one way of carrying out their environmental, conservation and tourism objectives. This, of course, would have a natural spin off in terms of job creation as the fishing industry and tourism development were identified by the group as being the most suitable sources of job creation for the area.

The Howth Peninsula is a mere 10 miles from the centre of our capital city. Howth/Sutton 2000 realised that unless the enormous and obvious asset of this mixed and delicately balanced environment was highlighted, it would be quickly destroyed (a) by building and other development, and (b) by overuse. Development land prices on the Howth Peninsula are amongst the highest in the country and many Dubliners who have visited the Howth Peninsula over the years are appalled at how little of the open spaces still remain and at the intensity of development in general. Howth/Sutton 2000 sees the Peninsula as a high quality amenity for the citizens of Dublin and it's visitors and believes that the facilities of the area, both natural and man made and it's accessibility by public transport make it unique in European terms.

What is so special? It has been described as a microcosm of the Island of Ireland and the visitor pack, "The Howth Peninsula", records this fact. It sets out in panels at the back of a fold away map, the various habitats on the peninsula. It identifies common plant and animal life and when best to view it. The Howth Peninsula boasts the presence of 80% of Ireland's wild flowers. On the doorstep of our capital city, with a population of over one million, we have a small bog, low heathland, which, despite the many fires caused by some young "bored" people, continues to sprout forth bell and ling heather, and the glorious yellow furze, which is at it's best in May/June. The woodlands are carpeted with wild garlic and bluebells. They are accompanied by Rhododendron Ponticum which, though threatening other species, is admittedly glorious in its purple hue. The Rhododendron Gardens at Howth Castle Demesne (Deerpark) with their wide variety of hybrid Rhododendrons and Azaleas can compete with Muckross House Gardens in Killarney in quality, if not in quantity. Many paths criss-cross the heathlands and meadowlands of the peninsula where horses graze in some of the most magnificent scenery in Ireland. From the famous East Mountain and West Mountain of the Hill of Howth there are panoramic views of Ireland's Eye and Lambay Islands to the north and Dublin Bay and the Dublin and Wicklow Mountains to the south. The City of Dublin spreads out to the west and is a mass of sparkling lights, lighting up the sky at night. It can be viewed from Shielmartin Mountain (the highest point) and Dun Hill opposite, a reputed resting place of the mythological figures Diarmuid and Grainne. The stony and sandy beaches provide rich opportunity for marine life enthusiasts and are easily accessed along the Lower Cliff Path which takes the walker practically right around the peninsula from Howth to Sutton or vice versa, where public transport (DART and bus) will carry them back to the city. The sea bird colonies along the cliffs can be easily and safely viewed from this path or a boat trip to Ireland's Eye during the summer season will provide rich pickings for ornithologists. On land, birds of heathland, meadowland and woodland abound though the fires and other untimely intervention by man has played havoc with habitats during the nesting season. Comment is often made on the number of foxes resident in the area regularly seen in gardens and disappearing into hedgerows as car lights approach.

The Howth Peninsula pack provides all this in colour and the map shows the main (though not all) pathways by which the visitor can criss cross the peninsula. The accompanying booklet, in two colours, depicts the main historical sites of the area, including one of the largest Dolmens in Ireland, a cairn, site of a promontory fort (now Baily Lighthouse), a holy well, a medieval abbey, the landlord's castle and three Martello towers. Information is also given in the booklet on places to eat, drink, sleep and be merry and other useful services, including transport.

Fingal County Council (formerly Dublin County Council) has praised the results of Howth/Sutton 2000's work and partially financed the publication of this visitor pack. Other funds were raised locally and generous funds came from the National Heritage Council.

A campaign has been raging for five years to protect the high amenity areas from further development. Howth/Sutton 2000 developed out of a wish to demonstrate the common sense reason for opposing certain developments. The group is now composed of two Tidy Town groups, Howth and Sutton, a combined Chamber of Commerce and a Planning Group. These groups network through the Howth/Sutton 2000 committee on many matters including Tourism Development, Job Creation, Transport, Environmental matters, etc. The FAS - Training and Employment Authority projects were one way of producing materials or doing work relevant to the Development Plan objectives of the group. Their five areas of study were Environment and Conservation, Job Creation, Tourism, Transport and Housing. In 1997, following five years of agitation and hard work by Howth/Sutton 2000 and others, the then Minister for the Environment, Mr. Brendan Howlin, T.D., announced a directive to Fingal County Council to prepare a Special Amenity Area Order (S.A.A.O.) for the seaward lands on the Howth Peninsula. The local councillors voted at a later date to extend this order to the inland portion of the peninsula. During the summer months a public information exhibition was on display explaining the process. Howth/Sutton 2000 provided all the information they had gathered over the years to assist and support this very important and historical initiative. Development pressure has increased since the former Minister's announcement, but with continued vigilance on the part of local groups and the good relationship which has developed with the Local Authority in preparing the S.A.A.O. and other matters, Howth/Sutton 2000 is hopeful that ground-up initiatives are seen to work and that networking between environmental and local business interests makes sense.

Howth/Sutton 2000 look forward to the implementation of the Special Amenity Area Order for the millennium and meanwhile continue to encourage and take direct interest in all matters concerning the beautiful environment in which they are privileged to live and which they hope to pass on to future generations of Dubliners.

Jean Finn, Howth Sutton 2000, "Fintona", Windgate Rise, Howth Summit, Co. Dublin.

A Boost for Ireland's Inshore Fisheries

By Matt Murphy

"THE socio-economic dividend of inshore fisheries is vital for those living along our seaboard," so says the Minister of the Marine, Dr. Michael Woods, T.D., in his foreword to the "Irish Inshore Fisheries Sector Review & Recommendations". He had asked BIM to undertake a strategic review of our inshore fisheries, in particular to examine structural and employment issues, conservation and management of inshore stocks and to identify existing and new development opportunities for the resources.

The report shows that the landings from the inshore sector are worth £30M i.e. 21% of total fish landings of £142M. Over 3,700 people are employed in the sector (representing almost 50% of total onboard employment in the fishing sectors.) There are over 1,744 vessel less than 15 metres in length in the sector – 83% of the national fishing fleet.

The report will be of major importance to the Government who will be submitting Ireland's proposals on what adjustments it needs to the Common Fisheries Policy, which will be decided by Brussels by the end of 2002. Inshore fisheries have never attained their full potential – in many ways they are the poor relations of the fishing industry. The inshore fishermen in most areas are unrepresented at national level. The main fishermen's organisations represent the larger boats and from the report it can be seen how true this is. Yes, the inshore fishermen have obviously been ignored.

The recommendations of the report include:

- A National Inshore Advisory Committee
- A pilot scheme should be established at local level to examine feasibility of setting up local Inshore Fisheries Committees.
- The Marine Institute should undertake an enhanced stock assessment and research programme of inshore stocks.
- Consideration to zonation of inshore waters for management purposes.
- Extend to all vessels the keeping of logbooks.
- BIM should undertake a review of marketing strategies and transport for inshore species.
- Inshore fisheries sector should be encouraged to avail of opportunities in aquaculture.
- BIM should carry out enhanced inshore fisheries development and training programmes.

The vital and most important section in this report are the comments on stock conservation by fishermen. These, if implemented, would have major significance in increasing the income of fishermen.

The main suggestions were:

- **Lobsters:** extend v-notching of spawning females (which means they are put back into the sea). Increase minimum size caught and limit the season each year.
- **Shrimps:** Limit pots per boat and fishing to five days. Prohibit sale of spawning shrimp. Introduce an escape panel in pot for small shrimp.
- **Seals:** They are a major problem to fish stocks and need culling.
- **Crabs:** Introduce a minimum size that can be caught.
- **Crawfish:** Discontinue crawfish nets, use pots only and introduce minimum size.
- Better Inshore organisations to represent them.
- Close local areas, on a rotation basis, to allow some recovery of stocks.
- Keep large fishing boats out of inshore areas.
- Better fisheries management for inshore areas.

There is now an opportunity for the Minister, Dr. Woods, to create a strong and vibrant inshore industry, by introducing many of the suggestions put forward by fishermen and the report's recommendations. Most, if not all, of the areas inshore are fished solely by Irish fishermen and thus can be controlled more easily. The inshore fish species landings can, with proper management and conservation regulations, be substantially increased in the coming years. This would give more secure employment to those already fishing and encourage young people into the fisheries.

This report is essential reading for all inshore fishermen and policy makers and especially local community groups. It is thorough, easy to read and understand - unusual for most reports. The Minister should be very pleased with his initiative in requesting BIM to undertake this report.

Environment Practice for Fish Farmers

By Matt Murphy

FISH farming in Ireland now produces one-third of the value of all Irish seafood. Its development has created genuine environmental concerns from local residences where it is being undertaken. It must be said that there is also a NIMBY (not in my backyard) lobby in certain areas who do not want any such development. They unfortunately are not prepared to see local employment being created in areas unable to attract industry, even in the "Celtic Tiger" era.

It must be said there are careless fish farmers who are untidy with their waste materials e.g. nets, ropes, pergola (mesh stockings for mussels). In some areas they failed to undertake good housekeeping practices. Because of this they are affecting most fish farmers and are giving the anti-lobby ammunition for further objection.

The recently published booklet "Aquaculture and the Environment" by BIM (Irish Fisheries Board) is most welcome. The purpose of the publication is to briefly explain what implications the Natural Heritage Areas (NHAs), Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) have for aquaculture operations. The aquaculture practices outlined in this booklet are given as examples of good environmental practice for aquaculture operators throughout the country.

The booklet stated: *"Far from being a threat to the aquaculture industry, properly implemented and scientifically based environmental and conservation legislation, will encourage a healthy, productive and profitable aquaculture industry, living in harmony with it's natural surroundings."*

Under the section on:

Aquaculture and Waste Management

- Recommendations are given on disposal, that a Waste Management Plan be implemented and that agreement be reached with the local authority on methods of collection and disposal of waste.
- In the disposal of chemicals, the manufacturers instructions to be followed
- All organic matters not to be disposed in the sea or watercourse.
- Waste storage to be out of public view.
- Finfish farms would have a plan to deal with large mortalities.

Infrastructure & Equipment: This section in the booklet gives the recommended action on certain issues.

- Always ensure that all necessary licences are compiled with. These include planning permission, foreshore licence and aquaculture licence. Water discharge licence.
- Keep noise levels of the operation at a level where they do not disturb neighbours.
- Keep onshore site tidy.
- Piers and jetties should be kept free and tidy.
- Make sure the site area does not contravene any seaweed rights, oyster fishery orders etc..

Other sections in the book explains the various areas of protection under Health regulations and the 1976 Wildlife Act. The animals that are protected under this Act include Cormorants, Herons, Terns, Oystercatchers, Bats, Otters, Seals, Dolphins, Whales, Propose. Culling of predators can only be carried out under licence.

That BIM has published this booklet has great significance. It is the marketing and grant aid semi-state body for the aquaculture industry. It realises that without a proper Environmental Practice the fish farming industry cannot expand and prosper. It is well aware of the genuine concern of the majority of the public and the hyped-up hysteria created by others.

BIM must insist that those it grant aids have to put an environmental management plan in place. It is only a minority of fish farmers that are rocking the boat but they must be dealt with severely. The isolated communities of the West and South West coasts need a thriving and expanding aquaculture industry – nothing must stand in the way of such development.

The Return of a "Keystone Predator" in the North Pacific

By Jane Watson

THE sea otter is back. A shy little marine mammal, the otter was once common all along the northeast Pacific rim, ranging from cold upwelled regions of Baja, Mexico to northern Japan. Conservative estimates suggest that prior to 1800, there were over 300,000 sea otters in the coastal waters of the North Pacific. But sea otters were highly valued for their pelts, and an intensive fur trade which lasted from the mid-1700s until their protection in 1911 reduced the worldwide population to fewer than 2,000 animals. In Canadian waters, the last known sea otter was shot in 1929.

Federal, provincial and state governments from Canada and the U.S. reintroduced sea otters to a remote portion of the west coast of Vancouver Island from 1969-1972. With little human intervention, the population has grown and spread at a rate of about 18% per year. In 1996 there were over 1,500 individuals, and the Canadian sea otter population was downlisted from endangered to threatened on Canada's list of species at risk.

This success is not unique. Reintroduced populations in Washington State and Southeast Alaska have also done well. Sea otters are fortunate in that they have few natural predators. Killer whales will prey on sea otters but appear to prefer blubber-laden seals, porpoises and dolphins. Bald eagles also take sea otters, often providing their offspring with sea otter pups.

Starvation is the greatest source of mortality in sea otter populations which have grown beyond the capacity of their habitat to support them. Female sea otters have one pup per year, but the low mortality rate, coupled with an abundance of resources, allows most sea otter pups born in Canadian waters to survive.

Sea otters are the smallest of marine mammals. An adult male may weigh up to 40 kg. Sea otters lack the thick layer of blubber found in most marine mammals and depend upon a dense fur coat and high metabolic rate to maintain body heat in the chilly north Pacific. Their high metabolic rate requires that sea otters eat up to one-third of their weight in food each day.

In British Columbia, sea otters act as a "keystone predator," a species that exerts a strong influence on the nearshore community, affecting its structure and biological diversity. In particular, sea otters feed on herbivorous invertebrates such as sea urchins, which graze intensely on seaweed and soft-bodied invertebrates. In B.C., sea otters appear to be the only non-human predator capable of controlling urchin populations. When sea otters were removed from the ecosystem 100 years ago, urchin populations increased and kelp forests along rocky coastlines declined, a profound ecological change that went largely unnoticed or recorded.

In areas without sea otters, urchin grazing restricts seaweed to inaccessible areas which are shallow and waveswept or have unstable substrate. Over the last ten years biologists have documented dramatic changes associated with the return of sea otters. As sea otters re-inhabit their historic range, urchins disappear and kelp forests grow. Kelp in turn affects the ecosystem, increasing nearshore productivity, providing particles of kelp for detritus-based food webs, creating habitat for adult and juvenile fish, and altering water currents which affects invertebrate settlement and even reduces coastal erosion.

Sea otters represent a valuable reminder of the interdependency of ecosystems. With continued non-intervention, and in the absence of environmental problems, the prospects for the sea otter should continue to look promising.

Photo: Tim Fitzharris

The sea otter is essential to the ecology of Canada's west coast.

Jane Watson is a biology instructor at Malaspina University-College in Nanaimo, B.C., Canada. The article was reproduced, with thanks, from the "Recovery - An Endangered Species Newsletter", published by the Canadian Wildlife Service.

ESB and its Role in Fisheries Management

By Maurice O'Callaghan

IN addition to generating all of Ireland's electricity requirements, ESB is also a major owner of inland fisheries in the country. Most of the fisheries are closely associated with the hydroelectric generating stations situated on the rivers Shannon, Erne, Lee, Liffey and Clady/Crolly. ESB runs a number of scientifically based fisheries management programs on the major systems to ensure the continued survival of all species native to these waters. In accordance with the terms of the Fisheries Act 1935 and subsequent legislation the particular focus of ESB is to maintain and preserve the migratory species on Ireland's waterways.

Each year ESB Fisheries publishes an annual report which offers some detail of the progress of ESB fisheries management programs. The report details the activities of the ESB across its broad fisheries management programs as it maintains and preserves fish stocks in accordance with government legislation. The ESB is responsible to the Minister of the Marine and Natural Resources for all activities relating to its role in Fisheries Management.

The main highlights from 1999's report include:

- Launch of phase Ill of the Shannon Salmon Management Programme
- Full recovery of the Mulkear River
- Excellent results from Parteen and Carrigadrohid hatcheries
- Completion of report on Trout stocks in Lough Derg
- Improvements to facilities at Pollaphouca reservoir and Inniscarra Lake

ESB operates its Fisheries conservation under the guidance of expert scientific groups in all fisheries management programs. Participating groups include experts from NUI Galway and Cork, Central and Regional Fisheries Board, Duchas and Department of the Marine and Natural Resources.

Highlights from the year:

Launch of Phase Ill of the Shannon Salmon Management Program:

The Minister for the Marine and Natural Resources launched Phase Ill of the Shannon Salmon Management Program. The programme is an ESB initiated proactive conservation measure aimed at preserving and maintaining the Atlantic salmon stock on the River Shannon. Phase 111 sets an action plan with clear, easy to evaluate targets for the implementation of the restocking and monitoring activities of the fisheries management.

The objectives set out by Phase Ill are:

- To ensure that 2000 wild salmon enter the cascade catchment annually to spawn
- To increase the understanding of salmon population in the residual catchment area
- To involve as many statutory and community groups as possible in the execution of the programme

Full Recovery of the Mulkear River:

In August 1997 there was a major fish-kill on the Mulkear River, Co Limerick. In response to the fish-kill ESB sponsored a two year post-graduate project to monitor the recovery of the river. The project is now complete and indications are that the ecology of the affected stretch has returned to normal and salmon stocks are close to full recovery.

Excellent results from Parteen and Carrigadrohid hatcheries

Parteen hatchery was constructed at Parteen weir in 1959. Its main goals are to assist the recovery of wild salmon populations upstream of Parteen and Ardnacrusha and to increase knowledge about salmon. As part of the Shannon Salmon Management Programme, 1.7 million unfed fry and 151,000 smolt were planted into the Shannon catchment over the last year.

Carrigadrohid hatchery on the River Lee was officially opened in 1956 and is located immediately downstream of Carrigadrohid generating station, Co. Cork. As part of the ESB initiated River Lee Salmon Management Programme an estimated 0.2m unfed fry and 90,300 smolt were released into the Lower River Lee.

Completion of Report on Trout Stocks in Lough Derg

A report of work carried out on brown trout in the Lough Derg catchment area during the period 1991-98 was issued by ESB during October 1998.

The report is a base line study which confirms reports that stocks of trout in the lake are seriously depressed. The reasons behind the decline in game fish stocks over the past decade is not fully understood but is thought to be linked to euthrophication. A proposal to carry out rehabilitation work on two feeder rivers to the lake is being investigated at present and involves cross agency co-operation to tackle the problem. There is some evidence to suggest that recent investment in local water treatment and agricultural pollution schemes is gradually improving the situation.

Improvements to facilities at Pollaphouca reservoir and Inniscarra Lake

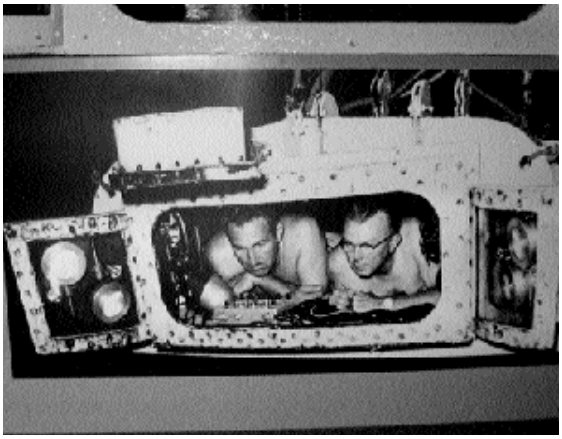
Pollaphouca reservoir is located at Blessington, Co. Wicklow and is owned and managed by the ESB. During 1998 improvements were made to car parking and access facilities on the reservoir. Facilities for disabled anglers were also among the new initiatives provided.

During the year, under license from ESB, car parking facilities and fishing stands were provided at 15 locations by South Western Regional Fisheries Board around Inniscarra reservoir, Co Cork.

Commenting on ESB's Fisheries activity Gerry Gough, Fisheries Manager, ESB said, "As ESB carries out its conservation work on Irish rivers it is evident that water quality continues to be a major problem for the management of fisheries. ESB welcomes the findings of Lough Ree/Derg Catchment Monitoring and Management Group which was produced earlier this year on the causes of poor water quality on the River Shannon. It is certainly a step in the right direction and ESB will be working closely with associated bodies to ensure the continued improvement of water quality in Irish rivers."

MY FATHER, THE NATURALIST

By Marcia Klingel Benouameur



GILBERT C. Klingel (1908-1983), a man of many talents, was an American naturalist, explorer, award-winning author, inventor, metallurgist, and boatbuilder. Of all these talents, however, he was first and foremost, a naturalist. His writings portray a love and understanding of all creatures, their cycles of birth, life, and death as well as their role in the ecological balance of nature. He knew that a breakdown of this balance would seriously endanger the environment of our earth. His inventions, as a pioneer in underwater exploration and photography, made the study of marine life easier to observe at a time when very few people thought it possible to spend extended periods of time below the surface of the water. His later years, as a retired metallurgist, led him to build boats by the sea he knew and loved so well.

Here was a man who enjoyed the simple life and the great outdoors and who often said he was born in the wrong century. He was self-educated, an avid reader, and a naturalist who preferred to observe the natural environment first-hand. He would like to have gone to such places as the Galapagos Islands to discover animal species unknown to biologists (as Darwin did) or have sailed with explorers (such as Captain Cook) in order to bring back plants and animals of the sea. Gilbert Klingel dreamed of carrying out a similar mission himself, in this century, and set out to do just that.

In 1930, he had a sailing ship built especially for a long expedition to the islands of the Caribbean. His 38-foot sailing yawl, the "Basilisk", was modelled after Captain Joshua Slocum's "Spray", the boat in which Slocum circumnavigated the globe singlehanded. Gilbert Klingel's expedition was sponsored by the American Museum of Natural History and the Natural History Society of Maryland and was to have been the first of its kind. Plans were made to sail from island to island in the West Indies to observe, collect, and gather information on rare species, especially lizards.

Gilbert Klingel's dream, however, was ruined by rough seas and a jagged coral reef. Shipwrecked on a desert island, he made the most of this tragic dilemma and discovered a natural world never before described in great detail. This misadventure later became the basis for his first book **Inagua**, which was published in 1940. He not only took many photographs and brought back specimens from this and other scientific expeditions, but also discovered several species of lizard new to science. While in Haiti, on another expedition, he took the first motion pictures of the Rhinoceros Iguana, a monster lizard, in its natural habitat.

Gilbert Klingel was one of those people who despite great odds at times, and little funds to carry out projects, still managed through faith and quiet persistence to reach goals which otherwise would have seemed unattainable. Using only make-shift equipment, such as a used boiler, garden hoses, and an automobile tyre pump, he invented a diving device in 1935 called the "Bentharium." With it, he made some of the first direct observations of the underwater life of the Chesapeake Bay. These studies, along with numerous field trips above and below the bay, eventually resulted in the publication in 1951 of Klingel's second, and best known book, **The Bay**.

This book soon caught the attention of the National Geographic Society and it requested his assistance in designing a new underwater diving device to photograph sea life under the Chesapeake Bay. Klingel's invention the "Aquascope" was built in 1952 and tested in 1953. The results of this research were published in the May 1955 issue of the National Geographic Magazine. The article was entitled "One hundred Hours Beneath the Chesapeake". The "Aquascope" is now on display in the Calvert Marine Museum, Solomon's Island, Maryland.

Though originally from Baltimore, Maryland, Gilbert Klingel chose to retire to Gwynn's Island, Virginia, a small island in the Chesapeake Bay located at the mouth of the Piankatank River. This was a place he had visited as a boy when the steamers came down the coast from Baltimore. It was a place he never forgot and always wanted to come back to. It was here he returned for the National Geographic project and it was here during the last twenty years of his life, he custom-built steel sailboats at his Gwynn's Island Boat Yard. Here he found the quiet life and once said: "The prime rewards are in small things, like listening to seagulls in the morning, enjoying the sunshine and hearing the wind..."

There is now a tiny museum on Gwynn's Island dedicated to preserving the history of the island and its inhabitants. One of the new exhibits on the second floor of the museum features the life and works of Gilbert Klingel. There is a second exhibit displaying most of his extensive butterfly collection. These exhibits are a small memorial to a man who contributed so much, not only to the island but to the field of natural history as well.

Marcia Benouameur, "Up the Creek", 24 Skipjack Lane, Hallieford, VA 23068, U.S.A.

Using Wetlands to Clean the Environment

By Michael Ludwig

WASTEWATER treatment is costly and complicated. Most of the waste systems use decomposition to process materials humans discard. Natural decomposition sustains plant life and is a portion of the nutrient cycle. The most common and least expensive decomposition systems use bacterial degradation. The bacteria break large molecules into smaller ones by using the carbon and oxygen of the molecules. The amount of decomposition obtained is related to the amount and types of bacteria used, the nature of the materials being acted upon, the temperature within the system and how long the material is acted upon. The resulting products are often discharged as a liquid flow called "effluent." Two of the main materials found in effluent discharges are compounds of nitrogen and phosphorus. These two materials are the principal elements in plant fertilizers. When plants are able to use the released nutrients they grow.

In nature, plants are unable usually to find sufficient amounts of nutrients to sustain unlimited growth. However, when supplied with additional nutrients, they increase their growth. In water, these growth events are often rapid and usually termed "blooms." Farm ponds in late spring often look as green as the adjacent grass and water visibility is limited to only a few inches of depth when algae populations bloom. A similar event occurs in coastal waters when nutrient increases are provided to phytoplankton. Those blooms can have detrimental effects when toxic organisms are the principal users of the nutrients and when a bloom dies rapidly. In the former case, a red tide's toxicity can threaten the safety of seafood. In the latter case, when bacteria rapidly decompose a bloom, oxygen levels in the surrounding waters can be depressed or depleted. These consequences of nutrient loading have been understood for decades and are the basis for most water pollution legislation.

Finding simpler and more dependable methods of treating wastewater and removing pollutants is a constant goal.Without advances in tec hnology, more costly facilities must be constructed to deal with an ever-increasing need to handle previously untreated as well as new flows of waste. In the 1950's, German researchers began using bacteria and aquatic plants to improve their treatment of wastewater. In the 1970's, the American Space program began to use the combination for water recycling in space ships. Another effort was undertaken by the Disney Company to treat the wastewater at Disney World in Florida. Others had learned that the growing cycle of plants limits their nutrient uptake period to the growing season. To overcome this problem the Disney people began using aquatic plants that grow year round. They selected the water hyacinth, an import from Europe, as their water cleaner. Floating on the water surface, the plants are constantly removing the nutrients released by bacteria by expanding their root system in the waters beneath the plants. The Disney problems are not nutrient removal, but what to do with the resulting plants. There are few calls for several tons of water hyacinth plants produced every few weeks! The Disney Company continues to investigate uses even as they grind the plants into mulch. Recent activities by the US Government to protect the Florida Everglades from sugar cane farm pollution rely on similar techniques.

In the 1970's, researchers began looking at combining wetland restoration projects and improving water quality by passing polluted waters through the plantings. This appeared to have two benefits; the plants grew better and the water was cleaner. Researchers began to study the use of planted wetlands as a means to remove all manner of materials in effluents. Investigations have included the use of created wetlands to clean up everything from the effluent from shellfish and finfish processing plants to water running off roads and farmland or moving through garbage dumps or "sanitary landfills." The investigators have usually found that wetlands, by themselves, can not perform the entire job. In a New Jersey study of saltmarshes being used to clean shellfish processing effluent, the plants could not take up nutrients during the fall, winter or early spring (a handicap for the processing plant that needs to run year round!). In California and New York the use of wetlands to treat sanitary landfill discharges were hampered by the presence of toxic substances in the "leachate" leaving the landfill. (Leachate is the water and dissolved or suspended substances mixture created by water passing through a landfill or other waste site in which soluble material exist.)

Today, we continue to seek the right mix of effluent or leachate discharge volume and concentration, the bacterial and plant species best able to process the materials while accumulating, without harm, toxic pollutants and maintaining healthy environments. Although wetlands from the mountains to the sea have benefited from the research, we are finding that there is no single, simple, inexpensive or obvious answer to obtaining or maintaining the highest levels of water quality in our streams and coastal waters and their associated wetlands.

Michael Ludwig, NOAA, NMFS, 212 Rogers Avenue, Milford, CT USA 06460, USA.

The Care and Conservation of Graveyards

GRAVEYARDS are an important feature of the historic landscape and frequently provide clues to understanding our past. In recent years the increased awareness among local communities of the importance of these sites has inspired many graveyard clean-up schemes. While well-founded projects can enhance the appearance of old graveyards and simultaneously fulfill an important educational role, ill-conceived graveyard schemes can do untold damage.

The best possible advice should be sought from the outset and adhered to throughout a scheme.

Before work is undertaken in a graveyard or a church within it, ownership and legal status should be checked carefully. Old graveyards and churches are generally owned by a local authority, Church authorities, or the OPW. In some cases a graveyard may be the property of a private individual and as with any other property, the owner's permission is required before any work can be carried out there.

Humps and hollows in ground surface are often indicative of underlying archaeological features.

It should be noted that under the 1930 National Monuments Act, as amended in 1987, it is an offence to carry out works on any national monument (a term which includes old graveyards and structures within them) in the ownership or guardianship of a local authority without the consent in writing of both the Commissioners of Public Works and the authority concerned. Under the 1994 National Monuments Amendment Act, anyone wishing to carry out work on a site or monument listed in the OPW Sites and Monuments Record is obliged to notify that office.

Before starting a graveyard project it is important to consider how it will be funded. Clearly the amount needed will depend on the type of work envisaged. In a case where a graveyard is owned by a local authority, the possibility of funding for maintenance work from that authority should be clarified. In some instances funds may be available from FAS for a graveyard clean-up.

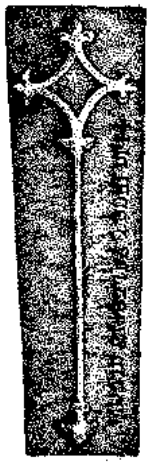
The first thing involved in caring for a graveyard is to decide, in consultation with an archaeologist, how much work you wish to do, how much you or your community can afford to spend, and how much alteration to a site is desirable. As a general rule, you should endeavour to alter the site as little as possible, indeed in the majority of cases, it is recommended that graveyard schemes limit themselves to vegetation clearance in an ecologically sensitive way. Judicious clearance of rank growth, striking a balance between the ecology and archaeology of the site, can leave a graveyard looking most attractive.

Old graveyards are also good habitats for a variety of insects, birds and mammals. Ivy-covered walls and ruins may be the home of bats and barn owls, while tall trees provide nesting sites for kestrels, sparrowhawks, rooks and jackdaws. Boundary hedges and scrub support a variety of birds such as thrushes, blackbirds, robins, wrens, tits and finches. In heavily farmed land, graveyards may be the only oasis left for some varieties of wildlife including grassland flora. Therefore, the removal of vegetation should be done in a judicious way so that, where possible, some is left for the benefit of the wildlife. The advice of a botanist is recommended for this important phase in a graveyard clean-up.

Under no circumstances should a graveyard ever be levelled off. The hummocks and hollows so characteristic of old graveyards frequently cover archaeological features such as wall-footings of early buildings, burials or ancient ditches. A mechanical digger should never be used in a graveyard.

All earthfast stones and gravestones should be left in the ground. Collapsed masonry from an ancient building within a graveyard may only be cleared under archaeological supervision. Any loose cut-stone architectural fragments found scattered about should be collected and carefully put aside in an area of the graveyard designated specifically for that purpose.

Unless graveslabs and headstones are in danger of falling or breaking, it is almost always best to leave them as they are. Straightening graveslabs involves disturbing the ground, thereby interfering with burials.



Box-tombs and table-tombs should not be moved or reconstructed without professional advice. Often these tombs and gravestones lend the graveyard its character and any attempt to lay the site out like a modern graveyard should be avoided.

Many graveyards are enclosed by attractive stone walls which occasionally incorporate ancient architectural fragments in their fabric and support interesting plant life. If a boundary wall is in need of repair, expert advice should be sought before any work commences. In general it is advocated that only very necessary repairs be undertaken. Existing masonry coursing should be maintained and correct mortars with flush or recessed pointing used at all times. It should be noted that ribbon pointing is inappropriate for an old wall. Under no circumstances should an existing boundary wall be pulled down.

For further information contact: The National Monuments and Historic Properties Service, Department of Arts, Heritage, Gaeltacht and the Islands, 51 St. Stephen's Green, Dublin 2.

Old pathways and mature trees enhance the appearance of graveyards and should therefore be retained.

SOLUTIONS TO LEAKING HOME HEATING OIL SYSTEMS

By Shane M. Bennet

THE BACKGROUND

Whether they realise it or not, home owners with oil storage tanks have put themselves in the unenviable position of storing several hundred gallons of a highly flammable and toxic chemical on their property. If this chemical escapes to the ground it can migrate both laterally and vertically to cause a host of detrimental effects both on the home owner's property and that of his neighbours. The unsuspecting home owner does not have to apply for a licence to take on this onerous liability; neither is there any equipment certification process nor manufacturer's maintenance schedule to meet. Every home owner with an oil-fired system is expected to become an expert in oil storage from day one without the benefit of any form of training.

THE PROBLEM

The problem begins when a significant quantity of oil is released in an uncontrolled fashion. This usually happens when a leak develops in either the tank or the connecting pipeline. However uncontrolled releases have also been known to occur during refuelling for a variety of reasons, most of them avoidable. Slow leaks are especially difficult to detect and it can take some time before a symptom manifests itself which is recognisable by the home owner.

Corrosion is the most obvious reason behind a leak developing in a tank or pipeline but there are a host of others. In the case of mild steel tanks the corrosion is rarely perceptible from external appearances and is generally more developed on the interior surface of the tank due to the constant condensation and evaporation of water vapour above the surface of the oil as a result of diurnal temperature changes. Typical failures can occur after about thirty years but are dependent on variables such as the gauge of steel used and the exposure of the tank to frequent temperature changes.

Underground tanks are less susceptible to such temperature changes but even these generally have a maximum life expectancy of less than forty years and some have been known to corrode in less than twenty-five years. Soil acidity and the action of static electricity are recognised as having a major role to play in the corrosion of underground mild steel tanks.

The plastic tanks that are now on the market are also vulnerable to failure. At least one manufacturer in Ireland has produced tanks which are especially prone to leakage. A recent court case laid the blame at the door of the mould manufacturers but this is scant comfort for the home owner especially when he has been given the reassurance that all tanks are certified as having been pressure-tested prior to delivery. The lifetime of plastic tanks is not yet known but on some of the early tanks the surfaces which are constantly exposed to sunlight (ultraviolet) begin to turn opaque after a few years and subsequently desiccate and become brittle. A realistic lifetime of these plastic tanks is therefore anticipated to be of much the same magnitude as the mild steel tanks. Two other phenomena to which the plastic tanks offer even less protection than the mild steel variety are fire and vandalism. For these reasons mild steel tanks continue to be the preferred choice for industrial applications.

The pipelines linking the oil storage tanks to the burner units have proven to be even more susceptible to leakage than the tanks themselves. Until relatively recently half-inch mild steel pipe has been the preferred choice although in some cases even lighter copper pipe has been employed. These pipes nearly always act as the electrical earth for the mild steel tanks and are thus continuously exposed to a mild form of electrolysis which can accelerate corrosion. However where lines have been lagged with a chemically resistant coating such as Denso™ tape, bitumen or Teflon™ they are generally adequately protected.

THE IMPACT

Heating oil leaks are generally only reported when their impact is sufficiently detrimental so as to require some form of remedial or containment action. These days home heating oil tanks rarely exceed 1,350 litres (300 gallons) but, if the oil were to be uniformly distributed in the subsurface, the total loss of a single tank could theoretically contaminate 270,000 kilograms of soil or 227 million litres of water to a concentration in excess of the Dutch intervention values.

When oil escapes it moves under the effect of gravity and percolates vertically where the ground surface is permeable. It will preferentially follow the line of least resistance such as that created by foundations, wall footings, or recently dug ground.

Some of the symptoms which have been reported in connection with heating oil losses are as follows:

- scorched grass and/or dying vegetation;
- complaints from the neighbours;
- dead earthworms, amphibians, and birds;
- strange odours (both indoors and outdoors);
- funny taste in the water or food (sometimes oil droplets);
- dry scaly skin (like excema);
- headaches and/or stomach sickness;
- oil burner keeps cutting out due to air-locking;
- unusual oil usage.

All these symptoms can translate into a sterile (dead) garden, a house with errant oily odours, a polluted well and water system, and a lawsuit from the neighbours who may have suffered the same consequences. Aside from the cost of the lost oil, the cleanup, and the tank/pipeline replacement, one must consider the gross inconvenience suffered by the home owner, his family and other affected parties.

Even these costs and inconveniences pale into insignificance when the potential loss of market value for affected properties is taken into consideration.

REMEDIAL ACTIONS

Immediately a heating oil loss is suspected by the home owner the insurers and the local authority should be notified. In the event that further advice is needed, either the Environmental Officer in the local authority or the Environmental Protection Agency can provide a list of specialists in this field.

The following is a list of some of the remedial actions which are commonly needed during cleanup:

- contaminated soil excavation, removal, and replacement;
- plume containment using pump and treat techniques;
- well abandonment and replacement (siting and construction are especially important);
- detergent wash and rinse of household water system following draining (including water appliances);
- excavation of an interceptor trench across the path of oil migration;
- chemical and bacteriological treatment of the subsurface;
- application of an indoor positive pressure system to eliminate vapours;
- groundwater sampling and analysis;
- tank and pipeline replacement including double-containment.

In rural areas the house is often supplied by its own well. If there is any chance that the well has been compromised the water must not be used for drinking or cooking purposes. If there is no oily odour from the water when it is boiled, it can be safely assumed that the oil content is sufficiently low (<1 ppm) so as to allow the water to be used for all other household purposes including bathing. The oil may appear intermittently however and it is essential to test both the water directly from the well and that supplied via the attic tank. Infants and small children are especially sensitive to water quality and, if there is any doubt, it is preferable to err on the side of extreme caution. Also remember that nearby wells may be affected and that those property owners have a right to know if their well may be affected.

THE COST

Cleanup costs for serious home heating oil leaks or spills are likely to exceed a figure of £1,000 under most circumstances. Where extensive damage has occurred, which affects for example a row of terraced houses, cleanup costs per house have regularly been known to exceed £10,000.

In most reported cases the home owner is not personally liable for the cleanup costs. If the property is insured, coverage may be provided for under an 'All Perils policy which often contains a sudden and accidental environmental damage clause. If the fault is one of poor installation, the company which installed the tank should have their own coverage. If the tank or line has been recently installed and has failed, then the tank supplier, manufacturer, or installer, may be liable. If the leak occurred on an adjoining property then the respective insurance companies should be in a position to agree liability.

PREVENTION

Many attempts to reduce the vulnerability of home heating oil storage tanks and lines to leakage have been practised in the past. Plastic tanks are only the latest attempt at improving home heating oil storage systems whilst keeping costs down. Cathodic protection using an electric field to counter corrosion was seen as the answer in the 1960s but fell prey to maintenance problems in the long term. The Teflon™ coated copper pipe was also a step in the right direction but, still has its disadvantages.

Double-containment has universally been accepted as an effective solution to the problem of leaking oil tanks at industry level and is now an accepted world wide standard. Double-containment of above-ground oil tanks is also a prerequisite under the IPC licensing system and could easily be adapted to suit home heating oil storage systems. The tank, whatever its construction, is placed within a purposely-constructed bunded area. The entire length of Teflon™-coated or Denso™-taped pipeline is sleeved with a further protective plastic outer cover and preferably routed over ground. Although unavoidable accidental heating oil releases will undoubtedly continue to occur, if these simple construction techniques are adopted, it can be expected that the number of home heating oil losses will be greatly reduced.

Shane M. Bennet, Contaminant Hydrogeologist, Grove Hill, Bishop Hill Road, Ballymore Eustace, Co. Kildare, Ireland.

Recycling Snippets

- In South Korea 15.4 per cent of discarded home appliances are captured and reused.
- The US Postal Services generated $8 million in recycling sales in 1997 from one million tons of paper, plastics, metals and other materials.
- Brighton Airport in Britain have reached a 26 per cent recycling level of waste generated from the airport and incoming flights.
- In the US 63.5 per cent of aluminium beverage containers are recycled.
- An all-recycled men's suit has been introduced in Japan. It costs US$175 and is made from old soft drinks bottles. Used suits can then be recycled.
- 10 million American households are now provided with curbside collection of used milk and drinks boxes.
- In 1996 in Canada over half of packaging waste was recovered for recycling.
- When the Superbowl was held in San Diego, USA, it generated over 56 tons of waste, of which 28 tons was recycled.
- An in-vessel organic composting system is being tested by the US Navy.

Necessity is the Mother of Invention

The Slufter silt depot on the Maasvlakte, off Rotterdam.

THE waterways which reach the sea at Rotterdam are all tributaries of the River Rhine and they carry a very great quantity of silt. In the estuary, and in the harbours which have been excavated there, the current is reduced so a major part of the silt settles as sediment. In addition, as each tide retreats it leaves behind further deposits of marine silt. If nature were permitted to run its course, within a few years the harbours would be completely silted up. To protect the port of Rotterdam from such a disaster around 23 million cubic metres of sediment is removed from the harbours and navigation channels every year. It is sufficient to fill 70 giant tankers, or, to put it another way, if the dredged material was distributed amongst the population of the Netherlands each citizen would get 150 bucketfuls every year!

Formerly people were pleased to have dredged material, which was in demand to raise the level of polders, industrial sites, recreational areas and residential districts. That time is long past. Since the nineteen seventies increasingly more insight has been acquired into the nature of the contaminants which accumulate in aquatic sediments. These contaminants are discharged into the Rhine, either directly or indirectly, by the water which drains off sprayed and/or fertiliser-rich agricultural land and also in the effluent produced by industry and cities. Part of the contaminant load remains dissolved in the water into the North Sea. Much, however adheres to the silt, which therefore becomes contaminated by a variety of substances. The dredged material is thus transformed from a desirable product into a troublesome waste material.

In 1975 a Steering Committee Disposal of Dredged Material was set up to investigate the best possible methods to handle the dredged contaminated material. By 1982 it published a policy plan for the handling of such material. It recommended that a site with a capacity of 150 million cubic feet would be needed.

In 1986 work began to create the "Slufter", a deep pit, in the sea at Maasvlakte off Rotterdam. During the one and a half year construction period a very great deal of work was carried out. Excavating a pit and constructing a ring dike sounds like a simple task. When, however, the pit extends over 260 ha and is 28m deep and when the excavation entails the removal of 37 million cubic metres of sand, which must be used to build 24m high dikes, it is anything but simple - certainly not when the sea tries to carry away again the sand that has just been discharged.

When the sand dikes were in place they were planted with marram grass to prevent erosion by wind, while on top of the ring dike a metalled road was made for the purpose of inspection. In accordance with the Waste Disposal Act the site is surrounded by a barbed wire fence, but six public observation points have been constructed.

The construction of the Slufter resulted in the formation of a new sea beach to which access is gained via a metalled road and for which car parks have been provided. The south side of the depot part of the area has been constructed as a "natural" environment. Extra sand was used to make artificial dunes alongside the ring dike. The variation in height causes irregular drifting as a result of which a natural landscape with a variety of vegetation has already been formed. Offshore an island has been made which, because it serves as a breeding ground and resting area for migrant birds, has come to be known as the "Bird Island". This entire area has been designated as a nature reserve and is closed to recreational use.

To cater for the excess water run-off from the Slufter a sedimentation basin was created nearby. Excessive water is removed from the Slufter via a pump sump and a special return water pipeline. During the placement of the dredged material continuous sampling takes place to determine the suspended matter content of the return water. When the suspended matter content reaches an unacceptably high level return water must first pass through this sedimentation basin on the Massvlakte. This sedimentation basin has an area of several hectares and, by reason of its shape, can reach a high purification efficiency. Once much of the suspended matter has settled out in this basin, the return water can be discharged into the harbour.

The dredged material for the harbours of Rotterdam is assessed for contaminants against qualitative norms. Category 1 is returned to the sea, category 2 and 3 are placed in the Slufter depot and Categories 4 heavily contaminated material is further segregated.

As it was decided that Category 4 would need extra care a further depot, which became known as "The Parrot's Beak", was constructed a short distance from the Slufter. This depot has an area of 29 ha and a storage capacity of about 1.2 million cubic metres. It is surrounded by a 3.3m high dike the slopes of which are covered by 2mm thick plastic sheeting. This high density polyethylene is intended to prevent contaminants from seeping out of the depot. Beneath the sheeting is a drainage system. The ground water is regularly sampled to check whether there has been an unexpected penetration of contaminants under the depot.

Each year from 1987 to 1993 over 10 million cubic metres of contaminated sludge was brought to the Slufter and the Parrot's Beak. Since 1993 this has been reduced to 5 million and by 2000 it is expected to fall further to 3 million cubic metres. These reductions have come about by approaching the major dischargers along the River Rhine and its tributaries and obtaining extensive reductions in contamination levels.

Sewage sludge from the province of South Holland is also transported to the Slufter. At present 55,000 tons of dry matter are accepted annually. At a special station the sewage sludge is mixed with the dredged material in the desired ration of 1:20.

There is no doubt that the Dutch have shown the way forward in the quest to reduce contaminants entering the marine environment. There is a lesson for all of us - but will we take it on board?

Rotterdam Municipal Port Management, P.O. Box 6622, 3002 AP Rotterdam, The Netherlands.

ENCOUNTER IN THE TUAMOTUS

By Pete Atkinson

IT is one of those rare halcyon days when I'm feeling serene and *Eila*, my 1935 English cutter is at rest. I sit in the cockpit with a beer, sundown on the way; it has been a hard day. About half a mile away I see a fish jump, breaking the calm atoll lagoon. With the binoculars I take a better look. Not a fish at all, but a dolphin; I can see its arching back glinting in the low sun.

Vicki grabs the snorkelling gear, I pull out my camera case and we pile into the dinghy. Planing, we cover the distance in no time. We stop the motor at a discreet distance and I snap on a 300mm lens with the idea of taking "dolphin barrel rolling against the sunset" pictures. Not that unlikely since we can see it is a spinner dolphin. But where are the others? Spinners are intensely social animals usually living in groups of 30 or more.

Vicki rows the dinghy towards the dolphin who seems curious about us, moving closer with each pass. I give the camera to Vicki and slip into the water. Suddenly, there it is, streaking past at the limit of visibility, about 20m away.

Instead of swimming towards the sleek animal, I feign some indifference, snorkel diving down, doing barrel rolls of my own, keeping a watch from the corner of my eye. With my palate I make sequences of clicking sounds; mumbo-jumbo to the dolphin, but conversation nevertheless. When I can see the dolphin, I half look away in appeasement, to show in the universal language of animals that there is nothing to fear.

I swim dolphin-style, neither towards nor away. Within minutes she is swimming past, just a dolphin's length between us. Vicki joins us in the water. It is only a few metres deep with a few coral heads. The sand between them reflects what little remains of the light.

The dolphin's behaviour is reminiscent of a puppy's, pleased to see us after a long absence. (The dolphin no doubt describing our behaviour as reminiscent of a couple of lunatics.) She swims away only to come skidding back, veering away at the last moment, bombarding us with clicks and whistles, tossing her head as though sniffing out a clearer sonic view.

Finally, as the colours become muted with the end of the day, a grey reef shark appears. I am hoping to see the much written about "dolphin kills shark" scenario. This may happen in the confines of an aquarium but in the ocean, as elsewhere in nature, animals usually establish hierarchies without recourse to violence. The dolphin and shark are indifferent to one another; the shark more interested in the aliens - us.

Cold and the gathering dusk persuade us to leave. Not wishing to shatter the calm, we row back to *Eila*, the dolphin leading the way by a dinghy length.

This, we think, is the conclusion of a unique encounter. In fact it is just the beginning.

We hadn't intended to come to Apataki at all. While in Takaroa, another atoll in the Tuamotu Archipelago of French Polynesia, a friend suggested that since I was so obsessed with sharks and manta rays, Toau would be an atoll worth visiting, with its clear water, few people and many fish.

But when we left Takaroa the wind was fresh from the southeast, making Toau a difficult destination and promising a wet, uncomfortable trip. I love the freedom to change plans at a moment's notice so that I can sail in a reasonably civilized manner. We decided instead to ease the sheets and try Apataki, a rectangular ring of coral fifteen miles long, with a village in the southwest corner of 250 people, and miles of uninhabited, palm-covered *motus* encircling the lagoon.

There are two passes, one by the village and another near the northwest corner. There we found anchorage off the *motu* of Rotoava; protected however, only from winds north of east. There was not a soul; just birds, terrestrial crabs, coconut crabs and a shallow brackish lake amongst the palms.

The next day we explore the *motus* further afield, taking the dinghy a couple of miles east across the calm lagoon. Of the dolphin - which Vicki has named Bojangles, partly on account of her ragged dorsal fin - there is no sign. Later, I spend long interludes up the mast searching the glassy lagoon surface for telltale activity.

At about 1600hrs, we take the dinghy down towards the pass. Vicki catches a glimpse of something; Bojangles has returned.

Again we stop the motor and row close. I slip into the water, this time with the camera in its underwater housing. The light is poor and the flashguns seem to disturb the dolphin, so I return it to the dinghy. She leads us into shallow water, a sandy bottom 5m deep, studded with beautiful coral heads reaching towards the surface. Here she plays games with us for half an hour. I let Vicki's tee shirt adrift in the water but Bojangles is uninterested. Dark falls and she is gone, but as we plane back to *Eila* she appears alongside, her low, powerful leaps effortlessly matching our 12 knots.

In the morning we again take the dinghy to the pass, thinking perhaps she spends the night outside, feeding in the deep water in the usual spinner fashion on small fish and squid. Although it is calm and easy to see any surface disturbance, there is no sign of her at all. Not until mid-afternoon do we find her, among the same pretty coral heads as yesterday. This time we are able to spend two hours with her, sometimes just an arm's length apart.

Often Vicki and Bojangles swim leisurely circles side by side around one particular coral head. The dolphin seems entranced, her eyes closing as they drift towards one another till almost touching. Then her eyes pop open and Bojangles gives a burst forward, only to slip back into the same mesmerized torpor.

Vicki runs her pendant along her chain necklace and Bojangles goes a bit crazy, rushing away to throw herself half out of the water a few times then zooms back, as if to make sure we are still there. When Vicki is cold she sits in the dinghy, gleaning what little warmth remains in the low sun. She whistles and talks to Bojangles, who swims very slowly, blowhole and head high out of the water for long periods. I quietly take pictures with natural light. The noise from the camera's advance motor doesn't seem to disturb her. When I am cold Vicki and I change places. I talk to Bojangles too and whistle a Maori tune we learned in New Zealand. It feels good and reassuring to watch this communion of our two species.

When, finally, we both leave the water, Bojangles does back flips and rushes around the dinghy. We return to *Eila* for film, intending to take some topside shots of her barrel-rolling against the sunset, but she is sedate now and not inclined to play games to order. The evening is perfectly calm, the interface of sky and lagoon absolutely seamless.

After dark she comes to visit *Eila*; we can easily hear her breathing from down below. We go outside to talk with her, thinking the chat itself is more important than what is said.

In the past we have had good responses from dolphins with Bach, so we try the double violin concerto on the cassette player. This time her behaviour seems unchanged.

During the night she visits us three more times; each time I feel obliged to go outside for a chat, to show her that she hasn't been forgotten.

In the morning we spot her at about 0930hrs. At last this is the kind of light I need for reasonable pictures. We make her acquaintance in her usual spot. Today her behaviour is more playful, more intimate. Often as she swims past she excretes a muddy jet plane vapour trail. Thus we can see the anus right next to the ventral slit which allows us to sex her. Male cetaceans have a gap between the anus and ventral slit. We spend two and a half hours with her, just frolicking in the shallows.

Often she shows us her ventral surface, often throws herself half out of the water and dashes away only to return. I try peek-a-boo with her but she gives no response. I use a wetsuit this time, and scuba gear intermittently.

Then there is the leaf: an old leaf the size of a hand, drifting on the surface. Suddenly it is caught on her flipper. Now it is adrift. I grasp the leaf, swim with it and release it. Bojangles glides up to the leaf, nods at it with her beak and it is caught on her flipper again. Vicki and I exchange elated smiles behind our masks, which instantly flood! Four times the dolphin catches and releases the leaf. At last we are cold, out of film and emotionally frazzled. We return slowly to *Eila*, the dolphin following all the way. She does a couple of circuits round *Eila* and returns to the shallows.

After lunch and changing films we return, finding her in a different place. Again beautiful coral but the water is turbid with plankton. She seems reluctant to interact at first and is more sedate now. Often she swims out towards deeper water, but the dinghy is anchored and we are reluctant to follow. She returns each time and passes close by as if to ask "Why?".

Finally she disappears into deeper water and does not return. On our way back to *Eila* we see no sign of her. The wind, however, almost absent over these past four days, has begun: the southeast trade. We have no protection here from the southeast so we prepare ourselves for leaving.

As a last farewell, she visits us that night, just once, and we go outside to say our goodbyes.

By morning the anchorage is marginal. I take the dinghy to her favourite coral heads but I cannot see her. I motor reluctantly back to *Eila* against the chop kicked up by the new trade. Vicki and I are silent as we put the outboard below and the dinghy on deck, exchanging long glances to which words would be a precarious addition. By mid-morning we are under sail, on our way to Tahiti.

Once in Papeete I was able to correspond with Wade Doak in New Zealand, a leading authority on extended encounters between humans and cetaceans and author of numerous books on whales and dolphins. Although there have been interlocks with groups of spinner dolphins in Brazil, this is the first extended interaction with a solitary spinner dolphin of which he is aware.

Pete Atkinson was a volunteer at Sherkin Island Marine Station in 1981/82.

Winter plumage turnstones on a quay at high tide. Turnstones get their name from their habit of turning over stones, pebbles, clumps of seaweed and other tideline debris, in search for food.

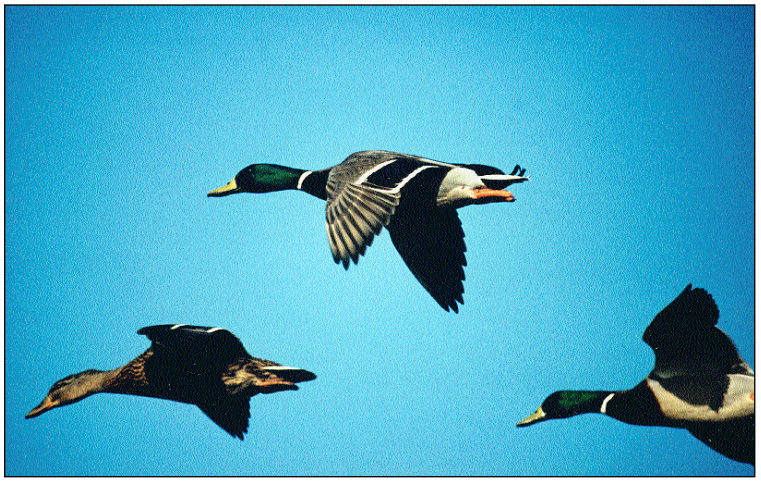
Male (left) and female (right) wigeon feeding on the edge of mudflats, showing the difference between the plumage of the sexes.

Due to their habit of occasionally taking young birds, herons are not always popular and are often driven away from a feeding area by intensive mobbing, in this case by a rook.

Birds, Beautiful Birds

Photography by
Richard Mills

From the book: "Ireland's Bird Life. A World of Beauty"
Published by Sherkin Island Marine Station, Sherkin Island, Co. Cork
Available for £16.99 (hardback) or £9.99 (softback), plus £3.50 postage.



In the past wild mallard ducks used to feed throughout the day, roosting at night. Because of hunting, they have changed their habits and generally loaf throughout the day in undisturbed sites, flying to nocturnal feeding grounds at dusk.

A frequent sight is that of gulls following boats out to sea to scavenge scraps of the catch. The commonest gull in Ireland is the herring gull, breeding mainly on the coast.

Introduction to Sustainable Living

Why should I make a choice for a sustainable lifestyle?

Current human activity, through its wasteful and inefficient use of natural resources, has the potential, if left unchecked, to inflict permanent damage to the capacity of the planet to support future societies and plant and animal life.

Problems are emerging on a global scale, e.g.

- Global Warming or Climate change
- Depiction of the Ozone Layer
- Decline of the tropical forests
- Species loss
- Unequal distribution of wealth both between countries and between different social groups within countries.

While these problems are global in scale, action must be taken at all levels, i.e. world wide, at continental, national, regional and local levels and by individuals.

We must think globally and act locally.

Development must not deplete the natural resource base - this is particularly important for Ireland.

The link between economic growth and increased environmental pressure must be broken. Sustainable development considerations should be taken into account in every policy and action.

The national and international framework to facilitate the change has been put in place and is continuously being updated and refined to reflect emerging needs.

Individuals must act. We cannot continue as we are doing now.

Fundamental changes in our lifestyles are required.

These changes require a systematic and comprehensive approach: sustainable development is a long-term process.

There are options and choices that have to be made.

Our lifestyle will create the heritage of generations to come.

Everyday activity counts.

What is "Sustainable Development"?

The term "Sustainable Development" reflects the interdependence of environment and development in the pursuit of a better quality of life for everyone. Sustainability requires the present generation to leave the environment in as good, or better, condition that it found it. Development recognises that human living, material well-being and economic activity must continue and grow. While these activities unavoidably have some impact on the environment, sustainable development policies seek to manage and control them as to respect the environment and use natural resources in a sustainable way.

The term "sustainable development" has been in use since the early 1970s. It has survived because both developers and environmentalists now realise that there is much common ground between them. Their concerns are mutually exclusive.

Perhaps the best and most understandable definition of sustainable development is that provided by the World Commission on Environment and Development in its Report - "Our Common Future" in 1987, more commonly known as the Brundtland Report:

"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

This definition recognises that economic activity is necessary to meet present economic and social needs while underlining the importance of maintaining the scarce and precious resources that will be needed by our children and grandchildren.

Other definitions have been proposed, e.g.

" improving the quality of human life while living within the carrying capacity of the Earth's supporting eco-systems"

based on recognition that

"we have not inherited the earth from our parents but borrowed it from our children"

in "Caring for the Earth; a Strategy for Sustainable Living", a report published by the World Union for the Conservation of Nature (IUCN); the United Nations Environment Programme (UNEP); and the World Wildlife Fund (WWW) in 1991.

A question of balance

The problems arise in choosing between what we need and what we desire. We need a clean and safe environment, we want an increasing array of consumer goods and services.

How we produce and how we consume resources at present places a heavy burden on our environment and affects our quality of life. The difficult, but not impossible, task facing us, in partnership with all concerned, is to find more environmentally friendly and socially sustainable ways of living and working.

Sustainable development seeks a balance between social and economic development and environmental protection, so that human activity does not undermine the long-term productivity of supporting eco-systems.

A question of integration

Integration of environmental considerations into other policies is widely acknowledged to be a key means of securing this balance. Recognition of this underpins Ireland's national approach to sustainable development strategy and informs the mechanisms and structures through which the attainment of strategic objectives is being pursued.

Change of lifestyles is an evolutionary partnership

The pursuit of sustainable development is not the sole responsibility of Government or any particular organisation or individual. The solution must be a partnership arrangement. It is also international experience that the process of change is an evolutionary rather than revolutionary process.

Ireland's Ecological Footprint

Ireland's ecological Footprint is already 1.23 times the size of the hand available,

In preliminary calculations by the UCD Environmental Institute, based on a standard methodology, the average size of Ireland's ecological footprint is 2.38 hectares per person, or a total of 86,325km^2 - some 1.23 times the size of the State (70,394km^2).

Features such as low population density and a high percentage of productive agricultural land have allowed Ireland to retain a relatively small footprint for a developed country. However, as this preliminary footprint measurement includes only four categories of domestic consumption (i.e. fossil fuels, built-up land, food and forestry), the results may be regarded as presenting a conservative illustration. Given that substantial socio-economic development needs remain, ecological footprinting provides a means of demonstrating the importance of sustainable development considerations in relation to lifestyle and consumption patterns.

WHAT CAN I DO?

Are you willing and prepared to join this partnership towards sustainability? In other words are you willing to make the choices for a quality and sustainable lifestyle?

Issued by: ENFO - The Environmental Information Service, 17 St. Andrew Street, Dublin 2. Telephone 01-6793144

WRECKFISH IN IRISH WATERS

By Declan T. Quigley

THE Wreckfish or Stone Basse *(Polyprion americanus)* is a large grouper-like fish belonging to the same family (Serranidae) as the Sea Bass *(Dicentrarchus labrax)*.

Wreckfish are found throughout the North and South Atlantic, in the Mediterranean, in the southern Indian Ocean (St Paul and Amsterdam Islands), and in the western South Pacific (southern Australia and New Zealand).

For many years the Wreckfish was regarded as a rare vagrant in Irish waters. Indeed, prior to 1952, only 12 specimens were known. However, the species has been reported with increasing frequency since the 1960's (46 specimens recorded between 1960 and 1995) and it is now known to be a fairly regular summertime visitor to our shores.

Wreckfish have been recorded in Irish waters nearly every month of the year, except during April, May and December. However, the vast majority of specimens have been recorded during late summer and autumn (July, August and September), with a peak occurrence in August. The species is rarely encountered during winter or spring.

All records to date have been confined to the S, SW and W coasts; the vast majority from Counties Cork and Kerry (Table 1). The species appears to be relatively rare along the W coast and there are no records at all from the N coast or Irish Sea.

Table 1. Distribution of Irish Wreckfish records

County	*Number*
Wexford	2
Waterford	5
Cork	35
Kerry	22
Clare	2
Galway	1
Mayo	1

Nearly 50% of the Wreckfish have been captured by anglers (Table 2). Indeed, the frequency of Wreckfish recordings appears to have increased in parallel with the growing popularity of sea angling in Irish waters since the early 1960's. Indeed, in 1978, the Irish Specimen Fish Committee (ISFC) decided to include the Wreckfish in its list of eligible species at a minimum qualifying weight of 3.628kg (8lbs). Since then, a total of 16 specimens has been recorded, including the current ISFC record, weighing 4.9kg, which was captured by a shark angler off Kinsale, Co Cork in August 1989. However, the Irish record is relatively small in comparison with the European record (48.5kg) which was captured off the Azores in August 1985.

Table 2. Capture methods of Irish Wreckfish

Method	Number
Rod & Line	31
Drift-Net	13
Trawl	7
Observed	6
Mackerel Net	3
Beam Trawl	1

Juvenile Wreckfish tend to be gregarious and pelagic for the first part of their life (up to a length of about 60cm) and they are often found associated with floating debris - hence the species common name. Indeed, on one occasion (September 1854) several specimens were found trapped in a floating barrel off Ventry, Co Kerry. Presumably, these unfortunate fish entered the barrel when they were very small and drank the contents dry ! It is interesting to note that the vast majority of Wreckfish captured in Irish waters were juveniles. Fish of this size have been aged at 1-7 years old. Wreckfish are thought to adopt a demersal habit when they reach maturity at a length of about 85cm. Adults tend to be more solitary and are found at depths of up to 1000m. They also grow to a large size (up to 100kg and 200cm) and live a relatively long life; the maximum age recorded in western Atlantic fish has been estimated at 32 years.

The Wreckfish was formerly considered to be rare in the western Atlantic. However, in 1987, a new fishery was developed for the species off the coast of South Carolina on a rocky area of the Blake Plateau known as the Charleston Bump (320N, 790W). Since then, increasing fishing pressure and reduced catches has resulted in the imposition of a total allowable catch (TAC) by the US fisheries authorities. Research led by Dr George Sedberry at the US Marine Resources Research Institute, South Carolina, has shown that Wreckfish on both sides of the N Atlantic belong to a single genetically related stock. The species therefore needs to be managed as a single stock throughout the N Atlantic.

Sedberry hypothesized that the pelagic juvenile Wreckfish found in the NE Atlantic (and off the Irish coast) originate from the spawning grounds on the Blake Plateau and are carried by passive drift across the N Atlantic in the Gulf Stream. Furthermore, it is thought that these juveniles eventually complete the return journey (by drift) back to the Blake Plateau by way of the N Atlantic Gyre. Indeed, the same patterns of water circulation may also mediate similar movements of juvenile Loggerhead Turtles (Caretta caretta) and Trigger Fish (Balistes capriscus) in the N Atlantic (see Sherkin Comment No. 23, 1997).

The author is currently collecting Irish Wreckfish specimens for the US Marine Resources Research Institute and would be grateful if specimens could be retained for examination. Specimens should be stored frozen together with details on date and location of capture. He can be contacted at the following address:

Declan T. Quigley, Gaelic Seafoods (Ireland) Ltd., Derryclare, Co Galway, (Telephone: 01-8208048; E-Mail myraquigley@eircom.net).

Photo: Declan Quigley

Wreckfish captured off the Blasket Islands, Co. Kerry, in August 1988.

Dún an Rí Forest Park

Páirc Fhoraoise Dhún Rí

Location: 1.5km north of Kingscourt on R179 to Carrickmacross.

Habitat: Dún an Rí is located in a area noted for the diversity of its geological formations. The forest itself lies in a tranquil glen. Lady's Lake is an artificial lake which was fed from water passing through the old flax mill at Cabra. The Cabra River runs through the park.

Length of Trails: There are a number of different walking paths in Dún an Rí. There are four walks of approximately 1.5-2 km in length, all with points of interest.

Main Tree Species: Dún an Rí is a forest of 229 hectares of which 146 hectares comprise of commercial forest. Norway spruce and oak are two important species in these commercial stands. The oak trees in Dún an Rí are managed to produce a valuable veneer crop. Selected trees will be grown for a rotation length of 150 years.

Other Flora: Most of the forest around the public car park is managed as an amenity wood. On the lower levels of the wood, hazel, holly and elderberry are strongly developed. In the undergrowth herb-robert, foxglove, ferns, bluebells and snow drops thrive in season.

Fauna: The park has an extremely varied plant community and as a result it is rich in a wide range of wild animals. Red and grey squirrels are common as are stoats and rabbits. Mink flourish along the river and otters have been spotted occasionally. The Irish hare is a resident of the park as is the pigmy shrew.

History: The Forest Park, embracing part of the Cabra Estate formerly owned by the Pratt family, is situated in the parish of Enniskeen which includes a portion of the Barony of Clonee, Co. Cavan and a smaller part of the Barony of Kells, Co. Meath. The O'Reilly family ruled the area until the end of the 16th century when they were supplanted by the Flemings who built Fleming's Castle at Cabra in 1605. In 1666, Col. Thomas Cooch, a forebear of the Pratt family, came into possession of the estate. The "Romantic Glen" of the Cabra River, stretching the full length of the park, is an area steeped in history and legend. It is said that Cuchulain camped here at night while conducting his single-handed defense of Ulster against the armies of Queen Maeve by day. The wishing well is the subject of a famous ballad *Doonaree* written by Eilis Boland which describes "the wishing well, beyond the chestnut tree in a shady nook, by a windy brook..." The chestnut tree still stands and is a feature of the parkland.

Facilities: There are various features identified by sign posts in the course of the several planned walks, including the wishing well, (a Holy Well called *Tobar na Splinne*), Cromwell's Bridge, Cabra Cottage - originally the residence of the Pratt family before they moved to Cabra Castle - the flax mill, the Lady's Lake and an old ice house. The ruins of Fleming's Castle can still be seen as well as Sarah's Well. Sarah's Bridge, built in 1801, is the starting point of many of the walks in the park.

"Discovering Ireland's Woodlands. A Guide to Forest Parks, Picnic Sites and Woodland Walks", produced by Coillte Teoranta - The Irish Forestry Board, provides details of forest parks, picnic sites and forest walks. Dún an Rí Forest Park is one of these forests. Price: £2.00.

Church and the Environment?

By Alex Kirby

MOST of the mainstream churches in Britain continue to report a gentle but apparently inexorable decline in numbers, however they may seek to disguise the reality.

Young people, in particular, find far less room for religion in their crowded lives than their parents did. Their interests are urgent, contemporary - and the nature of the world they're growing up in, the environment they'll inherit, preoccupies them far more than outdated mumbo-jumbo muttered by priests who've forfeited any claim to credibility.

The environment? Hang on a minute. The churches do have something to say about the environment, don't they? You bet they do. One of the threats to today's environment is our endless quest for novelty, for mobility, for nipping over the fence to see whether the grass really is greener on the other side. We're becoming more restless, more intent on seeking new thrills, with each rising generation. Yet the churches have not lost their ancient serenity: they simply manage to let it appear often not so much serene as torpid and introverted.

When I was reading theology at university nearly forty years ago, we were told not to bother about anything that had happened after the Council of Chalcedon, held in the year 451 AD - because, in the Church's view, nothing of importance had happened since then. There's serenity for you, and a sense of perspective (and a handy excuse for a lethargic undergraduate to do even less work than he'd have done otherwise).

The churches do know the value of stillness, of endurance, and even of that vogue word sustainability. You might expect then that Christians would be the natural guardians of the environment. One reason they often fail to match the promise of their vocation is because of faulty theology, summed up in the opening pages of the Old Testament with its account of the instructions to the newly-created Adam and Eve:

".... and God said unto them, Be fruitful, and multiply, and replenish the earth, and subdue it: and have dominion over the fish of the sea, and over the fowl of the air, and over every living thing that moveth upon the earth".

There aren't that many fish left for us to have dominion over, and it's the same with much of the rest of creation. And the Church's teaching is partly to blame. It has encouraged us to think the earth is there for us to exploit as we will.

Increasing numbers of Christians, though, would not now pay even lip service to doctrines as discredited as this. They do realise that fidelity to their creed means responsibility for the whole of creation. Some Christians - though not many, so far - live this out quite explicitly in their lives and witness. Many more would probably follow their example if they could see how to (and they can reasonably claim that they are deeply involved in trying to build a better world in many other ways: challenging racism, working to end poverty, living among the poorest people in this and any other society).

It's surprising how a simple idea can sometimes catch fire and enthuse all sorts of people. The London-based Conservation Foundation was wondering what it could do to mark the Millennium. It hit on the idea - hatched from an existing project to record and register ancient yews throughout Britain - of offering to every parish in England and Wales a young tree propagated from an ancient yew estimated to be at least two thousand years old, and therefore to have been growing at the time when Christ was born. In the first year of *Yews for the Millennium*, nearly one-third of English parishes had registered, and this small charity receives far more enquires about its yew project than about any other part of its work.

Those trees, as they grow, will be a tangible and visible link with the dawn of Christianity. The churches regard sacraments - the Eucharist, baptism, confession and the rest - as "outward and visible signs of inward and spiritual grace". The little yew trees will be a sacramental reminder to the faithful of their links with generations past - and future. And they may remind them as well of the responsibility we owe to our descendants, of the imperative demand of sustainable development for justice between the generations.

And they may even remind Christians that caring for creation means justice within our own generation. The way we live now has a direct effect on the way other people are able to live now. Protecting the environment is part of the Christian vocation. And it's now clear enough that that means learning to live more simply, in order that other people may simply live.

Alex Kirby, a former BBC correspondent, is editor of Newsnet 21, *the Conservation Foundation's environment news and information service on the Internet, available at www.newsnet-21.org.uk*

Old cross country routes should be kept open and not blocked by new gateless fencing. This is an ancient route from Lough Guitane, near Killarney, by way of Bennaunmore and Lough Crohane to the Roughty valley and Kilgarvan.

The Right to Roam?

By Daphne Pochin Mould

"AT the furthest fringe of the forest we crossed a barred gate in a deer fence, where a battered notice-board warns the free Briton that he is liable to be shot". Thus mountaineer and author W.H. Murray began an account of a climb on Scotland's Cairngorms in the late 1930's. The notice had mouldered away altogether when I wandered alone on those 4,000 foot hills, but I knew the story behind it. How the 19th century craze for deer and grouse shooting had led to landowners trying to close the mountains to walkers, and how a few brave men had faced down the keepers' guns and kept open the right to hill walk. But as a child in England I saw "Trespassers will be Prosecuted" signs everywhere, legally a wooden lie, and if you crawled under a field fence, you were likely to be roared at immediately by the farmer.

Until fairly recently you could go where you liked, unchallenged, in Ireland. (Not entirely, in the 50's, a farmer tried to stop me leaving the Gap of Dunloe road to climb onto the ridge of the Reeks). Now "No Trespassing" signs have sprung up like mushrooms, new sheep fences (gateless, style-less) bar ancient butter roads and the like. Farmers fear loss and damage from hordes of careless walkers though recent legislation should protect them from the current popularity of seeking compensation for any injury, real or imagined.

Few people hill walked in the 1950's. Going then into a Cork shoe shop to replace my climbing boots, they had none and its owner tried to persuade me not to engage in such an activity! Today, walking is massively popular and growing. The sheer numbers, in small groups or the large one of walking clubs are putting pressure on the countryside that is more than it can take. If they all behaved in accordance with the Country Code, all might be well, but there are reports of sheer vandalism, as well as damage to fences, leaving gates open, doing harm to livestock and standing crops, and leaving litter. And of course, in dry weather, walkers should all observe a "No Smoking" rule; it is only too easy to start a massive fire.

There is need for much education in proper respect for the countryside and for farming, but there is the further, and general, problem of tourism - too many people can destroy the very thing they want to see. The popular Irish mountains are having erosion trenches cut up to their summits by climbers' feet.

And here I would protest against the current wave of sponsorship of people doing things they would normally never think of. If you want to give to a charity, give and be done with it, don't ask someone to parachute from an airplane first, or push a peanut with their nose up the Devil's Ladder. Encouraging non hill walkers in large groups to climb our hills for charity, is no charity to the mountains who suffer the damage and litter. I quote from "Walking World Ireland", 1998 Annual which has a perceptive series of articles on this matter of the right to roam. "The extent of the filth and general disturbance left behind on Lugnaquillia following a sponsored night walk in aid of Mountain Rescue had to be seen to be believed" (Keith Collie. "Hill Walkers: Where are we going?"). The hills should be left for those who love and respect them. Poor Mount Everest, once the gleaming unattainable, is now being sadly abused, littered (and Everest litter includes dead bodies, left where they died) and to be reached by almost anyone with the money to pay for the trip. It has been suggested, and it would be a good plan, to only allow those on Everest who can make the summit without using oxygen.

Ireland now has a good series of long distance marked paths, but must beware of walkers being told: "That's your path, keep to it", for a fair sized minority of us are bird watchers, botanists, geologists, who need to move freely where our studies take us. The merlin will not nest atop a "Walking Man" sign.

And while some of these long distance ways are proper paths, others are merely widely spaced poles set on the hillside. This is just not good enough. In the absence of a proper path, walkers will cut a series of trenches and ridges, of stones and hillocks, horrible to walk on and causing an ever spreading area of erosion. The start of the pilgrim path up Mount Brandon from Faha is a case in point. True, making paths costs money but with volunteers, FAS schemes, etc. it should be possible to get it done. Nor are widely spaced markers much use, to strangers uneasy with maps and no compass in poor visibility, they need to be close enough to be seen when the mist comes down.

Then there are the "No Dogs" signs on these paths. They should be "Dogs must be on leads and under control". Judging by reports, human damage to the countryside and to farming is much greater than that of dogs. And sadly in these days, for a solitary walker, as I mostly am, a large dog (on a lead) is a necessary protection, though you can hardly take the animal out of a car without someone shouting to you about those "*******" dogs".

We need more circular way marked routes too for people working from a fixed base. And not only proper paths but better styles (a plank on two uprights through a sheep fence is useless to anyone even slightly less than active) and gates that can be easily opened and shut (not secured with a tangle of binder twine). The visually impaired and the disabled can enjoy country walking as well as the active. The National Park in Killarney has a special nature trail (with an audio tape) for the visually impaired, but a guide dog and the help of a sighted companion could open up many enjoyable walks. How many country paths can a wheelchair negotiate? And if not, why not? And as all our roads are now very unsafe for riders, should we not be planning more genuine "bridle paths", off road, where horses travel without anxiety or being blocked by sheep fencing and locked gates?

There is indeed much to be done. More education of people new to walking, learning to respect and better enjoy the countryside and to understand the needs of contemporary farming. We need consideration, not confrontation, between walkers and land owners and a realisation that Ireland is for all of us, not a preserve to be jealously guarded by any one single interest.

Photos: Daphne Mould

Mount Brandon summit, our second highest mountain mass. Erosion trenches cut by walkers on the traditional routes to the summit and St. Brendan's hermitage ruins.

Sherkin Island Marine Station Environmental Awards 1997 & 1998

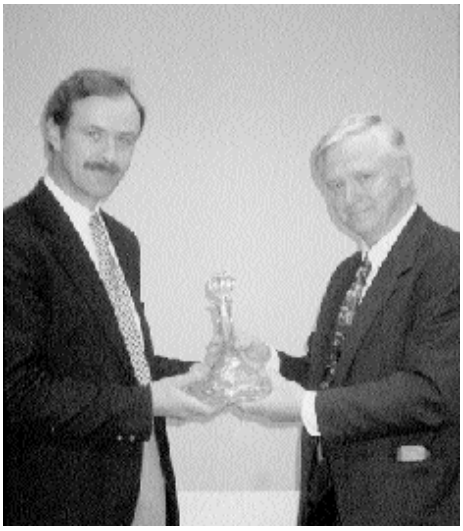
1997 Award Winner Mr. Tim Cadogan

By Matt Murphy

I HAVE known the recipient of our 1997 Environmental Award, Tim Cadogan, for many years. I was first introduced to him by the noted historian, the late Padraig O Maidin, Cork County librarian for many years. Tim was then a library assistant and is now Assistant County Librarian. Over the years he has guided us at the marine station to much important early historical information on the s.w. coastal area. This was especially so when we were preparing our book: "The Wild Plants of Sherkin, Cape Clear and adjacent islands of West Cork". He gave us invaluable help with the historical natural history of the islands. It is so exciting to get a reference 100 to 150 years old which adds another vital piece to the jigsaw. I always tell my young biologists that each research project is like a jigsaw. It has a past, a present and a future. Without all the ingredients there is something missing. Tim and some of his fellow historians so often supply the past - the other two ingredients - well, they are for another forum.

Tim is the person that people turn to when they need historical information when they are researching. He has a special interest in many aspects of local history and historical research. But abiding interests that have survived throughout are probably maritime history, newspaper history, 19th Century social history and genealogical research.

In the foreword to "Harbour Lights: The Journal of Great Island Historical Society", No. 1, 1987, he stated his view of local history, by saying:



Tim Cadogan being presented with the award by Matt Murphy

"Local history has, I believe, an important role to play in preserving our sense of perspective. Just as an individual's personal history and memory roots him in society and provides an identity, so also a sense of place, an appreciation of our locality's context in history and a recognition of trends and patterns in its development provide a necessary pride in an association with our physical surroundings."

Like many others of his generation, Tom's choice of career was accidental rather than planned. He inherited a passion for reading from his father and books would have been a feature of his life whatever his career. Therefore, as reference librarian he has been especially fortunate - surrounded by books, meeting interesting people and helping them to recreate a little bit of the past.

Tim and others like him throughout the country are making an immense contribution to the needs of researchers working in the environment. We must be made aware of the availability of precious references on plants, mammals, geology, marine life and archaeology. One particular reference we at Sherkin received from Tim was on a red tide or algal bloom that occurred in 1865 - 132 years ago, which was then described as an "extraordinary appearance in the sea". The article reported the following explanation for the occurrence:

"Several people have told us about a similar appearance all along Lough Ine, Baltimore, Cape Clear and Crookhaven. Some say it is the blood of American patriots that has been borne down her mighty rivers into the Gulf of Mexico and has then been carried by the great Gulf Stream to these our sympathising shores. Others (and with more probability) ascribe it to some volcanic eruption or upheaval which has taken place beneath our waters and has thrown up mud, scoria and ashes, thus to show us that we are not beyond the reach of this mighty source of the fairest portions of our earth." This article was published in the Skibbereen and West Carbery Eagle, on Saturday 6th May 1865.

What this reference has done for us at the marine station has been invaluable as it has shown us that the view held by some, that the present day algal blooms (red tides) are a modern phenomen, is incorrect.

I ask those of you that have an input into the provision of funds for county libraries to please add a little more funding for the preservation of archive material. I have outlined just a fraction of what Tim Cadogan has done for us through the reference department of the Cork County Library. We must continue to preserve this great historical information as it becomes available.

1998 Award Winner - Dr. Gillian Bishop

By Matt Murphy

IN the summer of 1975, eight young biologists came to our just founded Sherkin Island Marine Station as volunteers to begin survey work on and around the islands of Roaringwater Bay. They were a wonderful team whose enthusiasm and dedication pushed Eileen and myself to deciding that however we funded the projects they would continue and grow in the years ahead.

One of that team stood out as the leader. She had spent the previous 6 months doing rocky shore survey work in Bantry Bay. She above the others wanted me to expand our sites in Roaringwater Bay and beyond. Her reasoning was logical - more sites, more data, more years which would lead to more answers.

Our discussions in those days were in a small laboratory 12ft x 10ft with a galvanised roof, well ventilated. There were times when heavy clothing was needed to keep warm, even though it was summer time. By the end of that summer of 1975 our plans were to have sites on all the larger islands and the mainland of Roaringwater Bay. Sixty-seven were established in the late 1970s. It took longer to expand the survey east to Cork Harbour and West to Bantry Bay - by 1995 we had 145 such sites. The seed sown by Gillian Bishop has blossomed into one of the largest monitoring programmes of rocky shores in Europe.

Gilllian has the ability to layout in her argument both sides and then is prepared to come off the fence and say which way one must go.

When the time came to write about our over 20 years of data for the rocky shore of Sherkin Island, to me there was only one person who could interpret that vast information. At present Gillian is writing a book: "The Ecology of the Rocky Shores of Sherkin Island". It will, I believe, be a text book for schools, the academic and commercial worlds. She has set out to educate people and she is fulfilling that brief.

The important thing to me is that Gillian has a wonderful commitment to our marine station. She is always willing to help with advice in between looking after her family, her consultancy and her farm.

Dr. Gillian Bishop, from Inverurie, Aberdeen, Scotland.

Students' Fish & Potato Curry

Ingredients

- 1½ lbs/700g white fish - e.g. cod or ling or any white fish or shellfish
- 1lb/450g potatoes
- 8 oz/225g french beans (alternatively use frozen peas, courgette or any vegetable you like)
- 1 green or red chilli
- Salt and black pepper
- 2 tablespoons curry paste (select one that you like)
- 2 cloves of chopped garlic
- 4 oz/100g creamed coconut or 1 tin coconut milk
- 1 dessertspoon sugar
- Chopped fresh coriander
- Four large spicy poppadoms
- 1 lime
- Oil

Method

1. Bring 1/3 pint/190ml of water to the boil in a saucepan. Add raw fish and bring back to the boil for two minutes. Place a tight fitting lid on the saucepan and turn off the heat. Leave the fish to cook in the steam.

2. Cook beans in a saucepan for 2 minutes and put straight into cold water. Cut potatoes into pieces and boil for 10 minutes.

3. Chop chilli, discarding seeds and membrane.

4. Heat oil, fry cooked potatoes until golden brown.

5. Add chopped chilli, garlic and curry paste - cook for 1-2 minutes.

6. Mix the liquid from the fish with the creamed coconut (or use a tin of coconut milk) and add to the curry. Add sugar and simmer for 2-3 minutes.

7. Add the beans and heat through. Add the fish and coriander.

8. Serve with poppadoms and a squeeze of lime juice.

BIM Bord Iascaigh Mhara Irish Sea Fisheries Board

Water Quality in Ireland 1995-1997

By John Feehan

THAT there has been a further deterioration of the river system in Ireland since the early 1990s is the main finding of a report on water quality in the 1995-1997 period, published recently by the EPA.

This deterioration continues a trend which has been noted over the last 25 years and is attributed in the main to nutrient (phosphate) enrichment or eutrophication. While the degree of pollution is slight in many cases, it is of concern in view of its potential impact on stocks of the pollution-sensitive trout and salmon in rivers and lakes and because of the reliance on these rivers and lakes as sources for the bulk of the public water supply. This also has implications for the attainment of the goal of good ecological quality for waters, set by the proposed EU Framework Directive on water management.

The report gives assessments of the water quality of some 13,000 km of river and stream channel, 120 lakes and 23 estuarine and coastal waters. In addition, for the first time, an overview of the quality of groundwaters is given, based on sampling at nearly 200 representative locations, as well as information on the situation in the main canals. The bulk of the data presented arises from survey work carried out by the local authorities and the EPA, with additional information being supplied mainly by the Marine Institute and the Central and Regional Fishery Boards.

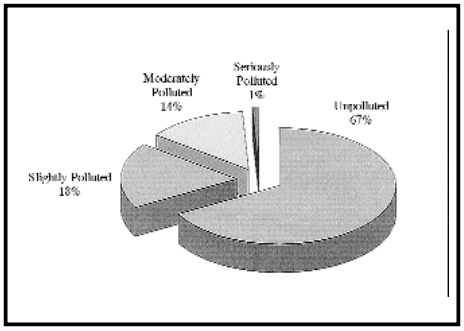


Figure 1: Water Quality in Rivers in 1995-1997 (13,200km)

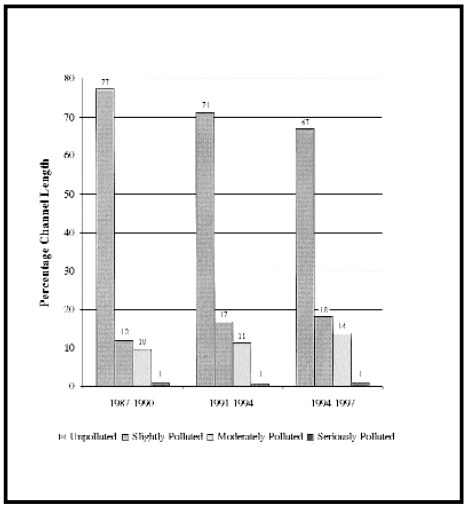


Figure 2: Recent Water Quality Trends in Rivers (13,200km baseline)

The assessments of the water quality of rivers and lakes given in this report have a particular significance in relation to the Phosphorus Standards Regulations adopted in 1998. Where a river stretch or a lake has been assessed as polluted in the 1995-1997 period, the Regulations require that specified improvements be achieved by 2007 while waters classified as unpolluted must be maintained as such.

The water quality classification of the river channel length surveyed in the 1995-1997 period is given in figure 1. This shows that only 67 per cent was assessed as unpolluted. The highest proportions of polluted channel were recorded in the eastern and south-eastern regions and the lowest in the southern and Donegal-Sligo part of the north western region. Figure 2 contrasts the situation for the last three periods of review, and shows an ongoing reduction in the length of unpolluted channel since 1987-1990.

Most of the slight and moderate pollution was attributed to agricultural activities but municipal waste discharges were judged to be responsible for most of the serious pollution (see figure 3). Although still small in overall extent (less than 1 per cent), the level of serious pollution showed an increase for the first time since the national surveys commenced.

The number of fish kills recorded by the Marine Institute in the period (173) showed an increase compared to 1991-1994 (116). Agriculture was the cause of most (97) of the kills in 1995-1997 followed by industry (37) and sewage (24). The increase in 1995-1997 reverses a decreasing trend which had been evident since the mid-1980s (see figure 4).

The overall quality of canal waters and their feeder streams was judged to be good.

Of the 120 lakes surveyed in the period, 97 were assessed as unpolluted, seven slightly polluted, 11 moderately polluted and five seriously polluted. Loughs Ramor and Oughter, two of the State's larger lakes, were placed in the latter category. As most of the unpolluted lakes are small, the lake surface area so classified was only 65 per cent of the total area surveyed. Overall, there was little change in the extent of water pollution in the lakes since 1991-1994. Although the surveys in 1995-1997 covered only a small proportion of the lakes in the State, they are regarded as representative and include most of the larger lakes.

Data for the estuarine and coastal waters indicate that, with a few exceptions, these are not significantly impacted by pollution. Exceptions include the Lee estuary and Inner Cork Harbour, the Castletown estuary near Dundalk and localised areas of the Liffey, Shannon and Garavogue (Sligo) estuaries which are affected by municipal discharges. Sustained eutrophication was judged to be affecting only a few areas, viz., inner Cork Harbour and the Broadmeadow estuary at Malahide. The enhanced growths of algae noted in the middle reaches of the Slaney, Barrow-Nore-Suir and Bandon estuaries may be partly due to the natural characteristics of these waters.

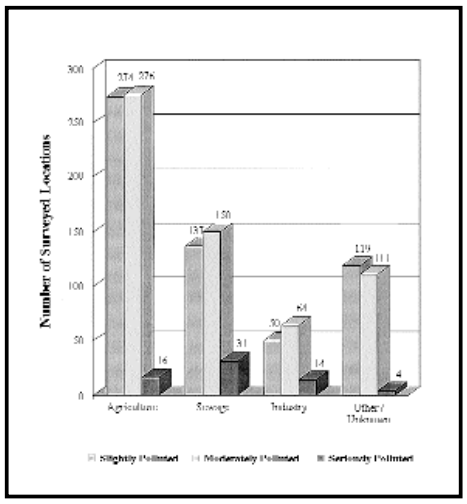


Figure 3: Number of surveyed locations polluted by various causes, 1995-1997

The generally satisfactory condition of bathing waters and the low levels of potentially toxic pollutants in commercial fish and shellfish provide further evidence of the limited impact of waste discharges in tidal waters. The new and upgraded waste treatment plants planned for the major coastal towns and cities over the next few years will further reduce the pollution threat to these waters.

The survey of groundwaters in the period indicated that there is no widespread pollution of particular aquifers. However, a significant number of the sources sampled showed signs of organic pollution and nitrate contamination. Of particular concern was the presence of faecal coliforms which were detected in over 30 per cent of the samples analysed for this parameter. This contamination is likely to be a major cause of the relatively poor quality of the private water supply schemes, as described in the national drinking water reports, and emphasises the need to disinfect all groundwaters used for supply.

It is concluded that the reduction of phosphorus inputs to freshwaters remains the chief task facing the water pollution control agencies. While there have been some success stories, it is clear that the measures taken to reduce eutrophication in the inland waters over the last two decades have been too limited and that the problem remains a major challenge.

In view of this situation, new management initiatives at catchment level, e.g. for Loughs Conn, Ree, Derg and Leane and for the rivers Boyne, Liffey and Suir, together with the statutory requirements under the Phosphorus Standards Regulations, are welcome and form a systematic approach to eutrophication control. They should contribute significantly to the achievement of good quality in our rivers and lakes, an objective highly desirable in itself, but also a requirement which will arise under the proposed EU Framework Directive on water policy.

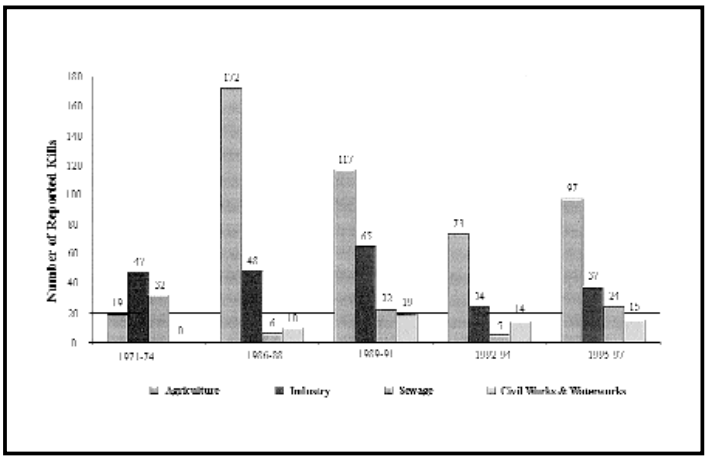


Figure 4: Fish-kills: 1971-1997 - Reported Cases

*Copies of the report, "*Water Quality in Ireland, 1995 to 1997", *with accompanying maps on Rivers and Lakes (price £20) are available, from: EPA Publications, St. Martin's House, Waterloo Road, Dublin 4. (Tel: 01-667 4474; Fax: 01-660 5848).*

John Feehan, EPA, Johnstown Castle Estate, Co. Wexford. Website: http://www.epa.ie

Publications of Interest

Shipwrecks of the Irish Coast

Volume 2 (932-1997)

By Edward J. Bourke

Published by the author
11 Cypress Drive, Dublin 6W.

ISBN: 0-9523027

£11.99/1998

The author, with this latest volume, has added a further 3000 shipwrecks around the Irish coast. This book, like the first, is a labour of love. So much research has gone into the finished work. Need I add that I first looked at the West Cork section where over 100 wrecks are listed. I'd like to have been alive in the last century with all the timber cargo that must have been washed up on the shores. There are very interesting chapters on diving to the Lusitania, the East India Trade and the salvage trade in Ireland. The list of 46 U-boats and 130 British submarines lost around our coast and 116 U-boats scuttled was intriguing.

This book is a must for anyone interested in Ireland's maritime history, especially scuba divers. Edward states that there are some 12,000 wrecks around our coast. He has now accounted for 5,500. Roll on Volume 3.

Population Dynamics of Commercial Fish in Inland Reservoirs.

By L. A. Kuderskii.

ISBN: 90 5410 259 4

1996 Hardback/A.A. Balkema Publishers/£50

For the first time in ichthyological literature, the author has analysed the structure of fish populations in inland reservoirs based on the absolute values of their mass. The structure of the population and its changes have been examined in seven fish species from small lakes, two from large lakes, and seven from large reservoirs in plains. Special attention has been drawn to the main indicator of the structure of population - correlation between the age of ichthyomass and mass maturation.

The material presented in this book and the conclusions derived are of great interest both for developments in populations ecology of fish and the theory of optimum fishing. The book is intended for ichthyologists, hydrobiologists, and ecologists studying theoretical bases of fish ecology and tackling applied questions of regulated fishing and conservation of fish stocks.

A. A. Balkema Publishers, P.O Box 1675, NL-3000 BR, Rotterdam, Netherlands

Fish Morphology

Horizon of New Research

Edited by: J. S Datta Munshi and Hiran M. Dutta

ISBN: 90 5410 289 6

1996/A.A. Balkema Publishers/£60.00

Fish Morphology: Horizon of New Research, an edited, multiauthored book, deals with the form and function relationships of fish morphology both at the macro and micro levels. It also examines the relationship between hard and soft structures and among the soft structures at the subcellular levels.

Twenty-six eminent scientists from five continents have contributed chapters in this book. The study of the morphology of fish as provided in this book gives a base line knowledge that can be applied to the morphology of higher forms of vertebrates including human beings. The techniques and methodology used in this book represent knowledge prevailing at the end of the twentieth century. They can be applied as research tools for researchers worldwide. One of the significant contributions to this book is the review of not only the contributors' own lifetime research but synthesis of on-going research by others in a much broader framework. It is hoped that this book will be useful for graduate students and research scholars of fish biology.

Complete British Wildlife Guide

P. Sterry

1997/HarpersCollins/£12.99

This book aims to serve the keen amateur naturalist rather than experts in any given field. However, the high quality photographs makes the book appealing to biologists interested in fields other than their own. An emphasis has been placed on birds, butterflies and flowering plants due to their general appeal and also common or visually striking examples of all animal and plant groups, including: reptiles, amphibians, trees, fish, seashore invertebrates, molluscs and fungi. The book is laid out with brief notes on each species placed opposite photographs for easy reference. The introduction includes descriptions of Britain's important wildlife habitats.

Butterflies of Britain and Europe

Text: T.Tomlan

Illustrations: R.Lewington

ISBN: 0 00219992 0

1997/HarperCollins/£17.99

This is a comprehensive field guide to butterflies found from Iceland to Morocco and Portugal to Moldova. The text includes notes on the distribution, variation, life history and habitat and a distribution map for each species. There are illustrations of the inner and outer sides of the butterfly wings and there are separate illustrations for males and females. They provide a valuable guide to identification and are drawn by R.Lewington who has illustrated other important works on butterflies. The book should stimulate interest in this fascinating and beautiful group of insects.

Garden Wildlife of Britain and Europe

Michael Chinery

1997/HarperCollins/£7.99

Ever wondered what wildlife can be found in your garden? This book contains photographs of about 400 species of plants and animals that are commonly found in European gardens. Common and scientific names are given for each species as well as a description and notes on its distribution and habitat. The book is divided into four sections: Vertebrates (mammals and birds), Insects, Other invertebrates (including spiders and snails) and Plants. The book also includes information on how you can attract more wildlife to your garden.

Collins pocketguide: Fish of Britain and Europe

PJ Miller & MJ Loates

ISBN: 0 00 219945 9

1997/HarperCollins/£12.99

A clear and concise guide to the fish found in marine and freshwater environments around both Britain and Europe is given by PJ Miller and MJ Loutes. The book reviews over 750 species. The descriptions given for each species include basic taxonomy and breeding information along with the habitat occupied. Each description is accompanied by a coloured illustration and distribution map.

Rare Birds in Britain & Ireland: A Photographic Guide

David Cottridge & Keith Vinicombe

ISBN: 0 00 219976 9

1996/HarperCollins/£25.00

This is, without a doubt, a book written by twitchers for twitchers. As the pursuit of exotic and bizarre migrants increases in popularity all the time there will certainly be a considerable demand for this insightful and well-presented book. Cataloguing all the bird species that have unintentionally arrived on our shores since 1958, we are given a detailed description of how to identify each bird, a historic account of its occurrences in Britain and Ireland and a section on its more usual haunts. With introductory chapters on migration, weather patterns and the implications of vagrancy, this book is an absolute must for bird obsessives. However, the beautiful photographs and attractive layout give the book a wider appeal. It should serve to encourage those who have never twitched to consider it and motivate those who have considered it to go out there and TWITCH!

Birdwatching: The Ultimate Guide to the Birds of Europe

Arnoud van den Berg, Tom van der Have, Guido Keijl, Dominic Mitchell

1997/HarperCollins/£16.99

This is an all encompassing guide to birdwatching in Europe. It is beautifully presented with superb photographs and sumptuous illustrations. The absorbing series of introductory chapters takes us through an astounding array of bird-related subjects. These include; the use of birds in mythology and religion, the origin of birds, classification, anatomy, displays, territory and mating, where and how to watch birds plus, of course, much, much more. Using a habitat by habitat approach more than 200 of the most commonly encountered species in Europe are described, each with its own photograph, illustration, distribution map and field notes. Such an appealing book will almost certainly make a welcome addition to the bookshelf of even the most casual of birdwatchers. For those more determined to embark upon this fulfilling pastime, "Birdwatching" will make an excellent introduction and will become an indispensable work of reference for every enthusiast.

The Conservation of Butterflies in Britain

Feltwell, J

ISBN: 0 907970 02 8

1995/Wildlife Matters Publishers

Interest in butterflies in Britain stems, in large part, from the Victorian naturalists. They were generally members of the landed nobility who took pride in building up vast collections of butterflies. Collecting of butterflies became like rhino-poaching in the 1990s, the rarer the prey, the more it was worth. Feltwell tells us the history of the decline in butterflies in Britain and also the history and future of attempts to control them. Gloomy stories of the extinction of some butterflies are contrasted with the more heartening stories of successful conservation of the Swallowtail and re-introduction of the Large Blue. One of the founders of the butterfly conservation movement in Britain was ironically also a member of the nobility, Lord Rothschild. This book tells us how the this movement has gained momentum and how reserves, the law and habitat management are used in conservation. Butterflies are described as 'symbols of the countryside', a view I am sure, many of us share. This book would be of interest to all who appreciate the presence of these delightful insects.

Wildlife Matters Publishers, Marlham, Henley's Down, Battle, TN33 9BN, U.K.

Meadows; A History and Natural History

ISBN: 0 86299 901 4

1992/Wildlife Matters Publishers/£16.99

One hundred years ago a book written about meadows would have seemed, at best, mundane and definitely unnecessary. However, the twentieth century has seen remarkable improvements in agricultural efficiency. This has brought untold benefits in terms of food production and food quality to the people of our country. Unfortunately we are paying the cost in terms of a reduction in the beauty and diversity of our countryside. Since the 1930s we have lost 97% of our meadows. Sweet smelling meadows brimming over with colours and wildlife are now a thing of the past. It, therefore, seems appropriate, that "Meadows, A History and Natural History" is written with a nostalgic air complete with sepia photographs and 15th century paintings. A charming and stimulating book, it tells us about cornfields, water meadows, hay meadows, dunes, downs and coastal grassland, glades and alpine meadows. It is a highly readable and absorbing explanation of the history and natural history of meadows. It makes a powerful plea for the conservation of the few flowering meadows that still remain. However, one cannot help feeling that, with the advance of modern agriculture continuing unabated, such meadows can only be preserved as museum pieces and will never again dominate our countryside as they once did.

Plant Ecology: Second Edition

Edited by Michael J. Crawley

ISBN: 0 632 03639 7

1997/Blackwell Science

An academic text primarily aimed at students and practising ecologists, the second edition of "Plant Ecology" builds upon the stimulating set of papers that formed the basis of the first. Whilst maintaining its dynamic approach and taking a plant centred view of ecology rather than the traditional quadrat centred view, the structure of the second edition has been completely revised. It still combines descriptive text with theoretical models and experimental data but has moved from the small to the large scale in keeping with contemporary methods. This fresh approach has allowed consideration of several new and important topics such as plant secondary chemistry, herbivory, sex and breeding systems. Additional chapters address topical applied issues in plant ecology including global warming, pollution and biodiversity. Each subject is dealt with in gratifying detail and this only serves to reinforce the fact that "Plant Ecology" is essential reading for all serious students of ecology.

Sharks and Rays

Tricas, Last, Deacon, McCosker, Walker, Taylor

ISBN: 0 00 220104 6

1997/HarperCollins/£16.99

A very informative guide recommendable to all lovers of the underwater world. Beautifully illustrated it covers almost every aspect of shark and ray biology, life and myth. Travellers notes aid in the planning of encounters in the wild, but the detailed field guide to species will bring anyone who cannot be tempted face to face with sharks rays and skates.

Environment Bulletin - Issue 37

Available free from Department of the Environment & Local Government, Custom House, Dublin 1.

This issue includes items on general environmental matters, water resources, air quality, planning, forestry and energy, waste management, EU and international environmental matters. The bulletin should be read by anyone interested in environmental topics.

Dances with Waves

- Around Ireland by Kayak -

Brian Wilson

1998/The O'Brien Press/£8.99

ISBN: 0-86278-551-0

Brian Wilson is one of the few people to circumnavigate Ireland by kayak and this is the colourful and entertaining story of his voyage of 1200 gruelling miles along a beautiful and often hazardous coastline. He encountered adventures on land and sea - kidnapped and ransomed on Sherkin Island, marooned by illness on the Blasket Islands, his kayak stolen in wild Connemara, befriended by Fungie in Dingle.

Paddling to the tunes of the waterproof song sheets which, apparently are an essential part of such a trip - he met every kind of weather and every kind of craft from currach to the might of the QE2.

His great circuit, beginning in Larne, Co. Antrim, took him through the entire litany of the shipping forecast - Irish Sea, Fastnet, Shannon, Rockall and Malin and brought him into contact with a very eclectic mix of people, including a mystic conservationist, yacht club admirals and a singing Lady Mayoress.

Much more than a travelogue - *Dances with Waves* weaves maritime myth, seafaring lore and natural history in an absorbing look at Ireland and its people.

Vastly entertaining for the sailor and landlubber alike, this is a story of a great adventure.

COD

- A Biography of the Fish that Changed the World -

Mark Kurlansky

1998/Jonathan Cape/£12.99

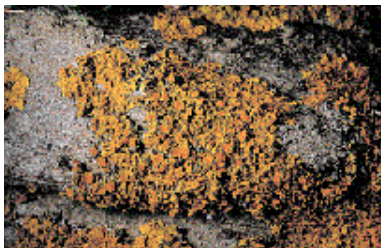
ISBN: 0-224-05104-0

The cod. Wars have been fought over it, revolutions have been triggered by it, national diets have been based on it, economies and livelihoods have depended on it. To the millions it has sustained, it has been a treasure more than gold. This book scans 1,000 years and four continents. From the Vikings to Clarence Birdseye, Mark Kurlansky introduces the explorers, merchants, writers, chefs and fishermen, whose lives have been interwoven with prolific fish. He chronicles the cod wars of the 16th and 20th centuries and blends in recipes and lore from the Middle Ages to the present. In a story that brings world history and human passions into captivating focus, he shows how the most profitable fish in history is today faced with extinction.

JUNIOR PAGES

What's what on Ireland's Seashore

A



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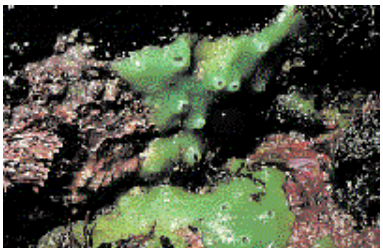

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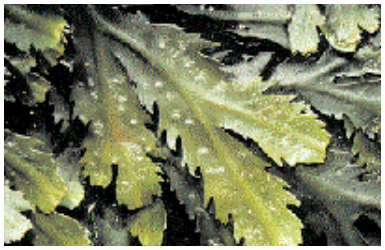

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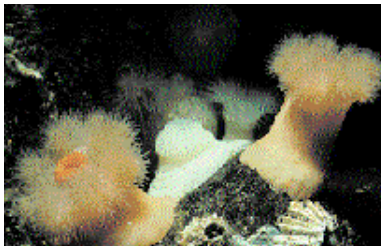


H

I

The marine life around Ireland's shores is rich and varied. Here is a very small selection of the many animals and plants to be found. Can you match the pictures with the name?

All animals and plants belong to a particular group. Once you have named each animal or plant try to pick the group to which it belongs.

For further information on Ireland's marine life, Sherkin Island Marine Station have produced a pocket-sized guide called "A Beginner's Guide to Ireland's Seashore", which is suitable for beginner's of all ages. Details on page 32. Answers to quiz on page 29.

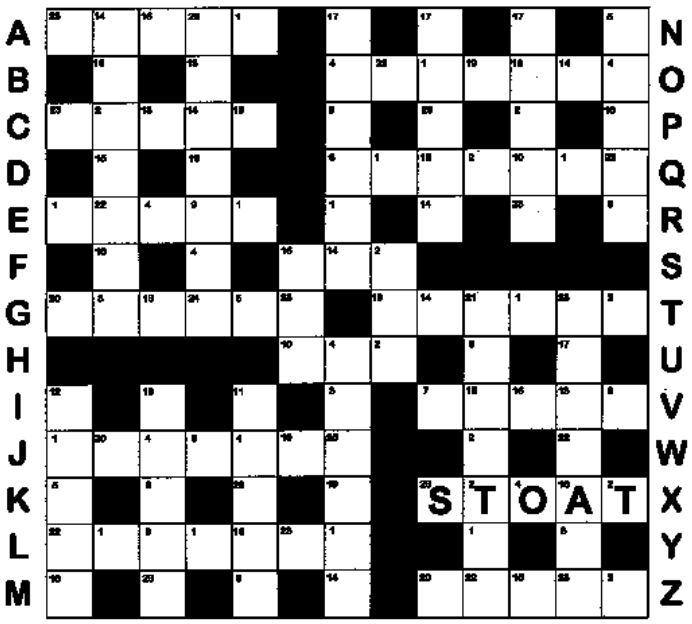
Match the picture to the name and then name the group

NAME	PICTURE	GROUP
Squat Lobster	A	Sponges
Two-spotted Goby	B	Worms
Breadcrumb Sponge	C	Sea Anemones & Relatives
Plumose Anemone	D	Starfish & Relatives
Serrated Wrack	E	Fish
Common Razor Shell	F	Seaweeds
Keel Worm	G	Crabs & Relatives
Common Brittlestar	H	Lichens
Orange Leafy Lichen	J	Shells & Relatives

Around in Circles

In this puzzle the first letter of an object is the last letter for another. For example, if one object begins with a "T" and ends with an "E" the object before it will have ended in "T" and the one after will have begun with an "E" - e.g. anTimEgg. Fill in the name of each object, beginning in any square, and you should fill the circle exactly. (Answers on page 29)

Searching for Words



REFERENCE GRID

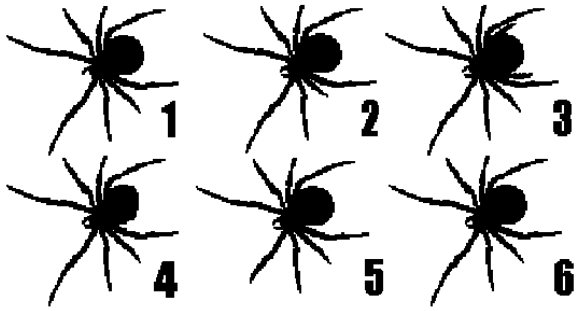
QUOTATION

Answers on page 29.

ALONG CAME A SPIDER!

Only one spider below is the mirror image of the spider on the right. Can you figure out which one it is?

Answer on page 29.



Environmental Competition for Primary School Children in Munster 1999

FOR the last couple of years, Sherkin Island Marine Station has been running the Environmental Competition for Primary School Children in Munster. The awards for this year's competition were presented by Mr. Dan Wallace, T.D., Minister of State at the Dept. of the Environment and Local Government, and Cllr. Sean Martin T.C., Deputy Lord Mayor of Cork, at Connolly Hall, Cork, during the Sherkin Island Marine Station Exhibition. The response to the competition from schools all over Munster was wonderful. Here is a very small selection of some of the 405 prize-winners.

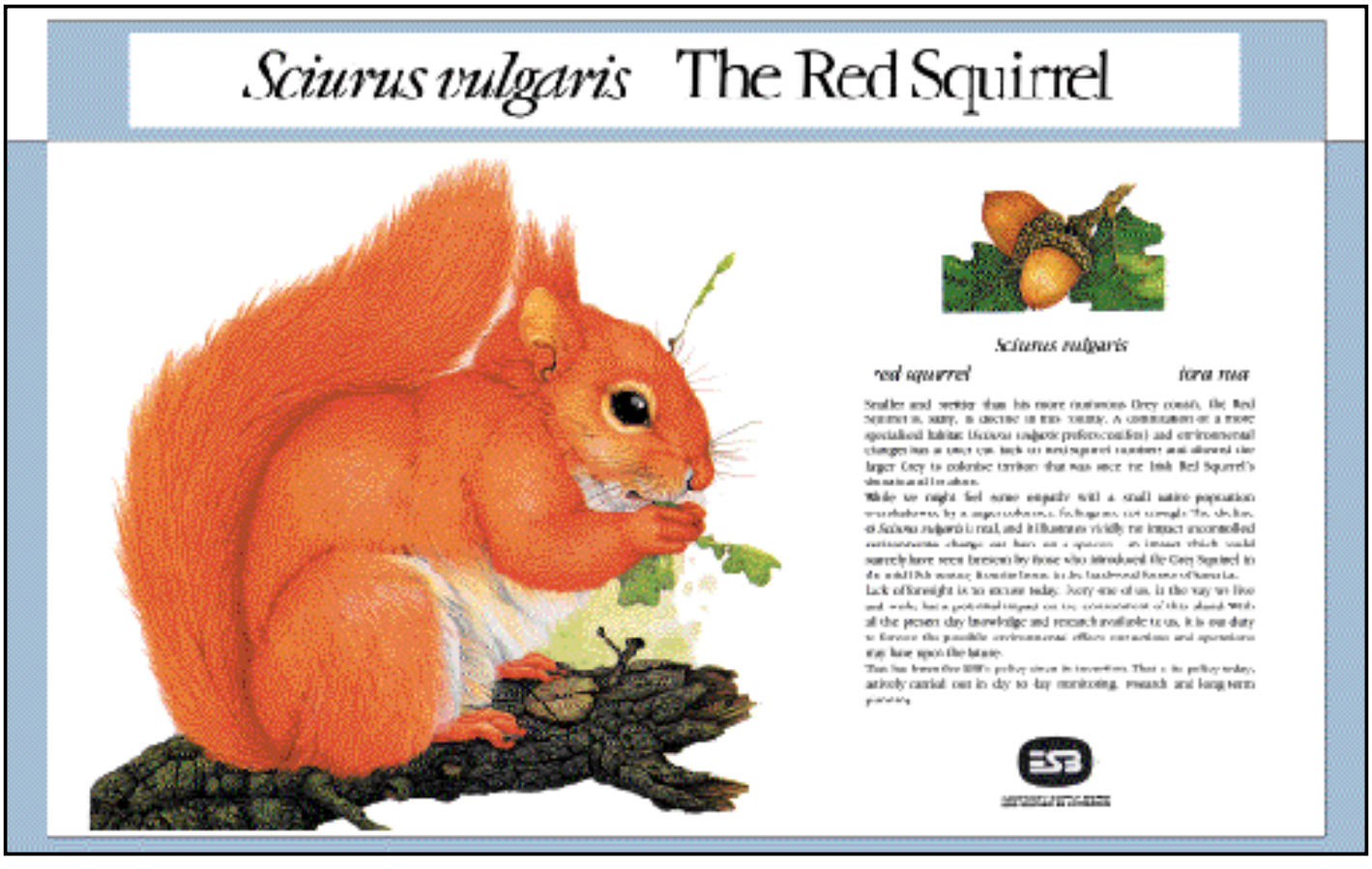
The competition this year was sponsored by BIM (Irish Sea Fisheries Board), Cork Corporation, Cork County Council, Denis McSweeny Photoshop, Cork, Dept. of the Environment & Local Government, Janssen Pharmaceutical Ltd. and Pfizer Pharmaceutical Corporation.

Above: Cullina N.S., Co. Kerry, being presented with their prizes by Mr. Dan Wallace, T.D., Minister of State at the Dept. of the Environment & Local Government. Also present are Ms. Catherine Reynolds, Janssen Pharmaceutical Ltd., Mr. Eddie O'Sullivan, Pfizer Pharmaceutical Corporation and Mr. Matt Murphy, Sherkin Island Marine Station.

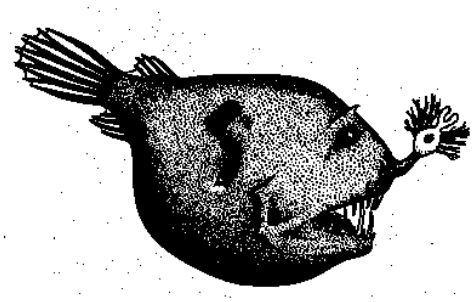
Below: Bealad N.S, Co. Cork, being presented with their prizes by Mr. Dan Wallace, T.D., Minister of State at the Dept. of the Environment & Local Government. Also present are Ms. Niamh Hunt, Janssen Pharmaceutical Ltd., Mr. Don Eglington, Pfizer Pharmaceutical Corporation and Mr. Matt Murphy, Sherkin Island Marine Station.

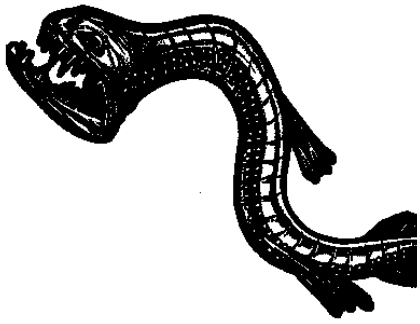
Right: Ballymoney, Co. Cork, being presented with their prizes by Mr. Dan Wallace, T.D., Minister of State at the Dept. of the Environment & Local Government. Also present are Ms. Niamh Hunt, Janssen Pharmaceutical Ltd., Mr. Don Eglington, Pfizer Pharmaceutical Corporation and Mr. Matt Murphy, Sherkin Island Marine Station.

Above: Cloghroe N.S., Co. Cork, being presented with their prizes by the Deputy Lord Mayor of Cork, Cllr. Sean Martin, T.C. Also present are Mr. Charlie Hipwell, Pfizer Pharmaceutical Corporation, Mr. Sean Flynn, Janssen Pharmaceutical Ltd., and Mr. Matt Murphy, Sherkin Island Marine Station.



Fish from the Deep!





DO these fish seem strange to you, ugly and unreal? Have you ever seen such a fish?

Well, these fish do exist but they live in the very deep waters of the oceans and are known as deep sea fish!! First, imagine a mountain 3,300ft high or a stretch of road two-thirds of a mile long and then try to imagine this depth below a boat that is floating on the surface of the water. Well this is where these creatures live. The average depth of the deep oceans is much deeper than this however - as much as 13,000ft (about 2 and half miles)!

The deep sea environment is very different to that of shallow coastal waters.

In the upper parts of the deep sea, there is little light. Fish that live or feed at this depth can see silhouettes of other sea organisms moving above them but cannot see things below them. However, just a little deeper and it is totally dark - no light from the surface can get through. It is also very cold at these great depths, only 2°C above zero all year round (Brrrr!!!). There is enormous pressure (weight) at this depth due to the weight of thousands of metres of seawater above. (Try lifting a bucket of water, well its millions of times heavier than that!) It has only been in recent times that humans have invented diving machines that can cope with this pressure and so catch a glimpse of this deep sea life. These diving vehicles or remote control submersibles are used as the weight of all that water would crush a man - diving in just a wetsuit - to death!!!

Why do these fish look so different?

The amount of food available for organisms at this depth is low compared to that of shallower areas. A deep sea animal must travel a long way to get small amounts of food. For this reason most of the fish have a slender, eel-like body which does not require as much food as larger bodies would. They also usually have large heads with big mouths which maximise the chance of catching their prey. In all, this makes them very efficient. Different kinds of deep sea fish catch their prey by a number of methods. For example, many have teeth that are quite large and sharp, so large that they can often be seen sticking out of the mouth when it is closed!!! These teeth help them to grab their prey and keep hold of it. Others are able to make their stomachs larger to carry larger prey, some can hold prey almost twice their own length in these stomachs!!!

Even though most have eyes, they are of little use in the dark and so deep sea fish mainly use smell, taste and touch to find their prey. Some fish use flashes of light to find their way around.

So what is this light and where does it come from?

Firstly this light is produced by many of the sea creatures of the deep, including deep sea fish,and is called BIOLUMINESCENCE.

This light is produced by a chemical process that takes place in the fish's bodies, usually in pockets on the surface called photophores. Here their chemicals mix with oxygen causing light to be produced. Or in other fish, the chemical process is carried out by the groups of bacteria that already live in or on the fish.

This bioluminescence is usually blue or pale green in colour although it is sometimes red or yellow.

Each species wears its light in different places and in different patterns. They maybe found either along the sides of the body, on the abdomen(belly), tail, fins, spines, head or in the mouth.

There are many uses of this light.

1) To catch prey - Spots of light may be found in the mouth, or on the end of spines that maybe on the top of the head or beneath the chin. In some species such as the Viper fish, the light is dangled in front of the mouth. This light is used to draw prey near to the fish or directly into the mouth.

2) As a defence mechanism - A sudden flash of light can startle the enemy and give enough time for the fish to escape.

3) As Camouflage - Fish that live or feed in the upper, slightly lighter layers of the deep sea can often be seen as silhouettes by predators from below as light from the surface shines down through the water. This makes them easy targets as food, however those that produce light can become invisible. What happens is that when they emit light they blend in or become camouflaged with the light shining from the surface and therefore are hidden!!!!

4) To identify others of the same species - Each species , as mentioned before, has different patterns of light over their body and when flashed these lights can act as a sort of communication. Communicating such information as location,direction and speed of fellow members of a shoal, which helps them to stick together or to even find a mate.

An unusual fact about fish that can produce this light is that they are usually found at depths between 1000ft and 8000ft. Below this level it seems there are relatively few that do this, and which seem quite happy to live in the dark!!

Based on an article from "Schoolword", published by the Mystic Marinelife Aquarium, 55 Coogan Blvd., Mystic, CT 06355-1997, U.S.A.

ANSWERS TO PUZZLES ON PAGES 26 & 27

Searching for Words (Page 27): 1-E; 2-T; 3-X; 4-O; 5-B; 6-W; 7-Q; 8-L; 9-D; 10-H; 11-V; 12-Z; 13-I; 14-N; 15-U; 16-A; 17-P; 18-J; 19-G; 20-C; 21-F; 22-R; 23-S; 24-M; 25-Y; 26-K. **Quotation:** Time not tide waits for no man.

Around in Circles (Page 27): Mushroo(m) Moth) Hedgeho(g) Gras(s) Spide(r) Rabbi(t) Tre(e) Earthwor(m)

Along Came a Spider (Page 27): No. 6

What's what on Ireland's Seashore (Page 26): Squat Lobster = I = Crabs & Relatives; Two-spotted Goby = G = Fish; Breadcrumb Sponge = C = Sponges; Plumose Anemone = H = Sea Anemones & Relatives; Serrated Wrack = D = Seaweeds; Common Razor Shell = E = Shells & Relatives; Keel Worm = F = Worms; Common Brittlestar = A = Starfish & Relatives; Orange Leafy Lichen = B = Lichens.

A VENTURE IN KENYA

JENNIFER DUNGAN is a 20 year old woman studying Mathematics in Trinity College, Dublin, who participated in The Gold Gaisce Award. One day, a little while ago, this nice shy woman walked into the Gaisce Office and said; "I know what to do in three sections of the Award to earn a Gold Gaisce Medal but I have not got a clue what to do for a venture!'-'

On the wall of the office was a poster outlining an expedition to Kenya. Jennifer was immediately hooked. Would this nice, shy woman be ready for a wild venture like this and would she be able to raise £ 1,000. Read on - the rest is her story.

John Murphy

MY CHALLENGE IN KENYA

The rest day on the way up to the top of Mount Kenya.

By Jennifer Dungan

Kenya. My mind wandered. I had images of lions playing with their cubs, elephants crossing the plain below Kilimanjaro, ostriches running against the background of a Masai tribesman with his cattle. And yet, this expedition was offering much more. We would climb Mount Kenya, camp on Masai homestead on the African plains, go on a photographic safari, snorkel in the coral reef in the Indian Ocean and live and work with street children in Africa's largest slum city. ***"When do I leave?"*** was my only question.

Well, okay, going to Kenya required a lot of preparation; physically, mentally, medically and especially financially. But I worked hard, had lots of injections and raised over £1,000 by writing to different companies in my local area asking for sponsorship. Everybody was so helpful, especially the team from *Gaisce - The President's Award*, without whom I would not have gone to Kenya.

There were two main elements to my trip:

1. For my ***Community Service*** I worked with street children in Kenya, and
2. For my ***Venture*** I had to climb Mount Kenya

The Street Children

The street children that I had the honour of meeting are some of the poorest children in the world. And I made friends with them.

They come from the streets, they steal, they sniff glue, they're filthy, they have no home or family, they're often hungry and ill, they speak a slang called Sheng which is virtually impossible to follow. They have been described as the world's biggest social problem.

But they are incredibly friendly, fun loving, curious, smart and full of character. And as you get to know them and communicate with them, it is this side that you see more and more. It becomes very difficult to ever imagine leaving them.

The Kenyan Scout Association runs the Street Children Project that I was working on. Working closely with the churches, local government and other NGO's (Non Government Organisations) the programme allocates small plots of land to the children who are then taught the basics of land development. They grow their own food, breed chickens to sell in the markets. Through education and by example the leaders of these Street Scout Groups teach the kids the elements of right and wrong, basic health care etc. Over a period of time the children stop sniffing glue and stealing and start to talk about what they want to do with their lives with a positive outlook. They leave the street gang and join the scout gang. Gradually they are integrated into schools and back into society.

I played with these children. We taught each other songs and sang them together. They showed me how to cook their food and shared it with me. They taught me their language and spoke it with me. They taught me about life itself. They humbled me with their generosity. I had come out here hoping in some way to help these kids but perhaps expecting them to be resentful or hostile towards me. They were just the opposite. They didn't have people to love and care for them, so they really appreciated the fact that someone cared enough about them to try to help them. Simple human contact and attention achieve spectacular results.

The road isn't easy for them. It's a tough world in which they live. And I had to remember that the kids that I met were the survivors. With only a 30% survival rate on the streets, these are the smartest and the fittest of the street kids. They don't have nice homes or a bright future. But what these street scouts have now is a sense of pride in themselves, and a goal to work towards - to become good Scouts.

I will never forget them.

Jennifer Dungan pictured with one of the scouts.

The Climb of Mount Kenya

Climbing Mount Kenya is one of the biggest achievements of my life so far. I say "so far" because it showed me that I can do anything I put my mind to. There were moments when I literally could not imagine being able to put one foot in front of the other one without collapsing. I often wondered if I would actually be able to do it. The fact was that I could; and there's nothing like being thrown onto your own resources in the middle of Africa to prove the point!

A very industrious dedicated boy washing his clothes at the African Education Fund School.

We arrived at the base of Mount Kenya in true Kenyan style - that is 3 hours late. And after using the flushing, sit down toilet - a very rare luxury indeed - we started our hike on an easy path. A little while down the road we came across some buffalo dung and a bit later we saw a huge, hairy and very still buffalo head staring out at us from the jungle. After about 3 hours of plodding Gavin, our expedition leader, suddenly piped up *"Do you realise that we are walking through the jungle in Kenya in the pitch dark?"* Help! And I found myself uttering what became my phrase of the trip *"Wow. Never in my life would I have thought I'd be doing this"*.

The 2nd day was definitely the toughest. Hiking through rain on the infamous Vertical Bog - a never ending mud slope - with everything that you need for 6 days on the mountain on your back is extremely draining. Eventually we arrived at 14,200ft. Put up tents, heat up bowl of Curry in a Hurry and get into bed were our orders, which we happily obeyed. We all looked forward to our rest day tomorrow.

Our 4th day on the mountain we hiked up a scree slope in strong wind and rain, which changed to snow as we got higher. We all packed into the small Austrian Hut at 15,800ft. It might have been cramped but more bodies means more heat! Up at 4am tomorrow for the final assault on Mount Kenya.

Like Good King Wencelas we all trudged in each other's footsteps through the snow. I feel I have to mention the night sky at this point. As we were on the equator we could see both the Northern and the Southern Hemisphere constellations. Add that to the fact that it was a clear night at 16,000ft with *no* light or air pollution, throw in lots of shooting stars and you get a breathtaking sight.

We arrived at the summit for sunrise. The horizon was a rainbow of colours acting as a border between the deep blue hue of the sky and the golden tinged rock and white snow of the mountain. And the scene changed every couple of minutes becoming more and more spectacular. Deep reds, oranges, pinks. All the endurance, the hard work, the facing of dangers, the abstinence, the plodding on in rigorous conditions was worth it. I was on top of the world. *"Wow. Never in my life would I have thought I'd be here "*.

Conclusion

For some people the word, "Kenya" spurts forth images of poisonous snakes and spiders, ferocious lions and crocodiles and lots of bugs. But the only "bug" that I was seriously affected by was the "travel bug". And it bit me hard. Symptoms? A longing for adventure, excitement and fun; a desire to meet the local people and share their lifestyle and culture; discovering and accepting challenges and above all a renewed perspective.

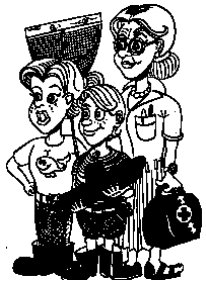
My trip to Kenya was the best thing that I have ever done. I still can't believe that it was me, a 19-year-old Irish girl, who climbed to the top of the second highest mountain in Africa (17,056ft). It was me who was working and playing with street children from slum cities. It was me who accepted a challenge and achieved my goal.

It would feel good to say, *"I know Kenya"*, *"Been there, done that, got the T-shirt"*. But of course I don't; what I know better is myself - Kenya helped.

Jennifer Dungan, Curraghreigh North, Tallow, Co. Waterford.

For further information contact John Murphy at An Gaisce - The President's Award, State Apartments, Dublin Castle, Dublin 2. (Tel: 01-4758746).

Captain Cockle & the *Cormorant*



by John Joyce

Episode Two - Monsters from the Deep!

(Abridged in four parts.)

"Oh my goodness!" cried Dr. Cockle. "You've landed in a giant sea anemone!"

***THE story so far* - Captain Cockle, his wife Dr. Catherine Cockle, and the grandchildren Jenny and William have flown to the North Sea in the amazing flying submarine *Cormorant* to rescue a pair of divers trapped on the bottom of the ocean under a collapsed oil rig. But time, and the divers' air is running out . . .**

Captain Cockle eased back on the throttle and the *Cormorant* settled onto the surface of the North Sea like a big yellow duck. With a click and a whirr, the rotor blades folded into the hull, and in a moment the dark water had risen up past the portholes as the electric motors pushed them towards the bottom.

William could see small fish floating past, and a fine snow of tiny creatures he could hardly make out.

"Plankton," said Jenny. "That's what whales feed on."

"Shouldn't be long now," said Captain Cockle and all at once, an endless wall of tangled steel seemed to shoot up from the sandy bottom and disappear in all directions into the blackness.

"Found the wreck," he said. "Now all we have to do is get the *Deepstar* out."

They spent a long time circling the huge mass of wreckage, looking for a gap large enough to get the *Cormorant* inside. William and Jenny could even see the faint glow of the Deepstar's lights deep inside the tangle of iron, but there was no way to reach it.

Then Captain Cockle saw the pipe.

"What do you think?"

"It must go right to the centre," said Jenny. "Where the other submarine is."

William peered down it.

"I can see light at the other end. But it's only two feet wide!"

"Horatio!" said Dr. Cockle. "You are not going to send the children down that pipe in diving suits!"

"Not at all," replied Captain Cockle solemnly. "But some time ago I discovered that with enough electricity, I could actually make atoms - the very stuff that makes up everything in the world - stick closer together. In other words, I can shrink this submarine and us inside her, until we are small enough to get inside that wreck. Now, how big do you think this submarine would need to be to fit down that pipe?"

"Less than two feet wide anyway," said Dr. Cockle, eyeing her husband strangely as she remembered all the other inventions of his that had either exploded or set fire to the workshop.

"Just what I would have guessed," said Captain Cockle, and began to type instructions on the ship's computer. "Hold tight, while I show you another special feature of this amazing submarine of mine!"

For a moment nothing happened. Then the whole submarine began to vibrate softly, just like a tin shed in a rainstorm. Outside the portholes, the sea lit up in a brilliant long lightning flash that crackled over the hull. Beyond the flashes, the wreck of the old oil rig seemed to be growing and growing . . .

And the pipe - that had been only two feet wide a moment before - was now a vast tunnel leading straight to the trapped divers they had come to save. Captain Cockle steered the tiny *Cormorant* inside, and down they went.

Five minutes later, they were looking out across the water at two sick, sleeping giants inside the huge glass dome of the *Deepstar* submarine.

"Oh! The poor men!" cried Dr. Cockle. "I have to get over to that submarine and help them!"

"Then we'll have to shrink it as well," said Captain Cockle. "You won't be able to treat them if you're only half the size of their big toes!"

There was another long flash of lightning as Captain Cockle shrunk the *Deepstar*. The two tiny submarines sat, no bigger than toys, on the ocean floor in the middle of the wreckage.

"Now it's time to go diving," said Captain Cockle. "Catherine. You get your medical bag. William! You'll have to go and operate the *Deepstar* controls while Jenny and I stay here and guide you out of the pipe with the *Cormorant* 's mechanical arms."

"Horatio! You cannot allow William out onto the bottom of the sea like this. He's less than an inch tall! He might be eaten by a crab!"

"There's nothing else we can do," said Captain Cockle. "Come on. You'll be roped together, and I'll be watching you from the *Cormorant* ."

William held on tightly to his grandmother's hand as they stepped out of the *Cormorant* 's diving hatch onto the sea floor. All around them was the circle of light from the two submarines, but the water beyond was very, very dark.

He wondered what animals might be out there waiting to make a meal of them as he turned slowly to clip the safety line to the *Cormorant* 's hull. But before he could do it, an enormous glassy prawn, ten feet long, with hard shiny legs and staring eyes that were blinded by the lights, crashed into them and sent them both spinning away from the submarine into the darkness. William landed on something soft and squishy, and looked about.

But it was too dark to see.

Then the soft, squishy thing he was lying on started to move!

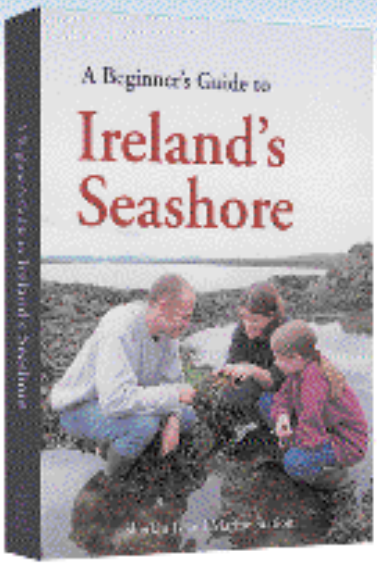
It moved like a huge jelly with arms - arms that reached up and wrapped around William's legs, pulling him softly backwards - towards its fat, fleshy mouth.

"Oh my goodness!" cried Dr. Cockle. "You've landed in a giant sea anemone!"

Will William and his granny end up as prawn cocktails? - Find out in in the next episode - The Enormous Eel - only in *Sherkin Comment.*

Adapted by the author from "Captain Cockle and the Cormorant " - published in Ireland by Poolbeg Press and available in all good book shops, price Ir£3.99

Check out Captain Cockle on the Web at the Captain Cockle Home Page on: http://www.cockle.com



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At BIM, the Aquaculture Development Division is committed to promoting self sustaining projects, creating sustainable jobs and economic well being in coastal regions. This focus aims to strengthen and integrate coastal communities targeting both fishfarmers and the inshore fishermen.

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