Porcupine Newsletter

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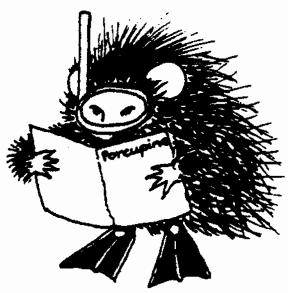

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EDITORIAL

Editorial comment is brief. Attention is drawn to items printed elsewhere: in particular Notices of Future Meetings. The Millport meeting was a great suceess: we thank Geoff Moore and all at Millport for hosting the meeting for providing excellent hospitality in the hostel, and Willie Fowler for putting in the hard work of the rest of the organisation. I have had an excellent response from speakers, so much so that have held over material until the next issue of PN, with apologies to those concerned (latest-received articles held over). Since there isn't a meeting before the next issue, could I ask for articles on any relevant subject. It would be nice to have more papers which are not tied to themes of meetings. To this end I am grateful to Frank Evans for drawing attention to the HMS Porcupine incident in Loch Fyne. I have added a note to one of the papers. Please do comment on any paper or subject, Letters to the Editor are very welcome but have become rare, if not endangered, species of late!

Response to my request to provide disks in addition to paper copy of articles has been most helpful despite some difficulties in persuading my computer to accept them. Before the next issue of PN I hope to have the latest technology in operation but still may have problems with tables and diagrams, so camera-ready copy of these will still be most necessary! Disks with the least amount of commands are the easiest to edit: text files, and please do not justify right!

The index to Vol 10 is supplied with this issue.

PLEASE NOTE THE FILL-IN SLIP CONCERNING YOUR ADDRESS AND INTERESTS. We wish to publish a new membership list with the next issue and therefore would like your contribution as soon as possible.

If you have not yet paid your subscription, please remit to Jon Moore as soon as possible. Unlike many Societies, we have not yet found the need to raise the subscription - £8 for full members, £5 for students.

MINUTES OF THE EIGHTEENTH ANNUAL GENERAL MEETING OF PORCUPINE

held at Millport on 5th March 1995 at 09.39 am

Roger Bamber was in the chair: fourteen members were present. There were no apologies for absence. The Minutes of the Seventeenth Annual General Meeting (published in PORCUPINE NEWSLETTER, Vol 5, No 9) were approved. There were no Matters Arising.

The Hon. Scretary's Report was presented by Ian Killeen and approved (see p 5 of this Issue).

The Hon. Treasurer's Report was presented by Jon Moore and approved.

The Hon. Editor's Report was presented by Shelagh Smith and approved. She explained that there were only two Newsletters in the last year because of lack of copy.

The following Office Bearers were re-elected;

Hon. Secretary	Ian Killeen
Hon. Treasurer	Jon Moore
Hon. Editor	Shelagh Smith

Bill Farnham and Fred Woodward retired from Council. The following Council Members were elected:

Roger Bamber	Frank Evans	Jan Light
Susan Chambers	Willie Fowler	Ivor Rees
Dave Connor	Robin Harvey	Ralph Robson
Mark Davis	Christine Howson	Dennis Seaward
Francis Dipper	Antony Jensen	Martin Sheader

The Hon. Auditor Nick Light was thanked for his work last year, and was re-elected for the coming year.

Future Meetings were discussed by the Hon. Secretary (see p 28 of this Issue).

Any Other Business:

Sweat shirts are still available at £11 (Roger Bamber).

A small stock of past PORCUPINE NEWSLETTERS is held by Shelagh Smith.

A proposal by the Committee to take PORCUPINE posters and other publicity to meetings of other organisations was aired.

The Meeting closed at 10.05 am with the Chair proposing thanks to those involved in the organisation of the millport Meeting, particularly Willie Fowler.

PORCUPINE
RECEIPTS AND PAYMENTS ACCOUNT
for the year ended 31 December 1994

Year to 31.12.93 £	Year to 31.12.93 £			Year to 31.12.94 £	Year to 31.12.94 £
		RECEIPTS			
1202		Subscriptions-	1993 & Prior	130	
8			1994	1206	
-			1995	34	
-			1996	16	
	1210				1386
	2	Sale of P.N. back numbers			-
	58	Bank Interest (net of tax)			43
	22	Sale of T Shirts			22
	50	Donations			150
	1342	Total Receipts			1601
		PAYMENTS			
422		Newsletter-	Printing	348	
120			Postage	131	
23			Envelopes	47	
565		Total Newsletter Costs		526	
-		Photocopying & Postage		74	
	565				600
	777	**SURPLUS BEFORE MEETINGS**			**1001**
		MEETINGS			
-		Credit from Evans/Buchanon meeting		18	
	-				18
	777	**SURPLUS FOR THE YEAR**			**1019**
	2393	**BALANCE BROUGHT FORWARD**			**3170**
		BALANCE CARRIED FORWARD			
1723			Current Account	2731	
1447			Deposit Account	1458	
	3170				**4189**

Hon Treasurer **Hon Auditor** **13 March, 1995**

HON. SECRETARY'S REPORT FOR 1994

As usual I shall report on the Society's meetings and then say something about membership and publicity.

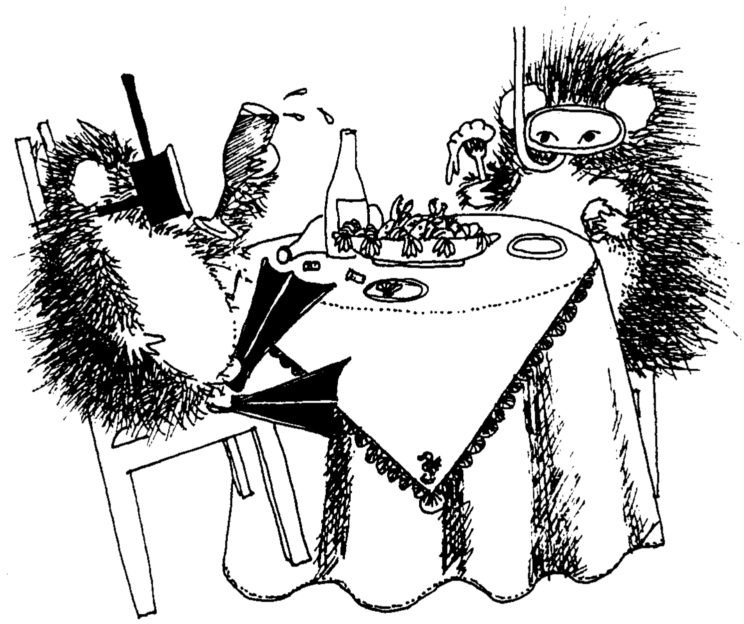
For the Spring meeting and AGM held on 5th and 6th March 1994, PORCUPINE joined forces with the National Museums of Scotland, Edinburgh. The first day was linked with a public meeting entitled ***The Braer Oil Spill - a Year of Results***, and on the Sunday the AGM was followed by a meeting on ***Marine Environmental Monitoring***. PORCUPINE is grateful to Susan Chambers of NMS for the opportunity to join the public meeting and for all her efforts in organising both meetings.

In September an extended field meeting to Guernsey was held jointly with the Conchological Society of Great Britain & Ireland. Thirteen participants made the journey and were able to record the rich and diverse marine life of the shores of Guernsey and its associated islands Sark and Herm. The trip provided a wealth of new and updated information. The society is very grateful to local PORCUPINE Roger Brehaut for superbly organising the meeting and for the hospitality received from him and his wife Dorothy.

Memebership currently stands at 181 which includes 7 Institutions who receive PN free of charge. Additionallywe have 7 student members. This is a slight fall on last year's numbers and fewer new members have replaced those who have resigned or been struck off for non-payment of subscriptions. Publicity was the subject of extensive discussion at the Council Meeting. Many ideas have been discussed to raise the profile of PORCUPINE including posters at Institutions, representation at appropriate conferences, sponsorship of research and so on. The response to the Essay Writing Competion was poor but we have decided to run it again this year.

As always I would ask all of you to do all you can to promote PORCUPINE.

Ian Killeen - Hon. Secretary



PRIZE ESSAY

An essay on any aspect of

THE BIOGEOGRAPHY OF THE NORTH EAST ATLANTIC

or a region thereof

first prize £100

is offered by PORCUPINE

Open to registered students, undergraduate or post-graduate, including Open University

Rules

1. Competitors must be registered students, either full time or part time,undergraduate or post-graduate. They must not at the same time be staff members of research establishments or institutions of higher education.

2. The Essay must be original work, typewritten or word-processed, and not exceeding 3,000 words. It may treat any part of the N E Atlantic, any group or groups of animals or plants, and any zone or zones from the shore to the deep ocean but must centre on biogeography. It may be illustrated with drawings, diagrams or graphs in black and white but not photographs.

3. Prizes are: for the winner: £100 plus two years' free membership of PORCUPINE. For each of two runners-up: two years' free membership of PORCUPINE.

4. The decision of the judges is final. The judges may refuse to declare winners and refuse to award prizes at their discretion.

5. Contributions must not have been published or submitted for publication elsewhere.

6. The winning contribution and those of the runners-up will be submitted to the Hon. Editor of PORCUPINE NEWSLETTER, the scientific journal of the Society, for possible publication. Publication will be at the Hon. Editor's discretion.

7. Contributions must be submitted to the Hon. Secretary of PORCUPINE at the address below to arrive not later than 30 November 1995. Winners will be notified before 31 January 1996.

Ian Killeen, Hon. Secretary PORCUPINE, 163 High Road West, Felixstowe, IP11 9BD.

HEMPEN TANGLES AND MYSTICAL TRIANGLES: THE EARLY HISTORY OF BIOTOPES

By DAVID HEPPELL
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We need not look back beyond the time of Edward Forbes (1814-54) to discover the origins of the concept of biotopes. Before his time the marine fauna, except for species of commercial importance, was regarded with little more than superstitious dread. An amusing account of the Shetlanders' opinion of such animals is given in his *History of British Starfishes, and other animals of the class Echinodermata*, 1841. Two years earlier, he and John Goodsir, had been the first to find the giant sea cucumber, *Cucumaria frondosa*, in British seas while dredging in Shetland. Of this discovery, Forbes wrote: 'The Shetlanders designate him by the . . . name of "Sea-Pudding" . . . He is arranged by them in an extensive though most unphilosophically constituted class of marine animals, to which they apply the term "Pushen," which being translated signifies poison. In this Thulean arrangement numbers of the rarest of British animals are unfortunately included, - I say, unfortunately, for all members of the class *Pushen* are unceremoniously and speedily thrust overboard almost as soon as seen in the fishing-boats, being considered unlucky and dangerous in their nature. The class in not an ultimate division. The Shetland fishermen arrange all marine animals not used as food under the general head of "Combustibles," - certainly a most extraordinary application of that excellent English word. "Combustibles" they divide into Harmless Combustibles and Pushen, under which last division I fear all the animals which it has been my fortune to describe in this volume must take their places.'

Forbes had been a keen exponent of the naturalist's dredge in his native Isle of Man from an early age and, when he came to Edinburgh in 1832 as a medical student, he took up dredging in the Firth of Forth and also joined James Smith of Jordanhill, Glasgow, in dredging trips to the Firth of Clyde. He was soon gaining important insights into biogeography and its significance in interpreting fossil assemblages. The success of his visit to Orkney and Shetland in 1839 was probably crucial. He wrote in his note-book: 'To add eleven or twelve new animals to the British fauna, and to see as many more exceeding rare species, confined to this locality, is no small harvest for a naturalist to reap in a fortnight, especially when it is considered that six days of that fortnight were lost, in a manner, at sea . . . NB. - Must go back to Shetland.'

By this time he had extended the intertidal divisions already recognized by marine ecologists into the sublittoral regions, commenting that: 'this subdivision of the tract between tidemarks into zones of animal life, is a representation in miniature of the entire bed of the sea'. Forbes proposed four depth zones: the littoral zone, the Laminarian zone, the region of corallines and, below 50 fathoms (90m), the region of deep-sea corals. At the Birmingham meeting of the British Association in August 1839, an important committee was appointed 'for researches with the dredge, with a view to the investigation of the marine zoology of Great Britain, the illustration of the geographical distribution of marine animals, and the more accurate determination of the fossils of the Pliocene period', to which end a grant of £60 was set aside. Forbes, Goodsir and Smith were all among the members of the committee, which was headed by J E Gray of the British Museum. This dredging committee was no doubt a direct result of the enthusiastic reception given at that meeting to the report by Forbes and Goodsir on their Shetland survey. Forbes and the younger naturalists spent convivial evenings at the Red Lion pub. With Forbes the star turn, with his humorous topical recitations of scientific progress, these evenings became so popular that by the next year's meeting in Glasgow the Red Lion Club was formally established, with Forbes the Lion King. It was for the Glasgow meeting that Forbes penned his well-known Dredging Song: 'Hurrah for the dredge with its iron edge, / And its mystical triangle, / And its hided net with meshes set / Odd fishes to entangle!'

The dredging committee was reconvened regularly over the next three decades, and provided small grants towards expenses, each time voting the money for a specific objective. The station data sheets recorded the species taken at each locality, the depth, distance from the shore and the nature of the bottom sediment, numbers of specimens taken and comments on the associations of one species with another. A synthesis of the dredging results was presented by Forbes in 1850 but, before that, Forbes had spent much of 1841 and 1842 in the Mediterranean, carrying out a faunal survey of the Aegean. Although the full zoological results of this were never written up, he did publish some important general conclusions, including the following:

1. 'Living beings are not distributed indifferently on the bed of the sea, but certain species live in certain parts, according to the depth, so that the sea-bed represents a series of zones or regions, each peopled by its peculiar inhabitants'. He expanded the number of bathymetric zones to eight, the deepest extending from 105fm (192m) to the greatest depth dredged in the Aegean, 230fm (420m).

2. 'The number of northern forms of animals and plants is not the same in all zones of depth, but increases, either positively, or by representation, as we descend'; in other words an increase in depth in the sea is equivalent to an increase in latitude.

3. 'All varieties of sea-bottom are not equally capable of sustaining animal and vegetable life', an observation with important considerations for the stratigraphical geologist.

4. 'The number of species is much less in the lower zones than in the upper. Vegetables disappear below a certain depth, and the diminution in the number of animal species indicates a zero not far distant.' This is the principle with which Forbes's name was most closely associated. His experience in the Aegean led him to expect an azoic region beginning somewhere around 300 fathoms (about 550m) and, consequently, as the greater part of the sea is far deeper than this zero point of life, that the greater part of deposits forming would be void of organic remains, at least of benthic animals.

This zero point of life was a doctrine readily taken up by Forbes's followers, of whom there were many. Although there was in fact already ample evidence for the existence of life at great depths, it was convincingly argued that the great pressure combined with the absence of light and heat must render life untenable. The contrary evidence was ignored or argued away. This was coupled in the popular mind with another strange idea that the pressure at great depths greatly increased the density of the sea-water, so that all the loose things in the sea floated at different levels according to their specific weight.

After Forbes's early death in 1854 his mantle was donned by two of his close friends, John Gwyn Jeffreys, a Swansea solicitor who had met Forbes at the British Association meetings, and the marine biologist Charles Wyville Thomson, who had dredged with Forbes during Forbes's student days in Edinburgh. Jeffreys had begun dredging as a teenager from a rowing boat in Swansea Bay, and he too had been attracted to Shetland by the richness of its marine fauna, as both Arctic and more southerly forms can be found there together. He first visited the islands in 1841, and subsequently made good use of his brother-in-law's yacht, the 'Osprey', usually accompanied by Canon Norman or the Irishman Edward Waller. In fact, every summer during the 1860s various groups of Victorian gentlemen set off for the remote islands to spend some weeks or even months dredging up to 30 or 40 miles offshore, and working up the material at their temporary headquarters at the lighthouse on the Walsay Skerries or at Baltasound on the island of Unst. Their long and detailed letters to their friends give a vivid impression of the rewards and disappointments of work, inevitably dominated by the all too often inclement weather. Usually, however, even with the difficulties of working from a sailing vessel in tempestuous seas they were able to sample enough to keep work going on shore, as well as at sea. Jeffreys and a helper frequently stayed ashore to sort the samples and preserve animals while the others kept up their labours on the yacht, perhaps because, as he later confessed to Norman: 'I detest the sea for its own sake, but put up with discomforts for the sake of science or natural history'.

Altogether Jeffreys made eight visits to Shetland for the purposes of dredging, as well as similar excursions to the Hebrides, Ireland and the Channel Islands. From 1861 to 1867 he headed all 21 dredging committees, general and local, established by the British Association. After the summer of 1868, however, by which time he had retired from his legal profession, he decided that, having invested several hundred pounds in the summer expeditions, enough was enough. In his last letter to Norman from Shetland he complained: 'The last chance of success is gone . . . The result of this (the last) week is one *Trochus amabilis* and a couple of sponges! It is quite enough to make a saint swear.'

The various dredging expeditions sponsored by the British Association had not ventured beyond 200 fathoms, but they had convincingly established the value of scientific dredgings. The prevailing notion of a zero of life at around 300 fathoms, however, was about to be decisively challenged. Just nine days after Jeffreys left Lerwick for the last time, William B Carpenter, President of the Royal Society, and Wyville Thomson left Oban for an eight-week cruise to the Faroe Islands and particularly to the deep channel between those islands and Shetland, specifically to ascertain the existence of marine animals at great depths. Through the Council of the Royal Society, the Admiralty, had been persuaded to make available the little wooden paddle-steamer HMS 'Lightning', one of the first steam-powered warships to be built, in 1823, for the Royal Navy. By 1868 she was 45 years old and quite unsuited for the role she had to play. Nevertheless, discoveries made during her voyage totally changed the accepted concepts of deep-sea biology and physics, arguably making this cruise even more important, day for day, than the later circumglobal voyage of the 'Challenger'.

Dredgings were made at 9 stations, the depth varying between 450 and 650 fathoms (820m - 1189m). Of particular interest were the bottom temperatures recorded on this cruise. It had been generally believed that sea water, like fresh water, had a maximum density at about 4 °C, so that the deeper parts of the ocean would be filled with water at that temperature. Instead, the 'Lightning' found a cold area, shaded on the chart, with bottom temperatures ranging from 1 °C to -1 °C, and an adjacent warm area with a bottom temperature of around 6 °C, with quite different faunal assemblages. Carpenter was anxious to investigate this phenomenon further and the Royal Society recommended another longer voyage in 1869, for which the Admiralty made available the wooden paddle-steamer HMS 'Porcupine', the principal naval survey vessel in home waters, built in 1844, under the command of Captain Calver.

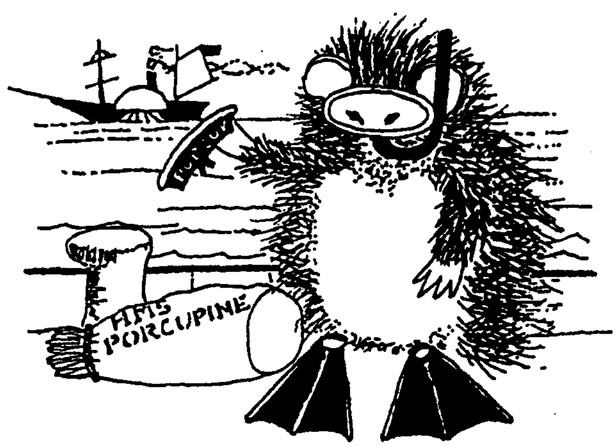
As neither Wyville Thomson not Carpenter could spare four months from their official duties, the voyage was planned as three separate cruises, with Gwyn Jeffreys in charge of the first, which dredged 32 stations, including several in the very deep water of the Rockall trough, the maximum depth reached being 1476fm (2700m). This encouraged Wyville Thomson, in charge of the second cruise, to make a change of plan, as he now wanted to show that marine life had no bathymetric limit and, instead of the proposed exploration of the area between Rockall and the Faroes, headed south to the deepest sounding shown on the Admiralty charts, 2500 fathoms indicated 250 miles west of Ushant. A successful dredge haul was made in 2435fm (4289m) which, on careful sifting, was found to contain specimens of all the major invertebrate phyla, molluscs, crustaceans, echinoderms, hydroids, sponges and assorted worms. The third cruise, with Carpenter in charge and Wyville Thomson also on board, returned to the Shetland-Faroe Channel to map the boundaries of the warm and cold water currents, and to determine their influence on the benthic animals.

To better sample the echinoderms, corals and sponges of the cold area, Captain Calver suggested a modification to the dredge. The simple expedient of attaching half a dozen of the swabs used for washing down the decks initiated, in Wyville Thomson's words, 'a new era in deep-sea dredging'. These 'hempen tangles' as they were known, were considered nearly as important as the dredge itself, and often more conspicuous in their results. Sometimes, when the ground was too rough for ordinary dredging, the tangles were used alone. An equally successful cruise by the 'Porcupine' to the Mediterranean the following year persuaded the Government to fund the circumglobal oceanographic expedition of HMS 'Challenger' in 1872-76.

The widely different sea-bottom temperatures at localities not far distant from each other, noted in the Shetland-Faroe channel during the 1868 expedition, was further investigated by the paddle-steamer 'Knight Errant' in 1880, with Wyville Thomson, now in failing health, and John Murray in charge of the scientific work. Soundings showed the existence of a suspected ridge, acting as a natural dam separating the cold Arctic water from the warmer water at similar depths in the North Atlantic. This expedition was only a partial success, but two years later, after Wyville Thomson's death, Murray returned for a very fruitful cruise on HMS 'Triton', and the ridge was named the Wyville Thomson Ridge, in honour of its discoverer.

Two other developments contributed significantly to the biogeographical study of the benthic communities around the turn of the century, both of which were spin-offs from the highly successful Fisheries Exhibition held in Edinburgh in 1882. The first was the setting up that year of the Scottish Fishery Board, which investigated the interactions between the physical components of the sea and the fish and its other animal inhabitants. Although the view that the sea's resources were inexhaustible was supported by some scientists (such as W C McIntosh of St Andrews), it was strongly contested by the inshore fishermen with diminishing catches, especially since the introduction of the steam trawler. The FRV 'Garland' was used for fisheries research by the Scottish Fishery Board from 1886 to 1902, although she was unsuitable for deep-sea work.

The second was the creation of the first marine biological station in Britain, in 1884, at Edinburgh. £1699 surplus from the exhibition was given to the Scottish Meteorological Society for carrying on their fisheries investigations, with power to establish with the funds a zoological station. John Murray, who had benefited financially from the 'Challenger' expedition, offered to equip a station if the Society would give an annual grant of £300 for three years towards expenses. This was agreed and work was started at a flooded quarry about a mile west of Granton Harbour, communicating with the sea by a narrow channel. An old iron hull, moored to the bank by chains, was fitted out as a floating laboratory and, from its appearance, became known as the 'Ark'. A small steam yacht, the 'Medusa', was specially built for dredging work in the Firth of Forth. In June 1885, both the 'Ark' and the 'Medusa' were taken through the Firth and Clyde Canal and moored in Millport Bay. The 'Medusa' then spent seven years exploring the sea lochs and shallow waters of the west coast of Scotland. Back at Granton the marine station flourished for a few years, but with the establishment of a permanent base in the west of Scotland, funds dried up for the Granton station, which was formally closed in 1903. Today it lies buried and forgotten beneath the paths of a public park. Before the end of the nineteenth century, the scientific work had been transferred to a new laboratory at Millport. The 'Ark', drawn up on the shore, was opened to the public as a museum of marine biology in 1894, under the charge of David Robertson, until it was destroyed in a great storm in December 1900. The foundation stone for the permanent laboratory was laid in October 1896. Roberston died the following month, and so did not live to see the opening, by John Murray of the new building in May 1897.



THE EUROPEAN COASTAL LAGOON BIOTOPE

By R S K BARNES
Department of Zoology, University of Cambridge, Cambridge CB1 3EJ

Coastal lagoons are pond- or lake-like bodies of saline or brackish water that are partially isolated from the adjacent sea by a sedimentary barrier, but which nevertheless receive an influx of water from that sea. They are also virtually tideless, are almost invariably shallow (<1 or 2m deep), and contain dense beds of submerged macrophytes such as *Ruppia* or *Zostera* with which many of their characteristic species are associated. Although lagoons comprise only 5% of the coast of Europe, they contribute a total of 13% of the world's coastline.

Lagoons are most characteristic of microtidal regions (with a tidal range < 2m), because large tidal ranges not only lead to powerful water movements that are usually capable of breaching and detroying any incipient sedimentary barriers, but they also result in the draining of any partially impounded water masses during low tide. Hence in Europe lagoons are particularly abundant only around the shores of the tideless Baltic, Mediterranean and Black Seas. But they are (or were) also present along the macrotidal North Atlantic coast, wherever offshore deposits of shingle are to be found as a result of past glacial action. shingle can here replace the more characteristic sand of microtidal seas as the barrier material because it is less easily redistributed by tidal water movements. The problem of retaining water during low tide in such systems still remains, however, and hence most surviving lagoons that are shingle-enclosed are of necessity entirely land-locked. Otherwise mud-flat or salt-marsh predominates.

Lagoonal basins can be formed in a variety of ways, to give rise to:

1. Estuarine lagoons, where barriers have moved onshore and have partially blocked existing drowned river valleys.

2. Typical lagoons - regions that have become partially isolated from the parent sea by the development of a spit or by one or more offshore/longshore barrier bars or islands (as in the majority of the world's lagoons).

3. Percolation lagoons - mostly small pools in low-lying land situated behind a longshore barrier through which sea water can percolate. The percolation that feeds them is derived from sea water soaking into the shingle barrier during high tide in the adjacent sea together with such rainfall as has soaked in.

Many former European estuarine lagoons, and indeed the majority of the former natural Atlantic coastal lagoon habitats, are now completely fresh water biotopes. Sea water entry is currently prevented by the establishment of an all-enclosing barrier too high to be overtopped (often here aided by man so as to prevent coastal flooding), or by the build-up of the lagoonal bed by sedimentation until the lagoon is perched above the height at which sea water can percolate in. Water can only percolate out. Conversion to fresh water lakes and obliteration by continued landwards movement of barriers is the immediate fate of all Atlantic lagoons, whilst infilling by sedimentation is the fate of lagoons in microtidal areas.

The amount and types of lagoonal habitat in Britain and Italy dramatically illustrates the marked contrast that occurs between macrotidal and microtidal Europe. First, most British lagoons fall into the estuarine-lagoon and percolation-lagoon categories since these types are particularly associated with shingle barriers, and accordingly they are usually completely land-locked. Land-locked estuarine lagoons are most under the infuence of fresh water for self-evident reasons, and hence the prevalence of the evolutionary succession to entirely fresh water habitat.

The lagoons of Italy and other Mediterranean countries, however, mainly fall into the typical-lagoonal category and most have open connections with the sea.

Secondly, microtidal Italy has more than 150,000ha of lagoonal habitat, and a lagoon of only 40ha area was, in general, not considered worth enumerating in a recent inventory of Italian lagoons. Macrotidal Britain has only 600ha of lagoonal habitat - 480ha of it in the the form of one single lagoon, The Fleet, and this is the **only** British lagoon to exceed 40ha area. A percolation lagoon of only 0.5ha can form a significant element in the conservation of British lagoonal habitat: in the Mediterranean and elsewhere it would be utterely insignificant!

Insofar as is known, however, the ecology of lagoons does not vary between the different types, and moreover their ecology seems to show the same general pattern seen in estuaries and other regions of coastal soft-sediment. Indeed, many of the species are the same as in other soft-sediment systems. Coastal lagoons contain invertebrate and fish faunas comprising mixtures of three broadly different elements: (a) essentially fresh water and (b) essentially marine or estuarine species capable of withstanding a degree of brackishness and (c) specialist lagoonal or 'paralic' species that are not in fact restricted to lagoons but also occur in the Eurasian inland seas, as well as in (the usually man-made) tideless brackish ponds and drainage ditches that are abundant in reclained coastal regions of Atlantic Europe. The main feature of this latter category is that they are species of marine ancestry that seem to be restricted to shallow, non-tidal maritime habitats. Over their ranges as a whole they are also clearly capable of inhabiting a wide range of salinity, including full-strength sea water.

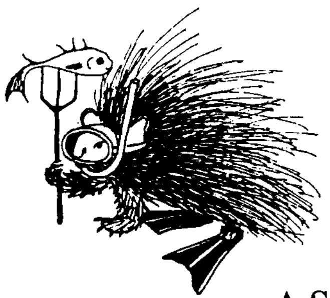
The ancestry of this specialist lagoonal fauna is not known with any certainty. It would seem clear that the ancestral habitat must have been tideless, marine at least in origin, and probably subject to a degree of periodic dilution by fresh water. The best candidate for the European fauna is probably the series of land-locked seas in the Ponto-Caspian basin that the old Tethys Sea degenerated into as a result of continental movements. Elements of this fauna then eventually penetrated through the Mediterranean basin to colonise northwestern Europe. The northern parts of their habitat would have disappeared during the glacial phases of falling sea level and they would have become locally extinct. Presumably they extended northwards again as the rising sea levels of each of the Interglacial periods re-created lagoonal biotopes. Such species are restricted to lagoons in northwestern Europe only because lagoons are the only tideless marine habitats available there.

What biological differences are there between these lagoonal species and their marine relatives, apart from the diagnostic trait of being apparently unable to survive in tidal seas, even sublittorally? The answer, unfortunately, is unknown or rather that, insofar as we know, they appear to show no common characteristic differences. This absence from tidal marine regions also raises the question of how they are dispersed from lagoon to lagoon. Insofar as Atlantic Europe is concerned, the most likely answer seems to be via mats of lagoonal vegetation at the times of coastal flooding that have occurred on average once every 25 years. Sea defence works are now in danger of rendering dispersal impossible and the fauna of individual lagoons isolated and relict.

There is a further marked contrast between the macrotidal Atlantic and microtidal Europe in the human usage of lagoons. Along the macrotidal Atlantic coast, most significant lagoons have been incorporated into nature reserves - largely to protect the wading birds and wildfowl that so abundantly frequent them - and other than bird watching there is no significant land or water use. In the microtidal Mediterranean, however, more than half of the larger lagoons are used for fish and shellfish cultivation. There is an average Mediterranean lagoonal fish yield of some 100kg/ha/year, and considerable culture of bivalve molluscs also occurs (mainly mussels and oysters). This form of use is typical of most of the world's lagoons (with the additional utilisation of prawns in the tropics), although it does not apply to the open Atlantic coast of Europe, largely because of the rarity of open lagoons there.

With the major exception of The Fleet, most surviving British lagoons owe their existence to man. Their basins have been created accidently, often in former salt-marsh creeks as a result of land reclaimation, or through gravel extraction. Alternatively they have been created by deliberate ponding back of the water mass to form bird habitat, or artificial lagoon-like habitats have arisen behind permeable sea walls or adjacent to faulty sea wall sluices. To some extent this has counteracted man's tendency to obliterate lagoonal habitat by infilling, drainage, conversion to alternative uses, and various other means. Lagoons throughout Europe are a threatened biotope, which is why they are a 'priority habitat type' under the European Union's Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora, and why one lagoonal charophyte and five lagoonal invertebrates are specifically protected under the British Wildlife and Countryside Act of 1981.

The ease with which the habitat can be created or re-created, however, poses considerable hope for the future. The permeability of shingle barriers means that the deliberate excavation of depressions to landwards of the will result in percolation-fed pools that, if suitably stocked with lagoonal species, may permit the fauna to survive in a series of refuges, notwithstanding the general disappearance of their true habitat and the loss of dispersal routes.



WITH MUSKET AND SHOT

A STORY OF FISHERY PROTECTION

By JEFF PARKES

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For a man born to adventure, who had joined the Royal Nay to see the world, being posted to a Fisheries Protection Vessel around the west coast of Scotland must have been more than a little disappointing. That, however, was the fate of Phillip Turner, a 34 year old Plymouth man with a superior education. In the Summer of 1853 he was a gunnery officer on board HMS ***Porcupine*** on patrol off the entrance to Loch Fyne. It was a thankless duty which he had come to regret.

Fishing had been a way of life in the area from time immemorial, for the waters were full of herring. The traditional method of catching them was by means of the drift net, cast over a shoal of fish and allowed to drift until it was full enough to make the catch worthwhile. It was a slow and inefficient way of making a living; too slow for some.

Around 1838 an unknown fisherman at Tarbert decided to join several drift nets together and cast them in a circle around the shoal. Every single fish was trapped within the ring and it soon became obvious that quick profits could be made by this new method. The ring net rapidly grew in popularity in the waters of Loch Fyne and Kilbrannan Sound.

Not everybody was happy with this development. Some people argued that it destroyed immature herring and that it disturbed, if not destroyed, spawning beds. Pressure was put on the Government and eventually, in 1851, an Act of Parliament was passed prohibiting the use of ring nets. Legislation, however, has to be enforced, whether on land or sea. In order to prevent ring netting a Royal Navy gunboat had to be sent to the contentious waters.

On 17th June 1853 a fishing boat named ***Annan*** left Tarbert with a crew of five, including Colin McKeitch, a 28 year old fisherman who was destined to play a principal part in that night's drama. They were going to assist in hauling at a net belonging to another boat in the same flotilla south of Skipness. The Act of Parliament passed eighteen months previously had caused a great number of fishermen about Tarbert to lose their livelihood. It was a constant game of cat and mouse with the Fishery Protection Vessel ***Porcupine*** which sent out boats to police the area and confiscate all the illegal nets found.

On the night of 17th/18th, the ***Annan***, with four other boats, found the sea too heavy to fish so returned to Tarbert, giving a tow to another boat. They were stopped by a cutter from the ***Porcupine*** which went alongside. A search was made of the ***Annan***, but no net was found: the cutter then went alongside the boat being towed.

McKeitch took the opportunity to call out in Gaelic to the men on the boat carrying the illegal net, warning them that the navy cutter was there. It was then that a shot rang out from a second cutter, which, in the fast fading light, had been mistaken for another fishing boat. McKeitch was hit in the shoulder. "I cried out instantly that I thought I was shot," he later stated. "The shock was very considerable ..... I saw two other shots fired from the same boat by a person who appeared to be the Officer in Charge. We sailed home quickly ..... I felt some blood comimg from my shoulder."

The wounded man was attended by a surgeon who confirmed that he found "a ball or slug [in his right shoulder] a little larger than a common pea." McKeitch was confined to his house for eight days and was still unable to do a man's work a month after the event.

Two days after the shooting incident he was visited by Robert Owen Leach, the officer in overall charge of the navy boats that fateful night. According to testimony he offered £50 to McKeitch to buy his silence, saying the man who fired the shot was married with a family and had been promoted; "it could do no good to see him punished." The fisherman refused, fearing he would be unable to walk the streets of Tarbert again of he had allowed himself to be bought off.

The case was heard in Inveraray on 22nd September 1853 before the Circuit Court presided over by Lord Cowan. The jury was out for some time before returning a unanimous verdict of Guilty of Culpable and Reckless Discharge of Loaded Firearms as libelled. Both Turner and Rennie were sentenced to three months in the Prison of Inveraray, but were released after 28 days.

Lieutenant George Melville Jackson, in command of the ***Porcupine***, stated that he had already captured two illegal nets and upon hearing that more would be used off Skipness he "sent out three boats in charge of Mr Leach, next in command to me. My orders were strict that no ball cartridge was to be used. I ordered a marine to be placed in each boat with a musket and blank cartridge."

The gunner's mate who issued the ammunition insisted there was nothing but blanks and other crew members all told stories which made the use of ball seem impossible. As for Turner, he declared " there were not to my knowledge any ball, slug or pellets on board the cutter." He ordered a marine, Peter Rennie, to charge the pistols when approaching Skipness; "if he charged them with any other than blank cartridge it was without my knowledge." He claimed that he had odered the musket to be fired because the fishing boat refused to heave to. This having no effect "I fired off the said pistols in the air."

Marine Rennie, who was charged alongside Turner, had loaded the musket from the cartridge pouch. "At the time that Mr Turner told me to fire my musket he said he thought that Mr Leach was in distress but gave no reason for giving the order [to fire]. I did not myself see any reason to suppose that he was in distress."

The battles over ring netting would continue for many years to come and in 1861 another fisherman was shot by a marine on an enforcement gunboat, this time with a fatal result. The case was heard in the High Court in Edinburgh. In summing up the Judge said "There was no doubt, on this occasion, the prisoners went out in the performance of their duty ..... also, the fishermen were at the time engaged in an unlawful occupation ..... The prisoners were enlisted in the naval service of the country, and were bound to follow the rules of that service ..... [if the jury] were of the opinion that the prisoners ..... had not acted carelessly or recklessly [they] were entitled to an acquittal. If, on th other hand, [the jury] were of opinion that they ..... had failed to use due caution, they were then bound to give a verdict against the prisoners." the verdict was Not Guilty.

Were Phillip Turner and Peter Rennie victims of a miscarriage of justice perpetrated by a locally biased jury? Certainly the latter case was taken well away from such influence and a different result aobtained. On the other hand, did Turner deliberately set out to hurt someone. Was he careless and reckless? The case is muddied because of an obvious attempt at a cover-up by the entire crew of HMS ***Porcupine.***

However you look at it, chasing after fishermen looking for illegal nets was a thankless and frustrating task, but perhaps necessary. Despite the measures taken by government and the patrol ships of the Royal Navy there are now no herring to be found in Loch Fyne.

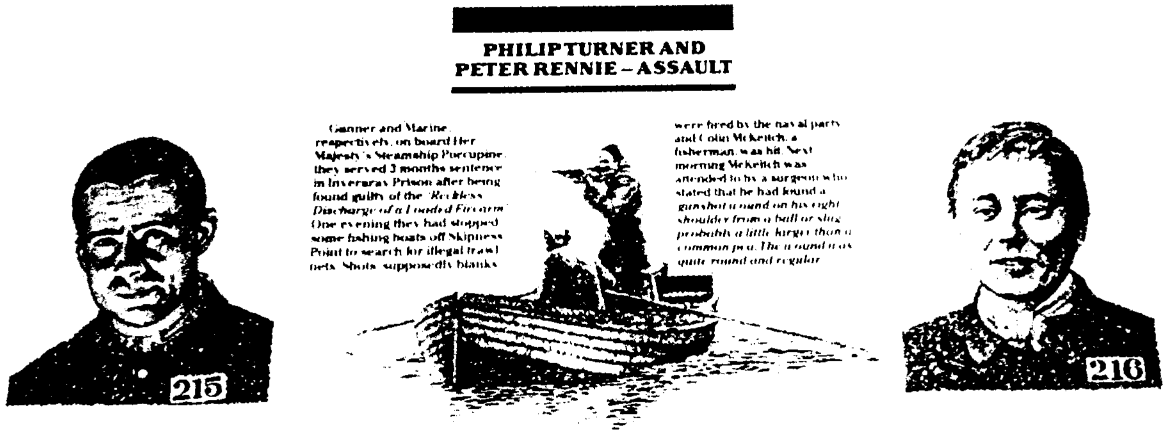

Illustration from a photograph of the poster display in Inveraray Jail

THE EFFECTS OF SCALLOP DREDGING ON MAERL BEDS IN THE FIRTH OF CLYDE

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INTRODUCTION

Work currently under way at the University Marine Biological Station, Millport (UMBSM) was reported to the Porcupine Society at their meeting on Marine Biotopes 2-6th March 1995. The current initiative ties-in with research at fisheries institutions throughout Europe to address international demand for a greater understanding of the effects of demersal fishing gear on benthic ecosystems. The present programme focuses on scallop dredging since Clyde maerl beds provide productive fishing grounds for the scallop *Pecten maximus* L. Impacts of scallop dredging on other sediment types include damage to target species (caught and uncaught) and increased mortalities of epi- and infaunal organisms (Medcof & Caddy, 1971; Caddy, 1973; Gruffydd, 1972; Chapman et al., 1977; Bullimore, 1985; Eleftheriou & Robertson, 1992; Devon Wildlife Trust, 1993). Scallop dredges have a great potential to cause long-term damage to maerl and its associated benthos, due to the brittle nature and extremely slow growth rates of maerl-forming plants (Hall-Spencer, 1994). These considerations have prompted the current urgent investigation to document the effects of scallop dredging on poorly studied and fragile maerl habitats.

The term `maerl' is applied here to living and dead unattached nongeniculate Corallinaceae (Rhodophyta) that have an algal core (see Irvine & Chamberlain, 1994). Maerl beds are of particular international conservation interest as they provide isolated habitats of high benthic biodiversity and biomass supporting many rare, unusual or endemic species (Southward, 1957; Cabioch, 1970; Keegan, 1974; Blunden et al., 1977; Maggs, 1983; Maggs & Guiry, 1982; 1987; 1989; Nunn, 1992; Howson et al., 1994). Large maerl thalli are amongst the oldest marine plants in Europe (Hall-Spencer, 1994) and contribute to deposits that take hundreds, perhaps thousands, of years to accumulate (Adey & McKibbin, 1970; Farrow, 1983; Augris & Berthou, 1990; Potin et al., 1990; Hall-Spencer, 1994). For this reason, management of the exploitation of maerl-forming *Lithothamnion corallioides* (P. & H. Crouan) P. & H. Crouan and *Phymatolithon calcareum* (Pallas) Adey & McKibbin is obligatory under the EC Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (1992). Significantly, these are the only seaweeds that have special legal protection in Britain.

METHODS

Five maerl beds were surveyed in the upper parts of the Firth of Clyde. Each deposit was initially located by van Veen grab sampling on transects over regions in which maerl was reported to occur. When maerl was located, its extent and bathymetry were surveyed by a combination of grab sampling and the research vessel's navigational system (Racal Decca Mk 53 Navigator & CVP Plotter, Skipper C5119 echo sounder). A remotely operated vehicle (Sprint, Perry Tritech Ltd) and operator were provided by the Scottish Office Agriculture and Fisheries Department to film transects across deposits in Stravanan Bay (Bute) and Creag Gobhainn (Loch Fyne), taking still photographs of points of interest (e.g. substratum topography, seaweeds and epifauna).

Detailed information concerning the biota associated with each maerl site was obtained from grab sampling and at least monthly observations using SCUBA divers equipped with a writing slate, tape measure, 1m2 quadrat, a tub (for specimen collection) and a weighted buoy for site marking. Still photographs of the sea bed and benthos were taken with Nikonos V cameras fitted with either close-up or wide angle attachments.

The scallop dredges under investigation (Fig. 1) are now standard in Scotland (manufactured by John Reid & Son of Tarbet and Islay). The mouth of each dredge is narrow (77cm) to enable the dredges to stay close to the bottom on rough ground. The dredge mouths are maintained perpendicular to the sea bed by a bar, towed on warps to the boat. The tow bar is held off the sea bed by a rubber bobbin at each end, designed to avoid snagging obstacles on the sea bed. Dredge teeth are 10cm long, 0.8cm wide and mounted 8cm apart (9 per dredge) to avoid small scallops being lifted into the dredges (Baird & Gibson, 1956; Drinkwater, 1974). In the past, scallop dredge teeth were fixed in position for use on smooth sediments (Elmhirst, 1945; Mason, 1972; Strange, 1981). Modern dredges, however, have teeth mounted on spring loaded pawls which reduce damage to the gear on rougher grounds (Chapman et al., 1977). A 92cm long mat made of linked 7cm diameter steel rings extends behind each tooth bar to withstand abrasion. This chain mail forms a robust belly to a bag that is completed on its upper side by coarse plastic netting to retain the catch. The dredges each weigh around 85kg, when the bridle and tow bars are included. A boat pulling twelve dredges drags approximately a tonne of steel across the sea bed.

British scallopers generally shoot dredges in gangs of three to nine on either side of the vessel from booms positioned amidships. In an attempt to prevent unnecessary damage, and to maximize manoeuvrability, a single set of three dredges was used and towed over the stern. For this reason, the effects reported here are less than would be expected from commercial dredging operations. The dredges were launched over the stern and towed at full speed until sufficient warp was paid out. Once in contact with the sea bed, the vessel was slowed to 1-2 knots to prevent the dredges leaping off the bottom and so fishing inefficiently. Precision dredging of experimental plots involved the use of two marker buoys set 10m apart (a little more than the beam of the boat) at right angles to the desired path of the dredges.

Some information concerning the impact of scallop dredges on maerl habitats was obtained from the examination of catches obtained during experimental dredge runs. Pre- and post-disturbance video film was taken by divers to provide a permanent record for future reference and useful footage of the action of scallop dredges was obtained on maerl beds. A 6.0mm lens colour underwater television camera (Osprey Electronics model 1362) was mounted, in conjunction with a compact underwater lamp (Osprey Electronics model 1132), on a purpose-built adjustable bracket. This bracket was armoured to protect the camera, cable and lights in the event of collision with boulders. It could be bolted in a number of positions on the tow bar and swivelled to view the gear from various angles. A surface control unit (Osprey Electronics model 1236) provided both power and focus control for the camera and lighting units, and was operated on board RV *Aora*. On shooting the dredges, images were viewed on a monitor and recorded on videotape (VHS; Ferguson Ltd, U.K.) with a time/date overlay provided by a video timer (VTG-88, FOR-A Company Ltd, Japan).

Granulometric shifts in sediment structure, live maerl burial and reductions in the amount of interstitial space available between maerl fragments were quantified using coring techniques before and after single and repeat dredging of marked experimental plots. A technique for casting sediment burrows (Atkinson & Chapman, 1984) was adapted; fibreglass resin (Scott Bader 2406 PA polyester resin with 10% by volume styrene thinner and 1% by volume liquid peroxide catalyst) was poured into the cores on the seabed, left to set *in situ* and retrieved the next day.

PRELIMINARY FINDINGS

The quantitative results of our investigations await statistical analysis and graphical presentation but initial results are given here. Abundances of the organisms associated with local maerl beds (>300 spp.) are available from the author on request.

One key finding was that there were few maerl grounds in the upper Firth of Clyde and that these were isolated and inextensive, and therefore vulnerable. Each ground proved to be a focus of high infaunal diversity and biomass consisting primarily of the maerl- forming *Phymatolithon calcareum* and differing in characteristics such as hydrographic regime, surface topography, size and depth of deposit, percentage of live maerl, etc. Some of the maerl beds are subject to periodic storm disturbance (Fig. 2).

The immediate effects of scallop dredges on maerl grounds were well illustrated by video footage taken from a variety of angles. As the dredges were towed forwards, a bow wave of fine particulates were suspended ahead of the gear. The bobbins usually rolled along the surface but ploughed into the sediment by up to 4cm when the tow bar was skewed on impact with large boulders, leaving trenches of crushed maerl. Cobbles, and boulders up to *ca* 1m3, were dislodged and overturned when hit by the tow bar or the dredge mouths. The dredge teeth projected fully into the maerl deposits (10cm) and moved with a stabbing motion, harrowing the seabed. Maerl was flicked over the dredge mouths as the dredge teeth jerked on spring-loaded pawls creating a billowing cloud of suspended sediment in the wake of the gear. Large macroalgae (e.g. *Laminaria saccharina*) were torn up as the dredge dragged through the sediment and large animals (e.g. *Echinus esculentus, Echinocardium pennatifidum, Spatangus purpureus, Luidia ciliaris, Ophiocomina nigra, Thyonidium drummondi, Neopentadactyla mixta, Mya truncata, Ensis arcuatus, Laevicardium crassum, Limaria hians, Pecten maximus, Buccinum undatum, Cerianthus lloydii, Chaetopterus variopedatus,* Myxicola infundibulum, *Eupolymnia nebulosa, Ascidiella aspersa* and *Ascidia mentula)* were either mangled as they were caught between the teeth of the dredge and entrained on the ottom or flicked into the chain mail bags which bounced along the sea bed behind the dredges. Even highly motile elements of the fauna were caught (e.g. butterfish, plaice, *Liocarcinus depurator* and *Pagurus bernhardus*). Dredge efficiency was put at 88% on maerl substrata, calculated by comparing the numbers of marketable size scallops caught with the numbers passed over by the dredges. Previous studies on other sediment types put catch efficiency values for spring loaded scallop dredges between 14-27% (Gruffydd, 1972; Chapman et al., 1977). The discrepancy is thought partly to be due to the fact that tooth penetration is deeper on maerl, i.e. 10cm compared with the 3cm recorded by Chapman et al. (1977) on other sediments, and partly because there was little lifting and leaping of the dredges since boulders were uncommon on the maerl grounds studied.

Scallop dredging has major repercussions for the structure of maerl habitats and their associated biota. Initial results have shown that fine sediments are eroded and maerl fragments are crushed and killed through burial, compromising habitat integrity and recovery. Nor are the gross effects of dredging confined to the immediate dredge path, for fine sediments are deposited over adjacent areas blanketing photosynthetic organisms and stressing filter-feeders through increased sediment loads. Significant effects on sea bed microtopography were clearly visible 8 months after experimental dredging, and the number and diversity of sessile fauna and flora remained reduced. The finding that damage occurred to most of the large macrofauna and flora living on and in local maerl beds was expected, considering the mechanics of dredge action. Of additional concern, from a conservation viewpoint, are the implications of selective damage to the biota which may lead to long-term shifts in the structure of maerl assemblages from K-selected species towards opportunistic species (e.g. scavengers and short-lived, R-selected species) and an overall lowering of biodiversity. We believe that society's use of the sea must be carried out in a way that avoids permanent damage to its plant and animal communities. If not, the marine environment and the industries it supports will be further degraded. Conservation of selected maerl grounds may make good economic sense, allowing them to form a nucleus of breeding scallops and enhance recruitment to fishing grounds nearby. In summary, our surveys have shown maerl beds to be important for conservation, being isolated areas of high biodiversity, and have provided evidence of the considerable damage that results from scallop dredging. Recovery of sites dredged in April 1994 is now being monitored.

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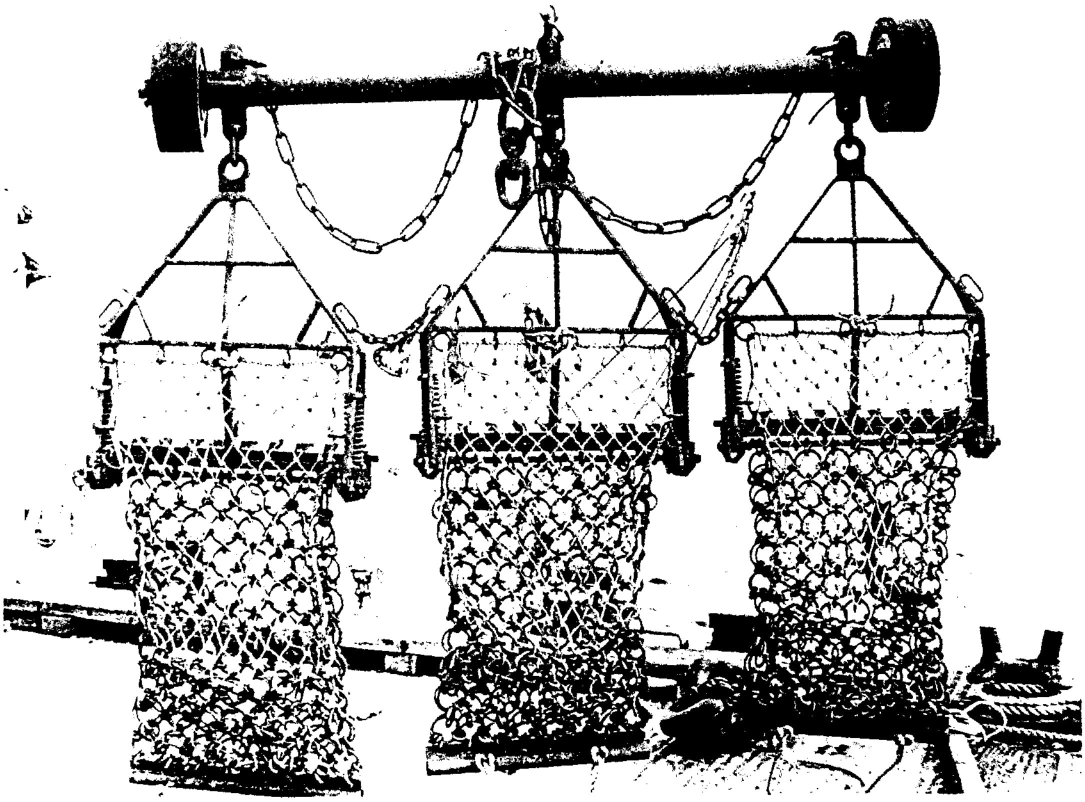

Fig. 1. Commercial scallop dredges typical of those used on the Scottish west coast. See text for details.

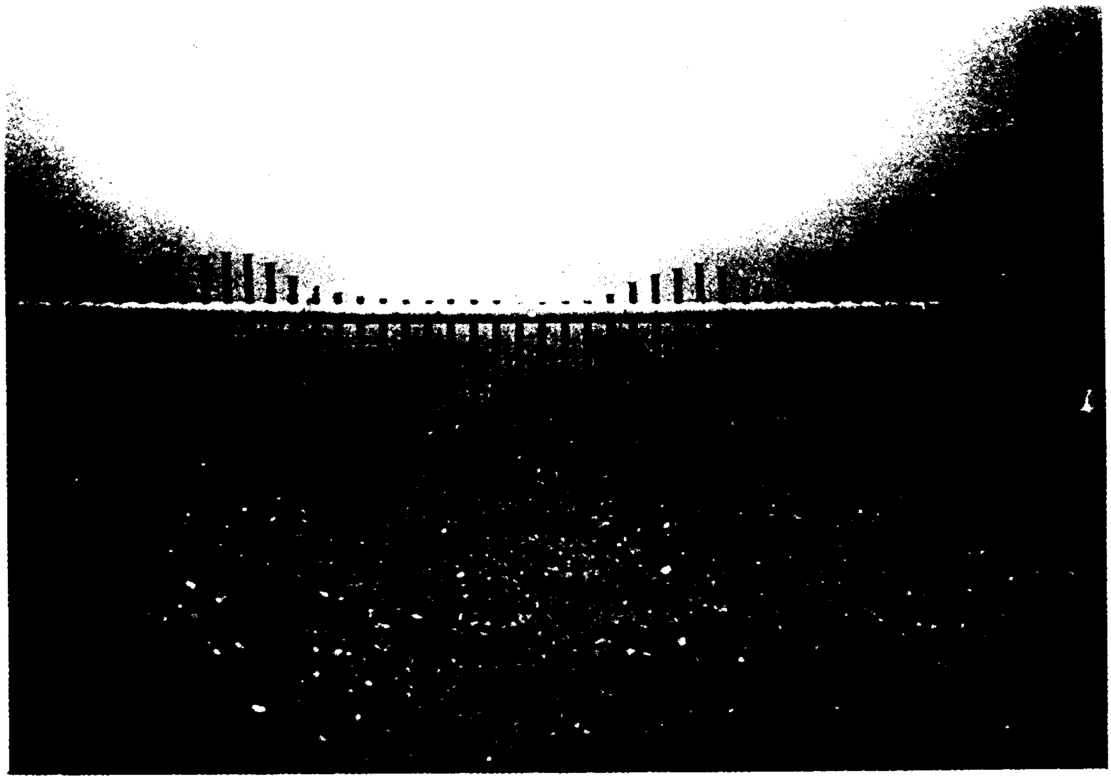

Fig. 2. Storm induced maerl bed disturbance off Bute, Firth of Clyde. Horizontal bar = 2m.

RARITY IN THE MARINE BENTHOS

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In recent years there has been increasing interest in the development of integrated coastal zone management plans for many parts of the Great Britain coastline. Such initiatives need to be based on good information about the wildlife resources and the pressures upon it. The Joint Nature Conservation Committee *Coastal Directories* will provide 16 regional summaries of available information. I am currently working on the presence of 'rare' marine benthic species, concentrating on those in the shore environment, the basis of a chapter in each of the reports.

Rarity assessment is a bit of a can of worms. In a recent book, Gaston (1994) rather aptly quoted Harper (1981): "Discussions will soon be at cross purposes if it is not clearly recognised that what is rare will depend on the scale of our individual experience on the range or narrowness of our special interests." This point is borne out by what sometimes appears to be conflicting opinions about the rarity of certain marine benthic species. In order to provide consistency in the rarity assertions made for various groups of benthic organisms and to provide a national perspective, a study area and criteria for assessment have been developed. This is perhaps the first time that rarity criteria (analogous to those currently used by the British Red Data Books and the International Union for the Conservation of Nature methodologies) have been applied to the marine benthos.

JNCC is currently assessing the rarity of marine benthic species based on the extent of their known distribution in the coastal waters of Great Britain. The criteria are based on the numbers of 10km squares of the Ordnance Survey National Grid (UK) in which the species has been recorded. ('Rare' occur in 7 or fewer and 'Scarce' in 45 or fewer). Data to support rarity assertions based on population size does not exist on a national basis for the vast majority of marine benthic species. Units of the UK Grid have been used because they are the same size throughout Great Britain, whereas boxes defined by units of latitude and longitude vary due to the convergence of longitudinal lines towards the poles (thus making them unhelpful for numerically assessing occurrence). The study area chosen for the present work is bordered by the three mile territorial limit because it is simple, well defined and most of the relevant survey data is within this near shore marine area. It is also important to achieve comparable rarity assessments across phyla. I see biogeographical mapping as a separate issue.

I am currently searching for records of rare marine benthic species in the literature as well as consulting with an increasingly wide range of taxonomic and biogeographic experts in order to draw sensible conclusions from the results. Of course, marine benthic species are not inherently nationalisitic and many that are rare or scarce in British waters are at the margins of a wider distribution. For this reason rarity in a national context will always need to be further qualified when considering the conservation importance of a species. Similarly, aspects of the life history and population structure of rarely occurring species may need to be considered when assessing conservation importance.

With the assistance of various experts, I now have about 300 species which may qualify as nationally 'rare' or 'scarce'. The aim is eventually to search for records of these in all survey reports and papers I can find. I am, however, continually looking to increase consultation in order to incorporate other worthy conspicuous candidate species. We will shortly be producing a JNCC report on our methodology and criteria for rarity assessment after it has been reviewed. I will be more than happy to dispatch copies of this report to interested parties once it becomes available.

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Gaston, K L, 1994. *Rarity*. London, Chapman & Hall. (Population and Community Biology Series, No 13).

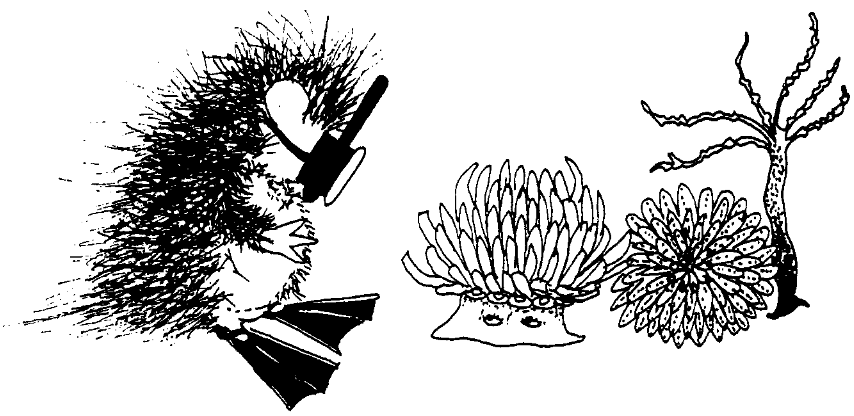
Harper, J L, 1981 , pp 189-203, in Synge, H, Ed. *The meanings of rarity*. In *The biological Aspects of Rare Plant Conservation*. New York, Wiley.

EDITOR'S COMMENT

The assessment of rarity is a very important and extremely complex problem. The greatest difficulty JNCC has in undertaking this task is lack of data. I have been consulted and personally I find it unwise to regard any of the mollusc species on their original list as rare, either because I happen to have more data, or because my experience and methods of collecting data, which are much more painstaking than those available to most workers, suggest to me that seldom-recorded marine benthic species of Mollusca are actually quite common in the appropriate habitats. Other so-called rare species are either adventitious or lie at the edge of their range. I find it difficult to separate biogeographical mapping or recording, which is extremely basic, from rarity assessment, one of the many uses to which such mapping can be put.

Ultimately, sooner I hope rather than later, the narrow geographical area within which JNCC is at present working will be enlarged, particularly to encompass greater depths of waters and the bulk of seas which lie beyond the littoral fringe. To this end, while I appreciate their reasons for at present using the National Grid, most people consider this to be unworkable in the wider marine area. The premise that rectanges of latitude and longitude, being or variable size, are not suitable may be valid for common, particularly inshore, species, but are they unsuitable for the assessment of 'rare' and 'scarce' species, according to JNCC's own definitions of these? One must also be prepared to look outwith British limits. At the moment a much wider organisation CLEMAM (Checklist of European Marine Molluscs), is considering delimiting biogeographic areas for the Northeast Atlantic. The Conchological Society of Great Britain and Ireland is also revising its methods of recording of species according to Sea Areas, using the ICES system. It would be desirable if all interested bodies could, eventually, use a single basis.

I invite Porcupine members to comment further on these two issues: rarity and how best to record it, both through the Porcupine Newsletter and direct to Bill Sanderson.



COMMENSAL POLYNOIDAE (POLYCHAETA) FROM PLYMOUTH

By S J CHAMBERS
National Museums of Scotland, Edinburgh EH1 IJF

The Polynoidae are a family of scaleworms which include some common intertidal species such as *Harmothoe imbricata* (Linnaeus, 1767) and *Alentia gelatinosa* (Sars, 1835). Another species *H. lunulata* (delle Chiaje, 1830) is also commonly recorded off shore in grab samples all around the British Isles. *H. lunulata* originally described from the Mediterranean is now known to be a complex of species. There is no type specimen of *H. lunulata* and the original description and figure are poor. Consequently several different species have been confused under this name so all records need to be checked. Many of the recent records have been re-identified as *H. marphysae*, *H. andreapolis* and *H. furcosetosa* (Tebble and Chambers 1982).

The genus *Harmothoe* Kinberg, 1855 has recently been sub-divided into *Harmothoe* s.str. and *Malmgrenia* McIntosh, 1874 (Chambers and Muir, in prep). *Harmothoe* species generally have ornate elytra and lateral antennae with ventral insertion whereas *Malmgrenia* includes those species with relatively smooth elytra and lateral antennae with lateral insertion.

In the introduction to the Plymouth Marine Fauna (1957), Spooner recorded several species of scaleworms including *H. lunulata* (delle Chiaje,1830) and 3 of its varieties that live in the tubes or burrows of other marine invertebrates. I have recently examined Spooner's collection and noted several associations. eg. *M. furcosetosa* is always found with *Amphitrite edwardsi* and H. glabra with *Chaetopterus*. Pettibone (1993) also published useful information on this group.

Spooner's collection which is in beautiful condition was made about 40 years ago by digging on the shore at low tide and preserving the host and commensal polynoid together.

If anyone knows of a similar collection of polynoids from the N.E. Atlantic please contact me as I would be very keen to examine the material. I would also be willing to look at specimen records of *H. lunulata*.

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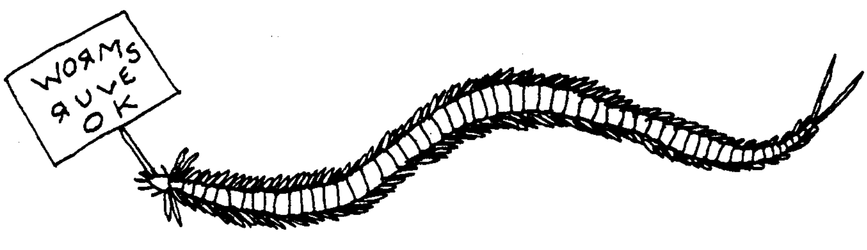
Chambers, S J and Muir, A I. Polychaetes: British Chrysopetaloidea, Pisionoidea and Aphroditoidea. *Synopses of the British Fauna* (New Series). (In prep).

Marine biological Association, 1975. *Plymouth Marine Fauna*. Plymouth.

Tebble, N and Chambers, S J, 1982. Polychaetes from Scottish Waters. Part 1. Family Polynoidae. Royal Scottish Museum Studies.

Pettibone, M H, 1993. Scaled Polychaetes (Polynoidae) associated with Ophiuroids and other invertebrates and review of species referred to *Malmgrenia* McIntosh and replaced by Malmgreniella Hartman, with descriptions of new taxa. *Smithsonian Contributions to Zoology*. 538



Availability of Long Term Plankton Data.

From a station five miles east of the port of Blyth, Northumberland, in a position approximately 55° 07'N 1°21'W Frank Evans, formerly of the Dove Marine Laboratory, holds a series of net zooplankton samples extending from the years 1969 to 1988 (Evans & Edwards, 1993). The samples were taken monthly when the weather allowed. The average number of months when samples were taken in each year exceeds eleven and was never less than ten. This data has been analysed under the taxa listed below; additionally some of the species of copepods have been sexed and juvenile stages separately listed.

Evans would be pleased to enter into correspondence with research workers who may have an interest in seeing the resulting data and who would wish to use it to further plankton or other studies. His address is: 15 Thirlmere Avenue, North Shields NE30 3UQ.

Evans, F & A. J. Edwards (1993) Changes in the zooplankton off the coast of Northumberland between 1969 and 1988, with notes on changes in the phytoplankton and benthos. *J. Exp. Mar. Biol. Ecol. 172. 11-29.*

Crustacea

Euphausiacea

Meganyctiphanes norvegica
Nyctiphanes couchi
Thysanoessa inermis
Thysanoessa raschi

Mysidacea

Schistomysis ornata

Amphipoda

Themisto compressa
Hyperoche medusarum

Copepoda

Calanus finmarchicus
Calanus helgolandicus
Pseudocalanus elongatus
Paracalanus parvus
Microcalanus pusillus
Temora longicornis
Acartia clausi
Acartia longiremis
Microsetella norvegica
Metridia lucens
Centropages hamatus
Centropages typicus
Oithona similis
Oithona plumifera
Corycaeus anglicus
Rhincalanus nasutus
Candacia armata
Anomalocera patersoni
Caligus spp.

Cladocera

Evadne nordmanni
Podon spp.

Urochordata

Oikopleura spp.
Fritillaria borealis
Salpa spp.

Chaetognatha

Sagitta elegans

Polychaeta

Tomopteris helgolandica
Autolytus spp.

Coelenterata

Ctenophore spp.
Aglantha digitale
Obelia spp.
Eutonina indicans
Euphysa aurata
Nanomia cara
Steenstrupia nutans
Bougainvillia spp.
Phialidium hemisphaericum
Solmaris corona
Sarsia spp.
Staurophora mertensi
Leuckartiara octona
Eutima gracilis
Aurelia aurita
Cyanea spp.
Cosmetira pilosella
Melicertum octocostatum

(Larvae)

Fish eggs
Fish larvae
Ascidian larvae
Tornaria larvae
Decapod larvae
Nephrops norvegica larvae
Anomuran larvae
Pisidia longicornis larvae
Caridian larvae
Brachyuran larvae
Euphausiid late larvae
Euphausiid nauplii
Cirriped nauplii
Cirriped cyprids
Bivalve larvae
Gastropod larvae
Clione limacina larvae
Phoronid larvae
Polychaete larvae
Bryozoan larvae
Ophioplutei
Echinoplutei
Metamorphosed aster/ophiuroids
Metamorphosed echinoids
Bipinnaria larvae

ROMAN POTTERY FROM PORCUPINE BANK

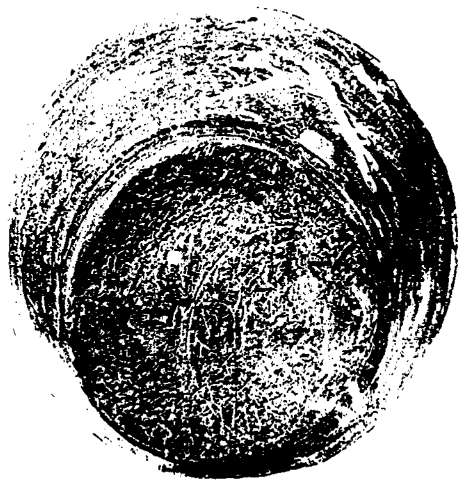
This item has reached PORCUPINE by a circuitous route and is an extract from O' Riordain, S P., (1947). Roman material In Ireland. *Proceedings of the Royal Irish Academy* **51C:** 35-82.

The vessel was dredged up in 1934 by the trawler *Muroto* while fishing on Porcupine Bank, 150 miles [240km] off the west coast of Ireland and in some 300m of water. The vessel is an *OLLA* or storage jar, of fairly thin, soft dark grey ware with traces of a darker coating. Only the base and lower part of the body remain. The smoothed edge of the fracture suggests that the damage may have been done anciently, except on one side where the break is fresh. The present dimensions of the pot are; height as preserved (to just below the shoulder 190mm: maximum diameter of body 203mm; diameter of base 124mm. The shape of the vessel, the quality of the ware and the rather careless workmanship are consistent with a Romano-British origin. It is difficult to fix a date, but from its general character it is not likely to be later than the 2nd century A.D.

The walls of the vessel as recovered are encrusted inside and out with marine deposits, as though it had lain on its side partly buried in the sea floor. The description of these by Colin Matheson, then Keeper of Zoology in the National Museum of Wales, reports that interior of the vessel on one side bears an incrustation of a polyzoan, also tubes of *Serpula vermicularis*, these occur on the outside of the vessel also, as do a number of what might be much abraided shells of a *Calyptraea*.

The external base of the Olla carries a lightly-incised *graffito;* two lines of lettering with an animal drawing below (possibly a bear), The lettering has been interpreted as: C PISCI/FAGI (? the property of Gaius Piscius Fagus).

The Olla was presented to the National Museum of Wales (Accession No 35.8).



BOOK REVIEW

***A FIELD GUIDE TO THE NUDIBRANCHS OF THE BRITISH ISLES.* 1994. B E Picton and C C Morrow. Immel Publishing Ltd. pp 143. £15.95 pbk.**

In 1979 the then Underwater Conservation Society (now the Marine Conservation Society) published a photographic guide to the Nudibranchs of the British Isles, authored by Greg Brown and Bernard Picton. A brief text was accompanied by excellent photographs of most of the species. This new guide replaces this work, and updates and substantially enhances the text.

The book is a paperback, 150 x 230mm. At this size and not being waterproof, it is for careful use in the laboratory, not for field work and *in situ* identification. The Introduction includes sections on Food & Feeding; Reproduction: Finding Nudibranchs; Recording; Conservation & Collecting; Anatomy. There are useful and interesting glossaries of technical terms and Latin names. The Introduction aims to be as untechnical as possible, but the reader faces a long list of Latin names of the food species of nudibranchs, many of which may be very unfamiliar. A table of types of rhinophores (sensory tentacles of nudibranchs) is excellent for use in identification, but there are no labelled diagrams of the four main nudibranch types. However, anatomy is by description only, which is difficult for the uninitiated. The drawings on p7 are cursory. More detailed drawings of the four main nudibranch types,labelled with the principal features used for identification, would have been an improvement.

The practical part of the book is mainly orientated towards divers rather than shore workers or others. Considerable detail is given on the finding, collecting and recording of nudibranchs by diving, but no detailed discussion of how to find or collect nudibranchs on the shore. However, it is possible to use this advice for the shore environment.

The main part of the book consists of the photographs and description of each species. Nomenclature generally follows the *Checklist of British Marine Mollusca* (Smith, S M & Heppell, D, 1991. *National Museums of Scotland Informations Series. No 11*). Of the approximately 110 described species, 100 are illustrated by a photograph, five by a painting or drawing. Photographs of undescribed or indeterminate species are also included. Most of the photographs are of a very high standard and the quality of reproduction is superb, making it easy to indentify specimens. The genus *Doto*, not well served in the past, is particularly clearly depicted. It would have been even better if good photographs or drawings of the hydroid prey species had been included! Each photograph of a species is accompanied by a half page of text describing the animal, its food, habitat and distribution. No keys are given, but each description ends with a note of 2-3 useful and practical key characteristics. Finally, at the end of the guide, there are suggestions for further reading and an Index.

A few errors and omissions have crept in, mainly regarding the distribution, which, one hopes will soon become further outdated. The conservation status of *Tenellia adspersa* should perhaps have been mentioned as it is in the Red Data book and therefore legally protected from collection. The photograph of *Aeolidiella alderi* is not from the Isle of Wight, but from the Fleet, Portland Harbour, Dorset. It is surprising that there are no Acknowledgements, since many people (members of the Marine Conservation Society, employing institutions such as English Nature, Ulster Museum etc.) have provided diving support, records, opportunities and facilities to the authors.

Overall, however, this is a superb guide, a 'must-have' for anyone interested in Mollusca, and indeed for anyone interested in the British marine fauna. It is both attractive and accessible to those who know little about nudibranchs, and full of information for the expert.

Julia Nunn, Ulster Museum, Belfast

FUTURE MEETINGS

AUTUMN 1995: ***"Marine surveying, from exploration to data processing"*** 7th & 8th October [provisional] at the Nation Museum of Wales, Cardiff, Full details will be published in the next issue of PN but any advance information may be obtained from Ian Killeen.

SPRING 1996: Venue and date to be decided. **Any offers??**

AUTUMN 1996: ***"Sediment/animal interactions in the marine environment".*** 15th & 15th September, Royal Holloway University of London, Egham.

Offers of Contributions - papers, displays, etc. are needed, urgently for Cardiff.