Porcupine Newsletter

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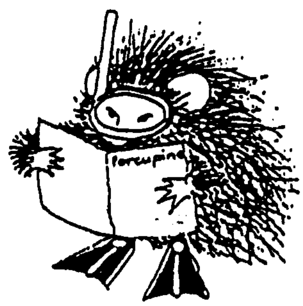

PORCUPINE

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EDITORIAL

We are pleased to include in this issue further reports from the Spring meeting at Lancaster (in response to requests even!!), The account of the summer field trip to the "Trink" (via the Dove Marine Laboratory and M,V, *Bernicia*), and the profuse results from the ensuing sampling will appear in the next issue, Suffice it for now to say that a good time was had by all who attended, despite certain hotels of the Cullercoats area trying to disown us, and imposed sexual segregation of loo facilities on the boat,

The next meeting will be the autumn meeting being held at Guildford on the subject of "Islands", on 28 and 29 October 1989, as explained in more detail in the accompanying announcement sheet, Next year's Spring Meeting and AGM will be on the subject of Marine Recording (as PORCUPINE returns to its roots), venue yet to be finalized, but announcements will appear in good time (organiser - the Hon, Records Coordinator Jon Moore),

Re warm summers - the winter minimum seawater temperature at Southampton was some 4°C warmer than normal this year, the summer has remained hot, yet all we get national-press-wise (!) is drivel about invading tropical killers (see p,137), Has any of the membership noticed any real effects of the milder season (yes, I appreciate that we may have to wait a while for good year classes, etc, to show), Hopefully there are sufficient established long-term projects (vide COST-647) in a position to identify any unusual factors of such a year as this one (if not exactly the much awaited global warming),

Some members have asked about the continuation of C,T, Cannon's "Millport Expedition" article (PN 4; p,43), To date no copy has appeared, apparently something to do with the effects of alcohol poisoning of the brain during the Millport meeting, I shall press the author to try harder (or drink less!),

Finally, in relation to the Autumn 1987 Pembroke meeting on aliens, xenobionts, etc,, the Hon, Ed, has gratefully received two copies of J, Knudsen's article on "Immigration of Marine Invertebrates to the Limfjord (Denmark) and the North Sea - Baltic Transition Area", as presented at the Jerusalem conference in June 1989, The paper is published elsewhere, but Members interested in these copies "For private circulation only" should contact me,

I look forward to articles relating to Members' summer holiday collecting, etc, (! Ever the optimist,), Roger Bamber, Hon,Ed,

THE ECOLOGY OF JUVENILE SOLE IN THE EASTERN IRISH SEA

by S.I. Rogers

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The economic importance of the Dover sole (*Solea solea*) fishery, and the adverse effects of some man-made changes to the environment, have in part stimulated research at this Laboratory into the experimental management of fish stocks. Part of this research requires a more complete understanding of the ecological constraints on natural pre-recruit populations.

Some of the more extensive flatfish nursery areas in the United Kingdom occur in the sheltered inshore regions of the eastern Irish Sea. Within these areas, the distribution of juvenile sole is restricted to coastal sites which are in or near large estuaries, and where the environmental conditions are most suitable for their growth and development. Surveys of one such nursery on the north Wales coast, west of the Dee estuary, have been conducted to identify the pattern of distribution of juveniles.

This work has been carried out from a chartered fishing vessel using a 2 m beam trawl, a standard method of sampling inshore fish. As with comparable surveys elsewhere, poor catch rates (typically <5 fish per 1000 m^2) made quantitative analysis difficult. It was considered that the three light tickler chains, standard fittings on the Directorate of Fisheries Research juvenile flatfish trawl, were insufficient to disturb the sole, a species that is known to bury itself and hence be less vulnerable to capture. To improve catch rates, the plain tickler chains were replaced with linked tickler chains made of heavier, spiked chain. Catches of flatfish improved, typically by a factor of 5, and greater quantities of benthic organisms were found in the cod end. This fishing gear is now the standard at the Conwy Laboratory for this work, and will allow the distribution of juvenile sole to be determined with greater accuracy.

Field research has initially concentrated on identifying those areas of the coast which, while apparently suitable for a sole nursery, do not seem to receive a larval settlement, and do not support a juvenile population. Part of the research of the DFR Conwy Laboratory, concerned with the experimental management of sole stocks, is to investigate the feasibility of extensive ranching of sole. This could be conducted most effectively in a site without a natural population.

During a recent survey, several environmental variables which were most likely to influence juvenile settlement and growth were recorded. These included the density of infaunal prey items, the sediment's organic content, water salinity and depth, and the granulometric characteristics of the substrate. Using multivariate analysis, the more important variables causing between-site and within-site variation were identified. Water salinity, depth and substrate homogeneity were important in distinguishing between sites, although differences were subtle. Within the sole nursery area, patches of consistently high juvenile abundance were best distinguished by the type of sedimentary environment. Median grain sizes in these areas were of fine sand ($2{\cdot}6 \pm 0{\cdot}1\ \phi$ on the Wentworth grade scale) and tended to be well sorted. The substrate in those areas with a lower density of juveniles consisted of more coarse material which was less well sorted. The association of infaunal prey items with particular environments will also influence fish distribution and add to the complexity of the system.

MARINE FOULING ON OFFSHORE STRUCTURES: THE BRITISH GAS EXPERIENCE

by Miss E.A. Lake
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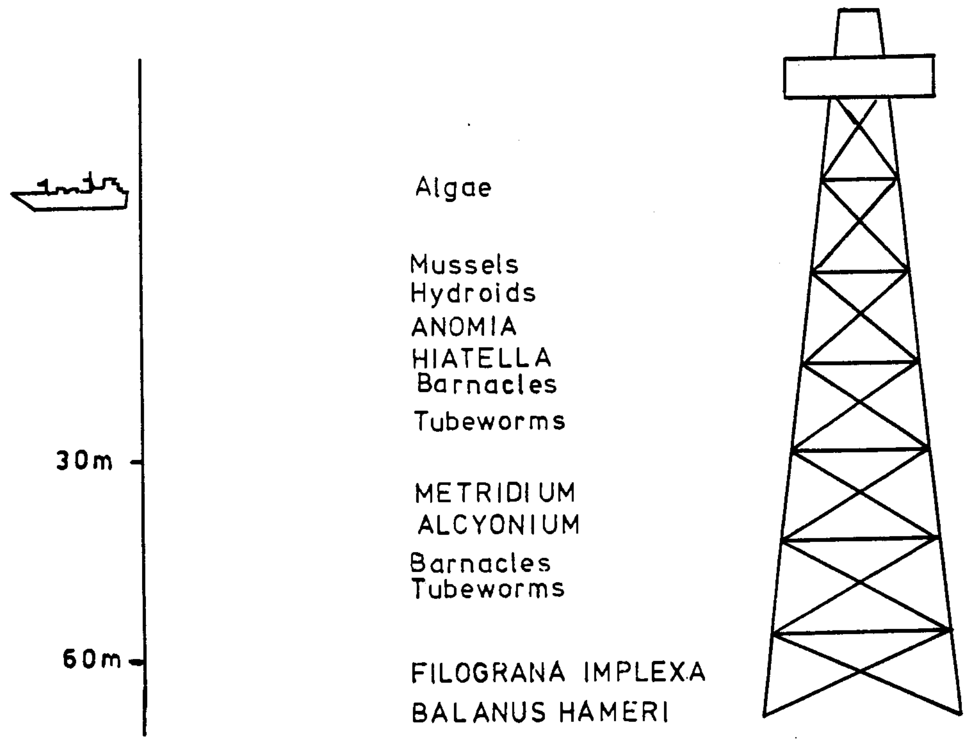
The term "marine fouling" refers to the unwanted build-up of marine organisms, especially mussels, on structures immersed in the sea, for example offshore oil and gas platforms, sea-water intake pipes, ships, etc..

Micro-organisms initiate settlement, and these are followed by macro-foulers, which are divided for convenience into hard and soft forms according to their body type. Hard foulers comprise calcareous-shelled animals such as mussels, barnacles and tube worms. Soft foulers include the soft-bodied animals such as soft corals, anemones, sponges, hydroids, etc., together with algae including *Ulva*, *Enteromorpha* and *Laminaria* to name a few. Associated with the fouling growths are vast numbers of free-living animals, such as starfish, brittle-stars, sea-urchins, nereid worms and scale worms, which prey or scavenge upon the sessile organisms.



There is a zonation of growth downwards on offshore platforms. Algae and barnacles tend to dominate the splash zone. Mussels (or occasionally hydroids) are usually dominant to a depth of 30 metres. Below this is a zone of barnacles and tube worms overgrown by soft coral (e.g. *Alcyonium*) and anemones, which may continue to a depth of 80 metres. Below 80 metres, growth tends to be sparse, and is dominated by the large barnacle *Balanus hameri*, and the tubeworm *Filograna implexa*.

The growth of fouling organisms, especially mussels, on offshore structures can lead to a number of problems, including:

a) increased member diameter, leading to increased wave resistance and therefore fatigue loading,

b) increased structural weight, possibly reducing structural stability,

c) increased surface roughness,

d) difficulty with inspection for structural defects, weld cracks, etc.,

e) the possibility of microbially enhanced corrosion occurring under the growth.

Removal of the growth so that it does not achieve levels which will give rise to one or more of the above problems costs offshore oil and gas operators millions of pounds per year. For example, the subsea area of a small platform is about 5,000 square metres. In a good day a diver can only clean about 5 m^2, and remotely-operated vehicles (ROVs) about 20 m^2. Diving is only possible at slack tide, in fairly calm seas, and with at least half a mile visibility (in case helicopters are needed for an accident). About one fifth of the sub-sea area of a platform is normally cleaned each year, but with diving costs at roughly £1,000 per day, and diving support vessels (DSVs) prices at £10,000 per day, it is easy to see how costs can escalate. In 1985, the cleaning of only one platform in Morecambe Bay took 41 days.

In order to maximise diver use, the normal cleaning time for offshore platforms is between March and September, the "good weather window". Unfortunately, this time coincides almost exactly with the breeding season of the major fouling organism, the mussel. Thus as soon as any fouling growth is removed, a new wave of larvae will be on hand to re-colonise the area.

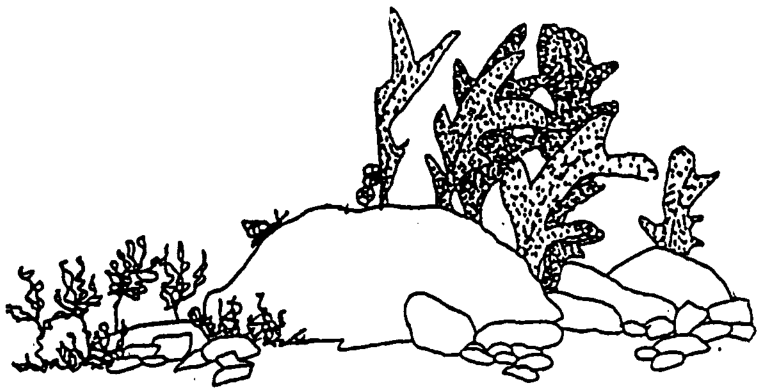
Because the removal of fouling or the use of proprietary antifoulants is so costly, we in the Biological Sciences Group of British Gas, have been trying to find a way to alleviate the problem. For the past seven years we have been examining samples from our offshore platforms in both the Morecambe Bay and Rough Gas Fields, and in the course of our studies it became apparent that there were subtle differences between the fouling population structures on different platforms. Further research indicated that these differences were due to the installation time. If a platform was installed in June, i.e. in the peak of the mussel larval season, then the dominant fouling organisms were mussels. Installation slightly later in the year, in July or August, resulted in a mixed mussel/hydroid population. We therefore sugested that if platforms were to be cleaned after the mussel fouling season, i.e. in late October or November, then organisms other than mussels, e.g. hydroids, which breed slightly later in the year, might colonise and at least prevent mussels settling for one year. A late cleaning experiment was carried out on one of our Rough platforms in November 1987, and the initial results are encouraging.

However, an anomaly on a Morecambe Bay platform (which was installed during the month of October) has even more interesting possibilities. On this platform, to the depth to which mussels are normally found, there is indeed a heavy fouling population, but of the amphipod *Jassa falcata*. The *Jassa* live in loose nests constructed from mud and sand. Obviously, although they obscure the underlying surface, the *Jassa* are no problem to remove - they can just be brushed away.

The natural phenomenon of the *Jassa* colonisation leads to an obvious extension of the theory of cleaning late in the year in order to encourage organisms other than mussels to settle. Whereas we had originally only considered the possibility of hydroid colonisation, the potential for colonisation by *Jassa*, hence giving a long term form of control over mussels, is enormous. A small experimental transfer of *Jassa* from one platform to another has been carried out, and was successful. The aim now is to try and breed *Jassa* with a view to introducing them to our offshore platforms as an environmentally safe antifoulant.

ACKNOWLEDGEMENT

The author wishes to thank British Gas plc for permission to publish this article, which is based on a talk given to Porcupine on 1st April 1989.



CULTIVATING KELPS OFF THE ISLE OF MAN

by Joanna M. Kain (Jones), T.J. Holt & C.P. Dawes

Port Erin Marine Laboratory, Isle of Man

Laminaria has been cultivated on a large scale in China for decades (Tseng, 1981), but different techniques of cultivation had to be found for use in Britain, partly because the endemic species are different (and it would be wrong to import exotic species) and also because of the different environmental conditions. An advantage at the start of the work was that a considerable amount was known about the European species (reviewed by Kain, 1979).

Why cultivate seaweeds when there are plenty growing on our coasts? There are several reasons: a crop should be a pure stand of the required species, the plants are of the same age and chemical constitution, the crop may be improved by genetic selection, and harvesting is much easier. The two main industries which can benefit from these attributes are phycocolloid and human food. Alginates vary in quality both with algal species and the age of the plant: both can be controlled by cultivation. Seaweeds are extensively eaten by Asians, and such consumption is increasing in Europe: clearly, high quality material is needed for the food market.

The basic life history of the Laminariales (kelps) is well known, and is shown diagrammatically in Fig.1. The large sporophyte produces around 50 million spores per cm^2 of blade (Kain, 1975). The development of the spore into a gametophyte can take one of two routes. Under certain laboratory (apparently "good") conditions they become mature in one to two weeks, but each female produces only one egg. Under less favourable conditions they are prevented from becoming fertile, and instead grow vegetatively as filaments; when these eventually become fertile, their fecundity is much higher, and each female can produce as many eggs as there are cells.

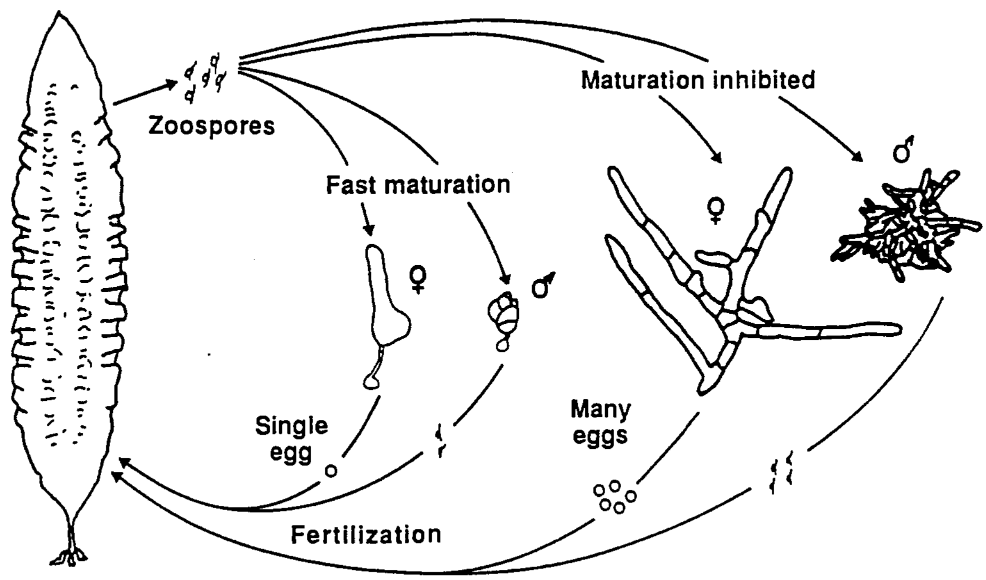


FIGURE 1. DIAGRAMMATIC LIFE HISTORY OF LAMINARIA

Thus the Laminariales is a group of plants producing prodigious numbers of spores, and although a gametophyte phase is obligatory this can be easily manipulated: fertilization and progression to the sporophyte phase is easily achieved. This is fortunate for cultivators because, in these plants, unlike the red algae, regeneration and vegetative reproduction are poor.

Cultivation work on Laminariales off the coast of the Isle of Man in the Irish Sea started in 1980 (Jones & Holt, 1981). At that time three species were used: *Laminaria saccharina*, *Alaria esculenta* and *Saccorhiza polyschides*. The last species has since been dropped.

It seemed that the most suitable substratum for the attachment of the plants was rope, but it was assumed that this would be too clumsy to be seeded directly. The gametophytes were therefore grown on string. Various types were tried: some natural fibres were found to be toxic; the best was polypropylene fibre film. This was wound around small frames which were immersed in seawater (Holt, 1984; Jones & Holt, 1985).

A spore suspension was produced from fertile plants from the sea, and was poured over the frames and the spores allowed to settle. The frames of string were then held in small tanks of enriched seawater at controlled temperature in the laboratory. Contaminants were discouraged by three means:

a. The seawater was fine-filtered.

b. Germanium dioxide (a diatom poison) was included in the medium for the first week.

c. Green light was used at a relatively low level, reducing the growth of unicellular green algae.

After some time the string was transferred to ropes in the sea. The first method used was to wind the string around the rope, but water movement converted the neat helix to one big loop with

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FIGURE 2. THE EFFECT OF INTERVAL BETWEEN SEEDING STRINGS UPON THE NUMBER OF PLANTS AND BIOMASS OF ALARIA ESCULENTA ARISING ON A HORIZONTAL ROPE.

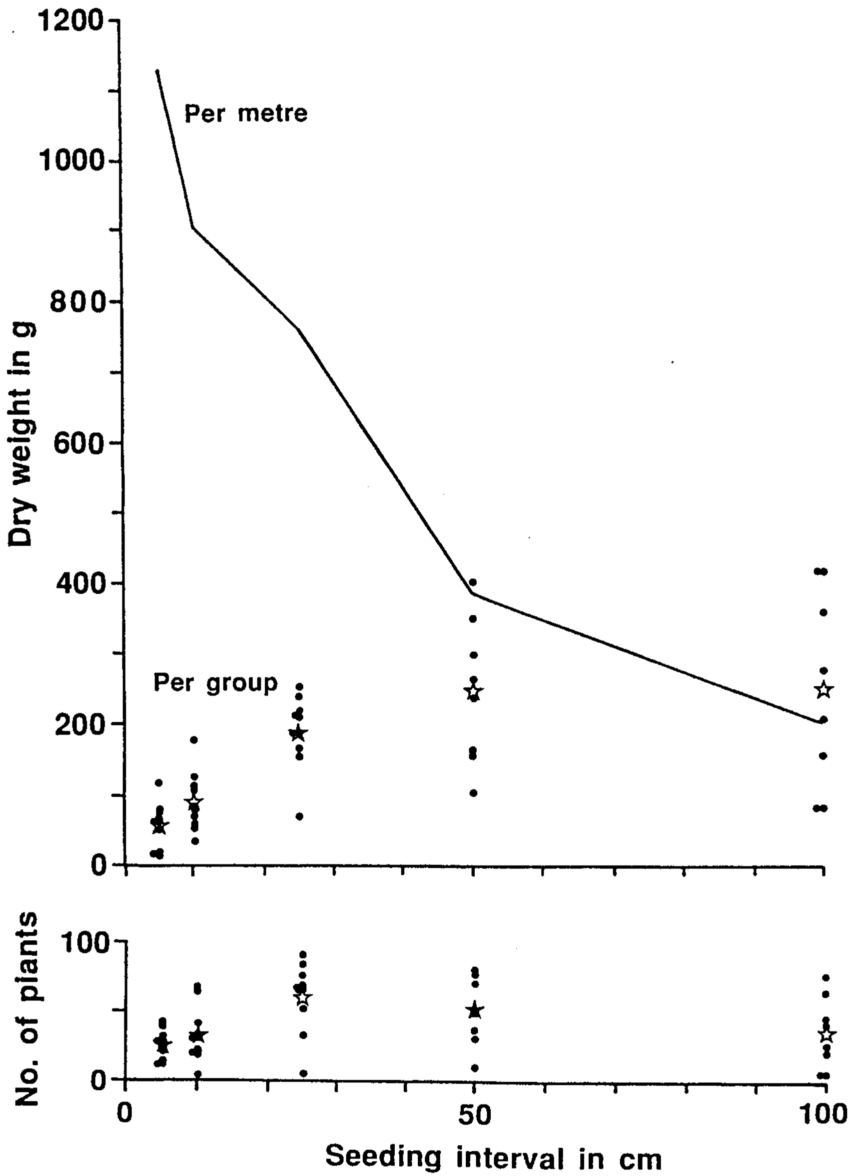
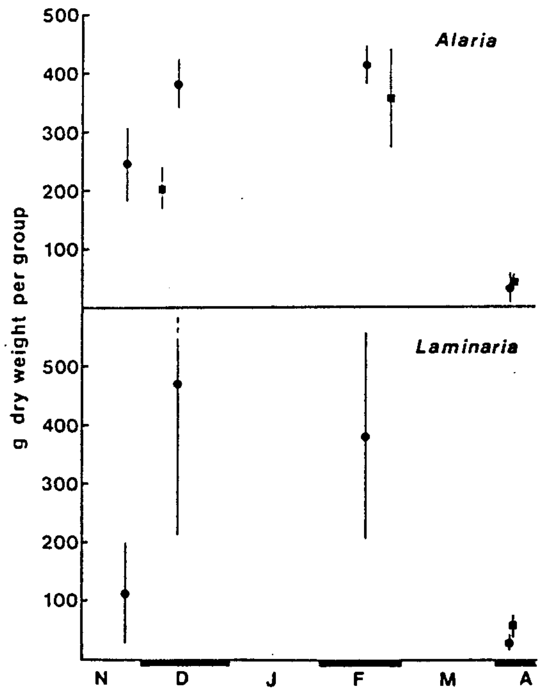


FIGURE 3. BIOMASS ARISING FROM SEEDING STRINGS OUTPLANTED AT DIFFERENT TIMES OF YEAR ON ROPES 2m BELOW SEA SURFACE. ● harvested in 1983; ■ harvested in 1984. (Bars are 95% confidence limits. From Kain & Dawes (1987), courtesy of Dr W. Junk Publishers.



all the turns at the ends. The method was therefore revised, and the string was cut into short lengths, each of which was passed through the lay of the rope. This was successful, though many of the plants grew only on the loose ends of the string and failed to attach to the rope.

The rope structures each consisted of a horizontal rope held in place by an anchored vertical rope at each end and at a given depth by a series of buoys and weights. Because of the tidal range (up to 6 m), the vertical ropes allowed considerable looping of the system at low water.

Various experiments were made on suitable cultivation techniques. The distance apart of the strings had a marked effect on *Alaria* (Fig.2). There was no difference between the sizes of groups of plants growing from strings placed one metre or half a metre apart. There was therefore no direct shading or other interference between these groups of plants. At intervals of less than a quarter of a metre, however, there was a significant reduction in biomass per group. At 5 cm intervals the biomass was less than a quarter of unimpeded groups. Despite this, the biomass per metre of rope rose dramatically as the seeding interval decreased. With this species, an interval of 25 cm was chosen as being economical of labour.

The time of year that seeding took place was found to be important (Fig.3). With *Alaria*, November was probably too early, while December and February produced similar biomasses, with numbers higher for February. April seeding produced a reasonable number of plants, but their biomass was relatively low. This was a consistent result over several years, and was due mainly to smothering by diatoms which flourished at this time of year.

Most kelp farmers seed string: gametophytes are attached to string while they are cultured. This is labour intensive; it is necessary for the string to be applied to rope by hand. It also carries some risk: the delicate young plants have to be exposed to the air which may be considerably colder or warmer than the sea; there may also be a danger of dessication. However, rope is too clumsy to seed directly. A compromise was therefore sought, and the possibility of seeding intermediate sized cord capable of bearing the weight of the algae and attached to a rope framework was investigated (Dawes, 1987; Kain & Dawes, 1987).

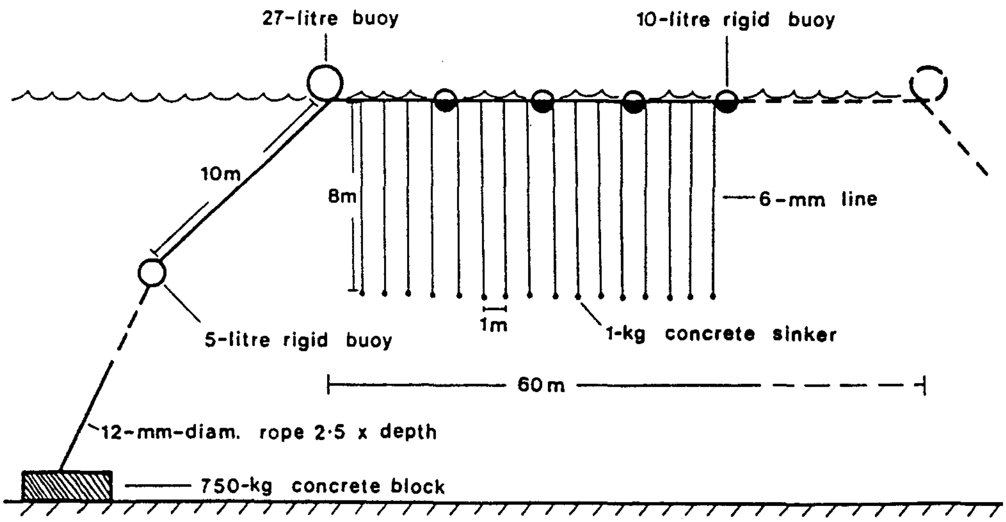


FIGURE 4. SUCCESSFUL ROPE SYSTEM USED FOR DEPLOYING DIRECTLY SEEDED CORDS (6 mm LINES) (from Kain & Dawes, 1987, courtesy of Dr W.Junk Publishers).

Polyethylene line of 6 mm diameter was wound around ½ m square wooden frames and placed horizontally in seawater tanks. The spore suspension was poured in twice, turning the frames over between each pouring. After the spores had settled, the frames were held vertically in tanks of enriched seawater in natural light. When the cords were placed in the sea they were cut into 8 m lengths and attached to the thick rope used before. Several different designs were tried, based on the horizontal rope system, but hanging the cords vertically. The frequency of the cords was varied, and 1 m intervals were found to be best. A 1 kg weight used at the lower end of each cord was found to be adequate. Free cords were preferred to cords joined at the bottom, avoiding a domino effect if one should break. The system worked quite well with buoyed anchor ropes keeping the whole taut (Fig.4).

The biomass of *Alaria* per metre of cord was always low on the uppermost metre (Fig.5). This could be due to inhibition by high light levels near the sea surface, the effect of wave action or damage by the boat. On the other hand, there was little falloff in biomass with depth except near the base of the cord. This was probably because the tidal currents lifted the cords and brought the lower parts into better illumination.

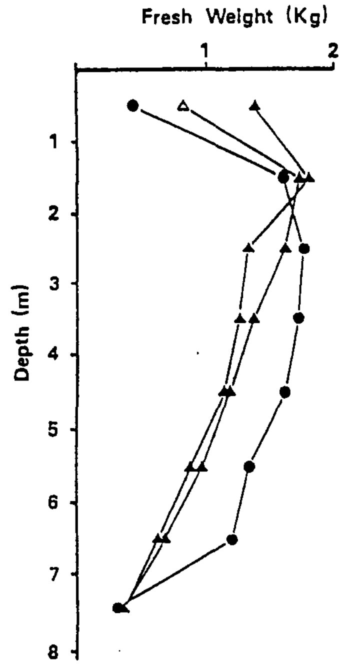


FIGURE 5. MEAN FINAL FRESH WEIGHT OF ALARIA PER METRE OF 6 mm (•) & 3mm (▲) VERTICAL CORD.

The most recent development is of a farm that should yield a profitable crop. The rope system has been further redesigned; instead of long lines it consists of a grid which remains in the sea throughout the year with seeded cords being added for the growing season (Fig.6). The grid is actually suspended 2 m below the surface; each supporting buoy has 2 m of rope below it attaching it to the horizontal rope. The grid measures 250 x 200 m, being 5 hectares. Seeded 6 mm diameter cords are produced as before, except that the frames are hung in the seeding tanks and not laid on the bottom. Instead of being hung vertically in the sea, the cords are attached at each end to 16 mm diameter grid ropes. Because of weather problems, only about a third of it was seeded last year (1988). The yield was about 6 wet tonnes of *Alaria* and 12 wet tonnes of *Laminaria saccharina*.

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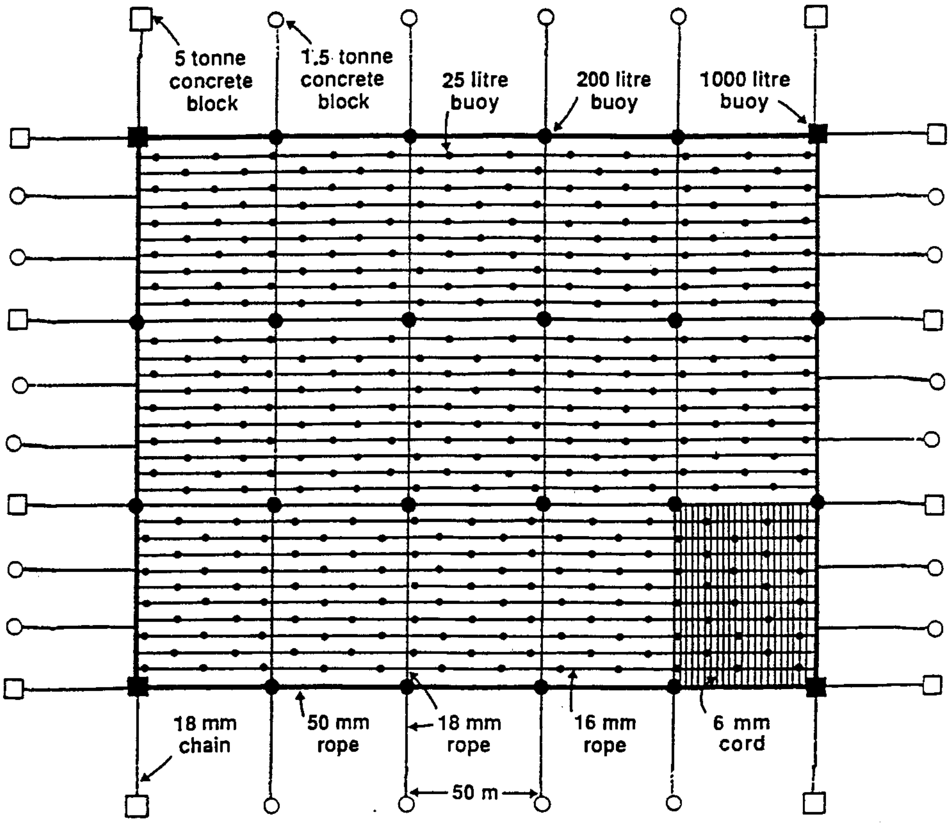

FIGURE 6. GRID ROPE SYSTEM SUPPORTED AT 2 m BELOW THE SEA SURFACE TO WHICH DIRECTLY SEEDED CORDS ARE ATTACHED (ONLY SHOWN IN BOTTOM RIGHT RECTANGLE). ANCHOR LINES NOT TO SCALE.

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NOTICES

Further issues of The Marine Fauna of Cullercoats series (Reports of the Dove Marine Laboratory, 3rd Series), prices now available:

No.23 **Oligochaeta**, M.A. Kendall (1988) £1·50
No.24 **Isopoda**, M. Sheader (1988) £3·00
No.25 **Hirudinea**, N.A.Hussein & E.W.Knight-Jones & **Kinorhyncha**, R.N.Bamber (1989) £2·00

WASTE INPUTS IN THE EASTERN IRISH SEA

by Martin R. Preston
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Introduction

As part of the work of the Anglo-Irish Irish Sea Study Group, which is preparing a follow-up report to the recent ICES report, the waste inputs to the Irish Sea are being reviewed. My involvement with this group has been concerned primarily with the problems associated with organic contaminants, but in this paper I also draw on the information relating to other contaminants, provided by my ISSG colleagues whose cooperation I should like to acknowledge.

The Eastern Irish Sea

The eastern side of the Irish Sea is a relatively shallow basin where non-tidal water movements are strongly influenced by the wind. Therefore contaminants released into this area may be widely dispersed from their point of release. The extent to which this occurs depends as much on chemical/biological interactions as on physical processes.

The introduction of contaminants into the region is dominated by a number of identifiable 'point' sources, namely the River Mersey, the sludge dumping site in Liverpool Bay and the Sellafield piped discharges (in the case of low level radioactive waste). In addition to these there are numerous diffuse sources, such as atmospheric inputs and runoff from land, about which we know very little.

In the following sections I describe very briefly what is known about the contaminants in the eastern Irish Sea.

1. OIL

Surveys for oil contamination are carried out on an occasional basis by MAFF. The general picture is one of fairly low concentrations which increase around the areas of active oil development or transport processes. Sedimentary oil tends to accumulate in fine-grained muds, and concentrations of 50 to >100 $\mu g\ g^{-1}$ are the norm in the region which includes the Morecambe Bay gas field and a zone extending south east towards the Mersey Estuary.

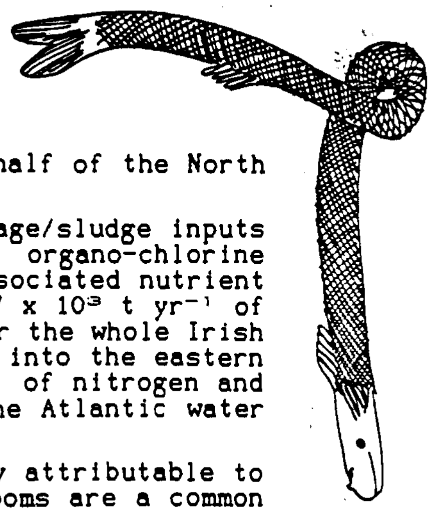
Problems associated with tainting are rare, but oily/tarry residues are still moderately common on beaches.

2. SEWAGE

Large amounts of sewage sludge arising mostly from Manchester sewage treatment works are dumped in Liverpool Bay. In 1987 this amounted to some 1·6 million wet tonnes (equivalent to about 6×10^4 tonnes dry weight).

In addition, large quantities of untreated sewage are released directly into the Mersey Estuary (around 400 $Ml\ d^{-1}$). With the construction of the major new treatment works in central Liverpool and on the Wirral bank, the amount of raw sewage entering the Irish Sea from this source will decrease. The effects of this should be seen in the early 1990's. However, the treatment process will in turn produce large quantities of sludge which, because it is likely to contain high levels of contaminants, represents a new and difficult disposal problem. This is particularly so given the general trend towards reduction of sea disposal.

Numerous beaches on the eastern coast in particular fail to meet EEC Bathing Water directives. Curiously, to my mind, Wirral



beaches do meet the standards, though only about half of the North Wales beaches comply similarly.

One of the more significant features of sewage/sludge inputs are the other contaminants, such as metals and organo-chlorine residues that are associated with them. Sewage-associated nutrient inputs are also considerable, totalling around 137 x 10^3 t yr^{-1} of nitrogen and some 22 x 10^3 t yr^{-1} of phosphorus for the whole Irish Sea with probably around 60 to 70% being released into the eastern basin. These figures compare with 102 x 10^6 t yr^{-1} of nitrogen and 28·4 x 10^6 t yr^{-1} of phosphorus coming in with the Atlantic water inflow from the south.

There do not seem to be any effects directly attributable to human-derived nutrient inputs, though plankton blooms are a common feature of the region and may reach nuisance proportions in some areas.

3. METALS

There are considerable inputs of metals to the eastern Irish Sea from both present day and historical activities. The major metal of concern is mercury where average levels in fish flesh hover uneasily just below the limit of acceptability. Whilst mercury inputs have declined quite considerably over the last 20 years or so, these declines are not mirrored in the biota, where levels stay relatively high. This is presumably because of the large reservoir still active in the sediment and biosphere.

Inputs of other metals are also mostly into Liverpool Bay, though there are other known sources of particular metals elsewhere in the region. The sludge site receives many metals, with zinc being the most abundant (about 110 t yr^{-1}) followed by chromium, lead, copper, nickel, cadmium and mercury. In general the English coastal waters show persistently higher metal concentrations than do other waters in the Irish Sea.

The best documented incidents of metal pollution are those of the alkyl lead poisoning of birds in the Mersey Estuary in 1979/80, and the alkyl tin compounds in anti-fouling paints. The phenomenon of imposex associated with alkyl tins is now widespread in the Irish Sea, though with the partial banning of the use of these compounds and their inclusion in the DOE "Red List" this situation should improve.

4. ORGANO CHLORINES

Despite the considerable reductions in the use of organo-chlorine pesticides and PCBs over the last 20 years, they are still common marine contaminants. Data for the eastern Irish Sea are very sparse, and it is not readily possible to identify present day distributions or trends. A substantial and identifiable input is again the sludge dumping site in Liverpool Bay. This is reflected by the concentrations in fish which tend to decrease on moving away from the site. There is no evidence to suggest that organo-chlorines represent a serious threat, though this statement must be qualified by saying that there is really very little good data for these, or indeed any other, organic contaminants.

Concerns over the seal disease outbreak last year and possible links to PCB contamination are being investigated by the Sea Mammal Research Unit and MAFF, but the limited number of deaths in the Irish Sea occurred in regions of generally low contamination, and I would be surprised if the concentrations in the dead seals were at physiologically significant levels.

5. RADIONUCLIDES

Radioactive discharges to the eastern Irish Sea are amongst the most contentious of all environmental issues. Quantities of waste discharged peaked in the mid 1970s, and have rapidly declined with improved treatment techniques on the Sellafield site. Present day levels may be expected to decline still further as treatment improves. Estimates of human exposure to radiation associated with nuclear discharges by the NRSB indicate that only around 0·1% of the total comes from this source, with 86% being from natural radiation and the bulk of the remainder coming from medical uses of radiation.

From the point of discharge, water-soluble radionuclides such as Cs^{137} move with the bulk sea water and generally migrate northwards. However, concentrations within Liverpool Bay are also similar to those further north. All concentrations show a declining trend reflecting the decline in discharges.

Radionuclides such as Pu^{239} which are not significantly water soluble tent to adsorb onto small particles, and highest concentrations are found in a patch of muddy sediment some miles offshore from Sellafield. Some particle-associated radionuclides can be transported back to land by certain processes involving the wind. Concern over the consequences of this and other processes relating to the nuclear industry are a source of active concern and investigation at present.

6. OTHER ACTIVITIES

The most important activity occurring in the eastern Irish Sea which has implications for contaminant redistribution is dredge spoil dumping. Large amounts of dredge spoil are taken from navigable waters and dumped elsewhere. This provides opportunities for spoil-associated contaminants to move from inland/estuarine waters to the eastern basin. The importance of this process to the marine environment is very difficult to assess.

There are increasing demands for sand and gravel from the construction industry, and marine resources will become increasingly economically viable as other sources reduce. It is likely that this type of activity will increase in the future.

Conclusions

The eastern Irish Sea receives the bulk of the contaminant inputs for the Irish Sea as a whole. Despite this fact, it is generally difficult to point the finger at any one detrimental effect that can be said to derive from human activities. That is not to say that there are no reasons for concern. Mercury concentrations are still relatively high, bathing beaches do not meet standards, and so on. The major problem that I face in trying to review the region is the lack of good quality data which would allow distribution and trends to be identified. With the "greening" of the government it is to be hoped that increased investment in pollution issues will improve this situation in the not too distant future.

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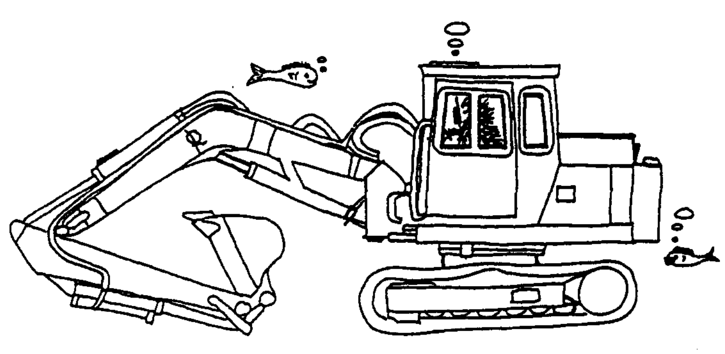

THE SCOTTISH MARINE GROUP

For over twenty years freshwater scientists in Scotland have net twice a year as the Scottish Freshwater Group. This group comprises scientists from a wide range of disciplines and organisations, including River Purification Boards, universities, colleges of higher education and government laboratories, as well as private individuals. It has always met at the University of Stirling, chosen primarily because of geographical convenience, but also because of the University's interest in marine and freshwater biology. The meetings have always been single day meetings, usually starting at about 10.00 a.m. and finishing about 4.00 p.m., and have comprised four or more papers plus a long lunch break enhanced by demonstrations. The keynote has always been informality. There is no organising committee, no A.G.M., no membership fee and no attendance charge. Consequently the meetings are always attended by a wide range of active scientists, from undergraduate and postgraduate students through to laboratory directors and professors.

The Scottish Marine Group, which held its first meeting in October 1988, is a direct copy of the Scottish Freshwater Group idea, in the understanding that imitation is the sincerest form of flattery. Again the meetings are one-day only meetings, held twice a year at the University of Stirling. The first meeting considered the topic of the sedimentary environment, with a wide range of talks ranging from geology through to marine biology. The second meeting, in April 1989, was given over to short research student talks in the morning, and longer talks on "man and the marine environment" in the afternoon.

All those interested in attending the next meetings of each group, which will both be held at the University of Stirling on Thursday 2nd November 1989, should contact the relevant organising secretary (see below), either to have their name added to the mailing list, or even more importantly to offer talks or demonstrations for the meeting. The success of these meetings hopefully lies in their informality and lack of any oppressive organisation, but also depends totally upon the enthusiasm of the members to offer talks and demonstrations. It should perhaps be noted that since the meetings are day meetings, with timings designed so that almost anyone in Scotland can get there on a day-return basis from their home, it is regretted that the organisers cannot arrange overnight accomodation or similar.

Scottish Marine Group Secretary	Scottish Freshwater Group Secretary
Dr J. Gamble	Dr P. Maitland
Dept. Agr. Fish. for Scotland	Fish Conservation Centre
Marine Laboratory	Easter Cringate
P.O. Box 101	Stirling
Victoria Rd, Aberdeen	FK7 9QX

Local Secretary for SMG & SFG
Dr D. McLusky
School of Molecular & Biological Sciences
University of Stirling
Stirling FK9 4LA

DEEP-WATER WHELKS IN GLASGOW'S MUSEUM COLLECTIONS

by Fred R. Woodward
Art Gallery & Museum, Kelvingrove, Glasgow G3 8AG

Numbers of deep-water whelks are relatively rare in collections: the following notes on material in the Glasgow Museums may be of interest since they contain new localities for some species resulting in an extension of their known distribution as well as bringing the existence of this material to the attention of research workers.

Phylum MOLLUSCA; **Subclass** Prosobranchia
Order Monotocardia
Suborder Stenoglossa (= Neogastropoda)
Superfamily Buccinacea
Family Buccinidae

Beringius turtoni (Bean)

Single individual in alcohol from 56°33·0'N 09°13·0'W, obtained by RRS Challenger on 23 October 1977, station collection number 16/77 (Haul 22) using a single warp trawl, from a depth of 2400 to 2900 metres. Registration number GLAMG Z 1977-259-141.

Remarks. This species is recorded from the east coast of England and the Shetlands, but as far as I am aware this is the first record for the west coast of Scotland.

Volutopsis norvegicus (Gmelin)

Single individual in alcohol from 56°25·02'N 09°10·03'W, obtained by RRS Challenger on 19 October 1977, station collection number 16/77 (Haul 30) using a Granton trawl at a depth of 650 to 725 m. Registration number GLAMG Z 1977-259-126.

Two examples in alcohol from the Hebridean Terrace, 56°33·0'N 09°16·0'W to 56°33·0'N 09°20·0'W, obtained by RRS Challenger on 1 May 1978, Voyage 7 (Haul 36), at a depth of 1000 m, together with two dead shells of *Troschelia berniciensis* (King). Registration number GLAMG Z 1978-95-15.

Four examples in alcohol from 56°25·02'N 09°10·03'W, obtained by RRS Challenger on 19 October 1977, station collection number 16/77 (Haul 30) using a Granton trawl at a depth of 650 to 725 m. Registration number GLAMG Z 1977-259-125.

One dead shell from 56°25·02'N 09°10·03'W to 56°29·15'N 09°09·13'W, obtained by RRS Challenger on 19 October 1977, station collection number 16/77 (Haul 30) using a Granton trawl at a depth of 650 to 725 m. Registration number GLAMG Z 1977-259-134.

Three dead shells from 56°25·03'N 09°09·13'W to 56°31·03'N 09°12·0'W, obtained by RRS Challenger on 24 June 1976 (Haul 15) using a Granton trawl at a depth of 627 to 740 m (average 720 m). Registration number GLAMG Z 1978-95-14.

Remarks. This species is recorded from the east coast of England and the Shetlands, but has not been previously recorded from the west coast of Scotland.

Turrisipho fenestratus (Turton)

Single dry shell from 56°25·03'N 09°09·13'W obtained by RRS Challenger on 24 June 1976, station collection number 9/76 (Haul 15) using a Granton trawl at a depth of 672 to 740 m. Registration number GLAMG Z 1978-95-18.

Remarks. This species is recorded from off the west coasts of Scotland and Ireland in deep water down to depths of 1300 m.

Colus gracilis (da Costa)

Single dry shell from 56°25·02'N 09°10·03'W, obtained by RRS Challenger on 19 October 1977, station collection number 16/77 (Haul 30) using a Granton trawl at a depth of 650 to 725 m. Registration number GLAMG Z 1977-259-44.

Single dead shell from 56°25·03'N 09°10·03'W to 56°29·15'N 09°09·13'W, obtained by RRS Challenger on 19 October 1977, station collection number 16/77 (Haul 30) using a Granton trawl at a depth of 650 to 725 m. Registration number GLAMG Z 1977-259-.

Remarks. This species is widely distributed around all coasts of the British isles, but has not been previously recorded for this sea area.

Colus islandicus (Gmelin)

Four examples in alcohol from 56°33·0'N 09°13·0'W obtained by RRS Challenger on 13 October 1977, station collection number 16/77 (Haul 22) using a single warp trawl at a depth of 755 to 860 m. Registration number GLAMG Z 1977-259-137.

One dry shell from 56°25·02'N 09°10·03'W, obtained by RRS Challenger on 19 October 1977, station collection number 16/77 (Haul 30) using a Granton trawl at a depth of 650 to 725 m. Registration number GLAMG Z 1977-259-135.

Remarks. This species has been recorded from the east coast of England, the Bristol Channel, Liverpool Bay, the Inner and Outer Hebrides, the Faroes and the Shetland Islands.

Colus jeffreysianus (Fischer)

Seven examples in alcohol from 56°25·02'N 09°10·03'W, obtained by RRS Challenger on 19 October 1977, station collection number 16/77 (Haul 30) using a Granton trawl at a depth of 650 to 725 m. Registration number GLAMG Z 1977-259-145.

Two examples in alcohol from 56°25·03'N 09°09·13'W obtained by RRS Challenger on 24 June 1976, station collection number 9/76 (Haul 15) using a Granton trawl at a depth of 672 to 740 m. Registration number GLAMG Z 1978-95-21.

Single example from 56°25·03'N 09°09·13'W obtained by RRS Challenger on 24 June 1976, station collection number 9/76 (Haul 15) using a Granton trawl at a depth of 672 to 740 m. Registration number GLAMG Z 1978-95-22.

Single example from Rockall Trough, 56°49·12'N 09°59·15'W to 56°51·12'N 09°56·08'W, obtained by RRS Challenger at station number 12/77 (Haul 10) using a single warp trawl at a depth of 2000 to 2030 m. Registration number GLAMG Z 1977-176-116.

Remarks. This species has been recorded from the English Channel to the west of Portland, south and west Ireland and off the Isle-of-Man, the present examples representing a northern extension of its recorded range.

Colus glaber (Kobelt)

Single example in alcohol from the East Slope of the Porcupine Bight, 51°15·0'N 11°39·0'W to 51°17·0'N 11°36·0'W, obtained by RRS Challenger at station number 7/78 (Haul 37) at a depth of 800 m. Registration number GLAMG Z 1978-95-22.

Single dry shell from 56°25·03'N 09°09·13'W obtained by RRS Challenger on 24 June 1976, station collection number 9/76 (Haul 15) using a Granton trawl at a depth of 672 to 740 m. Registration number GLAMG Z 1978-95-23.

Remarks. This species has previously only been recorded in British waters from the area to the south of Ireland and from deeper waters off the Faroes.

Colus marshalli (Iredale)

Single example in alcohol from 56°25·02'N 09°10·03'W, obtained by RRS Challenger on 19 October 1977, station collection number 16/77 (Haul 30) using a Granton trawl at a depth of 650 to 725 m. Registration number GLAMG Z 1977-259-144.

Single dry shell from 56°25·03'N 09°09·13'W obtained by RRS Challenger on 24 June 1976, station collection number 9/76 (Haul 15) using a Granton trawl at a depth of 672 to 740 m. Registration number GLAMG Z 1978-95-25.

Remarks. The only previous record for this species is off the north-west coast of Ireland.

Family Fasciolariidae

Troschelia berniciensis (King)

Six examples in alcohol from 56°25·03'N 09°09·13'W obtained by RRS Challenger on 24 June 1976, station collection number 9/76 (Haul 15) using a Granton trawl at a depth of 672 to 740 m. Registration number GLAMG Z 1978-95-17.

Two examples in alcohol from 65°33·0'N 09°13·0'W obtained by RRS Challenger on 23 October 1977 station collection number 16/77 (Haul 22) using a single warp trawl at a depth of 755 to 860 m. Registration number GLAMG Z 1977-259-132.

Two examples in alcohol from 56°25·02'N 09°10·03'W, obtained by RRS Challenger on 19 October 1977, station collection number 16/77 (Haul 30) using a Granton trawl at a depth of 650 to 725 m. Registration number GLAMG Z 1977-259-133.

Two dead shells from the Hebridean Terrace, 56°33·0'N 09°16·0'W to 56°33·0'N 09°20·0'W, obtained by RRS Challenger on 1 May 1978, Voyage 7 (Haul 36), at a depth of 1000 m, together with two live *Volutopsis norvegicus* (Gmelin). Registration number GLAMG Z 1978-95-13.

Remarks. This species occurs in British waters from the north-east coast of England, extending northwards around Scotland and continuing southwards to the south-west corner of Ireland.

ACKNOWLEDGEMENTS

My sincere thanks are due to Dr D. Burkel who originally collected the material, to Dr Shelagh Smith and Tom Pain for checking my identifications, and to Geoff Hancock and Richard Sutcliffe for comments on the manuscript.

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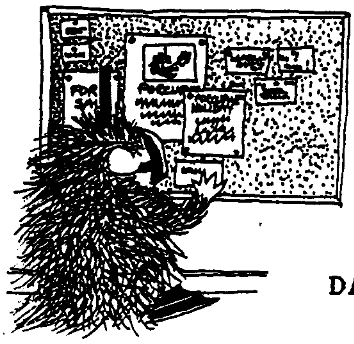

DANA REPORTS FOR SALE AT REDUCED PRICES

The series of Dana reports, which began in 1934, will be closed with the completion of the next number (91). The series gives the results of the collections made during the circumnavigation in 1928-1930 and of previous Dana expeditions. They include papers on many kinds of pelagic marine organisms.

Until recently the Dana reports were sold through E.J. Brill, Leiden. However, Brill has now terminated these sales and returned the unsold stock to the Carlsberg Foundation, which has presented the remaining copies to the "Professor Johannes Schmidt, D.Sc's Trust for Marine Research". This is a non-profit trust run by a board of marine biologists from the Zoological Museum, Copenhagen. One of its major purposes is to support foreign zoologists studying Dana material at the Zoological Museum.

We are now offering a special sale of the Dana reports at about 50% of the Brill prices. The income from this sale will make it possible for the trust to increase the number of foreign zoologists to whom partial support is given for studying Dana material in Copenhagen.

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Jørgen Nielsen

Zoologisk Museum, Universitetsparken 15, DK-2100 Ø, Denmark

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From the Danish Dana expeditions 1920-22 in the North Atlantic and the Gulf of Panama:

Letters to the Editor

from Mrs P. Nicolson
13 Windsor Crescent
Portree, Isle-of-Skye

Dear Sir,

I was wondering if you could help me in some enquiries I am making about the H.M.S. *Porcupine*. I am with the local history society in Portree, and have come across two gravestones of sailors of the H.M.S. *Porcupine*. They are two years apart in death, but buried in different cemeteries. I was therefore interested in the full story of why they came to be buried there.

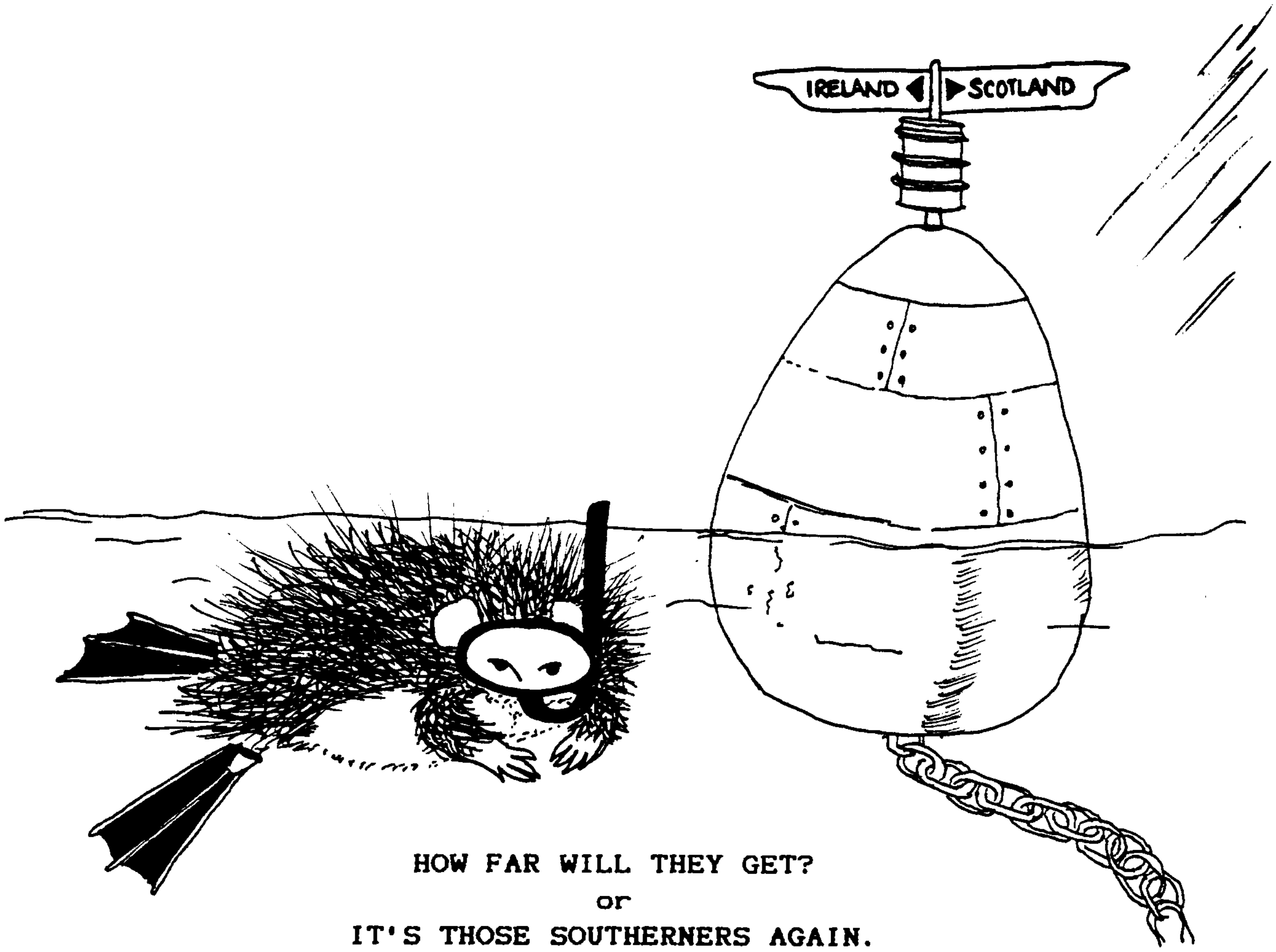
The first stone is for a " Cramer, aged 39 years. Erected by Captain and Officers 1859". This stone was erected in Portree, which was then a new cemetery.

The second is for a " Richard Williams, Captain's Coxswain, a faithful servant of his earthly master - 1861". This stone, however, was erected some two miles out of Portree in an old chapel cemetery which was disused in the 1850's as the new cemetery was in use in Portree.

If you have any information which can shed more light on this, or know of anyone I could contact, I would be very grateful.

Mrs P. Nicolson

Editor: I have sent Mrs Nicolson copies of the relevant articles in **PN** 1 (pp.8; 9; 159; 187), 2 (64; 143) and 4 (25). These mainly deal with the *Porcupine*'s history when under Calver's command, i.e. post-1863; if any Members have information on her during the earlier command of Lt Inskip, or what she was doing on Skye (just prior to her landing on Rockall and her discovering the Porcupine Bank), could they please get in touch with Mrs Nicolson (an old friend of yours, Ralph?).



HOW FAR WILL THEY GET?
or
IT'S THOSE SOUTHERNERS AGAIN.

by Shelagh Smith
Woodleigh, Townhead, Hayton, Carlisle, Cumbria CA4 9JH

As some people may know, Dave McKay and I are still plodding on gathering data for our proposed atlas of marine Mollusca of west Scotland. Pages of books being rectangular and coastlines being otherwise, as our southern boundary is 55°N we have included the north coast of Ireland. This poaching has proved very useful, because a number of southern species extend to Northern Ireland, especially Donegal, but most apparently fail to cross to Scotland. Sublittoral species apparently travel (arrive?) better, and a number have been recorded from the Antrim area, whereas there is undoubtedly a cut-off point for shore fauna in the region of Malin Head.

Record dates are totally random, but there has been a consistency of recorders, in that most of the sublittoral records of nudibranchs are from Bernard Picton (who would have undoubtedly have found the same species had they been present when he was in west Scotland), the others identified by myself. Records of nudibranchs, which depend more than other species on the few people who can recognise the more arcane species, differ a little from the distributions indicated in Thompson (1988), which suggests that more exchange of information is needed. The shore work has been done, if not by me, with me. Julia Nunn's mollusc expedition to Donegal this summer (June 1989) has added to the list of southerners. No doubt there are more yet to be discovered. I wonder if more southern species have been paying a perhaps fleeting visit to Scotland this year, taking advantage of warmer conditions.

This note should be read in conjunction with an earlier article on the same subject (Smith, 1987). To date:

IRELAND	SCOTLAND
Leptochiton scabridus	
Nonodonta lineata	
Rissoa lilacina ss	
Barleeia unfasciata	
Coriandria fulgida	*Coriandria fulgida*
Haminoea navicula	
Doto eireana	*Doto eireana*
Doto lemchei	
Doto onusta [1]	
Okenia elegans	
Greilada elegans	
Thecacera pennigera	*Thecacera pennigera* [2]
Cumanotus beaumonti	
Facelina annulicornis	*Facelina annulicornis*
Otina ovata [3]	*Otina ovata*
	Onchidella celtica [4]
Venus verrucosa [3]	
	Pholadidea loscombiana [5]
Octopus vulgaris [6]	*Octopus vulgaris* [6]

[1] Found on the shore, det BEP, probably commoner than the single record so far.

[2] Old records from the Clyde which have been assumed to be errors for *Polycera quadrilineata*, but in view of the recent finds in Ireland they may have been correct.

[3] Fresh dead shells only so far found, no reason to suppose that these species do not live in the area. Records of *Venus verrucosa* from Scotland have all proved to be *Circomphalus casina*.

[4] New records from Scotland are of sublittoral finds (Smith, 1987).

[5] New records indicate that this species is widespread, just a question of finding it in its sublittoral hidey-holes.

[6] The Irish specimen was found this year stranded on mud flats, alive but moribund. Records of *Octopus* appear from time to time and if verifiable have been found to be *Eledone*. That of Brown & Scott, 1886 (Allen, 1962) has been considered correct.

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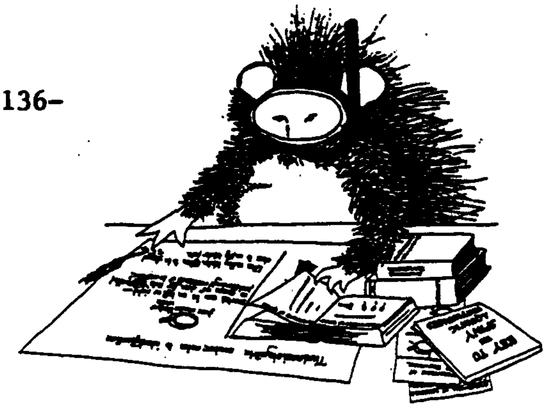


A DIVERS GUIDE TO THE MARINE FAUNA OF THE CLYDE REGION

by Rohan Holt

Department of Zoology, University of Glasgow

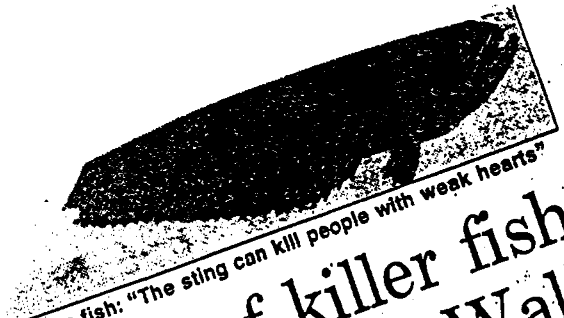
In June 1986 the first copy run of "A Divers' Guide to the Marine Fauna of the Clyde Region" was produced by a small group of students in the Department of Zoology, University of Glasgow. This was the culmination of only half a year's work and was designed to give the divers in the University club an idea of the diversity of animals they could see on any weekend dive around the Clyde and neighbouring sea lochs.

From the initial stages the guide was intended to bridge the gap between general and specialist guides to marine fauna, with an emphasis on practical field use by non-zoologically trained divers. To this end it was written with the sub-aqua enthusiast in mind, giving information on species found locally and how to identify them underwater. There were many problems faced when deciding on the species to include in the guide; not the least were those involved with keeping numbers down to avoid making the final product too expensive. Thosae species which are rare in the Clyde area, deeper than normal sports diving range, or those which require specialist techniques (such as microscopic examination) were also omitted, leaving altogether about 140 of the commoner animals to be included.

The book itself was designed to be taken onto the dive site, each page being enclosed in a splash-resistant wallet, and with a little care, even our sub-aqua club managed to take it out in the inflatable on several occasions without undue damage. However, there was a notable change in several of our club members, who would bring their own copy of the guide with them on dives, and as soon as they were out of the water they would start to recollect the species that had been seen on that particular dive. Logbooks would for the first time include the latin names of the species they had seen, and it made it a lot easier for those of us with particular interest in photography to get people to help us find the more unusual animals. We soon managed to sell 50 copies of the guide and went through a second production run with some improvement in the photographs.

Since then our species lists and stockpile of slides has grown considerably, mainly because we ventured further away towards the outer west coast constantly looking for new material in the sound of Jura and the coast around Mull. This was done with the aim of eventually superseding the Clyde Guide with a guide to the whole west coast of Scotland by the end of 1988.

Unfortunately, tragedy struck on the night of 19th February this year, when a fire swept through the Zoology Department destroying millions of pounds worth of lab equipment along with the main "Divers' Guide" slide collection. This has meant that we are now in the position of having to retake many of the missing photographs, which will probably take up much of this coming summer.



Weever fish: "The sting can kill people with weak hearts"

Shoals of killer fish off beaches of Wales

the greenhouse effec

ROGERS

Sea change tha may point to global warming

Correspondent

"PRESS RELEASE"
(?=EFFLUENT)

Put it down to the weather if you like, but the national press has caught us off-guard again. While we were all awaiting the inevitable annual crop of "*hot weather has caused massive invasion of tropical jellyfish onto our beaches*" ("Just when you though it was safe to go back in the water.......", "Phew! What a stinger.....", etc.), we are instead told of "*shoals of killer fish*" lurking around the beaches of west Wales (in particular?).

Apparently the warm weather has attracted "huge shoals" of lesser weever fish from the waters of North Africa; presumably these are supposed to have replaced the more normal "huge shoals" of *Echiichthys vipera* which are "attracted" from their native Scottish habitat during our more familiar cold summers! Or maybe the warm weather simply causes increased drivel to issue from the brains of some journalists.

We may consider increased sightings of luth (*Dermochelys*) a more realistic expectation of a warmer year (*vide* PN 4, p.65 "*et preq*"). But no, the 1989 obsession seems to be fish.

The Times of August 7 reports on its own "experiment" into global warming - a fishing trip with PML! This was interpreted as producing evidence of "potentially disastrous warming of the atmosphere by industrial gases", since four red mullet were caught!

So perhaps we wouldn't all have made that intellectual jump.

But then the 'correspondent' of the Times had the advantage of "knowing" that his other indicator species appearing off Devon and Cornwall, the triggerfish, "*is tropical*"! So should we assume that the long history of both these species having been recorded in Britain (e.g. PN 1, 119 *et seq*) represents a previously unnoticed development of the greenhouse effect before the phrase was coined?

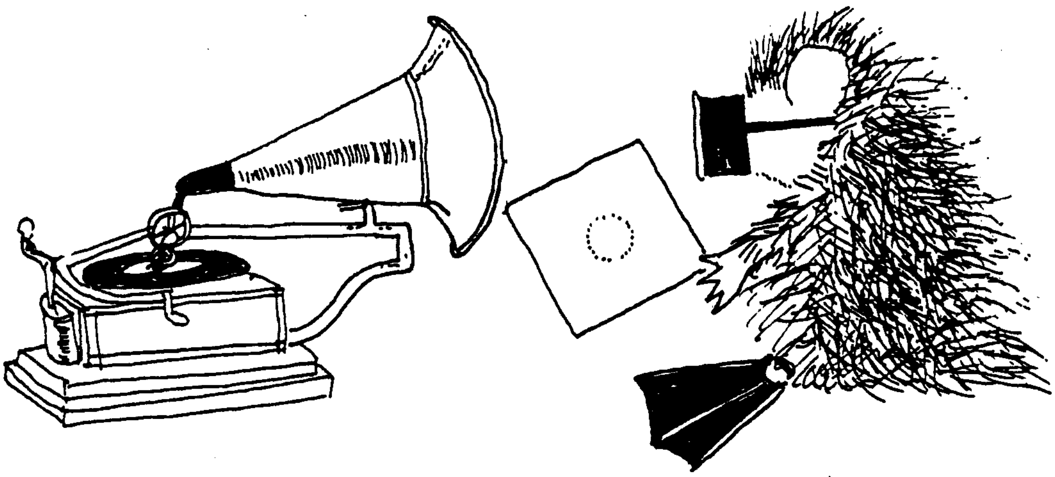
There are all too many cases where the boarding of the "green" bandwagon by politicians, media-ites (mediums?) and the well-meaning ignorant has resulted in gross publicity of misinformation. And thereby led to unjustified solutions to "save the world", while those attempting to find the true answers by means of competent research risk losing any support or funding.

It should be most significant to the reader that the aforementioned Times article expends some 24·5 'column inches' on the appearance of "exotic warm-water species" over the last decade, before then remembering to mention that no water temperature rise has yet been detected! Perhaps "tropical" fish use mediums too.

Meanwhile, we continue to approach the next ice-age, and I *know* because I saw four Arctic skuas in Shetland this month. Just wait for next year's national press silly season - you'll see.

Hon. Ed.

new records



Although there seems to be an absence of any new records of tropical species, the east coast (North Sea) has produced a few cooler-headed beasts lately.

Recent surveys of the Northumberland coast have produced:

Axinella infundibuliformis (L.) (Porifera:Axinellida): first record for the North Sea coast of the U.K. - see Sponge IV; previously recorded from Atlantic and Irish Sea coasts, plus Norway and the Faroes;

Bispira volutacornis (Montagu) (Polychaeta: Sabellidae): a "southern" species, this being the first record for Northumberland (or the "Cullercoats Sea Area");

Caryophyllia smithi Stokes & Broderip (Cnidaria: Scleractinia): the "Devonshire" cup coral shows an extended Lusitanian distribution, recorded occasionally on North Sea U.K. coasts: herewith a southern extension of its range from Newton;

all recorded sublittorally on Cresswell Skeres, Northumberland (ca 55°14'N 1°32'W) during a dive organised by Bob Foster-Smith (photograph of *Axinella* confirmed by Graham Ackers, to whom many thanks).

Baldia johnstoni Garwood & Bamber (Annelida: Polychaeta: Capitellidae), gen et sp nov, a low littoral sandy beach capitellid of *C.capitata* appearance, but lacking any capillary chaetae; recorded from Druridge Bay (55°18'N 1°35'W), Fluke Hole (55°24'N 1°35'W) and Fenham Flats (55°39'N 1°49'W) (*vide* Garwood & Bamber, 1988; Ophelia, 29:119-126).

And finally, further south:

Photis pollex Walker (Crustacea: Amphipoda: Isaeidae), taken from the sublittoral sandy seabed off Sizewell, Suffolk (52°13'N 1°38'E). Previously in U.K. known only from Dublin Bay, Liverpool Bay and the Mull of Kintyre (also Atlantic North America; see Myers & McGrath, 1981, JMBA 61, 759-768.) (coll. S. Batten, det. M. Sheader, to both of whom many thanks).

Roger Bamber.