

# DEEP-SEA NEWSLETTER



No. 18, April 1991

## THE SIXTH DEEP-SEA BIOLOGY SYMPOSIUM

COPENHAGEN, 30 JUNE - 5 JULY 1991

### THIRD ANNOUNCEMENT

The Copenhagen Symposium is taking shape. To date (10 April) 126 participants from 14 different countries have registered (see list, p. 2); another 26 colleagues have in various ways indicated keen interest in participation. Abstracts for 73 ordinary and 6 short, oral presentations, as well as for 20 posters have been received and are under consideration. Many friends and colleagues have indicated how much they anticipate our meeting and so do we! The meteorologists will do all they can to provide fair weather, particularly on Wednesday and Friday.

SYNOPSIS  
CENTER: August Krogh Institute (Zoophysiology),  
Universitetsparken 13, DK-2100 Copenhagen Ø. (The  
Natural Sciences Campus, next to the Zoological Museum)  
(see map on p. 3).

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                        \*Unno Grosz  
                        \*Karin Juterzenka  
                        \*Rolf Koppelmann  
                        \*Gerd Liebezeit  
                        \*Peter Linke  
                        \*Karin Lochte  
                        \*Bettina Martin  
                        \*Kirsten Michalek  
                        \*Olaf Pfannkuche  
                        \*Stephan Scheibe  
                        \*Gerd Schriever  
                        \*Thomas Soltwedel  
                        \*Hjalmar Thiel  
                        \*Claudia Thomsen  
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                        \*Sarah Kirstin Bronsdon  
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                        \*John Gage  
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                        \*Andrew Gooday  
                        \*Lawrence E. Hawkins  
                        \*Stephen Hutchinson  
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## A THINLY ENCRUSTING DEEP-SEA SPONGE WITH A SPECIAL STRATEGY

Demosponges of the family Hymedesmiidae are of a thinly encrusting (less than 1 mm thick) growth form. About sixty species of the genus *Hymedesmia* have been recorded from sublittoral and bathyal depths of the Greenland and Norwegian Seas, especially from Iceland and parts of the Scandinavian coasts (Alander 1942; Burton 1930, 1959; Lundbeck 1910; Tendal, unpubl.). From depths of more than 2000 m in the Norwegian and Greenland Seas only two species, *Hymedesmia lacera* and *H. stylata*, had been reported. They were described from a station of the Ingolf Expedition, at 2395m, between Iceland and Jan Mayen (Lundbeck 1910).

Although about 80 sponge species were known up to now from the area off West Spitsbergen (Svalbard) (Hentschel 1929; Koltun 1959; Steenstrup & Tendal 1982) not a single hymedesmiid was recorded. We therefore were able to fill a gap in the known distribution of many species, when we, during the Meteor Expedition 13 to that area (July/August 1990), found 14 species of *Hymedesmia*. Nine were recorded at depths between 200 and 600 m, six deeper than 2000 m, but none in between. The six deep-water species came from a single station, at 2360-2616 m. *H. norvegica*, *H. occulta*, *H. similis*, *H. splenium* and *H. sp.* (mayby n.sp.) were taken only once while *H. stylata* was also taken at two additional locations, at 2560 and 2570 m. *H. similis* was found also on three stations at 300-500 m (Barthel et al. 1991).

Despite its softness and loose consistency quite a number of *Hymedesmia stylata* specimens were found in the trawl and sledge samples, being one of eight species that by frequency of occurrence and abundance define a widely distributed sponge association in the abyssal basins of the Norwegian and Greenland Seas. While *Hymedesmia* species in general grow on really hard substrate, *H. stylata* is adapted to soft bottom conditions by growing exclusively on a losse accumulation of tests from agglutinated foraminifers and large sand grains. The sponge tissue with the silicious spicule skeleton covers the particles and holds them together so as to form rounded lumps with maximum lengths of up to 15 mm. Although the lumps can attain a thickness of several mm, the layer of tissue is always thin.

Knowledge of the biology of *H. stylata* is fragmentary. The sponge is positioned level with or slightly raised over the surrounding bottom. Pores for the intake of water are distributed all over the surface, and the oscules, which lead away the filtered water, are found on the tip of 2 mm high papillae. The specimens presumably grow slowly. They can be experienced to attain a relatively high age, at least 5 years for the 15 mm large specimens, if comparisons to conditions in shallower depths can be used as a minimum indication (Ayling 1983a, 1983b). Slime is produced all over the surface, probably either as a means of deterring predators and potential epibionts, or in order to deal with particles settling on the surface and threatening to clog the canal system. Larvae were not seen in our specimens, although we found them in several *Hymedesmia* species of the shallow water group.



*Hymedesmia stylata* on the bottom surface, with accumulated foraminifer tests and sand grains (schematic).



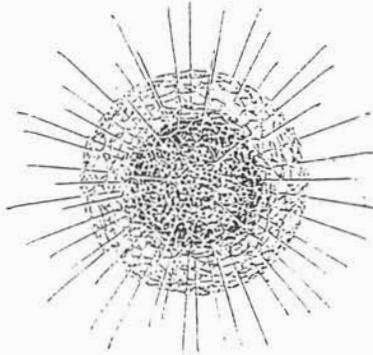
Silicious spicules from *H. stylata*. The curved one is magnified 900 x, the long ones 170 x. (After Lundbeck 1910).

### Literature

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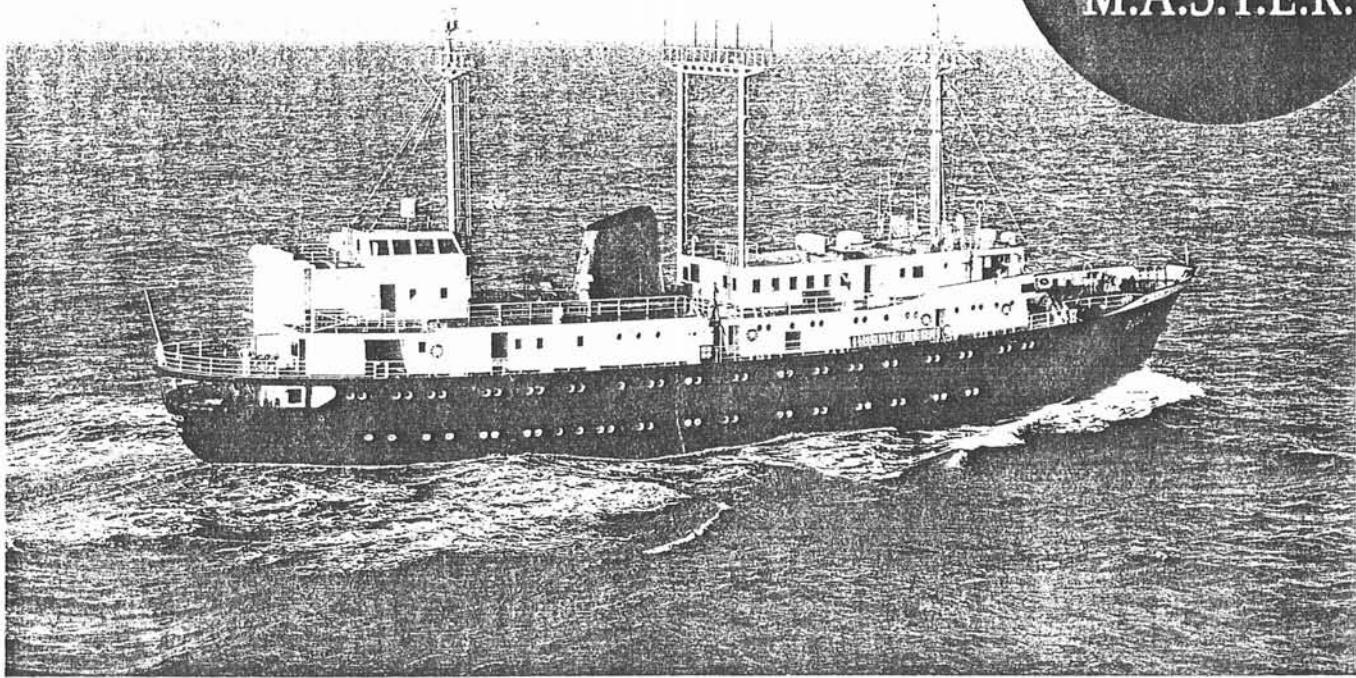
### CRUISING ON CUMULUS

*Cumulus* is one of the Meteorological Office's Ocean Weather ships. She is stationed in the Northeast Atlantic at Ocean Station LIMA ( $55^{\circ}\text{N}$ ,  $20^{\circ}\text{W}$ ). She makes routine port calls at Greenock. At the present time she has 20 spare berths which Oceanscan Master Services Ltd can offer to researchers and students. The company offers taught courses in marine science and technology, observational methods and the realities of sea-going. Alternatively, clients can take the ship on a facilities-only basis, in order to put on their own courses. The company is also able to take observers who want to enjoy the experience of sailing on an ocean weather ship and learn about her operation.

For research workers and people who want to test or calibrate equipment, *Cumulus* offers an excellent and cheap platform, costing a fraction of the price of a dedicated oceanographic research ship. Brochures with descriptions of the ship and her facilities and details of costs of trips for individuals or groups, can be obtained from Oceanscan Master Services Ltd, POBox 63, Godalming GU8 5TQ, UK, or phone 0483 860351.

Tony Rice  
IOS, Wormley

# TRAINING AT SEA



The Ocean Weather Ship CUMULUS is operated by Marr Vessel Management Ltd for the United Kingdom Meteorological Office and is stationed in the Northeast Atlantic, usually at station LIMA (around 55 deg N, 20 deg W). Routine port calls for stores and exchange of personnel are made regularly at Greenock, or at a west of Scotland port. The Ship, which has a reputation for comfort and sea kindliness, was designed and built for meteorological research. As such she has much more laboratory and living accommodation than is needed for her present mission. Provided that mission is not hindered, the

Director General of the Meteorological Office has decided that the excess capacity can be exploited for approved uses. As a result, OCEANSCAN MASTER SERVICE LTD is able to offer the ship's facilities for use in training and education at a fraction of the cost that would be entailed in using a dedicated oceanographic research vessel. The

company itself is offering taught courses in background science and technology, in observational methods and in seagoing operations for those who need to know something about the basics of working at sea. Alternatively, clients can take the ship on a "facilities only" basis in order to put on their own programmes. In the latter case, OCEANSCAN MASTER SERVICE LTD will assist with expert staff or technical support.

Individuals may register for scheduled courses or the company will put on courses tailored to the needs of groups. Because of operational constraints the basic modules of course length are two and four weeks, though minor variations may be possible. The maximum number of places is 20 and for groups of between 10 and 20 the total charge per place will be comparable with the charges that would be expected for a residential course on land. Every effort will be made to accommodate individual scientists needing to spend a short period at sea at about the same level of cost. Some details of the courses and facilities on offer are given overleaf.



#### NEWS FROM THE BENTHIC GROUP AT IOSDL

The benthic group at Institute of Oceanographic Sciences, Deacon Laboratory is investigating the influence of disturbance on deep-sea communities in a project known as LRP4 with the official title of "The responses of deep-sea benthic and benthopelagic communities to perturbation". The problem - or perhaps it is fortunate, with this type of study - is the present near absence of direct anthropogenic impact on the deep-sea floor. There are two ways round this problem: (i) you can create your own disturbance - the approach adopted by our colleagues in the DISCOL project, or (ii) you can let nature do this work for you - we are lazier than our German friends!

The basic principle of LRP4 is to investigate two abyssal plain locations subject to markedly differing environmental conditions. The major 'disturbance factor' we have selected is the degree of seasonality in the supply of organic matter to the benthos. Based on our earlier investigations in and around the Porcupine Sea Bight we knew that there was a strong signal in organic input in this area which we presume is related to the depth of winter mixing. So we worked the EC station on the Porcupine Abyssal Plain ( $48^{\circ}50'N$   $16^{\circ}30'W$ ) during two cruises in 1988 and '89 (FS Meteor cruise 6 Leg 7A and RRS *Discovery* cruise 185, see Thurston in D-SN no. 16).

Next we had to select a suitable station for comparison. The simplest option was to move further south to a region with an appreciably shallower depth of winter mixing and therefore hopefully with a much reduced seasonality in organic input. We opted for a station on the Madeira Abyssal Plain, which we worked during RRS *Discovery* cruise 194, August 1990. In practical terms this was an extremely successful cruise (see Thurston in D-SN no. 17); however, the presence of a comparatively recent turbidite (200-500 years old) suggests that we should look for an alternative location for future cruises.

So to date LRP4 has three extensive sets of benthic samples ranging from multiple cores to otter trawls, together with photographic material from Bathysnap deployments and sledge mounted cameras. With such a large set of samples we have spent some time developing the methods for processing this material, e.g. the 'weighing' of small specimens. One particular problem is the extremely laborious sorting of the finer (<1 mm) sieve fractions from the box core samples. To speed this process we have been testing the use of various extraction methodologies (decantation, elutriation and density separation); the results have been very encouraging and we hope to present a summary of this work as a poster in Copenhagen.

We have also found time to start collating the 'real' biological data from these samples. In addition to abundance and composition data on the various gears, we have been concentrating on the production of abundance and biomass size spectra. For practical reasons, the results are so far restricted to the larger organisms (otter trawls, sledges and 1 mm fraction of box cores), but already show a number of very interesting features. We intend to present some of these data at the Copenhagen meeting, but briefly they illustrate: (i) highly conservative size structure in temporal comparisons of the northern station data sets, (ii) a marked reduction in total benthic biomass and abundance at the southern station and, perhaps more importantly, some convincing evidence for the predominance of smaller organisms at this relatively oligotrophic site and (iii) a good agreement between the spectra produced by different gears, e.g. the modal body size of >1 mm box core macrofauna matches that obtained from corresponding sledge samples.

For the immediate future our plan is to return to our northern locality this summer and to locate a suitable new comparison site, perhaps towards the Cape Verdes. It will be with some sadness that we have to leave the Madeira Abyssal Plain site for it is in itself a very interesting location. Although the benthos are very thin on the ground in this area,

dropping in a baited camera elicits an active response from the resident scavengers. The IOSDL geologists have also been very active in this region; they initially informed us of the recent turbidite in this area (using the new TOBI sidescan system) noting large rafted sediment blocks, turbidity current channels and, in general, highly variable acoustic returns from the subsurface sediment layers. The scope here for studies of local-scale variations in the benthos would seem to be considerable. We, however, look forward to pastures (abyssal plains) new!

The benthic team

Tony Rice      Mike Thurston      Andy Gooday      Brian Bett      Penny Jackson  
with help from      Andrew Grantham      Sarah Lawrie      Adam Ward

THE SMBA TIME SERIES PROGRAMME

The time series programme sampling programme that has been undertaken by the Scottish Marine Biological Association in the Rockall Trough has now been running for almost twenty years. A lot has happened in deep-sea biology in that time, and some of the important changes in our view of deep-sea communities, such as the implications of seasonality, have directly resulted from study of these samples. These continue to generate interesting and challenging new data on seasonal dynamics of the bottom-dwelling populations, and the programme has been running long enough for us to recognise interannual changes in certain populations, although the majority seem remarkably stable in composition.

The bivalve molluscs seem to fall into this category, although some species show seasonal breeding with recruitment in summer, others show a summertime peak in recruitment despite showing no sign of seasonality in gametogenesis. However, this has allowed us to analyse probable age structure by tracking growth of recruitment modes in consecutive samples in the time series for many more species than might otherwise have been the case. However, one problem that has been encountered is that the 0.5 mm meshes of the epibenthic sled sampler seems too coarse to retain the smallest new recruits. This is particularly important with taxa such as bivalves whose rounded shape when small results in them being easily lost through the mesh of the net so that the smallest, and most recently recruited sizes were previously undersampled. The sampling programme until recently was very opportunistic, and had seldom achieved more than one sample a year over many years. The need to address new problems generated by the time series, such as the timing and intensity of seasonal recruitment, together with the important need for a true time series of samples of the benthopelagic fish through a whole year, rather than looking at samples taken over several years at different times of the year, led to a new suite of short cruises on RSS Challenger to the Rockall Trough.

Although the first cruise (in March 1990) of the series had to be aborted because of bad weather, the subsequent four cruises were very successful. The first of these, in June/July saw a series of epibenthic sled and Agassiz trawlings on the permanent station at 2,900 m depth in the southern Rockall Trough and the other repeat station in 2,200 m depth at St. "M" near the Anton Dohrn Seamount. A seasonal suite of samples were obtained for the first time using much finer-meshed nets (300 and 500 micron mesh). Although obtaining smaller samples than with the 1-mm mesh net used normally, the samples were successful in catching much smaller sizes, and earlier postlarval stages, of the bivalves and other macrobenthic fauna. A longer cruise in September also enjoyed good weather so that it was possible to complete additional sampling using the box corer on the permanent station in order to obtain further quantitative samples

of the macrobenthic community, but also gravity cores for the British Geological Survey. Primary processing of the larger invertebrates obtained on these first two cruises has been completed.

The programme of seasonal cruises was continued in December (a month never previously sampled in the time series programme in the Rockall Trough), with the cruise enjoying remarkably good weather during which the sampling programme was satisfactorily completed just before Christmas.

This gratifying result was matched by the final cruise of the series on RSS Challenger in February 1991. This cruise, which was joined by Dr. Craig Young of Harbor Branch Oceanographic Institute, Florida, and Dr. Paul Tyler of the Dep. of Oceanography, Southampton Univ., accomplished not only the full sampling programme, but also undertook the first ever attempts at fertilising ripe eggs obtained from various deep-sea asteroids and echinoids. With *Echinus affinis* trawled from 2,200 m successful spawnings were achieved in the ship's cold room, and in an experiment with fertilised eggs sealed in a container and sent down with the next trawl partial cleavage was achieved whilst a control group kept at atmospheric pressure did not, indicating that pressure is necessary for embryo development in a deep-sea invertebrate. Embryos of the slope-dwelling sea urchins *Echinus elegans* and *E. acutus norvegicus* from around 1,000 m were successfully cultured on board and brought ashore in a healthy condition.

Studies of feeding biology of various echinoderm and bivalve species have also been undertaken on these four successful seasonal cruises continuing a long-standing collaboration with Dr P.A. Tyler and his students at the Dep. of Oceanography of the Univ. of Southampton. Gonad and gut tissues were dissected out and examined on board or frozen for later analysis in an effort to relate differences in dietary constituents and storage products to the seasonal cycle in nutritive flux to the deep-sea bed that British studies in particular have demonstrated in recent years. Study of the gut contents of preserved samples of the small protobranch bivalve *Ledella pustulosa* from the 2,900 m deep Permanent Station have already shown marked seasonal differences in the composition and quantity of material which appear likely to be related to its seasonal breeding cycle. By contrast, in the non-seasonal breeding species *Malletia cuneata* no such seasonal differences in diet are evident.

The other important justification for the new set of cruises on RSS Challenger was to sample the benthopelagic fish through a full year for the first time. The fish were sampled with a 14-mm headline semi-bal' on otter trawl fished on either a single warp or paired warps, and with an Agassiz trawl. The aim on each cruise was to sample at depths of appr.: 700, 1200, 1500-1700, 2200, 2400 and 2900 m. This was achieved on most cruises except the first in March 1990 (when no sampling of any kind was possible) and in December when time was short. Nevertheless, the December cruise represented the first occasion when samples of either benthos or fish were obtained from this month. The reproductive condition of all fish was recorded and it was quite clear that most fish of the upper- to mid-slope had a well-defined breeding cycle. Previous sampling over a number of years had led to this conclusion but it was important to demonstrate the annual cycle in a single year. There was no evidence of an annual reproductive cycle in the fishes of the lower slope. Otoliths (ear bones) were collected from all the macrourid fishes and from a number of fish of other families. These will be used to age the fish and it is hoped that by studying the growing edge of the otoliths of juvenile specimens to determine whether the observed banding is laid down annually so as to validate the use of growth-band counts in ageing fish.

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## DEEP-SEA ENVIRONMENTAL CONSERVATION INITIATIVE

In Deep-Sea Newsletter 16 we reported on our projekt DISCOL (DISturbance and re-COLONization) experiment in a manganese nodule area of the South-east Pacific) which was originally planned with a much broader scope. Due to several reasons, in 1988 the programme has been pruned to our experiment, but the funding ministry - Bundesminister für Forschung und Technologie - suggested discussions on the problems of deep-sea environmental impact assessments and agreed on eventually supporting additional programmes.

Based on this proposal a discussion group was established to consider the problems of deep-sea mining and other deep-sea uses. Participants in this group "Tiefsee-Umweltschutz" (acronym: TUSCH, i.e. deep-sea environment protection) are representatives from several federal ministries, from companies, and academia, including marine scientists, engineers and jurists. Subjects of discussions are mining and other impacts, the realization of experiments and technical tests, developments of mining in other countries, and negotiations in the Preparatory Commission of the Seabed Authority, specifically concerning the mining code.

The close contacts established in this TUSCH group between persons of quite different experiences have led to much broader perspectives of all participants which results in a much better understanding of the general problems in the pertaining political, commercial, engineering, and ecological issues.

One outcome of these cooperative efforts was my participation in a seminar at the UN headquarters in New York in August 1990, during which 15 scientific papers were presented to the mining code decision makers. The main tendency yielded by this seminar aimed at not to conclude the mining regulations at this stage, but to keep paragraphs open for later additions. Mining the deep sea is assumed not to begin before another 15 or 20 years. Thus there is no immediate need for final regulations, and open passages allow better definitions after more research being done. However, appropriate research projects asking appropriate questions must be started to meet these administrative/political requirements.

Within the TUSCH group the marine scientists and engineers constitute the TUSCH Research Cooperative. During the last few months, a number of proposals have been written by members of the subgroup (plankton ecology: 1, engineering: 1, hydrographic modelling: 2, geology/geochemistry: 4, water column particulate matter: 1) and submitted to the ministry for review and hopefully for financial support.

In this country we think that environmental risk assessments are prerequisites for mining and other types of man's penetration into the deep sea. The postponed mining, an effect of the world market's metal prices and the framed United Nations Law of the Sea (1982), allows marine scientists and engineers to act before industry develops final technologies and starts impacting the deep sea. This is a rare but fortunate chance, and I wish to incite governmental authorities and scientists from other countries to join these efforts. I intend to return to this subject in a later issue of the Deep-Sea Newsletter and will then concentrate on the need for international cooperation in the field of application orientated deep-sea ecology.

Hjalmar Thiel, Hamburg



## DEEP-SEA RESEARCH AT THE NATURAL HISTORY MUSEUM, LONDON

The Natural History Museum has been actively engaged in the study of deep-sea invertebrates since the 1880s. More recently, some of these studies have been partly funded by a European Community, Marine Science and Technology (MAST) grant, and a NATO scientific grant.

The purpose of the studies include the identification and description of new taxa (both parasitic and free-living); the assessment of natural variability and the prediction of change in marine benthic organisms; the processes governing community structure, and modelling. The studies have been grouped according to organisms investigated as follows: - 1) Nematodes, 2) Parasitic Helminths, 3) Polychaetes, and 4) Fishes.

### MEIOFAUNA

#### Nematodes

The MAST programme, in association with the Institute of Oceanographic Sciences, Deacon Laboratory (IOSDL), and others, has been in operation at the Museum since 1990. The initial findings are outlined below.

Large multicore samples (diam. 5.6 cm, multicorer developed by Peter Barnett of the Scottish Marine Biological Association, SMBA) and sub-samples syringe cores (diam. 2.1 cm) taken by Andrew Gooday from the IOSDL cruises 185 (Aug.-Sep. 1989) and 195 (Aug.-Sep. 1990) were processed for nematodes. So far, 9 cores have been analysed, six from the IOSDL northern site ( $48^{\circ}50'N$   $16^{\circ}30'W$ , Porcupine Abyssal Plain) and three from the IOSDL southern site ( $31^{\circ}N$   $20^{\circ}W$ , Madeira Abyssal Plain). A further six cores are being processed. Cores were subdivided as follows: 0-5 cm (in 1 cm layers), 5-10 cm, 10-15 cm, and 15-20 cm. Taxonomic and ecological analysis was restricted to the surface 0-1 cm layer.

Given the labour intensive nature of nematode research it was important to establish whether the multicorer was sampling nematode communities efficiently. Hence, a comparison of nematode densities was made between multicore and syringe core samples to test for spatial variability within cores. Our comparisons suggested that the multicorer was an efficient tool (i.e. its diameter was not too large) and was capable of reflecting environmental heterogeneity. Further analysis could confidently be based on samples from multicores.

A qualitative and quantitative analysis of the nematode species between the northern and southern sites will be made, as these sites are environmentally different from each other. The northern site is subjected to a strong seasonal signal in the supply of organic matter to the benthos, in contrast to the southern site, where little or no seasonality is expected, and which was affected by a 200-500 year old turbidite. Such an assessment should indicate the effects of stress on nematode populations.

The distribution of marine nematodes along a depth transect across the Hebridean Terrace, Rockall Trough, is also being analysed in collaboration with Brian Elce of Brunel University (BU) and Peter Barnett of the SMBA.

Nematode populations from HEBBLE (the high energy site off Newfoundland and the San Diego Trough) are being analysed in collaboration with Brian Elce and David Thistle of Florida State University.

The data sets from these projects are all standardized from a taxonomic and ecological viewpoint and will allow the Museum and its collaborators to test various hypotheses about the processes structuring deep-sea nematode populations.

Currently, no keys exist to aid the identification of deep-sea nematodes, and shallow-water generic keys are being used as guides. Despite this difficulty, there have been some significant discoveries which will provide information on existing classifications and should result in the description of new genera and species.

### Parasitic Helminths

Studies carried out by the Parasitic Worms division on the taxonomy of parasitic helminths of deep-sea fish date back to the 1970s, from samples collected by the MAFF R/V *Cirolana*. Later work (1982), resulted in the description of *Neolebouria merretti* from 3311 m - the deepest digenetic then known.

More recently, interest has focussed on the possibility of using helminths (digeneans, cestodes, monogeneans, nematodes and acanthocephalans) as indicators of fish movement, both horizontally and vertically. To this end, there has been participation in cruises on the NERC R/V *Discovery* and *Challenger*. Among the results is the description of *Profundivermis intercalarias*, from 4850m. Effort has been put into assessing prevalence, intensity and host-specificity characteristic of these helminths, despite the difficulties of working on small sample sizes.

The morphological characters distinguishing deep-sea digeneans from their shallow-water relatives is not clear cut. To address this problem, work has begun to sequence part of the ribosomal RNA gene of some digeneans, in the hope that this information would allow the assessment of species boundaries between similar forms. This study should also help elucidate the phylogenetic relationships between similar forms in the deep and shallow waters and whether the deep-sea digenetic fauna is relict or whether species have been individually derived from shallow-water forms.

The ability of some deep-sea digeneans to complete a complex (most probably three host) life cycle in abyssal depths is intriguing. It is hoped that this work will shed some light on how these digeneans complete their life cycle in the deep sea.

### **MACROFAUNA**

#### Polychaetes

Three polychaete projects are currently underway at the Museum. The first centres on determining patterns of diversity and species distribution within the Rockall Trough. This is a collaborative project with John Gage, SMBA, Oban. Our initial results point to a bathymetric decline in species richness which may be linked to a decrease in the frequency of high energy currents. This gradient may also be reflected in the species distributions; areas in the eastern side of the Trough, with lowest levels of such disturbances, appear to have a high species similarity.

The second project is part of a collaboration with Tony Rice and the benthic group at the IOSDL and is in part funded by an EC MAST grant. The aim of this project is to determine the effect which different levels of environmental disturbance have on spatial heterogeneity of polychaete assemblages in different abyssal plain areas. Results from this and the Rockall study will be compared to other sites within the Atlantic and the Pacific.

The final project, in collaboration with Lawrence Hawkins and Stephen Hutchinson, Dept. of Oceanography, Southampton University, aims at the identification of the processes structuring deep-sea communities by assessing their effects on the physiology of dominant species. A PhD student, Sonia Batten, is developing the methodology for this approach.

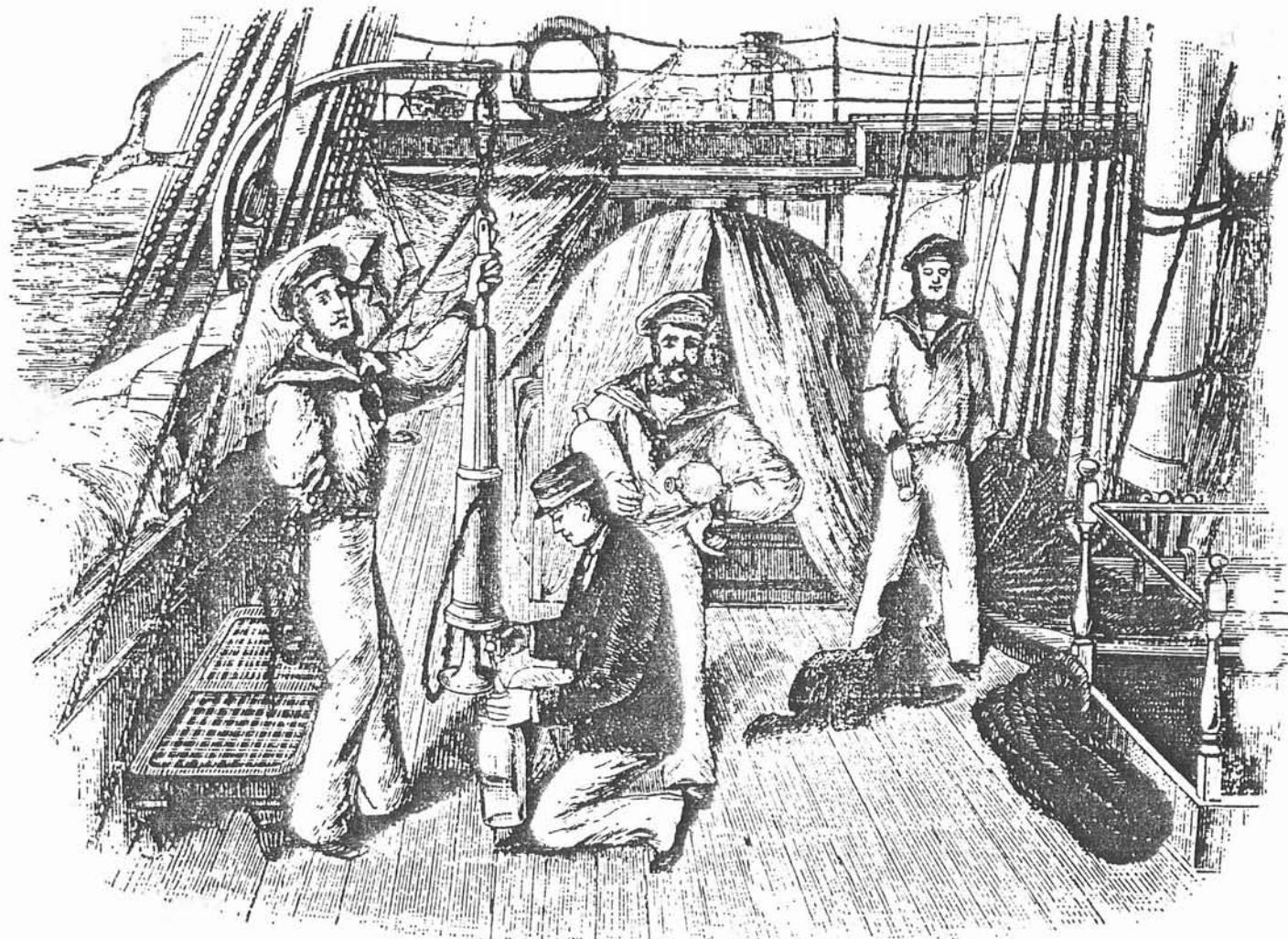
#### Fishes

Semi-balloon otter trawl sampling on both MAST cruises (1989, 1990) and collections from adjacent cruises have greatly extended the knowledge of abyssal demersal fish assemblages in the eastern North Atlantic. The MAST samples themselves yielded 144 fish representing 12 species and 7 families. One exceptionally large female ceratioid angler fish was included which, although damaged, appears to represent a new species of *Giantactis*. In all, the samples allow the sounding spans of 13 dominant abyssal demersal species from the region of 50°-20°N in the eastern North Atlantic to be given with reasonable confidence. In varying combinations, members of this group of species represent three distinct formal assem-

blages in the area.

By far the most dominant demersal species of continental rise and abyssal soundings in the northern hemisphere is *Coryphaenoides (Nematonurus) armatus*, a large top predator which probably plays a considerable role in the dispersal of organic matter around the ocean basins. The MAST samples have provided a more accurate determination of the southerly extent in abundance of this species in the eastern North Atlantic. Furthermore, they have contributed greatly to the knowledge of the different size sounding relationships overall and between sexes. There is a general 'smaller-shallower' trend in geometric mean size. While males are smaller than females at any given sounding, the increase in size with soundings is less marked in males.

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Sea water sampling in H.M.S. Challenger 1872 - 76

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