

DEEP-SEA NEWSLETTER

No. 16, November 1989

THE SIXTH DEEP-SEA BIOLOGY SYMPOSIUM
COPENHAGEN, 30 JUNE - 5 JULY 1991

FIRST ANNOUNCEMENT

As briefly mentioned in "Deep-Sea Newsletter" No. 15, we shall be happy to host the next deep-sea symposium here in Copenhagen and try to live up to the standard set at the previous meetings of this kind at Scripps 1981, Hamburg 1985 and Brest 1988.

The symposium will take place in the August Krogh Institute (Zoophysiology) which is located on the Natural Sciences Campus of the University next to the Zoological Museum and 2-3 km north of the City center.

The symposium will start on 30 June (Sunday evening) and end with a festival dinner at Tivoli Gardens on Friday 5 July. Thus, hotel arrangements should be made for a total of six nights (at least!).

The program will consist of oral and poster presentations on recent progress in the study of deep-sea organisms and ecosystems. Papers emphasizing multidisciplinary approaches are particularly encouraged.

Like at Brest we should like to select a number of themes. So far we have come up with the following:



A 16th century prospect of the port of Copenhagen

Deep-sea biota
The Antarctic deep-sea fauna
Deep-sea rhizopods: taxonomy and biology

We shall urge you to think about other (and perhaps better!) ideas and let us know at your earliest convenience.

A keynote speaker will be invited to introduce each theme.

Like at Scripps and Hamburg (but unlike at Brest) we do not intend to arrange for publication of contributed papers afterwards.

A mid-symposium excursion will be arranged, lasting preferably a whole day. It will take you to the Marine Biological Laboratory at Helsingør (Elsinore) and Kronborg Castle (with Hamlet's father's ghost), as well as to other famous castles in North Zealand.

Although prices at this early stage must be approximate we have decided to give them here (including anticipated increase) in order to provide an estimate of total costs in Danish kroner (1 US\$ = 7.35 D.kr.):

	Single	Double
Hotel: Category 1 (with private bath and breakfast included)	800	925-1000
Category 2 (breakfast included)	350	450
Youth Hostel (some double, some 5-bed rooms) ...	100	
Food per day	150-250	
Excursion (lunch included)	200	
Festival dinner	400	
Symposium fee	500	

Please fill in and return the preliminary form (p. 3). A more detailed form with binding notification will appear in the next issue of "Deep-Sea Newsletter" (September 1990).

You possibly know of some deep-sea biologists who do not regularly receive the "Deep-Sea Newsletter" but may perhaps be interested in participating in the symposium. We shall greatly appreciate if you would forward this information and the form to them!

Looking forward to hearing from you soon,

Torben Wolff

PAPERS FROM THE FIFTH DEEP-SEA BIOLOGY SYMPOSIUM, BREST 1988

The papers for this special issue of Progress in Oceanography are almost ready to go to press. The issue is scheduled to be Vol. 24 (1 and 2) and will be published in April 1990. I am negotiating with the publishers for a pre-publication offer to be made at a reasonable price; I hope that my and your idea of what is reasonable will match that of Pergamon Press. If anyone who is interested in this offer has not received details by February 1990, please send me an addressed envelope, and I will have the relevant information sent to you.

Martin Angel

Le Pennec, M., A. Donval & A. Herry: Nutritional strategies of the hydrothermal ecosystem bivalves.

Bathmann, U.V., R. Peinert, T.T. Noji & B. von Bodungen: Origin and fate of particles during pelagic sedimentation in the Norwegian Sea.

Renaud-Mornant, J. & N. Goubault: Evaluation of abyssal meiobenthos in the Eastern Central Pacific (Clarion-Clipperton fracture zone).

Zoological Museum
c/o Dr. Torben Wolff
Universitetsparken 15
DK-2100 Copenhagen, Denmark

Keep for your files

Symposium on Deep-Sea Biology

First Announcement (November 1989)

1. The Symposium will be held in Copenhagen, 30 June - 5 July, 1991
2. I am planning to attend the Symposium yes ____ with ____ persons
3. I wish to present a paper on _____
_____ Subject not decided ____
4. I wish to present a short communication on _____
_____ Subject not decided ____
5. I wish to present a poster on _____
_____ Subject not decided ____
6. I intend to participate in the mid-symposium excursion yes ____ no ____
7. Name and title:
Institution:
Address:

- Jeanthon, C. & D. Prieur: Resistance to heavy metals of heterotrophic bacteria isolated from the deep-sea hydrothermal vent polychaete *Alvinella pompejana*.
- Jollivet, D., J.C. Faugères, R. Griboulard, D. Desbruyères & G. Blanc: Spatial organization of a cold seep community of the South Barbados accretionary prism: tectonic, geochemical and sedimentary context.
- Haedrich, R.L. & N.R. Merrett: Little evidence for faunal zonation of communities in the deep-sea.
- Tunicliffe, V. & S.K. Juniper: Dynamic character of the hydrothermal vent habitat and the nature of sulphide chimney fauna.
- Dominguez, J., R.K. Kropp & R.B. Manning: Distribution patterns of deep-sea stomatopod Crustacea. Family Bathysquillidae.
- Roe, H.S.J., D.S.M. Billett & R.S. Lampitt: Benthic/midwater interactions of the Madeiran Abyssal Plain: Evidence for biological transport pathways.
- Carey, A.G., D.L. Stein & P.L. Rona: Distributional patterns of mega-epifauna and fishes in the Gorda Ridge axial Valley, Northeast Pacific Ocean.
- Attrill, M.J., R.G. Hartnoll & M.H. Thurston: Depth related migration of the red crab *Geryon trispinosus* (Herbst) (= *G. tridens* Krøyer).
- Van Praet, M., A.L. Rice & M.H. Thurston: Reproduction in two deep-sea anemones (Actinaria): *Phelliactis hertwigi* and *P. robusta*.
- Javarsson, J., T. Brattegard & J.O. Strömberg: Distribution and diversity patterns of asellote isopods (Crustacea, Isopoda) in the deep Norwegian and Greenland Sea.
- Monniot, C. & F. Monniot: Relationships between deep-sea tunicate populations west and east of the Straits of Gibraltar.
- Alberic, P. & J. Boulegue: Unusual amino compounds in the tissues of *Calypptogena* (Japan Trench): possible link with symbiosis.
- Jouin, C. & F. Gaill: Gills of hydrothermal vent annelids: functional anatomy and ultrastructure in two alvinellid species.
- Vangriesheim, A. & A. Khripounoff: Near-bottom particle flux variations: observations on the Meriadzek Terrace, Bay of Biscay.
- Mahaut, M.L., P. Geistdoerfer & M. Sibuet: Trophic strategies in carnivorous fishes: their significance in energy transfer in the deep-sea benthic ecosystem (Meriadzek Terrace, Bay of Biscay).
- Rowe, G.T., M. Sibuet, J. Deming & A. Khripounoff: Organic carbon turnover time in deep-sea benthos.
- Callan-Santini, H.: Mediterranean deep-sea amphipods: Composition, structure and affinities of the fauna.
- Thurston, M.H.: Abyssal necrophagous amphipods (Crustacea: Amphipoda) in the northeast and tropical Atlantic Ocean.
- Rice, A.L., M.H. Thurston & A.L. New: Dense aggregations of a sponge, *Pheronema carpenteri*, in the Porcupine Seabight (northeast Atlantic Ocean), and possible causes.
- Zeina, O.N.: What do the simple morphological features of deep-sea animals mean?
- Sokolova, N.N.: On size of the deep-sea macrobenthic invertebrates.
- MacDonald, I.R., W.R. Callender, R.A. Burke Jr. & R.S. Carney: Fine-scale distribution of methanotrophic mussels at a Louisiana slope cold seep.
- Horikoshi, M., T. Fujita & S. Ohta: Physiognomies and site factors of benthic associations in bathyal and hadal depths off the Pacific coast of northeastern Japan.

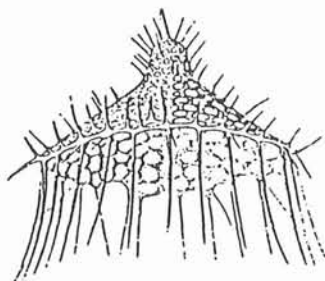


FIG. 93.—*Eucoryphalus huxleyi*, n. sp.

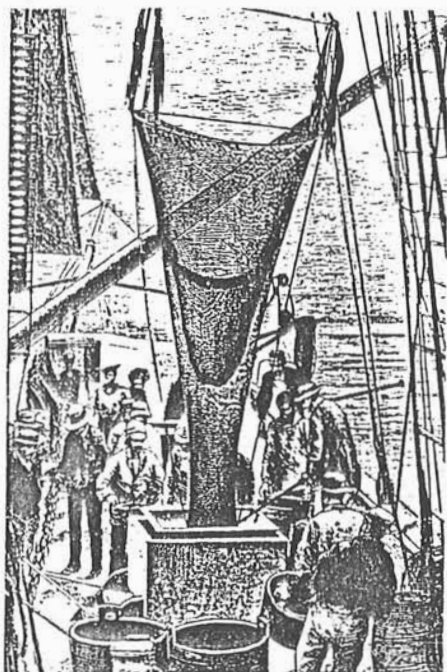
OCEAN CHALLENGE

The oceanographic society in Britain used to be called the Challenger Society. It was started as a dining club for those who were involved in the original Challenger Expedition and the working up of its material. Ever since it had retained its atmosphere of informality and amateurism. The society has decided to modernise itself and make its activities more relevant to the modern oceanographic community. It has been renamed "The Challenger Society for Marine Science". Its activities will still centre around arranging scientific meetings, but in the Spring of 1990 it will begin publishing a quarterly journal entitled "Ocean Challenge". The aim of the magazine will be to provide up-to-date information on research and events in a style which is comprehensible to all oceanographers regardless of their discipline. We, therefore, expect it to be useful to a much wider readership of students and interested laypersons.

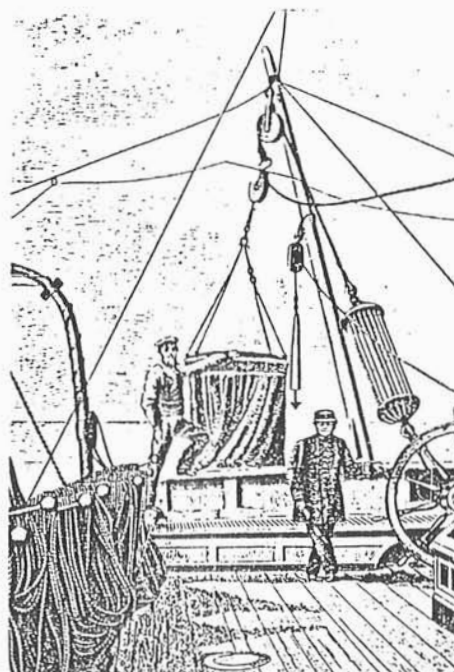
Initially the magazine will have a British emphasis, but we are eager to give it a full European dimension. It will be free to members of the Society, but we would like to expand its circulation. For individuals the best way of obtaining the magazine will be to join the Society. But the Society would be interested to hear from any other European Societies who would like to share in the venture and contribute to its contents. Further information can be obtained from:

Dr. J. Huthnance, Secretary of the Challenger Society for Marine Science, Proudman Oceanographic Society, Bidston Observatory, Bidston, Birkenhead, Merseyside L43 7RA, England.

Martin Angel



Chalutage à bord du Talisman (d'après E. Perrier).



(Doc. extrait de "The Depths of the Sea".)

DEEP-SEA NEWSLETTER - NEW CORRESPONDENTS

- KOREA: Prof. Sung Yun Hong, National Fisheries University of Pusan, Pusan.
- U.S.A.: Dr. Ken Smith, Scripps Institution of Oceanography, A-002, (West coast) La Jolla, California 92093. (Instead of Bob Hessler.)

NEW VENTS

LAK BASIN AND NORTH FIJI BASIN, WESTERN PACIFIC

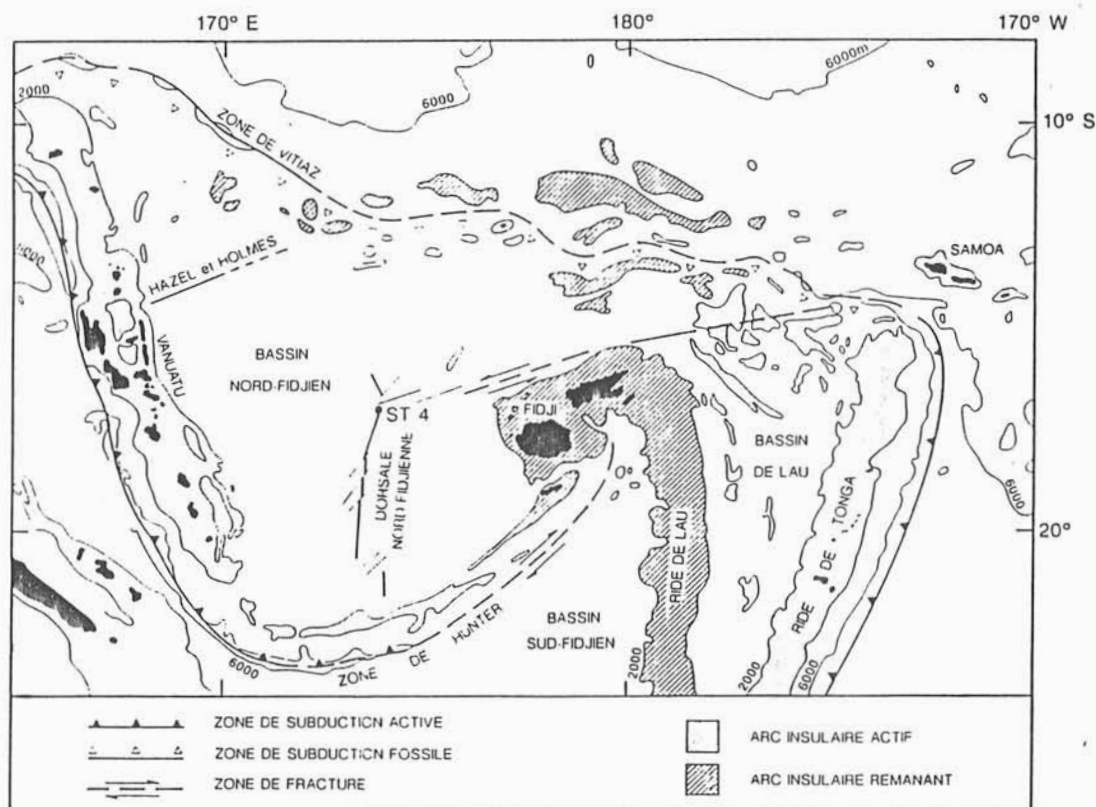
During the early summer of this year, the French deep-sea submersible "NAUTILE" visited two back-arc basins west and east of the Fiji Islands.

The Lau Basin was investigated during the BIOLAU cruise (05/12-27/89). Following the German-French cruise NAUTILAU which found active vents on Valu-Fa Ridge, French biologists, led by A.M. Alayse, dived twelve times on two vent sites: Hine Hina Field (22°32'S, 176°43'W, 1850 m) and Vailili Fields (22°13'S, 176°36'W, 1730 m).

The North Fiji Basin was investigated by a French-Japanese STARMER cruise (06/30-07/19/1989), with 11 dives for biologists and 9 for geologists. Biologists, under the co-leadership of S. Ohta and D. Desbruyères, worked on two vent sites: White Lady (16°59'S, 173°55'W, 2000 m) and Mussel Valley (18°49'S, 173°29'W, 2765 m).

Both in the Lau and the North Fiji Basin warm hydrothermal fields (10°-20°C) and hot chimneys were observed (>250°C).

In both basins the vent fauna is dominated by molluscs: mytillids spread over huge fields at warm vents, while gastropods are close to the hot vent areas. The mytillids belong certainly to a close relative of *Bymodiolus thermophilus*, the gastropods to a relative of *Alviniconcha* *listeri*. A black turrid (?) as well as a whelk is associated with this fauna. In the North Fiji Basin several species of *Paralvinella* were sampled on active anhydrite chimney walls and associated with warm vent organisms. Very few vestimentifera (new genus and species) were sampled in cold areas of the Lau Basin as well as perviate Pogonophora (*Siphonobranchia* n.sp.). At the boundary of active areas, barnacles are present in large populations. Crabs are abundant and are probably related to the Mariana Trench bythograeid. Lithodid crabs and shrimps (*Rimicaris* ?) are not uncommon. In the North Fiji Basin large populations of synaptid holothurians are associated with mussels at the boundary of the fields.



These expeditions emphasize, with reference to previous work in the western Pacific, that there is a western Pacific assemblage clustered around active vents which differs strongly from the East Pacific Rise assemblage, although mussel beds do seem a constant feature of warm hydrothermal vent assemblages.

Anne-Marie Alayse, Daniel Desbruyères and Suguru Ohta

DEEP-SEA STUDIES IN THE FAROE/SHETLAND CHANNEL

The BIOFAR project is a Nordic project the object of which is to:

1. Provide local knowledge of the marine benthic fauna of the Faroes, provide opportunities for further local studies and create Nordic contacts for such studies.
2. Provide knowledge of the benthic fauna in Faroese waters, which is interesting biogeographically, both as an aid to the understanding of the important fisheries, and as a reference area for pollution studies.
3. Use this inter-Nordic project to coordinate Nordic taxonomic expertise for the benefit of further marine research projects.



BIOFAR, which is funded by the Nordic Board of Ministers, the Carlsberg Foundation and the Faroese banks, began in 1988 and the sampling will continue until the end of 1990. So far there have been five research cruises, three by the Faroese Fishery Research Ship "Magnus Heinason" and two by the Norwegian Research Vessel "Håkon Mosby". These cruises have sampled over a wide area of the continental shelf and also on the continental slope down to depths of about 1000 m. Concurrent with the benthic sampling, studies are being initiated on the diets of the demersal fish stocks of the area so that the predation on the benthic fauna can be assessed. To the southeast of the Faroe Islands lies the Faroe/Shetland Channel and the midpoint of this channel is the approximate boundary between the Faroese and British Economic Zones.

Since the early 1970's the Scottish Marine Biological Association at Oban has been investigating the deep water communities of the Rockall Trough. The Rockall Trough is bounded on the east by the Rockall Bank. To the south it extends out onto the northeast Atlantic abyssal plain at depths of about 3000 m, while to the north it is separated from the Faroe/Shetland Channel by the Wyville Thompson Ridge at depths of about 500 m. The Wyville Thompson Ridge forms an effective barrier between the warmer northeastern Atlantic deep-water and the much colder water of the Norwegian Basin and in the deeper parts of the Faroe/Shetland Channel.

The studies of the bottom living fishes of the Rockall Trough have concentrated on the distribution, growth, reproduction and trophic ecology. A planned extension of the study into the Faroe/Shetland Channel to investigate the extent to which the Wyville Thompson Ridge acts as a faunistic barrier seemed to fit in with some of the aims of BIOFAR. A cruise of the British research ship "Challenger" in March 1990 will investigate the fish and benthos of both sides of the Faroe/Shetland Channel. The cruise will make full use of the deep-water capability of "Challenger", and otter trawling will be carried out using a semi-balloon trawl at depths between about 250 and 2000 m. This trawl, especially when fished on a single warp, also yields good samples of the megabenthos. The fish catches will be analysed as part of the SMBA program but the stomach con-

tents will form part of the BIOFAR program. The benthos of the slopes of the Channel will also be sampled with an epibenthic sampler and a detritus sledge as a contribution to BIOFAR.

If you are interested in further information on BIOFAR please contact the project leader Dr Arne Nørrevang. If you are interested in the "Challenger" cruise either as a participant or for the collection of deep material, please contact Dr John Gordon.

John Gordon
Dunstaffnage Marine Laboratory
PO Box 3
Oban, Scotland, PA34 4AD

Arne Nørrevang
Kaldbak Laboratory
Vid Skridubakka
FR-180 Kaldbak, Faroe Islands

THE SPONGE FAUNA OF THE DEEP WEDDELL SEA: STATUS AND THE NEED FOR FURTHER BIOLOGICAL AND FAUNISTIC INVESTIGATIONS

Without identification otherwise than "Porifera", sponges have been recorded from most of the Weddell Sea shelf, and down to 1200 m depth (Voss 1988). From the deeper parts, 2 species of demosponges and 10 species of hexactinellids (glass-sponges) have been recorded between 2500 and 4700 m (Topsent 1913, 1915).

During a cruise in January-March 1989 onboard the icebreaking "Polarstern" (Federal Republic of Germany), under the EPOS (European Polarstern Study) programme in the Eastern Weddell Sea we ran a project on ecology and taxonomy of sponges (Barthel, Tendal & Panzer 1989). Mainly working on the shelf, from 200-800 m depth, we also took a few deeper hauls with an Agassiz trawl.

One haul from 2000 m depth at 70°10'S, 29°41'W contains 18 species of sponges: 12 demosponges and 6 hexactinellids. One demosponge, *Myxilla asigmata* (Topsent, 1902), was already known from 2580 m in the Weddell Sea (Topsent 1913). Of the other 11 demosponges, 6 were known down to 900-1200 m, 4 were known as deep as 500 to 800 m, and one only to 200 m (Koltun 1964/1966, our investigation). Although no final identification has been made as yet, it seems that 3 of the hexactinellids occur shallower than 2000 m, and the other 3 are deep-sea species.

The scattered knowledge about the abyssal sponge fauna of the Weddell Sea, together with the preliminary analysis of this successful deep-sea haul, allows us to specify a series of questions to be considered when planning future deep-water investigations in the area:

1) Is the Weddell Sea abyssal fauna (provisionally taken as 2000 m) different from that of the South Atlantic?

Of the 10 hexactinellid species mentioned by Topsent (1913, 1915), 2 are only identified to genus. Of the other 8, 2 are found also in other oceans, while 6 are known so far only from the Weddell Sea (Lévi 1964). All the demosponges we found at 2000 m are known only from Antarctic-Subantarctic records.

2) Is there a special slope (bathyal) fauna in the inner Weddell Sea?

A strong element of the shelf fauna extends downwards to 2000 m, although a number of species seem to show a shallower distribution limit between 900 and 1200 meter (our investigation). We have found no genuine slope species.

3) Where is the upper limit of the abyssal zone in the inner Weddell Sea?

The occurrence in our sample of a few supposed deep-sea species, together with the topography, the temperature conditions and certain hydro-

logical characteristics indicate that the haul was taken in the transition zone to the real deep-sea fauna.

4) Does part of the shelf and slope fauna have its origin in the deep-sea?

Although species emerged from the deep-sea have been pointed out in other animals groups (Lipps & Hickman 1982), we cannot at present give examples belonging to the sponges. The question would probably especially pertain to the hexactinellids, and the answer could be provided through sampling from 1000 m downwards. Such investigations should concern morphological trends (spicule categories and dimensions, canal system variation), size/frequency distributions, reproductive frequency and modes, and differences in abundance.

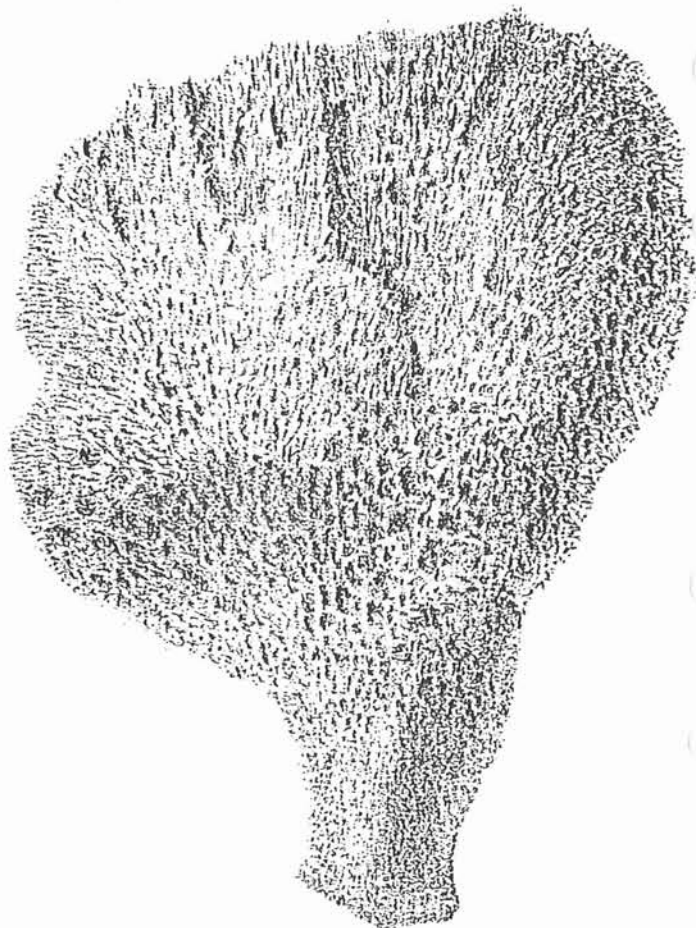
Dagmar Barthel
Institut für Meereskunde, Kiel

Ole S. Tendal
Zoological Museum, Copenhagen

Megaciella pilosus (Ridley & Dendy, 1886). The record of this species was one of the surprises of our study. It was hitherto known only from the Subantarctic region. Our find extends the known depth distribution with about 1800 m.

References

- Barthel, D., O.S. Tendal & K. Panzer, 1989: Ecology and taxonomy of sponges in the Eastern Weddell Sea shelf and slope communities. - In: I. Hempel (ed.): Berichte zur Polarforschung. The Expedition ANTARKTIS VII/3 and 4 (EPOS III) of RV "Polarstern" in 1989 (in press).
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- Lévi, C., 1964: Spongiaires des zones bathyale, abyssale et hadale. - Galathea Rep. 7: 63-112.
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- Topsent, E., 1913: Spongiaires de l'Expedition Antarctique Nationale Ecossaie. - Rep. Sci. Res. Voy. Scotia, vol. 7, Zoology: 2-72.
- 1915: Spongiaires recueillis par la "Scotia" dans l'Atlantique (1903-1904). - Trans. R. Soc. Edinburgh 51, 1: 35-43.
- Voss, J., 1988: Zoogeographie und Gemeinschaftsanalyse des Makrozoobenthos des Weddellmeeres (Antarktis). - Ber. Polarforsch. 45: 1-145.



News from the Institute of Oceanographic Sciences Deacon Laboratory

As some readers will know, IOSDL has just survived a traumatic year in which overall staff numbers were cut from 210 to 150 following a major financial crisis. This has left the Institute "slimmed down and fighting fit to meet the challenge ahead" according to official pronouncements. Most survivors feel older and greyer as a result!

One result of these upheavals has been a reorganization of science at IOSDL. Clearly there will be a great deal of continuity in most areas, but the emphasis will be more towards programmes rather than departments as has been the case in the past. It is hoped that these programmes, which will last for five years in the first instance, will give a greater degree of stability, both financial and in terms of ship-time, than we have experienced in recent years. The main biology programme is a benthic one, which will continue and expand the benthic work we have been doing recently. Our intention is to study the responses of deep-sea benthic and benthopelagic communities to perturbation. The long-term objective is to develop the abilities to detect, describe and predict changes in deep-sea communities resulting from natural and anthropogenic impact. To achieve this objective we hope to qualify and quantify the differences between two abyssal communities under water columns of different physical, chemical and biological characteristics, and to identify means whereby these differences can be most easily detected and defined. We will study the benthic and benthopelagic communities at two 4800m depth north Atlantic sites: the EC station on the Porcupine Abyssal Plain at 48° 50'N 16° 30'W which is characterized by deep winter mixing, high surface productivity and a strong seasonal signal in organic input to the sea floor, and a site at 31°N 20°W, SW of Madeira, where the depth of winter mixing is much shallower, and the organic input to the deeper layers is much less variable. At each site we shall measure total biomass and determine how it is distributed among different taxonomic, functional and size categories; determine the species diversity; examine life history strategies of the dominant organisms. We hope to have five cruises within the initial five year period, and visit each site at two different times of the year. The investigating team is led by Tony Rice, and consists of Mike Thurston, Andy Gooday, Dave Billett and newcomer Brian Bett, with backup from Ben Boorman and Penny Jackson. In order to broaden the scope of the programme we have set up collaboration with Nigel Merrett (now at the British Museum (Natural History)), Dr. John Lambshead (BM(NH)), Dr. Dai Roberts (Queens University Belfast), Dr. John Patching (University College Galway), Dr. George Wolff (University of Liverpool) and Professor John Murray, Professor Michael Sleight and Dr. Paul Tyler (all University of Southampton). This programme will tie in closely with another IOSDL biological programme being run by Martin Angel on midwater/benthic coupling.

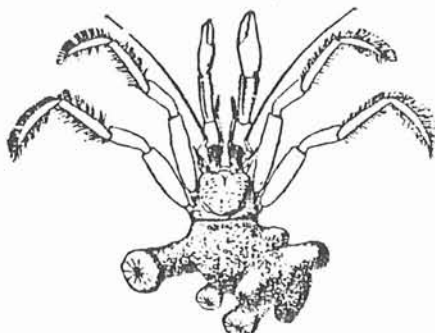
The first cruise under the new programme took place in August and September of this year. After a hectic loading period spent trying to stow all the equipment and paraphernalia for three cruises, *Discovery* sailed from Barry, South Wales, on 18 August. On board were twenty scientists and technicians from IOSDL and the Research Vessel Services, from the British Museum (Natural History), and Aberdeen, Southampton, Galway and Queens Universities. A few preliminary hauls were made on the Goban Spur near 49° 30'N 12°W before arriving at the EC station at noon on 22 August. Within 24 hours it had become obvious that this was not going to be a good cruise. The initial Bathysnap deployment timed out (as it should) during descent and could not be re-activated (as it shouldn't). Also on this rig was a navigational transponder - which also failed. During the afternoon the Chief

Engineer reported a problem with one of the main propulsion motors. No immediate solution could be found, and as a result we experienced periods during the first part of the cruise when the main propulsion had to be closed down, and we were dependent on the bow-thruster alone. During the second deployment (and the first at the EC site using the main winch), one of the winch motors overheated and the box corer had to be left on the bottom for some minutes. On recovery, the box core was found to contain no sample. In view of subsequent trouble with the box corer, the failure to sample may or may not have been attributable to the winch. Deployment 4 was an epibenthic sledge. Following a false start when the weak link parted and the sledge frame was quite badly bent against the ship, the sledge was finally got away. Traces on the chart recorder were very confused, but all was clarified later when the sledge became fast and the bridles parted resulting in a total loss of the gear. We had discovered a hitherto unrecorded seamount! Ben Billett as the 800m feature became known, was named for Dave Billett who was actually driving the sledge, but as most of us had a hand in the loss, it could have been named for anyone. Ben Billett is euphonious whereas Ben Thurston doesn't sound so good. At this point Tony, as principal scientist, felt like abandoning the cruise completely. However, reasoning that things had to get better, decided to stay. He was right - just! Despite uniformly excellent weather, the box-corer proved extremely reluctant to take any samples, and required extensive repairs on several occasions when, after premature triggering in midwater, the gimbal pins had to be rewelded. Also, and of more general significance, the winch problem grumbled on, precluding the operation of towed gear as opposed to vertical wire work. The problem was finally cured by removing the offending motor, which had to be stripped down, repaired, cleaned and reassembled.

Those of you who were on *Meteor* cruise 6 Leg 7A in May 1988 will know that IOSDL has a good relationship with our Royal Air Force. I'm sure that you will remember the flying display following the drop of a replacement camera on that occasion. On the present cruise, too, we needed help from the RAF to get to us several small but vital items. On the day of the drop there was no wind, but visibility was very poor. It was disconcerting to have a Nimrod make a pass directly overhead and yet not see the plane at all. It was even more disconcerting to have the pilot call us up and ask what was the height of our mast! At one stage it looked as though the drop would not take place - we were told "We'll just pop up and do a couple of passes over the *Queen Elizabeth II* a hundred miles north, then come back and see if the visibility is any better"! Fortunately it was.

Despite the catalogue of accidents, the cruise was something of a success, although we did not get down to the southern station beyond Madeira as we had planned. That will have to wait until 1990. We collected a lot of data together with samples from 15 multiple corers, 7 box corers, 5 epibenthic sledges and 5 other trawls, and everyone was satisfied with what they had achieved. Most significantly, we obtained ample evidence of phytodetritus (fluff) on the bottom, and of its significance to the benthic organisms.

Mike Thurston



Some recent observations on phytodetritus-inhabiting foraminifera

Benthic foraminifera occupy a variety of infaunal, epifaunal and suprabenthic microhabitats in the deep-sea. In 1986, aggregates of phytodetritus (rapidly sedimented material from the euphotic zone) collected in the BIOTRANS area (47°00'-47°30'N, 19°-20°W 4550m) were found to be inhabited by certain epifaunal foraminiferal species which, it was suggested, responded opportunistically to the arrival of this material on the seafloor (Gooday 1988). Since this discovery, work has progressed on several fronts. 1) Assemblages of phytodetritus-dwelling foraminifera have been observed in samples collected in 1982 at a much shallower site (1350m) in the Porcupine Seabight (Gooday & Lambshead in press). 2) Samples taken before detritus deposition at this bathyal site, and from the BIOTRANS locality indicate that such species undergo rapid population fluctuations in response to seasonal organic pulses (Gooday & Lambshead in press; Gooday & Turley in press). 3) Evidence is accumulating that phytodetritus provides a food source for the foraminifera which probably feed selectively on small algae and cyanobacteria (Gooday & Turley in prep.).

During *Discovery* Cruise 185 (August/September 1989) phytodetritus was collected in some quantity from a 4800m station on the Porcupine Abyssal Plain (49°N, 16°W). When time permitted (which was infrequently!), observations were made on fresh aggregates using a Zeiss epifluorescence microscope, kindly made available by Dr. Dai Roberts (Queens University, Belfast). Some additional fixed material was examined after the cruise. Individual aggregates (up to 8mm in size) contained between 0 and 12 live benthic foraminifera. Eleven species were recognised among 137 specimens from 36 aggregates (Table 1). The taxonomic composition of the assemblage is very similar to that found in the BIOTRANS area (Gooday 1988). Seven species occurred at both sites and the three most abundant species (*A. weddellensis*, *E. exigua*, *Tinogullmia* sp. nov.) were the same. There is some indication that species are unevenly distributed on the between-deployment scale. In particular, *Tinogullmia* sp. nov. is common in one sample (#26) and uncommon in the other two. Patchiness perhaps also exists on the scale of individual aggregates. For example, the three specimens of *Tinogullmia* sp. nov. found in sample #6 all occurred in a single aggregate.

The epifluorescence microscopy carried out during this cruise consolidates earlier indications that the foraminifera are ingesting microorganisms associated with phytodetritus. The protoplasm of *Tinogullmia* sp. nov. contained probable cyanobacteria (bright orange autofluorescence under green excitation) and calcareous species (*A. weddellensis*, *E. exigua* and others) contained algal cells. A TEM investigation of this material is currently underway to gain more precise information on the diets of these species (Gooday, Turley and Green, in prep.).

The material collected during *Discovery* cruise 185 thus adds weight to the hypothesis that opportunistic "bloom feeding" by some benthic foraminiferal species is a widespread phenomenon, at least in the northeast Atlantic. Phytodetritus deposition probably exerts a major influence on the population dynamics of these species.

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Table 1. Live benthic foraminifera in phytodetritus aggregates from Discovery station 11908 (Porcupine Abyssal Plain). Except for the bottom two lines, figures are percentages.

Sample	#6 Core 12	#16 Core 8	#26 Core 1	Total
Allogromiina				
1. <i>Tinogullmia</i> sp. nov.	5.9	5.8	38.2	13.9
2. <i>Allogromiina</i> sp. 1	-	1.9	-	0.7
3. <i>Allogromiina</i> sp. 2	-	1.9	-	0.7
Textulariina				
4. <i>Adercotryma</i> sp.	-	3.8	-	1.5
5. <i>Trochammina</i> sp. 1	9.8	19.2	9.8	12.4
6. <i>Trochammina</i> sp. 2	-	-	2.9	0.7
Rotaliina				
7. <i>Alabaminella weddellensis</i>	13.7	30.8	14.7	20.4
8. <i>Bulimina</i> sp.	9.8	-	5.9	5.1
9. " <i>Cibicides</i> " sp.	2.0	1.9	-	1.5
10. <i>Epistominella exigua</i>	58.8	32.7	29.4	41.6
11. <i>Globocassidulina subglobosa</i>	-	1.9	-	0.7
12. Indet	-	-	2.9	0.7
Total specimens	51	52	34	137
Aggregates examined	12	19	5	36

Andrew Gooday
Institute of Oceanographic Sciences Deacon Laboratory



DIRECTORY OF DEEP-SEA BIOLOGISTS

The questionnaire which appeared in Nos 13 and 14 of the Deep-Sea Newsletter ultimately produced 170 responses. The details provided are summarized on the following pages. If your name is not included, and if you would like it to be in a revised version of the directory to appear in a year or so, please send me the relevant information.

Tony Rice
IOSDL
Wormley, Godalming, U.K.

DIRECTORY OF DEEP SEA BIOLOGISTS

- | | | |
|------------------------------|--|--|
| Alayse-Danet, Mrs Anne-Marie | IFREMER,
BP 70,
29263 Plouzané,
France
tel: 98 224307 | Metabolism of abyssal animals, bacteria-animal relations in hydrothermal vents |
| Allen, Prof. John A. | University Marine Biological Station,
Millport,
Isle of Cumbrae, Scotland KA28 0EG
United Kingdom.
tel: 0475 530581 | Ecology of deep-sea benthos, ecology, biology, Functional morphology, evolution and taxonomy of bivalve molluscs and natant decapod Crustacea. |
| Aller, Dr. Josephine | Marine Sciences Research Center,
S U N Y at Stony Brook,
Stony Brook, NY 11794-5000,
U.S.A.
tel: (516) 689 9679 | Animal/sediment interactions, biogeochemistry. |
| Angel, Dr. Martin V. | Institute of Oceanographic Sciences
Deacon Laboratory,
Wormley, Godalming,
Surrey, GU8 5UB
United Kingdom.
tel: 042 879 4141 | Planktonic ostracods, flux studies, sources and results of variability, deep ocean waste disposal, conservation. |
| Armstrong, Dr. John D. | Zoology Department
University of Aberdeen,
Tillydrone Avenue,
Aberdeen AB9 2TN
United Kingdom. | Fish physiology, ecology and behaviour.
Acoustic telemetry of fish movements and physiological parameters |
| Arnaud, Dr Patrick M. | Station Marine d'Endoume
13007 Marseille,
France
tel: 91 52 91 94 | Mediterranean and Antarctic benthic ecology - special interest molluscs. |
| Bathmann, Dr. Ulrich V. | Sonderforschungsbereich 313,
Universität Kiel,
Olshausenstr. 40,
D 2300 Kiel
Federal Republic of Germany
tel: 0431 880 2381 | Sediment trapping, zooplankton contribution in particle formation, modification and to particle flux. Taxa - calanoid copepods, Foraminifera, Pteropoda. |
| Bergeron, Mr. Werner | Institut für Hydrobiologie und
Fischereiwissenschaft,
Universität Hamburg,
Zeiseweg 9,
D2000 Hamburg 50,
Federal Republic Germany
tel: 040 3807 2737 | Deep-sea zooplankton,
pelagic community structure,
ecology of deep-sea calanoid copepods. |
| Bertrand-Santini, Dr. Denise | Centre d'Océanologie de Marseille,
Station marine d'Endoume,
Rue Batterie des Lions,
13007 Marseille,
France
tel: 91 52 91 94 | Mediterranean Sea, East Atlantic Ocean,
deep fouling, benthos, Amphipoda. |
| Bertelsen Dr. Erik | Zoologisk Museum
Universitetsparken 15,
DK 2100 Copenhagen,
Denmark
tel: 01354111 | Deep-sea midwater fishes; especially Ceratioidei, Saccopharyngoidei, Mirapinnatoidei. |
| Billett, Dr. David S.M. | Institute of Oceanographic Sciences
Deacon Laboratory,
Wormley, Godalming,
Surrey GU8 5UB
United Kingdom
tel: 042 879 4141 | Benthic and benthopelagic biology, taxonomic expertise in echinoderms. |
| Blake, Dr. James A. | Batelle Ocean Sciences,
PO Drawer AH, 397 Washington Street,
Duxbury, Mass. 02331
U.S.A.
tel: (617) 934 0571 | Benthic ecology, systematics of Polychaeta |

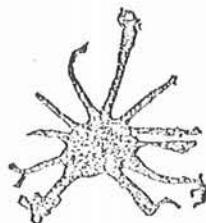
- Blaxter, Prof. John H.S. Dunstaffnage Marine Laboratory,
PO Box 3,
Oban, Argyll,
Scotland PA34 4AD,
United Kingdom
tel: 0631 62244
- Bouchet, Dr. Philippe Museum National d'Histoire Naturelle,
55 Rue Buffon,
75005 Paris,
France
tel: (1) 43 31 38 95
- Boudrias, Mr. Michel Andre, Marine Biology Research Division,
Scripps Institution of Oceanography,
La Jolla, Calif. 92093,
U.S.A.
tel: (619) 534 2665
- Boury-Esnault Dr. Nicole Centre d'Océanologie de Marseille,
Station Marine d'Endoume,
Rue de la Batterie des Lions,
13007 Marseille,
France
tel: 91 52 91 94
- Bousfield, Dr. Edward L. Curator Emeritus Invertebrate Zoology,
National Museum of Natural Sciences,
PO Box 3443, Station 'D', Ottawa,
Canada K1P 6P4
tel: (613) 954 7678
- Brattegard, Dr. Torliev Department of Marine Biology,
N - 5065 Blomsterdalen,
Norway
tel: (05) 22 62 00
fax: (05) 22 62 01
- Brown, Dr. Betsy Battelle Marine Science
439 West Sequim Bay Road,
Sequim, WA 98382,
U.S.A.
tel: (206) 683 4151
- Burnett, Mr. Bryan Meixa Tech,
531 Encinitas Blvd, Suite 111
Encinitas, CA 92024,
U.S.A.
tel: (619) 436 7714
- Cals, Mr. Philippe Université Pierre et Marie Curie,
12 rue Cuvier,
75005 Paris,
France
tel: 43 36 25 25
- Carey, Dr. Andrew G. College of Oceanography,
Oregon State University,
Oceanography Admin Bldg. 104,
Corvallis, Oregon 97331-5503,
U.S.A.
tel: (503) 754 2525
- Cary, Mr. S. Craig Scripps Institution of Oceanography,
A-002, Marine Biology,
La Jolla,
California 92093
U.S.A.
tel: (619) 534 6649
- Casanova, Dr. Jean-Paul Laboratoire de Biologie Animale
(Plancton),
Université de Provence,
Place Victor Hugo,
13331 Marseille Cedex 3,
France
tel: 91 95 9071
- Christiansen, Mr. Bernd Institut für Hydrobiologie und
Fischereiwissenschaft,
Universität Hamburg,
Zeiseweg 9,
D 2000 Hamburg 50
Federal Republic of Germany.
tel: 040 3807 2733
- Vertical migration, pressure effects on fish,
schooling, larval fish, reproductive strategies.
- Taxonomy of deep-sea Gastropoda,
larval biology.
- Swimming in crustaceans - particularly amphipods,
cumaceans, isopods and tanaids.
Benthic ecology - especially fluid flow-animal
interactions. Hydrothermal vents - community ecology.
Deep-sea photography, use of submersibles in research.
- Porifera - evolution, Atlantic and Mediterranean sponge
fauna.
- Deep-sea amphipods - Lysianassoidea, Pleustidae,
Phoxocephaloidea, Ingolfiellidea. Morphology,
phylogeny, life style, life history.
- Norwegian Sea, benthopelagic fauna, Crustacea -
Mysidacea in particular
- Polychaete systematics especially Sedentaria, benthic
productivity
- Nanobenthos, nodules: organism involvement in metal
accretion.
- Crustaceans of various modes of life, biogeography
and plate tectonics.
- Community ecology, food webs, environmental
interactions, polar ecology.
- Deep-sea hydrothermal and seep fauna - general
ecology of vent and vent like habitats.
- Deep Chaetognatha.
- Benthopelagic nekton - scavengers - amphipods.
Megabenthos - deep-sea photography.

- Clark, Miss Ailsa M. Gyllyngdune,
South Road,
Wivelsfield Green,
Haywards Heath, Sussex
RH17 7QS
United Kingdom
tel: 044 484 357 Systematics of Asteroidea/Crinoidea
- Coomans, Dr. Henry, E. Department of Malacology,
Institute of Taxonomic Zoology,
Zoological Museum,
University of Amsterdam,
Mauritskade 57,
PO Box 4766,
1009 AT Amsterdam,
The Netherlands
tel: (020) 525 6474 Caribbean Mollusca (Conidae).
- Cutler, Dr. Edward B. Utica College,
Burrstone Road,
Utica, New York 13502,
U.S.A.
tel: (315) 792 3150 Systematics and phylogeny of Sipuncula,
Zoogeography of continental slopes.
- Dando, Dr. Paul R., Marine Biological Association of UK,
Citadel Hill,
Plymouth, Devon,
PL1 2PB,
United Kingdom
tel: 0752 222772 Chemoautotrophy, especially symbiotic associations
between bacteria and invertebrates, chemistry of
reducing sediments, the use of stable isotopes in
tracing nutritional pathways.
- Dau Dr. Bruno Centre des Sciences de la Terre,
6 boulevard Gabriel,
Dijon,
France
tel: 80 39 6371 Sea urchins (Holasteroids), evolution, ontogeny.
- Davie Dr. Gareth J. Institute of Offshore Engineering,
Heriot-Watt University,
Research Park, Riccarton,
Edinburgh, Scotland
United Kingdom
tel: 031 449 5111 Benthic ecology, feeding strategies, scaphopods,
disturbance effects, environmental impact
assessment.
- Dean, Dr. Harlan K. Department of Invertebrates,
Museum of Comparative Zoology,
Harvard University,
26 Oxford Street,
Cambridge, Mass. 02138,
U.S.A.
tel: (617) 495 2472 or 2468 Organic enrichment in the deep sea, community
and population ecology of deep sea polychaetes,
population ecology and geographic variation of
deep sea molluscs.
- de Bo Dr. Francis CNRS
Université Pierre et Marie Curie,
Laboratoire Arago,
F 66650 Banyuls sur Mer,
France
tel: 68 88 00 40 Marine free living nematodes, statistical analysis,
meiofauna metabolism.
- Demin r. Jody W. School of Oceanography WB-10,
University of Washington,
Seattle, Washington, 98195,
U.S.A.
tel: (206) 543 0833 Psychrophilic, thermophilic and barophilic marine
bacteria.
- Jesbruyeres, Dr. Daniel M. Département Environnement Profond (DERO/EP), Polychaetous annelids, hydrothermal vent biology and
ecology, deep-sea biology/macrobenthos, recolonisation
experiments.
Centre de Brest,
IFREMER
BP 70,
29263, Plouzané,
France
tel: 98 224301
- L'Hondt, Dr. Jean-Loup L. Muséum National d'Histoire Naturelle,
Lab. de Biologie des Invertébrés
Marins et Malacologie,
57 rue Cuvier,
F- 75005 Paris,
France
tel: 16 (1) 45 87 36 30 Bryozoa (Ctenostomida and Cheilostomida), bathyal to
hadal.
- Pinet, Dr. Alain H.R., Centre de Recherche en Ecologie Marine
et Aquaculture (CREMA),
PO Box 5,
17137 L'Houmeau,
France
tel: 46 50 94 40 Ecology of deep-sea and hydrothermal vents meiofauna,
Taxonomy of harpacticoid copepods (Crustacea)

- | | | |
|---------------------------|---|--|
| Ellis, Dr. Derek V. | Biology Department,
University of Victoria,
Victoria, B.C.,
Canada V8W 2Y2
tel: (604) 721 7106 | Mining impact on benthos |
| Emig, Dr. Christian C., | Station Marine d'Endoume,
Rue de la Batteries des Lions,
13007 Marseille,
France
tel: 91 52 91 94 | Biology of Brachiopoda
ROV technology |
| Felbeck, Dr. Horst | Scripps Institution of Oceanography,
A-002,
La Jolla, California 92093,
U.S.A.
tel: (619) 534 6647 | Biochemistry and physiology of hydrothermal
vent animals, application of molecular biology
techniques in marine biology. |
| Ferrari, Dr. Frank, | SOSC/MSO,
Museum of Natural History,
Smithsonian Institution,
Washington, D.C. 20560
U.S.A.
tel: (202) 287 3797 | Distribution of sex and asymmetry in <u>Pleuromamma</u>
<u>xiphias</u> , spermatophore dimorphism in deep water
<u>Euchaeta</u> . |
| Fiala-Medioni, Dr. Aline | Laboratoire Arago,
66650 Banyuls sur Mer,
France
tel: 68 88 00 40 | Nutrition and energetic budgets in filter feeders
structural and biochemical adaptations in relation
to the nutrition of bivalve molluscs, symbiosis rel-
ationships between bacteria and bivalve molluscs. |
| Foell, Mr. Eric J. | PO Box 36,
Gloucester Point,
Virginia 23062,
U.S.A.
tel: (804) 642 3496 | Environmental effects of deep-sea mining, abyssal
megafaunal assemblages, occurrence and distribution
megafaunal analysis based on videotapes and
photographs. |
| France, Mr. Scott C. | Scripps Institution of Oceanography,
A-008,
La Jolla, Calif. 92093-0208,
U.S.A.
tel: (619) 534-2665 | Dispersal/distribution of deep-sea benthos,
hydrothermal vent community ecology
ecological genetics. |
| Gage, Dr. John D. | Scottish Marine Biological Association
Dunstaffnage Marine Laboratory,
PO Box 3, Oban,
Argyll, Scotland, PA34 4AD
United Kingdom
tel: 0631 62244 | Structure and dynamics of deep-sea benthic community,
quantification of deep-sea secondary production and
analysis of environmental controls, taxonomic expertise
in deep-sea echinoderms (family Myriostrochidae) and
bivalve molluscs. |
| Gaill, Miss Francoise, | CHRS,
Centre de Biologie Cellulaire,
67 Rue Maurice Gunsbourg,
94205 Iury Cedex,
France
tel: 46 72 18 00 | Annelids and vestimentiferan, hydrothermal vents,
studies on the integument, structural, biophytic
and biochemical studies, more generally studies on
the interface of the organisms with their environm |
| Gartner, Mr. John V. | Department of Marine Science,
University of South Florida,
140 7th Avenue SE
St. Petersburg, Fla 33701,
U.S.A.
tel: (813) 893 9130 | Deep-sea ecology (esp. Fishes) including age, growth,
reproduction, trophodynamics, parasitology, vertical
distribution and abundances, benthic/pelagic
interaction. Taxonomic expertise - meso- and bathy-
pelagic fishes, especially Family Myctophidae.
Also families with most groups invertebrates
especially caridean shrimps. |
| Geistdoerfer, Dr. Patrick | Laboratoire d'Ichtyologie,
Museum National d'Histoire Naturelle,
43 rue Cuvier,
F-75005 Paris,
France
tel: (1) 43 31 40 10 | Deep-sea fishes (benthic, benthopelagic, pelagic) |
| Genin, Dr. Amatzia | H. Steinitz Marine Biology Laboratory,
The Hebrew University of Jerusalem,
PO Box 469, Eilat 88103,
Israel
tel: 059 76181 | Hard-bottom fauna (Antipatharia, Crinoida, Porifera
Gorgonacea), vertical fluxes, interactions between
benthic and pelagic factors. |

- George, Prof. Robert Y. Center for Marine Science Research,
University of North Carolina
at Wilmington,
Wilmington,
North Carolina, 28403
U.S.A.
tel: 919 799 4722
919 256 3721
- Taxonomy: isopod crustacea, high pressure physiology,
origin and evolution of deep sea fauna, man's impact
on abyssal environments.
- Giere, Dr. Olav, Universität Hamburg,
Zoologische Institut
u. Zoologisches Museum,
Martin Luther King Platz 3,
2000 Hamburg 13,
Federal Republic of Germany
tel: (040) 4123 3865
- Structure and ecophysiology of "sulfide animals" from
all different habitats (vents, muds, mangroves etc.)
- Gooday, Dr. Andrew J. Institute of Oceanographic Sciences
Deacon Laboratory,
Wormley, Godalming,
Surrey, GU8 5UB
United Kingdom
tel: 042 879 4141
- Taxonomy and ecology of benthic Foraminifera.
- Gordon, Dr. John D.M. Scottish Marine Biological Association,
Dunstaffnage Marine Laboratory,
PO Box 3, Oban,
Argyll, Scotland, PA34 4AD
United Kingdom
tel: 0631 62244
- Deep-sea benthopelagic fish; sampling the deep-sea with
trawls; age, growth, reproduction and feeding of fish.
- Gordon, Dr. Malcolm S. Department of Biology,
University of California,
Los Angeles, Calif. 90024,
U.S.A.
tel: (213) 825-4579 or -3481
- Ecological physiology of fishes
Environmental physiology,
Effects of high hydrostatic pressures on organisms.
- Grassle, Dr. J. Frederick Woods Hole Oceanographic Institution
Woods Hole,
MA 02543,
U.S.A.
tel: (617) 548 8925
- Population and community ecology, polychaetes.
- Greene, Dr. Charles H. Section of Ecology & Systematics,
Corson Hall,
Cornell University,
Ithaca, New York 14850,
U.S.A.
tel: (607) 255 4703
- Zooplankton and micronekton ecology, crustaceans
(especially copepods and euphausiids), gelatinous
zooplankton (especially ctenophores), fisheries -
oceanography.
- G , Dr. Laurence CHRS,
Laboratoire Arago,
66650 Banyuls sur Mer,
France
tel: 68 88 00 40
- North western Mediterranean slope - ecology, meiofauna
and particularly harpacticoid copepods - nutrition -
experimentation.
- He, Dr. Alain Biologie des Invertébrés Marins,
Muséum National d'Histoire Naturelle,
55 rue Buffon,
75005 Paris,
France
tel: 43 31 38 95
- Bathyal ecology, biogeography, echinoderms.
- Haedrich, Dr. Richard Director, Ocean Sciences Center,
Memorial University of Newfoundland,
St John's, Newfoundland A1B 3X7
Canada
tel: (709) 726 6681 or 737 8833
- Biogeography, community structure, size spectra,
benthos and midwater, fishes (Stromateoidei).
- Hammer, Dr. William M. Department of Biology,
University of California Los Angeles,
Los Angeles, Calif. 90024,
U.S.A.
tel: (213) 825 9302
- Coelenterates, Crustacea, Ctenophores, behavioural
biology of oceanic animals.
- Hargrave, Dr. Barry T. Habitat Ecology,
Biological Sciences,
Bedford Institute of Oceanography,
PO Box 1006, Dartmouth,
Nova Scotia,
Canada B2Y 4A2
tel: 902-426-3188
- Benthic community energetics, Amphipod feeding ecology
Bacterial geochemistry, Animal-sediment relations.

Hargreaves, Mrs Patricia M.D.	Institute of Oceanographic Sciences Deacon Laboratory, Wormley, Godalming, Surrey, GU8 5UB United Kingdom tel: 042 879 4141	Ecology of decapods, euphausiids, mysids.
Harmelin, Dr. Jean-Georges	Station Marine d'Endoume, 13007 Marseille, France tel: 91 52 91 94	Bryozoa - biogeography/systematics; relationships between deep-sea and littoral cryptic assemblages.
Harvey, Mr. Robin,	Dunstaffnage Marine Laboratory, PO Box 3, Oban, Argyll, Scotland, PA34 4AD United Kingdom tel: 0631 62244	Echinoderms, bivalves, deep-sea benthos.
Hecker, Dr. Barbara	Lamont Doherty Geological Observatory, Palisades, New York 10960, U.S.A. tel: (914) 359 2900	Megafaunal zonation and trophic structure, seep taxa, and their evolution.
Heeger, Mr. Thomas	SFB 313 Universität Kiel, Olshausen Str. 40, D 2300 Kiel, Federal Republic of Germany tel: 0431 880 2343	Benthos, Foraminiferans, Scyphozoans (cnidocysts).
Heip, Dr. Carlo	Delta Institute for Hydrobiological Research, Vierstraat 28, 4401 EA Yerseke, Netherlands tel 1131 1920	Meiofauna
Hellal, Dr. Ahmed M.	Al-Azhar University, Faculty of Science, Zoology Department, Nasr City, Cairo, Egypt tel: Cairo 606776	Structure and distribution of deep sea fauna - Echinoderms, marine ecosystems - Red Sea.
Hendler, Dr. Gordon	Museum of Los Angeles County, 900 Exposition Boulevard, Los Angeles, Calif. 90007 U.S.A. (213) 744 6391	Echinodermata (particularly Ophiuroidea)
Herring, Dr. Peter J.	Institute of Oceanographic Sciences Deacon Laboratory, Wormley, Godalming, Surrey, GU8 5UB United Kingdom tel: 042 879 4141	Bioluminescence, vision, pigments, deep-sea physiology.
Hessler, Prof. Robert, R.	Scripps Institution of Oceanography A-002, La Jolla, California 92093, U.S.A. tel: (619) 534-2665	Soft-bottom ecology, biogeography, hydrothermal v ecology, Isopoda and Leptostraca (Crustacea: Malacostraca) - systematics, natural history, or phylogeny, anatomy.
Horikoshi, Prof. Masuoki	Dept. of Biology, Faculty of Science, Chiba University, Yayoichô 1-33, Chiba City, 260 Japan	Mero- and megabenthic community species composition, biomass, ecological distribution, physiognomy and site factors. Taxonomic interest: Mollusca (Vesicomidae).
Hulsemann, Dr. (Mrs) Kuni	Biologisches Anstalt Helgoland, Notkestr. 31, 2000 Hamburg 52, Federal Republic of Germany tel: 040 89693	Copepoda Calanoida: taxonomy, development, distribution, biogeography.



Jannasch, Dr. Holger, W.	Woods Hole Oceanographic Institution, Woods Hole, Mass. 02543, U.S.A. tel: (671) 548 1400	Deep-sea microbiology, microbial barophilism and psychrophilism, microbial metabolism and survival at low nutrient levels, physiology and ecology of deep sea hydrothermal vent bacteria, symbiosis in deep-sea invertebrates, extremely thermophilic hydrothermal vent bacteria.
Juniper, Dr. Kim	Department of Biology, University of Victoria, Victoria, B.C. Canada V8W 2Y2 tel: (604) 721 7019	Biogeochemistry/microbial ecology, hydrothermal vents and cold seeps.
Just, Dr. Jean	Museum of Victoria, 71 Victoria Crescent, Abbotsford, 3067 Victoria, AUSTRALIA tel: 03 4195200	Slope benthos, biogeography, evolution, Isopoda, Amphipoda - taxonomy.
Khripounoff, Dr. Alexis	IFREMER, Centre de Brest, BP 70, 29263 Plouzané, France tel: 98 22 43 02	Relation between deep-sea benthos and vertical organic flux, energy budget in deep-sea ecosystems.
Kinzer, Dr. Johannes	Institut für Meereskunde, Dusternbrooker Weg 20, D 2300 Kiel 1, Federal Republic of Germany tel: 0431 597 3912	Mesopelagic fish (myctophids, sternoptychids), feeding ecology, deep scattering layers.
Kirkegaard, Dr. Jorgen B.	Zoologisk Museum, Universitetsparken 15, DK 2100 Copenhagen Ø, Denmark tel: 01354111	Abyssal and bathyal polychaetes
Knudsen, Dr. Jorgen	Zoologisk Museum, Universitetsparken 15, DK 2100 Copenhagen Ø, Denmark	Deep-sea bivalvia.
Kukert, Mr. Helmut	School of Oceanography, WB-10, University of Washington, Seattle, Washington 98195, U.S.A. tel (206) 543 4911	Community processes of deep-sea macrofauna in sedimentary environments
Lead, Dr. P. John D.	Department of Zoology, British Museum (Natural History) Cromwell Road, London SW7 5BD United Kingdom tel: 01 938 8731	Marine nematodes, benthos, community structure, disturbance ecology.
Lea, Dr. Richard S.	Institute of Oceanographic Sciences Deacon Laboratory, Wormley, Godalming, Surrey, GU8 5UB United Kingdom tel: 042 879 4141	
Laubier, Dr. Lucien	IFREMER, 66 Avenue d'Iena 75116 Paris France tel: (1) 47 23 55 28	General deep-sea benthic ecology, polychaetes systematics and biogeography, hydrothermal and cold seeps assemblages.
Lemaitre, Dr. Rafael	Smithsonian Oceanographic Sorting Center National Museum of Natural History, Washington, D.C. 20560, U.S.A.	Systematics, zoogeography & ecology of Parapaguridae
Levi, Dr. Claude	Laboratoire de Biologie des Invertébrés marins, Muséum National d'Histoire Naturelle, 57 rue Cuvier, 75005 Paris, France tel: (1) 45 87 36 30	Deep sea (slope) sponges

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|----------------------------------|--|---|
| Levin, Dr. Lisa A. | Box 8208,
Dept of Marine, Earth and Atmospheric
Sciences,
North Carolina State University,
Raleigh, NC 27695-8208,
U.S.A.
tel: (919) 737 7840 | Infaunal community structure, seamounts, continental
slope, polychaeta, agglutinating Protozoa
(Xenophyphorea, Foraminifera). |
| Lloris, Dr. Domingo, | Instituto de Ciencias del Mar,
Paseo nacional s/n,
08003 Barcelona,
Spain
tel: (3) 310 64 50 | General deep ichthyology, biogeography. |
| Lochte, Dr. Karin, | Institut für Meereskunde,
Abt. Mikrobiologie,
Düsternbrooker Weg 20,
D 2300 Kiel,
Federal Republic of Germany
tel: 0431 597 3947 | Deep-sea microbiology, degradation of organic matter
and energy flux through microorganisms. |
| MacDonald, Mr. Ian R. | Department of Oceanography,
Texas A&M University,
College Station, Texas 77843,
U.S.A.
tel (409) 845 3839 | Hydrocarbon, deep communities, visual analysis. |
| Maciolek, Dr. Nancy J. | Battelle Ocean Sciences,
PO Drawer AH 397 Washington Street,
Duxbury, Mass. 02331,
U.S.A.
tel: (617) 934 0571 | Benthic ecology, systematics of polychaeta. |
| Mahaut, Mrs Marie-Laure | IFREMER,
BP 70,
29263 Plouzané,
France
tel: 98 22 43 03 | Deep-sea megafauna, food web modelling, benthic
ecology. |
| Mallefet, Dr. Jerome C. | Laboratoire de Physiologie Animale,
Université Catholique de Louvain,
Claude Bernard pl. croix du sud 5,
B-1348 Louvain La Neuve,
Belgium
tel: 010 47 34 76 | Bioluminescence of fishes, physiology, morphology,
biochemistry. |
| Manning, Dr. Raymond B. | Dept. of Invertebrate Zoology,
NIIB Stop 163,
Smithsonian Institution,
Washington, D.C. 20560,
U.S.A.
tel: (202) 357 4668 | Systematics of decapod and stomatopod Crustacea. |
| Mariano, Mr. Lastra V. | Departamento de Biología Animal,
Facultad de Biología,
Universidad de Santiago,
Santiago de Compostella,
La Coruña,
Spain
tel: (981) 596904 | Communities, population dynamics, polychaetes,
molluscs, amphipods. |
| Matthews, Prof. John (Jack) B.L. | Dunstaffnage Marine Laboratory,
PO Box 3,
Oban, Argyll,
Scotland, PA34 4AD
United Kingdom
tel: 0631 62244 | Zooplankton ecology, Crustacea especially Copepoda. |
| Mauchline, Dr. John | Scottish Marine Biological Association,
Dunstaffnage Marine Laboratory,
PO Box 3, Oban,
Argyll, Scotland, PA34 4AD
United Kingdom
tel: 0631 62244 | Biology of meso- and bathypelagic organisms, especially
crustacean calanoid copepods, mysids and euphausiids. |
| McFall-Ngai, Dr. Margaret | Scripps Institution of Oceanography,
A-002,
La Jolla,
Calif. 92093,
U.S.A.
tel: (619) 534 4718 | Vision in deep-sea fishes, adaptation of proteins
to high pressure - vertebrates and invertebrates. |

Meadows, Mr. Peter S.	Department of Zoology, University of Glasgow, Glasgow, United Kingdom tel: 041 339 8855	Sediment/benthos interactions, bioturbation, microbial activity, sediment properties.
Merrett, Mr. Nigel R.	Department of Zoology, British Museum (Natural History), Cromwell Road, London SW7 5BD, United Kingdom tel: 01 938 9430	Deep-sea fish taxonomy and ecology, especially reproductive and population biology, taxonomic groups of special interest - Macrouridae, Synphobranchidae, Liparidae and Ipnopidae.
Miller, Mr. John E.	Harbor Branch Oceanographic Institution 5600 Old Dixie Highway, Fort Pierce, Florida 34946, U.S.A. tel: (407) 465 2400	Systematics and ecology (behaviour) of bathyal echinoderms - Western Atlantic.
Mohr, Mr. John L. (Prof. emeritus)	3819 Chanson Drive, Los Angeles, CA 90043-1601, U.S.A. tel: (213) 295 5664	Parasitic and epizotic ciliates, especially chonotrich and chilotrich ciliates on crustaceans
Monniot, Dr. Claude	Laboratoire de Biologie des Invertébrés Marins et Malcologie, Museum National d'Histoire Naturelle, 55 Rue Buffon, 75005 Paris, France tel: 43 31 38 95	Tunicata - taxonomy, parasitism - worldwide.
Monniot, Dr. (Mrs) Francoise	Laboratoire de Biologie des Invertébrés Marins et Malcologie, Museum National d'Histoire Naturelle, 55 Rue Buffon, 75005 Paris, France tel: 43 31 38 95	Tunicates - taxonomy, ecology, distribution, Pharmacology.
Morita, Prof. Richard Y.	Department of Microbiology, Oregon State University, Corvallis, Oregon 97331-3804, U.S.A. tel: (503) 754 4441	Barophilic bacteria, hydrostatic pressure effects on microbial physiology, psychrophilic bacteria, starvation-survival of microbes.
Mullineaux, Dr. Lauren S.	Woods Hole Oceanographic Institution, Woods Hole, Mass. 02543, U.S.A. tel: (617) 548 1400	Larval settlement in boundary-layer flows, encrusting fauna of manganese nodules and crust, agglutinated Foraminifera.
Newman, Prof. William A.	Scripps Institution of Oceanography A-002, La Jolla, California 92093, U.S.A. tel: (619) 534 2150	Biogeography, systematics of Cirripedia (barnacles), past and present oceanic islands.
Nielsen, Dr. Jørgen	Zoologisk Museum, Universitetsparken 15, DK 2100 Copenhagen Ø, Denmark tel: 01354111	Systematics of fish - Order Ophidiiformes and suborder Saccopharyngoidei.
Ohta, Dr. Suguru,	Marine Ecology Division, Ocean Research Institute, University of Tokyo, Minamidai 1-15-1, Nakano-ku, Tokyo 164, Japan tel: 03 376 1251	Benthic ecology, deep-sea hydrothermal vent and cold seep communities, echinoderms - taxonomy and ecology.

Patching, Dr. John W.	Department of Microbiology, University College, Galway, Eire tel: 091 24411	In situ measurements of sediment/water interchange, bacterial biomass and activity in mid/deep waters.
Paterson, Mr. Gordon L.J.	Department of Zoology, British Museum (Natural History) Cromwell Road, London SW7 5BD United Kingdom tel: 01 938 9414	Polychaetes, community structure, disturbance ecology, biogeography.
Pawson, Dr. David L.	Room W323, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560, U.S.A. tel: (202) 786 2127	Deep-sea megafauna, especially echinoderms.
Pequegnat, Dr. Linda H.	8463 Paseo del Ocaso, La Jolla, Calif. 92037, U.S.A. tel: (619) 459 4885	Decapod crustaceans (caridean shrimps and galatheid crabs).
Pequegnat, Dr. Willis E.	As above	Deep-sea ecology, galatheid crabs (Decapoda, Crustacea).
Petersen, Dr. Mary E.	Zoologisk Museum, Universitetsparken 15, DK 2100 Copenhagen Ø, Denmark tel: 45 01 35 41 11	Polychaete systematics, (Cirratulidae and Chaetopteridae).
Pfannkuche, Dr. Olaf	Universität Hamburg, Institut für Hydrobiologie u. Fischereiwissenschaft, Hydrobiologische Abteilung, Zeiseweg 9, D 2000 Hamburg 50, Federal Republic of Germany tel: 40 3807 2565 telex 214565 ihf hh d	Energetics of benthos, macro- meiofauna, Oligocha-
Priede, Dr. Imants G.	University of Aberdeen, Department of Zoology, Tillydrone Avenue, Aberdeen, AB9 2TN, Scotland, United Kingdom tel: 0224 272873 telex: 73458 uniabn G fax: 0224 487048	Acoustic and satellite tracking techniques, energetics and behaviour of fishes - Osteichthyes, Chondrichthyes.
Prieur, Dr. Daniel	LP 4601 CNRS, Station Biologique, 29211 Roscoff, France tel: 98 03 16 94	Bacterial communities from hydrothermal vents.
Pugh, Dr. Philip R.	Institute of Oceanographic Sciences Deacon Laboratory, Wormley, Godalming, Surrey GU8 5UB, United Kingdom tel: 042 879 4141	Ecology of gelatinous organisms - particularly siphonophores.
Rex, Dr. Michael A.	Department of Biology, University of Massachusetts at Boston, Harbor Campus, Boston, Mass. 02125, U.S.A. tel: (617) 929 8387	Deep-sea Gastropoda - systematics and biogeography, community structure and evolution of deep-sea benthos.
Rice, Dr. Anthony L.	Institute of Oceanographic Sciences Deacon Laboratory, Wormley, Godalming, Surrey, GU8 5UB, United Kingdom tel: 042 879 4141	Benthic megafauna, particularly decapod crustaceans, spatial distribution and abundance, seasonality, larval development.

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|----------------------------|--|--|
| Riemann, Dr. Franz | Alfred Wegener Institut für Polar- und Meeresforschung,
D-2850 Bremerhaven 1,
Federal Republic of Germany
tel: 0471 4831 520 | Nematodes (free living, aquatic) - taxonomy and ecology, role of mucus in aquatic environment, amorphous rhizopodan protists (Labyrinthomorphs, xenophyophores, komoki). |
| Riemann-Zürneck, Dr. Karin | Alfred Wegener Institut für Polar- und Meeresforschung,
D-2850 Bremerhaven 1,
Federal Republic of Germany
tel: 0471 4831 532 | Deep-water sea anemones (subtidal - abyssal) - taxonomy and ecology, larval ecology of benthic invertebrates. |
| Robison, Dr. Bruce H. | MBARI,
160 Central Avenue,
Pacific Grove,
California 93950,
U.S.A.
tel: (408) 649 4616 | Midwater ecology - particularly fishes, cephalopoda and gelatinous animals; benthic ecology and community structure; submersibles, ROV's and advanced technology. |
| Rowe, Dr. Gilbert T. | Department of Oceanography
Texas A&M University,
College Station,
Texas 77843,
U.S.A.
tel: (409) 845 7211 | Carbon cycling and food chains, zonations, benthic landers, sediment traps. |
| Rucabado, Dr. Jaume | Instituto de Ciencias del Mar,
Paseo nacional s/n,
08003 Barcelona,
SPAIN
tel: 3 310 64 50 | Deep sea ichthyology, biogeography. |
| Schafer, Dr. Charles T. | Geological Survey of Canada,
Bedford Institute of Oceanography,
PO Box 1006,
Dartmouth, N.S.
Canada B2Y 4A2
tel: 902 426 7734 | Benthic Foraminifera, bathyal zone (1000-3000m), species - water mass relationships. |
| Schriever, Dr. Gerd | Institut für Hydrobiologie u.
Fischereiwissenschaft der Univ. Hamburg
c/o Zoologisches Institut
Biologiezentrum,
D 2300 Kiel 1,
Federal Republic of Germany
tel: 0431 880 4163 | Recolonisation of deep-sea benthos in manganese nodule area of S. Pacific, Harpacticoida (Crustacea, Copepoda) - ecology and taxonomy. |
| Shirayama, Dr. Yoshihisa | Ocean Research Institute,
University of Tokyo,
Minamidai 1-15-1,
Nakano-ku,
Tokyo 164,
Japan
tel: 03 376 1251 | Meiofauna ecology - biomass, vertical distribution, respiration, ingestion rates; taxonomic groups - nematodes, xenophyophores, scleractinians, kinorhynchans, loriciferans. |
| Sibuet, Dr. (Mrs) Myriam | IFREMER,
Centre de Brest,
BP 70,
29263 Plouzané,
France
tel: 98 22 43 03 | Deep-sea community structure of epibenthic megafauna, taxonomic groups - holothuroids, asterooids, Flux of organic matter ingested by large detritivores. |
| Siebenaller, Dr. Joseph F. | Department of Zoology & Physiology,
Louisiana State University,
Baton Rouge,
LA 70803,
U.S.A.
tel: (504) 388 1746 | Biochemical adaptation of deep sea by vertebrates and invertebrates, taxonomic groups - Isopoda, Asellota. |
| Sieg, Prof. Dr. Jürgen | Universität Osnabrück,
Abteilung Vechta,
Driverstr. 22,
2848 Vechta,
Federal Republic of Germany
tel: 04441 15 229 | Systematics and taxonomy of Tanaidacea (Crustacea), life-history strategies. |
| Smith, Dr. Craig Randall | Department of Oceanography,
1000 Pope Road,
University of Hawaii,
Honolulu, HI 96822,
U.S.A.
tel: (808) 948 7633 | Benthos, bioturbation, carbon flux, megafauna, succession. |
| Smith, Dr. Kenneth L. | Marine Biology Research Division A-002,
Scripps Institution of Oceanography,
La Jolla, California 92093,
U.S.A. tel: (619) 534 4858 | Marine ecology. |

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|--------------------------|--|---|
| Snelli, Dr. Jon-Arne | Trondheim Biologiske Station,
Bynesvn. 46,
N-7018 Trondheim,
Norway
tel: 07 52 13 58 | Norwegian deep sea Mollusca - systematics,
zoogeography. |
| Soetaert, Miss Karline | State University Ghent,
Ledeganckstraat 35,
B-9000 Ghent,
Belgium
tel: 091 227821 | Meiobenthos, nematodes. |
| Sorbe, Dr. Jean-Claude | Institut de Biologie Marine,
2 rue du Professeur Jolyet,
33120 Arcachon,
France
tel: 56 83 1022 | Structure and evolution of bathyal assemblages
(suprabenthic fauna). |
| Southward, Dr. Alan J. | Leverhulme Unit,
Marine Biological Association,
Citadel Hill,
Plymouth, Devon,
PL1 2PB
United Kingdom
tel: 0752 222772 | Evolution of symbiosis between chemosynthetic bacteria
and invertebrates on the slope/at hydrothermal vents. |
| Southward, Dr. Eve C. | Leverhulme Unit,
Marine Biological Association,
Citadel Hill,
Plymouth, Devon,
PL1 2PB
United Kingdom
tel: 0752 222772 | Deep-sea benthos, Pogonophora |
| Stehmann, Dr. Matthias | Ichthyologie Institut für Seefischerei,
c/o Zool. Institut u. Zool. Museum,
Martin-Luther-King-Platz 3,
D 2000 Hamburg 13,
Federal Republic of Germany
tel: 040 4123 5645 | Chondrichthyan fishes in general and worldwide,
systematics, distribution, biology and ecology of
demersal and benthopelagic deep-sea and confine
slope fishes, including submarine rises and bank
seamounts. |
| Stetter, Dr. Karl O. | Lehrstuhl für Mikrobiologie,
Universität Regensburg,
Universitätsstr. 31,
8400 Regensburg,
Federal Republic of Germany
tel: 0941 9433160 | Marine microbiology, thermophiles. |
| Stock, Prof. Jan H. | Institute of Taxonomic Zoology,
PO Box 4766,
1009 AT Amsterdam,
The Netherlands
tel: 020 525 6435 | Pycnogonida, Copepoda (Poecilostomatoida,
Siphonostomata), Amphipoda (Ingolfiellidae etc). |
| Strömberg, Dr. Jarl-Ove | Kristineberg Marine Biological Station,
Kristineberg 2130,
S-45034 Fiskebäckskil,
Sweden
tel: 46 523 22007 | General interest in isopods, including deep sea
species, biogeography of the Arctic Ocean deep-sea
fauna. |
| Svavarsson, Dr. Jorundur | Institute of Biology,
University of Iceland,
Grensásveg 12,
108 Reykjavik,
Iceland
tel: 1 685625 | Structure and function of arctic deep-sea ecosystem,
particularly benthos, Systematics and zoogeography of
arctic deep-sea asellote isopods (Crustacea). |
| Swinney, Mr. Geoffrey N. | Department of Natural History,
National Museums of Scotland,
Chambers Street,
Edinburgh, EH1 1JF
United Kingdom
tel: 031 225 7534 | Midwater fishes (N E Atlantic). |
| Tendal, Dr. Ole S. | Zoologisk Museum,
Universitetsparken 15,
DK 2100 Copenhagen Ø,
Denmark | Deep-sea photography, deep-sea protozoans, deep-sea
biology, taxonomy and biology of sponges, Komokiacea
(Foraminiferida) and xenophyophores. |
| ten Hove, Dr. Harry A. | Institute of Taxonomic Zoology,
PO Box 4766,
1009 AT Amsterdam,
The Netherlands
tel: 020 5256906 | Serpulidae (Polychaeta). |

Thiel, Prof. Dr. Hjalmar	Universität Hamburg, Institut für Hydrobiologie und Fischereiwissenschaft, Zeiseweg 9, D 2000 Hamburg 50, Federal Republic of Germany tel: 040 3807 2520	Benthos - total community, impact from industrial disturbances.
Thistle, Dr. David	Department of Oceanography, Florida State University, Tallahassee, Florida 32306, U.S.A. tel: (904) 644 6700	Soft-bottom community ecology, harpacticoid copepods.
Thurston, Mr. Michael H.	Institute of Oceanographic Sciences Deacon Laboratory, Wormley, Godalming, Surrey, GU8 5UB United Kingdom tel: 042 879 4141	Macro- and megafaunal biology, ecology and zoogeography, Amphipod biology, ecology and zoogeography, Taxonomy and systematics of: benthic and midwater gammaridean amphipods, hyperiid amphipods, Taxonomy, systematics biology, ecology and zoogeography of parasitoid isopods.
Tilot, Mrs. Virginie	IFREMER Centre de Brest, BP 70, 29263 Plouzané, France	Deep-sea megafauna in Pacific East, impact studies in deep sea bed mining.
Torres, Dr. Joseph J.	Department of Marine Science, University of South Florida, 140 7th Avenue South, St Petersburg, Fla 33701 U.S.A. tel: (813) 893 9131	Physiology of mesopelagic fishes and crustaceans
Troncoso, Jesus	Departamento de Biología Animal, Facultad de Biología, Universidad de Santiago, Santiago de Compostela, La Coruña, Spain tel: (981) 59 6904	Molluscs - systematics, ecology and biology.
Truesdale, Dr. Frank M.	School of Forestry, Wildlife & Fisheries, Louisiana State University, Baton Rouge, LA 70803, U.S.A. tel: (504) 388 4199	Archibenthic Decapoda of the Gulf of Mexico.
Tunncliffe, Dr. Verena	Biology Department, University of Victoria, PO Box 1700, Victoria, British Columbia, Canada V8W 2Y2 tel: 604 721 7135	Biogeography, hydrothermal vents, community structure, geological/biological interactions.
Turley, Dr. Carol M.,	Plymouth Marine Laboratory, Prospect Place, The Hoe, Plymouth, Devon, PL1 3DH, United Kingdom tel: 0752 222772	Deep-sea microbial communities - bacteria and flagellates, microbial decomposition and transformati of phytodetritus in the deep-sea, sedimenting aggregates and flow of energy to deep-sea, deep-sea phytodetritus - its microbial composition.
Tyler, Dr. Paul A.	Department of Oceanography, University of Southampton, Southampton SO9 5NH United Kingdom tel: 0703 595000	Echinoderms, reproduction in echinoderms and molluscs, population biology, feeding.
Vacelet, Dr. Jean	Station Marine d'Endoume, Rue Batteries des Lions, 13007 Marseille, France tel: 91 52 91 94	Sponges, similarities between the littoral cave ecosystem and deep-sea ecosystems.
van der Spoel, Prof. Siebrecht	Institute of Taxonomic Zoology, University of Amsterdam, Mauritskade 61, Postbus 4766, 1009 AT Amsterdam, The Netherlands tel: 020 5257234	Pelagic molluscs and medusae, worldwide taxonomy, zoogeography,

- | | | |
|---------------------------|--|---|
| Van Dover, Cindy Lee | Woods Hole Oceanographic Institution,
Woods Hole,
Mass. 02543,
U.S.A.
tel: (617) 548 1400 | Ecology of hydrothermal vent communities, use of stable isotopes as tracers of food web relationships and of habitat preference, Crustacea. |
| Van Soest, Dr. Rob | Institute of Taxonomic Zoology,
University of Amsterdam,
Mauritskade 61,
Postbus 4766,
1009 AT Amsterdam,
The Netherlands
tel: 020 5256901 | Sponges |
| Weikert, Dr. Horst | Institut Hydrobiologie
und Fischereiwissenschaft,
Universität Hamburg,
Zeiseweg 9,
D 2000 Hamburg 50,
Federal Republic of Germany
tel: 040 3807 2621 or 2781 | Plankton, meso- and bathypelagial, micronekton, specifically euphausiids and copepods. |
| Wenner, Dr. Elizabeth | Marine Resources Research Institute
Box 12559,
Charleston, SC 29412,
U.S.A.
tel: (803) 795 6350 | Deep-sea decapods - habitats and community ecology, reproductive biology. |
| Wheatcroft, Mr. Robert | School of Oceanography, WB-10,
University of Washington,
Seattle,
Washington 98195,
U.S.A.
tel (206) 543 0599 | Bioturbation, biogenic structures, megafauna, carbon flux control of community structure. |
| Williams, Mrs Isabelle P. | Woods Hole Oceanographic Institution,
Woods Hole,
Mass. 02543,
U.S.A.
tel: (508) 548 6450 | Hydrothermal vent ecology, culture and dispersal of larvae of benthic marine invertebrates, larval development and morphology of architectonicid gastropods and brachyuran crabs, systematics of tanaidacean Crustacea. |
| Williams, Miss Ruth | Marine Research Group,
Department of Biology,
University College of Swansea,
Singleton Park,
Swansea SA2 8PP
United Kingdom
tel 0792 205678 | Deep-sea Cirripedia, Pedunculata. |
| Williams, Ms Susan J. | Battelle Ocean Sciences,
1431 Spinnaker Drive,
Ventura, Calif. 93001,
U.S.A.
tel (805) 658 8677 | Polychaete systematics and ecology, deep-sea zoogeography and ecology. |
| Wilson, Dr. George D.F. | Scripps Institution of Oceanography,
A-002,
La Jolla,
Calif. 92093-0202,
U.S.A.
tel: (619) 534 6692 | Systematics of deep-sea Isopoda and other Crustacea, deep-sea community structure, numerical phylogenetics, numerical analysis of community structure, scientific applications of microcomputers. |
| Wilson, Dr. Raymond R. | Department of Marine Science,
University of South Florida,
140 Seventh Ave. South,
St. Petersburg,
Florida 33701,
U.S.A.
tel: (813) 893 9178 or 9131 | Deep-sea fishes, Family Macrouridae. |
| Wishner, Dr. Karen | University of Rhode Island,
Oceanography,
South Ferry Road,
Narragansett, RI 02882
U.S.A.
tel: (401) 792 6402 | Deep-sea and benthic boundary layer zooplankton especially copepods, food webs and feeding rates, biomass and distributions, biological - physical interactions. |
| Wolff, Dr. Torben | Zoologisk Museum,
Universitetsparken 15,
DK 2100 Copenhagen Ø,
Denmark | Deep-sea ecology, Isopoda, Decapoda. |

Yayanos, Dr. A. Aristides

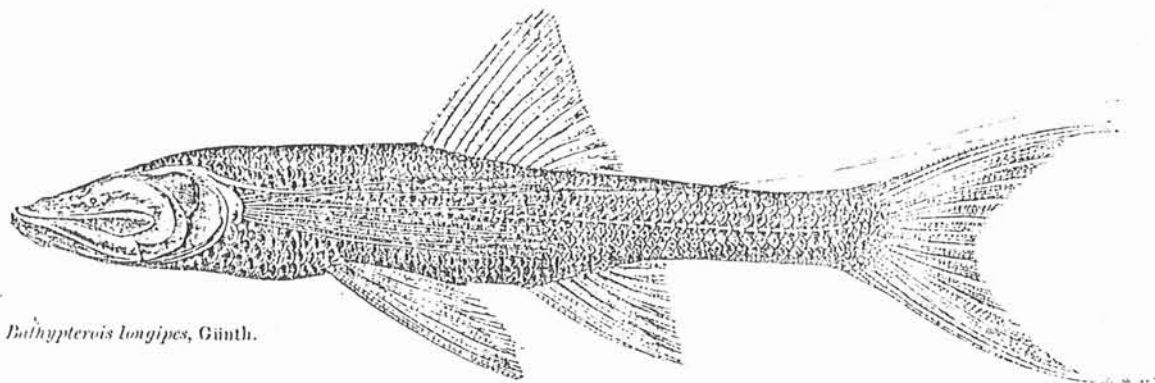
Scripps Institution of Oceanography,
Mail Code A-002
University of California San Diego,
La Jolla, CA 92093,
U.S.A.
tel: (619) 534 2935

Deep-sea bacteria, radiation biology, radioactive waste, amphipods, lipids, thermodynamics, high pressure

Zibrowius, Dr. Helmut

Station Marine d'Endoume,
Rue Batteries des Lions,
13007 Marseille,
France
tel: 91 52 91 94

Deep-sea benthos of Mediterranean (including the Plio-Pleistocene) and the N E Atlantic, deep water Scleractinia, Stylasteridae and Serpulidae worldwide, especially Serpulidae from hydrothermal vent communities and cold seep communities.



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Hydrographical observations made during the "Dana"-Expedition 1928-30. 1937, No. 12: 1-46	45

COELENTERATA

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MOLLUSCA

Gastropoda	
Pruvot-Fol, A., 1942: Les Gymnosomes - I. No. 20: 1-54	50
Tesch, J.J., 1946: The thecosomatous pteropods. I. The Atlantic. No. 28: 1-82	60*
Tesch, J.J., 1948: The thecosomatous pteropods. II. The Indo-Pacific. No. 30: 1-45	50
Tesch, J.J., 1949: Heteropoda. No. 34: 1-54	50
Tesch, J.J., 1950: The Gymnosomata - II. No. 36: 1-55	50
Laursen, D., 1981: Taxonomy of teleplanic larvae in the North Atlantic. No. 89: 1-44	90

Cephalopoda

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DISCOL - THE FIRST LARGE SCALE DEEP-SEA IMPACT STUDY

The acronym DISCOL is derived from the full project title "DISTurbance and re-COLonization experiment in a manganese nodule area of the South-East Pacific". In the last 20 years, international industrial and governmental consortia have been occupied with prospecting and exploration related to mining polymetallic nodules from the deep sea. There have been warnings that the environmental impacts of this industrial ocean penetration might have harmful influences on the abyssal ecosystem and biota, but research in this field remained rather limited.

The primary objectives of DISCOL certainly are environmental impact studies and the entire experimental design was dictated by the requirements of environmental evaluation. However, so little is known about the deep sea that the data collected during the DISCOL cruises will also be of general interest. Intensive and repeated studies in tropical oceanic deep-sea areas are rare. Data evaluation in the DISCOL programme will give information on abyssal community structure, since at least all the ecologically important animal groups will be studied taxonomically. The collected samples will provide knowledge on the abundance of mega-, macro- and meiofauna, organic sediment components, bacterial biomass and biotic activities. This will be the first time that successional phases in the re-development of communities may be recognized on a large scale. In future, additional geological and geochemical studies as well as planktological, physical and chemical investigations may also be conducted in the same general area.

In 1989 we conducted 2 cruises with RV SONNE as a start for the long-term project DISCOL.

The cruise DISCOL I

The phases of cruise DISCOL I

Cruise SO-61, lasting from 2 February (Balboa, Panama) to 3 April, 1989 (Callao, Peru), was split into two cruise legs, with a break in the harbor of Callao, March 5-8. The cruise time of two months was arranged into 5 somewhat overlapping phases: 1) locality search for the DISCOL Experimental Area (DEA), 2) pre-impact sampling, 3) disturbance, 4) post-impact sampling I, and 5) preparations for longterm measurements and observations between DISCOL cruises.

The preparatory phase: Establishment of the experimental area

First of all, the experimental area had to be selected. Several conditions were required for successful experimental work: The area should be relatively flat, should have no outcrops, and the density of manganese nodules should be low (about 5 kg of nodules per m²) to avoid failure of sampling equipment.

Based on information gathered by the Arbeitsgemeinschaft meeres-technisch gewinnbare Rohstoffe (AMR), a consortium in the FRG, during their exploration activities the general area was already determined before the cruise. Seabeam charting of an 8 x 12 nmi area with water depths at 3950-4300m helped to locate two suitable subareas. These were further inspected with the Ocean Floor Observation System (OFOS), which provides video-observations and photographs giving first impressions of the fauna and nodule coverage. Finally, one of the subareas was selected for further investigation and for the disturbance experiment. This area is termed the DISCOL Experimental Area (DEA). Some stations were positioned at a greater distance from DEA so as not to be influenced by the ongoing work or not to alter the DEA except through the impact.

The DISCOL Experimental Area: This is circular with a diameter of 2 nmi or 3750 m, corresponding to an area of 3.14 nmi² or 10.8 km². The central position is 07°04.4'S and 88°27.6'W, about 600 nmi south of the Galapagos Islands. Water depth according to the bathymetric SEABEAM chart

(10 m contour intervals) ranges from <4140 m to >4170 with most of the area between 4140 and 4160 m.

A circular area was chosen because its disturbance could best be achieved. Even with precise navigational aids, it would not have been possible to place the tracks of a disturber closely aside of each other. However, a circular experimental area, disturbed on diametrical courses should provide a central, highly disturbed and a peripheral, less disturbed subarea. For sampling purposes, the experimental area was subdivided into 8 pie-shaped sectors, facing the main geographical directions (Fig. 1). Additionally, the area was subdivided by concentric circles, with the inner line having a radius of 1000 m (Fig. 1,a) and second line at a radius of 1350 m (Fig. 1,b), leaving a width of 500 m (Fig. 1c) for the outer ring area. Sampling was planned to be conducted in the central circular area and in the outer ring, representing the areas likely to be most and least disturbed by the diametric traverses, respectively. The inner ring area was not to be sampled in order to concentrate all collections centrally or peripherally. For navigational reasons, the sampling positions were located on a midline in each sector, 500 and 1600 m away from the center. Due to time constraints, not all the sectors could be examined equally well. Therefore, sample distribution and sequence of sampling were randomly selected with equal numbers of samples in 5 central and 5 peripheral sectors.

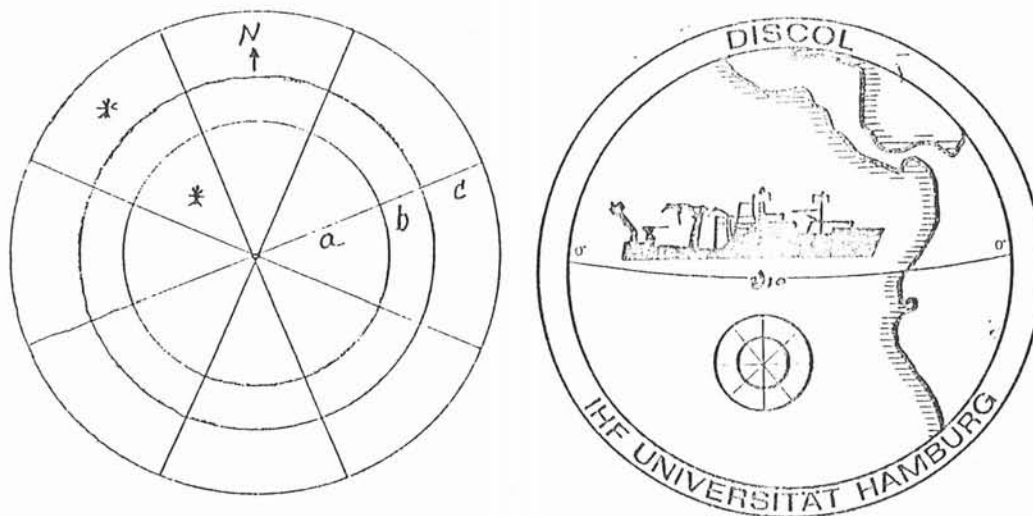


Fig. 1. The DISCOL Experimental Area (DEA)

The pre-impact sampling phase

This phase was mainly used for the collection of data, samples and observations as a baseline study for the DEA. Sampling was achieved with box corer and multiple corer inside the area, and with baited traps and trawl outside the area in order to avoid the deposition of weights from the freefall system and a disturbance inside the area before the impact phase, respectively. For video- and photographic observations, the OFOS was towed along transects and the Freefall Benthos Observation System (FBOS) was deployed several times for a few days. Shortterm current and turbidity measurements were conducted to obtain first impressions of the direction the sediment cloud would likely be transported in during the impact phase.

During this time, the plow-harrow (see below) was tested on two transects south of the area and the tracks were surveyed with OFOS. The impact on the sediment surface was felt to be appropriate for responding to the questions asked in this project.

The impact phase and description of the plow-harrow

During this phase, the experimental impact was created, employing what we termed the "plow-harrow" as the disturber. It was designed to be equivalent to a farmer's harrow, but each spine was made of a small double-sided plowshare as used in small motor-driven units to hill potatoes, for example. The plow-harrow was 8 m wide and assembled from 2 similar subunits mounted together. Each subunit had 3 horizontal beams, with the plows mounted on the 2nd and 3rd beam in its final version. A double-sided plow arrangement was mandatory because the plowing side of the equipment could not be predetermined. Several 0.42 m diameter steel spheres, as used in large fishery trawls, were shackled into the rig to prevent the plow-harrow from deeply penetrating into the sediment. The plows extended 5 cm beyond the plane of the rollers. This was thought to be appropriate since the total system was expected to sink into the sediment to some extent. The total system weighed 2.2 t.

A total of 78 plow-harrow crossings of the DEA was achieved during this phase. The plow-harrow was hoisted for inspection several times and generally some of the plows were lost and had to be replaced. The time necessary for repair was used to deploy baited trap chains, the FBOS and current meters or to run a CTD cast with the multisonde. In total an area of about 2 km² was plowed, and the remaining area of about 8 km² was impacted by resedimentation out of the plume created during the plowing.

The post-impact phase I

For a recolonization study the impact had to be evaluated. A sampling and observation programme was run which was rather similar to that of the pre-impact phase, using the same equipment at the same stations. Baited traps were not introduced into the DEA to avoid the unnatural contamination with fish bait. Only one very small trap was employed once in the center of the DEA combined with FBOS to permit comparison with conditions outside the area.

The preparatory phase for future research

Recolonization in the deep sea is certainly a protracted process and several further post-impact studies have to follow the post-impact phase I resampling. Exact relocation of the DEA is most important so that sampling can be done in exactly the same sectorial subareas. Therefore three sets of navigation transponders were lowered before departure. One unit was combined with FBOS plus 3 current meters, the other two only with current meters, all equipped to be recalled after the return of SONNE.

The cruise DISCOL II

With SONNE cruise 64 the practical work was continued at sea. This post-impact phase II was subdivided into 3 subphases, 1) hoisting of the navigation transponders combined with FBOS and a current-meter chain and setting an array of transponders for exact navigation and equipment positioning, 2) the second post-impact community study and 3) hoisting of two current-meter chains left there at the end of DISCOL I and setting of a longterm navigation transponder combined with a 500 m long current-meter chain in the center of the DEA, to measure longterm current speed and direction variabilities, - hopefully - until DISCOL III.

For DISCOL II RV SONNE left Callao/Peru on 2 September heading for the DEA and returned to Valparaiso/Chile on 1 October, 1989. Because of bad weather conditions and failure of the transponder navigation it was difficult to resample the DISCOL I stations within and reference stations outside the DEA. But last not least all stations were sampled successfully and 7 OFOS runs within and outside the DEA showed significant differences to the conditions during DISCOL I. In the impacted area vagile megafauna species like holothurians and hermit crabs were obviously less a-

bundant, within 20 hours of video-inspection only two holothurians and one hermit crab were seen within the plowed tracks, whereas they were abundant outside the tracks. Samples of 75 box corers and 30 multiple corers are waiting to be sorted and chemically analysed for sediment-bound organic components after their arrival in Hamburg and Kiel.

DISCOL participants

Except the authors there is a number of co-workers in this project. Recolonization demands taxonomic studies on species level and some specialists work on the most important taxa:

Polychaeta: Christian Borowski, PhD candidate, supervised by Gesa Hartmann-Schröder, Hamburg.

Nematoda: Christian Bussau, PhD candidate, supervised by Sievert Lorenzen, Kiel.

Harpacticoida: Gerd Schriever.

Ostracoda: Robin Whatley, University College of Wales, Institute of Earth Studies, Aberystwyth, U.K.

Foraminifera and Xenophyophoria: Caroline Mayburry together with Andy Gooday, Institute of Oceanographic Sciences, Deacon Laboratory and University College of Wales, Institute of Earth Studies, Aberystwyth, U.K., funded by the Natural Environment Research Council, U.K.

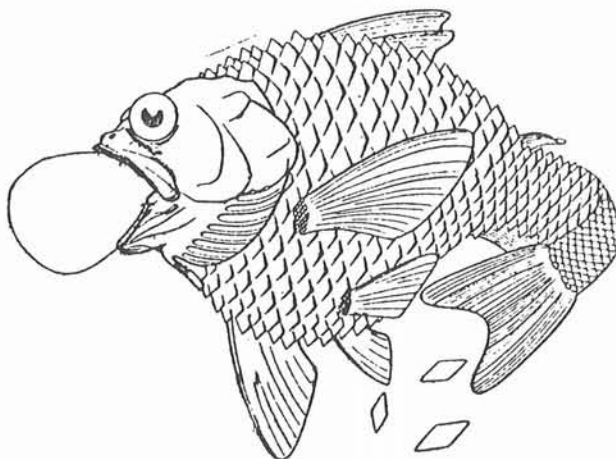
All the taxonomic material will be stored in Museum Senckenberg, Frankfurt, with Michael Türkay as contact person.

Other cruise participants were Eric Foell, USA (DISCOL I & II) as a consultant for the US National Oceanic and Atmospheric Administration, and Virginie Tilot, Brest, France (DISCOL II) funded by the European Communities, both will cooperate in video and photo evaluation; Sievert Lorenzen, Kiel, with interests in general ecology and nematodes, Helmut Kunkert, PhD candidate, supervised by Craig Smith, Honolulu, Hawaii, for bioturbation studies by x-raying sediment cores during DISCOL II to check for the thickness of the sediment layer that settled out of the plow-harrow disturbance plume.

Acknowledgements

The DISCOL scientists gratefully acknowledge the funds received for this project from the FRG Ministry of Science and Technology, the British Natural Environment Research Council and the European Community.

Hjalmar Thiel, Gerd Schriever
Hamburg



THE DEADLINE FOR THE NEXT ISSUE OF D.-S.N. IS 1st SEPTEMBER 1990

Editor: Torben Wolff, Zoological Museum of the University
Universitetsparken 15, DK-2100 Copenhagen Ø, Denmark

ISSN 0903-2533

