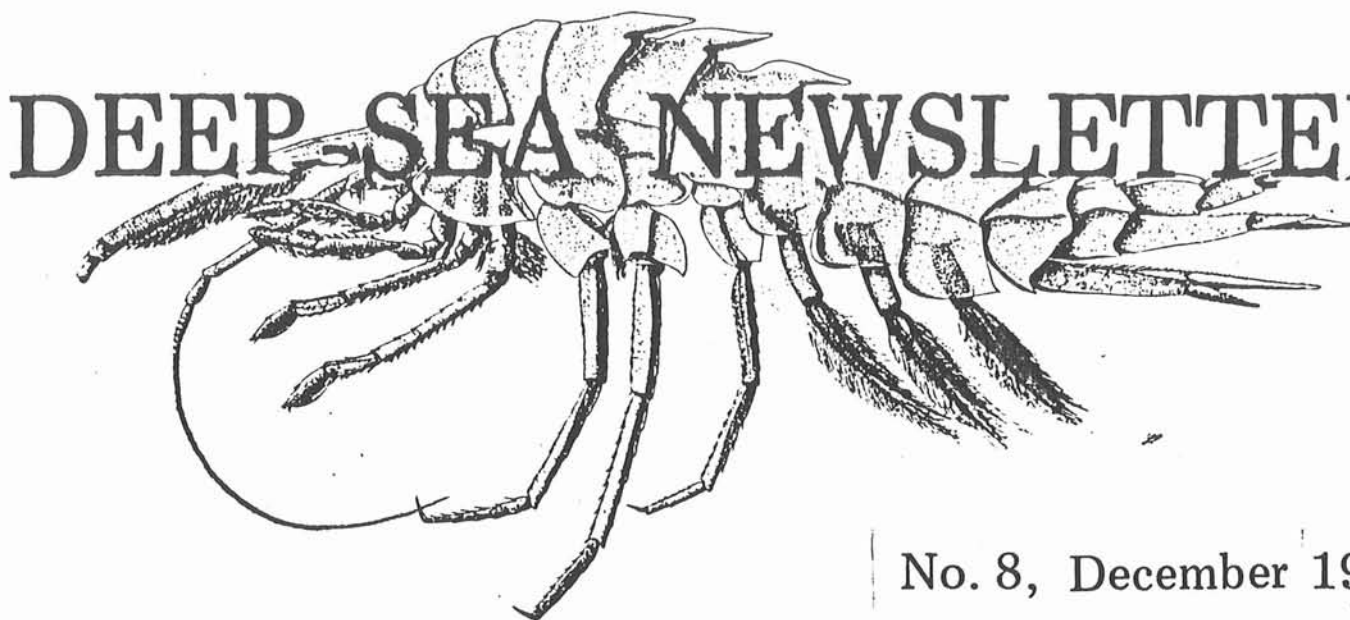


# DEEP-SEA NEWSLETTER



No. 8, December 1983

## Symposium on Deep-Sea Biology, June 1985

It was with great pleasure that I received the preliminary registrations for the Symposium on Deep-Sea Biology during the last months. A total of 40 colleagues from 11 countries declared their willingness to participate, and I know of others who plan to come to Hamburg. The replies clearly show that the interest in this meeting is wide enough to go ahead with the preparation of this event and that Hamburg is accepted as the place to gather. Though there are still 18 months from now on to arrange everything, I would like to brief you today about the symposium outlines and the schedule for the preparatory time.

Symposium background: After some loose meetings of deep-sea biologists, beginning in Hamburg in 1975, Bob Hessler arranged a first symposium at Scripps Institution of Oceanography in November 1981. This meeting had a well appreciated informal character stimulating a lot of discussions during the lectures and while we had cheese and red wine or beer on the balcony overlooking the Pacific near the lecture hall. I think most of us feel that we should maintain this type of informal get-together.

Apart from this, subjects of general interest have arisen from industrial activities penetrating the deep oceans. National and international working groups have begun to discuss the environmental impact introduced by mining the deep sea and the implications on species, communities and ecosystems. I believe it is about time to offer an international forum for the ventilation of these problems within a symposium, at which some policy and regulatory questions should be presented as well. Such a symposium topic surely needs a more official frame and therefore the symposium will be arranged in two closely related parts.

Symposium time schedule: The symposium will be held in Hamburg from June 23-29, 1985. June 23: informal meeting in the evening; June 24 and 25 will be assigned for the presentation of lectures and posters concerning all the problems of human impact on the deep sea; June 26-29 will cover all the subjects of deep-sea biology. One of these four days will be reserved for a mid-symposium excursion (June 27?).

This arrangement will allow to take part in one or in both parts of the symposium according to the specific interest of each participant.



Symposium preparatory time schedule:

2nd announcement: October 1984 by Deep-Sea Newsletter No. 9.  
February 15, 1985: Deadline for final title and abstract.

Symposium announcement evaluation: So far more than 40 colleagues expressed their interest to participate in the symposium.

70 % wish to present a paper.

10 % wish to present a short communication.

75 % intend to take part in a mid-symposium excursion.

I think this is a good basis on which we can proceed with the preparation of the symposium.

Some proposals were made which I gratefully acknowledge.

It was suggested to change the dates into September 1985, but I think that all dates allow the combination with other symposia or events. September will be too late because the terms will start during that month in many countries.

It was argued that early title nomination would favour the presentation of stale results. To avoid this, "subject not decided" could have been marked on the registration form, and I hope some magnificent data can be worked out and presented at the symposium, after such an early announcement.

It was emphasized to select papers for presentation if too many are offered. Yes, we have to do that.

It was proposed to publish a symposium volume. This matter is always discussed controversially. Surely, it is nice to have some of the papers presented together in a handy book. But it is no fun for authors and editors if the time lag between presentation and publication becomes too long. I have contacted a publishing company printing a series of symposium proceedings. They would be interested to publish a number of about 25 articles, and I think this could be appropriate as not all speakers will wish to publish in a symposium volume. The time schedule would be

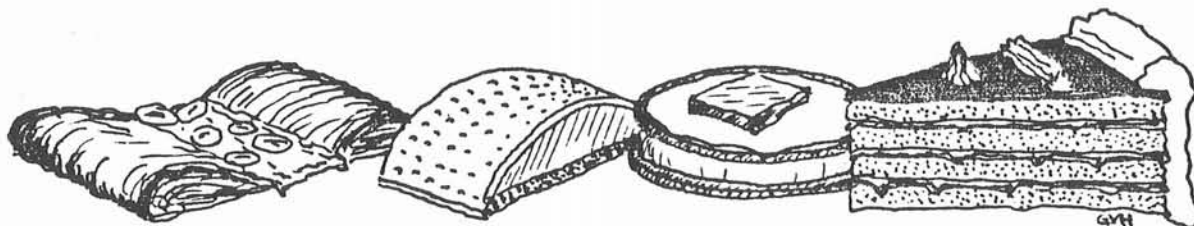
- manuscript to be delivered during the symposium;
- manuscripts reviewed and revised after 3 months;
- publication at latest 12 months after the symposium.

Only if all authors keep strictly to this schedule a joint publication may be reasonable. Papers being submitted later than the deadline to be set (e.g. October 1, 1985) will have to be rejected. We will ask the participants whether they prefer a common publication.

It was pointed out that the symposium should be announced in periodicals. This will be done.

Finally it was asked whether whip cream cake will be served during the mid-symposium excursion. Yes, Bob, this will be arranged as long as not all the participants come up with special desires!

Hjalmar Thiel



A New SCOR Working Group on Ecology of  
the Deep Ocean Floor

In 1982 the SCOR<sup>1</sup> Executive Meeting and the succeeding General Meeting considered a proposal for a Working Group on developments in the ecological studies of the deep ocean floor, taking into account the impact of industrial activities in the deep-sea environment. The proposal had been submitted by the FRG National Committee.

Since a more detailed proposal was needed I was asked, in collaboration with Hjalmar Thiel of the German N.C., to discuss the proposal with colleagues in the field and to assist the N.C. in submitting a revised proposal to the Executive Committee.

This discussion took place amongst a number of deep-sea benthos specialists, including members of existing waste disposal groups. It was generally felt that our knowledge is limited and that we do need further research, while there was less agreement about the inclusion of potential uses of the sea floor.

As a result of the discussion, the FRG National Committee submitted to the SCOR Executive Meeting in early September a proposal including 10S-terms of reference and suggesting Anthony Rice, IoS, Wormley, as Chairman. The proposal was discussed in detail and members of the Executive Committee felt that the justification of the Working Group must be scientific and that it should primarily restrict itself to science problems. In view of the current gaps in our understanding of the deep-sea communities it might be premature to consider in great detail the impact of exploitation and waste disposal.

On the basis of the debate, the establishment of WG 76, "Ecology of the Deep Ocean Floor" was approved. The terms of reference were modified and accepted as follows:

1. To recommend what further developments in methodology, theory and observation are needed to overcome the present shortcomings of our knowledge and concepts of the way deep-sea communities function and influence other chemical, physical and biological systems within the oceans.
2. To attempt to establish which deep-sea subsystems are fragile and which are most vulnerable to man's exploitation of the oceans and to develop a descriptive inventory of subsystems
3. To assess whether the methodology, theory and observational data exist and are adequate to provide forecasts of the impact on deep-sea ecology by man's activities.

The proposed membership list has been submitted to Tony Rice for his consideration and will not exceed 10 persons including himself. SCOR National Committees will also be asked to come forward with suggestions. The final membership list will be ready for approval at the next Executive meeting in April 1984.

WG 76 will be cosponsored by Unesco (Division of Marine Sciences), IABO<sup>2</sup> and CMG<sup>3</sup> (provided the membership will include a micropaleontologist).

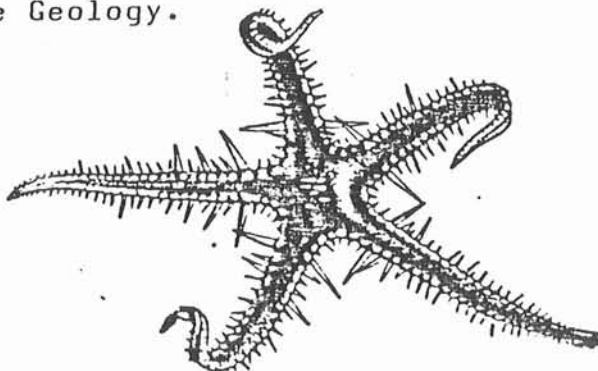
It is the intention to devote part of the Hamburg symposium (see above) to a general discussion of this issue. Hopefully many of the WG 76 members will be present at the meeting.

Torben Wolff

<sup>1</sup> Scientific Committee on Oceanic Research.

<sup>2</sup> International Association for Biological Oceanography.

<sup>3</sup> Commission on Marine Geology.





### Deep Seabed Mining Research Cruise

In 1978, Ocean Mining Associates (OMA), an international consortium formed to mine manganese nodules in commercial quantities, tested a prototype miner at approximately 15°N, 125°W. The tests were monitored by the scientists from the U.S. National Oceanic and Atmospheric Administration (NOAA) (Ozturgut et al., 1981) to determine environmental effects. It was not possible for NOAA to monitor the benthic impacts during these tests, and so a cruise was planned by Scripps Institution of Oceanography, under NOAA sponsorship and in cooperation with OMA, to return this year to the site of these equipment tests to evaluate the benthic impact in the area of test mining.

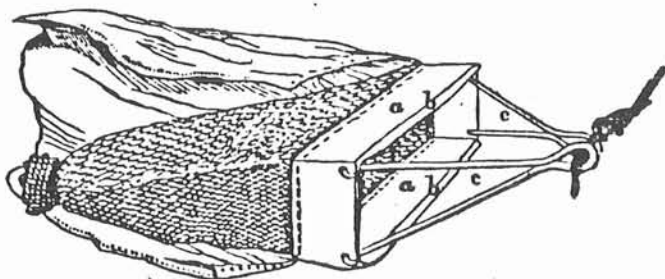
On June 4, 1983, the Scripps' ship R/V MELVILLE left San Diego for a 30-day cruise in the tropical Pacific Ocean to relocate the test mining tracks and collect benthic samples in the areas most likely affected by the mining collector. The cruise was a cooperative effort with the U.S. National Science Foundation which was funding Fred Spiess to evaluate the acoustic characteristics of manganese fields using his deep tow system. This system provided the means for accurately surveying the area of test mining through acoustic and photographic characterization and for navigating box cores precisely into the area of test mining, located in waters 4200-4500 meters deep. Such precise navigation ( $\pm 1$  m) was provided through a transponder net that was emplaced at the beginning of the study.

Robert Hessler and George Wilson, the chief biological investigators, were able to collect sixteen  $1/4\text{m}^2$  box cores, more than anticipated due to good weather and no coring problems. Six control samples were collected southwest of the tracks, six in the area of the tracks, one in a nearby area that had no nodules, and three other cores in unmined areas with nodules of differing sizes. The whole area was thoroughly photographed and acoustically characterized using the deep tow system. Subcores for meiofauna and geological analyses were taken and the nodule sizes and distribution in the core documented. In addition to analyses of the soft bottom community. Lauren Mullineaux, a graduate student of Hessler's, will be studying the epifauna of the nodules for her dissertation research.

Sorting has just begun so no results are yet available. It is anticipated that the study will be completed in late fall, 1983, so that results can be presented at the meeting in Hamburg. All of those who participated in the cruise were extremely excited about the success of sampling when the deep tow and box coring operations were combined. For the biologists, the ability to sample precisely at abyssal depths at an environmentally-mapped site, was a memorable pleasure. We are hoping that additional joint cruises can be carried out in the future.

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Ozturgut, E., J.W. Lavelle, R.E. Burns, 1981. Impacts of manganese nodule mining on the environment: results from pilot-scale mining tests in the North Equatorial Pacific. IN: Marine Environmental Pollution, 2. Dumping and Mining, (R.A. Geyer, ed.), pp. 437-474.

Jean Snider  
Manager, Deep Seabed Mining Marine  
Research Program



New Submarine Thermal Springs  
Preliminary Results of a Biological Expedition

During the first term of 1982, the French DSRV CYANA and its mother ship N.O. SUROIT made a series of 37 dives to a new submarine thermal spring area located on the East Pacific Rise, between 11° and 13° North. The fourth leg of the cruise (March 1982) was devoted to biology, with a team of French scientists led by D. DESBRUYERES, and one U.S. invited biologist (Dr. Judy GRASSLE, Woods Hole). Five CYANA dives were performed at 2620 meters depth, 12°49' N and 103°57' W, and three different groups of active hydrothermal vents have been studied (for more details, see C.R. Acad. Sc. Paris, t. 295, ser. III, pp. 489-494, November 8, 1982). Some 10,000 individuals have been collected, and several measurements of temperatures performed within the animal colonies. The three groups of springs belong to three different types: low temperature spring (20°C) coming through crevices in the rocks, a typical active white smoker, and a group of black smokers with a chimney of 15 m height and a temperature up to 320°C. The faunal composition combines features from both Galapagos and 21° North communities. The following species have been identified:

- the "mussel", identical with the one from Galapagos,
- the limpets,
- the annelid worms Alvinella pompejana and Paralvinella grasslei,
- the crab Bythograea thermydron,
- the Vestimentiferan Riftia pachyptila.

Several new species or genera have also been found (a different species of Bythograea, a new genus of Vestimentifera), as well as some species collected previously at other hydrothermal sites (for instance a new species of a large Hesionidae belonging to the genus Amphiduros). A striking peculiarity is the absence of the large white shells of the clam Calypptogena.

The ecological distribution of the animals in relation to the temperature gradient clearly shows that Alvinella pompejana is the highest thermophilic species, living between 20 and 40°C.

The use of baited photographic cameras shows no evidence at all of the scavenging amphipods usually very abundant in the deep sea.

We are now planning a new cruise using the DSRV CYANA to be performed by the very end of 1983 - beginning of 1984 at the same general location, on lateral volcanoes at distances of 5 to 10 nautical miles from the axis of the rise, where hydrothermalism still occurs.

Lucien Laubier  
Scientific Director

(This contribution arrived just a little too late for D.-S.N. no. 7-Ed.)

The Vertical Distribution of Foraminifera within the Sediment:  
Preliminary Results from the Baythyal Porcupine Seabight.

During April 1982, the Scottish Marine Biological Association's Multiple Corer (Barnett, Hardy & Watson, Deep-Sea Newsletter, No. 6) was deployed six times in a small area centred around 51°36'N, 13°00'W (1329m) in the Porcupine Seabight. Four of the cores from each drop were subsampled in order to study horizontal variability in numbers of meiofaunal organisms. The subsamplers were 20 ml medical syringes with the ends cut off. These yielded subcores which were sliced into 1 cm thick layers down to 5 cm to determine vertical distribution patterns. In examining this material, I am paying special attention to the Foraminifera. As a result, progress is agonizingly slow, but results at the half way point (12 subcores from 4 drops sorted) suggest that the effort is worthwhile.

Three of the subcores have been sorted for all living forams and the remaining nine for selected species. Depth-frequency data for the total living foram fauna (3 subcores) are summarized in Fig. 1. The concentration of specimens in the top 1 cm probably reflects the fact that the surface layer of these cores is virtually undisturbed (compare Fig. 1 with Coull et al. 1977, Marine Biology, v. 39, p. 239, Fig. 2). The vertical distribution pattern for the metazoan meiofauna is similar, although relatively fewer metazoans occur in the top 1 cm (Fig. 2).

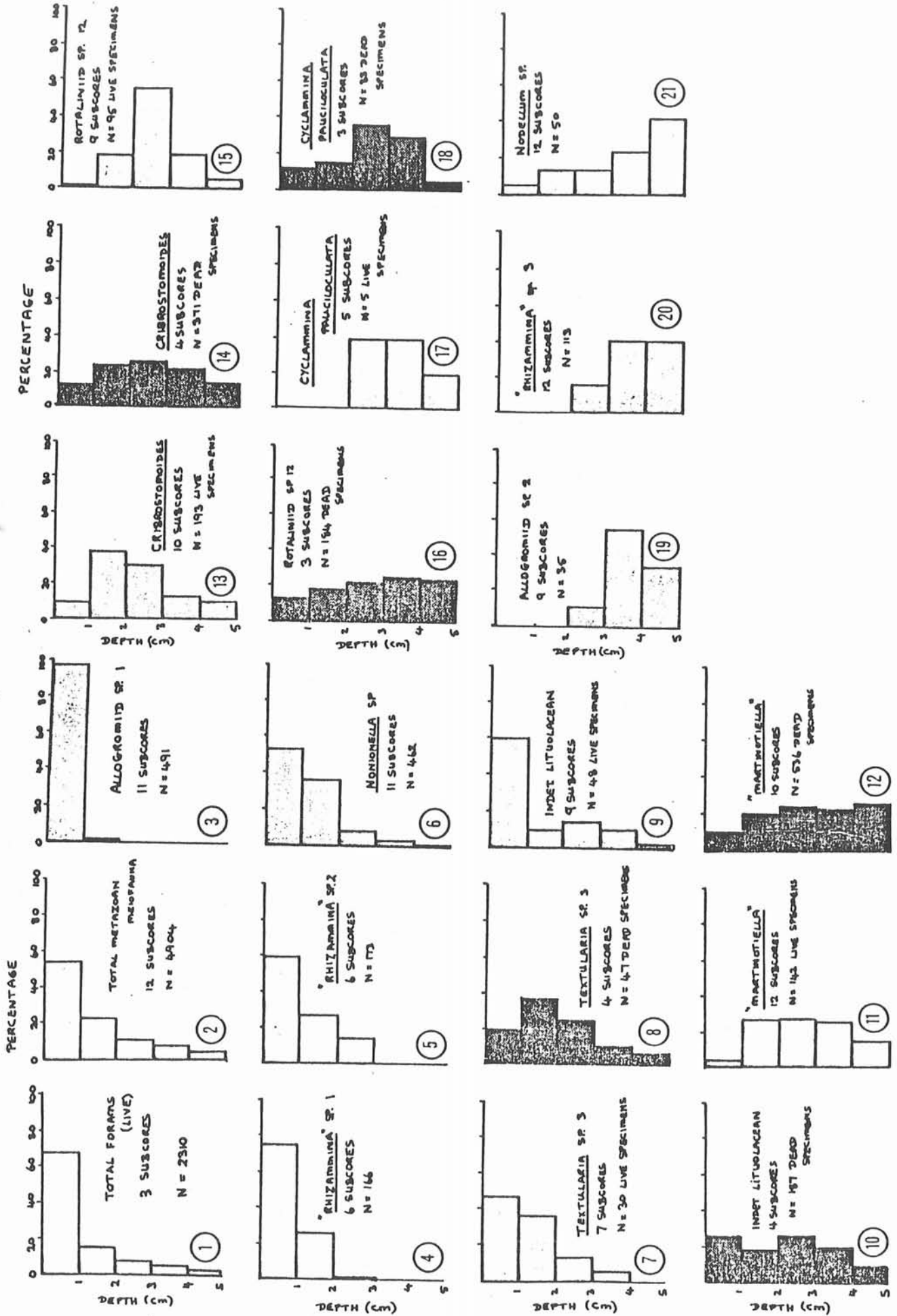
For individual species, several patterns of vertical distribution are discernable when depth-frequency data from subcores are combined: (i) Almost all specimens occur in the upper 1 cm (*Allogromiid* sp. 1, Fig. 3). This is perhaps the most common pattern. (ii) Maximum abundance is in the upper 1 cm below which numbers decrease at a greater than linear rate (Figs. 4-7). In one species there is a hint of a secondary peak at 2-3 cm (Fig. 9, also visible in the distribution patterns for dead specimens, Fig. 10). (iii) Specimens occur in all the layers and are most abundant between 1 cm and 4 cm depth (Figs. 11, 13, 15). (iv) Specimens are restricted to depths below 2 cm (Figs. 17, 19, 20). (v) A multi-chambered *allogromiid* foram (*Nodellum* sp.) appears to increase in abundance with depth (Fig. 21). However, this unique distribution needs to be confirmed by further observations.

For each species, the depth-frequency distributions are basically similar in all subcores. The location of the maximum abundance peak may, however, be subject to some variations. For example: *Nonionella* sp. is usually most common in the top 1 cm layer but peaks at 1-2 cm in 3 out of 11 subcores; *Cribr stomoides* sp. peaks at 1-2 cm in 8 subcores and at 2-3 cm in 2 subcores; "*Martinotiella*" peaks at 1-2 cm in 3 subcores, 2-3 cm in 3 subcores and 3-5 cm in 5 subcores. It has yet to be established whether these variations have any statistical significance.

There are some intriguing differences in the vertical distribution pattern of related species; for example between *Allogromiid* spp. 1 and 2 (Figs. 3, 19) and "*Rhizammina*" spp. 1 and 2 and "*Rhizammina*" sp. 3 (Figs. 4, 5, 20). The segregation of these species suggests vertical habitat partitioning (Jumars 1978, *Deep-Sea Research*, v. 25, p. 599; Joint, Gee and Warwick, *Marine Biology*, v. 72, pp. 157-164). The three "*Rhizammina*" species, which have branched tubular tests composed in part of *Globigerina* shells, require special study to determine whether they are agglutinated forams or xenophyophores belonging to the newly described infaunal genus *Occultamina* (Tendal, Swinbanks & Shirayama, 1982, *Oceanologica Acta*, v. 5, pp. 325-329).

Depth-frequency data for dead tests are available for 6 species (Figs. 8, 10, 12, 14, 16, 18). The live and dead patterns of vertical distribution are similar in a general way. However, dead specimens tend to be (i) more evenly spread through the sediment and (ii) reach their maximum abundance rather deeper than live specimens. The overall effect is to subdue the abundance peaks and shift them downwards by 1 cm. This presumably reflects the mixing effects of bioturbation.

Jumars and Eckman, in their recent review of the spatial structure of deep-sea benthic communities (in G.T. Rowe (ed), *Deep-Sea Biology*, The Sea, Vol. 8, pp. 399-451), have stressed the dearth of depth-frequency data for individual deep-sea species. They also point out that the small amount of data that is available is probably biased by post-sampling escape reactions (for example by polychaetes). In the case of forams, post-sampling vertical movement is perhaps less of a problem. Some forams can certainly move through sediments, albeit at a very slow rate (a fraction of a centimetre per hour; Severin & Erskian, *Journal of Foraminiferal Research*, vol. 11, pp. 133-136). The morphology of large, tubular forms such as "*Rhizammina*" spp. 1-3 must, however, surely dictate a virtually immobile existence. Moreover, living specimens of some of the other selected species (*Nonionella* sp., *Cribr stomoides* sp. 12) are usually enveloped, partly or completely, in a capsule of fine sediment. Had these specimens moved recently they would certainly have sloughed off such a delicate investment. It is therefore likely that the





vertical distribution patterns emerging for at least some of the foram species in these samples reflect natural distributions fairly accurately.

Andrew Gooday  
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Wormley, Godalming, Surrey,  
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### No Progress on Phyto-detritus by I.O.S.

In the last newsletter we briefly reported the recent IOS observations on the seasonal sedimentation of phyto-detritus to the deep-sea floor in the Porcupine Seabight (see also Nature, 302: 520-522). These results seemed to fit nicely with the discovery of reproductive seasonality in a variety of Rockall Trough invertebrates by John Gage, Paul Tyler and friends, and promised to at least dent the traditional view of long-term stability in the deep sea.

When the newsletter appeared we were about to leave on a five week cruise on Challenger in April/May to investigate the phenomenon in mid-water. We took everything we could think of to study the development of the spring phytoplankton bloom and the expected subsequent mass sinking of material through the water column (Seasoar, CTD, fluorometers, transmissometers, nutrient analysers, C<sub>14</sub> gear, mid-water cameras, pumps, nets and so on). And what happened? Well, you may remember that spring 1983 in north-western Europe was rotten. Gales in the Porcupine Seabight stirred up the water column every few days in the first half of the cruise, so that the spring bloom had no chance to develop. The situation improved in early May, but the bloom had not really established itself by the time we had to leave the area on May 7. We obtained lots of pre-bloom data, both in mid-water and on the bottom, but from the point of view of the main objective of the cruise, it was a total failure!

We left two bathysnaps deployed in the Seabight at 2000 m and 4000 each taking photographs at 8 hour intervals. The deeper one was retrieved in September and revealed the arrival of large quantities of detritus at this locality in the period from mid-June to mid-July. Unfortunately, the shallower bathysnap refused to leave the sea-floor so we have no idea when the material reached the bottom at this depth.

Disappointed, but undeterred, we have lots of plans for future research on the phyto-detritus, including a Challenger cruise to the Seabight next April. Unfortunately, continuing the sad saga, we have just learned that this cruise may have to be cancelled so that you may read another "no-progress" report from IOS in the next newsletter!

Tony Rice  
IOS, Wormley, U.K.





## FIRST ANNOUNCEMENT:

### 19th European Marine Biology Symposium

#### Dates

16 - 21 September 1984

#### Place

Plymouth Polytechnic, Plymouth, England.

#### Organising Institutes

Institute for Marine Environment Research  
Marine Biological Association of the United Kingdom  
Plymouth Polytechnic.

#### Scientific Programme

As with previous EMB symposia, the 19th meeting will be concerned primarily to communicate recent advances in biological research. In order to consider such advances in as broad a context as possible, the programme will be organised around four topics:-

- 1 Production at boundary systems.** Papers are invited that deal with rates of production and related processes at boundary systems such as shelf breaks, thermoclines and the fronts between stratified and mixed waters. Studies that assess the contribution of production at such boundaries towards the overall productivity of a region will be particularly welcome.
- 2 Dynamics of deep sea life.** Papers are invited that report new results and techniques, including direct observations, *in situ* experiments and sampling procedures, in the study of deep sea life. Studies of rates of key biological processes in the deep sea will be welcome.
- 3 Concepts of community organisation in the benthos.** Papers are invited that discuss the structural and functional properties of these communities within a particular (and specified) theoretical framework. We wish to provide a forum for the synthesis of theoretical and empirical studies that will contribute to a fundamental understanding of community organisation.
- 4 Adaptive aspects of biochemical and physiological variability.** Papers are invited that consider the genetical basis and the adaptive relevance of variability in biochemical and physiological processes. Studies that bear on the relationships between population genetics and physiological and/or biochemical ecology are particularly encouraged.

# 19th EUROPEAN MARINE BIOLOGICAL SYMPOSIUM

#### Symposium format

Each topic will be introduced by a keynote speaker followed by papers lasting at least a full day. Poster sessions will be held and rooms available for round-table discussion meetings. Visits will be arranged to the laboratories of the Marine Biological Association and the Institute for Marine Environment Research, where displays of research in progress will be available for discussion.

#### Accommodation

Accommodation will be provided by Plymouth Polytechnic, at Gilwell House (single rooms) and at Hoe Centre (double rooms). Gilwell House, which is within a short walking distance of the lecture hall, accommodates 200 persons; priority will be given to contributors, and further reservations will be based on the order in which registration forms are received. The Hoe Centre accommodates 40 couples; priority will be given to contributors accompanied by their partners. The fee for accommodation at Gilwell House or Hoe Centre, to include bed, breakfast, lunch and dinner from Sunday (evening meal) to Friday (lunch) inclusive, are approximately £75 per person; this fee does not include the symposium dinner. (Unfortunately, we cannot offer reductions for bookings less than six nights). Hotel and Guest House accommodations are available in Plymouth; information will be circulated on request (see enclosed registration form) with the second announcement.

#### Symposium fee

This fee will be approximately £50 and will cover the following items:-

- admission to all Symposium sessions, coffee breaks and organised social functions, including the Symposium dinner;
- final programme, book of Abstracts and tourist brochures for Plymouth and the surrounding area;
- the Symposium proceedings, mailed free of charge immediately on publication.

#### Registration

Those interested in attending the Symposium are requested to complete and return the attached Registration form, together with an Abstract of their proposed contribution, **by 29 February 1984**. A second announcement, containing more detailed information on the programme will be circulated by May, 1984. However, this second announcement will only be posted to those who have registered an interest by returning the Registration form.

We request that a deposit of £10 (cheques made payable to "EMBS 84") be paid when returning the Registration form.

#### Abstracts

The Organising Committee will review all Abstracts. The basis of acceptance will be relevance to the proposed topics and scientific excellence. In submitting an Abstract, therefore, authors are requested to avoid statements of intent and include instead an account of the objectives of the research, its theoretical context, a summary of the relevant results and the main conclusions drawn from the study. We might not be able to accept all papers submitted; however, facilities will be provided for poster sessions also, and some authors may prefer to offer a poster. In either case an Abstract of one A4 page is requested.

#### Deadlines

The deadline for submitting an Abstract (together with the Registration form) is 29 February 1984.

Contributors will be informed of the acceptance of their submitted papers (or posters) during April 1984.

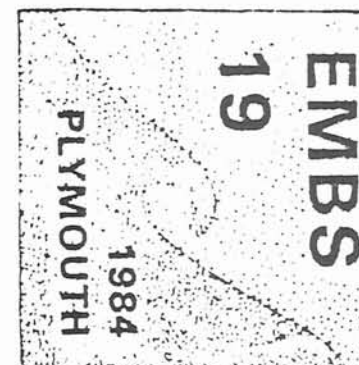
To facilitate early publication of the Proceedings, participants are requested to have manuscripts available at the Symposium, for consideration by the editorial committee.

#### Publication

The proceedings will be published by Cambridge University Press. Manuscripts will be subject to the normal peer review procedures of the Journal of the Marine Biological Association of the United Kingdom.

#### Address

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England



A Bonellid Echiuran Worm, the Maker of a Star-Shaped Lebensspur  
on the Surface of the Deep-Sea Floor

On the surface of the deep-sea floor, one can find abundant traces of various activities of megalobenthos. Nearly every frame of long series of bottom photographs typically includes at least one or more of these traces. Nevertheless, organisms are seldom caught in the act of making a trace. One of the earliest and most striking examples of such rare photographs was that of an enteropneust, trailing a fecal string that consisted of a spiral plus meanders ("Spirophycus") : Hantzschel, 1962), reported by Bourne and Heezen (1965) and subsequently cited several times elsewhere (Ewing and Davis, 1967; Heezen and Hollister, 1971; Lemche et al., 1976). We also have taken a similar photograph of an enteropneust making a "Spirophycus" trace in the Japan Trench (Hakuhō Maru Cruise KH-81-4, Stn. 12:  $38^{\circ}32.4'N$ ,  $133^{\circ}20.1'E$ ; 6,300 m).

These enteropneusts are epibenthic. It should be even rarer to photograph the making activities of endobenthos, an exception being half-buried ophiuroids such as Amphiura and Amphioplus, which always protrude their arms onto the surface. A very peculiar trace consisting of a line of elongate pits has been found in several places in the Atlantic as well as the Pacific including our records (Fig. 1) from the deep-sea shelf off Okinawa (Hakuhō Maru Cruise KH-73-2, Stn. 18:  $24^{\circ}47.0'N$ ,  $126^{\circ}26.3'E$ ; 1,700 m). But nobody has as yet taken a photograph suggesting the maker of this type of trace.

A star-shaped trace, surrounding a central burrow, is yet another example of a common trace produced by hitherto unknown endobiotic organisms. Dr. H. Thiel (1975: p. 577, fig. 1) published a clear photograph of such a star-shaped trace taken in the Iberian deep-sea. During our cruise to the Bay of Bengal on board the R.V. Hakuhō Maru (Cruise KH-76-5), we also photographed several of these star-shaped traces scraped on the surface of Globigerina ooze at all of six situations occupied (Fig. 2).

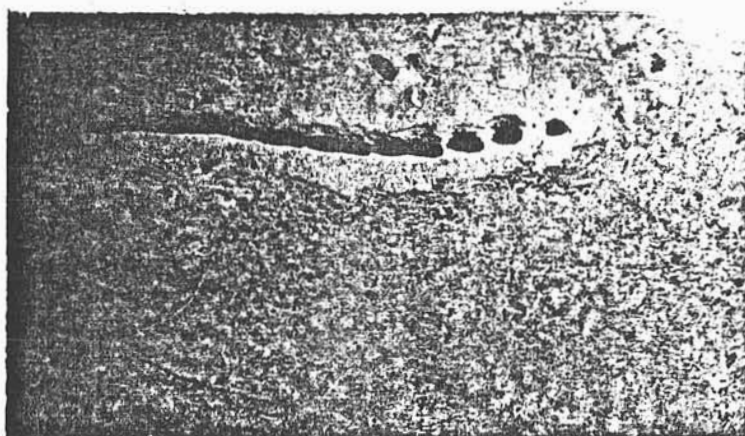


Fig. 1

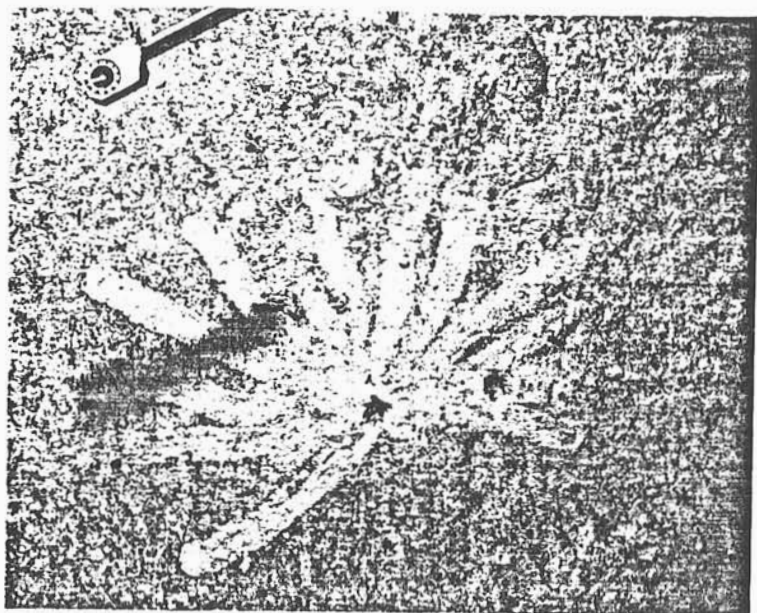


Fig. 2

At the very last of these stations we finally had the rare opportunity of photographing the maker of these star-shaped traces (Fig. 3). The organism had a long and slender soft body with a fan-shaped ending. The margins of this shaft-like body curled up so as to make a trough. One can recognize at a mere glance that this is the proboscis of an echiuran worm. Further, the bilobed or fan-shaped termination and thickness of the proboscis reminded us of a deep-sea bonellid echiuran, e.g., the genus Torbenwolffia (Zenkevitch, 1966). Torbenwolffia is re-

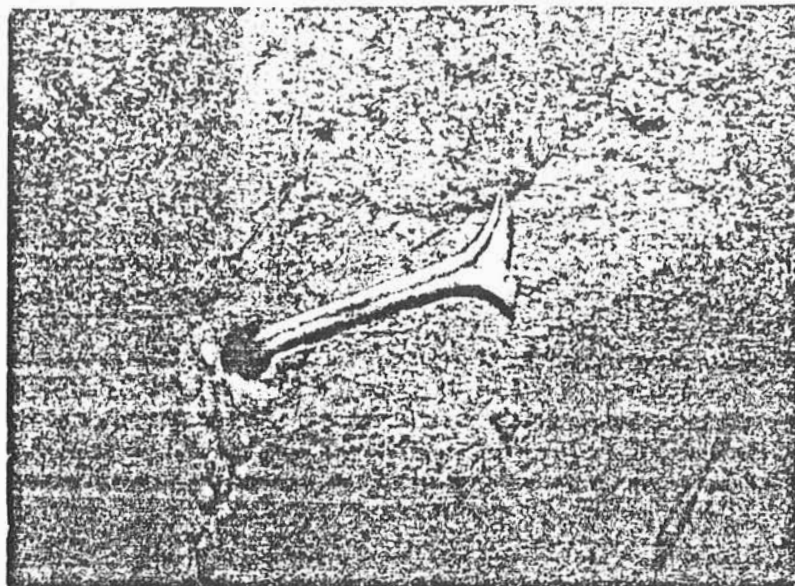


Fig. 3

species related to the unidentified bonellid worm in this photograph.

In the Bay of Bengal we found several different types of star-shaped traces, both the echiuran type described above and others. A paper on the possible mechanism of construction of such traces and their adaptive meaning in oligotrophic environments has already been prepared by one of the authors (Ohta, MS).

Masuoki Horikoshi - Suguru Ohta  
Ocean Research Institute, University of Tokyo

reported to be a monotypic genus, and the type species *I. galathea* Zenkevitch, 1966, was collected from hadal depths in the Kermadec Trench (5,850-8,300 m). Subsequently, the species was reported from an abyssal depth in the equatorial Atlantic (DattaGupta, 1981: Vema CPo6: 11°34'N, 32°53'E; 5,880 m), and a specimen compared to this species was collected from a box core of calcareous ooze at a depth of 4,167 m in the east-central Pacific (Berger et al., 1979). *Sluiterina flabellorhynchus* Murina, 1967, with a fan-shaped termination and thin trough-like or tubular proboscis, collected from the same locality as *I. galathea* in the equatorial Atlantic (Datta Gupta, 1981; see also Murina, 1976) might be another possible

- Berger, W.H., A.A. Ekdale & P.P. Bryant (1979). Selective preservation of burrows in deep-sea carbonates. Mar. Geol., 32: 205-230.
- Bourne, D.W. & B.C. Heezen (1965). A wandering enteropneust from the abyssal Pacific, and the distribution of "spiral" traces on the sea floor. Science, 150: 60-63.
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xx

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