DEEP-SEA NEWSLETTER

No. 10, April 1985

THE SYMPOSIUM ON DEEP-SEA BIOLOGY - HAMBURG 23-29 JUNE 1985

On 1 March Hjalmar Thiel sent a letter to all who had notified their interest in participating in the 4th Symposium on Deep-Sea Biology.

The first part of the symposium, "Human impact on the deep-sea ecosystem and related problems" (24-25 June) will include a total of 15 contributions ranging from impact of radioactive waste and munition dumping to manganese nodules, effects of deep-sea mining and regulations, followed by 6 papers covering a variety of topics. An evening discussion (25 June) will be devoted to the intriguing question: How many impact regulations do we need?

The general part, "Deep-Sea Biology" (26-29 June) starts appropriately with bacteria and works its way through a great variety of fascinating items (37 papers). On Thursday (27 June) everybody will get a (probably needed) opportunity to relax during a one day excursion to the lovely Hanseatic town and sea port of Lübeck and the beautiful Holstein countryside.

There will also be a pre-symposium gathering in the afternoon/evening of 23 June.

Most speakers were against the idea of a symposium proceedings volume, so no publication will be arranged.

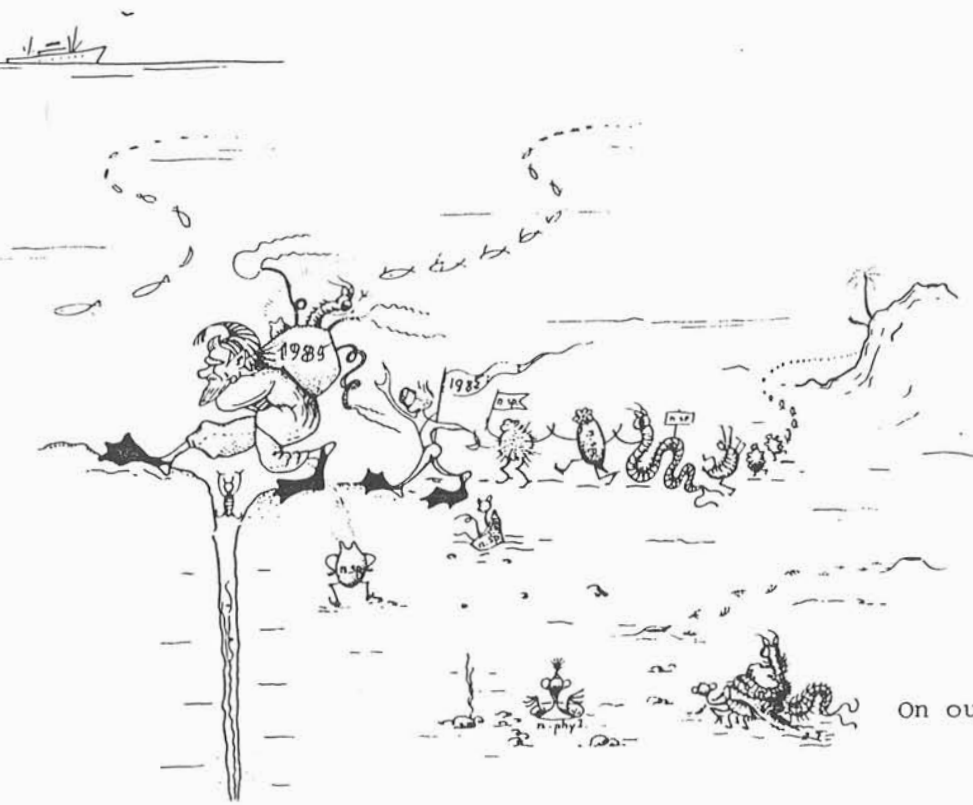
To date (15 April) a total of 25 deep-sea biologists and others have enlisted. The geographical distribution is as follows: Belgium 2, Canada 1, Denmark 5, France 9, FRG 28, Iceland 1, Italy 2, Japan 3, Netherlands 1, Norway 4, Sweden 1, UK 6, Uruguay 1, USA 31.

It is still possible to send an application for participation (Dr.Hjalmar Thiel, Inst.f.Hydrobiologie, Zeiseweg 9, Hamburg 50, FRG).

An Application Form was included in DEEP-SEA NEWSLETTER No. 9.

Looking forward to seeing you in Hamburg!

T.W.



On our way to Hamburg ....
(Zina Filatova del.)

Radiation-induced mutations in deep-sea animals?

In a most elegant study Swinbanks & Shirayama (1984) have demonstrated high levels of radioactivity in the plasma (granellare) and fecal pellets (stercomare) of the xenophyophore (Sarcodina, Protozoa) *Occultammina profunda*, found at hadal depths in the West Pacific. They raise the question whether xenophyophores as a result might show unusually high rates of radiation-induced mutation, and whether this opens the possibility to get insight into the long-term effects of such mutation (in fact over a span of about 500 million years, which is the possible age of fossils, *Palaeodictyon*, associated with the group).

The matter can be elaborated upon a bit. Working during the 1960's on the chemistry of barite in deep-sea sediments, Professor Gustav Arrhenius and his co-workers at Scripps Institution of Oceanography, California, also investigated in detail the composition of the $BaSO_4$ crystals (granellae) found in thousands in the plasma of the xenophyophore *Stannophyllum zonarium* from abyssal depths in the equatorial East Pacific. Their investigations (personal comm. 1968) showed not only the usual main components (Gooday & Nott 1982), but also a content of radiating elements.

It seems that the level of radiation may well be the same in *S. zonarium* as in *O. profunda* (in fact, some of the numbers used in the calculations of Shirayama & Swinbanks originate from another investigation on the presence of barite in a *Stannophyllum* sp., see Church 1970).

Accordingly, the same question can be raised in connection with *S. zonarium* about mutational effects of the radiation from elements in the animal's own plasma, and in this case not only with respect to the xenophyophore itself, but also to those animals which eat them. Not much is known about this end of the story, but the monoplacophore *Neopilina galatheae* can be mentioned as one of them (Tendal 1985).

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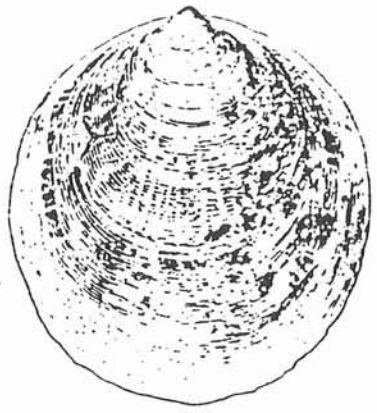
Ole Tendal
Zoological Museum, Copenhagen



There is a time for monoplacophore ecology.....

Over the years much interest has been paid to the recent monoplacophores since the first species, *Neopilina galatheae* Lemche, 1957, was described in detail by Lemche & Wingstrand (1959). A peak in our knowledge has recently been reached with the taxonomic revision by Moskalev et al. 1983, and the updating of the morphology and relationships by Wingstrand (1985).

For obvious reasons, the ecology of the group is much less known than the taxonomy and morphology. It is restricted to locality characterizations and a few observations on specimens brought on deck by trawl, with the single exception of *Laevipilina hyalina* (McLean 1979), which was kept alive in aquarium for nearly one month (Lowenstam 1978). Authors who offer an opinion on the lifestyle of monoplacophores tend to agree with the statement of Marshall (1979): "They are deposit feeders and presumably feed as they move slowly over the ooze."

This seems, however, to be too much of a generalization. It can be inferred from observations on animals in collections that monoplacophore species differ from each other in a series of traits pertaining to the feeding biology. Thus, McLean (1979) showed variations in radula morphology between four species. Also, the post-oral tentacles vary strikingly (Moskalev et al. 1983, fig.3, and original descriptions of the single species), even if one takes into consideration that some degree of difference could have been caused by the fixative, or might have to do with different age of animals belonging to the same species. Lastly, there are indications of differences in food choice; thus *Neopilina galatheae* feeds, as judged from close analysis of the intestinal contents, to a high degree on xenophyophores, which are giant rhizopods, while such food does not seem to be taken by *Vema ewingi* (Tendal 1985).

Substrate choice is another aspect of lifestyle, where differences among species are found. Only *Laevipilina hyalina* and *Monoplacophorus zenkevitchi* were taken adhering to solid substrate. *Neopilina oligotropha* and *N. rebainsi* are from samples that contained hard material, but the animals were not attached. For the other species, hard substrate does not seem to have been recorded for the catch.

Through morphology, monoplacophores appear closely related to polyplacophores, and functionally and in lifestyle they may be comparable to these and to "limpets". Although there is some disagreement on the matter (see, e.g., Peel 1977 and Ziegler 1983), their Cambrian-Devonian ancestors presumably lived on hard ground or at least on coarse bottoms. In the light of this the two families regarded as the most specialized (Moskalev et al. 1983), Laevipilinidae and Monoplacophoridae, may in fact contain the more primitive members of the class.

Twelve species of recent monoplacophores are known to exist. It appears that in order to catch up with the actual level of taxonomical and morphological knowledge the time has come for a closer comparison of these species from an ecological point of view. The features most likely to yield ecological information are presumably mouth region structures, radula, radula musculature, intestinal contents, gill morphology, arrangement of foot musculature, and shell form.

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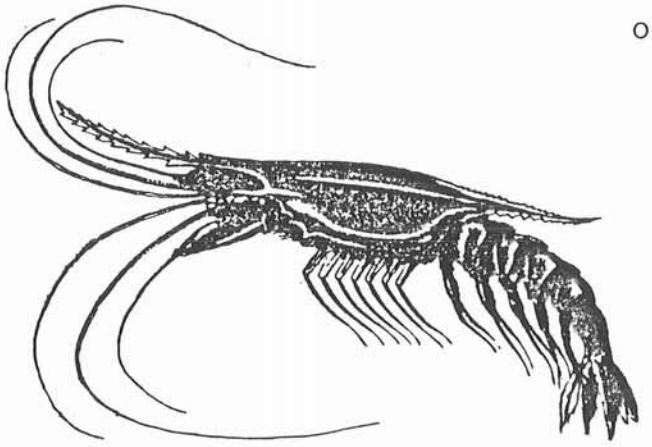
Ole Tendal



Bathyal and abyssal Bryozoa

collected during the Woods Hole Oceanographic Institution Research Program

The study of the Bryozoa dredged from 1961 to 1973 during the scientific cruises of the Woods Hole Oceanographic Institution (WHOI) is now concluded. The material of Bryozoa collected during this oceanographic program off the Atlantic coasts of North and South America, Europe, Africa and in the Mediterranean Sea, has proved to be of exceptional interest, as much for its faunistic diversity as for its biogeographic and phylogenetic importance.

Some new organizational types in Bryozoa have been displayed from the collected material: the quadriseriate ctenostomes of the genus *Neoflustrellidra*, the deep-sea umbonuloids (*Metrarabdotomorpha*), the peak of the evolution of Alcyonidioidea Ctenostomata, the head-shaped genus *Pseudalcyonidium*, with its monomyoecial filiform and excessively elongated pedicel. Very primitive taxa have been discovered in the Ctenostomata, for example, the plesiomorphic genus *Arachnoidea* and especially the genus *Protobenedenipora*; the latter is very near of the common "stem" of cheilostomes and ctenostomes, and constitutes an argument favourable to a polyphyletic origin of both taxa. In return, all of the groups of Cheilostomata considered as primitive (Aeteidae, Scrupariina, Malacostega *sensu stricto*) live in deep-sea biotopes. Two abyssal genera from the Atlantic North American basin (*Cheilonella* and *Protostomaria*) were up to now only known as fossils, respectively from German Eocene and Australian Tertiary. Various taxa supposed to be rare have been collected abundantly, sometimes with an extraordinary diversity of forms, of which it is now not possible to establish the precise taxonomic level; the cheilostomatous genus *Euginoma*, in 1981 only known for 2 species, is now represented by 14 forms, at least 8 of which are species.

During the cruises of the WHOI deep-sea program, 142 species of Bryozoa (47 new, but only 41 named) and probably 95 genera (15 new) were collected. Three-fifths of the known forms of Bryozoa from abyssal biotopes and more than 4/5 of the abyssal genera of Bryozoa were collected during this exceptional scientific program. A general systematic recapitulation of the studied material is the following:

- Order Ctenostomida: 21 species (7 new), 18 genera (5 new);
- Order Cheilostomida: 1. Anascina: 85 species (27 new), 52 genera (8 new);
  2. "Ascophorina" (*sensu lato*): 36 species (12 new), 23 genera (2 new);
- Order Cyclostomida: 29 species, 10-20 genera (1 new species; there may be up to 8 more, but the material is insufficient to enable the species to be properly defined and named).

The study of the deep-sea Bryozoa (collected by WHOI) has resulted in 13 publications (1965-1984) primarily by the late T.J.M. Schopf (who died in 1984) and J.-L. d'Hondt. The type-material is preserved in the collections of Muséum National d'Histoire Naturelle of Paris.

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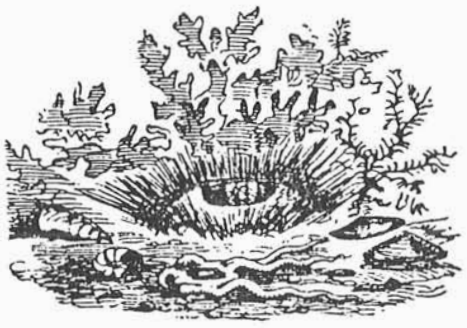

Canadian Studies in Deep Ocean Ecology 1983-1984

A deep ocean ecology project was initiated within the Marine Ecology Laboratory at Bedford Institute of Oceanography, Dartmouth, Nova Scotia, Canada, during 1982. The objective of the work undertaken by three scientists within the Canadian federal government, Department of Fisheries and Oceans, is to identify key ecological processes involving abyssal benthic and bentho-pelagic organisms which may be significant for the transfer of radioactive waste placed on or within the seabed. Field observations and experiments undertaken within the Deep Ocean Ecology Project at BIO during 1983 and 1984 have focused on determining how the presence of organisms of various size can alter the behavior and fate of radionuclides and other elements in abyssal environments.

Feeding biology of scavenging amphipods

Four separate experiments have been completed. A time lapse camera (720 frames, 10 min intervals over 5 days) focused on a small piece of bait (100 g mackerel) was moored 20 m above bottom at a site in the Nares Abyssal Plain (5845 m) in June 1982 (Hargrave 1985). The bait was completely consumed by scavenging lysianassid amphipods (*Eurythenes gryllus*) within 38 h. This was the only species photographed. An average feeding rate (1.8 g amphipod^{-1} h^{-1}) was calculated from the total number of amphipods counted and the time required for complete consumption of bait. There were never more than five amphipods present (usually one or two) and their residence time was 30$\pm$10 min. Weight loss calculated from changes in bait volume indicated an average consumption rate of 2.9 g amphipod^{-1}. It was estimated that amphipods of different sizes ingested 30% to 60% of their body weight before departure from the bait.

These indirect estimates of feeding rate by *E. gryllus* were confirmed by studies with baited traps carried out near Bermuda (4371 m) in April 1983. Traps with timed release and closure devices were deployed. Seventeen amphipods (*E. gryllus*) were captured and held *in situ* for 6 to 24 hours. Consumption was measured as weight loss of bait which could be compared to the weight of amphipod gut contents on retrieval of the traps. Amphipods quickly filled their guts on entering traps, with no subsequent feeding or egestion over the remainder of the experiment. No animals were alive when the mooring was retrieved, probably because of exposure to warm surface waters.

Work with live individuals of *E. gryllus* occurred during an expedition (CESAR) to the Canadian Arctic Ocean in May 1983. Moorings were suspended through the ice (85^{o}N, 88^{o}W) on the bottom at 2050 m depth. When pack-ice movement was less then 1 km/day, up to 300 *E. gryllus* were trapped over 6-8 hours. Some amphipods were kept in -1.5^{o}C water for up to nine days with no apparent ill effects of decompression. Work is still underway to determine ingestion and digestion rates.

Benthic biomass and size fractionation

Work has continued to develop methods which allow the quantification amd manipulation of various size categories of benthic biomass (Schwinghamer 1981a, b, 1983, 1985). Floatation in a silica sol is used to separate micro- and meiofauna from sediment and an image analyzer is used to quantify the volume of biomass in different logarithmically-graded size categories. Preliminary work to assess the effect of adding or removing various size classes of organisms on whole-core respiration rate measurements was begun on a cruise to the shelf-slope area off Nova Scotia during 1983. The method holds potential for analyzing the distribution of radioactive or other toxic substances amongst organisms of different size within a complete benthic community.

The image analysis system has been used to determine the size composition of benthic samples from the Nares Abyssal Plain in June 1982. Photographs were analyzed to assess the biomass of larger organisms living at the sediment surface. The results indicate that although the biomass of bottom fauna is low in the Nares, the size structure is similar to coastal benthic communities in similar sediments. A technique to measure *in situ* colonization and growth of micro-organisms on sterile surfaces is currently being developed. A multiple chamber bottom tripod to expose sterile sediments for colonization (following the design of D. Desbruyères, C.O.B., France) will be constructed and serve as a platform for exposure of sterile substrates near the seabed.

The colonization experiments are intended to test the general idea that biological processes in the deep sea proceed at low rates. Low rates of food supply, low temperatures and high pressure should limit metabolic rates and reduce the importance of

organisms in changing the abyssal environment. However, few direct measures of the activity of deep-sea organisms have been made. The experiments discussed above to measure the feeding rates of scavenging amphipods, and many earlier studies with baited cameras, show that mobile fauna have the ability to respond rapidly to the presence of food. No studies have considered if a similar stimulation of activity of fauna within the sediment occurs following food enrichment.

On a Nares cruise by the CSS Hudson in November 1984 the response of meiofauna to organic enrichment was directly examined. Two box cores taken at 5845 m were used to incubate sterile dye-labelled sardines in cores pushed into the undisturbed sediment surface. Two boxes were replaced on an acoustic-release mooring near the bottom and retrieved after six days. A third box was incubated in a refrigerated bath on deck. The dye had moved to 2 cm depth during the incubation of cores containing pieces of bait. This was carried out by abundant nematodes and foraminifera in the sediment, since vertical penetration was restricted to their burrows. This shows that it may be misleading to consider abyssal environments as biological deserts. The fauna in and above the bottom can be stimulated by food enrichment. Any disturbance which increases the amount of available food will attract mobile animals and stimulate activity of those in the sediment.

Sediment-water exchange processes

An *in situ* dialysis probe (Kepkay 1985), developed to quantify the diffusion of isotopes introduced into the subsurface of undisturbed sediment, was tested with and without the presence of poisons to halt biological activity. The experiments were carried out with nearshore sediment to apply the technique to measure the mobility of trace metals and two radionuclides (^{241}Am and ^{137}Cs) in terms of their binding rates.

A second probe was constructed to allow simultaneous measurements with and without poisoning. Bacterial and chemical processes were involved in binding and restricting the mobility of both radionuclides. The binding of ^{241}Am was closely associated with bacterial manganese oxidation, whereas ^{137}Cs remained in solution, behaving more like copper. The probe has been tested using ^{54}Mn introduced at the depth of transition from oxidizing to reducing conditions, and probes were placed in box cores from 5845 m described above. This data has yet to be fully analyzed, however, results show that studies of *in situ* ion mobility in sediments are possible using the probe. The role of microbial participation in the flux of substances through the sediment can be quantified directly.

Laboratory experiments have been performed to study the exchange of ^{241}Am and ^{237}Pu between seawater, labelled organic particles and sediments (Hargrave 1985a). Concentrations of both elements adsorbed onto moulted exoskeletons from a euphausiid decreased exponentially with 50% retention times of three to seven days when moults were incubated in filtered seawater with small amounts of sediment. Most of the radioactivity lost from moults was adsorbed to <43 µm silt particles which comprised >95% of the sediment weight. However, when adsorbed concentrations were calculated as atoms μm^{-2}, adsorption of both actinides was greatest in the carbonate-rich sand size fraction of the sediment. The enrichment shows that non-homogeneous distributions may arise between particle types when actinides such as ^{241}Am and ^{237}Pu sorbed to surfaces of organic particles are transferred to sediments.

Extension of these studies is underway to consider the degree to which benthic animals enhance rates of transfer of actinides between organic substrates, sediment particles, and seawater by their pumping, burrowing, and feeding activities. Preliminary observations with benthic polychaete worms added to cores has shown that the distribution of these elements in the sediment is not homogeneous. Highest concentrations occurred around worm burrows. The mucous lining of burrows produced by worms is highly reactive and concentrates ^{241}Am and ^{237}Pu to levels above that in surrounding bulk sediment. The non-homogeneous distribution of elements and the role which organisms play in establishing concentration gradients affects the exposure of benthic organisms to higher concentrations of toxic substances than analysis of bulk sediments indicates. Localized concentrations could also be of significance in modifying release rates of substances such as transuranic elements from sediment.

Sedimentation in the ocean

Knowledge about downward particle flux is needed for inclusion in numerical models

of advection and diffusion, if the flux of particle-reactive material in the ocean is to be adequately described. One requirement for representing effects of particle scavenging in any oceanic dispersion model is an estimate of the rate of particle sedimentation. Recent studies with sediment traps in areas which differ in levels of phytoplankton production were summarized (Hargrave 1984, 1985b) to show that small particle sedimentation might be predicted by a relationship between organic and dry matter deposition and depth. The analysis was undertaken to provide data for a box model of ocean dispersion being developed by the Seabed Working Group of the Nuclear Energy Agency.

Dry matter sedimentation was calculated for different ocean regions for which estimates of phytoplankton production are available. The calculations showed that particulate matter sedimentation at bathypelagic depths (>1000 m) in central regions varies within narrow limits (5-50 g $m^{-2}y^{-1}$). However, sedimentation in upwelling and shelf-slope areas is underestimated by the empirical equation derived from studies of sedimentation away from ocean margins. Rates are high over shelf areas (25-250 g m^{-2} y^{-1}) where terrigenous material and laterally transported particulate matter increase sedimentation. Areas of high phytoplankton production in upwelling regions have rates of dry matter flux an order of magnitude greater than those in the central ocean. Scavenging of particle reactive elements from the water column by setting particular matter is thus greater near the margins of ocean basins.

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Publications:

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Investigations on deep-sea bottom fauna at the P.P. Shirshov Institute of Oceanology in 1982-1984

In recent years the Institute of Oceanology of the Academy of Sciences of the USSR has obtained two new modern oceanographic research vessels, "Akademik Mstislav Keldysh" and the new "Vityaz". Each of these vessels can accommodate about 150 persons, half of which are the scientific staff.

The new flagship of the research fleet of the Academy of Sciences, the "Akademik Mstislav Keldysh" (displacement 6339 tons, length 122 m), was built by the shipyard Hollming Oy (Rauma, Finland) and delivered in 1981. There are 17 laboratories equipped with automatic systems for continuous measurement of the most important environmental parameters. The vessel has been designed for worldwide operation and has facilities for using a "Piscis" type of submersible vehicle. The highly integrated system for the automation of research combines the versatile measurement and analysis equipment with the computing equipment of various laboratories for sampling, working up and recording of experimental data. There are also many winches for research, an A-frame and other mechanisms to permit sampling at any depth of the ocean. Up to now the vessel has accomplished 8 cruises.

R/V "Vityaz" (displacement 6358 tons, length 110 m) was built in Shezin (Poland) in 1981. It is a stern trawler with an A-frame and mainly intended for deep-sea benthos investigations. It has 18 laboratories and 13 winches, including those for deep-sea trawling. To date the new "Vityaz" has been on 6 cruises.

Studies of sea-mounts and oceanic ridges and their rift zones

The systems of sea-mounts and ridges are amongst the less studied with regard to taxonomic composition and degree of quantitative development of life in the world ocean. However, the area covered by these structures is very vast, and their importance for life in the ocean is great. Due to peculiarities of their hydrological regime, some sea-mounts may cause a local increase in productivity of the surface waters which may be reflected in increased productivity of the near-bottom ichthyofauna and benthos. The importance of biological investigations of oceanic ridges and sea-mounts was stressed in the decisions of the Symposium "Biology of the Pacific Ocean Depths" at the 14th Pacific Science Congress in 1979 (Khabarovsk).

The main investigations during the second cruise of the new R/V "Vityaz" (April-June 1982) were concentrated within the Bermuda energy-active region of the Atlantic under the geophysical program and the program "DUMAND". Additional biological studie were carried out under the national "Ecosystem" program, including investigations of the fauna of the oceanic ridges and sea-mounts. The benthic fauna group (headed by L.I. Moskalev) worked mainly with the Sigsby and Galathea trawls and investigated the sea-mounts Josephine and Rockaway. The benthic fauna of the top and slopes of the Great Meteor sea-mounts was studied in detail. From depths between 280 and 5420 m were obtained 31 trawl samples. The bathyal fauna of the two sea-mounts has its own physiognomy in taxonomic composition and trophological characteristics, and it differs significantly from the benthic fauna of the adjacent sea floor. A suspension-feeding epifauna dominates: sponges, gorgonians and madrepores, numerous sea-urchins and polychaetes. Judging from the various sea-urchins (many of which were found in this region for the first time) the bottom fauna of the Central Atlantic sea-mounts appears to be similar on the generic level to that of mountainous regions of the tropical and subtropical zones of the Pacific and Indian Oceans as well as to that of the near-continental areas of the Atlantic, where the sea-urchins are living at the same depths. In contrast to the Pacific fauna, species endemism was not found in the investigated mountainous region of the Atlantic. Judging from the sea-urchins, the colonisation of these regions originated in the western regions of the Atlantic.

Sea-urchins, madrepores and polychaetes make it possible to trace a well expressed vertical, biogeographic zonation in the mountainous regions of the open ocean, both regarding taxonomic composition and ecological physiognomy, and to single out the upper and lower bathyal zones.

In contrast to this, the fauna of the abyssal basins and the bases of the sea-mounts is poor (7-8 g animals in a trawl sample). Here deposit-feeders predominate. An interesting finding was represented by a sea-lily *Cyathidium foresti* (order Cyrtocri-

nida) from 960-1140 m on the eastern slope of the Great Meteor sea-mount. This is an additional proof of the conservation of the primitive "living fossils" on sea-mounts. This sea-lily was actually taken at the same place where it was first found by the German "Meteor" Expedition in 1967, and our specialists hoped beforehand to obtain this rare species.

During the 4th cruise of the R/V "Akademik Mstislav Keldysh" (23 July - 16 Oct. 1982) rather extensive geological investigations of the deep-sea benthos were carried out within the "Ecosystem" and comprised also studies of the bottom inhabitants of the mountainous regions of the open ocean. Included were also attempts to reveal hydrothermal vents or traces of their activity. Investigations were mainly carried out in the area of the Reykjanes ridge (North Atlantic), and also the Josephine and Atlantis sea-mounts were studied.

By means of grabs and trawls, visual observations from the submersible "Piscis", bottom-photographs, videotapes and aimed selection of samples, the taxonomic composition and structure of the bottom communities were studied. A total of 53 quantitative samples taken with the "Okean-50" grab and 26 trawl samples were obtained, three-fourths being obtained in the rift zone of the Reykjanes ridge. Five biological dives of the "Piscis" gave an opportunity to carry out visual observations and to sample organisms which are not caught or are damaged by other means. About 400 photographs from 500-2400 m and 11 videotape recordings were obtained.

As far as we know, this is the first time such a detailed survey, with trawls and grabs, of a comparatively limited area of the rift zone has been made. We succeeded in preparing maps of the quantitative distribution of the benthos biomass, of trophic zones and bottom communities and in revealing the peculiarities of the bottom population of the area investigated. On the crests and the marginal ledges of the ridge the benthos biomass is bordered by a 10 g/m^2 isobenth, but it may attain 5-10 kg/m^2 in some places because of a great development of suspension-feeders (sponges, sea-lilies, brittle-stars). Predators are common. On the stone fan and at the base of scarps benthos biomass comprises 5-7 g/m^2 and mainly consists of membranous sponges. On the lower slopes infauna organisms with biomass not exceeding 1 g/m^2 predominate. On the soft muddy sediments of the small inner basins and in the rift valley various deposit-feeders prevail. The average biomass is 0.5 g/m^2, and large epifauna forms are absent.

A special cruise of two R/V: "Akademik Kurchatov" (36th cruise) and "Rift" (2nd cruise) took place in Febr.-May 1983 in the western part of the Indian Ocean. The main aim was a multifaceted investigation of the taxonomic composition and quantitative distribution of phyto-, micro-, meso- and macroplankton, of the ichthyofauna and the benthos of isolated sea-mounts and ridges. Sea-mounts as Equator, Fred and Forcoir were investigated in detail. Some stations were made on Rodrigues and Chain Ridges as well as on submarine elevations N.W. of Nosi-Bé Island (Madagascar) and near Agalego Isl. At present the samples are being worked up.

Publications

A number of books (in Russian) concerning investigations of biology of the great depths of the world oceans have been published by the Institute:

1. "The research vessel "Vityaz" and her expeditions (1949-1979)". Publishing House "Nauka", Moscow 1983, 388 pp. Ed. A.S. Monin. - This contains the main results and achievements of 65 expeditions of the veteran of the Soviet research fleet in physics, chemistry, geology and biology of the Pacific, Indian and Atlantic Oceans. It also contains information about the vessel, the expedition routes and lists of new taxa of animals sampled, mainly deep-sea ones. These lists include more than 1100 species, 170 genera, 25 families and several higher taxonomic categories. There are 16 phototables, demonstrating the most interesting representatives of the deep-sea fauna, and a list of publications based on "Vityaz" material.

Many well-known biological oceanologists who repeatedly took part in the "Vityaz" expeditions have contributed: G.M. Beljaev, M.E. Vinogradov, N.G. Vinogradova, A.V. Ivanov, K.N. Nesis, N.V. Parin, T.S. Rass, Z.A. Filatova and others.

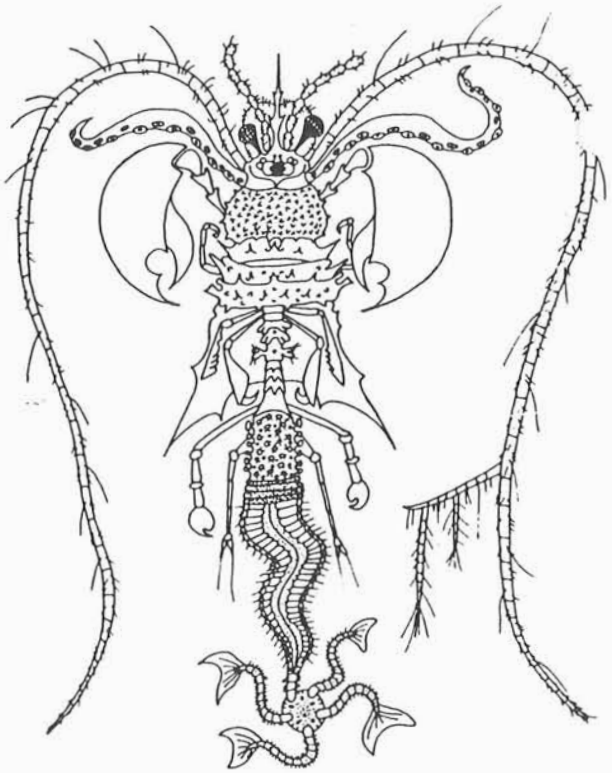
2. "The deep-sea bottom fauna of the Pacific Ocean". Transactions of the P.P. Shirshov Institute of Oceanology, Academy of Sciences of the USSR, Vol. 115. Publishing House "Nauka", Moskow 1981, 199 pp. Ed. Z.A. Filatova. - This book is a result

of work on some groups of the deep-sea animals collected during the expeditions of the Institute of Oceanology. The species composition, distribution and significance in the bottom fauna of the region investigated are described, data on ecology of some species are given, and some suggestions concerning faunistic connections with other ocean areas are made.

The articles deal with the following subjects: Deep-sea benthic eutrophic regions of the World Ocean (M.N. Sokolova); Interspecies variability of *Caryophyllia* (Madreporaria)(N.B. Keller); Distribution of Polynoidae from the Canada Basin (R.Ja. Levenstein); Geographical distribution of abyssal polychaetes of the East Pacific (N.V. Kucheruk); The systematic position of Polycopidae (Ostracoda, Cladocopina)(V.G. Chavtur); New deep-sea Ostracoda (Polycopidae) from the Kurile-Kamchatka Trench (V.G. Chavtur); Australian and New Zealand deep-sea Cirripedia (G.B. Zevina); Amphipods from deep-sea trenches in the western Pacific (O.E. Kamenskaya); Antarctic Tanaidacea and their geographical and bathymetrical distribution (R.K. Kudinova-Pasternak & F.A. Pasternak); The abyssal gastropod species *Sipho danielsseni* and *Mohnia mohni* (V.Ya. Lus); New species of *Tacita* (Prosobranchia, Buccinidae) in the NW Pacific (V.Ya. Lus); New and rare cancellothyroid brachiopods (O.N. Zezina); New deep-sea Myriotrochidae (Holothurioidea) from the northern and south-western Pacific (G.M. Belyaev & A.N. Mironov); Deep-sea echinoids of the genus *Plesiodiadema* (A.N. Mironov); Pogonophora of the Caribbean (M.A. Gureeva).

3. "Investigations of the deep-sea bottom fauna". Transactions, vol. 117. Publishing House "Nauka", Moscow 1982, 197 pp. Ed. A.P. Kuznetsov & N.V. Vinogradova. - Here are given general characters and quantitative benthos assessment of the deep-sea basins of the Mediterranean Sea, of the Iberian and West European basins of the Atlantic, the Red Sea and southeastern Pacific as well as new data on the deep-sea fau. of the Arctic Ocean.

The subjects are: Some problems of quantitative investigations of the bottom fauna (Z.A. Filatova); Meiobenthos - a subject and its research problems (M.N. Sokolova, O.N. Zezina & O.E. Kamenskaja); The bottom fauna of the Iberian and West European basins of the Atlantic (N.G. Vinogradova, O.N. Zezina, R.Ja. Levenstein, F.A. Pasternak & M.N.Sokolova); Quantitative and ecological characterization of the Peruvian slope fauna (N.V. Kucheruk); Quantitative distribution of the deep-sea bottom fauna in the Red Sea (F.A. Pasternak); Madreporarian corals of the genus *Deltocyathus* (N.B. Keller); Polynoid polychaetes from the Japan Trench (R.Ja. Levenstein); Deep-water Maldanidae (Polychaeta) of the Pacific, the genus *Maldanella* (N.N. Detinova); Nutrition of the deep-sea polychaete *Harmothoe derjugini* off Japan (M.N. Sokolova); Composition, distribution and origin of holothurians of the family Myriotrochidae (Apoda)(G.M. Belyaev & A.N.Mironov); Benthonic Foraminifera of the Canada Basin (T.A. Khusid); Abyssal polychaetes of the Norwegian Sea (J.A. Girkov); Deep-water benthos of the Mediterranean (N.G. Vinogradova, O.N. Zezina, R.Ja. Levenstein, F.A. Pasternak & M.N. Sokolova); Madreporarian corals from the Mediterranean (N.B. Keller); Deep-sea Tanaidacea from the Mediterranean (R.K. Kudinova-Pasternak); Composition, origin and peculiarities of the Mediterranean deep-sea isopod fauna (F.A. Pasternak); Sipunculans and echiurans of the Mediterranean and the Iberian Basin (G.-V.V. Murin).



Zina Filatova's fantasy of the strangest of all deep-sea organisms ....

4. "Structure, formation and ways of distribution of the ocean bottom fauna". Transactions, vol. 119. Publishing House "Nauka", Moscow 1984, 213 pp. Ed. A.P. Kuznetsov & N.G. Vinogradova. - This book gives general characteristics and a quantitative assessment of the deep-sea benthos of some regions of the Pacific and Atlantic Oceans, and the significance of main components of the bottom fauna in formation of benthic communities of different regions is pointed out. In addition, hydrobiological and historical premises of the asymmetry of recent bathyal faunas and the chance of the existence of a peculiar vertical, thalassobathyal zone on the underwater sea-mounts and ridges are discussed.

The subjects treated are: Hydrological and historical reasons for faunistic asymmetry in the bathyal zone (O.N. Zezina); The deep-sea bottom fauna of the Pacific equatorial zone (E.P. Turpaeva); Benthic investigation in the North American Atlantic Basin (N.G. Vinogradova, R.Ja. Levenstein & F.A. Pasternak); Species composition of the deep-sea bottom assemblages of the trophic regions (M.N. Sokolova); Feeding adaptations and trophic structure of Bivalvia in the sea benthos (A.P. Kuznetsov); Agerma-type corals of the Great Meteor sea-mount (N.B. Keller); Gorgonarians of the sea-mount in the northern part of Kapingamarangi Rise and probable existence of a particular thalassobathyal vertical zone of sea-mounts (F.A. Pasternak); New deep-sea Polychaeta (Maldanidae) (N.N. Detinova); Composition and distribution of Mediterranean echiurans (G.V. Murina); A new deep-sea Tritoniidae (Opistobranchia) from the Kurile Islands (I.S. Roginskaya); Size, structure and distribution of the deep-sea Bivalvia (Ledellidae)(Z.A. Filatova & A.A. Schileyko); Redescription of *Chiroteuthis joubini* Voss, 1967 (Cephalopoda)(K.N. Nesis & I.V. Mikitina); Ecological classification of the deep-sea amphipoda (O.E. Kamenskaya); Homeomorphy in shell structure of some deep-sea brachiopods (O.N. Zezina & O.N. Morosova); Distribution, ecology and evolution of starfishes of the genus *Freyella* (Brisingidae)(S.V. Galkin & N.M. Korovchinsky); Morphology and distribution of the recent echinoids of the genus *Echinocyamus* (A.N. Mironov & A.Yu. Sagaidachny); Grab samples in the West European Basin of the Atlantic (N.P. Mokeyeva).

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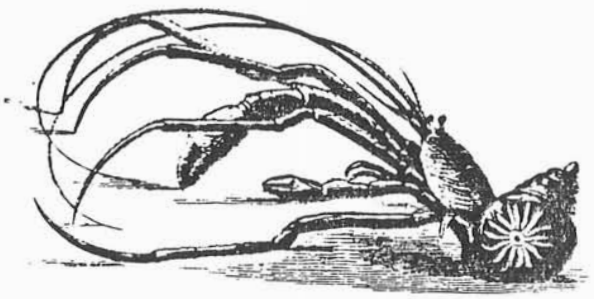


NEWS FROM FRANCE 1.....

Biogas program - Publication announcement

From 1972-74 and 1977-81, eleven oceanographic cruises were conducted in the framework of the Biogas program by a team of Frensh deep-sea biologists. Several scientists from other European countries participated in some of the cruises, and the biological samples collected were worked up by a large network of international zoologists.

In October 1982, the main results of the Biogas program were presented and discussed at a one-week symposium at Brest. The papers prepared for this symposium were then arranged for publication by IFREMER (ex.CNEXO and ex.ISTPM) as a book reporting on Biogas results.

The book comprises four main parts: The first part describes the hydrological features, currents, morphology, sedimentology of the areas studied north and south of the Bay of Biscay, and gives data on the surface primary productivity and organic fluxes which fuel the deep benthic communities.

In the second part, the roles of various size categories of benthic fauna (meiofauna, macrofauna and megafauna) are considered with respect to their density and biomass.

The third part deals with the dynamics of deep benthic communities: the role and importance of free-living bacteria as well as bacteria associated with the guts of benthic invertebrates; the relationships between meiofauna and macrofauna, based on results of settlement experiments of fauna in azoic sediments moored for nearly one year; and the importance of megafauna as shown by baited trap and automatic camera.

The fourth part deals with the conclusions written by various zoologists taking part in the study and for most of the zoological groups recorded includes information on taxonomy, biogeography, depth distribution, morphology, etc. Some new taxa are also described within this part.

Appendices give a list of all samples taken during these cruises, a description of sampling and analytic methods used for organic matter content, and a selected bibliography of about 120 titles directly connected with the Biogas program.

The book is expected to be published by IFREMER by mid-May, 1985. We hope it will be of some interest for deep-sea biologists.

Lucien Laubier

NEWS FROM FRANCE 2.....

Hydrothermal vents of the East Pacific Rise - Biology and ecology of the 13°N area

First announcement

In the framework of the scientific group "Ecoprophyce", a national symposium is being organized on the hydrothermal vents of the East Pacific Rise, with special emphasis on the 13°N area where the French submersible Cyana made two cruises (March 1982 and March 1984) to study the biology and ecology of benthic communities around the vents (see last Deep-Sea Newsletter).

Time: 4-7 November, 1985
Place: Institut Oceanographique, 195 Rue Saint-Jacques, F-75005 Paris
Organisation Committee: D. Desbruyères, Departement Etudes Océaniques, IFREMER Centre de Brest, B.P.337, F-29273 Brest Cedex
- A. Bianchi, Laboratoire d'Ecologie et Biochemie microbiennes Université de Provence, 3 Place Victor Hugo, F-13331 Marseille 3
- A. Fiala-Medioni, Laboratoire Arago, F-66650 Banyuls-sur-Mer
- M. Roux, Departement des Sciences de la Terre, Université Claude Bernard-Lyon I, 27-43 Bd du 11 Novembre F-69622 Villeurbanne Cedex
- L. Laubier, IFREMER, 66 Avenue d'Iéna, F-75116, Paris

Topics of the symposium: After the two cruises in 1982 and 1984, the French group of deep-sea biologists is improving our knowledge about this new hydrothermal site (13°N) which has also been visited by Alvin in late spring 1984. Studies are being conducted in zoology, ecology, and biology of the association between bacteria and different invertebrates, and their biogeochemistry, microbiology and genetics. Several foreign speakers will be invited to the symposium to give lectures on other hydrothermal areas such as the Juan de Fuca sites studied by Canadians, and selected geophysicists, geologists and geochemists will summarize the present knowledge in their own field of science.

The papers presented during the symposium will be allowed 30 minutes time, including 10 minutes for discussion. A preliminary schedule for the seven working sessions of each three hours will be prepared and distributed by the end of May 1985.

We hope to publish the Proceedings of this meeting in the beginning of 1986.

Lucien Laubier

NEWS FROM FRANCE 3.....

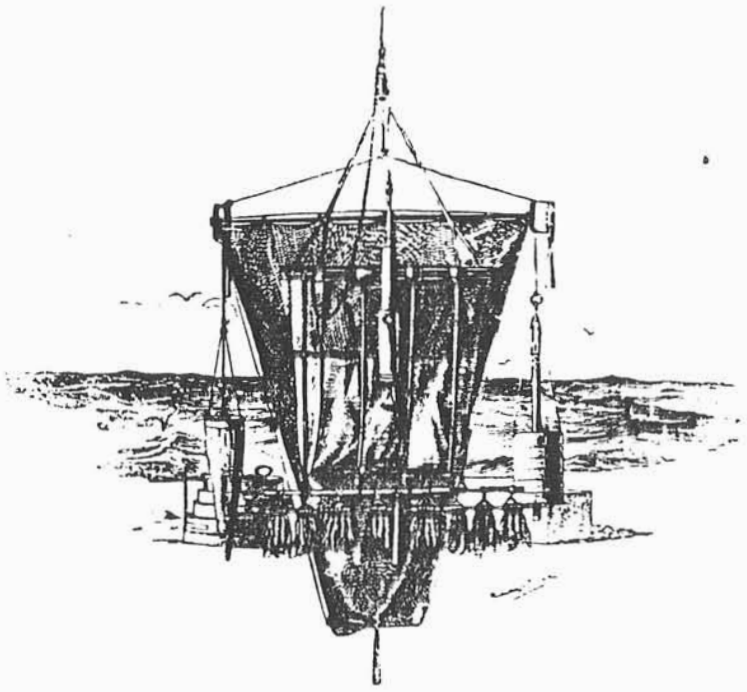
Cruise "BALGIM" (Biologie AtLantique GIbraltar Méditerranée)

From 20 May to 20 June 1984, Ph.Bouchet, together with eight other French deep benthic biologists, conducted a cruise in the Spanish-Moroccan Gulf, the Strait of Gibraltar, and the Alboran Sea in the Mediterranean. The main objective of the cruise, organized in the general framework of the scientific French group Ecoprophyce (see previous Deep-Sea Newsletter), was to study the benthic bathyal communities east and west of the Strait of Gibraltar and to compare the southern and northern areas of the Spanish-Moroccan Gulf with regard to the possible influence of outflow of Mediterranean water, which is strictly restricted to the Spanish coast, where it sinks to the density balance. Biological sampling with dredges and beam trawls was conducted at 150-2000 m depth. 125 sampling operations were successfully achieved, 80% in the western part, 20% in the Alboran Sea.

The preliminary results show a considerable difference in the stations north and south of the Spanish-Moroccan Gulf. In the south, a typical NE Atlantic bathyal community is found, with large populations of echinoderms, highly diversified, and with hexactinellid sponges occurring below 600 m. In the north, the situation is drastically different. The stations have been located with regard to the Mediterranean, using water samples near the bottom. The Mediterranean water influence is very clear: below the Mediterranean water level (from 300 m depth immediately west of Gibraltar to 1300 m depth at Cape St.Vincent), the same typical NE Atlantic bathyal community occurs. In the Mediterranean water range, the fauna is a very poor one, with only a few species. Above the level of the Mediterranean water, and even at Cape St.Vincent, which is far west of Gibraltar, the bathyal community is not typical of the NE Atlantic. The samples in the Alboran Sea confirm our present knowledge of the Mediterranean bathyal benthos, with very low specific diversity and biomass.

Generally speaking, these results suggest that the poverty of the Mediterranean bathyal benthos is mainly due to the quality of the Mediterranean water rather than to the biogeographical barrier at Gibraltar.

Lucien Laubier



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THE DEADLINE FOR THE NEXT ISSUE OF D.-S.N. IS 1st NOV. 1985

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