



No. 24, May 1996

EIGHTH DEEP-SEA MARINE BIOLOGY SYMPOSIUM 1997

CHANGE OF LOCATION: FROM GALWAY TO MONTEREY

Those present at the Crete Symposium in 1994 will remember the debate regarding the location of the next symposium. Particularly non-Europeans felt that since only one previous meeting had been held outside Europe (at Scripps in 1981) it was about time for a change. There were invitations from two American institutions, in addition to one from Ireland (Galway). Nevertheless, a great majority subsequently voted for Galway after having been informed that this was the second official (and third unofficial) invitation from Galway and that the 9th symposium would not be in Europe. Accordingly, John Patching extended an invitation to Galway in the latest Deep-Sea Newsletter, without indicating a final date. A close cooperation with Tony Rice was anticipated.

At the time John and Tony did not know that they and many other Europeans, from March to September 1997, would be involved in a MAST 3 project: "High Resolution Temporal and Spatial Study of the Atlantic Abyssal Locality (BENGAL)", coordinated by Tony Rice and with participation of nine European countries.

Last autumn John sent me a contribution to be published in the next (February 1996) issue of the Newsletter. In view of the said activities, he and Tony had - after considerable thought and discussion - decided to propose to move the meeting to 1998. They believed that, because of the project, a meeting in 1997 would suffer by the absence of many European colleagues or, if they managed to attend, by the absence of presentations from them. Besides addressing me, John published his message through internet.

A significant feature about the deep-sea symposia is their informality and lack of bureaucracy which contributes to their success. This does mean, however, that there is no clear way of making decisions between meetings.

In response to my usual request in January to the correspondents for contributions to the next issue, Craig Young informed me that there had been "quite a bit of grumbling about the 1-year delay... particularly since there was such a heated discussion in Crete about the next venue!" Craig further pointed out that virtually every meeting is missed by some deep-sea biologists with conflicting cruises and that a change of the long established tradition with 3-years intervals would be unfortunate. He suggested that the D-SN would be the appropriate forum to discuss it and offered to put forward a formal written proposal for a change of location.

I realized that using the D-SN in this way would mean a delay of several months. It would probably also result in limited response in view of the fact that John's message through internet had produced only two reactions: Craig's and one other opinion (against the change of year). It was evident that if another location was to be found for 1997, Monterey which got the second highest vote in Crete should be asked to act as host.

After having been informed about Craig's arguments, John and Tony - although still believing that the change was justified and reasonable - "now felt that the 1997 meeting should be held in Monterey and the 2000 meeting in Galway."

Fortunately it turned out that, according to Jim Barry, Monterey was very interested in hosting the meeting. Obtaining the necessary approval of the management of Monterey Bay Aquarium Research Institution has, however, meant a further delay. Meanwhile I have informed Jim about the approximate dates of the BENGAL cruises to be taken into consideration when deciding on the date for the meeting.

Please find below the splendid invitation from Monterey. I wish you all - and in particular a lot of the BENGAL people - a happy "au revoir" in Monterey in 1997 - and in Galway in 2000!

Torben Wolff

# THE EIGHTH DEEP SEA BIOLOGY SYMPOSIUM

Monterey, California, U.S.A., 22 September - 27 September, 1997

## First Announcement

### **SYMPOSIUM LOCATION AND SCHEDULE**

The 8th Deep Sea Biology Symposium (DSBS) has been moved to Monterey, California, in consideration of the one year delay required to host the event in Galway, as originally planned during the 7th Symposium at Crete. The 8th DSBS will be co-hosted by Monterey Bay Aquarium Research Institute (MBARI) and Monterey Bay Aquarium (MBA), and is tentatively scheduled for the 22th through the 27th of September, 1997. Monterey is a beautiful setting for the 8th DSBS, and we invite all of the deep-sea scientific community to attend and enjoy the symposium, associated events, and leave a bit of time to explore the central California coast.

The symposium will be held at the Monterey Bay Aquarium, located in Monterey, California, approximately 100 miles south of San Francisco. Formerly the capital of California, Monterey was an important port-of-call during the early period of California's history, and was a center of an enormous sardine fishery in the first half of this century. Monterey is now a tourism destination along the central coast, known for its history, beautiful coastlines, diving, golf, sea otters, and other sights. Monterey Bay Aquarium is situated on "Cannery Row", a site formerly occupied by sardine canneries, and now a focal point for local tourism. In addition to its public aquarium displays, MBA has facilities suitable for the conference. Accommodations are available from a variety of nearby hotels (several listed below).

In addition to tourist attractions near to MBA, we plan at least one mid-symposium excursion touring the scenic "17-Mile Drive" and stopping for a mid-day hike at Pt. Lobos State Reserve, a rugged and stunningly beautiful coastal habitat. A second or alternate excursion touring several wineries in the Monterey region will be planned depending upon interest. In addition, MBA will host late afternoon and/or evening events at the aquarium, including the new 'Outer Bay Waters' exhibit, and MBARI will host a tour of the new research facilities (research laboratories and ships) at Moss Landing, 20 miles north of Monterey. A symposium dinner will be arranged for the evening preceding the last day of the DSBS.

### **SYMPOSIUM FORMAT**

The format for the DSBS will be similar to earlier meetings, including both oral and poster presentations concerning deep-sea organisms and ecosystems. We invite papers on any related topic, and are particularly interested in presentations relating to processes influencing the function and organization of deep-sea communities or populations. Themes of interest include, but are not limited to;

- Diversity, Adaptation, and Evolution of Deep-Sea Biota
- Pattern and Function of Deep-Sea Populations and Communities
- Source and Utilization of Carbon Inputs in Deep-Sea Systems
- Metabolic or Physiological Studies of Deep-Sea Biota
- Microbial Processes in Deep-Sea Habitats
- Deep-Sea Pelagic Community Studies
- Sedimentation and Diagenesis in Deep Ocean Habitats
- Reproduction in the Deep-Sea
- Interdisciplinary Studies in Deep Ocean Settings (JGOFS, ...)
- Studies of Specialized Habitats (Seeps, Vents, Oxygen Min. Zone)

M B A R I



We invite suggestions for additional or alternative symposium topics. We will invite keynote speakers for each topic of the symposium, with the final selection of topics based upon abstract submissions. A compendium of abstracts will be printed for the symposium.

## **SYMPOSIUM EXPENSES**

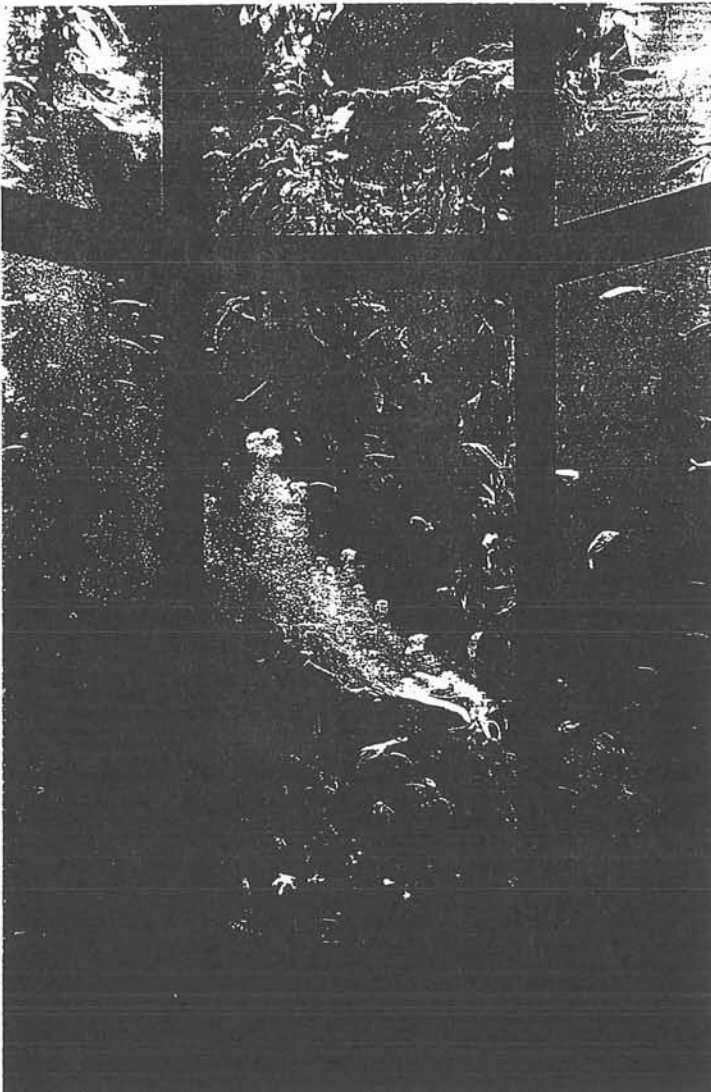
Hotel prices and other expenses for the 8th DSBS are approximately as follows:

### Hotel Accommodations.

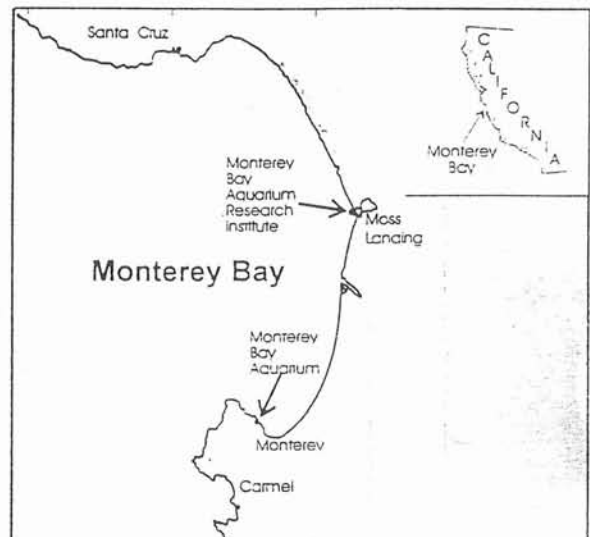
5 star	\$165 - \$225 per room (single or double occupancy)
4 star	\$135 - \$165 per room (single or double occupancy)
3 star	\$90 - \$135 per room (single or double occupancy)

Hotel rates reflect the cost per room for one or two persons, and include taxes, but generally do not include meals. Rates may be reduced further with higher occupancy (e.g. 3 or 4 persons / room).

Food per Day	\$25 to \$50	
Excursion (lunch included)	\$35	
Symposium Dinner	\$50	
Symposium Registration Fee	\$100	Students - \$50



## **MONTEREY BAY AQUARIUM**



Double and greater occupancy lowers the rates by about  $\frac{1}{2}$  or perhaps more. We will do our best to make available the cheapest rates possible at the local hotel and motels. We also plan to provide (at MBARI's cost) a shuttle service to move people to and from hotels in the morning and afternoon.

In order to help project costs for the symposium negotiate hotel prices, plan excursions, etc., please notify the hosting organizations in one of the following ways to express your interests in attending the 8th DSBS;

1 INTERNET

Contact MBARI's Home Page at "<http://www.mbari.org/>", click on the heading for the "8th Deep Sea Biology Symposium", and follow the instructions to complete the symposium planning form

2: EMAIL

Send a message to [goan@mbari.org](mailto:goan@mbari.org), including answers to each of the questions on the symposium planning form.

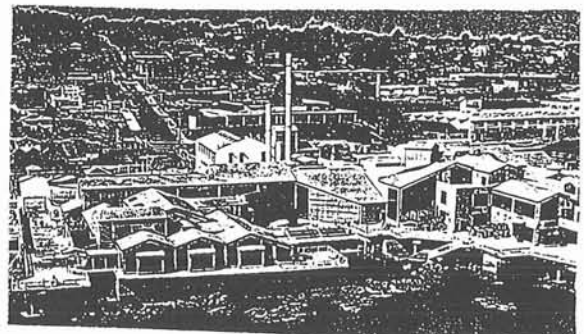
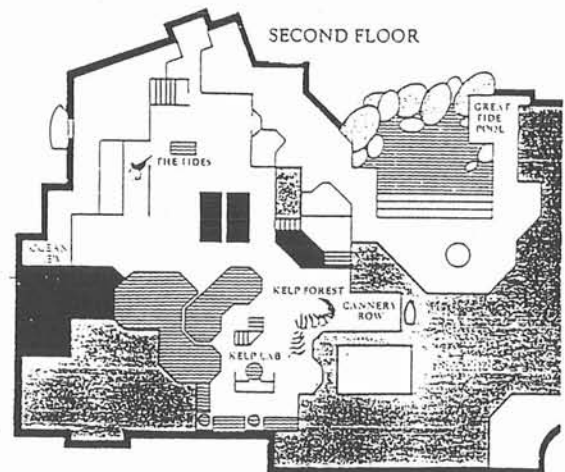
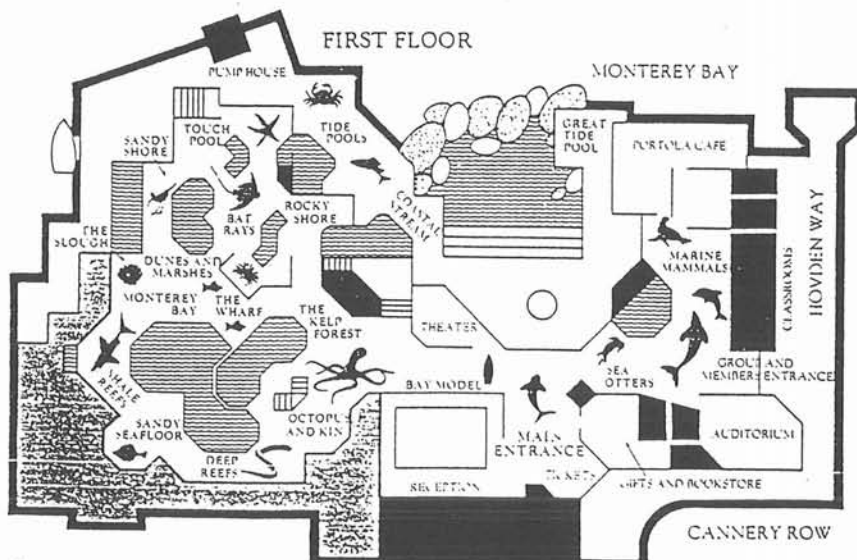
3: FAX

Complete the symposium planning form below, and fax it to Annette Gough, 408-775-1645

4. SURFACE MAIL

Send the completed symposium planning form to; 8th DSBS, MBARI, P.O. Box 628, Moss Landing, CA. 95039, U.S.A.

## THE AQUARIUM: AN ECOLOGICAL PLAN



## 8th Deep Sea Biology Symposium Planning Form First Announcement, May 1996

### ***Hosting Organizations / DSBS Coordinators***

Monterey Bay Aquarium Research Institute / Drs. J.P. Barry and B.H. Robison

Monterey Bay Aquarium / Drs. C. Harrold and R.E. Kochevar

P.O. Box 628, Moss Landing, CA 95039, U.S.A.

(408) 775-1726 (phone), (408) 775-1645 (fx), barry@mbari.org (email),

http://www.mbari.org/ (internet)

### ***Participant Information***

1. I am planning to attend the 8th DSBS Yes \_\_\_\_\_ with \_\_\_\_\_ persons

2. I wish to present a paper on

\_\_\_\_\_ Subject not decided

3. I wish to present a short communication on

\_\_\_\_\_ Subject not decided

4. I wish to present a poster on

\_\_\_\_\_ Subject not decided

5. I intend to participate in the mid-symposium excursion to;

17 Mile Drive and Pt. Lobos

Yes \_\_\_\_\_

No \_\_\_\_\_

Monterey Regional Wine Tasting Tour

Yes \_\_\_\_\_

No \_\_\_\_\_

6. I intend to participate in the Symposium Banquet

Yes \_\_\_\_\_

No \_\_\_\_\_

7. Name and Title:

\_\_\_\_\_

Institution

\_\_\_\_\_

Address

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## THE DEEP-SEA NEWSLETTER CORRESPONDENTS AND DISTRIBUTORS

- AUSTRALIA: Dr. Jean Just, Australian Biological Resources Study (Fauna), GPO Box 636, Canberra ACT 2601.
- BELGIUM: Dr. Magda Vincx, Marine Biology Section, Zoological Institute, State University of Gent, Ledeganckstraat 35, B-9000 Gent.
- CANADA: Dr. Verena Tunnicliffe, Dept. of Biology, University of Victoria, P.O. Box 1700, Victoria, B.C., Canada V8W 2Y2. Tel: (604) 721-7094. Fax: (604) 721-7120.
- FRANCE: Dr. Myriam Sibuet, IFREMER, Centre de Brest, B.P. 70, F-29263 Plouzané.
- GERMANY: Dr. Hjalmar Thiel, Alfred-Wegener-Institut für Polar- und Meeresforschung, Columbusstrasse, 27515 Bremerhaven. Fax: +49 471 4831 580, E-mail: hthiel@awi-bremerhaven-de.
- GREECE: Dr. A. Eleftheriou, Dept. of Biology, University of Crete, P.O. Box 1470, Heraklion - 71110. Fax: +30 81 241882.
- HOLLAND: Dr. Jaap van der Land, Rijksmuseum van Natuurlijke Historie, Postbus 9517, NL-2300 LB RA
- ICELAND: Dr. Jörundur Svavarsson, Institute of Biology, University of Iceland, Grensávegur 12, Reykjavik. Fax: 354 525 4069.
- INDIA: Dr. P. Sivadas, National Institute of Oceanography, P.O. Box 1913, Providence Road, Cochin 682 018. Fax: 91 0484 374618.
- JAPAN: Dr. Masuoki Horikoshi, Pabylon-Meguro 302, Meguro 1-3-31, Meguro-ko, Tokyo 153.
- KOREA: Prof. Sung Yun Hong, National Fisheries University of Pusan, Pusan. Fax: 051 625 9947.
- NORWAY: Dr. Torleiv Brattegard, Universitetet i Bergen, Institutt f. Fiskeri- og marinbiol., Høyteknologisenteret, N-5020 Bergen, e-mail: torleiv.brattegard@ifm.uib.no.
- RUSSIA: Dr. Nina Vinogradova, Institute of Oceanology, Academy of Sciences, 23 Krasikova Street, Moscow 117218.
- SWEDEN: Prof. J.-O. Strömberg, Kristineberg Marine Biological Station, S-450 34 Fiskebäckskil.
- UNITED KINGDOM: Dr. Tony Rice, Southampton Oceanography Centre, Empress Dock, Southampton SO14 3ZH. Fax: +44 (0) 1703 596, e-mail: pht@ua.nwo.ac.uk.
- U.S.A. (East): Dr. Craig Young, Division of Marine Science, Harbor Branch Oceanogr. Inst., 5600 Old Dixie Highway, Fort Pierce, FL 34946. Fax: (407) 468 0757.
- (West): Dr. Ken Smith, Scripps Institution of Oceanography, A-002, La Jolla, Calif. 92093.

Requests for receipt of D-SN should be directed to the correspondents. Contributions on new discoveries and other matters of interest to the deep-sea community may be sent through your correspondent or directly to me whose gratitude will in both cases be unlimited.

Editor



## METHANE SEEPS INVESTIGATION

During September 1995, the laboratories of Craig Young (Harbor Branch Oceanographic Institution) joined those of Paul Tyler (Univ. of Southampton) and Kevin Eckelbarger (Univ. of Maine) for a brief cruise to cold methane seeps on the Louisiana Slope. The project was supported by NOAA (National Undersea Research Program, Wilmington), and the objective was to examine reproductive and developmental processes in seep animals. With the collaboration of postdocs Anna Metaxas and Elsa Vazquez, Young and Tyler fertilized the eggs of two vestimentiferan species in the genera *Escarpia* and *Lamellibrachia*. Early embryonic development was documented and larvae were reared in vitro for three weeks. These are the first vestimentiferans to be reared into the larval stage in vitro. All of the developmental processes seem to confirm that vestimentiferans are closely related to polychaetes. Details will appear shortly in a letter to Nature.

Craig Young,  
Harbor Branch, Oceanographic Institution,  
Department of Larval Ecology, Fort Pierce, Florida, USA

# VISUAL OBSERVATIONS FROM DSRV "MIR" IN LOCATION OF THE RUSSIAN SUBMARINE "KOMSOMOLET" WRECK

In June–August 1994 and in June–July 1995 two cruises (33th and 36th) of R/V "Akademik Mstislav Keldysh" took place in the Northwest Norwegian Sea, to the location of the wreck of the Russian nuclear submarine "Komsomolets" (73° 42' N, 13° 15' E), depth 1700 m. One of two main objectives of the cruises was to investigate the pelagic ecosystem in the whole water column, especially near the bottom. On the basis of these data, we had both to reveal possible paths of radionuclide migrations and to estimate (qualitatively) the resulting radionuclide flux in case of depressurization of the submarine carcass. Standard gears (BR closing plankton nets with mouth area 1 m<sup>2</sup>, 150–l water bottles) as well as the direct visual observations from DRSV "Mir" were used. The latter allowed us to describe vertical biological structure more precisely than is usually done using standard methods. It was reasonable to pay the main attention on the vicinity of the sea floor where one should expect the first contact of radionuclides with the biota. Since meso- and microscale patterns of vertical distribution remain almost undescribed, this paper is devoted to this subject, basing our information mainly upon visual observations. More detailed and illustrated information will be presented in the nearest future in the book "Oceanographic research and underwater technical operations on nuclear submarine wreck "Komsomolets", Moscow, Nauka, 1996.

**METHODS.** Pelagic population of the water column was observed during three dives of DRSV "Mir": June 22, 1994 (observer M.E. Vinogradov), June 28, 1994 (observer A.L. Vereshchaka), and June 17, 1995 (observer G.M. Vinogradov). We counted all the animals passing through an iron cubic frame with a rib (75 cm in 1994 and 50 cm in 1995). Observations began at a depth of about 100 m where the water got dark, while the vehicle continued to descent and finished at the bottom. Near the bottom, we used the horizontal movement of the vehicle at various distances from the bottom (from 1–2 m above the bottom (mab) to 60 mab). This allowed us to observe microscale variability in distribution of plankton near the bottom.

**RESULTS.** At the location, 9 planktonic species were dominant: The copepods *Calanus finmarchicus*, *C. hyperboreus*, *C. glacialis*, *Metridia longa*, *Euchaeta* spp, the chaetognath *Sagitta elegans*, the hyperiid amphipod *Themisto abyssorum*, the shrimp *Hymenodora glacialis*, and the mysid *Birsteiniamysis scyphops*. The Norwegian Sea deeps are filled with the local Arctic water. Therefore, many shallow water species that are often met near the surface in other areas with ordinary water stratification, penetrate in the Norwegian Sea as deep as to the bottom vicinity (about 1700–2000 m).

The surface waters 100 m thick were dominated by two mixed populations of *C. finmarchicus* and *C. glacialis*. A few specimens were observed from DSRV even near the bottom, but their share in the total biomass of the standing crop population seemed to be close to zero. Since these species dwell in the upper layers they are believed not to be important in possible radionuclide vertical transport.

In contrast the dominating copepod *C. hyperboreus* lived in the deeper waters much closer to the sea floor. At the time of our observations, they occupied depths from 600 m to the bottom, the maximum being at 900–1000 m (the estimated abundances were very similar: 2.0 ind/m<sup>3</sup> estimated during the dive of 28.07.1994 and 2.2 ind/m<sup>3</sup> of 22.07.1994). These animals were abundant also within the layer 0–100 mab. Since the animals seasonally migrate in the deeper layers during the winter, the *C. hyperboreus* population is believed to have periodical and sufficient contact with the near-bottom layer and thus is important in the possible radionuclide transport. *Metridia longa* was the only dominant diurnal migrant in the area, dwelling mainly in the depth range 50–600 m. *Euchaeta* spp. were evenly distributed throughout the water column. Although found near the bottom and capable of vertical movements, these copepods are not abundant enough to be an important factor in radionuclide.

Juveniles of *Sagitta elegans* occurred in the 100–600 m layer and were replaced below this by adults (600–1100 m). According to our visual observations, the population of *S. elegans* was apparently stratified: The specimens with developed testes dominated in the 600–900 m layer (1.5 ind/m<sup>3</sup>) while those with developed ovaries were much more abundant deeper, in 900–1100 m (1.0 ind/m<sup>3</sup>). Since chaetognaths do not dwell below 1100 m, they would rather prevent upwards radionuclide migration by feeding on the migrant copepods and providing a carnivorous radionuclide "filter"

In the arctic waters the shrimp *Hymenodora glacialis* dwelt below 600 m. It was homogeneously distributed throughout the water column from that depth to the bottom. Close to the sea floor, at 50–100 mab, its abundances rose but fell abruptly at 2–20 mab where few specimens were observed from DSRV "Mir". Although having possible contact with ejected radionuclides, these shrimps can not migrate to the upper layers and be eaten by commercial fishes. Like *S. elegans*, the carnivorous shrimps rather participate in the "filter", preventing the upward migration of radionuclides.

The hyperiid *Themisto abyssorum* occurred throughout the whole water column, apparently making no difference between deep Arctic and transformed Atlantic surface waters. During the dive of 22.07.1994, enormous swarms of these animals, containing thousands of individuals, were observed near the lost submarine. These aggregations seemed to be spawning and were supposed to be related to the moon phase (that day there was a full moon). As comparatively large and movable hyperiids gathered just near the sea floor in the almost complete

absence of predators feeding on them, *Th. abyssorum* could provide intensive upward transport of radionuclides and therefore must be taken into consideration. The following year, 17.07.1995, *Th. abyssorum* were again observed near the submarine; abundances were much less: tens and hundreds of specimens.

The last species, *Birsteiniamysis scyphops*, lived close to the bottom at a distance of 0.5-5 mab. They could only be observed from the DSRV or caught by the Sigsbee trawl, the standard plankton gears being useless for their capture. Their concentration in the layer 1-2 mab was estimated as 0.2 ind/m. In spite of possible direct contact of the mysid with rejected radionuclides, the animals seem not to be important for the vertical radionuclide transport due to lack of vertical migrations.

In the near-bottom layer, numerous benthopelagic scavenging lysianassoid amphipods were also present. In the baited trap positioned on the deck of the submarine (10 mab) 15.-17.07.1995, we found 1720 *Tmetonyx cicada*, 1059 *Scopelocheirus abyssii*, 214 *Eurythenes gryllus*, 65 *Paracallisoma* sp. nov., and 72 other lysianassoids. In another trap positioned on the sea floor near the submarine (0 mab) 7.-11.07.1995, we caught 649 *T. cicada*, many other lysianassoids (and 11 *Leptamphous sarsi* (family Eusiridae)), but only 2 *S. abyssii*, *E. gryllus* and *Paracallisoma* were lacking. In numerous benthic Sigsbee trawl samples taken in the area, only one *E. gryllus* and a few *Paracallisoma* were present. Two *S. abyssii* were caught by the BR plankton net 10-300 mab and 250-700 mab. This group of the near-bottom animals also seems to be unimportant for the vertical radionuclide transports but may be important in horizontal disperse during their quest for prey.

The obtained picture of biological structure of the water column as applied to the radionuclide transport problem may be summarized as follows: (1) only two dominant species can provide significant transport of radionuclides due to their vertical movements: *Calanus hyperboreus* and *Themisto abyssorum*. The resulting flux will be much reduced by the dense "filter" of carnivores (*Sagitta elegans*, *Hymenodora glacialis*) dwelling at the intermediate depths. Taking into consideration the local character of the radionuclide pollution and soon its dilution in the water masses, only a small and insignificant share of the total radionuclides is believed to appear in the surface layer, be eaten by fishery animals, and end up as food for man.

The other striking result of our observations is the discovery of a very sharp change in structure of the water-column community near the bottom. This is especially intriguing if one remembers the homogeneity of the water-column (with respect to temperature, salinity, density, oxygen) in the deep of the northwest Norwegian Sea. Probably, these changes reflect only the influence of the sea floor. At a distance of some hundred meters, abundances of pelagic animals become higher than in the upper waters (in *H. glacialis* population twice as high as in adjacent layers). Probably, the local enrichment of the environment by organic matter takes place there with following aggregations of animals. Closer to the sea bed, at 20-60 mab, the "face" of the pelagic community undergoes a striking change that is believed to indicate its return to the benthopelagic nature. Abundances of pelagic animals fall significantly whilst the water column becomes dominated by the benthopelagic community. The "face" of the latter is clearly recognisable by presence of species observed only in the vicinity of the bottom. These are, except as already mentioned *Birsteiniamysis scyphops*, the cirrate octopus *Cirroteuthis*, lysianassoid amphipods, lobate ctenophores and medusae (of the genus *Halopsis*?). The benthopelagic animals dominate in the lower about 10 m layer adjacent to the sea

floor. Radionuclides just ejected from the submarine would contact immediately with this benthopelagic community. It is a question for future studies which share of them would be accumulated in these communities and which will be transported upwards by pelagic animals penetrating the near-bottom layer from above.

M.E. Vinogradov, A.L. Vereshchaka & G.M. Vinogradov  
Russian Academy of Sciences



# HADAL BOTTOM FAUNA OF THE ANTARCTIC TRENCHES

Biological research in the deep-sea trenches in the Antarctic Ocean began in 1962-1963 during the expedition of R/V "Eltanin (USA) in the South Sandwich South Orkney (now Lorie) Trenches. Ten years later the study of the Antarctic trenches was resumed by the USSR. During the 11th cruise of R/V "Akademik Kurchatov" (1971-1972), and the 16th and 43rd cruises of R/V "Dmitryi Mendeleev" (1976,1989) the South Sandwich, Lorie, Endurance, Orkney, Macquarie and Hjort Trenches were investigated (Figs. 1-2). In all, 21 trawl samples and 11 quantitative grab samples were taken with an "Okean-50" bottomsampler (0,25m<sup>2</sup>) at depths from 5000 m to 8116 m. About 60.000 specimens of bottom invertebrates were collected. A rich and diverse fauna, in its taxonomical composition typical for the ultra-abyssal or hadalzone, inhabits most of the trenches. But in the Macquarie and Lorie Trenches, where the maximal depth is less than 5500 m, the fauna has a transitional character between that of the abyssal and ultra-abyssal ones. Many species appeared to be new to science.

The benthic biomass is large, being an order of magnitude greater than that on the adjacent oceanic floor. It reaches 4-9 g/m<sup>2</sup> at the trench bottom. In the Orkney Trench at 6160 m an extraordinarily large benthos biomass - 117 g/m<sup>2</sup> - was found (Figs. 3, 4). It is a unique value for the depths 6-7 km, being 1-2 and even 3 orders of magnitude greater than the biomass calculated for the same depths in all trenches of the eutrophic regions of the World Ocean.

The trawl catches of the Atlantic trenches contained thousands of specimens and about a hundred species of bottom metazoa; the catches at the Maquarie and Hjort Trenches were not so rich. The composition of the benthos of the South Sandwich, Lorie and Endurance Trenches is similar at the generic level, whereas the fauna of the Orkney Trench differs greatly from the rest in the presence of an enormous quantity of Kelliellidae (Bivalvia). The bottom communities everywhere are polymictic. The deposit feeders predominavite greatly in the values of the total biomass of benthos.

contrast, the species inhabiting the oceanic floor penetrate there to greater depths. Unexpectedly, rather close zoogeographical relation with the fauna of the trenches of the northwestern part of the Pacific Ocean are found in some taxons.

Similarity of the faunistic composition, value of the benthic biomass and trophic characteristics, which have been determined for the Antarctic trench fauna and for that of the north eutrophic trenches of the Pacific Ocean, confirm the fact that the biological structure of the Ocean may be seen even at the maximal oceanic depths.

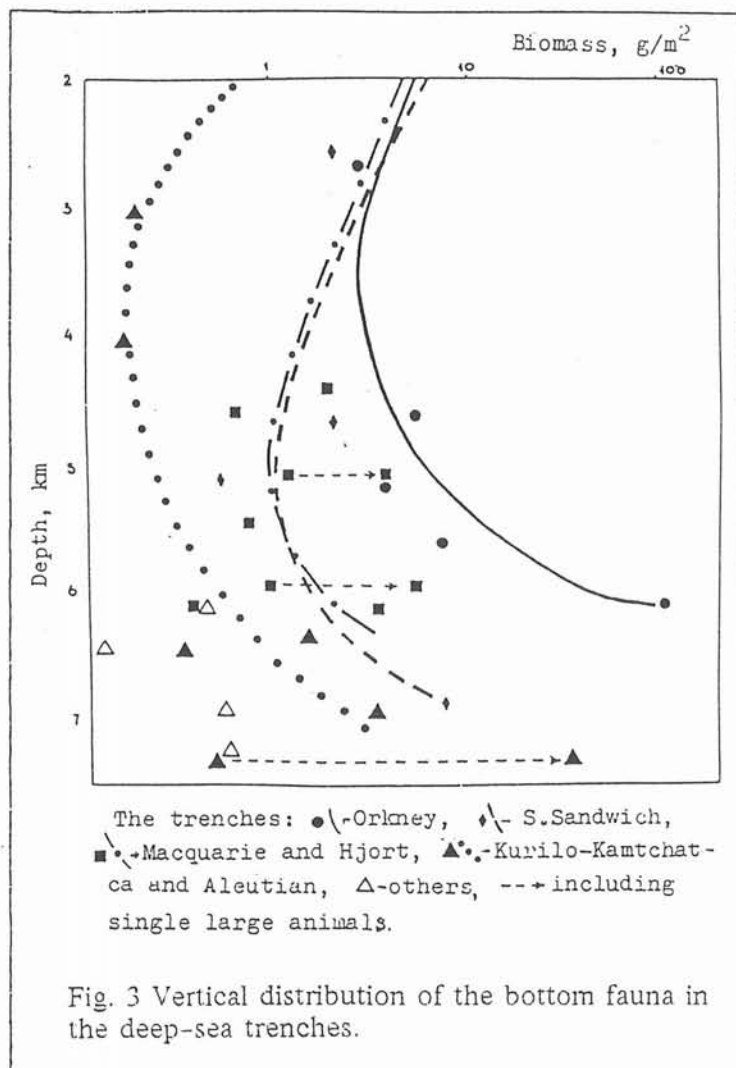


Fig. 3 Vertical distribution of the bottom fauna in the deep-sea trenches.

## Reference

Vinogradova, N.G., A.V. Gebruk & V.N. Romanov, 1993: Some new data on the Orkney Trench ultra-abyssal fauna.

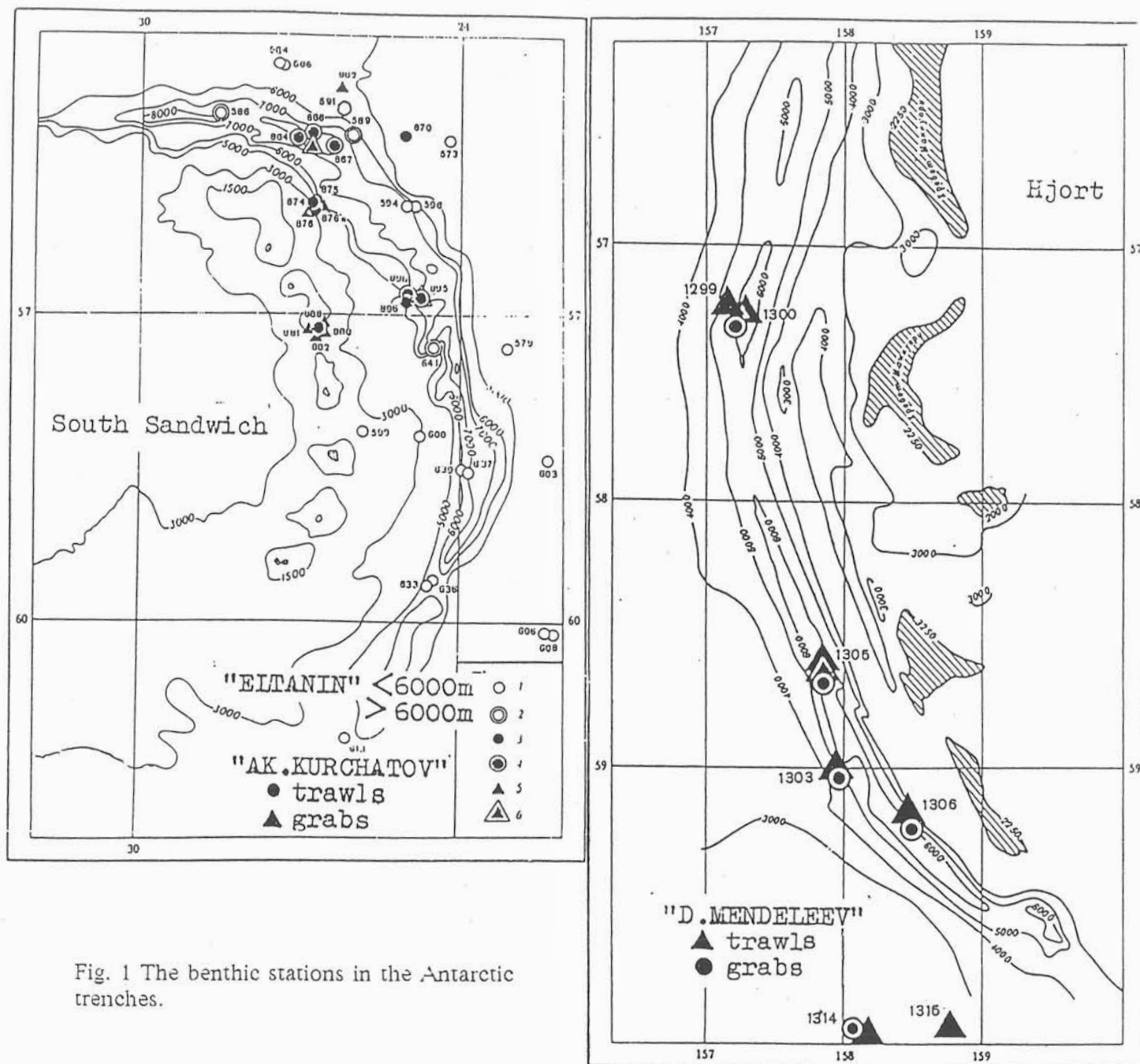
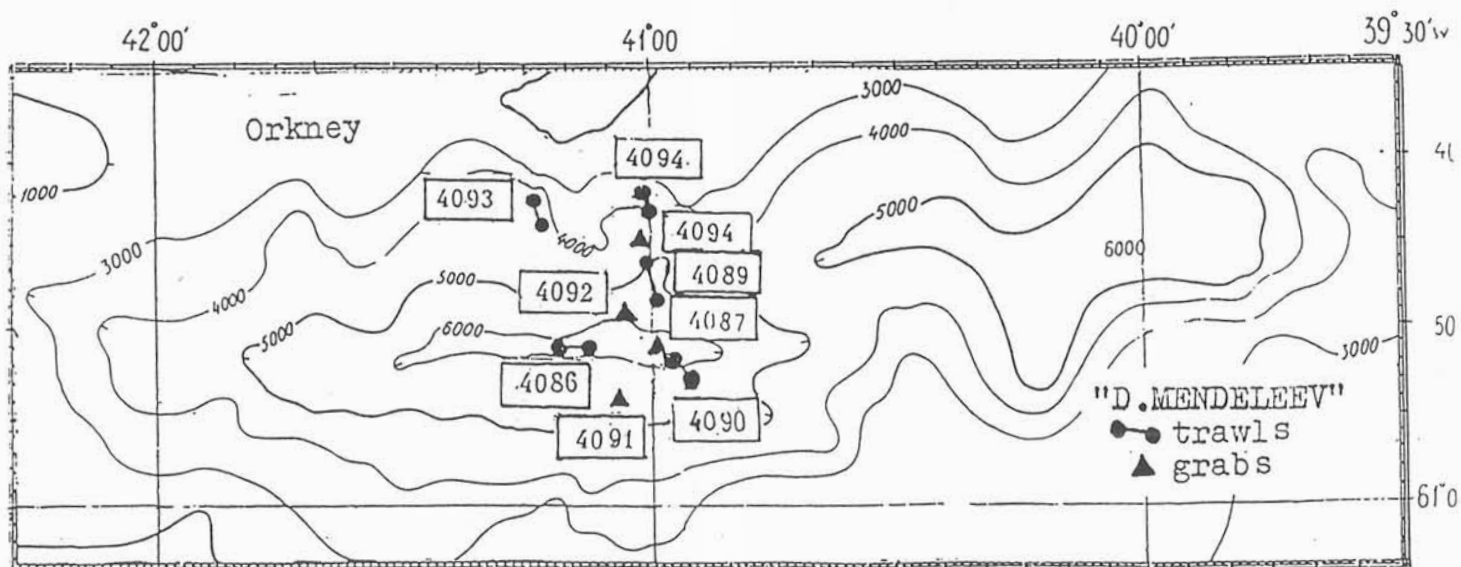
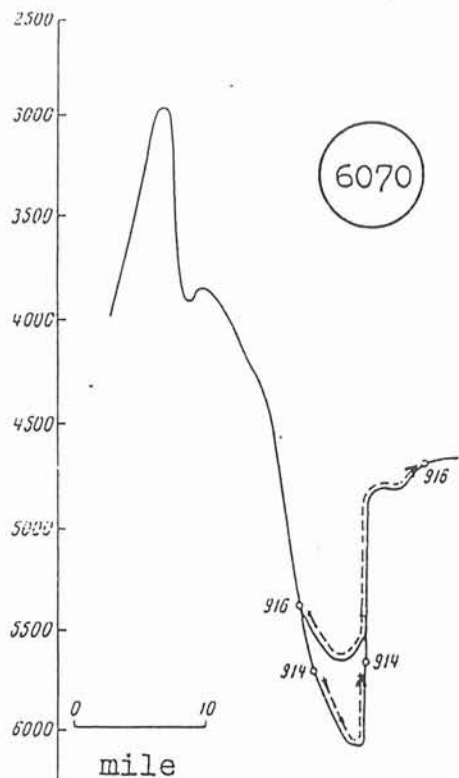
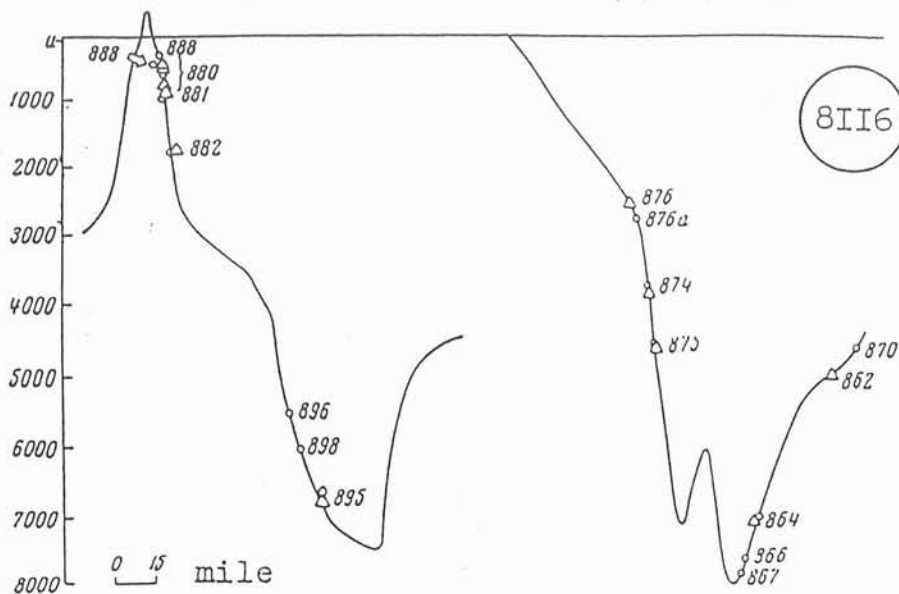


Fig. 1 The benthic stations in the Antarctic trenches.

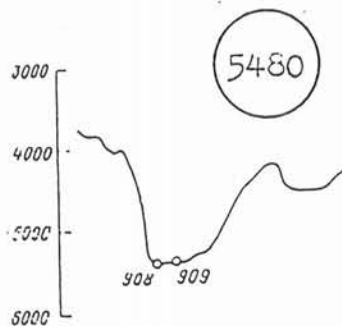




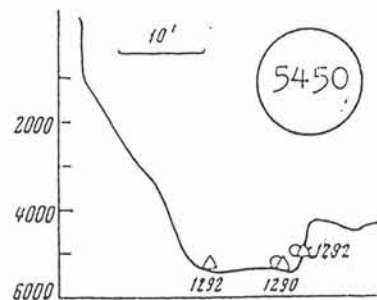
Endurance ( $56,5^{\circ}\text{S}$ ,  $50,5^{\circ}\text{W}$ ).



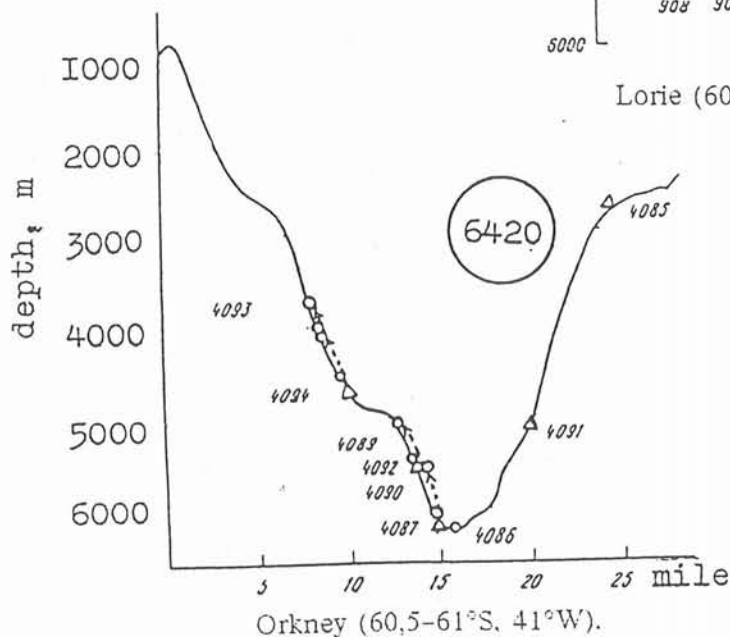
South Sandwich ( $55-57^{\circ}\text{S}$ ,  $25-27^{\circ}\text{W}$ ).



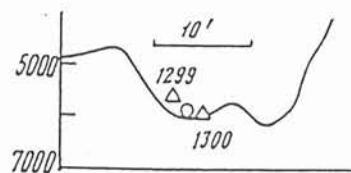
Lorie ( $60^{\circ}\text{S}$ ,  $44^{\circ}\text{W}$ ).



Macquarie ( $54,5^{\circ}\text{S}$ ,  $159,5^{\circ}\text{E}$ ).



Orkney ( $60,5-61^{\circ}\text{S}$ ,  $41^{\circ}\text{W}$ ).



Hjord ( $58,5-59^{\circ}\text{S}$ ,  $157,5-158,5^{\circ}\text{E}$ ).

8116 maximal depth of trawling ○ trawls △ grabs --- way of the trawl

Fig. 2. The benthic stations in six Antarctic trenches during Russian expeditions 1972-1989.

- Pp. 213-221 in R.Z. Klekowski & K.W. Opalinski (Eds.): The second Polish-Soviet Antarctic Symposium, Dziekainow Léсны, 1993.

Nina G. Vinogradova,  
P.P. Shirshov Inst. of Oceanology, Russian Academy of Sciences

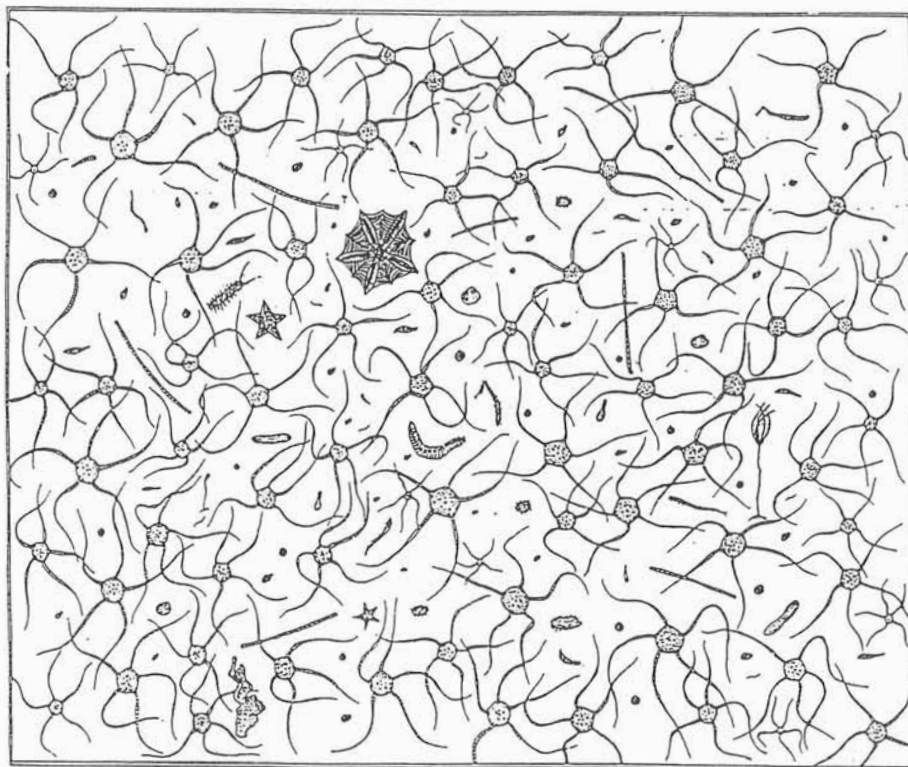


Fig. 4. The fauna of a grab sample, Orkney Trench, depth 6160 m, area 0,2 m<sup>2</sup>. R/V "DMITRY MENDELEEV", CRUISE 43 1989, ST. 40S7.

Composition (number of specimens in paranthesis): Spongia (1); Hydrozoa: *Stephanoscyphus* (1), Actiniaria (2); Nematoda (7); Polychaeta (14), incl. *Kesun abyssorum*, *Travisia profundus*, *Nereis abyssus* and *Ilyphagus coronata*; Pogonophora (1), fragments of tube of *Spirobrachia*; Mollusca: Scaphopoda (5), Gastropoda (3), Bivalvia (47, fam. Kelliellidae n.sp.); Echinodermata: Crinoidea (1), Asteroidea (3, incl. one large pterasteroid), Ophiuroidea (77, incl. *Ophiura irrorata polyacantha*), Echinoidea (1, *Pourtalesia* sp. aff. *debilis*). In all 168 specimens.

## RÉSULTATS DES CAMPAGNES MUSORSTOM

This series publishes reports and monographs on tropical deep-sea faunas, with emphasis on little-known regions of the Indo-Pacific.

The recently published volume 13 (1995), edited by Alain Crosnier, contains three major monographs on decapod crustaceans, on a worldwide basis: The diogenid hermit-crab genus *Trizopagurus*, the archaic crabs of the family Homolodromiidae, and the family Homolidae which contains some spectacular, bright red and very spiny species, which are often figured in popular accounts of life in the deep sea.

Vol. 14 (1995) is devoted to molluscs. The bivalve contributions deal with bathyal Pectinoidea, species of Trapezidae, and carnivorous bivalves. Amongst the six gastropod papers may be mentioned one on deep-water cones from the New Caledonia area and one on the deep-water genus *Calliotectum*.

Vol. 15 (1996) is also mainly carcinological: cirrhitid isopods, mysids, euphausiids, shrimps, several contributions on squat lobsters (incl. revision of *Bathymunida*), and deep-water gall crabs and swimming crabs.

The volumes are richly illustrated by drawings, photographs, and often colour plates.

The MUSORSTOM series is a joint program of the Muséum national d'Histoire naturelle and the Institut français de Recherche scientifique pour le Développement en Coopération (ORSTOM).

Further information may be obtained from: Éditions du Muséum, 57 rue Cuvier, 75005 Paris, France. The price of the volumes is: 562, 612, and 562 FF TTC.

THE LARVE PROJECT AND PROPOSAL GUIDELINES  
November 1995



## Introduction

The Larvae At Ridge Vents Project is a component of the RIDGE (Ridge Inter-Disciplinary Global Experiments) Initiative, a coordinated, interdisciplinary program aimed at understanding the geology, physics, chemistry and biology of processes occurring along the global mid-ocean ridge system. The goal of the LARVE Project is to investigate larval dispersal and gene flow in vent environments and evaluate the potential role of these processes in generating and maintaining biogeographic patterns along mid-ocean ridges and across ocean basins. These experiments are coordinated within RIDGE to foster interdisciplinary studies of reproduction, larval ecology and physiology, physical transport processes, recruitment and population genetics in deep-sea hydrothermal vent habitats.

## Project description

The scientific motivation behind the LARVE Project can be found in the 1993 RIDGE Biological Objectives report, and in the 1994 RIDGE Workshop (Fallen Leaf Lake, CA) report on Dispersal, Gene Flow and Larval Biology at Deep-Sea Hydrothermal Vents. The description of the LARVE Project given here is a brief summary of the essential experimental components as adopted by the April 1995 Experimental Design Workshop sponsored by RIDGE. These documents can be obtained from the RIDGE Office, University of New Hampshire, Room 142, Morse Hall, 39 College Road, Durham, NH 03824-3525 (Telephone 603-862-4051; FAX 603-862-0083; e-mail [ridge@unh.edu](mailto:ridge@unh.edu)).

The LARVE Project is a series of interrelated experiments and observations that address the persistent questions of how vent species maintain their populations in ephemeral vent environments, how they colonize new vents, and what controls their distributions over regional and global scales. These processes can be fully understood only through coordinated investigation of a series of events: reproduction, larval dispersal, recruitment, gene flow, and, ultimately, speciation.

The specific objectives of the project are to obtain critical measurements and observations in four different stages of the process leading to dispersal and gene flow between vent habitats:

1. Reproduction. This component includes observations of gametogenic patterns and gamete production as evidence of spawning periodicity and synchrony, studies of environmental cues for spawning, and quantitative measurements of reproductive output (age at first reproduction and variations in reproductive effort over time and relative to environment). These measurements will be coupled with models to characterize reproductive output at the community level.

2. Larval dispersal and retention. An understanding of mechanisms controlling the fate of larvae in the water column requires a multidisciplinary approach, including a characterization of the flow patterns in hydrothermal plumes and benthic boundary layer that influence larval transport, corresponding measurements of the three-dimensional larval distributions in the water column near vents to reveal how currents facilitate larval dispersal or retention, and laboratory studies (conducted at pressure, if necessary) of larval growth, development, physiology and swimming and sinking behaviors. Species-level identification of larvae will be critical for some aspects of these field studies.

3. Recruitment. To understand what controls recruitment success in vent larvae and post-larvae, it is necessary to know whether specific cues are involved in the settlement process, and to document settlement episodicity and early post-settlement mortality. Studies of early post-settlement processes will address the importance of species interactions during recruitment.

4. Gene flow and biogeography. To measure levels of successful exchanges among populations that result from dispersal, genetic surveys will be conducted on target species. Biogeographic (phylogeographic) surveys on ridge-segment and multi-segment scales, coupled with geological surveys will be conducted to locate and explain gaps between genetic populations. These studies will lead to modeling of metapopulation dynamics in collaboration with geological studies.

The region between 9-10°N on the East Pacific Rise (EPR) will be the primary location for coordinated studies on larval biology, retention, and recruitment; larger-scale gene-flow studies will expand to regional ridge segments. Active vent sites with diverse biological communities are concentrated in the area near 9°50'N.

#### Target Species

To focus the studies of the different components of the project, and ensure that they mesh into a cohesive whole, the following are recommended as target species (based on abundance, ecological importance, and to represent a range of reproductive and developmental modes):

*Riftia pachyptila* (vestimentiferan tube worm)  
*Tevnia jerichonana* (vestimentiferan tube worm)  
*Bythograea thermydron* (crab)  
*Munidopsis subsquamosa* (galatheid crab)  
*Bathymodiolus thermophilus* (mussel)  
*Calypptogena magnifica* (clam)  
*Cyathernia naticoides* (trochoid archaeogastropod)  
*Lepetodrilus elevatus* or *L. pustulosus* (limpets)  
*Phymorhynchus* sp. (egg-capsule producing turrid gastropod)

#### Ship requirements

The ideal schedule for the LARVE project as outlined in the project description includes six cruises over a four-year period. Five of these cruises require submersible (or ROV) operations; the other cruise requires a moderate-sized conventional ship for deployment of moorings anticipated to be a component of the large-scale physical oceanographic studies. Some of the submersible cruises may require a moderate-sized conventional ship in addition to the submersible support vessel to provide for personnel, equipment (e.g., high-pressure larval culture systems), and transportation to a US port. Requests for this additional ship will be proposal dependent. Aside from the initial mooring deployments, physical oceanographic studies are expected to be conducted from the submersible support vessel.

The initial cruise effort (Fall 1997) requires two vessels; 28 days on station in the submersible-support vessel and 7 days on station in a conventional ship. Subsequent cruises will require the submersible-support vessel for 21 days on station.

These ship requirements are estimates designed to accommodate a likely scenario of 3-4 projects per cruise, with a typical project requiring 2 cruises, and others (e.g., time-series studies of reproduction and settlement, and larval studies) requiring 3 or more cruises. The six cruises are spaced over a four year period to facilitate these time-series projects, and to allow for greater flexibility in scheduling of projects.



### Project Time Line

Feb. 1996	LARVE proposals submitted to NSF
Fall 1996	Development of hyperbaric chambers for larval culture, physiology and behavior; Preparation for physical oceanographic studies
Spring 1997	Laboratory and field teams meet to coordinate initial field experiments
Fall 1997	*Four-week submersible cruise to initiate reproductive and demographic sampling, laboratory and field experiments on spawning cues, larval physiology and behavior studies in hyperbaric chambers (incl. symbiont acquisition), studies of larval dispersal and retention near vents (including identification and quantification of larvae of vent species), studies of intensity and timing of settlement, intraspecific genetic surveys, biogeographic (phylogeographic) survey across ecological and geological gaps; One-week cruise to implement segment-scale physical oceanographic study
Winter 1997	Field teams meet to evaluate preliminary data and coordinate 1998 field studies
Spring 1998	Three-week submersible cruise to continue previous studies (particularly those on reproduction and settlement that require frequent visits), and initiate laboratory and field experiments on settlement cues, flow field characterization on vent scale, metapopulation dynamics modeling
Fall 1998	Three-week submersible cruise to continue field studies and/or initiate projects mentioned above
Winter 1998	P.I. meeting/workshop
Fall 1999	Three-week submersible cruise to continue field studies and/or initiate projects with later starts
Winter 1999	P.I. meeting
Fall 2000	Three-week submersible cruise to complete remaining field studies
Spring 2001	Workshop

\* Initial cruises are open to any of these "high-priority" studies, but it is anticipated that some will be initiated later in the project. "Submersible cruise" requires an underwater vehicle with advanced manipulative and collection capabilities; a remotely operated vehicle (ROV) is a possible alternative for these cruises.

#### Project coordination

Potential investigators are encouraged to contact The RIDGE Office for more information on timing and location of planned studies and to receive a bibliography of relevant references. A five-member Coordinating Committee has been formed to assist the RIDGE Office with the collection and dissemination of information regarding planned LARVE experiments and observations. Proposals may be submitted by individuals, or as coordinated programs conducted

by multiple P.I.s. The target submission date for the LARVE project is Feb. 15, 1996; this target date includes components scheduled to begin several years into the project. P.I.s are encouraged to submit proposals for the target date, but additional proposals will be considered after this date. Coordination of cruise legs and the interpretation of results will be facilitated through P.I. meetings and RIDGE-sponsored workshops.

Because repeated trips to the 9-10°N region of the EPR provide an opportunity for time-series observations, proposals are encouraged for experiments that could be accommodated on any of the LARVE cruises; priority will be given to those studies that complement the scientific objectives of LARVE. Projects using study sites other than 9-10°N on the EPR are not encouraged, but will be considered if need is demonstrated.

#### Non-U.S. participation

The LARVE Project is not a formal InterRidge program, but non-U.S. participation is encouraged. The roles and responsibilities of all personnel, including any non-U.S. investigators, must be clearly defined in the appropriate proposal submitted to RIDGE.

### HYFIFLUX TO THE HYDROTHERMALLY ACTIVE ZONE OF THE NORTH FIJI BASIN

Originating from geological research, the HYFIFLUX project is a program to study hydrothermalism and associated geological, geochemical and biological processes in the North Fiji Basin (SW Pacific). It is based on cooperation of scientists from various German universities and institutes (among the biologists: Dr. Türkay, Frankfurt, Dr. Giere, Hamburg and from IFREMER, Dr. Auzende). In January 1995 the first cruise was performed with the German RV "Sonne". Equipped with a video-photo deep tow system (EXPLOS), a TV grab for rock sampling and a multicorer for soft sediment cores, the area between the West Fiji Ridge and the North Fiji Fracture Zone was mapped in detail.

Of particular interest to the biologists were the active and inactive hydrothermal sites located at the northern tip of the 15°N segment of the Central Spreading Ridge. The newly mapped "Sonne 99 Field" mostly contained a benthic macrofauna not directly related to active hydrothermalism. Nor did the meiofauna composition show any specific indications, like bacteria-symbiotic taxa, for hydrothermal anomalies. This conformed with only slight temperature anomalies in the suprabenthic water layer. However, the high percentage of suspension feeders (sponges, gorgonians and crinoid echinoderms), especially of an euplectellid sponge and occasional occurrence of the galatheid crustacean *Munidopsis* indicated a hydrothermal activity of low level.

Contrastingly, the LHOS-field, studied formerly by French scientists, contained a rich fauna specifically adapted to active hydrothermalism with numerous *Bathymodiolus*, *Alviniconcha*, *Alvinellides*, *Neolepas* and *Munidopsis*. These characteristic forms rarely occurred syntopically, rather small areas being dominated each time by one of the taxa. Three fish species were observed in the hydrothermally active area, and one specimen (new species?) was actually caught. Among the new fauna was an as yet unidentified bivalve. Numerous specimens were fixed for further taxonomic and ultrastructural studies. Of particular interest is the provannid gastropod *Ifremeria nautilei*, dominant in numerous hydrothermal fields of the West Pacific. Its symbiosis with bacteria is presently being studied for the first time in electron microscopical detail.

It is the future aim of the HYFIFLUX project to further assess - in close interdisciplinary cooperation between geologists, chemists, micro- and macrobiologists - the links between geochemical and biological processes. It is our hope to find biological correlates for the various stages of originating, highly active and ageing hydrothermal areas, thus enabling us to use the composition of the benthos as a tool for calibrating hydrothermalism. For this purpose another HYFIFLUX cruise is planned for 1997.

Olav Giere,  
Zool. Inst. & Zool. Mus., Hamburg, Germany

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THE DEADLINE FOR THE NEXT ISSUE OF D.-S.N. IS 1st DECEMBER, 1996

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

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