DEEP-SEA NEWSLETTER

No. 3, February 1980

Although several readers have expressed their appreciation of the DEEP-SEA NEWSLETTER, I have, like most editors of similar publications, difficulty in getting contributions. Hopefully, this calamity will eventually be overcome, and we should all be grateful to those having contributed.

It has been suggested to publish again the list of the voluntary "agents" (who do a great job in duplicating and distributing the newsletter in their home countries). The list will be found on p. 2, with the latest additions.

The deadline for the next issue is 1 September 1980. I look forward to receiving contributions from individuals, groups or institutions, either reports, interesting details from own research, information about not easily available literature, research requests, etc., etc.

Torben Wolff
Editor

A deep-sea biology meeting in 1981/82 ?

Participants in the Khabarovsk deep-sea symposium agreed that a meeting might be held in 1982, and Brest, Wormley, Copenhagen, Woods Hole or Scripps were suggested as appropriate locations.

In a recent letter to the Editor, Bob Hessler mentioned that he and John Gage have discussed holding a deep-sea meeting. Bob would be willing to host it, if it were kept informal. No major organizational expenses should be involved, and an excellent auditorium at Scripps could be reserved for the purpose. November 1980 was found to be appropriate. The goal of such a meeting would be to allow deep-sea biologists the opportunity to interact informally; the conversations would be more important than the talks. For this reason, no publications would come out of this meeting.

Bob Hessler will be pleased to receive a letter from those interested in participating. The letter should indicate whether they want to speak and whether the suggested date is fitting.

The Editor feels that in case particularly European deep-sea biologists anticipate serious difficulty in raising sufficient funds for covering travel expenses to Scripps, this should also be mentioned. Although we should all like to go to Scripps, it may prove necessary to find a more centrally located meeting place.

TW

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We should like to broaden future distribution, preferably to other European countries. Suggestions in this respect are welcome.

Deep fjords as convenient research areas

In June 1979 a Workshop on fjord oceanography was held at the Institute of Ocean Sciences, Sidney, B.C., Canada (Proceedings to be published by Plenum Press). Most scientists would not consider fjords as deep-sea environemnts, as they are almost surrounded by land. However, during our workshop Torleiv Brattegard (Bergen, Norway) pointed out that the Sognefjord in Norway has a maximum depth of about 1300 m and therefore might squeeze into the elite category of the deep sea. Brattegard emphasized aspects of fjords which make them desirable analogues (mini-oceans) of the deep ocean, which range from cheaper ship-time to less seasickness! Scientists based near deep fjords (Alaska, British Columbia, Chile, New Zealand) also have these fascinating research areas available for study. Perhaps more collaboration between deep fjords and deep sea biologists is in order.

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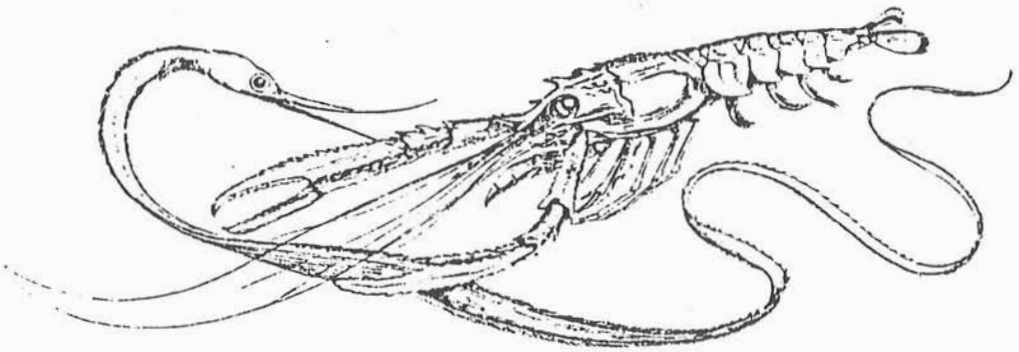

Deep-water bottom trawling surveys of the ISH

1. History. The collection of the Institute for Sea Fisheries, Hamburg (ISH) received fish samples from research cruises by colleagues in the Institute, participated in cruises with members of its Ichthyology Department, or was in charge of such surveys. The material collected was obtained mainly from stations along the continental slopes and adjacent deep-sea planes (200-2200 m depth) all over the Atlantic Ocean. But the effort has during recent years been concentrated to certain areas.

Two out of the three fishery research vessels at the disposal of the Federal Research Centre for Fisheries in Hamburg are well equipped also for deep-water investigations and have been used in such programs for more than the last 15 years. These ships also offer the most interesting advantage that this kind of deep-water trawling can be done with very large gear of commercial size; thus the quantity of the catches is quite different, and the gear normally is less selective than scientific gear. The two vessels are FRV "Walther Herwig" (tonnage 2250) and FRV "Anton Dohrn" (tonnage 1943; originally names "W. Herwig" from 1964 to 1973), both built like modern commercial stern-trawlers.

Besides obtaining smaller collections mainly from the NE-Atlantic with the first FRV "Anton Dohrn" (1955-1973) the department's staff was engaged in or received material from mainly the following long time surveys or programs with FRV "Walther Herwig": SW-Atlantic off Uruguay and Argentina (1966, G. Krefft), SE-Atlantic off South Africa (1967), SW-Atlantic off Uruguay and Brazil (1968, G. Krefft and A. Post), SW-Atlantic off Argentina (1970/71, M. Stehmann), NE-Atlantic during the OVERFLOW '73 program (1973, G. Krefft, A. Post, M. Stehmann), two cruises in West British waters (1974, M. Stehmann), West British waters and Bay of Biscay (1975, M. Stehmann), Atlantic sector of Antarctic waters (1975/76, G. Krefft and M. Stehmann), SW-Atlantic off Argentina (1978, M. Stehmann). Recently a cruise with FRV "Anton Dohrn" was carried out in the NW-Atlantic off the US (1979, M. Stehmann).

2. Research activities and program. The small staff of the Ichthyology Department was for many years unable to do much more than identify such large amounts of material and incorporate it into the collection. Nevertheless, a great number of papers was published predominantly dealing with selected taxonomic problems and/or faunistic treatment of certain taxa in restricted geographical areas.

But the nature and amount of the samples, which form a major part of the ISH collection, should enable us now to start the next step of study, viz. to work out some kind of a comparative faunistic analysis for the main slope areas in the Atlantic Ocean in order to get a better idea about the ecology of these demersal and benthopelagic fish species. This would mean to work out aspects of the faunal composition, the bathymetric distribution of species and their relative abundance, the geographical distribution and migrations of stocks in correlation with abiotic environmental factors, the composition of stocks concerning sex and maturity stages and to a limited extent also age, and all these points accompanied by the continuation of taxonomic studies.

This as a schedule will be difficult to carry out with my own single man effort only as the present situation is. The department has already been assisted by several foreign colleagues for years and also by G. Krefft, who is still working with us after his retirement in 1977. Nevertheless, an intensification of such international cooperation seems necessary especially in this field, and I am sure many colleagues feel the same in their own situation. Recently some more useful contacts could be established, and I hope for an extension of international cooperation.

3. Publications. It would cover a lot of space to give references here. Our department's contributions have mainly been published in the "Archiv für Fischereiwissenschaft" over the years as also those of colleagues working on ISH material. Information and lists of these publications are available on request from our department.

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A research request:

Zoogeography of the Atlantic Ocean bathyal regions

Based on an analysis of several thousand recently collected sipunculan worms plus a survey of 65 articles published on sipunculans since 1827, as well as all of the literature of Pogonophora, it is suggested that an assemblage of worms is restricted to bathyal depths (100-3000 m) but that their distribution around the Atlantic Ocean basin is not continuous. Therefore, to account for these discontinuities zoogeographical barriers must exist. From the data, it is probable that the locations of five of these barriers are:

1. off Cape Lookout, North Carolina
2. near the Rio Grande Rise off southern Brazil
3. near the Walvis Ridge off South West Africa
4. between northwest Africa and the Azores
5. east and west of Iceland across the southern end of the Norwegian Sea.

These barriers likely result from a combination of topographical and hydrological features (currents) isolating certain portions of the bathyal region vis-a-vis the dispersion of pelagic larvae.

(Abstract of talk given at AAAS meetings, Houston, Texas, January, 1979)

However, there are still significant gaps in the data base, especially from central and northern South American and African slopes. If anyone has collections of sipunculans gathering dust on their shelves from these areas and depths, I would be very muc interested in examining them.

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Recent French deep-sea activities

1. A recolonisation experiment on azoïc sediments was performed to study the rate of species colonisation and life history of benthic species on a permanent bottom station at 2160 m depth in the Bay of Biscay on the Meriadzeck Terrace.

Two distinct sediment patterns are used to study the influence of assimilative organic matter: the first from the same area, the second from a neritic station at 100 m depth off the Britanny coast.

Sediments were collected with a REINECK box-corer, frozen at -21°C for eight months and then partitioned in 16 trays of a free-vehicle. That device could be brought to the surface by an acoustic release or by a timed release. While descending or hauling up, the trays were closed to prevent any disturbance of the interface. The free-vehicle was retrieved in September 1979 after leaving it at the bottom for 6 months.

The first results indicated that a very intensive settlement occurred in sediments collected in the same area. Surprisingly, settlement was three times lower in the neritic sediment although organic matter was three times higher. Number of animals found in deep-sea sediments was nearly four times higher than in control cores. The production of organic matter in experimental conditions is 420 cal.m^{-2} during 6 months.

The results are presently in press in "Oceanol.Acta" by D. Desbruyères, J.Y. Bervas & A. Khripounoff: A fast recolonisation of deep-sea sediment.

2. A hydrothermal vent polychaete. At present D. Desbruyères and L. Laubier are working on the very curious polychaetous annelid, collected by "Alvin" during RISE expedition in the hydrothermal areas recently investigated by the U.S. and French submersibles "Alvin" and "Cyana". This big worm, called successively "worm with anemone head", "terebellid polychaete" and "Pompei worm" lives in large "honeycomb" tubes forming a spongy porous mass on a spherical edifice with hot water extruding from the top; it seems to have also a swimming behaviour and "Alvin" observers have seen worms

crawling in front of the dead light of the submersible. The species also has two different successive ontogenic types: the first has a transformed abdomen and can perhaps be considered as a natatory scattering stage; the second is bigger, without swimming structures and seems to be a sedentary stage. This large sedentary species clearly belongs to a family new to science which does not fall easily within the orders or natural groups of families such as the Spionimorpha, Sabellimorpha, Terebellimorpha or others.

3. SAFARI MD 20, "Marion Dufresne", 20 Aug. - 26 Sep. 1979. During this geological-biological cruise initiated by the French National Museum, four main stations were investigated in the Mozambique, North Crozet, West and East Madagascar basins, between 4000 and 5000 m depth. Sledges, trawls and piston corers were our common samplers with two new devices: 1) a large section piston corer (10 cm) was always successfully used and permitted to get sediments from the upper cretaceous to the actual; 2) the SIPAN, a core sampler of 1 m^2 section allowed a series of polydisciplinary studies: sedimentology, stratigraphy, chemistry and biochemistry, zoology, and ecology. Parts of the bottom very rich in manganese nodules (more than 100 kg/m^2) were brought to the surface with an undisturbed interface. These samples, compared with others devoid of nodules, will perhaps indicate a possible influence of metallic ions on the settlement, growth and microdistribution of some animal groups.

The macro- and meiofaunae are poorer in the East Madagascar basin than in others, but perhaps not less diversified. This could be linked to local variations of the surface productivity. Molluscs and madrepores with calcified shells were found in areas where coccoliths and forams were totally dissolved, and once more the mode of extraction of calcium carbonate by these animals arises.

For the first time a study of the enzymatic spectra in deep-sea fishes, actinians, molluscs, echinoderms and ascidians was undertaken. Preliminary results show that the invertebrates are able to digest plant sugars more than proteins, and this not only through their gut but by their whole body (F. and C. Monniot).

4. At the Colloquium on Echinoderms (3 - 8 Sep. 1979) in Brussels, M. Sibuet presented a paper: "Adaptation of Echinoderm fauna to abyssal life" (to be published in M. Jangoux (Ed.): Echinoderm Present and Past, Balkema, Rotterdam). The synthesis of literature and personal observations permitted to show the main morphological, physiological and genetic characteristics in relation to the mode of life. The change of composition of the asteroid fauna with depth has also been analyzed using the recent synonymy for all the records in the Atlantic Ocean. This analysis indicates that the morphological distinctions between the species increase with depth until 3000 m and decrease at greater depth.

5. Gut contents of holothurians collected during several N.E. Atlantic cruises aboard the R/V "Jean Charcot" have been analyzed by A. Khripounoff and M. Sibuet in a paper (in preparation): "Contribution a l'étude de la nutrition d'Echinodermes abyssaux: I. Alimentation des Holothuries". The description of several ingested particles (organic and mineral) was made and shows the absence of real alimentary diet. The chemical analyses of gut contents across the intestinal tube indicate the amount of organic matter assimilated and selected by dominant species of holothurians.

6. The anatomy, histology and histochemistry of the digestive tract of several Elasipoda will be studied by C. Massin (Univ. of Brussels, Belgium) at COB, Brest, for ten months. He will also work on parasitism (mainly sporozoans and nematodes) within holothurian digestive tracts. This work is supported by NATO and FNRS grants.

Myriam Sibuet

7. New data and results on deep-sea meiofauna. The 14 CNEXO/COB cruises made over the 1970-1977 period in various areas of the Atlantic and the Mediterranean have allowed collection of a considerable amount of data concerning the deep-sea meiofauna. From these data, some features of its quantitative distribution have been pointed out: e.g. wide variability of densities within the 1000-2500 m bathymetric zone, enrichment of abyssal rises, relationships with the productivity of pelagic ecosystems, correlations between the abundance of meiofauna and the protein content of sediments, etc.

The study of the small-scale arrangement of organisms has revealed a patchy distribution for most of them. The clump sizes of nematodes and harpacticoid populations have been evaluated. Qualitatively, the vertical zonation and evolution of meiofaunal communities agreed with the models previously proposed for the macrofauna, i.e.: increase of species diversity from 1000 m to 35000 m and decline of this diversity in the proper abyssal plain. The specific structure of nematode populations has been studied through the comparison of the observed hierarchy of species with several mathematical models having a known ecological significance. The best fit was obtained with Motomura's log-linear model. Therefore, two associations of species ("nomocenoses") were detected in each of 10 cm^2 samples analyzed, this fact indicating that two distinct (but spatially unlimited) microbiotopes are overlapping at the 10 cm^2 scale.

Alain Dinet
Station Marine d'Endoume, Marseille

News from the Institute of Oceanographic Sciences, Wormley

Since the appearance of the last Newsletter we have had two moderately successful IOS cruises to the Porcupine Sea Bight (Challenger 9/79: June/July 1979 and Discovery 105: Sep./Oct. 1979). We were delighted to be joined by Jørgen Knudsen on the first leg of Discovery 105, and by Jørgen Kirkegaard for the second, and much more exotic leg, which worked off the north-west African coast.

Since we started the work in the Sea Bight in late 1977 we have taken a total of 38 semi-balloon trawl samples and 30 epibenthic sledge samples in depths ranging from 200 to 4800 m, most of the latter in conjunction with the bottom camera. On the two most recent cruises the modified and, we believe, much improved sledge has been used and this is the subject of a separate report by Bob Aldred. Furthermore, the mid-water group at IOS have been doing some fascinating near-bottom work in the Sea Bight and Martin Angel has written a short account of the results obtained so far.

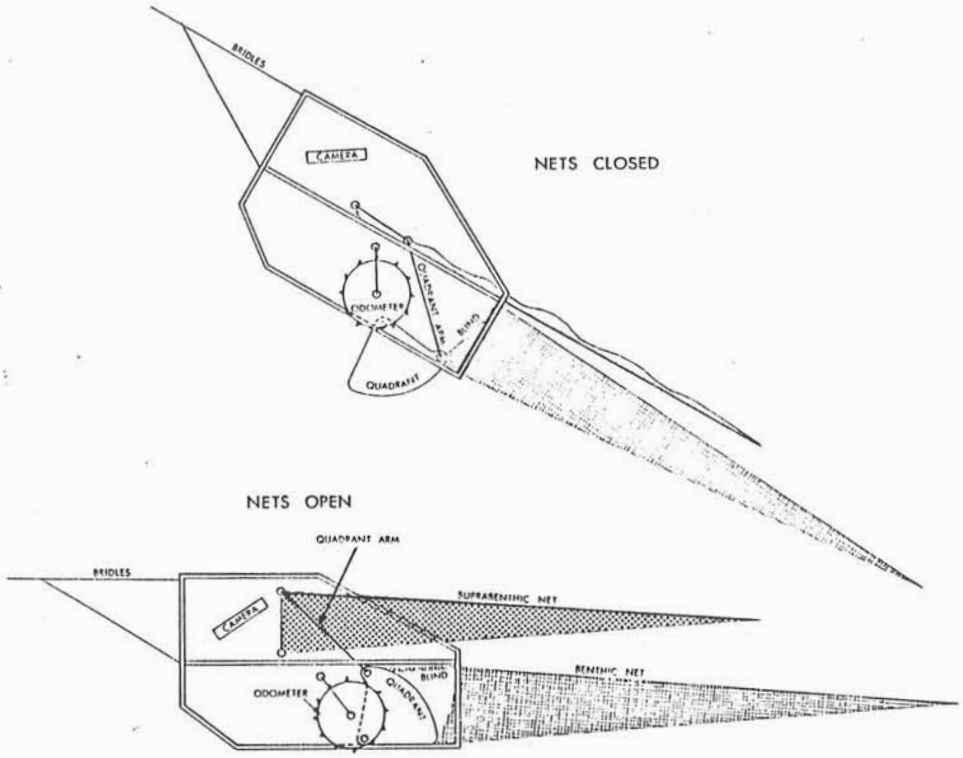
As for the benthic samples themselves, they continue to accumulate in our limited storage area with distressing rapidity - and come out of it to be sorted and worked on much more slowly! We cannot say much about the samples yet, except that we have continued to collect large numbers of Kolga hyalina and that by the time the next Newsletter appears we should be able to give some results.

Tony Rice

The new IOS epibenthic sledge

The new epibenthic sledge, with suprabenthic addition, mentioned in the last Newsletter, has now been completed and used with considerable success from "Discovery" and "Challenger".

The sampling area of the benthic part of the sledge has remained the same as the previous model. However, the need for a more quantitative fine mesh sample has lead to the single net being replaced by three smaller nets: a centre net with a 1 mm mesh, balanced by a net on either side with 4.5 mm mesh. Although having three catches is initially rather extravagant on jars, time saving is considerable as the coarse outer nets wash clean during hauling and only the centre one needs extensive sieving. The suprabenthic net has a mouth area of 0.6 m^2, a mesh size of 0.33 mm and the bottom bar is approximately 0.6 m off the sea bed. It opens and closes mechanically by a bar (the quadrant arm) attached to opening/closing quadrants on the lower nets, raising and lowering the mouth when bottom contact is made or lost (see figure).



The increased height of the frame has allowed the camera to be raised and consequently set at a steeper angle. The smaller area photographed is more than compensated for by the less oblique angle and subsequent increase in detail, making quantitative analysis easier and more accurate.

The odometer wheel, which initially had some teething problems, is now functioning correctly and giving sensible distances run. Thanks to the IOS 'Applied Physics Group' the acoustic telemetry has reached a degree of sophistication with which even they are impressed. We are now able to monitor directly depth, temperature, distance run, camera function, sledge horizontal (i.e. on the bottom), net open/closed and upside-down. In addition, there is an inclinometer which can be fixed in various positions. So far it has been used to measure the degree of opening of the suprabenthic net and the roll of the sledge in mid-water. Once the initial panic of sorting out the plethora of traces on the recorder has passed, the sledge is easy and quite exciting to fish. When bottom contact is made and fishing commences a number of events occur, the monitoring of which gives precise information as to the behaviour of the gear. Two traces appear, net horizontal and net open. The camera switches on, showing each frame by temporary displacement of the temperature trace. The odometer trace starts to move across the chart, indicating that the sledge is fishing (a complete sweep of the chart is equivalent to 300 m travelled along the bottom). If the inclinometer is fitted to the mouth of the suprabenthic net its trace moves to indicate the degree to which the net has opened. This device is also sensitive enough to indicate the front of the sledge beginning to lift, the normal occurrence shortly before the sledge leaves the bottom altogether. If required this can be quickly countered by paying out more wire.

Handling the half ton sledge has not proved to be as much of a problem as was feared, provided the ship has an open stern. If this is the case the sledge is lifted horizontally with a four legged sling and positioned with the back of the skids outboard. The lift is transferred to the towing bridles and the sledge tipped over the stern. Retrieval is equally simple; bringing the sledge high against the stern of the ship it can be pulled horizontally onto the deck using a capstan or auxillary winch.

The new sledge has been used on 22 occasions in the Porcupine Sea Bight and on the N.W. African coast. As well as providing many interesting samples it has taken approximately 3000 photographs.

R.G. Aldred

Near-bottom RMT 1+8 sampling

Near-bottom (i.e. within 50 m off the sea bed) macroplankton and micronekton samples were collected using an RMT 1+8 during Challenger Cruise 9/79 at soundings of 4000, 2700, 1500, 1200, 700, 500, 400 m up the northern flank of the Porcupine Sea Bight. Partly through a considerable improvement in acoustic reception resulting from the development of a towed backwardly looking hydrophone, and partly through the unexpectedly calm weather, the proximity of the net to the bottom could be measured using the reflections of the sound transmissions of the net monitor mounted immediately above the nets. The deepest samples, as was expected, contained a very small catch. The sample from 1500 m contained little micronekton but a fair sized catch in the plankton net consisting mostly of small copepods. At 1200 m the RMT 8 catch was large and very gelatinous. The 700 m catch was really remarkable; the RMT 8 catch had a displacement volume of 8.81, i.e. 158 mls/1000 m^3 water filtered - nearly two orders of magnitude larger than corresponding midwater catches taken at the same depth in midwater! The catch was mostly gelatinous, with a great preponderance of the medusae Aglantha digitale. As the sampling moved up the slope so the displacement volume decreased, but the proportion of crustaceans increased.

Further sampling was carried out close to the sea bed on Discovery Cruise 105 working down the slope of the Goban Spur to the south of the Porcupine Sea Bight, at depths of approximately 1700, 1400, 1200, 1000 m. This time a multiple version of the RMT 1+8 was used, so that the 100 m layer above the sea bed could be divided into three sampling zones. Although the very large increase in biomass of standing crop was not observed again, there was a clear increase by a factor of 2-3 in standing crop close to the sea bed. Initial rough sorting suggests that a vertical zonation of organisms occurs in this near bottom zone, but the species composition of the samples did not appear to differ from midwater catches at similar depths over greater soundings.

Martin Angel

Forthcoming IOS benthic cruise:

November 1980 - RRS "Challenger" - Porcupine Sea Bight.

Papers recently published or in press

Aldred, R.G., M. Nixon & J.Z. Young, 1979: The blind octopus, Cirrothauma. - Nature, 275: 547-549.

Aldred, R.G., K. Riemann-Zurneck, H. Thiel & A.L. Rice, 1979: Ecological observations on the deep-sea anemone Actinoscyphia aurelia. - Oceanol. Acta, 2: 389-395.

Angel, M.V., M.J. Fasham & A.L. Rice (in press): Marine biological requirements neede before the safety of a programme of disposal of high level radio-active waste in the ocean can be assessed. - In: R.A. Geyer (Ed.): Marine Environmental Pollution. Elsevier.

Athersuch, J.A. & A.J. Gooday, 1979: On Zabythocypris redunca sp.nov. (Ostracoda). - A Stereo-Atlas of ostracod shells, 6 (4): 21-26.

Kirkegaard, J. & D. Billett (in press): Eunoë laetmogonensis, a new species of polynoid worm, commensal with the bathyal holothurian Laetmogone violacea, in the North East Atlantic. - Steenstrupia.

Merrett, N.R. (in press): Bathytyphlops sewelli (Pisces: Chlorophthalmidae) a senior synonym of B. azorensis, from the eastern North Atlantic with notes on its biology. - Zool. Jl Linnean Soc. 67.

Markle, D.F. & N.R. Merrett (in press): The abyssal alepocephalid, Rinoctes nasutus (Pisces: Salmoniformes), a redescription and an evaluation of its systematic position. - J. Zool.

Rice, A.L., 1979: A remarkable benthic catch of portunid crab zoeae (Decapoda, Brachyura). - Crustaceana, Suppl. 5: 17-21.

Rice, A.L., R.G. Aldred, D.S.M. Billett & M.H. Thurston, 1979: The combined use of an epibenthic sledge and deep-sea camera to give quantitative relevance to macrobenthos samples. - Ambio, Spec.Rep. No. 6: 59-63.

Rice, A.L. & J.B. Wilson (in press): The British Association Dredging Committee: A short history. - J. mar. Res.

Thurston, M.H., 1979: Scavenging abyssal amphipods from the north-east Atlantic Ocean. - Mar. Biol. 51: 55-68.
- 1980: Abyssal benthic Amphipoda (Crustacea) from the East Iceland Basin. 1. The genus Rhachotropis. - Bull. Br. Mus. nat. Hist. (Zool.) 38: 43-67.
- 1980: Abyssal benthic Amphipoda (Crustacea) from the East Iceland Basin. 2. Lepichinella and an allied genus. - Ibid.: 69-87.

Investigations in the Soviet Union of the deep-sea bottom fauna 1975-1979

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At the Editor's request, Dr. N.G. Vinogradova prepared a survey of recent Russian deep-sea benthos studies. It contained i.a. names of authors, titles, and very interesting summaries of books and all papers on the deep-sea fauna in the relevant volumes of the Trudi of the Institute of Oceanology in Moscow. Unfortunately, the survey, in its original shape, went beyond the limits of this newsletter and had to be drastically abbreviated. Readers wishing specific information are requested to apply to Dr. Vinogradova or to the Editor.

General remarks. Extensive biological investigations at great oceanic depths inclusive of deep-sea trenches, initiated and led by Academician L.A. Zenkevich, began in 1949 with the first cruises of the R/V "Vitiaz". The research has been centered on the biological structure of the ocean and based on the quantitative evaluation of biological mass phenomena in the ocean. The investigations comprise the composition of the bottom fauna, patterns of vertical and geographical distribution, trophic zonation and structure of deep-sea bottom biocenoses, ecology (modes of life and food habits). A special trend of research is devoted to the history of formation and evolution of the bottom fauna and its adaptation to life at great depths (e.g. vision).

Scientific staff. For many years the Laboratory of Benthos was headed by L.A.Zenkevich and from 1977 to 1979 by Z.A.Filatova; its present head is A.P.Kuznetsov. Studies of the deep-sea fauna are carried out by the following specialists: F.A.Pasternak (Pennatularia); N.B.Keller (madreporarian corals); R.J.Levenstein, N.V.Kutcheruk, and N.N.Detinova (polychaetes); Z.A.Filatova (monoplacophores and bivalves); A.A.Shileiko (bivalves); L.I.Moskalev (gastropod mollusks, limpets, monoplacophores); V.I.Lus (gastropods); S.D. Chistikov (scaphopods); O.E.Kamenskaya (amphipods); E.P.Turpaeva (pantopods); O.N.Zezina (brachiopods); G.M.Belyaev (echinoderms, mainly holothurians); A.N.Mironov (echinoids); N.M.Litvinova (ophiuroids); N.G.Vinogradova (tunicates).

In addition, various groups of invertebrates are studied in collaboration with specialists associated with other laboratories and institutes: V.V.Murina (sipunculids and echiurians), Inst. of the Biol. of Southern Seas; R.K.Kudinova-Pasternak (tanaids) and G.B. Zevina (cirripeds), Moscow State Univ.; V.M.Koltun (sponges) and A.V.Ivanov (pogonophores), Zool.Inst., Ac.Sc.USSR; E.A.Shornikov and V.G.Chavtur (ostracods), Inst. of Marine Biol. Far-East Scient.Centre.

Special investigations are carried out by Z.A. Filatova (quantitative distribution of bottom fauna and structure of deep-sea biocenoses); G.M. Belyaev (fauna of deep-sea trenches, quantitative distribution, history of formation); N.G. Vinogradova (vertical faunistic zoning and zoogeography of the abyssal); M.N. Sokolova (feeding of bottom invertebrates, patterns of bottom fauna distribution according to food habits); and I.S. Zharkova (vision of deep-sea invertebrates).

Expeditions. Continued intensive oceanological studies were performed by the three vessels of the Institute: the "Vitiaz", the "Akademik Kurchatov", and the "Dmitry Mendeleev". Deep-sea biological research was carried out as follows:

1. Cruise 57 of the "Vitiaz", Feb.-May 1975. Eight trenches in the western Pacific: Riu-Kiu, Philippines, Yap, Palau, Mariana, Volcano, Izu-Bonin, and Banda. Altogether 29 stations at depths down to 10,730 m. Rich collections and valuable knowledge were obtained of the composition, patterns of distribution, origin and affinities of bottom dwellers at the greatest depths of the western Pacific.

2. Cruise 59 of the "Vitiaz", May-June 1976. The northwestern and eastern deep-sea basins of the Sea of Japan. At 20 stations deeper than 2000 m new material was obtained revealing qualitative composition and quantitative distribution of the bottom fauna.

3. Ultimate 65th cruise of the "Vitiaz", Feb.-Apr. 1979. The last expedition, finishing the oceanological work of the world-famed research vessel, had a biological program. Basins of the Mediterranean (Ionian, Adriatic, Tyrrhenian, Balearic, and Alboran) at depths down to 3650 m and basins of the NW Atlantic at depths down to 5650 m. Qualitative and quantitative samples of the bottom fauna, meiobenthos, benthic and pelagic fishes were collected.

The "Vitiaz" paid her farewell visit to oceanographical centres in France, Spain, Portugal, England, and Denmark. The number of stations occupied in the Pacific, Indian, and Atlantic Oceans during the 30 years of her oceanological research work is 7943. With the name "Vitiaz" is associated a great epoch of modern oceanology, fundamental studies of the World Ocean having been based on material collected by this vessel.

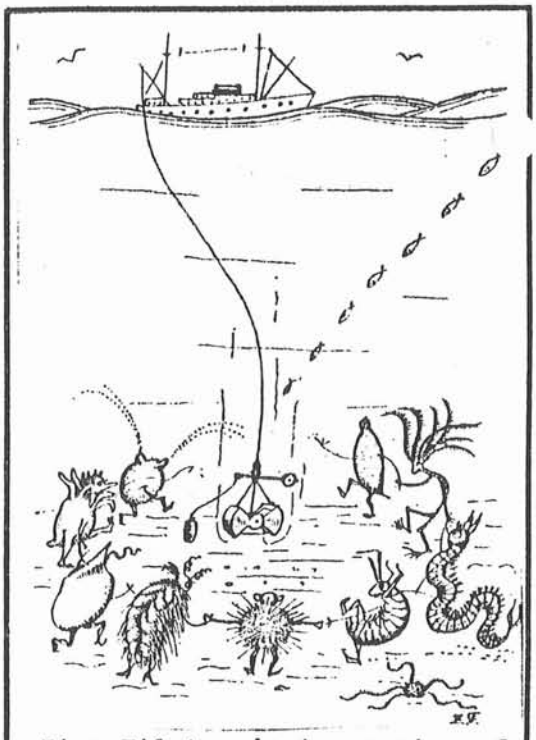
4. Cruise 16 of the "Dmitry Mendeleev", Dec.1975-Mar.1976. This was a specialized cryological cruise, partly under the program of scientific cooperation with Australia, with participation of scientists from Australia, New Zealand, India, and the U.S.A. Investigations were carried out in the Australia-New Zealand region and adjacent subantarctic waters down to 65°38'S. Altogether 157 oceanological stations were occupied. The chief purpose of the expedition was the study of the composition, quantitative distribution and genesis of benthos and nekton in the bathyal, abyssal and ultra-abyssal (hadal) zones of the ocean.

For the first time successful trawling and bottom-sampling were carried out in the Macquarie and Hjort Trenches (at depths down to 6650 m). Furthermore, the bottom fauna of the Tasmanian, New-Caledonian, South Fiji, Emerauld, and South-Australian basins was studied together with hydrological conditions (down to 6200 m), hydrochemistry of near-bottom and silt waters, sedimentary geomorphology and geology.

5. Cruise 20 of the "Dmitry Mendeleev", Jan.-May 1978. Investigation of the functioning of Pacific pelagic ecosystems in the region of the Atakama Trench, trawl samples from 1500 to 5880 m, and a bottom-sampler section through bathyal and upper abyssal depths down to 3700 m (8 stations deeper than 1000 m). Concurrent hydrological investigations of bottom and silt water were carried out.

6. Cruise 21 of the "Dmitry Mendeleev", Aug.-Dec. 1978. Besides primarily geophysical and geomorphological investigations in the western Pacific, the bottom fauna was explored. The main purpose was to test the bathyscaph "Pisces" and its effect on bottom fauna investigations. This was the first Soviet instance of the descent of a benthologist. The dive was carried out on the outer slope of the Hermit at 610-818 m. Video records and photographs were obtained, and bottom invertebrates were collected with a manipulator. Five dredge and three trawl samples were also taken at 1000-4470 m in the region of the Shatsky Elevation and the Markus-Nekker Seamount.

Equipment. The vessels of the Institute of Oceanology used a Sigsby trawl with a 2.3 m wide frame and the Galathea trawl with a 6 m frame. For quantitative studies the bottom-sampler "Ocean-50" (covering 0.25 m^2) was used. Good results were obtained during the hydrochemical investigations with a vinyplast 7 l water bottle fixed directly over the bottom-sampler which made it possible to sample water close to the



Zina Filatova's impression of the work of "Ocean-50".

bottom (N.E. Fedikov, 1972, in: Voprosy gidrobiologii nekotorykh raynov Tikhogo Okeana, Vladivostok). The samples were washed in a special washer with a capron sieve with a 0.425 mm mesh (N.F. Fedikov, 1960, Trudi Inst. Oceanology).

Publications. The period under review is mentioned in the first volume of the 10-vols monograph "Okeanologia" (Publ. House "Nauka"). The first two volumes, "Biology of the Ocean", appeared in 1977. Vol. 1, "Biological structure of the ocean", contains a detailed analysis of our present knowledge of the distribution of aquatic organisms in the World Ocean and the adaptation of organisms to the vital factors of the marine environment. Vol. 2, "Biological productivity of the ocean", pays special attention to the analysis of pelagic and benthic communities and their structural-functional characterization.

In 1977 appeared also a 2-vols edition of selected works of L.A. Zenkevich, "Biology of the northern and southern seas of the USSR" and "Biology of the ocean", with the early articles of L.A. Zenkevich on e.g. the biology of great oceanic depths.

The scientific results of the expeditions of the Institute are published in its Transactions (Trudi). During the period under review, several volumes have been published devoted to the biology of great oceanic depths.

Thus, vol. 103 (1975) is devoted to the results of cruise 11 of the "Akademik Kurchatov" in 1971-72 in the Scotia Sea and the South-Sandwich, South-Orkney, and Peru-Chile Trenches. The volume contains papers on benthonic Foraminifera, Pennatularia, polychaetes (3 papers), Priapulida, gastropods (Tacita), bivalves (Xylophaga), Cirripedia, Tanaidacea, Pantopoda, Brachiopoda, holothurians (Elpidia), pourtalesiid echinoids, ascidians (Situla), pogonophorans (Spirobrachia), and fish (Notoliparis).

Vol. 100 (1975) is devoted to the results of cruise 14 of the "Akademik Kurchatov" in 1973 in the Caribbean Sea (particular attention was given to the study of the great depths) and the Gulf of Mexico. The volume contains papers on bottom coelenterates, pennatularians (Umbellula), madreporarian corals, brachiopods, ophiuroids, echinoids, isopods, Cirripedia Thoracica, and benthic fishes (2 papers).

Vol. 99 (1976) is devoted to the results of research work in the Pacific on the composition and distribution of the deep-sea bottom fauna, carried out by the "Vitiaz", "Akademik Kurchatov" and "Dmitry Mendeleev". The volume contains papers on the division of the World Ocean by the trophic structure of the deep-sea macrobenthos, madreporarian corals (Fungiacyathus), Antipatharia, cocculinid gastropods, deep-sea Buccinum, the brachiopod Pelagodiscus atlanticus, ampharetid polychaetes, Echiurida, Tanaidacea, Ophiuroidea, Echinoidea, Asteroidea (Brisingidae), the pelagic and near-bottom fauna of the maximum oceanic depths, the quantitative distribution of the bottom fauna of the Japan Sea, distribution of the Philippine Trench bottom fauna, bivalves (Spinula), and the organ of sight of a pantopod.

Vol. 108 (1977) contains papers on the collections from Cruise 57 of the "Vitiaz": bottom fauna of eight trenches in the western Pacific (including the Palau and Yap Trenches), Foraminifera of the Peru-Chile Trench, agermatype corals (particularly Leptopenus), eunicid polychaetes (Paraonuphis), lepetid gastropods, ultra-abyssal (hadal) Cirripedia Thoracica, two amphipods from the Yap Trench, trench tanaids, pelagic ostracods from the Kurile-Kamch. Trench, trench holothurians (Myriotrochus), and bivalves (Policordia).

Vol. 112 (1978) and vol. 113 (1978) mainly summarize the results of Cruise 16 of the "Dmitry Mendeleev" in the Australia-New Zealand region. Besides papers on hydrology, hydrochemistry, geomorphology, and the biology of its pelagial, several papers deal with the deep-sea benthos. In vol. 112 there are studies on a third species of the ultra-abyssal fish genus Notoliparis, western Pacific trench polychaetes (Polynoidae), and the bottom fauna of trenches of the Macquarie complex. Vol. 113 contains papers on the quantitative distribution of the bottom fauna of the area and particularly of the amphipods, the trophic characteristics of southern hemisphere basins, the benthos of the western Peruvian basin and nearby regions, madreporarian corals, polychaetes (3 papers), bonellid echiurids, sipunculids and priapulids, lepetellid gastropods, a new buccinid gastropod, the nudibranch Coryphella stimpsoni (Japan Sea), Tanaidacea (Caribbean area), holothurians (Myriotrochus), and meridosterbous echinoids.

Papers on deep-water biology published elsewhere:

A.P. Andriashev, 1977: Some additions to the scheme of vertical zonality of the marine bottom fauna. In: Adaptations within Antarctic ecosystems (Ed. G.A. Ilano), Proc. 3rd SCAR Symposium on Antarctic Biology, Washington.

M.N. Sokolova, 1976: Trophic zonality of deep-sea macrobenthos as an element of the biological structure of the ocean, Okeanologia 16, 2.

M.N. Sokolova, 1978: Trophic classification of types of deep-sea macrobenthos distribution, Doklady AN SSSR 241, 2.

F.A. Pasternak & R.J. Levenstein, 1978: New data on the patterns of deep-sea bottom fauna distribution in the Sea of Japan, Okeanologia 18, 5.

Finally, during the period under review several monographs have been published, devoted to separate groups of bottom animals:

Kh.M. Saidova, 1976: Benthic Foraminifera of the World Ocean (zonality and quantitative distribution), Publ. House NAUKA.

O.N. Zezina, 1976: Ecology and distribution of recent brachiopods, Publ. House NAUKA.

V.V. Murina, 1977: Marine sipunculids of the Arctic and boreal waters of Eurasia. In: Keys to the fauna of the USSR, publ. by the Zool. Inst. of the USSR Acad.Sci., NAUKA.

Conferences and Meetings

a) First Congress of Soviet oceanologists, Moscow, 20-25 June 1977. In the symposium "Biology of oceanic depths" (convener Z.A. Filatova) the following reports were presented: Quantitative distribution of deep-sea bottom fauna (Z.A. Filatova); Zoogeographic demarcation of the abyssal and ultra-abyssal (G.M. Belyaev & N.G. Vinogradova); On the epifauna of ferromanganese nodules in the Pacific Ocean (M.N. Sokolova); New data on the compo[illegible]tion and distributional patterns of the deep-sea bottom fauna in the Sea of Japan (F.A. Pasternak & R.J. Levenstein); Morphological variability of deep-sea corals associated with the singularities of their ecology and vertical distribution (N.B. Keller).

b) 14th International Scientific Pacific Congress, Khabarovsk, 20 Aug. - 5 Sept. 1979 (see below).

c) 4th All-Union Colloquium on Echinoderms, Tblisi, 10-14 Sept. 1979. Reports on deep-sea echinoderms are included in the program.

Nina Vinogradova

The Symposium "Biology of the Pacific Ocean Depths"
XIVth Pacific Science Congress (USSR, Khabarovsk, August 1979)

From 20 August to 1 September, 1979, the XIV Pacific Science Congress, organized by t[illegible] International Pacific Science Association (IPSA) took place in Khabarovsk, the USSR. This congress worked under the motto "Natural resources of the Pacific Ocean - for the benefit of mankind".

Under Committee F (Marine Sciences) and Section F II (Marine Biology) was held, on August 24-25, Symposium F II b I: Biology of the Pacific Ocean Depths (more than 2000 [illegible]. The USSR convener was Dr. N.G. Vinogradova; the co-convener was Prof. H.L. Sanders (Woods Hole, USA), who was very active in the preparations but unable to attend the symposium. Prof. T. Abe (Tokyo Univ., Japan) therefore served as foreign co-convener during the congress. There were 14 official symposium participants: Japan 1, Rumania 1, USA 4 and USSR 8.

At four meetings 13 reports were given on trophology, patterns of geographical and vertical distribution of bottom invertebrates and fish at great depths, ecology, evolution and adaptation to deep-sea life. Especially the fauna of the hadal (ultraabyssal) zone was discussed.

1. M.N. Sokolova (Inst. Oceanol., Moscow): "The trophic large-scale regions of the World Ocean floor and the characteristics of their population". - The ocean floor is divided into regions with eutrophic and oligotrophic conditions and gradually worsening feeding conditions for deep-sea macrobenthos. From the near-continental eutrophic region towards the southern oligotrophic areas successive decrease in occurrence and confinement of detritus-feeding invertebrates occurs and also in size, number and abundance of species of all invertebrates. Size, shape and relationship of similar animals in trophic regions are different.

2. N.V. Kucheruk, N.B. Keller, R.J. Levenstein, R.K. Kudinova-Paternak, F.A. Pasternak, Z.A. Filatova (Inst. Oceanol., Moscow): "New data on the distribution of some groups of bottom invertebrates and the zoogeographical division of the abyssobenthal

zone of the Pacific Ocean". - The peculiarities of the zoogeographical divisions of the Pacific Ocean floor were discussed. There is a need for divisions of species with near-continental, oceanic and pantalassic patterns of the trophic distribution. The submarine ridges are not obstacles but are beneficial to dispersal of the near-continental fauna through the oceanic eutrophic area.

3. R.D. Turner (Harvard Univ., Cambridge, USA): "Deep-sea biology around wood islands" and "The Galapagos thermal vents studied by the Alvin". - Wood as primary food source in the deep sea (1860-4000 m) becomes available to other benthic organisms due to the activity of the Xylophaginae (wood-boring bivalves). Density, frequency of occurrence and growth rates of benthic animals on and around "wood islands" are higher than under natural conditions on the sea bottom.

Along the Galapagos Rift around the thermal vents at 2500-2700 m a remarkable fauna of large benthic animals was discovered, distributed in a definite order. The base of the food chain appeared to be bacteria oxydizing the hydrogen sulfide.

4. M.A. Rex (Univ. Massachusetts, Boston, USA): "Towards a model of speciation in deep-sea gastropods". - Patterns of species diversity, distribution, geographic variation, larval dispersal and taxonomic diversity are synthesized to propose a model of speciation in deep-sea snails.

The results suggest that to snails the continental slope and rise depths afford the greatest potential for successful speciation, and that the abyss is a less important centre of radiation.

5. R.Y. George (Univ. North Carolina, Wilmington, USA): "Low and high pressure acclimation patterns of marine crustaceans from different depth zones". - The main theme deals with reversible pressure responses of marine crustaceans from shelf, slope and abyssal zones and also points out the 'pressure acclimation potentials' (pap-values) of the different species on exposure to simulated deep-sea conditions. The data suggest that there appears to be a significant group effect, indicating implications of phenotypic pressure accommodation patterns in decapod species and genetic adaptations to pressure regimes in some amphipod species.

6. N.V. Parin and V.E. Becker (Inst. Oceanol., Moscow): "Fishes of the Pacific Ocean (review of geographic distribution)". - The main types of the oceanic and distant-neritic distributional ranges of mesopelagic fishes, as exemplified by Myctophidae, were considered. According to general patterns of distribution, four areas may be designated as regions of primary ichthyogeographic rank: the Western-central Tropical, Eastern Tropical, Southern and Northern regions.

The classification of the distributional ranges of bathypelagic species is not equally well elaborated, but some of the patterns are similar to those of mesopelagic fishes.

7. A.V. Neyelov and A.P. Andriashev (Zool. Inst., Leningrad): "The fish fauna of the southern part of the East-Pacific ridge and its origin". - The fish fauna in the area of the Eltanin fracture zone has faunistic relations with New Zealand and the Kerguelen-Macquarie region and comprises the more widely distributed species. In accordance with the biology of these species the colonization of this region happened in different ways. To bottom and bathyal-pelagic species the mid-oceanic ridges and other rises are the pathways in their dispersal across the open ocean.

8. W.G. Pearcy, D.L. Stein and R.S. Carney (Oregon State Univ., Corvallis, USA): "The deep-sea benthic fish fauna of Cascadia and Tufts abyssal plains and adjoining continental slope in the Northeastern Pacific Ocean." - The study of the deep-sea benthic fish fauna from 400 to 5000 m was based on 577 trawlings. The number of species decreased from 400 to 2000 m, then increased on the lower slope before declining to low numbers on the abyssal plains. Number and biomass per square meter decreased with increasing distance from land.

9. T. Abe, S.P. Applegate, H. Shimma, J. Toda, K. Fukui and H. Fujii (Tokyo Univ., Japan): "Deep-sea sharks and squaline". - The squaline ($C_{30}H_{50}$) is found in remarkable quantity in liver oils of many deep-sea squalids and in some other sharks, as well as in basking sharks (Cetorhinus maximus) and ragged-tooth sharks (Odontaspis ferox). Commercial basking shark may be one of the main sources of squaline in many branches of industry. In addition, some data are given on the biology and distribution of these two shark species.

10. V.V. Federov (Zool. Inst., Leningrad): "Deep-water fishes of the Bering Sea and origin of secondary deep-water forms". - Deep-water fishes of the Bering Sea and secondary deep-water forms emerged due to the periodic fluctuations of the ocean level in the Cenozoic. To avoid elimination during the regressions, bottom and demersal fishes

were forced to colonize the bathyal zone, penetrate into pelagic waters or to widen their distributional ranges. These ways may be traced among liparids, zoarcids, scorpaenids and some other groups.

11. O.E. Kamenskaya (Inst. Oceanol., Moscow): "Hadal amphipods from the trenches of the Pacific Ocean." - At present 34 species of amphipods are known from the hadal zone in the Pacific. At about 6000 m depth the change of the species composition of this group occurs. There are the upper (transitional) and the lower (deeper than 7000 m) subzones of the hadal zone. In trenches lying within eutrophic regions, carnivorous forms prevail, but in low production trenches detritus-feeders and suspension-feeders predominate. The patterns of geographic distribution of hadal amphipods depend on their mode of life. In nekto-benthic forms the distributional ranges are far wider than in true bottom species. Biomass of amphipods comprises 4-8 mg/m^2 on the floor of the Pacific, 11 mg/m^2 in trenches.

12. R.Y. George: "Abyssal and ultraabyssal (hadal) biota of the Peru-Chile Trench: zonation, origin and affinities". - This paper points out the patterns of vertical zonation of 60 species of isopod Crustacea in the Milne-Edwards Deep. The eutrophic nature of the ultraabyssal zone is characterized on the basis of biomass and relative numerical abundance of indicator species. The Peru-Chile Trench fauna is compared with that of the Kurile-Kamchatka Trench and the Puerto Rico Trench. The paper also throws light on origin and adaptations of the hadal fauna.

13. M. Bacescu (Zool. Mus., Bucharest, Rumania): "Some zoogeographic problems of Mysidacea of the Peru-Chile Trench and the waters off the Philippine Archipelago". - The Peru-Chile Trench is the centre of origin of such archaic genera of mysids as Eucopia, Hansenomysis and Mysimenzies. On the other hand, the Philippine waters may be considered as another centre of emergence of the Paralophogaster species and partly of the genus Gnathophausia and some others. Coral reefs are considered the centre of origin of the genus Heteromysis.

The Symposium attracted great attention. About 50 marine biologists from adjoining symposia attended the meetings and took active part in them.

During the discussions it was emphasized that since the structure and patterns of spatial distribution of deep-sea life had been fairly well investigated, special attention should be paid to the functional aspects of the deep-sea communities and, in the first place, to the distribution of energy flow from the surface towards great depths, transformation of this flow within the abysso-benthal zone and a reverse interaction of bottom communities with those of the pelagic zone, and transmission of energy from bottom animals at great oceanic depths to the surface communities through inhabitants of the pelagic zone.

There is a great need for better techniques of sampling to make possible a quantitative evaluation of the biological phenomena at the oceanic depths, and a need for better equipment to study the physiology of deep-sea inhabitants.

These and other aspects of the discussion were reflected in the following

Resolution of the Symposium

1. The Symposium states that the depths of the ocean, representing 2/3 of the surface of the globe, should be thoroughly studied in future. Our knowledge of this area is still insufficient.

2. Deep-sea research in recent years has revealed the important role played by mid-oceanic ridges as zoogeographical barriers to the abyssal fauna and as pathways for spreading of bathyal and abyssal faunas in the open ocean. Mid-oceanic ridges, underwater mountains and other elevations are often areas of high biological productivity. Specialized biological expeditions using new techniques are needed.

3. The Symposium points out the importance of studying deep-sea trenches and fracture zones, and the environmental conditions and their dynamics in these still little known areas. The study of the biology of the hadal zone is of considerable theoretical and practical importance.

4. Structural aspects of the distribution of life at great depths are relatively well known. Stress should be laid on the study of functional aspects of biological phenomena and energy flux within and to great depths.

5. The study of micro- and meiofaunas, including physiological and functional character-

istics, and the elucidation of the role of these size groups in food chains and turnover of matter and energy should be intensified.

6. Nutrition and energetics of the deep-sea fauna, including mechanisms for transport of energy (food) into the deep sea, rates of transport, food-web pathways, and decomposition of organic matter enroute should be studied.

7. Opening-closing nets should be used to evaluate vertical movements of nekton and hyperbenthos within the water column. More studies of the biomass, metabolism and interactions of pelagic and benthic deep-sea communities are needed.

8. Mechanisms of transport of elements or pollutants from the deep-sea benthos into the water column are of special interest to assess impacts of deep-sea disposal of man-made wastes. At present we have too insufficient data on the dynamics and interactions of deep-sea benthic and pelagic life to predict the possible fate of such wastes, not only in the seismically active trenches and fracture zones but also in other deep-sea areas. We view with concern any disposal of toxic radioactive or man-made wastes in the deep sea.

9. We hope that experts on the deep-sea fauna will work in close contact with each other; moreover, the Symposium encourages cooperation among scientists of different countries and joint research of the great depths of the ocean. It is urgent to organize the next symposium on deep-sea biology in 2 or 3 years.

10. We wish to express our cordial thanks to the convener, Dr. N.G. Vinogradova, who organized our fruitful symposium.

Some interesting reports on faunas of the deep sea were given at three other symposia: "Hydrobiology and biogeography of the shelf communities", "Invertebrates of the fringing seas of the Pacific Ocean", and "The communities and biogeography of the open ocean (to 2000 m)".

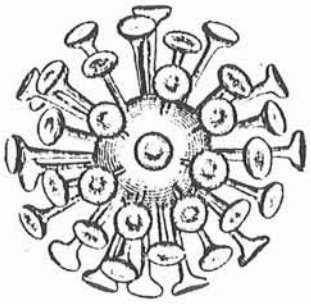
1. O.N. Zezina (Inst. Oceanol., Moscow): "On the formation of the recent bottom fauna at the shelves and slopes of the Pacific Ocean as is evident from the Brachiopods". - Recent meridional asymmetry of warm-water faunas reflects hydrological asymmetry of the ocean regarding its meridional (latitudinal) axis. Position of the distributional centres of the warm-water faunas on the western shelves and slopes resulted from the long-aged meridional asymmetry of the faunas. The time when the Recent cold-water faunas emerged is determined as Late Paleogene and coincides with the time when the present thermohaline circulation of the ocean was formed.

2. E.W. Dawson (N.Z. Oceanogr. Inst., Wellington, N.Z.): "The bathyal marine fauna of the New Zealand Exclusive Economic zone". - Working up of some 2000 benthic stations by the Institute disclosed differences in distributional patterns of the most abundant species of corals, crabs, mollusks, echinoderms, and fishes in the area.

3. A.V. Ivanov (Zool. Inst., Leningrad): Based on embryology and development of Pogonophora new suggestions are given concerning the place of this group in the classification. An analysis of phylogenetic affinities among Protostomia shows that this group cannot be considered taxonomically homogenous. Pogonophora constitutes an independent group of Coelomata equal in taxonomical rank to such independent supertypes as Deuterostomia, Chaetognatha, Tentaculata, and Trochozoa.

On the initiative of the head of the Institute of marine biology of the Far-Eastern Centre of the Academy of Sciences of the USSR, Prof. A.V. Zhirmunsky, the reports from Subsection F II a ("Biology of the Shelf") will be published in editions of the Academy of Sciences under supervision of his Institute.

N.G. Vinogradova



Conservation of the Cortes-Tanner Banks, Southern California

At the Editor's request, Dr. John Mohr, Los Angeles, California, has prepared this review of the latest development in the protection of only one of several particularly valuable areas off Southern California, where preservation measures should be taken.

After McLean's discovery in 1975 that he had a small neopilinid monoplacophoran species from the southern Californian Continental Borderland, a Bureau of Land Management survey under K. Fauchald (now of the US Natl Museum of Natural History) and G.F. Jones and team at University of Southern California established a locus for the neopilinid below 300 m on Cortes-Santa Rosa Ridge (the Cortes-Tanner Banks, long known as a prime fishing area in recent years partly "legally protected" because of purple coral, Allopora, there). Subsequently, H.A. Lowenstam (California Institute of Technology) in several collections took about a score of live individuals (some kept alive to three weeks in his laboratory) for studies of behavior, providing McLean more specimens for the description (1979) of Vema hyalina and N. Riser and P. Morse, at Nahant, histologically fixed material. So far (fide H.A.L.) all specimens come from cobbles at probably just one place (the published position for the original take being doubtful), but Lowenstam thinks they may occur on soft bottom.

At least nine companies have provisional permits to drill for oil and gas on Corte Tanner Banks; Bureau of Land Management most recently authorized Marathon Oil Co.'s drilling four. Shell Oil Co. contends that requirements to remove well cuttings and spent drilling mud from Tanner Bank area are not needed because tests Eco-Mar, a Santa Barbara firm, made for Shell there showed "explosive dispersion", thus preventing damaging concentration.

Other than Allopora's right to protection, the presence of Vema makes the area "biologically sensitive", but that only after University of Copenhagen natural scientists remonstrated formally to the U.S. Secretary of Interior; subsequently the Malacological Society of Great Britain and Ireland, the American Malacological Union, and the Western Society of Malacologists have expressed concern officially. Agency scientists note that such international attention is embarrassing, that the action was immediately post ho and clearly propter hoc. Protection requires effective joint action by Department of Interior's Geological Survey (enforcing care in drilling operations) and Bureau of Land Management (most other aspects of operation), Environmental Protection Agency (control of discharges to the sea), Department of Commerce's Pacific Fisheries Management Council (in NOAA) (effects on fishes and corals) and Coast Guard (providing vessels for moves by the other agencies). None of these has shown interest in enforcing restrictions; Coast Guard officers recently joined with an oil industry representative in plans to oppose " 'crazies' and environmentalists".

Lamellibranchia barhami (vestimentiferan) occurs at two points on Patton Escarpment, several genera of pogonophorans occur in Tanner Basin or other parts of the Borderland (E. Southward in litt.), ten to a dozen kinds of solenogasters occur at various points (fide Patrick LaFollette), and assemblages of marl sand foraminiferans on Cortes-Santa Rosa Ridge have been characterized as "the Pleistocene alive and well". None of the steward agencies has recognized the presence of any of these as significant.

John Mohr

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