GEOMAR REPORT

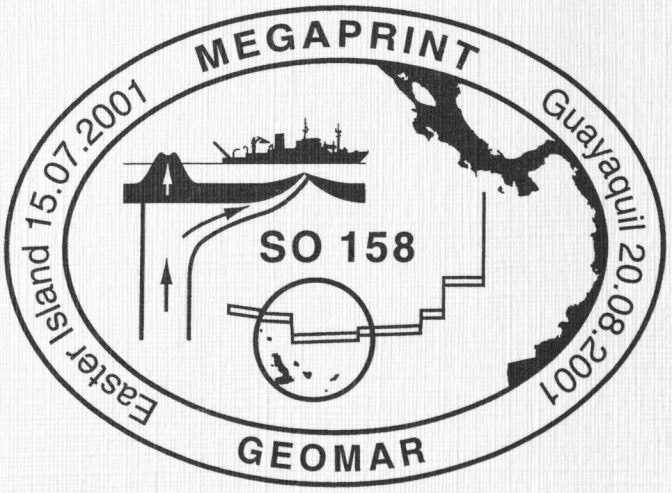
FS/RV SONNE
FAHRTBERICHT SO158
CRUISE REPORT SO158

MEGAPRINT

MULTIDISCIPLINARY EXAMINATION
OF GALÁPAGOS PLUME RIDGE INTERACTION

ISLA DE PASCUA - GUAYAQUIL

JULY 15 - AUGUST 20, 2001



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Edited by
Reinhard Werner
with contributions of cruise participants

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1. ZUSAMMENFASSUNG/SUMMARY

Hauptziel der Ausfahrt SO158 war die systematische Beprobung vulkanischer Gesteine mit Dredgen im Seegebiet nördlich des Galápagosarchipels und entlang des Galápagos-Spreizungszentrums (GSC) im Bereich zwischen 85° und ca. 93°W. An den Gesteinsproben werden vulkanologische, petrologische und geochemische Untersuchungen im Rahmen des Projektes MEGAPRINT durchgeführt. Mit MEGAPRINT soll ein besseres Verständnis der Struktur eines Mantelplumes und geodynamischer Prozesse in dem von Plume-Rücken-Wechselwirkungen geprägten Bereich des zentralen Ostpazifiks erreicht werden. Außerdem sollen grundlegende Informationen über Morphologie, Hydrothermalismus, Plattentektonik und Tiefseeorganismen in diesem Gebiet gewonnen werden. Während SO158 wurden insgesamt 88 Stationen angefahren. Dabei wurden neben 3 Magnetik- und 3 Schallprofilen sowie 5 Biologiestationen (jeweils TV-Greifer, Meiofaunadredge, Kastengreifer) 95 Dredgezüge an 78 Stationen durchgeführt. Auf der gesamten Ausfahrt ging kein Gerät verloren.

Die Gesteinsbeprobung verlief an 90% der petrologischen Stationen (= 71 Stationen) erfolgreich und erbrachte insgesamt 552 Proben. Am GSC, das in Abständen von ca. 10 bis 15nm beprobt wurde, dominierten dichte, weitgehend aphyrische Pillow- oder Schichtlaven mit bis zu 1 - 2cm mächtigen Glaskrusten. Im Norden der Transformstörung bei ca. 91°W weisen absolut frische Laven an einem Seamount auf aktiven Vulkanismus in einem bis zu 3.300m tiefen Graben hin. Am Top eines Seamounts nordwestlich der Transformstörung wurden Fe-Oxihydroxid-Silicia-Fragmente beprobt, die als Reste von oxidierten Sulfid-Chimneys angesehen werden. Im Gegensatz zum GSC erbrachte die Beprobung der Seamounts petrographisch sehr unterschiedliche, mitunter plagioklas- oder olivinreiche Vulkanite. Struktur und Textur der Laven und vulkaniklastischen Gesteine insbesondere von den größeren der beprobten Seamounts weisen deutlich darauf hin, dass viele von ihnen einst im Flachwasser oder subaerisch aktiv waren. Mächtige Mn-Krusten und der Alterationsgrad der Gesteine von den Seamounts im Osten von Galápagos deuten ferner darauf hin, dass es heute dort keinen aktiven Vulkanismus mehr gibt.

Mit Ausnahme von 2 Kastengreifereinsätzen waren auch sämtliche Geräteeinsätze an den Biologiestationen erfolgreich. Daneben erbrachten 58 der Dredgestationen Sediment für biologische und teilweise zusätzlich auch für sedimentologische Untersuchungen. Ebenfalls 58 Dredgezüge lieferten verwertbare Makrofauna. Eine erste Sichtung der Magnetikdaten ergab, dass auf allem 3 Profilen Daten in hervorragender Qualität gewonnen werden konnten. Das neu auf der *Sonne* installierte SIMRAD-EM 120 Fächerecholotsystem bewährte sich insgesamt hervorragend. Durch seine im Vergleich zum HYDROSWEEP-System erheblich größere Abdeckung war es möglich, ohne nennenswerten zusätzlichen Zeitaufwand ergänzend zu den geplanten Arbeiten große Teile der Arbeitsgebiete detailliert zu kartieren. Diese Kartierungen erbrachten u.a. erstmals ein umfassendes Bild der Morphologie der Achse des GSC und von Lineationen nördlich und östlich von Galápagos. Als überraschend erwies sich dabei die für einen mittelozeanischen Rücken ungewöhnlich komplexe Morphologie des Spreizungszentrums.

Auch konnte festgestellt werden, dass die Verteilung und Morphologie der Seamounts nördlich und östlich der Galápagosplatform systematisch variiert.

The major objective of the SO158 cruise was the systematic sampling of volcanic rocks in the area north of the Galápagos archipelago and from the Galápagos spreading center (GSC) between 85° and 93°W. Planned volcanological, geochemical and geochronological studies on the rocks recovered during SO158 are part of the MEGAPRINT project. The major goal of the MEGAPRINT project is to map out geochemical gradients in volcanic rocks between the Galápagos islands and the GSC in order to improve our understanding of the chemical structure of mantle plumes and of geodynamic processes in an area of the East Pacific being marked by plume-ridge interaction. Furthermore, MEGAPRINT should provide important informations on morphology, hydrothermalism, plate tectonics and deep sea organisms in this area. During SO158 a total of 88 stations were accomplished. Along with 3 magnetic- and 3 echo sounder profiles and 5 biology stations (TV-grab, meiofauna dredge and box corer), 95 dredge hauls were performed at 78 stations. No equipment has been lost or damaged during SO158.

Rock sampling was successful at 90% of the petrological stations (= 71 stations) and yielded a total of 552 rock samples. Dense, largely aphyric pillow- and sheet lavas with up to 1 - 2cm thick glass crusts dominate at the GSC where dredge sites were spaced approximately every 10 to 15nm. Extremely fresh lava dredged at a small seamount within the 3300m deep graben in the northern part of the 91° transform fault indicates young volcanism in this area. Fe oxyhydroxide-silica fragments sampled at the top of a seamount north-west of the 91° transform fault are interpreted as remains of a chimney. By contrast to the GSC sampling of the seamounts yielded petrographically varying, partly plagioclase- or olivine rich volcanic rocks. Structure and texture of lavas and volcaniclastic rocks from the seamounts indicate that many of them (in particular the larger seamounts) were once active in shallow water or under subaerial conditions. The rocks from the seamounts east of Galápagos posess thick Mn-crusts and are strongly altered suggesting that no active volcanism exists in this area at present.

The 5 biology stations were also successful. In addition 58 of dredge stations recovered sediment for biological and partly also for sedimentological studies. 58 dredge hauls delivered usable macro fauna as well. Preliminary data processing and quality control of the magnetic data from the 3 profiles recorded on SO158 proved an excellent data quality. Overall, the newly installed SIMRAD EM 120 echosounding system proved as an excellent tool during the entire cruise. The greater aerial coverage allowed by SIMRAD is a significant improvement over the HYDROSWEEP system because it allows continuous detailed mapping of the working area without any significant time loss for station operations. Among others the mapping operations on SO158 provided for the first time a more complete picture of the morphology along much of the axis of the GSC and the lineations north and east of the Galápagos Islands. The new maps of the GSC reveal a surprisingly wide range of axial morphologies at the GSC and systematic variations in distribution and morphology of the seamounts north and east of the Galápagos platform.

2. ACKNOWLEDGEMENTS

We would like to express our deepest gratitude to Captain Hartmut Andresen and all crew members of the RV *Sonne* for their expert help, advice, and professionalism. No equipment was lost thanks to their diligent and expert control of both the RV *Sonne* and the winches. These are significant achievements considering the difficulties of handling a research ship, winches, and other equipment while sampling rocks and sediments under considerable time pressure.

We thank the Government of Ecuador for granting permission to work within their territorial waters. We also gratefully acknowledge the support of Dipl. Ing. Essy Santana in this matter.

The MEGAPRINT project is funded by Bundesministerium für Bildung und Forschung (BMBF) project award to Prof. Kaj Hoernle. His advice and contribution have been essential to the success of MEGAPRINT. The biological part of SO158 is in addition funded by a grant of the Deutsche Forschungsgemeinschaft (DFG) to Dr. Birger Neuhaus.

3. PARTICIPANTS

3.1. Ship's Crew

Andresen, Hartmut	Captain		
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Rosin, Peter	A.B.	Becker, Michael	A.B.
Kreft, Norbert	A.B.		

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4. INTRODUCTION TO THE MEGAPRINT PROJECT

(K. Hoernle, R. Werner, F, Hauff)

4.1. Objectives

The main objective of the SO158 cruise was detailed sampling of volcanic rocks, sulphide and manganese deposits, and deep-sea benthic marine fauna from the Galápagos spreading center (GSC) between 85°W and 93°W and seamount volcanoes between the GSC and the Galápagos Islands (Fig. 4.1.). Additionally objectives were to obtain bathymetric and magnetic data in the survey area during station transits and on specific profiles.

The SO158 cruise and follow-up sample studies and data interpretation are part of the interdisciplinary project MEGAPRINT (= **M**ultidisciplinary **E**xamination of **GA**lápagos **P**lume **R**idge **INT**eraction) The major goal of MEGAPRINT is to map out geochemical gradients in volcanic rocks between the Galápagos Islands and the GSC in order to improve our understanding of the chemical structure of mantle plumes and of material transfer from plumes to nearby ocean ridges. Throughout the world's oceans mantle plumes or hotspots such as Iceland, Azores, Easter Island and Galápagos cause regional geochemical and bathymetrical anomalies along adjacent mid-ocean ridges. The interactions between mantle plumes and mid-ocean ridges are, however, not well understood. Although these processes take place deep in the earth's interior and therefore can not be observed directly, state of the art geochemical and geophysical methods can map plume ridge interactions and yield important information on mantle flow and mantle melting. The Galápagos hotspot is after Iceland the second largest mantle plume that interacts with a mid-ocean ridge. Its distinct chemical zonation, structure and geometry of the Galápagos plume systems are worldwide unique and serve as an ideal basis for a "field-based" test of plume ridge interaction.

Melts from the Galápagos Hotspot or mantle plume ascend through the overlying lithosphere and erupt on the ocean floor forming the Galápagos Islands (volcanoes that rise above sea level) and Galápagos platform. The lithospheric plate thins toward the GSC or mid-ocean ridge in the north, where the Nazca and Cocos Plates are being pulled apart (Fig. 4.2.) and new oceanic crust and lithosphere are being formed. Upon encountering the base of the lithosphere, the ascending plume material primarily flows northwards until it reaches the GSC. Melts are extracted from the plume material as it flows northwards form submarine or seamount volcanoes north of the Galápagos Platform. Therefore, in the MEGAPRINT project, we plan to investigate the interaction of the Galápagos plume with the overlying lithosphere (plume-lithosphere interaction) and with the GSC (plume ridge interaction), as well as the chemical structure of the upper part of the Galápagos Plume.

The magmatic rocks sampled on cruise SO158 will be geochemically analyzed with different methods in several laboratories. For example the major element chemistry constrain magma chamber processes within the oceanic crust, but also yield information on the average depth of melting, temperature, and source composition in first approximation. The further analytical effort will concentrate on methods that pass information on deep seated mantle processes. Trace

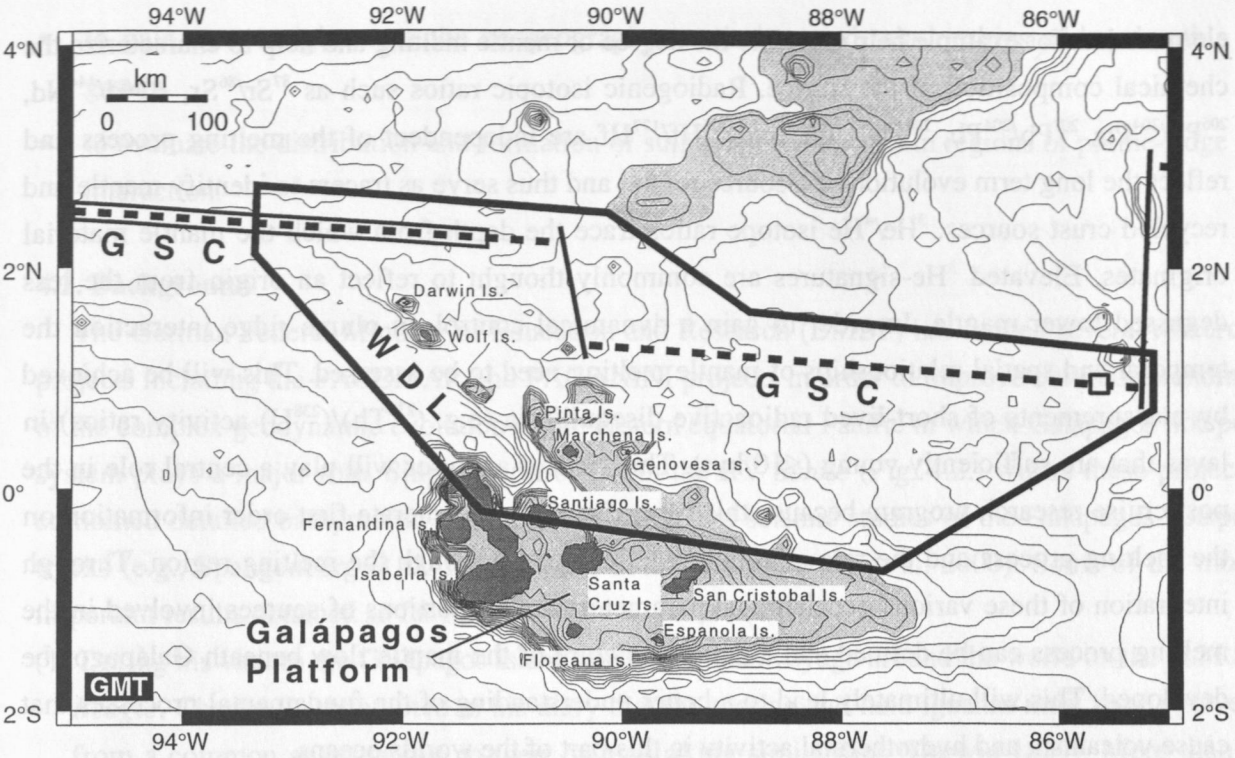

Fig. 4.1.: Schematic map showing the Galápagos archipelago and the axis of Galápagos Spreading Center (GSC; dashed line). The thick black line marks the working area of SO158 (open square: sampling site of cruise SO39; white stripe: working area of RV *Maurice Ewing* Ausfahrt EW0004).

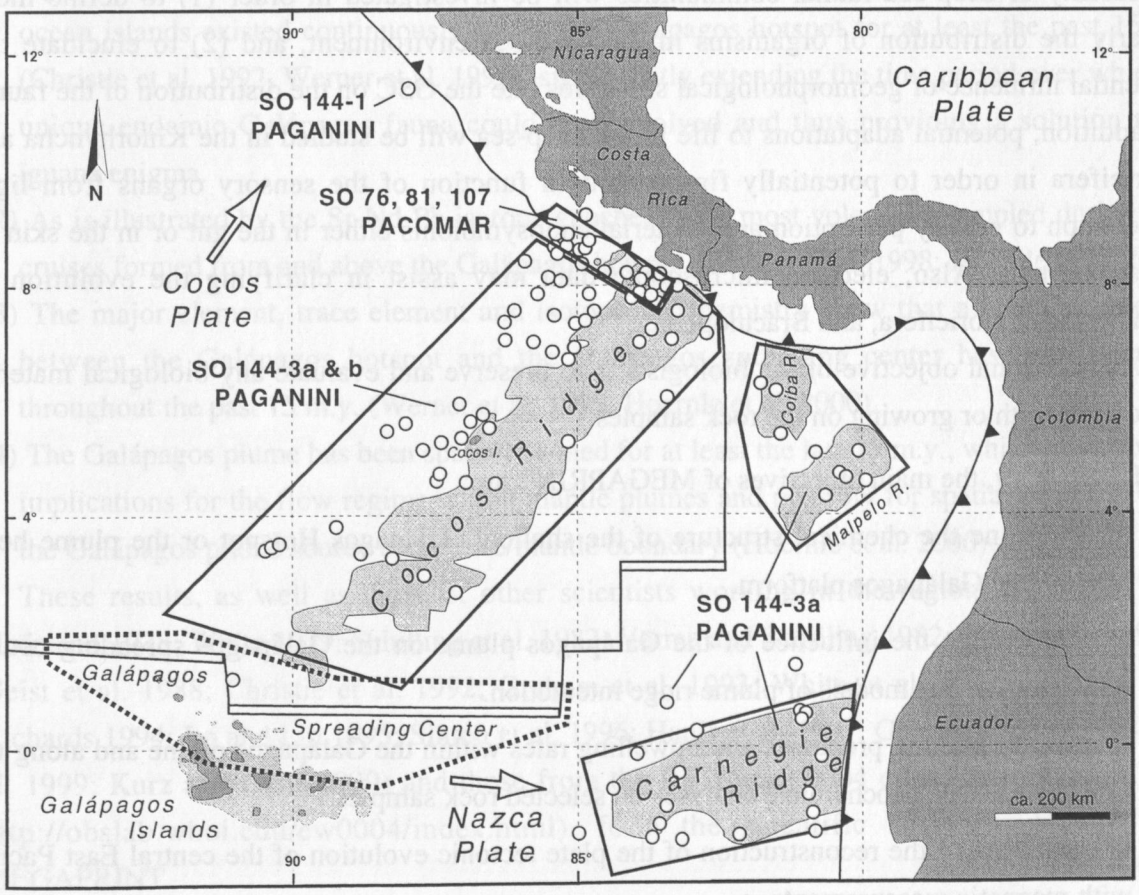

Fig. 4.2.: Petrological sampling on former R/V *Sonne* cruises. Open squares mark dredge and TV-grab stations (dashed frame: working area of SO158).

element data for example help to define the degree of mantle melting and help to characterize the chemical composition of the source. Radiogenic isotopic ratios such as $^{87}Sr/^{86}Sr$, $^{143}Nd/^{144}Nd$, $^{206}Pb/^{204}Pb$, $^{207}Pb/^{204}Pb$, $^{208}Pb/^{204}Pb$, and $^{176}Hf/^{177}Hf$ are independent of the melting process and reflect the long term evolution of a source region and thus serve as tracers to identify mantle and recycled crust sources. $^{3}He/^{4}He$ isotope ratios trace the depth from which the mantle material originates. Elevated ^{3}He-signatures are commonly thought to reflect an origin from the less degassed lower mantle. In order to gain a dynamical control on plume ridge interaction the temporal and spatial relationships of mantle melting need to be assessed. This will be achieved by measurements of short-lived radioactive disequilibria (e.g. $(^{230}Th)/(^{238}U)$ activity ratios) in lavas that are sufficiently young (≤10 kyr). This type of analyses will play a central role in the post-cruise research program because this type of study will generate first order information on the melting process and the rate at which mantle rises up though the melting region. Through integration of these various geochemical parameters the proportions of sources involved in the melting process can be defined and a detailed picture of the mantle flow beneath Galápagos be developed. This will ultimately lead to a better understanding of the fundamental processes that cause volcanism and hydrothermal activity in this part of the worlds oceans.

The analysis of the biological samples gained on SO158 concentrates on the key groups Kinorhyncha, Loricifera (= corset animals), Gastrotricha (= bottle animals), Copepoda, Brachiopoda (= lamp shells), Tardigrada (= bear animals), and Porifera (= sponges). The variability of deep-sea faunal communities will be investigated in order (1) to define more clearly the distribution of organisms in the deep-sea environment, and (2) to elucidate the potential influence of geomorphological structures like the GSC on the distribution of the fauna. In addition, potential adaptations to life in the deep-sea will be studied in the Kinorhyncha and Loricifera in order to potentially find a shift in function of the sensory organs from light perception to gravity perception and bacterial endosymbionts either in the gut or in the skin of these animals. Also, electron microscopic data may assist in clarifying the evolution of Kinorhyncha, Loricifera, and Brachiopoda.

An additional objective of the biologists is to preserve and evaluate any biological material recovered with or growing on the rock samples.

In summary, the main objectives of MEGAPRINT are:

- to determine the chemical structure of the shallow Galápagos Hotspot or the plume head beneath the Galápagos platform.
- to characterize the influence of the Galápagos plume on the Galápagos spreading center (GSC) and to test models of plume ridge interaction.
- to quantify melting processes and upwelling rates within the Galápagos plume and along the GSC by specific geochemical analyses on selected rock samples.
- to contribute to the reconstruction of the plate tectonic evolution of the central East Pacific with magnetic measurements.

- to gain new insights into the zoogeography, evolution, and relationships of key benthic groups.
- to evaluate the distribution and formation of sulphide ore deposits in regions of plume-ridge interaction.

4.2. Background

The German Federal Ministry of Education and Research (BMBF) has funded several research projects including the PACOMAR and PAGANINI projects in order to improve our understanding of the complex geodynamic evolution of the eastern equatorial Pacific in which Galápagos hotspot system plays a major role. Ship expeditions with the RV *Sonne* (Fig. 4.2.) within these projects combined detailed bathymetric mapping, sampling, and seismic studies of the Galápagos hotspot tracks (e.g., Spangenberg et al. 1997; Bialas et al. 1999; Werner et al. 2000). Some of the most important results obtained so far follow:

(1) During his visit to the Galápagos Islands on his famous voyage around the world on the H.M.S. *Beagle*, Charles Darwin noted in his diary that the marine and land iguanas must have evolved from a common ancestor due to their many striking similarities (Darwin 1859). More than a hundred years later scientists showed that it would take at least 15 m.y. to derive both types of iguanas from a common ancestor (Bowman et al. 1983), generating a major evolutionary enigma since the present day Galápagos Islands are no older than 3-4 m.y. (White et al. 1993). Age dating of samples from the Galápagos hotspot tracks with the $^{40}Ar/^{39}Ar$ method show that ocean islands existed continuously above the Galápagos hotspot for at least the past 15 m.y. (Christie et al. 1992, Werner et al. 1999), significantly extending the time period over which the unique endemic Galápagos fauna could have evolved and thus providing a solution to the iguana enigma.

(2) As is illustrated by the Sr-Nd-Pb isotope geochemistry, most volcanoes sampled during these cruises formed from and above the Galápagos hotspot (Werner et al. 1998; Hoernle et al. 2000).

(3) The major element, trace element and isotope geochemistry show that a complex interplay between the Galápagos hotspot and the Galápagos spreading center has been occurring throughout the past 15 m.y. (Werner et al. 1999; Hoernle et al. 2000).

(4) The Galápagos plume has been spatially zoned for at least the last 15 m.y., which has important implications for the flow regime within mantle plumes and possibly for spatial zonation within the Galápagos plume source at the core/mantle boundary (Hoernle et al. 2000).

These results, as well as those of other scientists working in the region (e.g.,White and Hofmann 1978; White 1979; Schilling et al. 1982; Verma and Schilling 1982; Verma et al. 1983; Geist et al. 1988; Christie et al. 1992; Graham et al. 1993; White et al. 1993; Feighner and Richards 1994; Ito and Lin 1995; Sinton et al. 1996; Hauff et al. 1997; Geist et al. 1998; Geist et al. 1999; Kurz and Geist 1999) and those from the RV *Ewing* 0004 cruise (see Fig. 4.1. and http://obslab.whoi.edu/ew0004/index.html), form the scientific basis for SO158 and MEGAPRINT.

5. CRUISE NARRATIVE

(R. Werner)

In the morning of 14.07.2001 RV *Sonne* anchored off coast Easter Island with the SO158 scientific party boarding in the afternoon of the same day. In the meantime repair work on a drive shaft bearing was fully underway by the RV *Sonne* crew and a specialist flown in from Germany. Due to the excellent work effort by all people involved in this task, the repair was finished in the afternoon of 16.07. The following sea trials and a renewed inspection of the bearing were carried out successfully in the night between 16 and 17.07., so RV *Sonne* was able to leave Easter Island early morning on 17.07. Accompanied by mixed weather conditions and little swell the ship headed for La Libertad (Ecuador) in order to refuel and complete the scientific party with two U.S. American scientists. The transit time to Ecuador has been mainly used to prepare the scientific work as well as slightly modify and adjust the working program to the somewhat reduced ship time. In addition, a subgroup of scientists has been introduced by the system operators to the handling of the newly installed multibeam echosounding system (SIMRAD). On 19.07. the ship briefly stopped and launched a probe to retrieve an acoustic profile of the uppermost 1500m water column; necessary to calibrate the SIMRAD system. From then on high quality bathymetric data were continuously recorded during the cruise. Furthermore, a seminar was set up in which scientists involved in SO158 gave informal talks on geology, geophysics and biology. Whereas these talks focused on the scientific background and targets of SO158, they also provided an opportunity for cruise members to get introduced to various scientific topics, covered by the multidisciplinary scientific community on board.

In the early morning of 25.07. RV *Sonne* reached La Libertad (Fig. 5.1.), where the two U.S. scientists boarded and the ship was refueled. In the afternoon of 26.07.the RV *Sonne* departed La Libertad toward the study area. With the help of the RV *Sonne* crew the scientific equipment and sampling devices were prepared for mission during the La Libertad stop and on the transit.

Scientific work began 27.07. at 6:00 am on the transit into the work area with a 150nm magnetic profile extending northwest from Carnegie ridge to the GSC. In the late evening of 27.07. RV *Sonne* reached the first dredge station at the GSC. In the following 7 days the petrological sampling focused on the GSC between 85°W and 90°30´W (Figs. 5.2., 5.3.). Dredge sites were spaced approximately every 10nm (nautical miles) with a total of 38 dredge hauls at 34 stations. Furthermore a biological station 12nm north of the GSC was probed successfully using the TV grab, meiofauna dredge and box corer. In addition to the sampling work, sound velocity profiles of the uppermost 1500m of the water column were recorded with a probe in order to recalibrate the SIMRAD system. Work on the Eastern GSC finished on 04.08. in the morning and the ship came into sight of the Islands Isabela and Pinta. Petrological and biological sampling continued at 10 stations on seamounts in the area of the transform fault north of the Galápagos archipelago (Fig. 5.3.). On several days a school of pilot whales provided some entertainment and approached the ship very closely especially during station work.

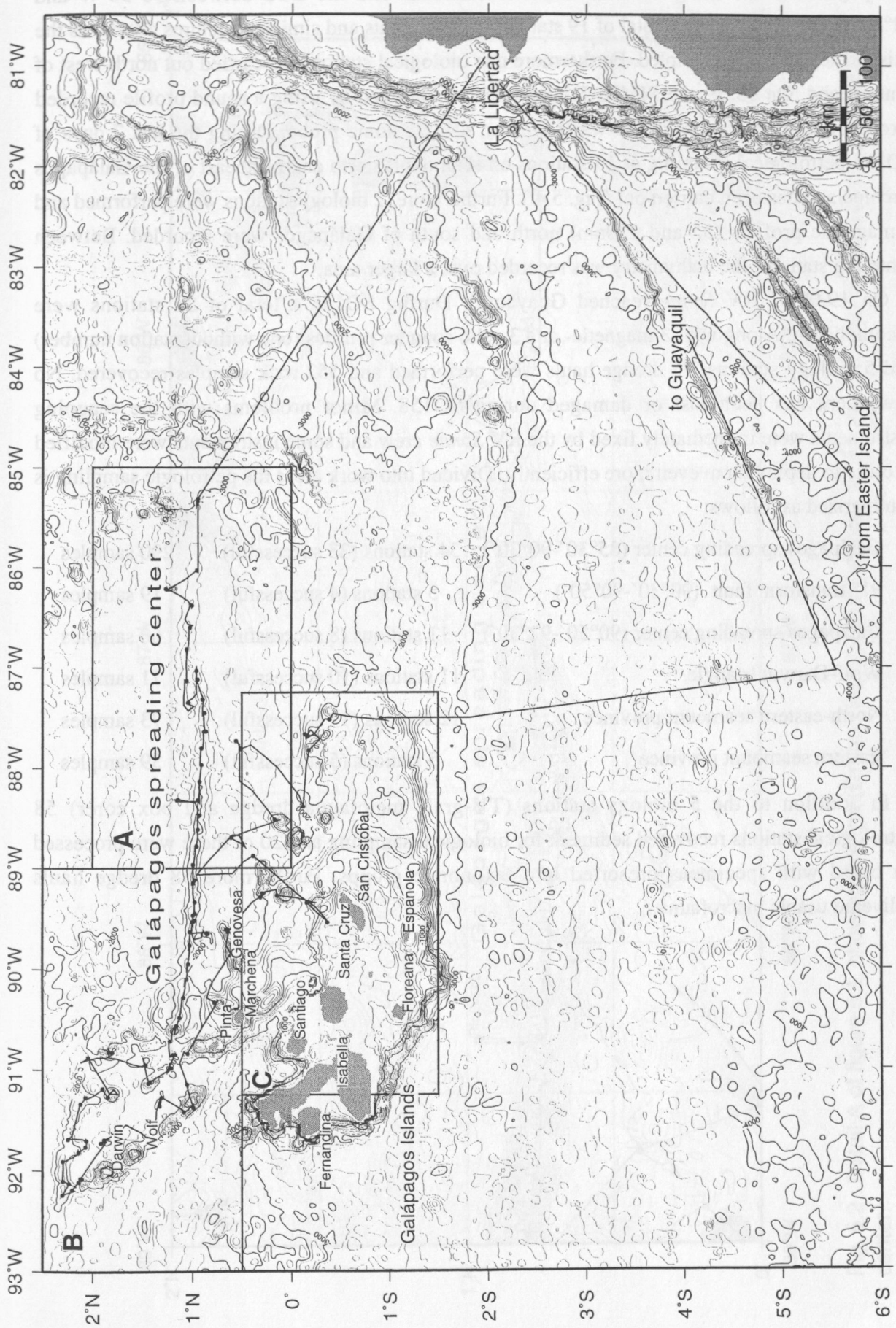

Fig. 5.1.: Ship track and stations for SO158.

From 07.08. til 11.08. petrological work was focused in the region north of the main Galápagos islands, along the Wolf-Darwin lineament and the GSC between 90°50´W and 92°30´W (Fig. 5.3.). Here a total of 19 stations on seamounts and similar structures as well as the axis of the GSC were sampled. Furthermore one biological station was carried out north-west of Pinta island. On 08.08. the SIMRAD was again recalibrated by using a sound profile recorded through the upper 1500m of the water column using a sonic probe. During the last 7 days of SO158 petrological sampling at 16 stations on seamounts north and northeast of the Galápagos Archipelago has been carried out (Fig. 5.4.). Furthermore, 2 biology stations were performed and 2 magnetic profiles (35 and 230nm) north and south of Galápagos were recorded. Between sampling stations, the bathymetry was recorded over a larger area.

On 19.08.01 RV *Sonne* reached Guayaquil. During SO158 a total of 88 stations were accomplished. Along with 3 magnetic- and 3 echo sounder profiles (one without station number) and 5 biology stations, 95 dredge hauls were performed and 552 rock samples recovered. No equipment has been lost or damaged during SO158. Minor problems with the seagoing instruments were immediately fixed by the RV *Sonne* crew and some instruments were modified in order to deploy them even more efficiently. Divided into work areas the petrologic sampling is summarized as follows:

- Galápagos spreading center (85°30´-90°30´) 34 stations (33 successful) 290 samples
- 91° transform fault (90°30´-90°50´) 5 stations (4 successful) 19 samples
- Galápagos spreading center (90°50´-92°30´) 11 stations (8 successful) 60 samples
- Wolf-Darwin triangle 11 stations (10 successful) 71 samples
- North-eastern seamount province 12 stations (11 successful) 73 samples
- Eastern seamount province 5 stations (5 successful) 39 samples

In addition to the 5 biology stations (TV-grab, meiofauna dredge and box corer) 58 petrological stations recovered sediment for biological sampling and 20 of these were processed on board with specimens presorted into taxonomic groups. Furthermore 58 dredge hauls delivered usable macrofauna.

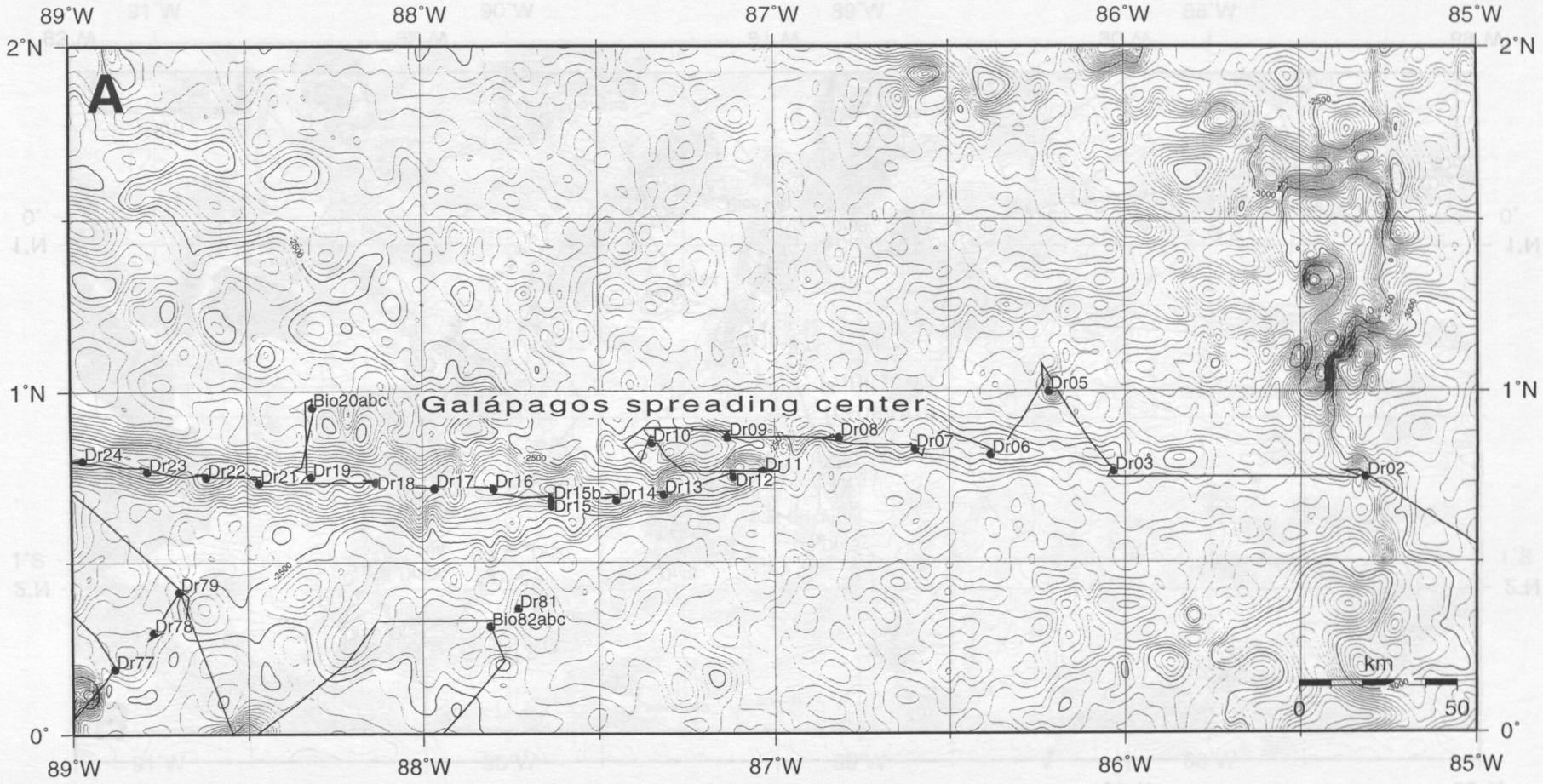

Fig. 5.2.: Detail A of figure 5.1. showing dredge (Dr) and biology (Bio) stations at the eastern part of the Galápagos spreading center.

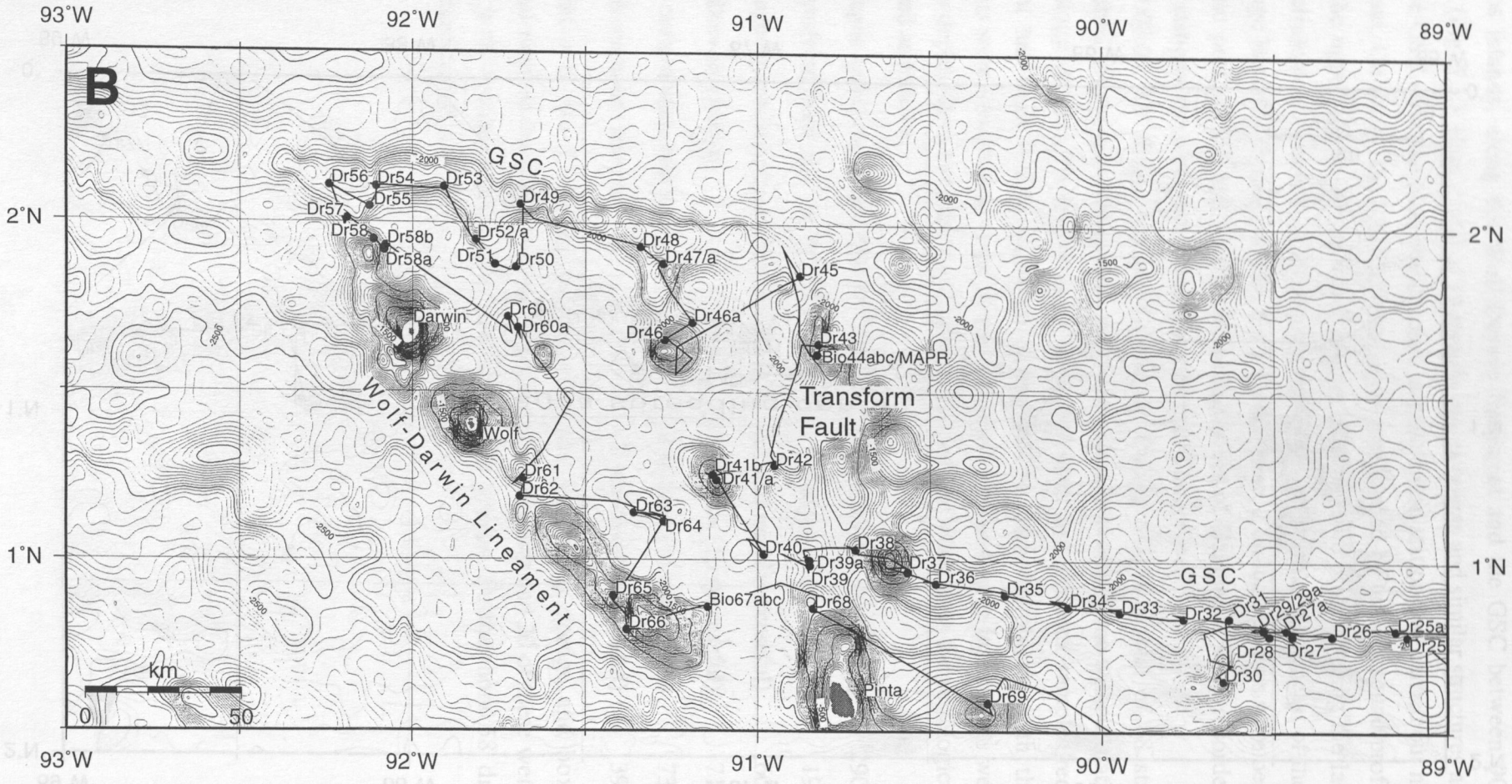

Fig. 5.3.: Detail B of figure 5.1. showing dredge (Dr) and biology stations (Bio) at the Galàpagos spreading center (GSC), the transform fault north of the Galápagos archipelago and along the Wolf-Darwin lineament.

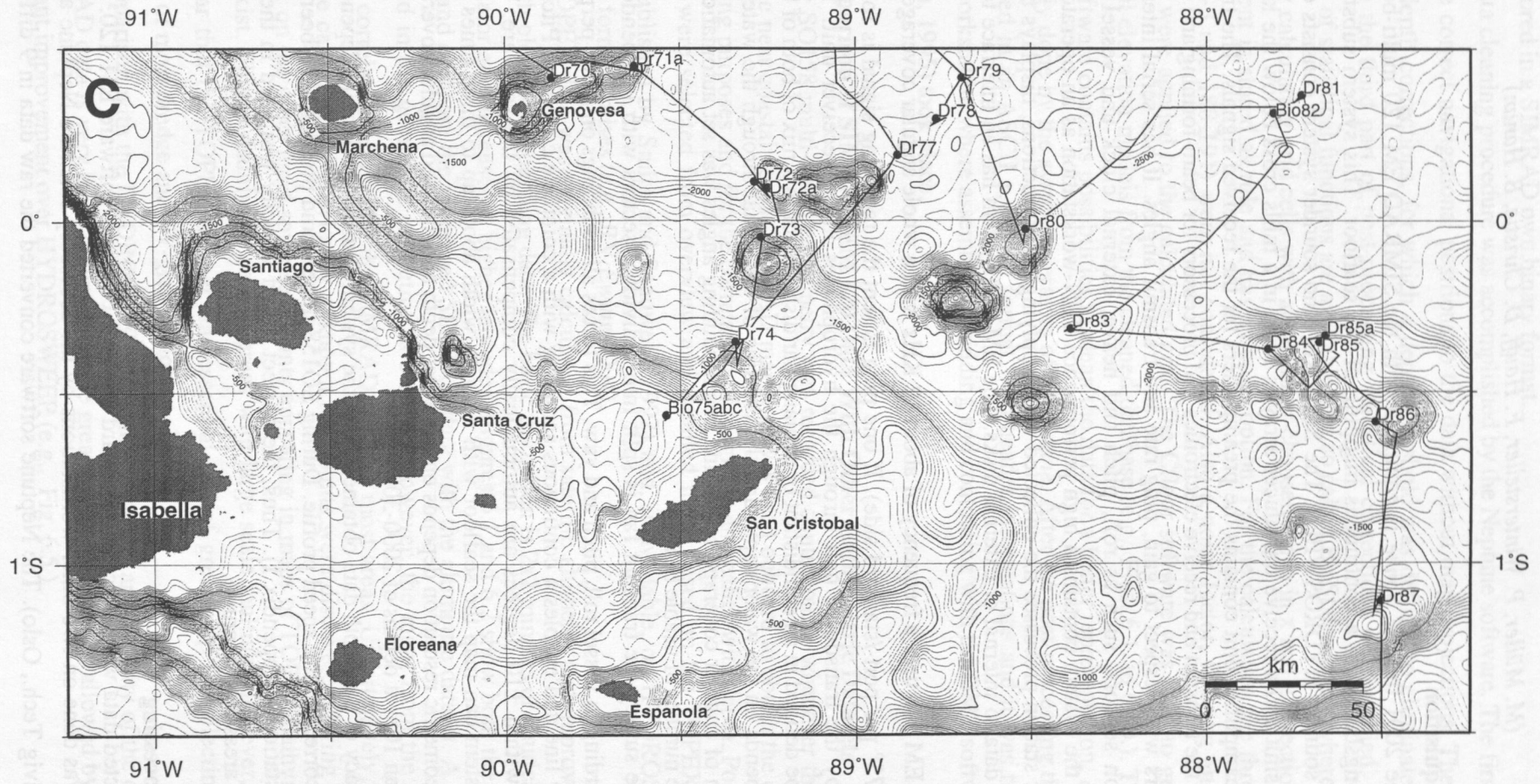

Fig. 5.4.: Detail C of figure 5.1. showing dredge (Dr) and biology stations (Bio) north and north-east of the Galápagos archipelago.

6. BATHYMETRY

(M. Müller, P. Wintersteller, F. Hauff, D. Christie, B. Hanan)

6.1. Data Acquisition

Since June 2001 the RV *Sonne* is equipped with the SIMRAD EM 120 multi-beam echo sounder (Kongsberg) for a continuous mapping of the seafloor. This system substitutes the former echo sounder HYDROSWEEP. The SIMRAD echo sounder system consists of several units. A transmit and a receive transducer array is fixed in a mills cross below the keel of the vessel. A preamplifier unit contains the preamplifiers for the received signals. The transceiver unit contains the transmit and receive electronics and processors for beam-forming and control of all parameters with respect to gain, ping rate and transmit angles. It has serial interfaces for vessel motion sensors, such as roll, pitch and heave, external clock and vessel position. Furthermore the system contains a high performance SUN-workstation as an operator station. The operator station processes the collected data, applying all corrections, displays the results and logs the data to internal or external disks. The EM 120 system has an interface to a sound speed sensor.

SIMRAD EM 120 uses a frequency of about 12 KHz with a whole angular coverage sector of up to 150° (75° per port-/starbord side). If one ping is sent the receiving signal is formed into 191 beams by the transducer unit through the hydrophones in the receiver unit. The beam spacing can be defined in an equidistant or equiangular distance, or in a mix of both of them. The ping-rate depends on the water depth and the runtime of the signal through the water column. The variation of angular coverage sector and beam pointing angles was set automatically. This optimized the number of usable beams.

During the survey the transmit fan is split into individual sectors with independent active steering according to vessel roll, pitch and yaw. This forces all soundings on a line perpendicular to the survey line and enables a continuous sampling with a complete coverage. Pitch and roll movements within ±10 degrees are automatically compensated by the software. Thus, the SIMRAD system can map the seafloor with a swath width about up to three times the water depth. The geometric resolution depends on the water depth and the used angular coverage sector and is less than 10m at depths of 2000-3000m.

The accuracy of the depth data obtained from the system is usually critically dependent upon the use of a correct sound speed profile. During SO158 three sound profiles have been recorded at different stations (Appendix I). Thus, the correct sound velocity was used in the different geographical areas on this cruise.

6.2. Data Processing

The collected data were processed onboard with the coverage software EM 120. The post-processing was done on two other workstations by the accessory software Neptune and Cfloor (Roxa, Smedvig Tech., Oslo). The Neptune software converted the raw data in 9 different files

which contains informations about position, status, depth, sound velocity and other parameters and are stored in a SIMRAD own binary format.

The data cleaning procedure was accomplished by the Neptune software. The first step was to assign the correct navigational positions to the data without map projections. The second step was the depth corrections, for which a depth threshold was defined to eliminate erratic data points. In the third part of post-processing statistical corrections were applied. Therefore, a multitude of statistical functions are available in a so called BinStat window where the data are treated by calculating grid cells with an operator-choosen range in x and y direction. Each kind of treatment is stored as rule and has an undo option. For the calculation the three outermost beams (1-3 and 188-191) were not considered. Also a noise factor, filtering and a standard deviation were applied to the calculated grid. The Cfloor software was used to generate maps and digital elevation models from the cleaned database (e.g., Figs. 6.1. to 6.10.). Thus, also the Cfloor software contains possibilities to clean the data for a better representation. All this work was mainly done by the system operators of RV *Sonne*. After the post-processing the data could be exported in an ASCII x,y,z file format with header informations and it was transferred to another workstation where assembling, gridding and contouring with the GMT software (Wessel and Smith, 1995) took place.

6.3. Comparison of SIMRAD EM 120 Data With Other Bathymetric Datasets

During SO158 multi-beam bathymetry was recorded continuously whenever the vessel was outside the near coastal zones. SIMRAD mapping was used onboard to obtain the correct depth for dredging purposes and for the correlation of magnetic anomalies with depth. Possible dredge locations were selected from overview and detailed maps based on the TOPEX bathymetry dataset published by Smith and Sandwell (1997) and, if available, on HYDROSWEEP data gained on former cruises (e.g., RV *Ewing* 0004).

The TOPEX data was originally calculated from satellite altimetry and improved in several places with older echo sounding data. The basic resolution is 2x2 minutes or nautical miles (nm) at the equator and increases at higher latitudes. Figures 6.1 and 6.2 show both the same part of the GSC and compare the processed SIMRAD data with the altimetric dataset. A difference in details and in the geometric resolution is evident. However, the maps from the satellite data generally correlate closely with the SIMRAD data for most areas. Unfortunately, this was not always the case. Several previously unknown seamounts were discovered during SO158 (e.g., Fig. 6.2.); on the other hand some seamounts appearing in maps of TOPEX bathymetry dataset did not exist. This is mainly the case in areas with large scale faulting. However, it should be made clear that the TOPEX dataset was essential and of great help for selecting and initial searching of most dredge and TV-grab stations.

In comparison with the HYDROSWEEP system the quality and quantity of the data recorded by SIMRAD data is very high. In particular the greater area of coverage allowed by SIMRAD is a significant improvement over HYDROSWEEP (e.g., Fig. 6.5.)

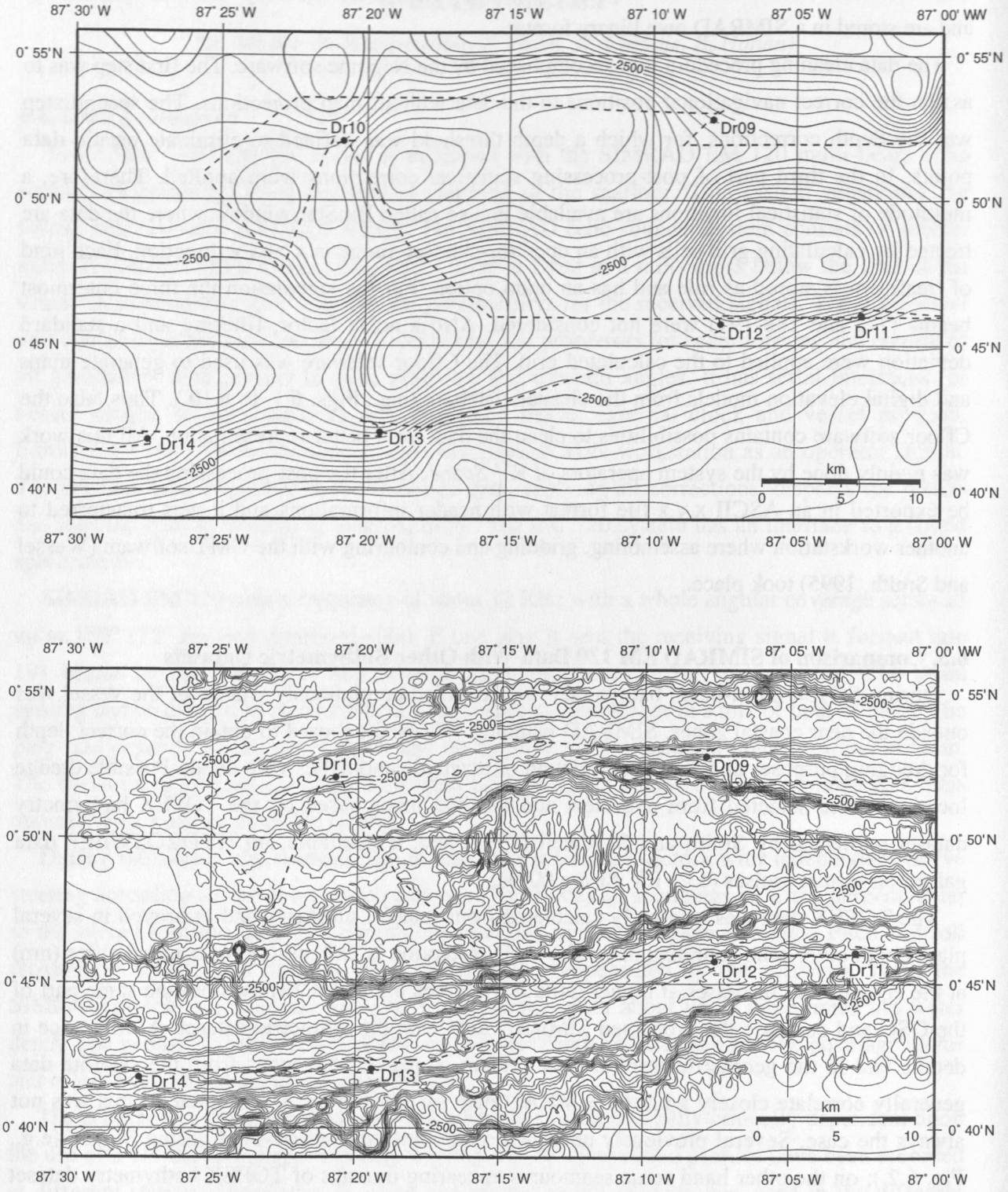

Fig. 6.1.: Bathymetric maps of the overlap of the Galápagos spreading center based on TOPEX data (upper image) and SIMRAD EM 120 data (lower image). Ship track (dashed line) and dredge stations (dots) are also shown.

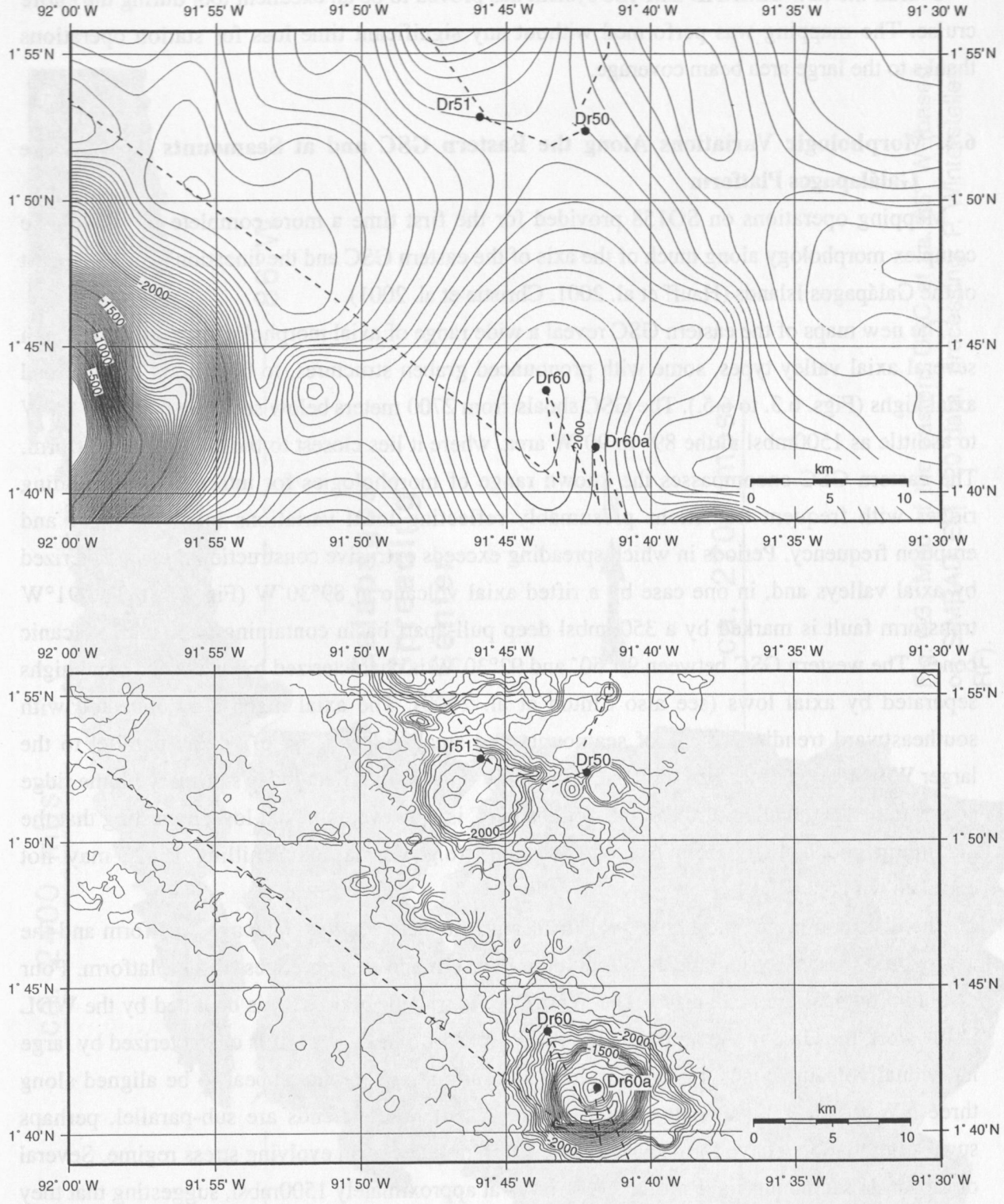

Fig. 6.2.: Bathymetric maps of (off-axis) seamounts south of the Galápagos spreading center based on TOPEX data (upper image) and SIMRAD EM 120 data (lower image). Ship track (dashed line) and dredge stations (dots) are also shown.

Overall the new SIMRAD EM 120 system has proved to be an excellent tool during the entire cruise. The mapping was performed without any significant time loss for station operations thanks to the large area beam coverage.

6.4. Morphologic Variations Along the Eastern GSC and at Seamounts Around the Galálapagos Platform

Mapping operations on SO158 provided for the first time a more complete picture of the complex morphology along much of the axis of the eastern GSC and the lineations north and east of the Galápagos Islands (Hauff et al. 2001, Christie et al. 2001).

The new maps of the eastern GSC reveal a wide range of axial morphologies, ranging through several axial valley types, some with pronounced graben structures, to both narrow and broad axial highs (Figs. 6.3. to 6.5.). The GSC shoals from 2700 meters below see level (mbsl) at 86°W to as little as 1500mbsl in the 89° to 90°W area, where it lies closest to the Galápagos platform. The eastern GSC encompasses the known range of morphologies for intermediate spreading ridges with frequent transitions presumably reflecting local variations in melt supply and eruption frequency. Periods in which spreading exceeds extrusive construction are characterized by axial valleys and, in one case by a rifted axial volcano at 89°30´W (Fig. 6.6.). The 91°W transform fault is marked by a 3500mbsl deep pull-apart basin containing two small volcanic cones. The western GSC between 90°50´ and 92°30´W is characterized by two broad axial highs separated by axial lows (see also Sinton et al. 2000). The axial highs are connected with southeastward trending chains of seamounts and small ridges (Fig. 6.7.), sub-parallel to the larger Wolf-Darwin lineament (WDL), commonly thought to reflect today's primary plume ridge connection. The junction of the WDL and the GSC is, however, an axial low suggesting that the maximum geochemical influence of the plume (e.g.,Verma and Schilling 1982) may not correlate with the WDL.

The distribution and morphology of the seamounts between the Galápagos platform and the nearby GSC varies systematically around the northern and eastern edges of the platform. Four distinct provinces are recognized: The Wolf-Darwin triangle (Fig. 6.8.) is bounded by the WDL in the west, the GSC in the north and the 91°W transform in the east. It is characterized by large individual volcanic cones, many of which have summit craters that appear to be aligned along three NW trending lineaments (including the WDL). These trends are sub-parallel, perhaps suggesting that they have formed at slightly different times in an evolving stress regime. Several of the larger seamounts have prominent terraces at approximately 1500mbsl, suggesting that they have been islands at some time. Between the larger seamounts, numerous small volcanic cones and circular, flat-topped structures interpreted as (monogenetic?) pillow mounds are common on the seafloor. Their relationships to the NW trends defined by the larger structures is unclear. The North-eastern Province (Fig. 6.9.) is a region of large single cones lying close to the north-east and northern margin of the Galápagos Platform. Several of these have flat tops at the approximate depth of the adjacent platform as well as distinct terraces at greater depths. Further from the platform, a number of smaller seamounts occur. Several of these lie along low ridges

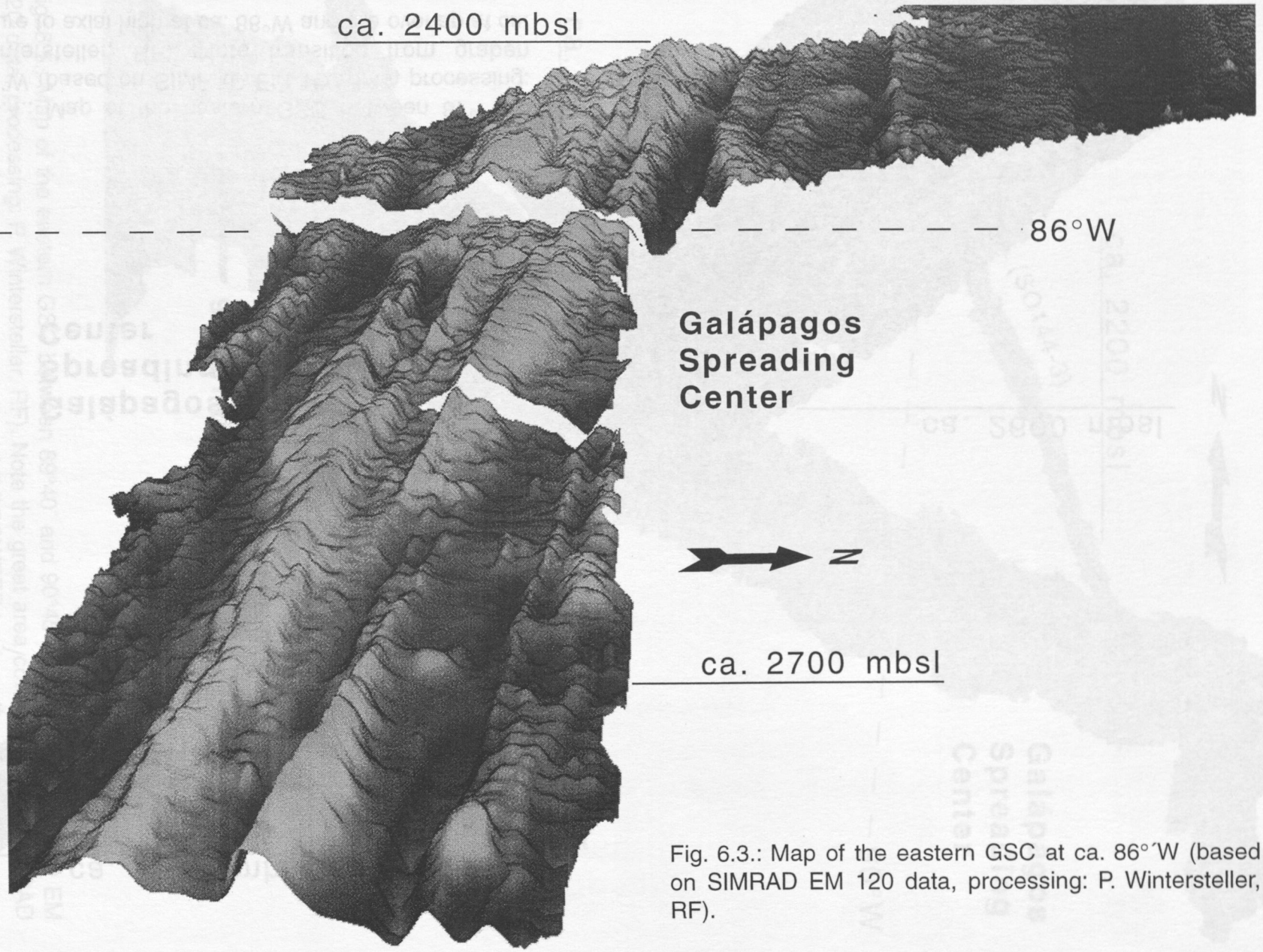

Fig. 6.3.: Map of the eastern GSC at ca. 86°´W (based on SIMRAD EM 120 data, processing: P. Wintersteller, RF).

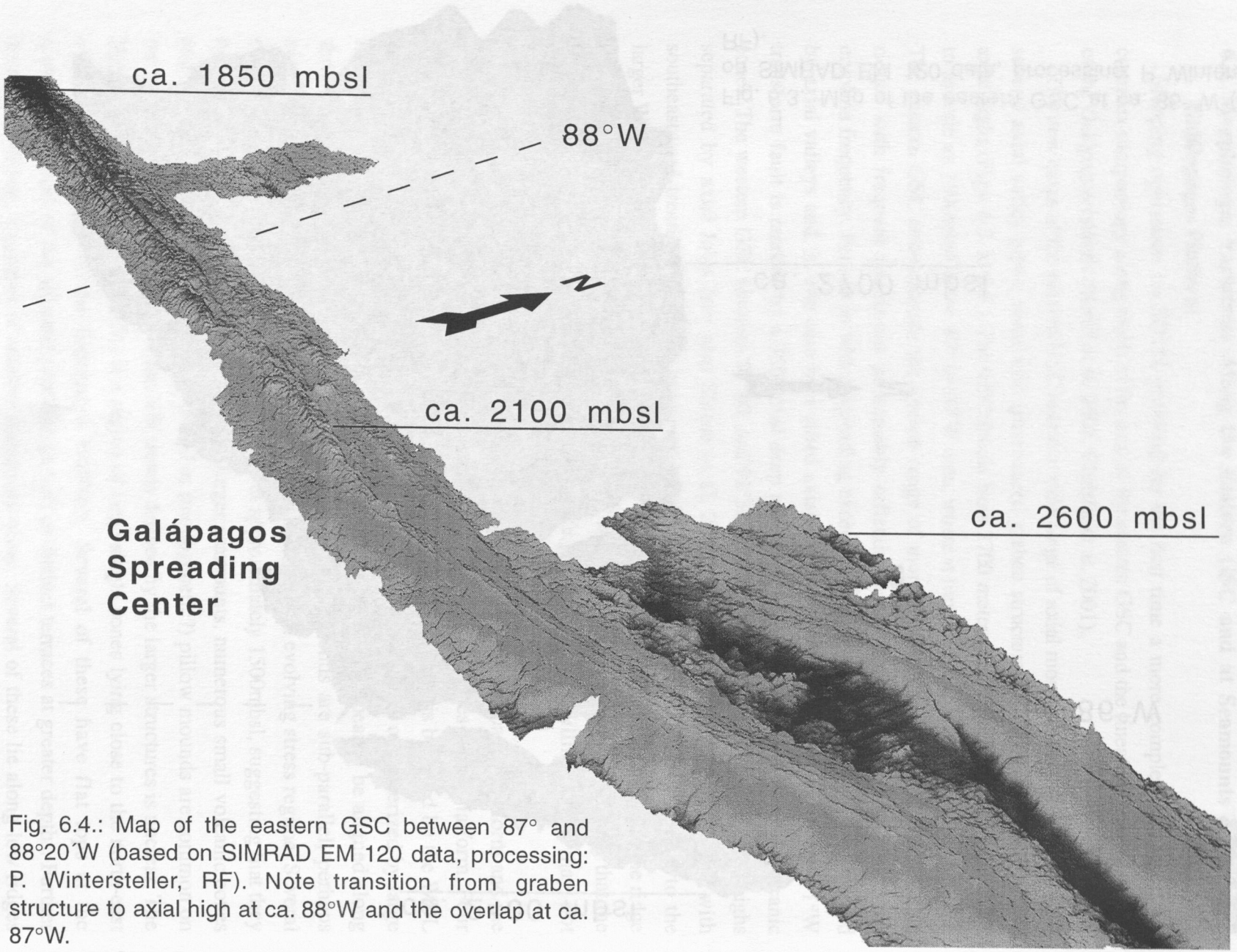

Fig. 6.4.: Map of the eastern GSC between 87° and 88°20´W (based on SIMRAD EM 120 data, processing: P. Wintersteller, RF). Note transition from graben structure to axial high at ca. 88°W and the overlap at ca. 87°W.

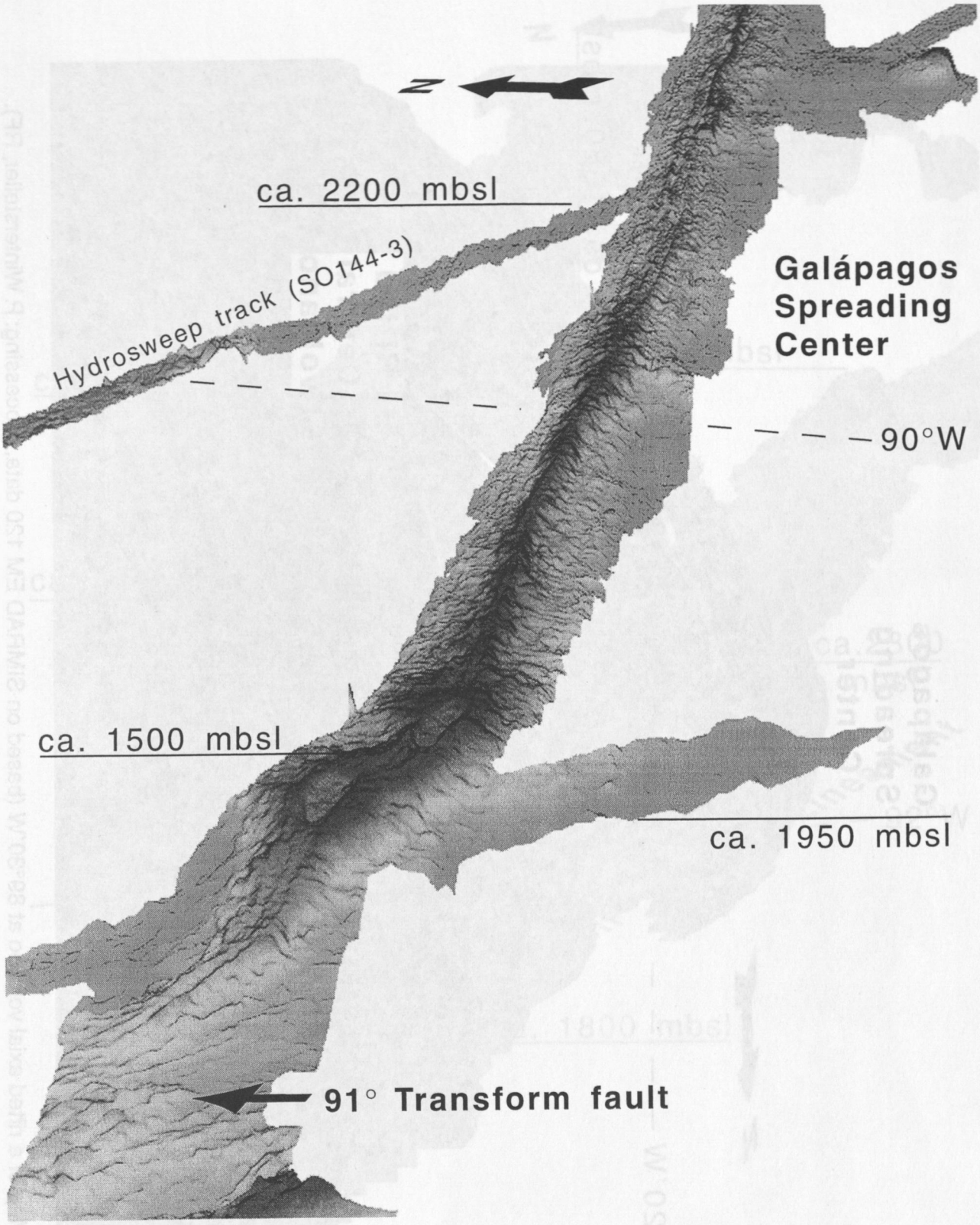

Fig. 6.5.: Map of the eastern GSC between 89°40´ and 90°45´W (based on SIMRAD EM 120 data, processing: P. Wintersteller, RF). Note the great area coverage of the SIMRAD track along the GSC in comparison with the HYDROSWEEP track on the top right.

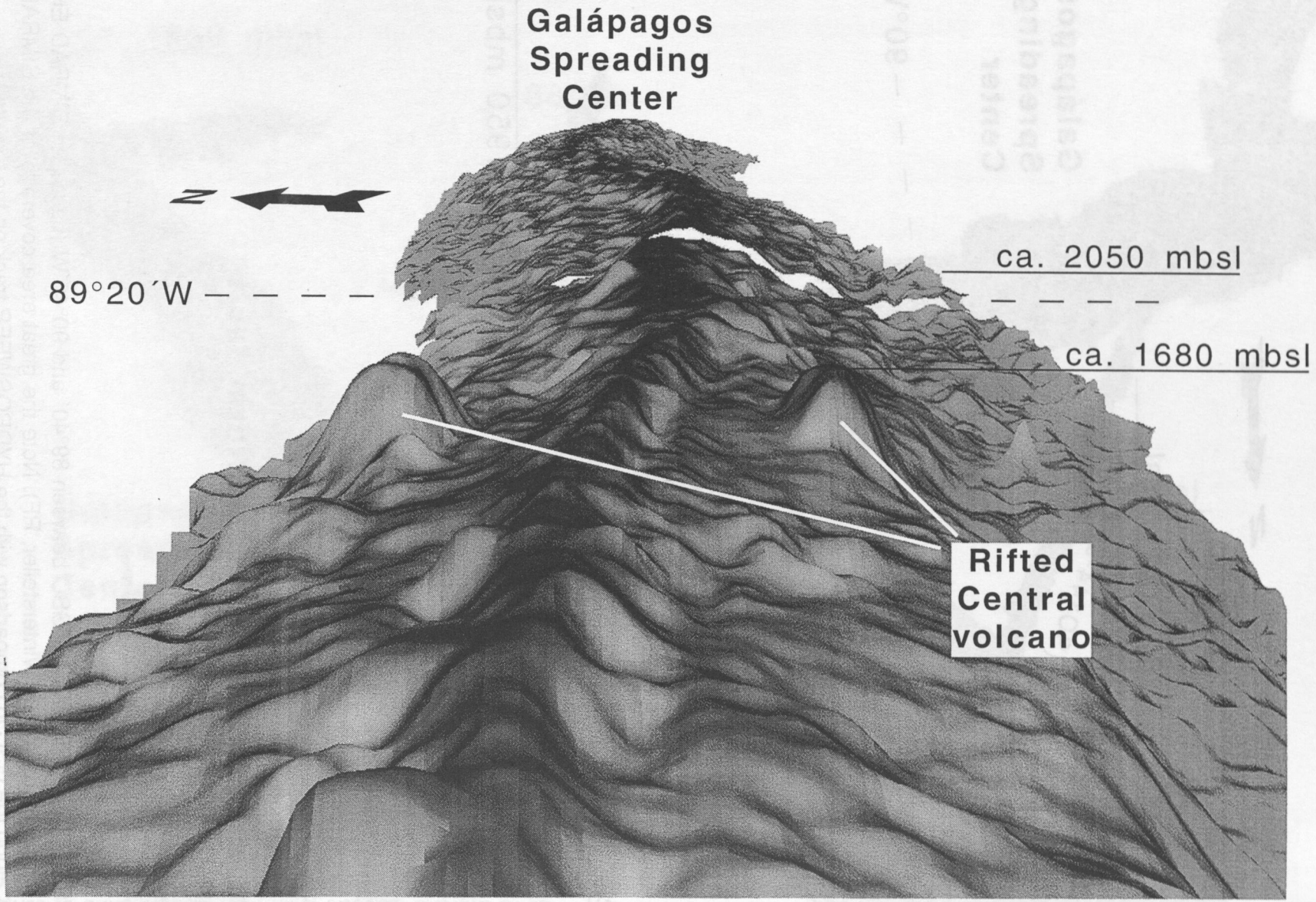

Fig. 6.6.: Map of a rifted axial volcano at 89°30´W (based on SIMRAD EM 120 data, processing: P. Wintersteller, RF).

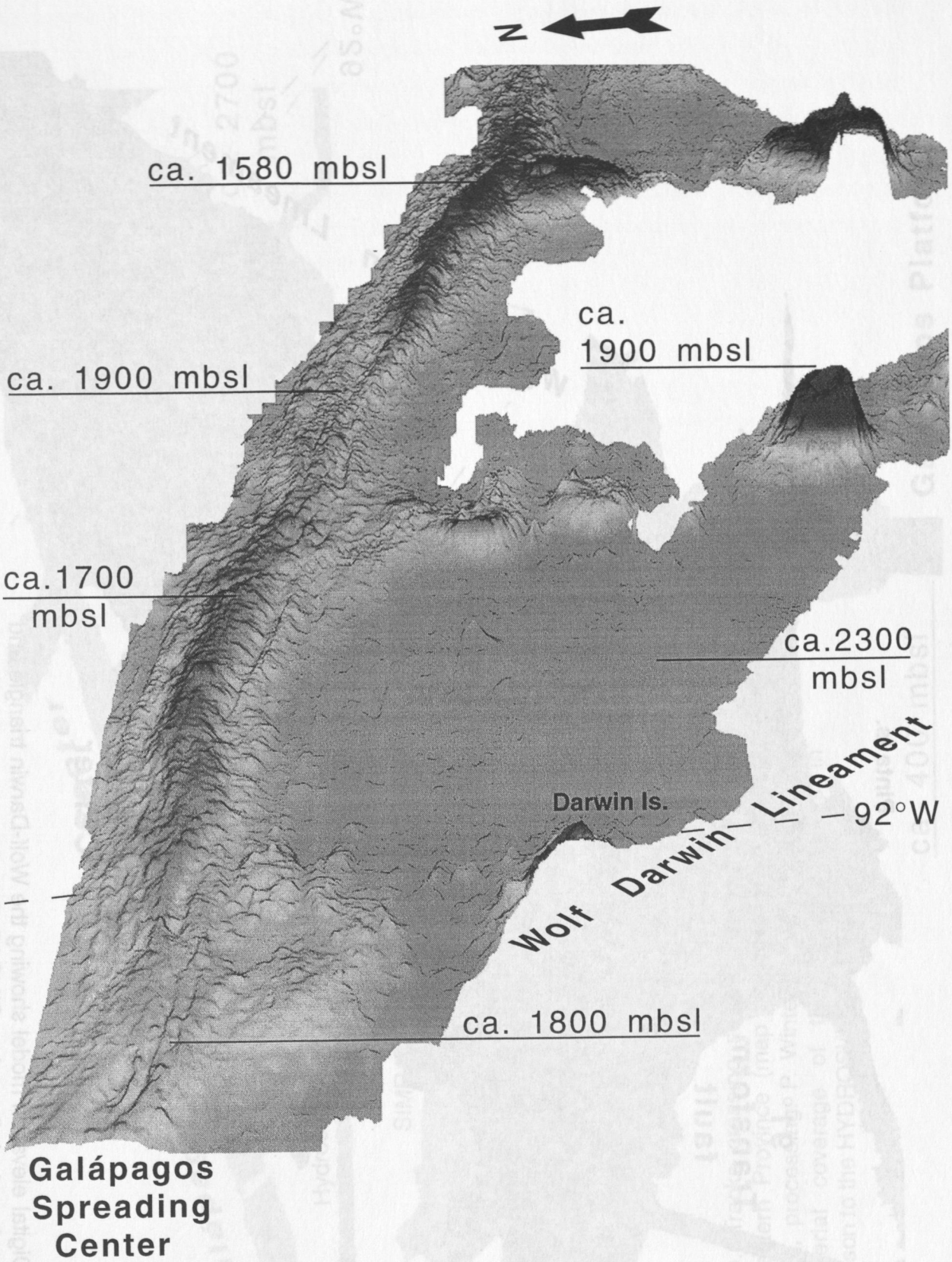

Fig. 6.7.: Map of the western GSC between 91° and 92°20´W (based on SIMRAD EM 120 data, processing: P. Wintersteller, RF). The two axial highs in this area are connected with southeastward trending seamount chains.

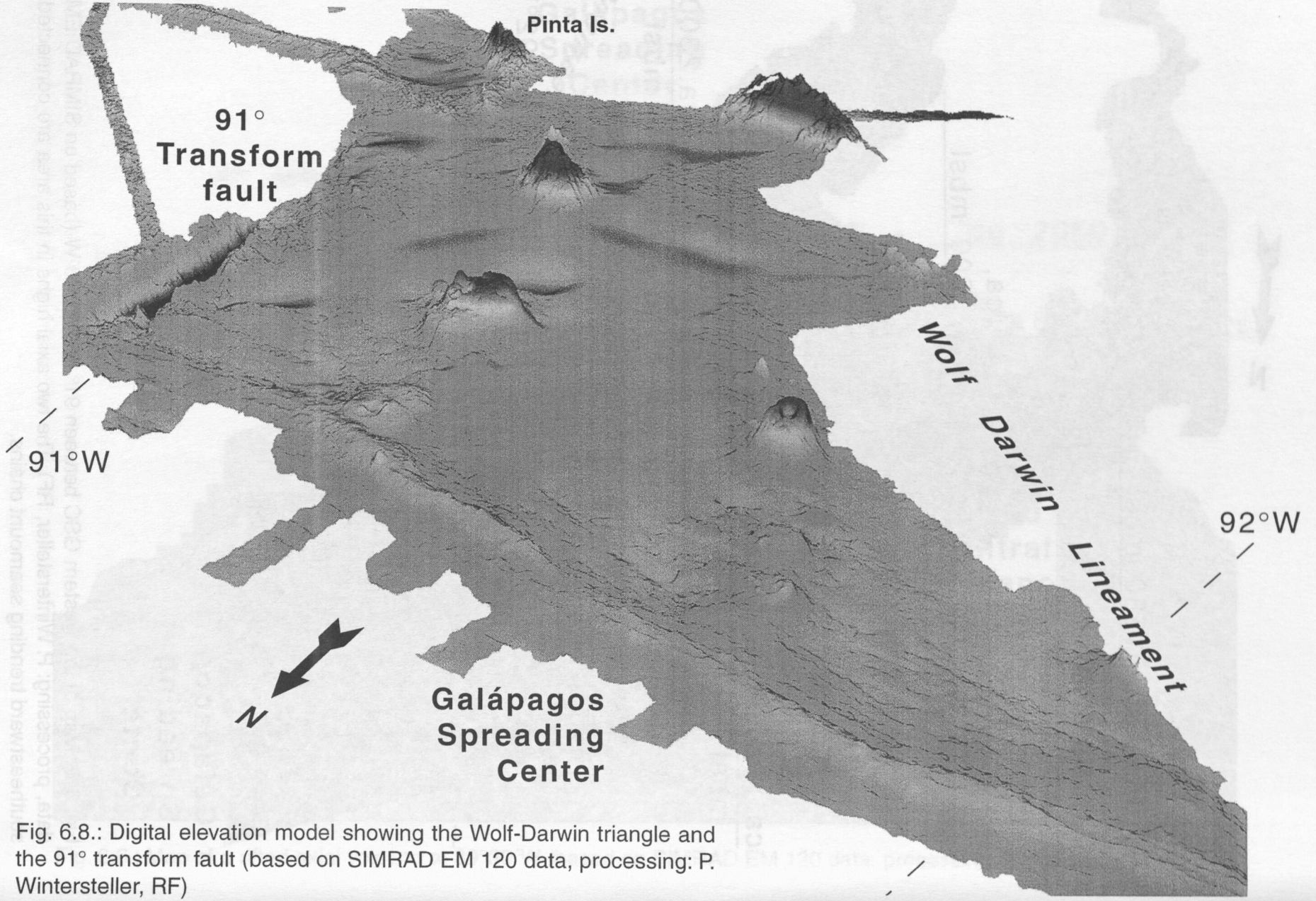

Fig. 6.8.: Digital elevation model showing the Wolf-Darwin triangle and the 91° transform fault (based on SIMRAD EM 120 data, processing: P. Wintersteller, RF)

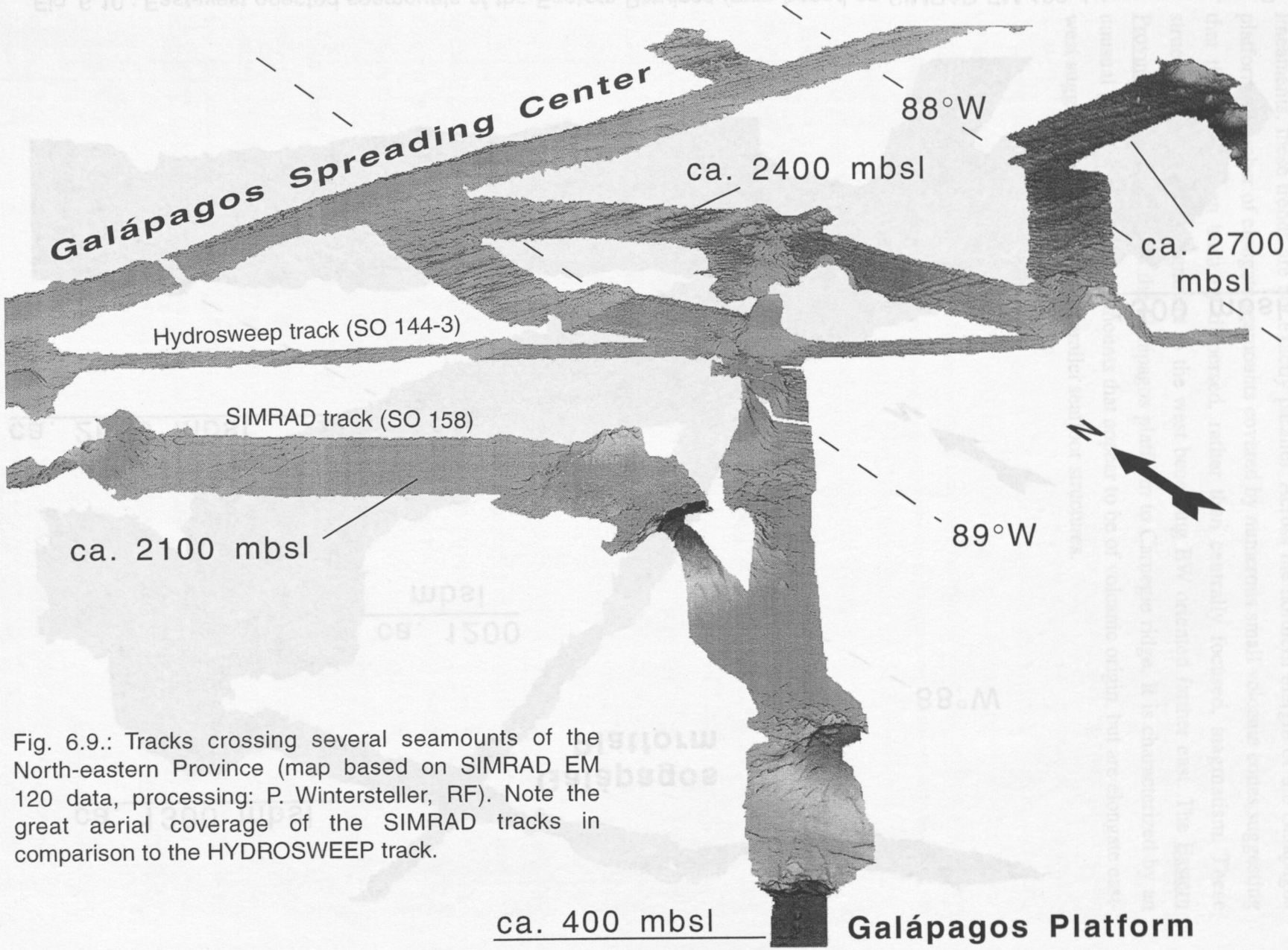

Fig. 6.9.: Tracks crossing several seamounts of the North-eastern Province (map based on SIMRAD EM 120 data, processing: P. Wintersteller, RF). Note the great aerial coverage of the SIMRAD tracks in comparison to the HYDROSWEEP track.

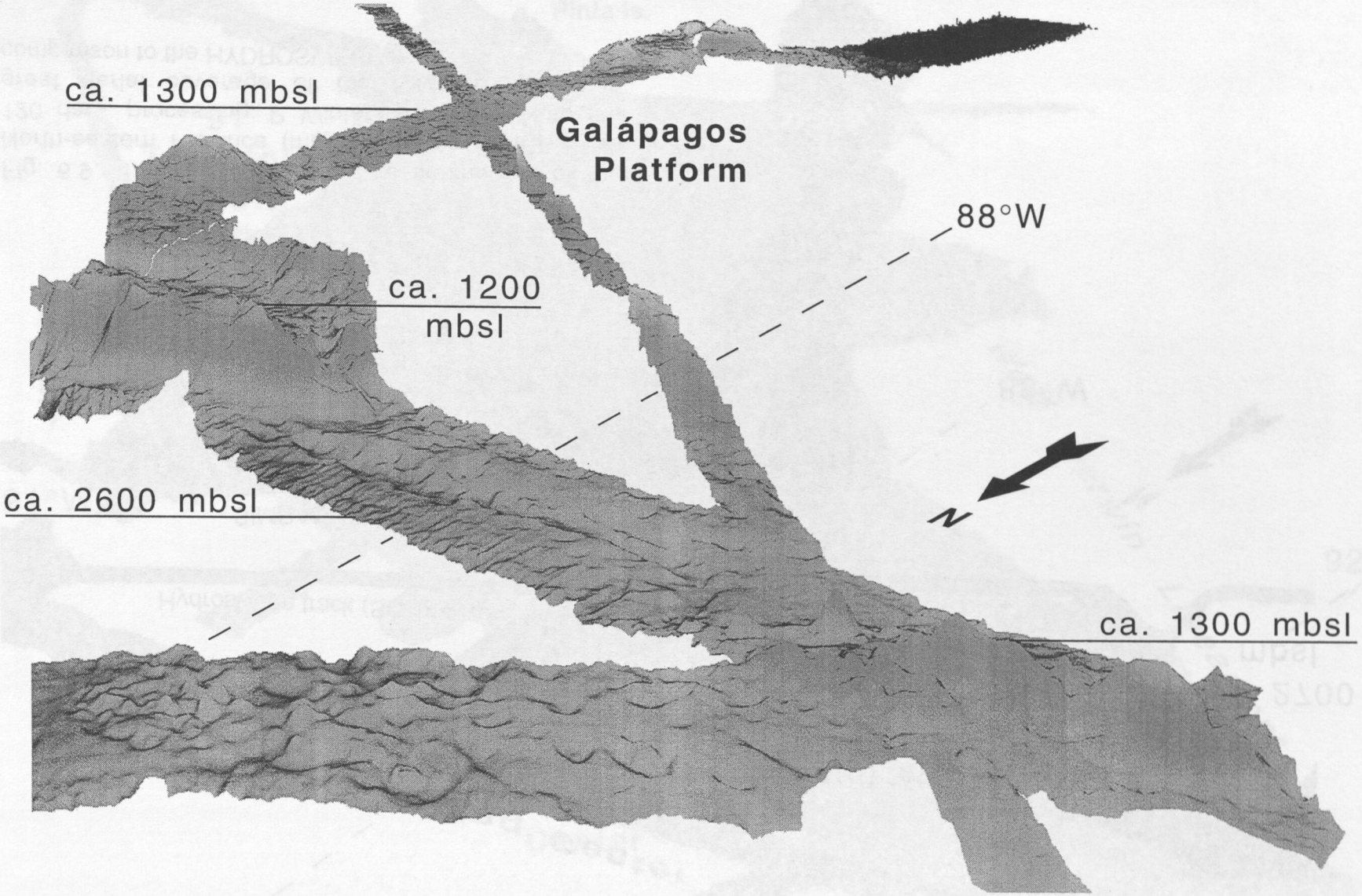

Fig. 6.10.: East-west oriented seamounts of the Eastern Province (map based on SIMRAD EM 120 data, processing: P. Wintersteller, RF).

that extend NE from the larger volcanoes and are characterized by numerous small (monogenetic?) volcanoes similar to those of the Wolf-Darwin triangle. As with the NW lineaments, these trends are not exactly parallel. Across the northern margin of the Galápagos platform a number of elongate seamounts covered by numerous small volcanic cones suggesting that they have been built by dispersed, rather than centrally focused, magmatism. These structures have a NW alignment in the west becoming EW oriented farther east. The Eastern Province (Fig. 6.10.) links the Galápagos platform to Carnegie ridge. It is characterized by an unusual group of mid-sized seamounts that appear to be of volcanic origin, but are elongate east-west suggesting control by axis-parallel seafloor structures.

7. MAGNETICS

(M. Müller and U. Barckhausen)

7.1. Introduction

In most regions of the world's oceans a characteristic pattern of linear magnetic anomalies is observed. The sequence of positive and negative magnetic anomalies is the result of repeated reversals of the earth's magnetic field direction during the continuous formation of oceanic crust at a mid-ocean ridge. The timing of the reversals is known with good accuracy. With the reversal timescale it is possible to deduce the time when a piece of oceanic crust was formed from the observed pattern of linear magnetic anomalies. Thus, magnetic measurements along the ship's tracks provide information about the age of the ocean floor. Irregularities and breaks in the linear pattern give information about later volcanic and tectonic activity in the oceanic crust.

In order to measure the anomalies in the earth magnetic field a marine proton magnetometer was used on cruise SO158. An equipment consisting of several parts was installed for this cruise on board of RV *Sonne*, with a special sensor which is filled with few liters of unleaded gasoline. Through an electric impulse a strong magnetic field generates in the coil and forces the magnetic moment of the protons of the liquid to be aligned to the excited field. When the electric current is turned off, the previously created field breaks down and the protons realign themselves with the Earths magnetic field. This happens precisely with a certain frequency which is proportional to the intensity of the Earths magnetic field. This frequency is measured as an electric current generated by a magnetic induction in the coil and will amplified and transformed to the magnetic field intensity which is recorded. The measure unit is 10^{-9} Tesla and is equal to 1nT.

7.2. Data Acquisition

During the cruise SO158 we used the GeoMetrics G801/3 Marine Proton Magnetometer. This system consists of a sensor unit, a winch with 350m marine cable and a control unit. On board of RV *Sonne* the winch was placed on the portside quarterdeck and the sensor was towed to the port side of the vessel. A boom led the cable 7m to the side of the vessel in order to prevent it from being tangled with the ships sideboard. The sensor was towed at nearly 300m (approx. three times the ship length) behind the ship to minimize the influence of the hull of the vessel and to get a resolution of about 1nT. The measured values of the total intensity magnetic field were displayed on a console and written as digital output coded in BCD values. The delivery rates of data came through a digital multiport interface to a PC and was set to every 3 seconds for one value. On the PC a special software was installed which stored the data together with UTC-time in ASCII tables. The system worked well without any problems throughout the cruise.

7.3. Data Processing

A total amount of ca. 415nm (= ca. 770km) of magnetic data were recorded (Fig. 7.1.). A list of all measured profiles is given in Appendix II. The raw data were transferred to a SUN

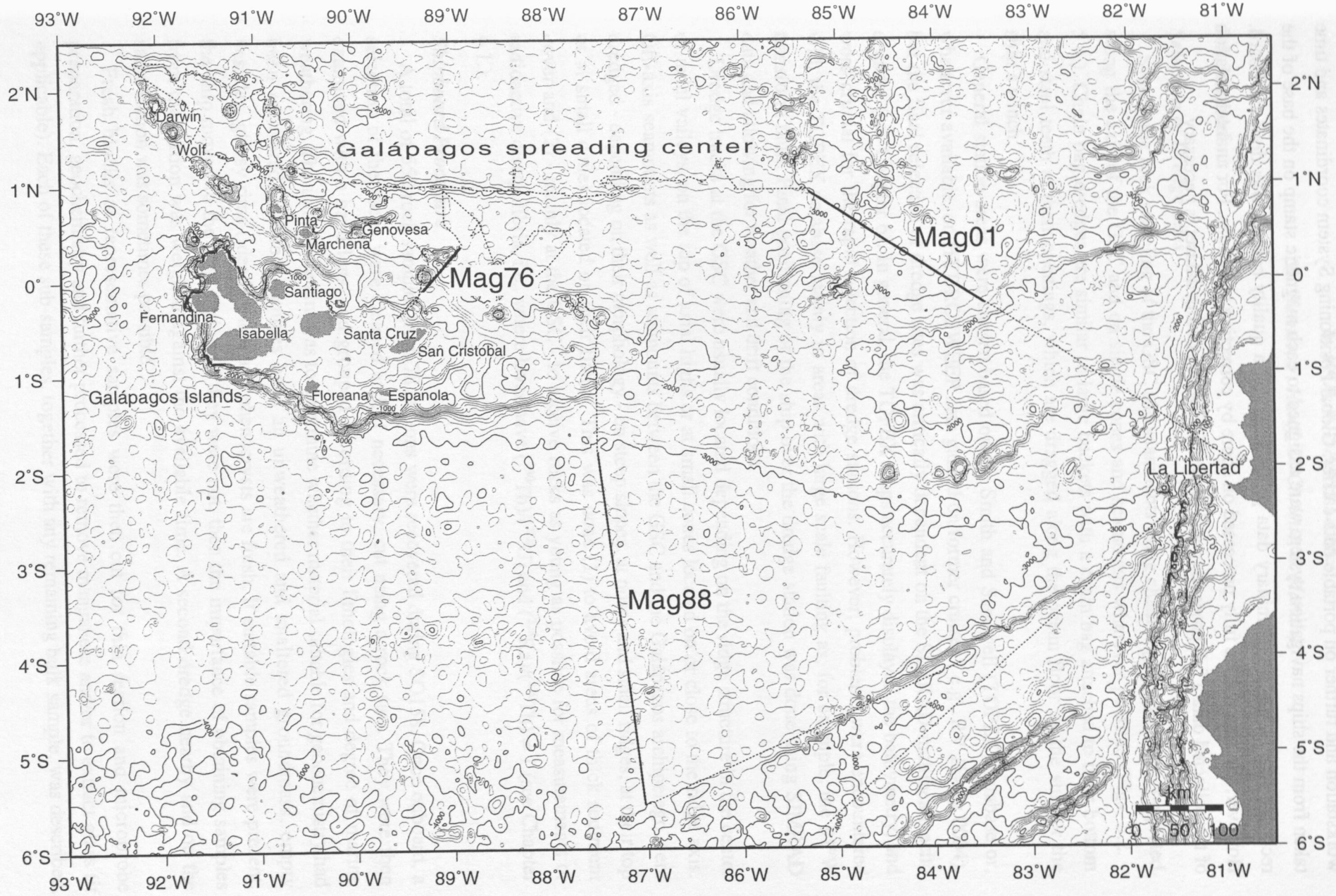

Fig. 7.1.: Magnetic profiles of SO158.

workstation and further on portable data carrier. Global Positioning System coordinates and time taken from the ships navigation system were assigned to each magnetic stamp on the base of the recorded time. Only a preliminary data processing and a quality control was done on board. However, the data will be fully processed on shore by correcting variations. For an interpretation of the collected data a full processing and integration with existing dataset is necessary.

8. ROCK SAMPLING

(R. Werner, F. Hauff, D. Christie, B. Hanan)

8.1. Methods

Selection of Dredge Sites

Systematic rock sampling of the GSC and seamounts using chain bag dredges was completed along the axis of the GSC and on single cones and seamounts wherever possible (Figs. 5.2. - 5.4.). Chain bag dredges are similar to large buckets with a chain bag attached to their bottom and steel teeth at their openings, which are dragged along the ocean floor by the ship or the ship´s winch.

General station areas were chosen based on the Smith and Sandwell (TOPEX) database or, whenever available, on HYDROSWEEP data gained on former cruises (e.g., RV *Ewing* 0004), but the final selection of dredge sites was critically dependent on the SIMRAD-multibeam echo sounder (see Chapter 6). In general, the TOPEX maps accurately displayed the bathymetry, and were crucial for the rapid selection of dredge stations. However, problems were encountered with the TOPEX database mainly in areas with large scale faulting as, for example, the 91°W transform fault. Final positioning of the ship over the dredge station was done using SIMRAD data and allowing for weather and drift conditions.

Dredge tracks at the GSC were usually located depending on the ridge structure in the center of axial valleys, on the top of axial highs or at small cones located on or close to the ridge axis. Off-axis seamounts as well as seamounts between the GSC and the Galápagos archipelago were dredged - depending on their morphology - on steep slopes, at noses and small ridges, at their top or at small cones located on their flanks. This was done (1) to avoid areas of thick sediment cover and (2) - mainly at the GSC - to receive rocks as young as possible for measurements of radioactive disequilibria, i.e., where lavas have $(^{230}Th)/(^{238}U)$ and $(^{226}Ra)/(^{230}Th) \neq 1$ (see Chapter 4.1.).

Shipboard Procedure

A total of 552 rock samples from 78 stations were recovered during SO158. Once onboard, a selection of the rocks were cleaned and, if necessary, cut using a rock saw. They were then examined with a hand lens, and grouped according to their lithologies and degree of marine weathering. The immediate aim was to determine whether material suitable for geochemistry had been recovered. Suitable samples have an unweathered and unaltered groundmass, empty vesicles, glassy rims (ideally), and any phenocrysts are fresh. If suitable samples were present, the ship moved to the next station. If they were not, then the importance of obtaining samples from the station was weighed against the available time. A second dredge nearby and on the same station was sometimes possible.

Fresh blocks of representative samples were then cut for thin section and microprobe preparation, geochemistry and further processed to remove manganese and/or to extract glass (if applicable). Each of these sub-samples, together with any remaining bulk sample, was described,

labeled, and finally sealed in either plastic bags or bubble wrap for transportation to GEOMAR or cooperating institutions. There, further studies will involve petrographic examination of thin sections, analyses of phenocryst and groundmass phases using the electron microprobe, determination of major and trace element geochemistry by X-ray fluorescence spectrometry and inductively coupled plasma mass spectrometry, analyses of radiogenic isotope ratios by thermal ionization mass spectrometry (TIMS), and radiometric dating of suitable samples by the $^{40}Ar/^{39}Ar$ technique (see also Chapter 4.1.).

A brief summary of the main shipboard findings for each sampled area is provided below. More detailed informations on the location of the stations, number of samples, and principal lithologies of the samples are listed in Appendix III.

8.2. Galápagos Spreading Center (GSC) and 91° Transform

Eastern Part (85°30´-90°30´)

Dredge sites were spaced approximately every 10nm between 85°30´and 90°30´W with a total of 38 dredge hauls at 34 stations on the ridge axis and on two off-axis seamounts. Only one station ca. 15nm north of the GSC at 86°12´W was unsuccessful (DR 05, Fig. 5.2.). At this site the maps based on the Smith and Sandwell (TOPEX) data set predict a up to 7km broad and 300m high, flat-topped off-axis seamount with steep flanks. A SIMRAD survey, however, proved that this feature does not exist but a shallow, east-west trending ridge-like structure being approximately 100m high. A dredge haul at the southern flank of this structure failed to return hard rock samples. At the other stations a total of 290 samples comprising mainly dense pillow and sheet flow fragments with up to 2cm thick fresh glass crusts were recovered. Petrographically the majority of these rocks appear very homogeneous. At most stations, aphyric basalts and occasional basalts with sparse plagioclase or olivine phenocrysts occur. Only two stations differ significantly; one recovering basalt containing 5-10 vol.% plagioclase phenocrysts up to 5mm, and one recovering gray, glassy lava, possibly andesite. Overall, alteration products such as palagonite are rare with most rocks being relatively fresh, but at a few stations, recovered basalts had thin manganese oxide coatings. A dredge site at an off-axis seamount (DR 30, Figs. 5.3. and 9.1.) recovered Mn-encrusted aphyric basaltic sheet flow fragments and hydrothermally altered sediment (see Chapter 9).

Transform Fault (90°30´-90°50´)

The transform fault graben is located north of the Galápagos archipelago and connects the eastern and the western part of the GSC. The fault extends over ca. 55nm in NNW-direction and is marked by several pull apart basins. The most striking one is located in its northern part, extends over ca. 20nm in N-S and 4nm in E-W direction, and is up to 3.500m deep (Fig. 6.8.). A TV-grab survey in the center of this basin proved that, besides sediments, pillow lava occur on the floor. Furthermore two volcanic cones (100 and 300m high) are located in its deepest part. One of these cones was dredged (DR 43) recovering extremely fresh pillow fragments with glass and plagioclase phenocrysts. The occurrence of pillow lava being uncovered by sediments on the

floor of the basin and the fresh lava at the cone strongly indicates young volcanism in the transform fault graben.

Between or close to the basins several small, up to 300m high volcanic cones and circular flat-topped structures occur. 5 dredge hauls at 4 stations at these volcanoes yielded a total of 13 samples comprising mainly aphyric pillow basalt fragments. Only a few show minor amounts of olivine and/or plagioclase microphenocrysts. By contrast to the volcanic cone within the basin most of these rocks are slightly to heavily altered and encrusted with up to 1cm thick Mn-layers.

Western Part (90°50´-92°30´)

Morphologically the GSC between 90°50´ and 92°30´W is marked by two broad axial highs (see chapter 6.4.). Several off-axis (?) seamounts occur on or close to its southern flanks, in particular at sites where the NW-trending seamount (see chapters 6.4. and 8.3.) chains meet with the ridge axis. Mapping of some of these seamounts revealed a wide range in morphology including volcanic cones up to 500m high, seamounts with flat tops and circular flat-topped structures up to 2nm in diameter.

Dredge sites were spaced every 10 to 20nm on the ridge axis and on 6 seamounts. A total of 60 samples were recovered from 11 stations. Three stations on seamounts failed to return rocks. The rocks recovered from the ridge axis are homogeneous basalts and correspond to those sampled at the eastern part of the GSC. They comprise mainly dense, aphyric pillow and sheet lava fragments with up to 2cm thick fresh glass crusts. Basalts with sparse plagioclase phenocrysts, degassing channels, vesicles and/or thin Mn coating occur occasionally. The rocks dredged on the seamounts are mainly aphyric pillow basalt fragments being more vesicular and altered than those from the ridge axis. Many of them show thin Mn-coating. Sampling in the top area of an seamount south of the rifge axis at 91°16´W yielded Fe oxyhydroxide-silca fragments (station DR 47, see Chapter 9.2.). Based on their structure they are interpreted as the oxidized remains of a hydrothermal sulfide deposit. The hydrothermal activity appears to have been restricted to the top of the seamount because fresh pillow basalt fragments with unaltered glass crusts were dredged at station DR 47a on its lower slopes.

8.3. Seamounts

In this chapter the seamounts sampled between the Galápagos platform and the GSC during cruise SO158 are grouped based on the provinces defined in chapter 6.4.. From the petrographical point of view, however, the north-eastern province can be subdivided into a northern and a north-eastern province. For morphological description and interpretation see also chapter 6.4..

Wolf-Darwin Triangle

The Wolf-Darwin triangle (Fig. 6.8.) is bounded by the Wolf-Darwin lineament (WDL) in the west, the GSC in the north and the 91°W transform in the east and comprises the 3 NW-trending seamount chains (lineaments) and single seamounts. 17 dredge hauls on 5 large seamounts, 6 small cones or circular, flat-topped structures, and a ridge-like structure (altogether 11 stations)

in this area recovered a total of 74 rock samples. Only one station at a large seamount was not successful.

The majority of the rocks from the other large seamounts is vesicular or highly vesicular. Completely rounded volcanic and/or sedimentary rocks and nearshore sediment (beach deposits) occur frequently. These observations confirm that most of these seamounts may represent submerged ocean islands (see chapter 6.4.). Petrographically, however, the 4 successfully sampled large seamounts differ significantly:

- A dredge from the top area (350mbsl) of a seamount (DR 41a) belonging to the eastern NW-trending lineament yielded, besides sediments, ultraphyric feldspar basalts with 0.5 - 1cm long, platy crystals. A second dredge on its slope at 600mbsl (DR 41b) recovered aphyric basalt fragments.
- Rocks dredged at a more than 1000m high seamount (DR 46) of the same lineament comprise only aphyric, dark gray vesicular basalt.
- Rocks recovered at the base of a 900m high conical seamount (DR 60) of the central NW-trending lineament appear to be particularly interesting since they comprise highly phyric plagioclase-olivine-basalt fragments with ca. 5 vol.% olivine (2 - 5mm) and 10 vol.% plagioclase (3 - 5mm). A dredge on the top of the same volcano yielded strongly altered, aphyric basalt.
- A dredge haul on the slope of a large seamount of the WDL (DR 65) recovered vesicular aphyric basalt fragments from large pillows, smaller lobate pillows and sheet flows. The fresh matrix and glass rims of these rocks indicate recent volcanic activity in this area.

In contrast to the large seamounts the rocks from the small cones and circular flat-topped structures appear relatively homogeneous. The dredges from 5 of these volcanoes yielded aphyric, sometimes slightly vesicular pillow basalt fragments with glassy rims or, in one case, just fragments of the glass rims. Only a dredge on a 150m high flat-topped volcano of the WDL (DR 62) recovered petrographically differing rocks being fresh plagioclase-olivine-phyric pillow basalt fragments. The dominance of pillow lavas at this structures supports the interpretation based on their morphology that they are (monogenetic?) pillow mounds (see chapter 6.4.).

Most rocks from the seamounts sampled within the Wolf-Darwin triangle are fresh or only very slightly altered but frequently covered with thin Mn-crusts. Laminated Mn-crusts up to 5cm, however, occurred on the dense aphyric pillow basalts from the east-west trending, apparent tectonic ridge-like structure east of the WDL (DR 63 and 64).

Northern Province

This province is located north of the Galápagos platform and comprises the seamount and island "cluster" at the southern end of the WDL. Here a total of 28 samples were recovered from a large seamount (station DR 69) and the lower slopes of Pinta (DR 68) and Genovesa (DR 70 - 71a) islands. The rocks from the base of the islands are characterized by the common occurrence of highly plagioclase-phyric basaltic pillow lavas with up to 15 vol.% plagioclase crystals (1 - 15mm in size). At stations DR 68 and 71a up to 2 vol.% fresh olivine (up to 5mm in diameter)

also occur. The pillow fragments are dense or slightly vesicular and have partly weathered glass margins. A dredge haul at the base of the seamount yielded dense, aphyric pillow basalt fragments with up to 8mm thick glassy rims covered by Mn- and Fe-oxides.

North-eastern Province

The north-eastern province encompasses the seamounts between the eastern Galápagos islands and the GSC (see Fig. 6.9.). Nine dredge hauls at 6 large and 2 small seamounts recovered 45 samples from this area. One station on a large seamount close to the GSC (DR 81) failed. At most stations dense, aphyric pillow basalts with glassy rims and occasional pillow basalts with sparse plagioclase occur. Only one station (DR 80) yielded pillow basalts with up to 10 vol.% vesicles (< 5mm in diameter. Basalt and clastic sediment cobbles dredged at a ca. 1300m high seamount (DR 73) located directly north of the Galápagos platform may indicate subaerial activity at this site. Alteration along cracks, partly altered glass, alteration halos, Fe-oxides, and up to 1cm thick, partly laminated Mn-crusts are common features of the majority of the rocks from all stations indicating that no active volcanism exists north-east of the Galápagos at present.

Eastern Province

The eastern province comprises seamounts located close to or on the easternmost end of the Galápagos platform (see Fig. 6.10.). Most of these mid-sized or large seamounts are east -west elongated. 6 dredge hauls at 5 stations yielded a total of 39 samples. Dredging recovered primarily a broad spectrum of layered, reworked clastic volcanogenic sediments. Medium to strongly altered, aphyric basalt fragments occur only at two stations (DR 83 and 84). The high vesicularity of the lavas and the textures of the volcaniclastic rocks in this area certainly indicate that at least the larger seamounts were active in shallow water or subaerially. At one station (DR 85), pumice fragments up to 5cm were found within volcaniclastic sediments. Advanced alteration and thick (up to 3cm) Mn-crusts suggest that these volcanoes are inactive and represent the oldest of the four seamount provinces.

9. HYDROTHERMALISM

(T. Seifert, D. Christie)

Two sample locations of the SO158 cruise (stations DR 30 and DR 47; Figs. 5.3., 9.1., and 9.2.) show indications for hydrothermal activity in the studied area. These dredge stations were selected for sampling of fresh basalts and glass.

9.1. Station DR 30 (Hydrothermal Sediments)

Sediments showing colored staining of probable hydrothermal origin from station DR 30 were dredged in a water depth of about 1660m at the northwestern edge of a seamount top which is located about 10nm south of the eastern GSC at 0°39'N and 89°39'W (Fig. 9.1.). Most of the samples in this dredge were aphyric basalt pieces (sheet lava flow) with Mn-oxihydroxide crusts (up to 4mm) covered by brownish Fe-oxihydroxide coatings.

Three sub-groups of colored (green, black, brown, red, yellow) sediments were sampled (DR 30-6 to DR 30-8, see Appendix III) indicating hydrothermal activity in this area. The DR 30-6 group includes eight sub-samples characterized by a greenish color. The samples contain approximately 100 % of globular Foraminifera shells with a grain size from 0.2 to 0.63mm. The shells are covered by greenish coatings, black Mn-oxihydroxides and brownish Fe-oxihydroxides. Based on a first microscopic study these precipitates indicate hydrothermal influence.

The sample suite DR 30-7 are characterized by greenish, reddish, brownish and yellow colors, which is common for hydrothermal sediments. They consist of about 80 – 90 % Foraminifera shells like the above mentioned samples with the remainder being altered glass fragments.

The sample suite DR 30-8 shows similar characteristics to the previous sub-sample group, but they also include basalt fragments.

For detailed study the hydrothermal (?) sediments will be analyzed by mineralogical (e.g. RDA, REM) and geochemical methods (e.g. Au, Zn, Cu, Pb, S analyses) at the Institute of Mineralogy of the TU Bergakademie Freiberg. Sedimentological work is planned at the Institute of Geosciences of the Ernst-Moritz-Arndt-University, Greifswald.

9.2. Station DR 47 (Hydrothermal Fe-silica Chimney Fragments)

About 250 hydrothermal Fe-oxihydroxide-silica fragments and four pieces of hydrothermal (?) altered basalt and some clastic glass fragments cemented by hydrothermal (?) precipitates were dredged from the top of a seamount in about 1550m water depth (Fig. 9.2.). Station DR 47 is located slightly off axis at 1°53'N and 91°17'W between the 91° W transform fault and the WDL (Fig. 5.3.). The hydrothermal activity in this location appears to have been restricted to the seamount top because basalts with fresh glass crusts were dredged from its slopes (station DR 47a, see Appendix III).

The Fe-oxihydroxide-silica fragments can be divided into two sample suites: About twenty samples of the Fe-oxihydroxide-silica fragments show structures which are interpreted as filled

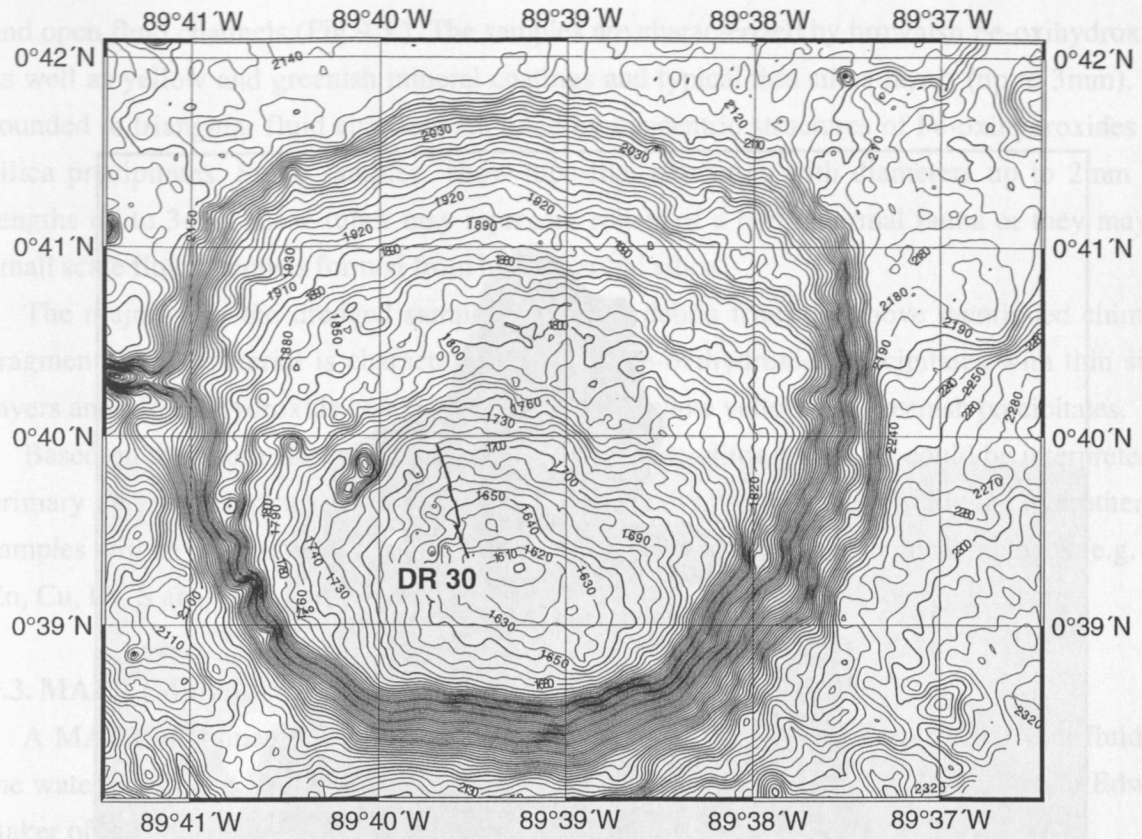

Fig. 9.1.: Dredge station DR 30 located about 10 nm south of the eastern Galápagos spreading center at the northwestern edge of a seamount top with the sampling site of hydrothermal(?) sediments.

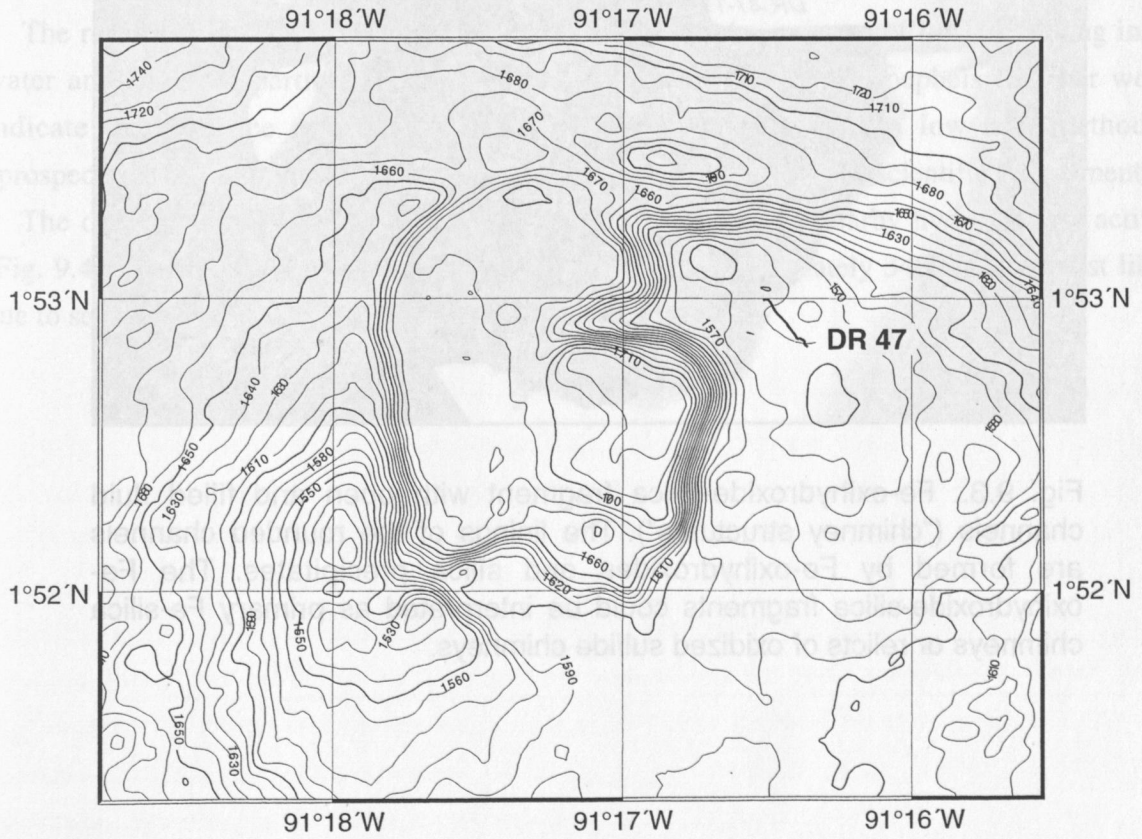

Fig. 9.2.: Dredge station DR 47 on the top of a seamount located slightly off-axis between the 91°W transform fault and the Wolf-Darwin lineament with the sampling site of Fe-oxihydroxide-silica chimney fragments.

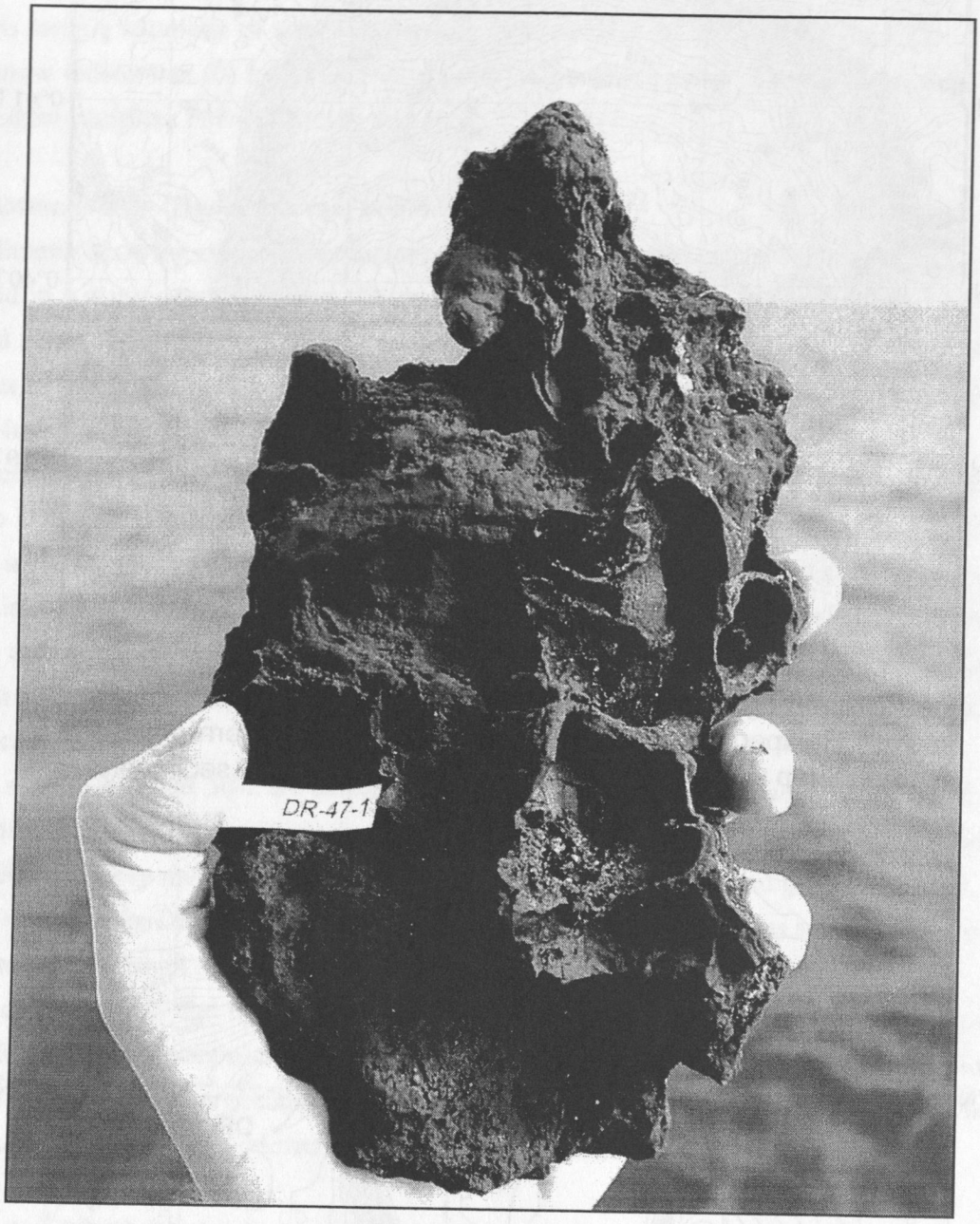

Fig. 9.3.: Fe-oxihydroxide-silica fragment with open and filled fluid channels ("chimney structures"). The linings of the rounded channels are formed by Fe-oxihydroxides and silica precipitates. The Fe-oxihydroxide-silica fragments could be interpreted as primary Fe-silica chimneys or relicts of oxidized sulfide chimneys.

and open fluid channels (Fig.9.3.). The samples are characterized by brownish Fe-oxihydroxides as well as yellow and greenish mineral coatings and typical thin silica layers (up to 3mm). The rounded to triangular fluid channels are lined by concentric structures of Fe-oxihydroxides and silica precipitates. Some samples show tube-like structures with diameters up to 2mm and lengths up to 3cm. These tubes may represent relicts of a hydrothermal fauna or they may be small scale fluid channels formed from hydrothermal silica.

The majority of the dredged samples represent debris from the above mentioned chimney fragments. This material is characterized by soft Fe-oxihydroxide precipitates with thin silica layers and Mn-oxihydroxide coatings. Some samples show yellow and greenish precipitates.

Based on the above descriptions the Fe-oxihydroxide-silica fragments could be interpreted as primary Fe-silica chimneys or oxidized sulfide chimneys. For a detailed study the hydrothermal samples will be analyzed by mineralogical (e.g. RDA, REM) and geochemical methods (e.g. Au, Zn, Cu, Pb, S analyses) at the Institute of Mineralogy of the TU Bergakademie Freiberg.

9.3. MAPR (Miniature Autonomous Plume Recorder) Deployment

A MAPR instrument was deployed to check for the presence of hydrothermal vent fluids in the water column at Station DR 44 (Fig. 5.3.). The instrument was kindly loaned by Dr Edward Baker of the NOAA PMEL Laboratories in Seattle, Washington.

PMEL MAPRs are self-contained instruments which can be attached to the wire during normal station deployments. They record data from temperature, pressure and nephelometer. Data are recorded internally and retrieved by connecting the instrument to PC after deployment.

The result is a profile of temperature and of „nephels“ (a measure of light scattering in the water and hence of particle content). A peak in temperature and in nephels together would indicate the presence of a hydrothermal plume. MAPRs provide a low cost method of „prospecting“ for hydrothermal plumes in conjunction with a variety of scientific deployments.

The deployment at Station DR 44 provided no indication of nearby hydrothermal activity (Fig. 9.4.). A large spike in the nephelometer signal at approximately 3400mbsl is most likely due to sediment stirred up by the box corer.

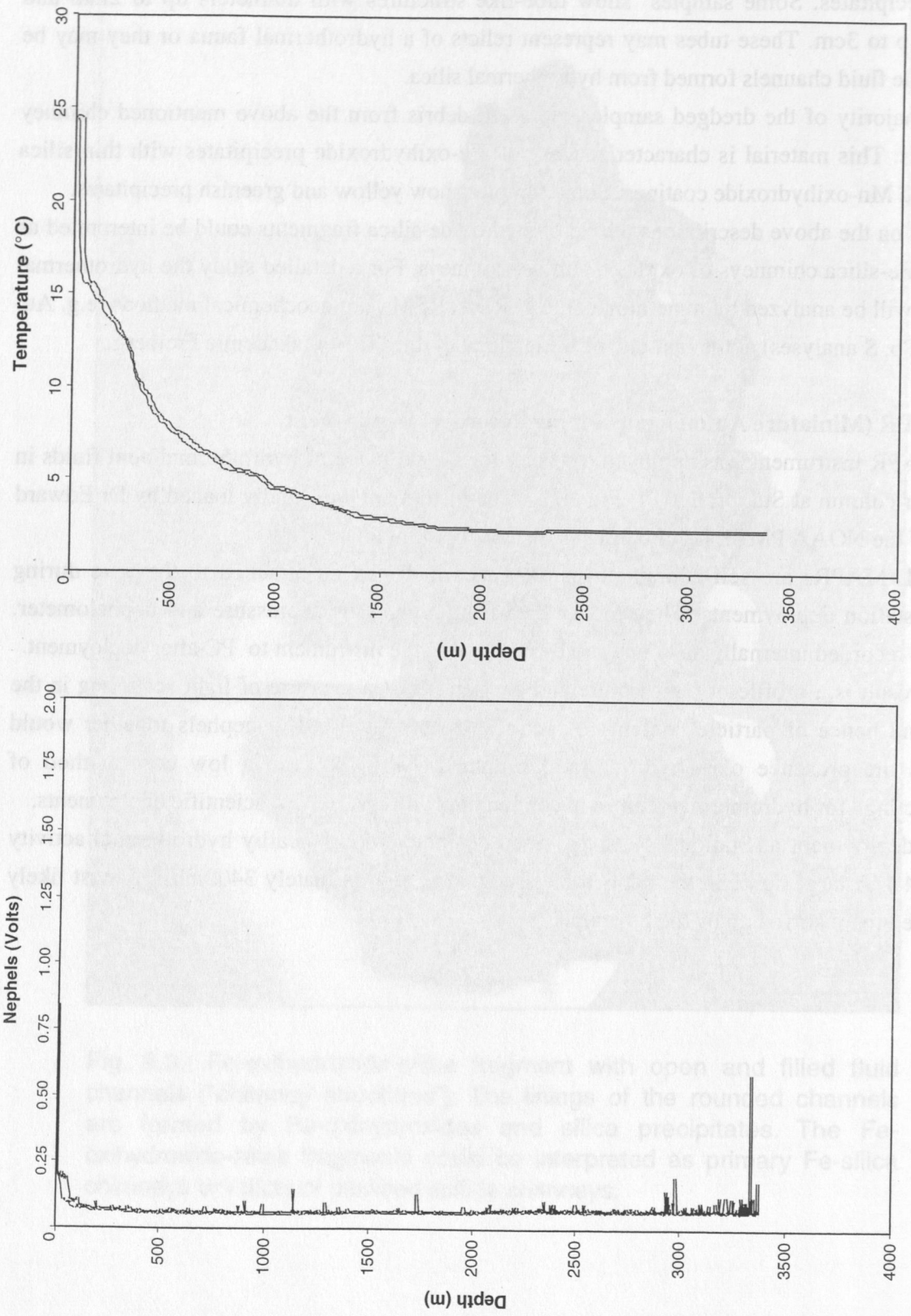

Fig. 9.4.: Profiles of optical transmissivity and water temperature recorded by the MAPR instrument at station KG44c.

10. MANGANESE CRUSTS

(N. Gussone)

At several dredge stations rocks or sediments were covered by dark brownish-black crusts of iron manganese oxide/hydroxide (see also Chapter 8). The thickness of the crusts varies from less than 1mm to about 33mm. At 16 stations samples of manganese crusts were collected (see Table 10-1). Layered manganese crusts are commonly used as geochemical archives for seawater composition. They precipitate from seawater and, therefore, record any variation in the chemical and isotopic composition of the paleo-ocean water.

Table 10-1: Stations with manganese crust samples

	No. of	**Thickness/mm**	
Station	samples	min	max
DR 19	1		1
DR 30	5		3
DR42	1		3
DR60	1		1
DR60a	1		1
DR63	2	30	33
DR64	8	15	32
DR65	1		3
DR72	1		4
DR74	1		20
DR77	1		1
DR78	2	15	20
DR80	1		10
DR84	1		10
DR85	1		15
DR86	11	18	32
DR87	1		10

The isotopic composition of Nd, Hf and Pb can be used for the reconstruction of changing water masses as the different ocean basins have different isotopic compositions of Nd, Hf and Pb. This is due to the different mean ages of the continents surrounding the ocean basins and due to the short residence times of Nd, Hf and Pb in the oceans (few hundred years). This is much shorter than the ocean mixing time, so that regional differences can develop. Therefore, these elements are suitable to record changes in ocean circulation. With the analysis of the isotopic composition of Nd, Hf and Pb it is possible to calculate mixing rates of different water masses and reconstruct paleo-water currents. Changes in ocean circulation can be caused either by tectonic events (i.e., uplift/ lowering of the Strait of Gibraltar or the closure of the Central American Gateway) or by climatic changes (glacial / interglacial).

11. SEDIMENT SAMPLING

(U. Schulz, I. Stottmeister, A. Kießling, N. Gussone)

On cruise SO158 sediments were sampled in sediment traps installed in the dredges and using a TV-grab and a box corer at 5 biology stations (see chapter 12). 21 dredges as well as 5 TV grab and 3 box corer deployments yielded enough sediment for sedimentological descriptions and studies in addition to the biological investigations. A detailed description of these sediments is given in Appendix IV.

In most cases major components of the mixed sediments from the sediment traps are foraminifera, often embedded in a clayey matrix. Volcaniclastic components (glass and rock fragments) occur also frequently but in minor amounts. At the biology stations 20, 44, 67, 75, 82 the TV grab and/or box corer yielded sedimentary profiles of up to ca. 40cm length. The sediment at station 20, located 12nm north of the Galápagos spreading center (GSC) in 2.500m water depth, consists of foraminifera shells and fragments and volcaniclastic material in a muddy matrix. Three striking horizons, approximately 15cm thick, show strong bioturbation. Station 44 within the 3.300m deep transform fault graben at 90°50´W and station 67 northwest of Pinta island in 2.120m water depth yielded profiles consisting at the surface of a layer of brownish clay and in the lower parts again of up to three horizons of strongly bioturbated greenish grey clay sediment with high contents of foraminifera fragments and minor amounts of volcaniclastic material. Station 75 on the Galapagos platform (390m water depth) recovered sandy sediment with carbonate fragments, foraminifera (mainly Globigerina) and minor volcaniclastic material, whereas station 82 in deeper water south of the Galápagos spreading center (2.660m water depth) recovered strongly bioturbated, clay-rich sediment with a different foraminiferal assemblage.

At three box corer stations (22, 44, 82) core-top samples (0 - 0.5cm) were taken to collect shells from recent or subrecent planktonic foraminifera from which the $\partial^{44}Ca$ shall be determined. Recent investigations have shown that the $\partial^{44}Ca$ of *Globigerinoides sacculifer* is strongly correlated with the Sea Surface Temperature (SST) and, therefore, $\partial^{44}Ca$ can be used as a SST proxy. However, only few $\partial^{44}Ca$ –data are available. So far *Globigerinoides sacculifer* is the only temperature calibrated species, which is suitable for reconstructing SST variation. We took samples to investigate the inter-specific and intra-specific differences of $\partial^{44}Ca$ in a natural environment.

12. BIOLOGY

(B. Neuhaus, P. Götz, J. Kasper)

12.1. Shipboard Procedure

The sites for the 5 biological stations 20, 44, 67, 75, and 82 were preliminary selected on the basis of the TOPEX database maps. At the site, the ocean floor was checked for absence of rocky surface and flatness with PARASOUND and SIMRAD profiling; the latter allowed visualization of the ocean floor at depth line intervals of 10m. The ocean floor was then inspected by the TV-grab on a transect of about 200m in length.

At the 5 biological stations, sampling was facilitated by different gear, namely a TV-grab, a meiofauna dredge after Higgins, and a box corer, in order to obtain a larger amount of surface sediment which is generally most densely inhabited by the fauna. After the TV-grab, a meiofauna dredge attached to a heavy weight sampled the same area that was observed by the TV-grab. Subsequently, the box corer was used once at each station in order to receive some surface sediment as undisturbed as possible.

Biological samples were obtained in several ways:

Meiofauna.

Sediment sampled by two sediment trap tubes (length: 21cm, diameter: 4cm) inside the chain bag dredges was fixed immediately in cold 8% formaldehyde buffered with buffer tablets for haematology (Merck). After at least one day of fixation, the sediment was washed carefully with plenty of tap water on a 40µm-sieve and centrifuged (KENDRO Heraeus Multifuge 3s) three times for 5 minutes with three times the amount of Levasil at 4000rpm in order to quantitatively extract the meiofauna. After rinsing with tap water on a 40µm-sieve, specimens were stored in 70% ethanol.

Sediment was sampled with the TV-grab together with macrofaunal specimens whenever possible. The entire hole from the TV-grab was carefully checked for additional macrofaunal organisms buried in deeper layers of the sediment. A part of the sediment was sieved with a 500µm-sieve. About 2.5kg of near-surface sediment were fixed in cold 8% formaldehyde and processed as described above. Samples received by the meiofauna dredge were split into three portions: About 1.2kg of sediment were centrifuged immediately with all liquids cooled to 11°C and preserved subsequently in 2% formaldehyde plus 5% glutardialdehyde in cacodylate buffer for electron microscopy. Another 0.5-1.5kg of sediment were fixed immediately in the same fixative for future ultrastructural studies. This material was later washed with deionized water (pH=7) on a 40µm-sieve, centrifuged for meiofauna, and stored in 0.1M cacodylate buffer with some fixative added to prevent mould during transportation. About 6-8kg of additional sediment were fixed in cold 8% formaldehyde and processed as described in the previous paragraph. From the box corer, only the upper 3-5cm of sediment were taken and either centrifuged immediately (stations 20c, 44c) or fixed directly for electron microscopy (station 82c) as stated above.

The TV images were recorded on video tape and later analyzed for the structure of the benthic animal community and the density of inhabitation of organisms.

Macrofauna.

The main source for the macrofauna were hard rocks, harvested with the chain-bag dredge. The organisms were collected from the rocks with the help of forceps, scalpels and chisels if necessary. Since larger organisms were most often abraded from the rock surface before they came on board, the majority of usable biological material was found in gaps and holes of the rocky substrates and only occasionally larger organisms were encountered as trapped between the rocks or in the chain bag itself.

Macrofauna collected from rocks (and to a smaller extent from sediment) was immediately fixed in 4% buffered formaldehyde (see above) or in 96% pure ethanol in case of brachiopods and subsequently investigated in the biological laboratory of RV *Sonne* under the microscope. Characteristic features were documented with the help of a video camera mounted on the microscope as video sequences and as video prints and the classified animals sorted into separate vessels. There was always a certain number of organisms which could not be clearly determined with the working capabilities available on the ship. Thus, the video sequences and video prints (see Appendix VII) will be helpful for further investigation at home and for the discussion with specialists. The investigation on board was limited by the vibration of the engine, which did not allow the use of higher microscopic magnifications, and the lack of time and of literature necessary for thorough investigation.

12.2. Preliminary Results and Discussion

All station locations and biological samples are listed in Appendix V.

Meiofauna

The sediment samples from the dredge and biological stations revealed species from almost all marine invertebrate groups of the animal kingdom, and demonstrated the diversity of animal life north and south of and in part on the GSC as well as in a transform fault and on the Galápagos platform. During the cruise, samples from 20 of 58 holes (geological and meiofauna dredge, TV-grab, box corer) yielding sediment were checked or pre-sorted for meiofauna, 1043 specimens of the meiofauna were isolated already. Only small sub-samples of the biological station material were inspected on board of RV *Sonne* in order to get a first impression of the richness of the fauna. Further sorting at Berlin is expected to reveal many more specimens, since it is rather difficult to trace especially the smaller sized meiofauna groups such as Loricifera and Tardigrada with a stereomicroscope at magnifications of 30x on board of a moving ship.

Foraminifera and Nematoda outnumbered by far all other meiofaunal groups followed by the Copepoda. Tardigrada were found commonly at stations 20, 44, 67, and 82 between 2500m and 3500m depth, but do not seem to inhabit shallower locations. However, a comparison of these species with species from the beaches of the Galápagos Islands (McKirdy et al. 1976) will be extremely interesting. Kinorhyncha and Loricifera have been recovered occasionally in the pre-sorted samples. As we learned just recently from a colleague, especially Loricifera tend to come out of a centrifuged sample last – and due to limited time only a small sub-sample from each biological station was checked for meiofauna.

Gastrotricha were quite frequent below the top of a seamount at a depth of 600m (station 41b) and on the Galápagos platform at 390m depth (station 75b), but seemed to be missing at greater depth. Currently, it cannot be decided whether the species found during the cruise are identical to any of the 18 species described by Schmidt (1974) from beaches of the Galápagos Islands. It does not come as a surprise that the Gastrotricha inhabit both the platform and the seamount, since strong westward oriented water currents exist at this time of the year in the upper 200m below the ocean surface. However, if these preliminary observations will be supported by further sorting, the question arises how the species of this animal group once colonized both platform and seamount so far away from the coast of the American mainland where Gastrotricha occur frequently. One has to bear in mind that Gastrotricha do not possess any larval stages that can be drifted far away by water currents.

The high number of meiofaunal specimens found even in small sediment samples on this cruise is due to the extensive usage of the density centrifugation method. This technique is supposed to recover meiofaunal organisms quantitatively from any kind of sediment be it mud or deep-sea clay or sand (Higgins & Thiel 1988). Only the loan of the KENDRO Heraeus Multifuge 3s with its large centrifugation volume of 4 x 600ml (taking 4 x 150ml of sediment) allowed to process the enormous amount of about 60kg of sediment on board of RV *Sonne* in a reasonable amount of time.

Macrofauna

Qualitative aspects of macrofauna settlement

The 88 stations (see Appendix V) of the MEGAPRINT cruise include:

- 5 profiles stations: station numbers 01, 04, 59, 76, 88
- 5 biological stations: station numbers 20, 44, 67, 75, 82
- 15 repeats: station numbers 15B, 27A, 29A, , 39A, 41A, 41B, 46A, 47A, 52A, 58A, 58B, 60A, 71A, 72A, 85A.

Among these 93 chain bag dredges, 13 were „negative", that is, they did not contain rocks or comparable substrate suitable for macrofauna settlement. These were the dredge stations 05, 29, 45, 51, 52, 52a, 55, 56, 57, 58A, 66, 71, 81. Twenty-four of the 80 "rock-positive dredges" contained no macrofauna - or only traces of beginning settlement, which were too small to be collected, such as tiny tubes or plaques occurring at unreachable or uneven places on the rock surface. This refers to the dredges number 03, 07, 09, 11, 12, 15, 15B, 16, 19, 23, 24, 26, 27, 27A, 29A, 32, 34, 35, 36, 39A, 54, 60A, 63, 73. From the remaining 56 dredges (with rocks and macrofauna), representatives of the following zoological taxa were collected in different frequency:

Table 12-1: Frequency (in %) in the occurrence of taxonomic groups of macrofauna collected from dredge hole material during the RV *Sonne*-158 cruise.

Porifera	68 %,	Mollusca	21 %
Bryozoa	50 %	Crustacea	21 %
Polychaeta	41 %	Echinodermata	19 %
Brachiopoda	36 %	Sipunculida	3 %
Cnidaria	29 %	Pantopoda	3 %

In 76% of the positive 58 dredges we met macrofauna organisms, which could not be classified so far with the facilities on board.

As one can see from the above statistics, Porifera (= sponges) were the most common organisms in our probes, followed by Bryozoa, Polychaeta and Brachiopoda. Porifera and Bryozoa exhibited the richest diversity in size, morphology and internal organisation. In the future, they might be best candidates for fast recognition of characteristic biocoenosis. Some taxa, which were not very common, deserved nevertheless our special interest; these were the Sipunculida and Pantopoda, the Solenogastres among the phylum Mollusca, and an enteropneust that we discovered in the sediment (dredge station number DR 46).

Altogether 393 macrofauna-samples were preserved in formalin or ethanol for further investigation and later addition to scientific collections. Those animals that have been documented on video were stored in special vessels to easily find them again for reinvestigation. This collection of micrographs (see Appendix VII) will essentially support the further investigation of the samples in Berlin as well as their handling by specialists for different taxonomic groups.

The number of individuals per preserved sample varied between one and about twenty; in the average there were 5-10 animals in each vessel. Thus, the overall number of macrofauna organisms preserved during the cruise was around 2.500 specimens.

Differences in macrofauna settlement on rocks collected from seamounts (SM) and from the GSC

Forty chain bag dredges containing rocks came from seamounts and another 40 from the *GSC* (see Appendix VI). Comparing the macrofauna settlement of these two types of probes we find a clear difference as shown in Table 12-2.

The last line in Table 12-2 (SM – GSC) shows the „surplus in settlement" on seamounts as compared to settlement on rocks from the GSC. If one also accounts the absolute number of specimens found at the two different localities, the discrepancy is even more impressive: at GSC localities we most often found less and generally smaller specimens on the rock surface than in material from seamounts. In addition, rocks from the GSC were much more often without epifauna (21 out of the 40 GSC dredges and only 3 among the 40 seamount dredges).

Besides the fact, that the rocks from the GSC are much younger, namely only a few thousands of years old, the rocks from this locality are in general characterized by glass surface, which is

hard and smooth and therefore difficult to be settled by animals which need a rough substrate with gaps and holes as shelter against current and predators. In this regard, the much older and weathered material from the seamounts supposedly offers more time and better condition for macrofauna settlement and growth. Especially the common manganate crust on seamount rocks seems to be ideal for macrofauna organisms; here we found the richest biocoenosis with larger animals in higher diversity.

Table 12-2: Frequency in the occurrence of taxonomic groups in dredge hole from different dredge localities (SM versus GSC). Abbreviations: ***BRA*** = Brachiopoda, ***BRY*** = Bryozoa, ***CNI*** = Cnidaria, ***CRU*** = Crustacea, ***ECH*** = Echinodermata, *GSC* = Galápagos Spreading Center, ***MOL*** = Mollusca, ***POL*** = Polychaeta, ***POR*** = Porifera, *SM* = seamount.

	POR	***CNI***	***MOL***	***POL***	***CRU***	***BRY***	***BRA***	***ECH***	***others***
40 SM stations	25	14	12	16	9	22	18	9	51
40 GSC stations	13	4	1	8	3	8	6	3	9
Difference between sites from *SM* and *GSC*	**12**	**10**	**11**	**8**	**6**	**14**	**12**	**6**	**42**

There are of course further factors that influence settlement and biomass production of macrobenthic organisms, e.g. current, food supply and the presence of predators. These factors are more difficult to analyse and we demand detailed information about the special situation at the different localities.

TV observation of the sea floor.

The use of the TV-grab offered one possibility to directly observe the deep-sea bottom and its visible macrofauna at a specific dredge station. For technical reasons the use of the TV grab was restricted to flat areas without rocks as it was the case at the biological stations 20, 44, 67, 75 and 82. Each time, the TV grab moved slowly over ground for a period of at least 20 minutes and a distance of several hundred meters, which allowed to gain a general impression of the properties of the locality. Animal life at the 5 stations was very different. Especially station 44 presented a considerable number (about 5 per square meter) of sea feathers (Cnidaria: Pennatularia) and many decapod crustaceans. Nearly all of them - sea feathers as well as crustaceans - were oriented into one direction (West), obviously opposed to a relatively strong underwater current which may be essential for the high biomass production in this area.

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APPENDIX I: SOUND VELOCITY PROFILES

Station		Date (UTC)	Time (UTC)	Lat.	Lon.	Water depth (m)	Recorded profile (m water column)
(on transit)	Start	19.07.01	21:22	-19.494	-100.234	4150	0 - 1500
	End	19.07.01	22:12	-19.491	-100.248	4135	
SP 4	Start	28.07.01	14:25	0.773	-86.034	2413	0 - 1500
	End	28.07.01	15:50	0.771	-86.032	2404	
SP 59	Start	08.08.01	20:00	1.949	-92.111	2147	0 - 1500
	End	08.08.01	21:00	1.950	-92.113	2206	

APPENDIX II: MAGNETIC PROFILES

Station		Date (UTC)	Time (UTC)	Lat.	Lon.	Water depth (m)	Profile length (nm)
MAG 1	Start	27.07.01	11:07:00	-0.553	-83.305	1962	ca. 150
	End	28.07.01	3:29:00	0.766	-85.332	2931	
MAG 76	Start	13.08.01	3:06:00	-0.286	-89.280	1556	ca. 35
	End	13.08.01	6:53:00	0.147	-88.911	2450	
MAG 88	Start	16.08.01	15:49:00	-2.004	-87.499	3062	ca. 230
	End	17.08.01	16:47:00	-5.733	-87.033	3959	

APPENDIX III: DREDGE STATION LOCATIONS AND ROCK SAMPLE DESCRIPTIONS

Station	Date (UTC) Time (UTC) Depth Coordinates	Sample no., Sample description	
DR 02	28.07.2001 on bottom: 05:30:00 h 2840.0 m 0°45.000' N 85°19.970' W off bottom: 06:35:00 h 2650.9 m 0°44.647' N 85°20.573' W	-1:	Aphyric fragment of a pillow, 1 – 2% vesicles 1 – 0.5 mm in diameter, vesicles are unfilled, 2 mm thick, highly weathered glass rim; up to 1 mm wide fractures through pillow interior, partly filled with Fe-hydroxide.
DR 03	28.07.2001 on bottom: 12:20:00 h 2458.0 m 0°46.503' N 86°2.009' W off bottom: 13:01:00 h 2397.0 m 0°46.260' N 86°2.012' W	-1: -2: -3:	Glass and aphyric basalt fragments. Altered glass and fresh basalt fragments. Basalt and glass fragments, 4 pieces (-3a, -3b, -3c, -3d).
DR 05	28.07.2001 on bottom: 19:24:00 h 2776.2 m 1°0.996' N 86°13.99' W off bottom: 20:48:00 h 2633.1 m 1°1.767' N 86°13.965' W		No hard rock samples.
DR 06	29.07.2001 on bottom: 01:17:18 h 2423.0 m 0°49.566' N 86°23.120' W off bottom: 20:45:30 h 2394.0 m 0°49.808' N 86°22.657' W	 -1: -2: -3: -4: -5: -6: -7: -8: -9: -10: -11: -12:	Unit A: Pieces 1a, 1b (presumably also includes pcs 2-4): Aphyric basalt slab, cooled both sides with heckly glass exterior. Same as -1. Same as -1. Same as -1. Unit B: Aphyric pillow basalt fragments, 0.5 – 1.0 m in diameter, with glass-lined hollow interior. Includes pcs 5-10 Same as -5. Same as -5. Same as -5. Same as -5. Same as -5. Unit C: 15 pcs loose glass. Unit D: (Pcs 12 – 14) Angular boulders 15 x 15 cm, no glass, aphyric, <1% microphenocrysts of plag, <0.5%

DR 06 (continued)			microphenocrysts of olivine, dense matrix.
		-13:	Same as -12.
		-14:	30 x 20 cm piece of deeply weathered pillow (weathered along fractures), aphyric dense basalt.
DR 07	29.07.2001	-1:	Aphyric pillow basalt fragment, brocken into 1-5 kg pieces (glass. has been removed from -1, -2, -4).
	on bottom: 06:39:57 h		
	2415.0 m	-2:	Same as -1.
	0°50.920' N	-3:	~15 g glass pieces (poor quality) of -1.
	86°36.697' W	-4:	Same as -1.
	off bottom: 07:10:00 h	-5:	Bag of glass pieces (poor quality).
	2365.0 m	-6:	10 x 8 cm pillow rim, 5 cm thick, 0.5 – 1 mm glass crust, partly devitrivied.
	0°50.683' N		
	86°36.501' W	-7:	8 x 8 cm triangular shaped pillow fragment, partly altered glass crust.
		-8:	8 x 5 cm pillow fragment, dense matrix, no vesicles, aphyric with 1 – 2% microphenocrysts of plag, < 0.3 mm thin glass rim.
DR 08	29.07.2001	-1:	Aphyric pillow basalt fragment, fresh glass rim, slab for powder, glass removed for geochemistry, small vesicles, not filled, microphenocrysts of plag and olivine.
	on bottom: 10:42:45 h		
	2379.1 m		
	0°52.268' N		
	86°49.899' W	-2:	Same as -1, 15 – 20 cm.
	off bottom: 11:46:30 h	-3:	Same as -1, 30 x 20 cm.
	2291.0 m	-4:	Loose glass chips and small pieces of fresh glass.
	0°52.060' N	-5:	Same as -1, 12 x 15 cm.
	86°49.647' W	-6:	Same as -1, 10 x 15 cm.
		-7:	Same as -1, 15 x 20 cm.
		-8:	Same as -1, 22 x 15 cm.
DR 09	29.07.2001	-1:	Pillow basalt fragment with thin glassy rim, aphyric, small (< 1 mm) vesicles, not filled; fresh glass and interior, but not abundant glass.
	on bottom: 15:44:30 h		
	2432.8 m		
	0°52.672' N	-2 to	
	87°8.143' W	-10:	Similar pillow fragments, all look like same flow.
	off bottom: 17:10:40 h		Same as -1, pillow basalt and glass in one piece.
	2311.0 m	-11:	
	0°53.127' N		
	87°7.547' W		
DR 10	29.07.2001	-1:	Larger pillow fragment, weathered, aphyric, poor glass; glass removed.
	on bottom: 21:58:02 h		
	2466.8 m	-2:	Slab ca. 0.5 m in diameter, aphyric, good glass.
	0°51.985' N	-3:	Small pillow fragment, poor glass.
	87°21.172' W	-4:	Larger pillow fragment, ca. 50 cm in diameter.
	off bottom: 23:12:19 h	-5:	5 x 10 cm slab, similar to -1.
	2471.2 m	-6:	Large pillow fragment, similar to -1.
	0°52.069' N	->	Additional "museum samples" to GEOMAR, Freiberg.
	87°20.411' W		
DR 11	30.07.2001	-1:	8 x 5 cm pillow fragment, < 0.2 mm altered glass crust, 1 – 2% plag (micro)phenocrysts up to 0.5 mm, < 1% olivine microphenocrysts and a single olvine crystal (2 mm in diameter), 3 – 5% vesicles < 0.3 mm, open, not filled; -> this rock appears to be fresh.
	on bottom: 03:44:00 h		
	2267.5 m		
	0°46.182' N		
	87°2.801' W		
	off bottom: 04:30:20 h		
	2181.6 m	-2.	8 x 4 cm pillow margin with 3 mm glass crust, outer surface dark brown with thin Mn-crust.
	0°45.902' N		
	87°2.647' W	-3:	Pillow piece, Mn-coated with some weathered glass.
		-4:	Small slab from outer pillow margin. Similar to -2.
		-5:	Loose basalt chips.

DR 12	30.07.2001 on bottom: 06:38:40 h 2228.7 m 0°45.897' N 87°7.597' W off bottom: 07:11:00 h 2174.4 m 0°45.658' N 87°7.485' W	-1:	30 x 30 cm pillow fragment, 0.5 – 1 mm altered glass crust with very little glass present, fractures are lined with Fe-oxyhydroxides and possibly thermal alteration, fresh interior, dark grey, fine grained, ca. 2% unfilled vesicles (0.2 – 0.5 mm in diameter); microphenocrysts of plag and olivine; plag laths (~ 0.2 mm) visible in outer 1 – 3 cm; alteration (yellow/grey) on fractured surface penetrating 3 – 5 mm into interior leading to lighter grey colour and some red clay vesicle filling.
DR 13	30.07.2001 on bottom: 10:21:45 h 2239.8 m 0°42.201' N 87°19.555' W off bottom: 11:17:00 h 2198.7 m 0°41.951' N 87°19.227' W	-1: -2: -3: -4: -5: -6: -7: -8: -9: -10: -11: -12: -13: -14: ->	25 x 18 cm pillow fragment, aphyric basalt with glass rim, fractured surface, weathered grey-yellow. 20 x 14 cm pillow fragment, aphyric basalt with glass rim, dark black on weathered fracture surfaces. 10 x 14 cm aphyric basalt fragment with some altered glass. Yellow/black on fracture surfaces. 4 x 14 cm pillow fragment, aphyric basalt with glass; dark, black/yellow fracture surfaces. 10 x 11 cm pillow fragment, aphyric basalt with altered glass. 8 x 14 cm aphyric basalt fragment with glass, yellow to black on weathered surfaces. 14 x 20 cm aphyric basalt fragment with glass, yellow – black weathered fracture surfaces. 14 x 20 cm aphyric basalt with glass, fracture surfaces weathered yellow. 18 x 18 cm pillow fragment, aphyric basalt with glass, brown – yellow weathered fracture surfaces. 8 x 12 cm pillow fragment, aphyric basalt with glass, fracture surfaces weathered grey. 12 x 15 cm pillow fragment, aphyric basalt with some glass, fracture surfaces weathered grey to yellow. 18 x 26 cm pillow fragment, aphyric basalt with altered glass, dark, black fracture surfaces. 18 x 18 cm pillow fragment, phyric basalt with glass, dark, black weathered surfaces on fractures. 25 x 25 cm pillow fragment, aphyric basalt with glass, dark grey to yellow-orange weathered fracture surfaces. without number: glass from sediment
DR 14	30.07.2001 on bottom: 14:14:31 h 2282.0 m 0°41.874' N 87°27.457' W off bottom: 14:53:10 h 2224.5 m 0°41.528' N 87°27.212' W	-1: -2: -3: -4: -5: -6: -7: -8:	15 x 15 cm fresh black basalt fragment with glass, aphyric, small unfilled vesicles, -> good fresh glass. 10 x 10 cm fresh pillow fragment with glass, small vesicles, unfilled; fracture surface grey to yellow. 10 x 15 cm pillow fragment, fresh basalt with glass. 15 x 20 cm pillow fragment, basalt with glass rim, fractures weathered yellow to grey, unfilled vesicles. Same as –4, 10 x 10 cm. Same as –4, 20 x 10 cm. Same as –4, 8 x 4 cm. loose glass.

DR 15a	30.07.2001 on bottom: 17:49:00 h 2094.2 m 0°40.644' N 87°38.008' W off bottom: 18:29:22 h 2111.0 m 0°40.671' N 87°37.632' W	-1:	8 x 8 cm chunk of basalt. aphyric, with altered glass rim and Mn-crust.
DR 15b	30.07.2001 on bottom: 20:22:13 h 2202.3 m 0°41.994' N 87°38.411' W off bottom: 21:15:19 h 2172.1 m 0°41.967' N 87°37.970' W	-1:	2 cm x 2 cm x 3 mm glass slab, mostly altered, very little fresh areas.
DR 16	31.07.2001 on bottom: 00:11:24 h 2197.2 m 0°43.529' N 87°48.277' W off bottom: 01:07:14 h 2115.6 m 0°43.208' N 87°48.293' W	-1: -2: -3: -4: -5: -6:	10 x 10 cm pillow fragment with some fresh glass; broken into 4 pieces; fine-grained, dark grey; 1 – 2% irregular open vesicles; slight yellow alteration on fracture surfaces. 3 x 5 cm piece as above, probably the same pillow. Same as –2. 5 x 5 cm pillow fragment, same lithology as -2 Same as –4. 3 glass fragments, belong to one of the above pieces.
DR 17	31.7.2001 on bottom: 04:07:00 h 2173.6 m 0°43.305' N 87°58.311' W off bottom: 05:26:16 h 2134.0 m 0°43.035' N 87°57.812' W	-1: -2: -3: -4: -5: 6 to -20: -21: -22 to -24: -25: -26:	Type 1: Fresh aphyric pillow lava fragment with 1-2 mm thick glass rims, large "botryoidal" glass 2 - 3 cm in diameter, dense matrix, 1% open vesicles. Large pillow slab similar to -1. Small pillow fragment similar to -1. Small pillow fragment similar to -1. Large pillow fragment similar tos -1. Same as -1. Type 2: Older (?) aphyric pillow lava fragment with poor, 1-2 mm thick glass rims, small "botryoidal" glass 1 cm in diameter Same as -21. Type 3: Oldest (?) pillow fragment with p alagonite on glass crust, aphyric, light grey, 5% open vesicles < 5 mm in diameter, flat outer surface. Altered pillow basalt fragment, possibly hydrothermal.
DR 18	31.7.2001 on bottom: 08:28:00 h 2127.4 m 0°44.257' N 88°8.427' W off bottom: 09:26:30h 2096.8m 0°44.223' N 88°7.970' W	-1:	30 x 30 x 5 cm thick basalt slab with 0.5 – 1 cm thick Mn-oxide coating, chilled both sides, weathered glass on one side; broken into 7 pieces; fine-grained, aphyric, irregular vesicles 0.5 – 1.0 mm in diameter, unfilled, vesicles increase from 0% at glassy edge to 3 – 5% at other edge.

DR 19	31.7.2001	-1:	Fresh aphyric basalt fragment with 0.5 cm thick fresh glass rims, broken into 3 pieces, dark Mn-coating on glass surface and along fractures in pillow.
	on bottom: 12:29:00 h		
	1970.0 m		
	0°45.075' N	-2:	
	88°19.892' W	-3:	Same as -1.
	off bottom: 13:14:30h	-4:	Same as -1.
	1924.0m	-5:	Same as -1.
	0°45.214' N	-6:	Loose glass fragments.
	88°19.622' W		Loose rock chunks.
		->	All pieces are from the same pillow.
DR 21	01.8.2001	-1:	20 x 30 cm pillow fragment with thin weathered glass crusts on complex outer surface; dark grey, fine-grained aphanitic basalt; up to 5% vesicles 0.5 –1.5 mm in diameter, unfilled; 15 – 20% Plag. phenocrysts (0.5 – 2.0 mm), mostly rounded; ~1% olivine phenocrysts (ca. 1 mm).
	on bottom: 03:21:00 h		
	1997.7 m		
	0°44.995' N		
	88°28.338' W		
	off bottom: 04:28:00h		
	1919.0m	-2:	20 x 30 x 10 cm pillow fragment, same lithology as -1.
	0°44.662' N		
	88°28.352' W	-3:	20 x 10 x 20 cm pillow fragment, same lithology as -1.
		-4:	Weathered glassy rim in several pieces.
		-5:	3 small pillow fragments for archive.
DR 22	01.08.2001	-1:	Type A: Large reasonably fresh pillow fragment with botryoidal glass, large „bots", ca. 2 cm in diameter. Includes pcs -1 to -7 + -27
	on bottom: 07:18:30 h		
	1838.0 m		
	0°45.522' N	-2:	Same as -1.
	88°37.952' W	-3:	Glass chip, same lithology as -1.
	off bottom: 08:27:00h	-4:	Glass chip, same lithology as -1.
	1850.4m	-5:	5 x 5 x 5 cm pillow fragment, same lithology as -1.
	0°45.650' N	-6:	3 small pillow fragments, same lithology as -1.
	88°37.448' W	-7:	Large pillowfragment, same lithology as -1, could yield plenty glass.
		-8:	Type B: Flat slab, glass on one side, glass has flat surface with minimal weathered flaky glass.
		-9:	3 fragments, same as -8.
		-10:	Type C: Larger pillow (> 50 cm in diameter) with smaller diameter "botryoidal" surface.
		-11:	Pillow fragments, same lithology as -10.
		-12:	Type D: Older (?) pillow fragment, > 1 m in diameter, with flatter glass surface, strong rounded.
		-13:	Pillow (~50 cm in diameter), same lithology as -12
		-14:	Type E: ~5 cm thick basalt slab with relatively fresh hackly glass surface
		-15 to -17:	Same as -14 with omly small amounts of glass.
		-18 to -24:	Same lithology as -14 with more availyble glass.
			Type F: basalt slabs, most likely part of same original
		-25	Single slab selected for sampling.
		-26:	five pieces for archive
		-27:	Additional pillow fragment with glass (same lithology as -1).

DR 23	01.08.2001	-1:	Aphyric pillow basalt fragment with fresh glass
	on bottom: 11:12:30 h		rim, botryoidal glass, orange alteration fracture
	1766.7 m	-2:	surfaces.
	0°46.798' N		Large aphyric pillow basalt fragment with
	88°47.728' W		botryoidal glass, yellow-orange alteration on
	off bottom 12:25:30h	-3:	fracture surfaces, some vesicles close to glass rim.
	1775.3m		Large aphyric pillow basalt fragment with
	0°46.695' N	-4:	botryoidal glass, yellow-orange alteration on
	88°47.370' W		fractures.
		-5:	25 x 15 cm aphyric pillow basalt fragment with
			glass rim, fracture surfaces altered yellow-orange.
		-6:	8 x 8 cm pillow basalt fragment with glass, altered
			fracture surfaces.
			Loose glass.
DR 24	01.08.2001	-1:	Large pillow fragment with abundant fresh glass,
	on bottom: 15:24:30 h		aphyric glass with unfilled vesicles adjacent to
	1806.7 m		glass rim.
	0°48.014' N	-2:	Small sheet flow fragment with glass.
	88°58.075' W	-3:	Small sheet flow fragment with fresh glass,
	off bottom: 16:43:07 h		unfilled vesicles.
	1768.0 m	-4:	Sheet flow fragment with glass, unfilled vesicles.
	0°48.196' N	-5:	Small sheet flow fragment with glass.
	88°57.415' W	-6:	Sheet flow fragment with glass.
		-7:	Sheet flow fragment with glass.
		-8:	Sheet flow fragment with glass.
		-9:	Loose sheet flow fragments.
		-10:	Pillow fragment with glass, unfillred vesicles,
			fracture surfaces yellow-orange.
		-11:	Loose glass.
DR 25	01.08.2001	-1:	Small pillow fragment without glass, weathered
	on bottom: 19:51:18 h		dark grey to black (Mn-) surfaces.
	1753.3 m	-2:	Several small glass chips from sediment trap.
	0°47.947' N		
	89°7.526' W		
	off bottom: 20:32:50 h		
	1761.7 m		
	0°48.131' N		
	89°7.282' W		
DR 25a	01.08.2001	-1:	30 x 20 x 5 cm slab (sheet flow fragment), good
	on bottom: 22:22:53 h		glass on one side.
	1779.9 m	-2:	Irregular sheet flow pieces.
	0°48.565' N	-3:	Aphanitic to fine-grained dark grey basalt shett
	89°9.644' W		flow fragment, ~1% empty tiny vesicles <0.5 mm
	off bottom: 23:15:00 h		in diameter, <1% ol phenocrysts up to 1-2 mm.
	1722.0 m	-4:	Same as -3.
	0°48.276' N	-5:	Same as -3.
	89°9.459' W	-6:	5 x 5 x 5 cm glassy „bud".
		-7:	5 x 5 x 3 cm glassy slab.
		-8:	10 – 15 small glass pieces.
		->	additonal 25 pieces to archive.
DR 26	02.08.2001	-1:	60 x 60 cm pillow fragment, 2 – 3 mm fresh glass
	on bottom: 02:01:00 h		crust, large (up to 0.5 cm) plag crystals, < 0.5%
	1703.9 m		small olivine phenocrysts.
	0°47.403' N	-2:	Same as -1, but different piece. However this piece
	89°20.503' W		has 2 – 3% olivne (2 – 3 mm!).
	off bottom: 03:17.00 h	-3:	Same as -1, but different piece.
	1699.0 m	-4:	Same as -1, but different piece.
	0°47.394' N	-5:	Same as -1, but different piece.
	89°20.118' W		

DR 27	02.08.2001	-1:	5 x 5 x 5 cm pillow fragment, aphyric, sparely vesicular, almost no usable glass.
	on bottom: 05:45:00 h		
	1708.1 m	-2:	Glass chip from sediment tube.
	0°47.760‘ N	-3:	Glass chip from sediment tube.
	89°27.101‘ W		
	off bottom: 06:28:30 h		
	1675.3 m		
	0°47.827‘ N		
	89°26.821‘ W		
DR 27a	02.08.2001	-1:	20 x 20 x 5 cm pillow fragment with good glass, black aphanitic with irregular clusters of plag (up to 3 mm in diameter).
	on bottom: 08:03:30 h		
	1701.6 m		
	0°48.115‘ N	-2:	20 x 15 x 15 cm pillow bud, very little glass.
	89°28.628‘ W	-3:	5 x 5 x 5 cm pillow fragment, weathered surface with Mn-oxides.
	off bottom: 09:52:00 h		
	1701.8 m	-4:	15 x 10 x 10 cm pillow fragment, little glass.
	0°48.076‘ N		
	89°28.713‘ W		
DR 28	02.08.2001	-1:	30 x 25 cm dark, aphyric pillow basalt fragment with glass, fracture surfaces Mn-coated, unfilled vesicles.
	on bottom: 12:58:00 h		
	1767.4 m		
	0°47.759‘ N	-2:	25 x 20 cm pillow basalt fragment with glass (same lithology as -1).
	89°31.952‘ W		
	off bottom: 13:43:00 h	-3:	17 x 18 cm pillow basalt fragment with glass (same lithology as -1).
	1681.7 m		
	0°47.529‘ N	-4:	15 x 15 cm pillow basalt fragment with glass (same lithology as -1).
	89°31.987‘ W		
		-5:	13 x 12 cm pillow basalt fragment with glass (same lithology as -1)..
		-6:	7 x 3 cm pillow basalt fragment with glass (same lithology as -1).
		-7:	5 x 6 cm pillow basalt fragment with glass (same lithology as -1).
		-8:	Loose glass.
DR 29	02.08.2001	-1:	Loose glass from sediment trap (< 1g).
	on bottom: 15:19:00 h		
	1713.0 m		
	0°48.900‘ N		
	89°32.495‘ W		
	off bottom: 16:14:00 h		
	1683.0 m		
	0°48.802‘ N		
	89°32.177‘ W		
DR 29a	02.08.2001	-1:	Fresh glass fragments from fresh aphyric pillow basalt, vesicles are unfilled, some yellow-orange alteration on fracture surfaces.
	on bottom: 17:32:10 h		
	1687.4 m		
	0°48.817‘ N	-2:	Single piece of glass (similar lithology as -1).
	89°32.176‘ W	-3:	Glass and rock fragment (similar lithology as -1).
	off bottom: 18:15:00 h	-4:	Glass fragments (similar lithology as -1).
	1689.3 m	-5:	Glass fragments (similar lithology as -1).
	0°48.731‘ N	-6:	Loose glass, very fresh (similar lithology as -1).
	89°31.873‘ W	-7:	Fresh pillow fragments and glass, aphyric basalt with unfilled vesicles.
		-8 to -15:	Pillow fragment and glass (similar lithology as -7).
		-16:	Loose rock fragments.
		->	All fragments appear to be from the same flow.

DR 30	02.08.2001	-1:	4 cm sheet flow fragment with Mn encrustation.
	on bottom: 22:22:10 h	-2:	~10 cm Mn-encrusted sheet flow fragment.
	1708.9 m	-3:	Same as -2.
	0°39.951' N	-4:	30 x 30 cm slab, ca. 5 – 10 cm thick, 3 – 4 mm
	89°39.698' W		Mn-oxides crust (brown), ~1 mm black Mn-oxide
	off bottom: 00:09:10 h		on inner surface, 0.5 cm glass on outer surface
	1612.1 m		grading to black aphanitic aphyric basalt.
	0°39.345' N	-5:	Same as -4.
	89°39.536' W		
DR 31	03.08.2001	-1:	40 x 40 cm pillow fragment with 3 – 4 mm thick
	on bottom: 02:36:30 h		glass, fractures covered with Fe-hydroxides 1 – 3
	1811.2 m		cm deep from outside, aphyric matrix, dense, 2 –
	0°50.013' N		3% vesicles up to 3 mm in diameter, unfilled.
	89°38.498' W	-2:	Pillow fragment, same type as -1.
	off bottom: 04:01:00 h	-3:	Pillow fragment, same type as -1.
	1647.0 m	-4:	Slab of sheet flow material broken into 10 pieces.
	0°49.651' N	-5:	Single pillow piece with 0.5 cm glass rim.
	89°38.455' W	-6:	30 x 40 cm pillow fragment, small glass rim.
		-7:	30 x 30 cm pillow fragment, little glass rim.
		-8:	Pillow tube with lots of fresh glass.
		-9:	4 pieces of a pillow fragment, 3 have glass rims.
		-10:	3 pieces of pillow fragments, glass is probably altered.
DR 32	03.08.2001	-1:	Large (ca 5 kg) complex pillow fragments,
	on bottom: 06:28:30 h		abundant glass, black, aphyric sparse plag.
	1680.4 m	-2:	Similar large pillow fragments, 5% elongate
	0°50.311' N		vesicles beneath glass.
	89°46.449' W	-3:	Sheet flow slab, ca. 3 cm thick, 20 – 30% elongate
	off bottom: 07:38:00 h		vesicles in lower half.
	1640.4 m	-4:	Same as -3.
	0°49.970' N		
	89°46.150' W		
DR 33	03.08.2001	-1:	30 x 40 cm pillow basalt fragment with fresh glass
	on bottom: 10:21:00 h		rim, aphyric, vesicular, alteration on fresh surfaces
	1754.8 m		yellow-orange..
	0°51.602' N	-2:	20 x 25 cm pillow basalt fragment with fresh glass,
	89°57.086' W		similar to -1.
	off bottom: 11:27:00 h	-3:	30 x 20 cm pillow basalt fragment with fresh glass.
	1642.0 m	-4:	20 x 15 cm pillow basalt fragment with fresh
	0°51.504' N	-5:	glass..
	89°56.849' W		Pillow fragment with glass, looks older than -1, Mn
		-6:	coating.
		-7:	Pillow fragment with glass, looks like -5.
			10 cm diameter rock-like basalt ornament with
		-8:	glass.
			Loose glass from sediment trap.
DR 34	03.08.2001	-1:	30 x 25 cm sheet flow basalt fragment with fresh
	on bottom: 14:19:00 h		glass.
	1642.0 m	-2:	5 x 10 cm sheet flow basalt fragment with glass,
	0°52.880' N		looks like -1.
	90°6.771' W	-3:	25 x 25 cm altered pillow fragment with fresh
	off bottom: 15:44:00 h		glass, aphyric with vesicles, looks older than the
	1642.0 m		sheet flow fragments.
	0°52.619' N	-4:	Same as -3.
	90°6.291' W	-5:	Fragments of basalt with glass.
		-6:	Fragment of pillow basalt, no glass, same as -3.
		-7:	3 x 3 cm sheet flow fragment with glass, looks like -1.
		-8:	10 x 10 to 5 x 5 cm sheet flow basalt fragments

DR 24 (continued)			with abundant fresh glass (~25 pieces).
		-9:	5 fragments of sheet flow basalt with thick layers of glass.
		-10:	Sheet flow basalt fragment with glass (~14 pieces).
		-11:	Loose glass, ca. 15 g.
DR 35	03.08.2001	-1:	Fresh pillow fragment with glass, aphyric, with vesicles.
	on bottom: 18:38:00 h		
	1583.0 m	-2:	Pillow fragment with glass, alteration on fracture surfaces and Mn-coated, looks older than -1.
	0°54.704‘ N		
	90°17.505‘ W	-3:	Pillow fragment with glass, looks like -2.
	off bottom: 19:58:00 h	-4:	Pillow fragment with glass.
	1591.2m	-5:	Sheet flow fragment with glass.
	0°54.502‘ N	-6:	Pillow fragment with fresh glass.
	90°17.010‘ W	-7:	4 x 8 cm sheet flow fragment with glass, fresh.
		-8:	Small sheet flow fragment with glass, aphyric, vesicles.
		-9:	Loose glass from sediment trap.
DR 36	03.08.2001	-1:	50 x 50 x 50 cm complex pillow fragment, abundant glass, 2 glass layers saved as A (outer layer) and B..
	on bottom: 22:50:00 h		
	1557.0 m		
	0°56.261‘ N	-2:	30 x 20 x 20 cm pillow fragment, abundant glass.
	90°29.784‘ W	-3:	30 x 50 x 15 cm fragment, abundant glass.
	off bottom: 00:02:00 h	-4:	30 x 15 x 10 cm slab.
	1591.2m	-5:	20 x 20 x 20 cm pillow fragment, looks older than other samples, aphyric, <20% large complex vesicles (up to 5 mm in diameter).
	0°54.502‘ N		
	90°17.010‘ W		
		-6:	20 x 20 x 10 cm slab, abundant glass.
		-7	5 x 10 x 5 cm slab, grey glassy interior, possible andesite (2 more in archive).
		->	11 additional pieces in archive
DR 37	04.08.2001	-1:	30 x 40 cm fragment of aphyric pillow basalt, fresh glassy rim, 2 – 4 mm thick, degassing channels 1 – 2 mm wide.
	on bottom: 02:24:00 h		
	1500.7 m		
	0°58.888‘ N	-2:	40 x 20 cm pillow fragment, glassy rim. Fractures covered with Fe-oxyhydroxide.
	90°34.501‘ W		
	off bottom: 03:32:30 h	-3:	30 x 50 cm pillow fragment, glass appears partly altered with 1.5 cm wide green layers.
	1482.3m		
	0°58.783‘ N	-4:	40 x 40 cm pillow fragment, same facies as -1 to -2.
	90°34.158‘ W	-5:	
		-6:	60 x 30 pillow fragment, same facies as -1 to -4.
		-7:	Same as -5.
DR 38	04.08.2001	-1:	8 pieces of a broken pillow, aphyric, dense matrix, degassing channels (2 – 4 mm in diameter), below chilled margin, 3 – 5 mm fresh glassy rim, yellow – red alteration along fractures, plag microphenocrysts < 0.5 mm.
	on bottom: 06:10:30 h		
	1716.9 m		
	1°2.467‘ N		
	90°43.911‘ W		
	off bottom: 06:56:30 h	-2:	60 x 30 cm pillow fragment, similar to -1, but different piece.
	1669.2 m		
	1°2.355‘ N	-3:	Slab of sheet flow, glass is mostly altered, vesicles covered with Fe-oxide.
	90°43,676‘ W		
DR 39	04.08.2001	-1:	Basalt fragment, 6 cm in diameter, max. 7 mm Mn-crust.
	on bottom: 10:15:00 h		
	1685.2 m	-2:	Small pieces of glass from sediment traps.
	1°0.680‘ N		
	90°51.775‘ W		
	off bottom: 11:08:00 h		
	1599.1m		
	1°0.543‘ N		
	90°51.533‘ W		

DR 39a	04.08.2001 on bottom: 12:40:30 h 1587.3 m 0°59.096' N 90°50.943' W off bottom: 14:22:00 h 1532.6 m 0°58.773' N 90°50.631' W	-1: -2: -3: -4: -5: -6: -7:	Pillow fragment, glass completely altered, Mn-coating, aphyric basalt with vesicles. Basalt fragment, glass mostly altered, Mn-coating, aphyric with vesicles. Pillow fragment, glass altered, Mn-coating, aphyric with vesicles. Altered pillow with some fresh glass left, aphyric with vesicles. Pillow fragment, similar to -3. Pillow fragment, similar to -3. Pillow fragment with glass, mostly altered, some fresh glass left.
DR 40	04.08.2001 on bottom: 17:41:00 h 2003.0 m 1°01.070' N 90°58.995' W off bottom: 19:14:00 h 1850.0 m 1°01.019' N 90°58.997' W	-1: -2: -3: -4: -5: -6:	Curved pillow basalt rinds with glass rim coated by Mn. Pillow fragment with glass rim coated by Mn. Pillow fragment with glass rim coated by Mn. Pillow fragment, Mn coated. Pillow fragment, Mn coated. Pillow fragment, Mn coated.
DR 41	04.08.2001 on bottom: 22:46:00 h 455.9 m 1°14.202' N 91°07.289' W off bottom: 23:20:29 h 434.1 m 1°14.433' N 91°07.178' W	-1:	2 rocks of unknown composition, 2 mm Mn-crust.
DR 41a	05.08.2001 on bottom: 00:10:44 h 410.2 m 1°14.100' N 91°07.103' W off bottom: 01:19:20 h 310.2 m 1°14.029' N 91°06.959' W	-1: -2: -3: -4: -5: -6: -7: -8: -9: -10: -11: -12: -13:	Ultraphyric plagioclase basalt, 0.5 – 1 cm prismatic crystals, appear weathered, but some are fresh; 5% vesicles. glass chip attached (cemented) to a basalt fragment Slab of beach sediment, may contain glass. 4 pieces of beach sediment (?), laminated structure. 2 round cobbles, sediment with black-grey clasts, clasts are covered with reddish layer. vesicular basalt cobble, 20 – 25% vesicles, filled at the edge of the cobble. Sediment cobble, yellow-orange, grain size < 1 mm, unclear origin, Fe-hydroxides. Aphyric basalt cobble, mostly open vesicles, large holes filled with bio-material. Ultraphyric plag.-basalt fragment with strongly weathered matrix, vesicles are filled, may contain K-feldspar. 2 vesicular rock fragments, unclear origin, appears to be strongly weathered. 4 subrounded cobbles, 5 – 10 cm diameter, probably plag-phyric basalt, similar to -1 and -9. 3 cobbles, similar to -11. 3 pieces of biogenetic rocks (carbonate).
DR 41b	05.08.2001 on bottom: 02:25:00 h 633.2 m 1°15.105' N 91°07.919 W off bottom: 03:40:00 h	-1: -2: -3:	30 x 20 cm aphyric, vesicular basalt fragment, 10% vesicles, vesicles are open except outermost 1 cm. 20 x 20 cm basalt fragment similar to -1, vesicles are filled or lined with Fe-hydroxide. 30 x 30 cm basalt fragment with 15 – 20% vesicles up to 8 cm wide, no open vesicles in central pert.

DR 41b (continued)	553.2 m 1°14.956‘ N 91°07.670‘ W	->	No glass in this dredge.
DR 42	05.08.2001 on bottom: 06:49:30 h 1873.0 m 1°16.833‘ N 90°57.178‘ W off bottom: 07:59:00 h 1772.4 m 1°16.818‘ N 90°56.760‘ W	-1: -2:	Mn-encrusted basalt fragment, Mn-layers 0.5 – 1 cm thick, below Mn-crust partly palagonitized glass, basalt matrix is medium altered, mainly along cracks, greyish – brown coloured matrix, plag and olivine microphenocrysts < 0.5 mm. glass pieces of -1.
DR 43	05.08.2001 on bottom: 11:45:30 h 3302.4 m 1°38.900‘ N 90°49.436‘ W off bottom: 14:05:20 h 3192.1 m 1°38.519‘ N 90°49.134‘ W	-1: -2: -3: -4: -5: -6:	Plagioclase-phyric pillow fragment with fresh glass. Same as -1. Same as -1. Pillow fragment, no glass, plag phenocrysts. 3 x 3 cm pillow fragment with glass, plag phenocrysts. Loose glass.
DR 45	06.08.2001 on bottom: 06:48:30 h 2176.5 m 1°51.104‘ N 90°52.624‘ W off bottom: 07:54:00 h 2112.2 m 1°50.976‘ N 90°52.213‘ W		No hard rock samples.
DR 46	06.08.2001 on bottom: 13:14:13 h 1859.0 m 1°39.472‘ N 91°16.191‘ W off bottom: 13:56:40 h 1791.0 m 1°39.198‘ N 91°16.078‘ W	-1: -2: -3:	Basalt fragment, dark grey vesicular basalt (best piece for analysis). Same as -1, only smaller. Same as -2.
DR 46a	06.08.2001 on bottom: 16:12:20 h 2323.5 m 1°42.572‘ N 91°11.370‘ W off bottom: 17:34:10 h 2146.9 m 1°42.376‘ N 91°11.036‘ W	-1: -2: -3: -4:	Large aphyric pillow basalt fragment with glass, Mn-coated, fracture surfaces altered. Apyric pillow fragment with glass, Mn-coated, fracture surfaces altered. Lobe of pillow basalt with glass, Mn-coated, good glass. Aphyric pillow basalt fragment with glass, Mn-coated, with vesicles.
DR 47	06.08.2001 on bottom: 20:38:00 h 1552.4 m 1°53.000‘ N 91°16.500‘ W off bottom: 21:06:00 h 1558.7 m 1°52.850‘ N 91°16.370‘ W	-> ->	~300 oxidized chimmey fragments (?), see chapter 9 for description. 1 Mn-encrusted weathered pillow fragment with devitrified glass.

DR 47a	06.08.2001 on bottom: 22:26:00 h 1663.0 m 1°53.304' N 91°16.902' W off bottom: 23:10:00 h 1543.0 m 1°53.187' N 91°16.743' W	-1: -2: -3: -4: -5: -6: -7: -8: -9: ->	Fresh dense pillow basalt fragment, aphyric, abundant fresh glass, some Mn-coating and alteration on fracture surfaces. Slab of glass rim, 1 – 2 cm thick (glass to used as interlaboratory standard). Same as -1, 1 – 2 cm thick fresh glass crust. Same as -1, thinner glass crust but still fresh. Glass rim, 2 – 3 cm thick, partly palagonatizid along cracks. Same as -1, 2 pieces 0.5 – 1 cm fresh glass. Broken glass piece, 1 – 2 cm thick, fresh. 8 pieces of pillow fragments similar to -1. Bag of loose glass and pillow fragments. Complex pillow forms, likely intruded into wet sediment.
48 DR	07.08.2001 on bottom: 01:15:00 h 1593.8 m 1°56.010' N 91°20.399' W off bottom: 02:34:00 h 1575.3 m 1°56.091' N 91°20.045' W	-1: -2: -3: -4: -5: -6: -7: -8: -9: -10 -11:	Pillow fragment broken into 3 pieces, fractures are lined with orange-yellow Fe hydroxide, degassing vesicles 1 cm below fresh glass rim, aphyric. This pillow appears older than others. Slab of a sheet flow, dense matrix, aphyric, <2 mm glass rim. Pillow fragment, 0.5 cm glassy rim, fractures lined with Fe-oxide, could be as old as -1. 2 fragments of pillow tube, 10 cm in diameter, similar to -2. 20 x 10 cm sheet flow fragment, covered with glass on top and bottom, glass ca. 4 mm thick, aphyric, dense matrix, same as -2. Sheet flow fragment, glass rim up to 1 cm thick, same as -2. 10 x 8 cm sheet flow fragment, 1 – 2 cm thick glassy rims, same lithology as -2. 15 x 10 cm sheet flow fragment, < 0.5 mm glass rim, dense matrix. 3 pieces of sheet flow lava similar to -2 with 0.5 mm fresh glass rims. 3 pieces (10 – 20 cm diameter) of sheet flow fragments, subangular shape, almost entirely covered with glass. 10 x 10 x 4 cm slab chilled at both sides
DR 49	07.08.2001 on bottom: 06:26:00 h 1786.3 m 2°03.390' N 91°41.311' W off bottom: 07:32:30 h 1799.7 m 2°03.594' N 91°40.895' W	-1: -2: -3: -4: -5: -6: -7: -8:	40 x 40 cm aphyric sheet flow fragment, 0.5 – 1 cm thick fresh glass, minor alteration along cracks. Jumbled lava fragments, fractures lined with Fe-oxide. 30 x 20 cm sheet flow fragment similar to -1, but slightly more altered. 20 x 20 cm pillow fragment, medium quality glass, with brown outer surfaces suggesting that it is older, minor alteration along cracks. 10 x 20 cm pillow fragment, glass rim with with brown outer surfaces suggesting that it is older, large degassing channels (up to 0.5 cm in diameter) near glass rim, uppermost glass palagonitized. 30 x 20 cm pillow fragment, 1 – 2 cm glass on one side, only minor Fe-staining along fractures, aphyric and dense, 5% vesicles. 40 x 40 cm slab, covered with 0.5 cm glass on one side. 20 x 40 cm pillow fragment with flat outer surface

DR 49 (continued)			and little remaining glass, aphyric, up to 2 cm degassing channels, appears older than the rest of the dredge?
		-9:	6 pieces of pillow fragments with fresh glass, similar facies as -6.
		-10:	Pillow fragment with glass rim on inner side 0.5 cm thick, outermost glassy layer is altered.
		-11:	5 basalt samples with glass, aphyric and dense.
DR 50	07.08.2001 on bottom: 10:49:00 h 2317.8 m 1°52.324' N 91°42.172' W off bottom: 12:03:00 h 2110.3 m 1°52.269' N 91°41.853' W	-1: -2: -3: -4: -5: -6: -7: -8: -9: -10:	Pillow basalt with glass, Mn-coated, some orange alteration of glass, aphyric, vesicles. Pillow fragment with glass, Mn-coated, aphyric, with vesicles. Pillow fragment with glass, Mn-coated, yellow-orange alteration. aphyric, vesicles. Pillow fragment with glass, aphyric, similar to -1. Pillow fragment, some glass, Mn-coated, yellow-orange alteration fracture surfaces, aphyric, vesicles. Pillow fragment, some glass, Mn-coated, yellow-orange alteration fracture surfaces, aphyric, vesicles. Pillow fragment, some glass, Mn-coated, yellow alteration fracture surfaces, aphyric, vesicles. Pillow fragment, some glass, grey-yellow alteration fracture surfaces, Mn-coating on glass, aphyric, vesicles Loose small pillow fragments with glass. Big pieces of loose glass, may be from -1.
DR 51	07.08.2001 on bottom: 14:20:00 h 1938.0 m 1°52.806' N 91°45.821' W off bottom: 15:35:00 h 1820.0 m 1°52.600' N 91°45.448' W		No hard rock samples.
DR 52	07.08.2001 on bottom: 17:55:40 h 1959.4 m 1°57.104' N 91°49.110' W off bottom: 18:51:20 h 1707.5 m 1°56.971' N 91°48.920' W		No hard rock samples.
DR 52a	07.08.2001 on bottom: 20:24:54 h 2135.2 m 1°56.700' N 91°49.501' W off bottom: 21:47:55 h 1842.7 m 1°56.475' N 91°49.160' W		No hard rock samples.

DR 53	08.08.2001 on bottom: 00:33:00 h 1704.7 m 2°06.400‘ N 91°54.600‘ W off bottom: 01:58:30 h 1677.1 m 2°06.034‘ N 91°54.297‘ W	-1: -2: -3: -4: -5: -6:	80 x 50 cm pillow fragment, aphyric, dense, 0.5 – 1.5 thick glassy rim, very minor alteration, 1 – 2% vesicles <0.5 mm in diameter; piece may have been broken off for a while due to little cover on surface. 40 x 40 cm pillow fragment, similar to -1, 0.5 mm thick fresh glass, fractures appear more altered. 20 x 20x 8 cm pillow slab, aphyric and dense, 1 – 2 cm fresh glassy rim, ~4% vesicles on one side, uppermost glass layer is a bit altered. 2 pieces of a pillow slab, similar to -3. 10 x 20 cm pillow slab, similar to -3. Pillow fragments, single piece originally (fit together), aphyric and dense, 5% vesicles, glass is more crystallised than other samples and fractures are more Fe stained -> could be altered.
DR 54	08.08.2001 on bottom: 04:47:00 h 1726.8 m 2°06.371‘ N 92°06.451‘ W off bottom: 06:05:00 h 1710.9 m 2°06.218‘ N 92°06.160‘ W	-1: -2: -3: -4: -5: -6: -7: -8:	~70 x 70 cm pillow fragment, brocken into at least 5 pieces, aphyric, dense, 4% vesicles <0.3 mm in diameter, glassy rim, fractures and partly glass lined with Fe oxide, 2% 0.5 mm plag phenocrysts. 20 x 20 cm pillow fragment, 1 cm thick glass rim on one side, similar to -1. 10 x 10 cm pillow fragment, 0.5 – 1 cm glass rim, similar to -1. 2 slab pieces, each 8 x 8 cm, <1 cm glassy rim, uppermost glass is palagonatized. Slab of sheet flow (?), similar to -4. 9 x 8 cm slab of sheet flow (?), similar to -4. 20 x 10 cm pillow basalt fragment, similar to -1 but possibly older with less, more weathered glass. 5 x 8 cm basalt slab with glass.
DR 55	08.08.2001 on bottom: 08:14:30 h 1911.4 m 2°02.829‘ N 92°07.628‘ W off bottom: 09:02:30 h 1882.9 m 2°02.704‘ N 92°07.368‘ W		No hard rock samples.
DR 56	08.08.2001 on bottom: 11:29:00 h 1876.7 m 2°06.579‘ N 92°14.524‘ W off bottom: 12:23:00 h 1762.1 m 2°06.371‘ N 92°14.316‘ W	-1: -2:	Pillow fragment, small amount of glass, aphyric, vesicles, fresh rock, Mn-coating. Pillow fragment, vesicles, aphyric, fresh rock,. glass, Mn-coating.
DR 57	08.08.2001 on bottom: 14:49:20 h 1922.6 m 2°00.801‘ N 92°11.558‘ W off bottom: 15:34:50 h 1880.5 m 2°00.771‘ N 92°11.236‘ W	-1: -2: -3:	Pillow fragment with glass, aphyric, vesicular. Same as -1. Same as -1.

DR 58	08.08.2001 on bottom: 18:12:00 h 2271.0 m 1°56.999‘ N 92°06.909‘ W off bottom: 18:58:00 h 2139.0 m 1°56.985‘ N 92°06.666‘ W	-1: -2:	5 x 4 cm glass piece, altered, coated with Mn and Fe-oxide. 4 x 4 cm glass piece, altered, coated with Mn and Fe-oxide.
DR 58a	08.08.2001 on bottom: 20:29:00 h 2285.1 m 1°55.197‘ N 92°05.100‘ W off bottom: 23:04:00 h 2203.1 m 1°55.090‘ N 92°04.900‘ W		No hard rock samples.
DR 58b	09.08.2001 on bottom: 00:59:00 h 2350.8 m 1°56.003‘ N 92°04.799‘ W off bottom: 01:40:30 h 2256.3 m 1°56.002‘ N 92°04.599‘ W	-1: -2: -3: -4:	50 x 50 cm pillow fragment, covered with sediment, appears to be altered from outside. 25 x 20 cm pillow fragment, 0.3 mm Mn-crust, frech glass observed beneath Mn; fragment entirely covered with Mn, debris deposit, aphyric, 2% open vesicles. 10 x 10 cm pillow fragment, Mn-encrusted, ~ 5 mm thick glass rim, low quality glass. 2 small (~10 x 10 cm) pillow fragments.
DR 60	09.08.2001 on bottom: 06:02:00 h 1864.4 m 1°43.454‘ N 91°43.552‘ W off bottom: 06:49:30 h 1832.2 m 1°43.384‘ N 91°43.308‘ W	-1: -2:	40 x 30 cm highly phyric plag-ol-basalt fragment, olivine and plag are all fresh, ~5% olivine (2 – 4 mm), 10% plag (3 – 5 mm). This is <u>possibly</u> a picrit. Glassy rim covered with 2 – 3 mm Mn, glass is fresh; this lava was highly viscous; 3% open vesicles < 0.5 mm in diameter; fragment is broken into 2 halves. Same as -1.
DR 60a	09.08.2001 on bottom: 08:45:30 h 1294.5 m 1°41.526‘ N 91°41.826‘ W off bottom: 10:06:30 h 1113.4 m 1°41.611‘ N 91°41.403‘ W	-1:	Aphyric basalt strongly altered, inner core is fresh.
DR 61	09.08.2001 on bottom: 14:55:00 h 1710.6 m 1°14.398‘ N 91°40.913‘ W off bottom: 16:05:10 h 1567.9 m 1°14.402‘ N 91°40.472‘ W	-1: -2: -3: -4: -5: -6:	Pillow basalt fragment with glass, vesicular, with Mn-coated fresh glass, fracture surfaces yellow-orange. Pillow fragment, similar to -1. Pillow fragment, similar to -1. Pillow basalt fragment, aphyric, vesicular, Mn-coated glass rim. Pillow basalt fragment, aphyric, vesicular, Mn-coated glass rim. Pillow fragment with glass, aphyric, vesicular, some Mn-coating.

DR 62	09.08.2001	-1:	Plag-olivine-phyric pillow basalt fragment with glass, Mn-coated, fractures with yellow-orange alteration.
	on bottom: 17:54:00 h		
	2151.0 m	-2:	Plag-olivine-phyric pillow basalt fragment with glass, Mn-coated, fractures with yellow alteration.
	1°11.199' N		
	91°41.405' W		
	off bottom: 19:35:00 h	-3:	Plag-olivine-phyric pillow basalt fragment with glass, Mn-coated, yellow-orange alteration.
	1925.0 m		
	1°11.198' N	-4:	Similar to -3.
	91°41.094' W	-5:	Plag-olivine-phyric pillow basalt fragment with glass, Mn-coated, yellow-orange surface alteration.
		-6:	Plag-olivine-phyric pillow basalt fragment with glass, Mn-coated, yellow-orange surface alteration.
		-7:	Loose glass.
DR 63	10.08.2001	-1:	10 x 10 cm Mn-encrusted pillow fragment, Mn crust 3.3 cm thick, laminated with 0.5 cm thick cyclic layering, individual layers are <0.3 mm thick; Basalt appears still fresh, aphyric, dense, with 2% open vesicles.
	on bottom: 00:33:30 h		
	2005.0 m		
	1°08.301' N		
	91°21.611' W		
	off bottom: 01:31:30 h		
	1845.6 m		
	1°08.496' N		
	91°21.230' W		
DR 64	10.08.2001	-1:	30 x 30 cm Mn-encrusted pillow slab, Mn crust 2 – 3 cm thick, laminated; pillow slab 3 – 7 cm thick, aphyric basalt.
	on bottom: 03:26:00 h		
	2005.6 m		
	1°06.727' N	-2:	8 x 3 cm basalt fragment, similar to -1, but Mn is more diffuse.
	91°16.437' W		
	off bottom: 04:39:30 h	-3:	Angular basalt fragment encrusted with 2 cm Mn, basalt has 3% partly filled vesicles up to 1 mm.
	2011.7 m		
	1°06.717' N	-4:	Similar to -1, may have fresh glass preserved.
	91°16.462' W	-5:	10 x 10 cm Mn-encrusted basalt fragment similar to -1.
		-6:	Angular aphyric basalt fragment, 4% vesicles, 1 mm diameter, partly filled or lined with alteration products, Mn crust 0.5 cm (thinner than all other samples).
		-7:	Similar to -6, but basalt is more altered.
		-8:	4 x 4 cm Mn-encrusted basalt fragment.
		-9:	Mn crust.
		-10:	4 small (1 – 2 cm) pieces of Mn crust.
DR 65	10.08.2001	-1:	Large pillow fragment, aphyric, vesicular with glass, yellow-orange alteration on fracture surfaces.
	on bottom: 08:10:00 h		
	1061.3 m	-2:	Similar to -1
	0°53.718' N	-3:	Large flow sheet fragment with glass, aphyric, vesicular.
	91°25.154' W		
	off bottom: 09:20:30 h	-4:	Pillow fragment, highly vesicular, some glass.
	1925.0 m	-5:	Highly vesicular pillow basalt fragment with glass, yellow-orange alteration on fracture surfaces.
	0°53.642' N		
	91°25.100' W	-6:	Pillow fragment, no glass, dense, not as vesicular as rest of dredge.
		-7:	Lobate pillow, vesicular, aphyric, with glass.
		-8:	Basalt fragment with corals.
		-9:	Pillow fragment, vesicular, glass, yellow-brown alteration fractures.
		-10:	Sheet flow fragment.
		-11:	Small pillow fragment with glass.

DR 66	10.08.2001 on bottom: 11:42:30 h 1316.8 m 0°47.772‘ N 91°22.787‘ W off bottom: 12:36:00 h 1329.7 m 0°47.784‘ N 91°22.784‘ W		No hard rock samples.
DR 68	11.08.2001 on bottom: 01:28:30 h 1640.2 m 0°51.562‘ N 90°50.421‘ W off bottom: 02:41:30 h 1481.0 m 0°51.346‘ N 90°50.515‘ W	-1: -2: -3: -4: -5: -6: -7: -8: -9:	70 x 70 cm pillow basalt fragment, Mn-encrusted, plag-phyric with 10% plag (1 - 2 mm in diameter), <2% fresh olivine (up to 5 mm in diameter), weathered glass rim, up to 1 cm weathering zone, inside light grey and mostly fresh. Same as -1, 30 x 30 cm. Same as -1, 30 x 30 cm, weathered glass margin. Same as -1. Same as -1, 5 x 5 cm, with 1 cm thick glassy rim with little fresh glass. Same as -1, <5 cm thick weathering rim (this appears to be the freshest sample). Same as -1. Same as -1. 80 x 80 cm pillow fragment, similar to -1.
DR 69	11.08.2001 on bottom: 08:10:00 h 1260.3 m 0°35.005‘ N 90°20.004‘ W off bottom: 09:01:30 h 1124.9 m 0°34.698‘ N 90°19.925‘ W	-1: -2: -3: -4: -5: -6: -7: -8:	30 x 30 cm pillow fragment, 5 mm thick glassy rim covered with Fe-oxide and palagonite, but glass still fresh, matrix dense and aphyric. Similar to -1, 40 x 40 cm, glass crust <1 mm thick. 40 x 50 cm pillow fragment, ~5 mm thick glass rim preserved on one side (~ 30 cm^2), otherwise similar to -1. 50 x 60 cm pillow fragment, similar to -1, broken into several pieces, 5 – 8 mm thick glass rim covered with Fe-oxides. 4 platy pillow fragments of a single piece, <1 mm thick glass rim, covered with Mn-oxide, matrix dense and aphyric. -> sample is different than -1 to -4. 30 x 30 cm pillow fragment, glassy rim is covered with Mn-oxide, Fe-oxide and partly palagonite, glass <1 mm thick, matrix dense and aphyric. -> sample is different than all others. 20 x 30 cm pillow fragment similar to -1, glass still fresh although covered with Mn- and Fe-oxide. Archive sample similar to -1, 3 mm thick fresh glass rim.
DR 70	11.08.2001 on bottom: 14:37:10 h 1667.0 m 0°24.995‘ N 89°52.012‘ W off bottom: 15:45:10 h 1299.5 m 0°24.633‘ N 89°51.725‘ W	-1: -2: -3: -4: -5: -6:	Large pillow basalt fragment with plag phenocrysts up to ~1 cm, some glass. Large pillow fragment with glass, plag and vesicles. Pillow fragment with glass and plag. Pillow fragment with glass and plag, yellow-orange alteration. Loose small basalt fragments with abundant fresh glass. 8 x 6 cm fragment with glass.

DR 71	11.08.2001 on bottom: 19:08:30 h 1756.0 m 0°27.903' N 89°36.609' W off bottom: 20:57:00 h 1722.0 m 0°27.893' N 89°36.597' W		No hard rock samples.
DR 71a	11.08.2001 on bottom: 22:25:00 h 1535.0 m 0°27.000' N 89°37.807' W off bottom: 23:20:00 h 1364.0 m 0°26.773' N 89°37.597' W	-1: -2: -3: -4: -5:	80 x 70 cm pillow basalt fragment, highly plag-phyric, 10 – 15% plag up to 1.5 cm, 2% olivine up to 2 mm, 3 – 4 cm fresh glassy rim with plag crystals, dense light grey matrix, 4% open vesicles <0.2 mm in diameter. 50 x 40 cm pillow fragment same as -1, but different piece. 30 x 30 cm pillow fragment same as -1, but different piece. 20 x 20 cm pillow fragment similar to -1 to –3, but plag. crystals are sorted (25% of the piece is crystal free), still some good glass on one side. 15 x 10 cm pillow fragment, less plag cystals.
DR 72	12.08.2001 on bottom: 04:15:00 h 2128.5 m 0°06.947' N 89°17.398' W off bottom: 05:44:00 h 1836.0 m 0°06.811' N 89°16.957' W	-1: -2: -3: -4: -5:	30 x 30 cm aphyric pillow fragment encrusted with 0.8 mm laminated Mn crust, glassy rim up to 1 cm thick, appears ± fresh, rock is dense, <0.5% vesicles, altered along abundant 1 mm wide cracks. 2 platy pillow basalt fragments, glass is mostly altered, otherwise similar to -1. Platy pillow basalt fragment, similar to -1. 10 x 10 cm pillow basalt fragment, same as -1. 20 x 10 cm pillow basalt fragment with Mn crust, 5 mm thick, mostly fresh glassy rim, similar to -1.
DR 72a	12.08.2001 on bottom: 07:12:00 h 1556.8 m 0°05.846' N 89°15.006' W off bottom: 08:34:30 h 1324.7 m 0°05.785' N 89°14.500' W	-1: -2: -3:	80 x 90 cm pillow fragment broken into at least 3 pieces when dredge was dumped; dense, aphyric, glassy rim up to 3 mm thick, appears fresh but entirely covered by Fe-hydroxide and palagonite, fractures are lined with Fe-oxide and spotty Mn-oxide. 30 x 30 cm pillow fragment, similar to -1. 10 x 10 cm pillow fragment similar to -1.
DR 73	12.08.2001 on bottom: 11:51:00 h 1632.2 m 0°02.820' S 89°16.256' W off bottom: 13:05:00 h 1500.0 m 0°02.765' S 89°15.853' W	-1: -2: -3: -4: -5: -6: -7:	Pillow fragment with a little glass, Mn-coated. Basalt cobble, altered, aphyric, vesicles. Basalt cobble, aphyric, vesicles. Basalt cobble, center fresh. Basalt cobble, altered. Basalt cobble, altered. Clastic sediment cobble.
DR 74	12.08.2001 on bottom: 17:05:00 h 1386.0 m 0°21.188' S 89°20.604' W off bottom: 18:38:00 h 1615.0 m 0°21.122' S 89°20.459' W	-1:	Pillow basalt fragment, vesicular, Mn-encrusted, altered, very little fresh glass.

DR 77	13.08.2001 on bottom: 08:38:30 h 1690.4 m 0°11.502' N 88°52.798' W off bottom: 09:50:00 h 1543.3 m 0°11.571' N 88°52.495' W	-1: -2: -3: -4: -5: -6: -7: -8: -9: -10:	20 x 30 cm aphyric pillow fragment encrusted with 2 mm Mn, one 2 x 2 cm glass chip, matrix is dense, medium altered, 1 cm thick alteration halo. 3 x 3 cm pillow slab, glassy margin Pillow fragment, altered and Mn-encrusted glassy rim, glass is of very low quality. 30 x 40 cm pillow fragment similar to -1. Pillow fragment similar to -1, glass chipped off, alteration halo 8 mm wide. 3 pieces of pillow interior, 1% plag microphenocrysts slightly to medium altered. 4 pieces of pillow interior, altered margin, plag phenocrysts. Lava (?) fragment, looks encrusted, irregular shape, not pillow or sheet lava flow. Pillow fragment, glass, Mn-encrusted. Pillow fragment, glass, Mn-encrusted.
DR 78	13.08.2001 on bottom: 19:52:00 h 1926.0 m 0°17.902' N 88°46.148' W off bottom: 20:43:00 h 1816.0 m 0°17.802' N 88°45.889' W	-1: -2: -3: -4: -5: -6: -7: -8: -9: -10: -11:	Pillow basalt fragment with glass and thick Mn-coating. Pillow basalt fragment with patch of glass. Pillow basalt fragment, altered. aphyric. Pillow basalt fragment, altered, aphyric, no glass, >1 cm Mn crust. Pillow basalt fragment, altered, aphyric, no glass, >1 cm Mn crust. Pillow basalt fragment, altered, aphyric. Pillow basalt fragment similar to -1, Mn crust. 5 x 5 x 0.5 cm pillow rim, good glass. 5 x 5 cm pillow rim, good glass, 0.5 cm Mn crust. Same as -9. Same as -9.
DR 79	13.08.2001 on bottom: 23:13:00 h 2412.0 m 0°25.001' N 88°41.755' W off bottom: 00:15:00 h 2333.0 m 0°24.820' N 88°41.484' W	-1: -2:	30 x 40 cm pillow fragment, 5 mm thick Mn crust, 1 cm thick, altered glassy rim, ± fresh matrix, altered along cracks, dense, aphyric. 10 x 10 cm pillow fragment similar to -1.
DR 80	14.08.2001 on bottom: 05:27:30 h 1656.8 m 0°01.433' S 88°30.974' W off bottom: 06:18:00 h 1555.0 m 0°01.561' S 88°30.802' W	-1: -2: -3: -4: -5: -6:	50 x 30 cm pillow fragment, 5 mm thick MN crust. 40 x 50 cm pillow fragment, similar to -1. 20 x 30 cm pillow fragment, aphyric, Mn-encrusted. Pillow fragment, fresh inner core, aphyric, 10% vesicles 0.5 mm in diameter, unfilled, matrix appears fresh. 20 x 20 cm pillow fragment similar to -4, vesicles are filled in the 1 - 2 cm wide alteration halo. 40 x 30 cm pillow fragment, similar to -1to - 5.
DR 81	14.08.2001 on bottom: 13:42:00 h 2436.4 m 0°22.013' N 87°43.836' W off bottom: 15:12:54 h 2332.3 m 0°21.765' N 87°43.302' W		Not hard rock samples.

83 DR	15.08.2001 on bottom: 07:01:30 h 1428.9 m 0°18.901‘ S 88°23.270‘ W off bottom: 08:19:00 h 1213.8 m 0°19.139‘ S 88°22.935‘ W	-1: -2: -3: -4: -5: -6: -7: -8: -9: -10: -11:	20 x 10 cm basalt fragment, dense matrix, aphyric, strongly altered from brown to greenish brown, alteration halo 2 cm thick. 10 x 15 cm basalt fragment, similar to -1 but strongly altered through going light brown alteration, 5 mm thick Mn crust. 10 x 10 cm basalt fragment similar to -1, medium to strongly altered. 20 x 30 cm angular basalt fragment, strongly altered, fresh inner core (3 cm in diameter). 20 x 20 cm pillow fragment, similar material as -1, but few pieces of fresh glass. Pillow fragment similar to -5 but strongly altered matrix. Pillow fragment, same as -5, few fresh glass. Pillow fragment, similar to -5, little fresh glass. Pillow fragment, similar to -5. Same as -9. Same as -9.
DR 84	15.08.2001 on bottom: 13:04:20 h 1780.0 m 0°22.503‘ S 87°49.520‘ W off bottom: 14:13:30 h 1639.8 m 0°22.792‘ S 87°49.173‘ W	-1: -2: -3: -4: -5:	Large pillow basalt fragment, vesicular, Mn-encrusted, includes sediment with glass. Pillow basalt fragment with both aphyric and plag-phyric regions,, Mn-encrusted. Aphyric pillow basalt fragment. Aphyric pillow basalt fragment. Pillow basalt fragment, vesicular, Mn-encrusted.
DR 85	15.08.2001 on bottom: 18:23:00 h 1384.2 m 0°21.240‘ S 87°40.799‘ W off bottom: 19:38:00 h 1411.0 m 0°21.230‘ S 87°40.830‘ W	-1:	~50 kg Mn-encrusted volcaniclastic sediment containing pumice fragments up to 5 cm in diameter, basalt fragments up to 1 cm in diameter, glass (completely palagonized), other highly altered material and shells or brachiopoda; up to 1 cm thick Mn crust.
DR 85a	15.08.2001 on bottom: 21:10:27 h 1421.0 m 0°20.104‘ S 87°39.710‘ W off bottom: 22:06:33 h 1316.0 m 0°20.318‘ S 87°39.531‘ W	-1:	Volcaniclastic sediment, green with milky white porphyroclasts, may be zeolite or amorpheous silica?
DR 86	16.08.2001 on bottom: 02:35:00 h 1778.5 m 0°35.152‘ S 87°31.131‘ W off bottom: 03:59:30 h 1661.2 m 0°35.415‘ S 87°30.804‘ W	-1: -2: -3: -4: -5:	40 x 30 cm Mn-encrusted volcanic breccia, basalt clasts are light grey, dense, 5% vesicles, mostly fresh, 2 cm thick Mn crust. One small glass fragment extracted for analysis. 50 x 40 cm Mn-encrusted volcanic breccia, basalt clasts are angular, 10% unfilled vesicles, slightly altered volcaniclastic, yellow-green matrix consisting of pumice-like particles. Mn-encrusted basalt clasts, strongly altered with 3 cm thick halo, aphyric basalt, dense. Mn-encrusted volcaniclastic sediment, 3 cm thick Mn crust. 10 x 5 cm piece of volcaniclastic sediment.

DR 86 (continued)		-6:	10 x 10 cm piece of yellow green volcaniclastic sediment with pumice clasts (2 – 3 cm in size).
		-7:	10 x 20 cm piece similar to -6, 1.5 cm thick Mn crust.
		-8:	30 x 10 cm piece similar to -6, 2.5 cm thick Mn crust.
		-9:	30 x 30 cm piece similar to -6, 3 cm thick Mn crust.
		-10:	10 x 10 cm piece similar to -6, 2.5 cm thick Mn crust.
		-11:	Mn-plate consisting of 3 cm thick Mn and encrusting basaltic material.
		-12:	Plate of basalt breccia (~1 m in diameter) encrusted with 3 cm Mn.
		-13:	Mn-nodule (?), 3 cm in diameter.
		-14:	8 x 8 cm Mn-encrusted volcaniclastic sediment.
		-15:	30 x 30 cm aphyric basalt clast.
		-16:	10 x 10 cm Mn-encrusted volcaniclastic sediment.
DR 87	16.08.2001	-1:	Mn-encrusted yellow-brown sediment, coarse-grained clasts (several mm in diameter), layering visible, unclear origin.
	on bottom: 09:07:00 h		
	1153.1 m		
	1°05.461‘ S	-2:	10 x 8 cm cobble, yellow-brown but no Mn crust.
	87°30.196‘ W	-3:	Same as -1.
	off bottom: 10:24:00 h	-4:	Same as -1 with 2 cm cavity and mineralization (?).
	969.5 m	-5:	Similar to -1.
	1°05.806‘ S		
	87°29.936‘ W		

APPENDIX IV: SEDIMENT DESCRIPTIONS

Colors given in the sediment description are according to TGL 34329. For station locations see Appendices III and V.

Abbreviations:

DR: Chain bag dredge

TVG: TV-grab

KG: Box corer

Station	Sediment description
DR 11	Clay with high water content, brown, containing foraminifera (mostly Globigerina) in grain size 0.2 – 0.63 mm. Color: „dunkelbraungrau 451 DBG“.
DR 13	Clay with high water content, brown, containing foraminifera (mostly Globigerina) in grain size 0.063 – 0.2 mm. Colors: „dunkelbraun 45 DB“ and „schwarzbraun 55 SB“.
DR 16	Clay with high water content, brown, containing foraminifera (mostly Globigerina) in grain size 0.063 – 0.2 mm. Colors: „dunkelbraungrau 451 DBG“ and „braungrau 351 MBG“. Few pieces of glass and basalt.
TVG 20a	No intact sedimentary profile. Uppermost sediments may be missing. Top part: ca. 15 cm clay, brown, containing foraminifera (mostly Globigerina) up to 0.63 mm grain size. Uppermost 5 cm very high water content. Color: „schwarzbraungrau 551 SBG“. 4 up to 8 cm clay, pale yellow-grey, containing foraminifera (mostly Globigerina) up to 0.63 mm grain size, bioturbation. Color: „hellbraungrau 251 HBG“. Lower part: clay, grey with greenish and brownish parts, containing foraminifera (mostly Globigerina) up to 0.63 mm grain size, bioturbation. Colors: „hellolivgrau 221 HLG“ and „grüngrau 3∅1 MNG“.
KG 20c	Top part: ca. 20 cm clay, brown, containing foraminifera (mostly Globigerina) up to 0.63 mm grain size. Color: „schwarzbraungrau 551 SBG“. 4 cm clay, pale yellow-grey, containing foraminifera (mostly Globigerina) up to 0.63 mm grain size, bioturbation. Color: „hellbraungrau 251 HBG“. Lower part: clay, grey with greenish and brownish parts, containing foraminifera (mostly Globigerina) up to 0.63 mm grain size, bioturbation. Colors: „hellolivgrau 221 HLG“ and „grüngrau 3∅1 MNG“.
DR 25a	Clay, silty, pale greenish-grey, containing foraminifera (mostly Globigerina) up to 0.63 mm grain size. Few pieces of glass. Color: mixture „hellolivgrau 221 HLG“ and „weißolivgrau 121 WLG.“
DR 28	Clay, silty, pale greenish-grey, containing foraminifera (mostly Globigerina) up to 0.63 mm grain size. Few pieces of glass. Color: mixture „hellolivgrau 221 HLG“ and „weißolivgrau 121 WLG.“
DR 39	Sediment, brown, grain size 0.2- 0.63 mm, consisting of foraminifera, (intact shells and fragments), mostly Globigerina. Few pieces of glass and basalt (0.063 – 0.2 mm), basalt covered with manganese. Color: „dunkelbraungrau 451 DBG“.
DR 41a	Sediment, dark grey, grain size 0.2- 0.63 mm, consisting of shells, (intact shells and fragments), mostly foraminifera (Globigerina), few up to 1 cm fragments of bivalves. Few round pieces of basalt and altered glass. Color: „schwarzolivgrau 521 SLG“.

DR 41b	Sediment from inside a big pillow basalt: Clay, silty, yellow and light yellow. Few foraminifera (Globingerina). Very few pieces of glass and basalt. Colors: „weißocker 1.4 W.K“ and „dunkelocker 4.4 D.K“.
TVG 44a	No intact sedimentary profile. Clay, light grey to light greenish grey and brown, foraminifera. Brown clay probably from the sediment surface. Color: „weißgrauoliv 112 WGL“ and „hellgrauoliv 212 HGL“. Included layers: volcanoclastic material, especial glass (ca. 2 – 4 cm thick). up to 5 cm thick layer of clay, light grey to dark grey, high water content.
KG 44c	Sedimentary profile without surface. Top part: 6 cm clay, dark brown, shell fragments and shells of foraminifera. volcanoclastic material, especial glass. Color: „schwarzbraungrau 551 SBG“. 6 cm clay, mixed colors dark brown and grey, foraminifera, glass. Highly bioturbated. Colors: „schwarzbraungrau 551 SBG“ and „dunkelbraungrau 351 MBG“. Lower part: clay, light greenish grey. Bioturbation. Colors: „hellolivgrau 221 HLG“, „hellgrüngrauen 2∅1 HNG“ „weißgrüngrau 1∅1 WNG“.
DR 47	Sediment, brown, consisting of shells and shell fragments in grain size 0.063 to 0.63 mm. Mostly foraminifera (mostly Globigerina, many intact shells) partly covered with Mn, including glass fragments. Color: „dunkelbraungrau 451 DBG“.
DR 47a	-Sediment, light grey, dominate grain size between 0.2 bis 0.63 mm. Mostly foraminifera (Globigerina dominate), shells and shell fragments, partly encrusted with Mn. Many glass fragments, very few basalt fragments. Color: „hellolivgrau 221 HLG“. -Sediment, brownish, grain size 0.063 – 0.63 mm, formed mostly by foraminifera, very few glass and basalt fragments. Color variing between „dunkelocker 4.4 D.K“ and „braungrau 351 MBG“. -Clay, light grey, grain size up to 0.2 mm, containing foraminifera (mostly Globigerina), few glass and basalt fragments. Color: „hellgrauoliv 212 HGL“.
DR 58a	Sediment with dominate grain size 0.063 – 0.63 mm consisting of foraminifera, (mostly Globigerina), partly Mn encrusted. Little clay. Few fragments of glass and basalt.Color: „braungrau (bräunlichgrau) 351 MBG“.
TVG 67a	Disturbed sedimentary profile. Surface sediments: brown clay with abundant foraminifera in grain size 0.063 - 0.63 mm, mostly intact shells. Few glass fragments. Color: „dunkelbraungrau 451 DBG“. Light grey clay with abundant foraminifera in grain size up to 0.63 mm, mostly intact shells. Color: „hellgrauoliv 212 HGL“.
KG 67c	No sediments.
DR 72	Clay, brown, with abundant shells and shell fragments of foraminifera, partly Mn encrusted. Glass and basalt fragments. Color: „dunkelbraungrau 451 DBG“.
DR 72a	Clay, white, some coarser particles 0.063 – 0.2 mm: glass fragments, few basalt fragments and foraminifera, mostly fragments. Colors: „weiß 1.1 W.G“ and „weißbraungrau 151 WBG“.
DR 73	Clay, brown, some coarser particles 0.063 – 0.63 mm: foraminifera (mostly Globigerina intact shells dominant), few fragments of glass and basalt (0.063 – 0.63 mm). Color: „braungrau 351 MBG“.
TVG 75a	Sediment, light grey, with dominate grain size 0.063 – 0.63 mm consisting of foraminifera, (mostly Globigerina, intact shells dominant), larger (up to1 cm) shell fragments not exactly to identify. Few fragments of glass and basalt. Color: „hellolivgrau 221 HLG“.
KG 75c	no sediments.
DR 78	Clay, dark brown, with abundant foraminifera in grain size 0.2 – 0.63 mm: mostly intact shells of Globigerina. Few fragments of glass and basalt 0.063 – 0.63 mm. Color: „dunkelbraungrau 451 DBG“.

DR 79	Clay, with abundant foraminifera , mostly intact shells of Globigerina, some encrusted with Mn. Few fragments of glass and basalt.
DR 80	Sediment, brown grey, with dominate grain size 0.063 – 0.2 mm consisting of foraminifera, (mostly Globigerina, intact shells dominant). Few fragments of glass and basalt 0.063 – 0.63 mm. Color: „braungrau 351 MBG“.
DR 81	Clay, dark grey and light grey, few foraminifera (mostly Globigerina), very few fragments of glass and basalt. Colors: „schwarzbraungrau 551 SBG“, „dunkelbraungrau 451 DBG“ and „weißgrauoliv 112 WGL“.
TVG 82a	Surface sediments: Clay, dark grey, with few foraminifera up to 0.63 mm. Color: „schwarzolivgrau 521 SGL“. Clay, greenish grey, with foraminifera up to 0.63 mm. Bioturbation. Colors: „weißgrauoliv112 WGL“, „hellgrauoliv 212 HGL“ and „graugrün 31∅ MGN“.
KG 82c	Surface sediments: 5 cm of clay, dark grey, color: „schwarzolivgrau 521 SLG“. 5 – 7 cm of clay, dark brown, containing foraminifera up to 0.63 mm, bioturbation. Colors: „schwarzbraungrau 551 SBG“ and „braungrauen 351 MBG“. Ca. 4 cm of clay, light brown, containing foraminifera up to 0.2 mm. Color: „hellbraungrau 251 HBG“. Clay, greenish grey, with foraminifera up to 0.63 mm. Bioturbation. Colors: „weißgrauoliv112 WGL“, „hellgrauoliv 212 HGL“ and „graugrün 31∅ MGN“.
DR 84	Sediment from inside a pillow basalt. Sediment, white, consisting of foraminifera (mostly Globigerina) in grain size 0.063 -0.2 mm. Color: „weißgrau 1.1 W.G“.
DR 85	Sediment, white to light grey, consisting of foraminifera (mostly Globigerina) of grain size 0.2 – 0.63 mm. Very few fragments of glass and basalt. Color: „weißgrauoliv 112 WGL“.
DR 86	Sediment, white to light greenish grey, consisting of foraminifera (mostly Globigerina) of grain size 0.2 – 0.63 mm. Very few fragments of glass and basalt. Colors: „weißgrauoliv 112 WGL“ and „hellolivgrau 121 HLG“.

APPENDIX V: STATION LOCATIONS AND BIOLOGICAL SAMPLE DESCRIPTIONS

Please notice that only successful biological stations are listed in the following.

Abbreviations:

Taxonomic identifications:

BRA :	Brachiopoda
BRY:	Bryozoa
CNI:	Cnidaria
CRU:	Crustacea
DIV:	various organisms and structures preserved together
ECH:	Echinodermata
MOL:	Mollusca
PANT:	Pantopoda
POL:	Polychaeta
POR:	Porifera
12 *:	number of meiofaunal organisms sorted on board (number without asterisk = specimens counted but not sorted)
PROT:	Protozoa
SIP:	Sipunculida
ball:	ball-like organism/colony
basis:	basis of destroyed epibenthic organism
disk:	disk-like organism/colony
keratoid:	keratoid trumpet-like tube
tube:	other dwelling tubes
???:	unidentified organism/structure

Vessels for preserved organisms:

Nunc:	2 ml screw top cryo-cup
K 50, 100, etc:	50 ml (100 etc. ml) Kautex bottles

Dredge Station characteristic:

GSC:	Galápagos spreading center
KG:	box corer
MDR:	meiofauna dredge
SM :	seamount
TVG:	TV-grab

Video Print:

VP:	number of video print made of this organism

Station, Location	Date (UTC) Time (UTC) Depth Coordinates	Biological Samples
DR 02 ***SM***	27.07.2001 on bottom: 05:30:00 h 2840.0 m 0°45.000‘ N 85°19.970‘ W off bottom: 06:35:00 h 2650.9 m 0°44.647‘ N 85°20.573‘ W	***Hard rocks*** (1) Nunc ***POR***: 2 Porifera ***VP 01, VP 02*** (1) Nunc ***MOL***: Polyplacophora (1) ***VP 03*** ***Sediment***
DR 03 ***GSC***	28.07.2001 on bottom: 12:20:00 h 2458.0 m 0°46.503‘ N 86°2.009‘ W off bottom: 13:01:00 h 2397.0 m 0°46.260‘ N 86°2.012‘ W	***Hard rocks*** Nunc ***FOR***: Foraminifera ***VP 04*** ***Sediment***

DR 05 ***SM***	28.07.2001 on bottom: 19:24:00 h 2776.2 m 1°0.996' N 86°13.99' W off bottom: 20:48:00 h 2633.1 m 1°1.767' N 86°13.965' W	***no*** hard rocks, no macrofauna ***Sediment*** (attached to the dredge)
DR 06 ***GSC***	28.07.2001 on bottom: 01:17:18 h 2423.0 m 0°49.566' N 86°23.120' W off bottom: 20:45:30 h 2394.0 m 0°49.808' N 86°22.657' W	***Hard rocks*** (some) (1) Nunc ***BRY***: Bryozoa (2 types, one stalked, the other tree-like) ***VP 05a, VP05b*** (1) K 50: ***BRY*** numerous treelike colonies ***VP 06*** (1) Nunc ***BRA***: Brachiopoda (2 types), [Formalin fixation] (1) Nunc (***?***): white calcareous disk ***Sediment*** (very little)
DR 07 ***GSC***	29.07.2001 on bottom: 06:39:57 h 2415.0 m 0°50.920' N 86°36.697' W off bottom: 07:10:00 h 2365.0 m 0°50.683' N 86°36.501' W	***Hard rocks*** (few) Nunc ***PROT***: Foraminifera ***no*** sediment
DR 08 ***GSC***	29.07.2001 on bottom:10:42:45 h 2379.1 m 0°52.268' N 86°49.899' W off bottom: 11:46:30 h 2291.0 m 0°52.060' N 86°49.647' W	***Hard rocks*** (1) Nunc ***POR***: Porifera (1) Nunc ***BRA***: Formalin fixation (1) Nunc ***BRA*** (?): 2 Brachiopoda (Formalin fixation) (1) Nunc ***POL***: Polychaeta (tube only) (1) Nunc (***?***): egg-like structure (1) K 50 ***ECH*** ***no*** sediment
DR 09 ***GSC***	29.07.2001 on bottom:15:44:30 h 2432.8 m 0°52.672' N 87°8.143' W off bottom: 17:10:40 h 2311.0 m 0°53.127' N 87°7.547' W	***Hard rocks*** Nunc ***PROT***: Foraminifera ***no*** sediment
DR 10 ***GSC***	29.07.2001 on bottom: 21:58:02 h 2466.8 m 0°51.985' N 87°21.172' W off bottom: 23:12:19 h 2471.2 m 0°52.069' N 87°20.411' W	***Hard rocks*** (many) tiny epibenthic organisms (Foraminifera, polychaete tubes, etc.) impossible to collect from rock surface; in addition: (1) Nunc ***PROT***: Foraminifera (1) Nunc ***POR***: 1 ball-like, 1 membraneous ***VP 07*** (1) Nunc ***BRA***: (Formalin fixation) ***Sediment*** (some)

DR 11 ***GSC***	29.07.2001 on bottom: 03:44:00 h 2267.5 m 0°46.182‘ N 87°2.801‘ W off bottom: 04:30:20 h 2181.6 m 0°45.902‘ N 87°2.647‘ W	***Hard rocks*** Nunc ***PROT***: Foraminifera ***Sediment*** (some)
DR12 ***GSC***	30.07.2001 on bottom: 06:38:40 h 2228.7 m 0°45.897‘ N 87°7.597‘ W off bottom: 07:11:00 h 2174.4 m 0°45.658‘ N 87°7.485‘ W	***no*** hard rocks, no macrofauna ***Sediment*** (some)
DR 13 ***GSC***	30.07.2001 on bottom: 10:21:45 h 2239.8 m 0°42.201‘ N 87°19.555‘ W off bottom: 11:17:00 h 2198.7 m 0°41.951‘ N 87°19.227‘ W	***Hard rocks*** (some) _ few epifaunal specimens (1) Nunc ***PROT:*** Foraminifera (1) Nunc ***POR***: 2 *Sycon*-like sponge (1) Nunc ***POL***: tubes, one with annelid ***VP 08*** (1) Nunc ***CRU***: leg of a crustacean ***Sediment*** (some) - Foraminifera: many - Copepoda: 2* - Nematoda 27* - Sipunculida 2* - Desmoscolecida 6*
DR 14 ***GSC***	30.07.2001 on bottom: 14:14:31 h 2282.0 m 0°41.874‘ N 87°27.457‘ W off bottom: 14:53:10 h 2224.5 m 0°41.528‘ N 87°27.212‘ W	***Hard rocks*** (some) (1) Nunc ***POR***: 2 Porifera *Sycon*-like (1) Nunc ***BRA***: ETOH fixed (as always from here on)(VP 07) (1) Nun ***BRY***: Bryozoa (1) (VP 08) (1) Nunc ***POL***: 2 dwelling tubes (*Spirorbis*-like) ***no*** sediment
DR 15 ***GSC***	30.07.2001 on bottom: 17:49:00 h 2094.2 m 0°40.644‘ N 87°38.008‘ W off bottom: 18:29:22 h 2111.0 m 0°40.671‘ N 87°37.632‘ W	***Hard rock*** (single) _ ***no*** epifauna ***Sediment*** (some) - Foraminifera: many - Nematoda 66 - Polychaeta 1 - Copepoda 7 - Isopoda 1 - Tunicata (?) 1
DR 16 ***GSC***	30.07.2001 on bottom: 00:11:24 h 2197.2 m 0°43.529‘ N 87°48.277‘ W off bottom: 01:07:14 h 2115.6 m 0°43.208‘ N 87°48.293‘ W	***Hard rocks*** ***no*** epifauna ***Sediment*** - Foraminifera: many - Copepoda 8 - Nematoda 100 - Tardigrada 1 - worm-like 1

DR 17 ***GSC***	31.7.2001 on bottom: 04:07:00 h 2173.6 m 0°43.305‘ N 87°58.311‘ W off bottom: 05:26:16 h 2134.0 m 0°43.035‘ N 87°57,812‘ W	***Hard rocks*** (many) _ few epifaunal specimens Nunc ***BRY***: flat bryozoan colony ***Sediment*** (some) - Foraminifera: many - Copepoda 2 - Nematoda 25 - Polychaeta 1
DR 18 ***GSC***	31.7.2001 on bottom: 08:28:00 h 2127.4 m 0°44.257‘ N 87°8.427‘ W off bottom: 09:26:30 h 2096.8m 0°44.223‘ N 87°7,970‘ W	***Hard rocks*** (some) (1) Nunc ***POR***: 1 „*onion*-sponge“ (-): Foraminifera and small polychaete tubes on rock surface ***Sediment*** (additional sediment between rocks) - Foraminifera: many - Copepoda 5 - Nematoda 35 - Sipunculida 2 - Polychaeta 3 - Bryozoa 1
DR 19 ***GSC***	31.7.2001 on bottom: 12:29:00 h 1970.0 m 0°45.075‘ N 87°19.892‘ W off bottom: 13:14:30 h 1924.0m 0°45.214‘ N 87°19,622‘ W	***Hard rocks*** (few) ***no*** epifauna ***Sediment*** - Foraminifera: many - Copepoda 8 - Nematoda 65 - Polychaeta 1 - Bryozoa (?) 1
TVG 20a	31.07.2001 on bottom: 16:47:00 h 2500,6m 0°57,273‘ N 88°18,776‘ W on deck: 18:53:13 h 0 m 0°57.307‘ N 88°16,360‘ W	***Sediment*** (upper sediment lost during heaving) ***VP 11 a-c*** - Foraminifera: many - Nematoda 290 + 103* - Desmoscolecida 15* - Polychaeta 3 - Oligochaeta 1* - Sipunculida 1* - Copepoda 30* - parasitic Copepoda (?) 1* - Ostracoda 3* - Tardigrada 7*
MDR 20b	31.07.2001 on bottom: 20:20:00 h 2493,0 m 0°57,277‘ N 88°18,463‘ W off bottom: 20:43:03 h 2.496,0 m 0°57.285‘ N 88°18,307‘ W	***Sediment*** - Foraminifera: many - Nematoda 600 - Oligochaeta 6 - Polychaeta 10 - Copepoda 34 - Ostracoda 1 - additional Crustacea 2 - Bivalvia 3
KG 20c	31.07.2001 on bottom: 23:21:40 h 2491,3 m 0°57,274‘ N 88°18,448‘ W on deck: 00:12:41 h 0°57.273‘ N 88°18,451‘ W	***Sediment*** - Foraminifera: many - Nematoda: many - Polychaeta 10* - Sipunculida 1* - Copepoda 51* - Ostracoda 1* - Tardigrada 4*

DR 21 ***GSC***	01.8.2001 on bottom: 03:21:00 h 1997.7 m 0°44.995‘ N 88°28.338‘ W off bottom: 04:28:00 h 1919.0m 0°44.662‘ N 88°28,352‘ W	***Hard rocks*** (few) _ few epifaunal specimens (1) Nunc ***POR***: 3 pieces of slimy sponge (1) Nunc ***BRY***: 2 tiny pieces of Bryozoa ***no*** sediment
DR 22 ***GSC***	01.08.2001 on bottom: 07:18:30 h 1838.0 m 0°45.522‘ N 88°37.952‘ W off bottom: 08:27:00 h 1850.4m 0°45.650‘ N 88°37,448‘ W	***Hard rocks*** (many) _ few epifaunal specimens (1) Nunc ***PROT***: Foraminifera (1) K 50 ***POR***: flat Porifera (1) Nunc ***BRY***: 1 tree-like and 1disk-like Bryozoan (1) Nunc ***POL***: pieces of tubes from Polychaeta ***no*** sediment
DR 25 ***GSC***	01.08.2001 on bottom: 19:51:18 h 1753.3 m 0°47.947‘ N 89°7.526‘ W off bottom: 20:32:50 h 1761.7 m 0°48.131‘ N 89°7,282‘ W	***Hard rock*** (single) _ no epifauna Plastic box ***ECH***: 1 damaged sea star from chain sack (soft) ***no*** sediment
DR 25a ***GSC***	01.08.2001 on bottom: 22:22:53 h 1779.9 m 0°48.565‘ N 89°9.644‘ W off bottom: 23:15:00 h 1722.0 m 0°48.276‘ N 89°9,459‘ W	***Hard rocks*** (many) _ some epifauna Nunc ***CRU***: 1 crustacean ***VP 12, VP 13 a-c*** ***Sediment***
DR 26 ***GSC***	02.08.2001 on bottom: 02:01:00 h 1703.9 m 0°47.403‘ N 89°20.503‘ W off bottom: 03:17.00 h 1699.0 m 0°47.394‘ N 89°20,118‘ W	***Hard rocks*** (many) _ very few epifaunal specimens Nunc (***???***): pieces, cut from dark-brown, resin-like material on one of the hard rocks (2x3x0,5cm) ***no*** sediment
DR 27 ***GSC***	02.08.2001 on bottom: 05:45:00 h 1708.1 m 0°47.760‘ N 89°27.101‘ W off bottom: 06:28:30 h 1675.3 m 0°47.827‘ N 89°26,821‘ W	***Hard rock*** (single) Nunc ***PROT***: Foraminifera ***no*** sediment

DR 28	02.08.2001	***Hard rocks*** (many) _ some epifauna
	on bottom: 12:58:00 h	(1) Nunc ***POR***: 1 glass sponge ***VP 16***
SM	1767.4 m	(1) Nunc ***POR***: 1 spherical and 2 membraneous Porifera
	0°47.759' N	(1) Nunc ***BRY***: stalked Bryozoan colony
	89°31.952' W	(1) Nunc ***POL***: 1 polychaete in its tube ***VP 14***
	off bottom: 13:43:00 h	(1) Nunc ***POL***: polychaete tubes, one with annelid ***VP 15***
	1681,7 m	
	0°47.529' N	***Sediment*** (ca. 100 g)
	89°31,987' W	- Foraminifera: many
		- Nematoda 24
		- Polychaeta 2
		- Copepoda 3
DR 30	02.08.2001	***Hard rocks*** (few)
	on bottom: 22:22:10 h	(1) Nunc ***???***: white calcareous ball
SM	1708.9 m	(1) Nunc ***POR***
	0°39.951' N	(1) Nunc ***POL*** (?): see video
	89°39.698' W	(1) Nunc ***BRA***
	off bottom: 00:09:10 h	(1) K 100 ***ECH***: 1 crinoid, +/- complete
	1612.1 m	(1) K 100 ***ECH***: crinoid in pieces ***VP 17***
	0°39.345' N	
	89°39,536' W	***no*** sediment
DR 31	03.08.2001	***Hard rocks*** (single)
	on bottom: 02:36:30 h	(1) Nunc ***POR***: diverse sponges
GSC	1811.2 m	(1) Nunc ***POL***: tube pieces
	0°50.013' N	
	89°38.498' W	***Sediment*** (some)
	off bottom: 04:01:00 h	
	1647.0 m	
	0°49.651' N	
	89°38,455' W	
DR 33	03.08.2001	***Hard rocks***
	on bottom: 10:21:00 h	(1) Nunc (***???***): horny trumpet (VP1/So 144)
GSC	1754.8 m	(1) Nunc ***POR***: diverse sponges
	0°51.602' N	(1) Nunc ***CNI***: hydrozoan colonies ***VP 21, VP 23***
	89°57.086' W	(1) Nunc ***BRY VP 18- 20***
	off bottom: 11:27:00 h	(1) Nunc ***SIP***: ca. 12 mm ***VP 21, 22***
	1642.0 m	(1) Nunc ***CRU***: 1 *Caprella*, 1 barnacle
	0°51.504' N	(7) Nunc (***???***): brown Porifera-like mat, ***VP 25***
	89°56,849' W	(1) K 50 ***SIP*** (?): ca. 10 cm long ***VP 24***
		(1) K 100 ***ECH***: 1 crinoid climbing on a „tree"
		(10) K1000 ***POR*** (?): white rods
		(11) K 50 ***POR*** (?): small part of white rod ***VP 26-31***
		no sediment
DR 36	03.08.2001	***Hard rocks*** _ some epifauna, not collected
	on bottom: 22:50:00 h	
GSC	1557.0 m	***Sediment*** (_ of a tube)
	0°56.261' N	- Nematoda 12*
	90°29.784' W	- Desmoscolecida 1*
	off bottom: 19:58:00 h	- Polychaeta 1*
	1591.2m	- Copepoda 1*
	0°54.502' N	
	90°17.010' W	

DR 37 ***GSC***	04.08.2001 on bottom: 02:24:00 h 1500.7 m 0°58.888‘ N 90°34.501‘ W off bottom: 03:32:30 h 1482.3m 0°58.783‘ N 90°34.158‘ W	***Hard rocks*** _ some epifauna (1) Nunc ***PROT***: Foraminifera ***VP 39*** (1) Nunc ***POR***: Porifera ***VP 35*** (1) Nunc ***POR***: column-like sponge ***VP 36*** (1) Nunc ***MOL***: 1 bivalve ***VP 32*** (1) Nunc ***POL***: *Spirorbis*-like polychaete tube ***VP 38*** (1) Nunc ***BRY***: ***VP 37*** (1) Nunc ***keratoid***: keratoid tubes (2 cm x 1mm thick) (1) K 100 ***POR***: Porifera on piece of rock (1) K 50 ***POL***: polychaete in its dwelling tube ***VP 33*** (10) K 50 ***VERT*** (?): fish embryoes (?) ***VP 34*** ***no*** sediment
DR 38 ***GSC***	04.08.2001 on bottom: 06:10:30 h 1716.9 m 1°2.467‘ N 90°43.911‘ W off bottom: 06:56:30 h 1669.2 m 1°2.355‘ N 90°43,676‘ W	***Hard rocks*** (some) _ few epifaunal specimens Nunc ***POR***: 1 glass sponge (as VP 16) ***no*** sediment
DR 39 ***GSC***	04.08.2001 on bottom: 10:15:00 h 1685.2 m 1°0.680‘ N 90°51.775‘ W off bottom: 11:08:00 h 1599.1m 1°0.543‘ N 90°51.533‘ W	***Hard rocks*** (single) _ few epifaunal specimens K 50 ***CNI***: hydrozoan colony ***VP 40*** ***Sediment*** (_ of a tube) - Foraminifera: many - Copepoda: 1* - Nematoda 18* - Desmoscolecida 3*
DR 39a ***GSC***	04.08.2001 on bottom: 12:40:30 h 1587.3 m 0°59.096‘ N 90°50.943‘ W off bottom: 14:22:00 h 1532.6 m 0°58.773‘ N 90°50.631‘ W	***Hard rocks*** (few) Nunc ***PROT***: Foraminifera ***Sediment*** (_ of a tube)
DR 40 ***GSC***	04.08.2001 on bottom:17:41:00 h 2003.0 m 1°01.070‘ N 90°58.995‘ W off bottom: 19:14:00 h 1850.0 m 1°01.019‘ N 90°58.997‘ W	***Hard rocks*** (some) _ few epifaunal specimens (1) Nunc ***POR*** (?): ***VP 44*** (1) Nunc ***POR*** (?): various basis (1) Nunc ***BRA***: 5 brachiopods (fixation in ETOH) (1) Nunc ***BRA***: formalin fixation (1) K 50 ***POR***: various sponges (1) K 50 ***CNI*** (1) K 50 ***BRY***: ***VP 42, VP 43*** ***Sediment*** (_ of a tube)
DR 41 ***SM***	04.08.2001 on bottom: 22:46:00 h 455.9 m 1°14.202‘ N 91°07.289‘ W off bottom: 23:20:29 h 434.1 m 1°14.433‘ N 91°07.178‘ W	***Hard rock*** (single) (1) Nunc (***???***): white structure from rock (1) Nunc ***POL***: hind part of a polychaete (1) K100 ***ECH***: arm of bristle star ***Sediment*** - Nematoda 44* - Desmoscolecida 2* - Polychaeta 2*

DR 41 (cont.)		- Oligochaeta 1* - Copepoda 8*
DR 41a ***SM***	04.08.2001 on bottom: 00:10:44 h 410.2 m 1°14.100' N 91°07.103' W off bottom: 01:19:20 h 310.2 m 1°14.029' N 91°06.959' W	***Hard rocks*** (few) _ rich epifauna (1) Nunc: schill from polychaete dwelling tube ***VP 45*** (1) Nunc: as above (1) K 50 ***MOL***: shell from a bivalve (1) K 50 ***CNI***: sea anemone (see macro-photography) (1) K 50 ***POL***: ***VP 46*** (1) K100 ***POL***: larger polychaetes (1) K200 ***ECH***: sea urchin from chain sack ***Sediment*** ($^1/_3$ of a tube of coarse sediment) - Foraminifera: many - Nematoda 23* - Desmoscolecida 4* - Epsilonematidae 15* - Plathelminthes 1* - Gastrotricha 8* - Gastropoda 1* - Polychaeta 5* - Copepoda 9*
DR 41b ***SM***	05.08.2001 on bottom: 02:25:00 h 633.2 m 1°15.105' N 91°07.919 W off bottom: 03:40:00 h 553.2 m 1°14.956' N 91°07.670' W	***Hard rocks*** (few) _ very rich epifauna (1) Nunc (***???***): (1) Nunc ***PROT***: Foraminifera (1) Nunc ***CNI***: ***VP 48-49*** (1) Nunc ***CNI***: ***VP 52-54*** (1) Nunc ***MOL***: Polyplacophora (1) Nunc ***MOL***: Gastropoda: *Fissurella*-like (1) Nunc ***MOL***: Bivalvia ***VP 47*** (1) Nunc ***BRY*** (1) K 50 ***POR***: slimy sponges (1) K 50 ***POR***: solid sponges (1) K 50 ***CNI***: coral-like (1) K 50 ***CNI***: fan-like ***VP 50, 51*** (10) K 50 ***POL***: various polychaetes (11) K 50 ***CRU***: various crustaceans (12) K 50 ***ECH***: sea star, pieces of bristle star (13) K100 ***POR***: soft (membraneous) sponges (14) K200 ***stone***: stone with epifauna (15) K1000 round: ***CNI***: Gorgonian-like colony (body wall full of crystalline sklerites ***VP 52-54***) ***no*** sediment
DR 42 ***SM***	05.08.2001 on bottom: 06:49:30 h 1873.0 m 1°16.833' N 90°57.178' W off bottom: 07:59:00 h 1772.4 m 1°16.818' N 90°56.760' W	***Hard rock*** (single) _ no epifauna ***Sediment*** (some) - Foraminifera: many - Nematoda 86* - Desmoscolecida 18* - Plathelminthes 3* - Loricifera (?) 3* - Polychaeta 4* - Oligochaeta 4* - Copepoda 22* - Ostracoda 1* - Crustacea 1* (1) K 50 ***ECHIURIDA (?):*** from sediment ***VP 72, VP 73***

DR 43 ***SM***	05.08.2001 on bottom: 11:45:30 h 3302.4 m 1°38.900‘ N 90°49.436‘ W off bottom: 14:05:20 h 3192.1 m 1°38.519‘ N 90°49.134‘ W	***Hard rocks*** few epifaunal specimens (1) Nunc ***tubes*** keratoid tube (see Sonne 144-3, VP 01) (1) Nunc ***POL***: two damaged polychaetes ***no*** sediment
TVG **44a**	05.08.2001 on bottom: 19:00 h 3448,1 m 1°36.90‘ N 90°49.71‘ W grab: 19:43 h 3495,0 m 1°36.86‘ N 90°49.57‘ W	***Sediment*** (macrofauna) (1) Nunc ***tubes***: extremely thin tubes (1) K 50 ***tubes***: dwelling tubes (1) K 50 (***???***): slimy 1x1x3cm body, yellowish, damaged ***Sediment*** (meiofauna)
MDR **44b**	05.08.2001 on bottom: 22:33 h 3506 m 1°36.98‘ N 90°49.60‘ W off bottom: 22:51 h 3506,0 m 1°36.94‘ N 90°49.60‘ W	***Sediment*** - Foraminifera: many - Nematoda: many - Nematoda (long tail) 12* - Desmoscolecida 96* - Kinorhyncha 4 * - Polychaeta 8* - Sipunculida 1* - Copepoda 185* - Ostracoda 6* - additional Crustacea 8* - Tardigrada 13*
KG 44c	05.08.2001 on bottom: 01:57 h 3446,7 m 1°36.905‘ N 90°49.696‘ W on deck: 03:07 h 1°36.903‘ N 90°49.696‘ W	***Sediment***
DR 45 ***SM***	06.08.2001 on bottom: 06:48:30 h 2176.5 m 1°51.104‘ N 90°52.624‘ W off bottom: 07:54:00 h 2112.2 m 1°50.976‘ N 90°52.213‘ W	***no*** hard rocks, no macrofauna ***Sediment***
DR 46 ***SM***	06.08.2001 on bottom: 13:14:13 h 1859.0 m 1°39.472‘ N 91°16.191‘ W off bottom: 13:56:40 h 1791.0 m 1°39.198‘ N 91°16.078‘ W	***no*** hard rocks ***Sediment*** (macrofauna; _ of a tube) (1) Nunc ***ENT***: enteropneust ***VP 55*** ***Sediment*** (meiofauna)

DR 46a ***SM***	06.08.2001 on bottom: 16:12:20 h 2323.5 m 1°42.572' N 91°11.370' W off bottom: 17:34:10 h 2146.9 m 1°42.376' N 91°11.036' W	***Hard rocks*** (some) _ many small epifaunal specimens (1) Nunc: ***keratoid*** tube (see Sonne 144 VP 01) (1) Nunc (***eggs?***): egg masses ?, ***VP 57*** (1) Nunc ***balls***: brown balls (see Sonne 144 VP **) (1) Nunc ***tubes***: various dwelling tubes (1) Nunc ***POR*** (1) Nunc ***POR***: small sponges (1) Nunc ***POR***: ***VP 60*** (1) Nunc ***POL*** (1) Nunc ***POL*** (?): polychaete with its tube ***VP 58, VP59*** (10) Nunc ***BRY*** (11) Nunc ***BRA*** (12) K 50 ***POR***: Porifera ***no*** sediment
DR 47 ***SM***	06.08.2001 on bottom: 20:38:00 h 1552.4 m 1°53.000' N 91°16.500' W off bottom: 21:06:00 h 1558.7 m 1°52.850' N 91°16.370' W	***no*** hard rocks, ***redbrown material*** _ rich epifauna (1) Nunc ***keratoid*** keratoid tube (see Sonne 144 VP 01) (1) Nunc ***disk*** white disk (1) Nunc ***balls***: white balls (see Sonne 144 VP **) (1) Nunc ***POR:*** slimy (1) Nunc ***CNI + POL***: polychaete on hydrozoan (1) Nunc ***MOL:*** 1 gastropod (1) Nunc ***MOL:*** 1 bivalve (1) Nunc ***POL*** (1) Nunc ***CRU:*** 1 barnacle + 1 *Caprella*-like (as epifauna) (10) Nunc ***BRA***: 8 brachiopods (11) K 50 ***POR***: Porifera (12) K 50 ***POR***: colony on piece of stone (as VP 52) (13) K 50 ***CNI*** (14) K 50 ***BRY*** (15) K 50 ***BRA***: empty shell (formalin fixation) (16) K 50 ***DIV*** (17) K 50 ***ECH*** ***Sediment*** (some)
DR 47a ***SM***	06.08.2001 on bottom: 22:26:00 h 1663.0 m 1°53.304' N 91°16.902' W off bottom: 23:10:00 h 1543.0 m 1°53.187' N 91°16.743' W	***Hard rocks*** (some, fragile) _ few epifaunal specimens (1) Nunc: ***BRY*** (1) Nunc (***???***): transparent long and thin tubes ***Sediment*** (1 _ tubes)
DR 48 ***GSC***	07.08.2001 on bottom: 01:15:00 h 1593.8 m 1°56.010' N 91°20.399' W off bottom: 02:34:00 h 1575.3 m 1°56.091' N 91°20.045' W	***Hard rocks*** (many) _ very few epifaunal specimens Nunc ***CRU***: 1 barnacle ***no*** sediment
DR 49 ***GSC***	07.08.2001 on bottom: 06:26:00 h 1786.3 m 2°03.390' N 91°41.311' W off bottom: 07:32:30 h	***Hard rocks*** (many) _ few epifaunal specimens (1) Nunc ***tubes:*** transparent tube ***VP 62*** (1) Nunc ***PROT***: Foraminifera on empty dwelling tubes (1) Nunc ***POL***: one polychaete (1) Nunc ***BRA***

DR 49 (cont.)	1799.7 m 2°03.594‘ N 91°40.895‘ W	***no*** sediment
DR 50 ***SM***	07.08.2001 on bottom: 10:49:00 h 2317.8 m 1°52.324‘ N 91°42.172‘ W off bottom: 12:03:00 h 2110.3 m 1°52.269‘ N 91°41.853‘ W	***Hard rocks*** (some) _ few epifaunal specimens (1) Nunc ***tubes:*** various small tubes from hard rocks (1) Nunc ***MOL***: one bivalve (in ETOH) (1) Nunc ***BRY*** ***Sediment*** (1 tube)
DR 51 ***SM***	07.08.2001 on bottom: 14:20:00 h 1938.0 m 1°52.806‘ N 91°45.821‘ W off bottom: 15:35:00 h 1820.0 m 1°52.600‘ N 91°45.448‘ W	***no*** hard rocks, no macrofauna ***Sediment*** (some)
DR 52 ***SM***	07.08.2001 on bottom: 17:55:40 h 1959.4 m 1°57.104‘ N 91°49.110‘ W off bottom: 18:51:20 h 1707.5 m 1°56.971‘ N 91°48.920‘ W	***no*** hard rocks, no macrofauna ***Sediment*** (some)
DR 53 ***GSC***	08.08.2001 on bottom: 00:33:00 h 1704.7 m 2°06.400‘ N 91°54.600‘ W off bottom: 01:58:30 h 1677.1 m 2°06.034‘ N 91°54.297‘ W	***Hard rocks*** (several) _ few epifaunal specimens (1) Nunc ***POR*** (1) Nunc ***CNI*** (?): ***VP 70*** (1) Nunc ***POL***: empty (?) dwelling tubes ***Sediment*** (2 tubes)
DR 55 ***SM***	08.08.2001 on bottom: 08:14:30 h 1911.4 m 2°02.829‘ N 92°07.628‘ W off bottom: 09:02:30 h 1882.9 m 2°02.704‘ N 92°07.368‘ W	***no*** hard rocks, no macrofauna ***Sediment*** (2 tubes)
DR 58 ***SM***	08.08.2001 on bottom: 18:12:00 h 2271.0 m 1°56.999‘ N 92°06.909‘ W off bottom: 18:58:00 h 2139.0 m 1°56.985‘ N 92°06.666‘ W	Glass from ***Hard rock*** Nunc ***BRY*** ***no*** sediment

DR 58a ***SM***	08.08.2001 on bottom: 20:29:00 h 2285.1 m 1°55.197‘ N 92°05.100‘ W off bottom: 23:04:00 h 2203.1 m 1°55.090‘ N 92°04.900‘ W	***no*** hard rocks, no macrofauna ***Sediment*** (1 _ tubes)
DR 58b ***SM***	09.08.2001 on bottom: 00:59:00 h 2350.8 m 1°56.003‘ N 92°04.799‘ W off bottom: 01:40:30 h 2256.3 m 1°56.002‘ N 92°04.599‘ W	***Hard rock*** (single) _ rich epifauna (1) Nunc ***PROT***: Foraminifera of dwelling tubes walls (1) Nunc ***POR***: various small sponges (1) Nunc ***POR*** ?: ***VP 77*** (see also VP44) (1) Nunc ***POR*** : glass sponge ***VP 75*** (1) Nunc ***POR*** ?: „white disk“,with special relief***, VP 79*** (1) Nunc ***CNI*** : as VP 70 (1) Nunc ***CNI*** or ***BRY***: ***VP 76***, common (vessel missing) (1) Nunc ***CNI*** or ***BRY***: ***VP 80*** (1) Nunc ***MOL***: as VP 32 (10) Nunc ***POL***: polychaete in ist tube, ***VP 78*** (11) Nunc ***BRY*** :see VP 43 (12) Nunc ***BRY*** see VP 06 (13) Nunc ***BRA*** (Formalin fixation) (14) Nunc ***BRA*** (fixed in ETOH) (15) Nunc (***disks***): white and brown disks dredge does not possess sediment tube holders
DR 60 ***SM***	09.08.2001 on bottom: 06:02:00 h 1864.4 m 1°43.454‘ N 91°43.552‘ W off bottom: 06:49:30 h 1832.2 m 1°43.384‘ N 91°43.308‘ W	***Hard rocks*** (2 tiny and 1 small piece) _ nearly no epifauna Nunc ***CNI*** or ***BRY*** (see VP 70) dredge does not possess sediment tube holders
DR 61 ***SM***	09.08.2001 on bottom: 14:55:00 h 1710.6 m 1°14.398‘ N 91°40.913‘ W off bottom: 16:05:10 h 1567.9 m 1°14.402‘ N 91°40.472‘ W	***broken brownish material*** _ rich epifauna (1) Nunc ***POR*** (1) Nunc ***CNI*** (1) Nunc ***CNI***?: „buttons“ to „thin stick coral“ (1) Nunc ***CNI***?: „buttons“ to „thin stick coral“ (1) Nunc ***CNI***?: „buttons“ to „thin stick coral“,***VP 84,VP 85*** (1) Nunc ***CNI***?: „buttons“ to „bamboo stick coral“ (1) Nunc ***POL*** (1) Nunc ***POL***?: „red worm“, damaged (1) Nunc ***CRU*** (10) Nunc ***BRY*** (11) Nunc (***???***): „unknow yellow something“ (12) Nunc ***balls*** (13) Nunc ***disks*** (14) Nunc ***tubes*** (15) K 50 ***POR*** (16) K 50 ***POR*** (17) K 50 ***CNI***: „tree-like colony“ (18) K 50 ***CNI***?: „buttons“ of „thin-stick corals“ (19) K 50 ***CRU***: „*Scalpellum*-like crustacean“ (20) K200 ***CNI***?: „bamboo stick coral“ (21) K200 ***PANT***: Pantopoda (22) K200 ***ECH***: brittle stars

DR 61 (cont.)		(23) K500 ***CNI***: tree-like colonies; covered with mold (?) (24) 5 l buckett ***CNI***: rods of „bamboo coral“ dredge does not possess sediment tube holders
DR 62 ***SM***	09.08.2001 on bottom: 14:55:00 h 1710.6 m 1°14.398‘ N 91°40.913‘ W off bottom: 16:05:10 h 1567.9 m 1°14.402‘ N 91°40.472‘ W	***Hard rocks*** (many) _ very few epifaunal specimens (1) Nunc ***POR*** (1) Nunc ***CNI*** (?): as VP 70 (1) Nunc ***POL***: (1) Nunc ***BRA***: 2 (in ETOH) Nunc ***disks***: white disks (vessel missing) dredge does not possess sediment tube holders
DR 64 ***SM***	10.08.2001 on bottom: 03:26:00 h 2005.6 m 1°06.727‘ N 91°16.437‘ W off bottom: 04:39:30 h 2011.7 m 1°06.717‘ N 91°16.462‘ W	***Hard rocks*** (few) _ few epifaunal specimens (1) Nunc ***CNI***: as VP 70, VP 80 (1) Nunc ***CNI***: „tiny tree-like coral „ (1) Nunc ***BRY***: fan-like colony (1) Nunc ***BRA***: 2 (1) Nunc ***MOL***: 1 bivalve in ETOH (-) tiny glass sponge: not preserved dredge does not possess sediment tube holders
DR 65 ***SM***	10.08.2001 on bottom: 08:10:00 h 1061.3 m 0°53.718‘ N 91°25.154‘ W off bottom: 09:20:30 h 1925.0 m 0°53.642‘ N 91°25.100‘ W	***Hard rocks*** (many) _ rich epifauna (1) Nunc ***MOL***: 2 (1) K 50 ***CNI***: Hydrozoa (1) K 50 ***POL***: (1) K 50 ***CRU***: (1) K 50 ***BRA*** (Formalin fixation) (1) K 50 ***BRA*** (1) K 50 ***ECH*** (1) K 50 ***tubes*** (1) K 50 ***for photography*** ! (10) K 100 ***POR*** (11) K 100 ***CNI*** (12) K 100 ***CRU*** (13) K 100 ***BRY*** (14) K 100 ***Prüfen*** (15) K 200 ***POR***: slimy (16) K 200 ***POR*** medium size (17) K 200 ***CNI*** Hydrozoa (18) K 500 ***POR***: large specimens (19) K 1000 ***POR***: on stone pieces (20) K 1000 ***POR***: „fleece-like sponge“ (21) K 1000 round ***POR***: „bread-sponge“ (22) K 1000 round ***POR***: „white column-sponge“ (23) K 1000 round ***POR***: mixed, partly on stones (24) 5 l buckett: ***POR***: on stone with further epifauna (25) 5 l buckett: grenadier ***fish*** (?), partly damaged dredge does not possess sediment tube holders
TVG 67a	10.08.01 on bottom: 16:03:00 h 2121,3 m 0°51.812’ N 91°8,753’ W grab: 16:31:00 h 2125,0 m 0°51.816’ N 91°8.730’ W	***Sediment*** (macrofauna) (1) Nunc ***PROT***: white balls = large Foraminifera ? (1) Nunc ***POR***: sponge needles (1) Nunc ***MOL*** Scaphopoda (cf. *Dentalium*) (1) Nunc ***MOL***: parrot beak of cephalopod (1) Nunc ***???***: moss-like structure (1) K 50 ***POL***: some polychaetes in good condition, some tubes empty (1) K 50 ***PROT:*** Sediment sample

TVG 67 (cont.)		***Sediment*** (meiofauna)
MDR 67b	10.08.01 on bottom: 17:49:00 h 2121,0 m 0°51.80' N 91°8,70' W off bottom: 18:55:50 h 2119 m 0°51.80' N 91°8.56' W	***Sediment*** - Foraminifera: many - Nematoda: many - Desmoscolecida - Kinorhyncha 4* - Loricifera 1* - Polychaeta - Copepoda - Ostracoda - additional Crustacea - Tardigrada*
DR 68 ***SM***	11.08.2001 on bottom: 01:28:30 h 1640.2 m 0°51.562' N 90°50.421' W off bottom: 02:41:30 h 1481.0 m 0°51.346' N 90°50.515' W	***Hard rock*** (single) _ rich epifauna (1) Nunc ***POR :*** "candelabrum sponge", ***VP 89*** (1) Nunc ***POR :*** "balloon-sponge", ***VP 90*** (1) Nunc ***POR*** : "feather-sponge", ***VP 91*** (1) Nunc ***POR*** "tree-sponge", ***VP 92*** (1) Nunc ***POR***: "garland-sponge", ***VP 93*** (1) Nunc ***CNI:*** as VP 70 (1) Nunc ***CNI:*** Hydrozoa (1) Nunc ***CNI*** or ***BRY***: ***VP 96*** (1) Nunc ***POL***: *Spirorbis*-like (10) Nunc ***CRU***: Cirripedia ***VP 88*** (11) Nunc ***BRY VP 94*** (12) Nunc ***ECH*** (13) K 50 ***POR*** (14) K 50 ***POR***: slimy sponges (15) K200 ***CNI*** : „tree-like hydrozoan" (16) 10 l container (incl. also sample from 69 DR) ***CNI***: „Bamboo coral" ***no*** sediment
DR 69 ***SM***	11.08.2001 on bottom: 08:10:00 h 1260.3 m 0°35.005' N 90°20.004' W off bottom: 09:01:30 h 1124.9 m 0°34.698' N 90°19.925' W	***Hard rocks*** (some) _ some epifauna (1) Nunc ***POR:*** small specimens (1) Nunc ***CRU:*** Cirripedia/Balanida (1) Nunc ***BRY*** (1) Nunc ***BRA*** (in ETOH) (1) Nunc ***DIV*** (1) Nunc ***???*** Cushion ***VP 87*** (1) K 50 ***POR*** (1) 10 l container (incl. also sample from DR 68) ***CNI***: hydrozoan colony, seafeather-like ***no*** sediment
DR 70 ***SM*** DR 70 (cont.)	11.08.2001 on bottom: 14:37:10 h 1667.0 m 0°24.995' N 89°52.012' W off bottom: 15:45:10 h 1299.5 m 0°24.633' N 89°51.725' W	***Hard rocks*** (many) _ few epifaunal specimens (1) Nunc keratoid ***tube*** (see So 144 VP 01) (1) Nunc ***POR*** (1) Nunc ***MOL*** (1) Nunc ***POL*** (1) Nunc ***BRA (in ETOH)*** (1) Nunc ***balls*** and ***disks*** (1) Nunc ***tube***: „thin tranparent tube" (1) K 50 ***FOTO*** ***Sediment***

DR 71a ***SM***	11.08.2001 on bottom: 22:25:00 h 1535.0 m 0°27.000‘ N 89°37.807‘ W off bottom: 23:20:00 h 1364.0 m 0°26.773‘ N 89°37.597‘ W	***Hard rocks*** (many) (1) Nunc ***POR:*** as VP 63 (1) Nunc ***POR*** (1) Nunc ***BRY*** (1) Nunc ***CRU:*** Copepoda, probably pelagic (1) Nunc ***keratoid*** tube (1) K 50 ***CNI:*** "yellow-scarlett sponge" as in K 1000 round (1) K 50 ***CNI:*** Hydrozoa (1) K 50 ***POL*** (1) K 50 ***POL*** (10) K 50 ***POL*** (11) K 50 ***POL*** (12) K 50 ***POR*** (13) K 100 ***POR*** (14) K 100 ***CRU***: crustacean on piece of rock (15) K 100 ***ECH:*** Ophiuroidea (16) K 750 ***POR:*** "white perforated sponge" (17) K 750 ***POR***: "white perforated sponge" (18) K 1000 round ***CNI***: "yellow-scarlett sponge" + Ophiuroidea ***no*** sediment
DR 72 ***SM***	12.08.2001 on bottom: 04:15:00 h 2128.5 m 0°06.947‘ N 89°17.398‘ W off bottom: 05:44:00 h 1836.0 m 0°06.811‘ N 89°16.957‘ W	***Hard rocks*** (few) _ few epifaunal specimens (1) Nunc ***POR*** (1) Nunc ***POR:*** slimy sponges (1) Nunc ***POR*** as VP 58 (1) Nunc ***BRA*** (1) Nunc ***CNI:*** as VP 70 (1) K 750 ***POR:*** piece of sponge with long needles ***Sediment*** (very little)
DR 72a ***SM***	12.08.2001 on bottom: 04:15:00 h 2128.5 m 0°06.947‘ N 89°17.398‘ W off bottom: 05:44:00 h 1836.0 m 0°06.811‘ N 89°16.957‘ W	***Hard rocks*** (some) (1) Nunc ***POR*** (1) Nunc ***BRY*** (1) Nunc ***disks*** (1) Nunc ***basis***: white base (of Anthozoa?) (1) K 50 ***POR***: white massiv sponge + two unindentified black sticks (-) VP 70 (-) thin tubes ***Sediment*** (some)
DR 73 ***SM***	12.08.2001 on bottom: 11:51:00 h 1632.2 m 0°02.820‘ S 89°16.256‘ W off bottom: 13:05:00 h 1500.0 m 0°02.765‘ S 89°15.853‘ W	***Hard rocks*** (few) _no epifauna ***Sediment*** (little)
DR 74 ***SM***	12.08.2001 on bottom: 17:05:00 h 1386.0 m 0°21.188‘ S 89°20.604‘ W off bottom: 18:38:00 h 1615.0 m 0°21.122‘ S	***Hard rock*** (single) (1) NUNC ***PROT***: Foraminifera (1) Nunc ***POR:*** "peacock-sponge" (1) Nunc ***POR:*** "garland-sponge" ***: VP 99*** (1) Nunc ***CNI:*** see VP 70, VP 36, VP 96, VP 48, ***VP 100*** (1) Nunc ***CNI***: pink coral (1) Nunc ***MOL:*** bivalve (1) Nunc ***POL***

DR 74 (cont.)	89°20.459' W	(1) Nunc ***BRA*** (1) Nunc ***BRY*** (10) Nunc ***ECH*** (11) Nunc ***disks*** (12) Nunc ***tube***s (13) K 50 ***POR*** (14) K 50 ***CRU*** (15) K 200 ***POR*** ***no*** sediment
TVG 75a	12.08.01 on bottom: 21:27:00 h 387,2 m 0°33.893' S 89°32.415' W grab: 21:48:00 h 387,31 m 0°33.892' S 89°32.273' W	***Sediment*** (macrofauna) (1) Nunc ***MOL:*** Thecosomata ("Pteropoda") (1) Nunc ***MOL:*** Scaphopoda (1) Nunc ***MOL:*** Solenogastres ***VP* 107** (1) Nunc ***BRY:*** disk-like colony ***VP 108*** (1) Nunc ***Sediment*** TVG, all Foraminifera (1) K 50 ***CNI:*** Alcyonacea (?), ***VP*** 105/106; see large specimens in flask (wide mouth bottle) (1) K 50 ***POL***: many polychaetes, some in good condition, others damaged (1) K 50 ***SIP***: Sipunculida (?) (1) K 50 ***MOL:*** bivalve, complete mussel (?) (10) K 100 ***CNI:*** basis of Anthozoa (11) K 200 ***MOL:*** empty shells of gastropodes and bivalves (12) K 500 ***MOL:*** empty shells (13)K500 ***CRU:*** 2 Decapoda ***Sediment*** (meiofauna)
MDR 75b	12.08.01 on bottom: 22:44:00 h 388,0 m 0°33.901' S 89°32.413' W off bottom: 23:02:00 h 387,4 m 0°33.901' S 89°32.282' W	***Sediment*** - Foraminifera: many - Plathelminthes (?) 5* - Nematoda: many - Desmoscolecida 5* - Epsilonematidae 12* - Gastrotricha 55* - Loricifera (?) 1* - Solenogastres (?) 3* - Copepoda many - Ostracoda 1* - additional Crustacea
DR 77 ***SM***	13.08.2001 on bottom: 08:38:30 h 1690.4 m 0°11.502' N 88°52.798' W off bottom: 09:50:00 h 1543.3 m 0°11.571' N 88°52.495' W	***Hard rocks*** (1) Nunc ***CNI:*** "sack-shaped Anthozoa" (1) Nunc ***CNI*** or ***BRY:*** see VP 92 (= "trees") (1) Nunc ***BRY*** (1) Nunc ***BRA*** (1) K 50 ***POR*** (1) K 100 ***ECH*** Ophiuroidea ***Sediment*** (very little)
DR 78 ***SM***	13.08.2001 on bottom: 19:52:00 h 1926.0 m 0°17.902' N 88°46.148' W off bottom: 20:43:00 h 1816.0 m 0°17.802' N 88°45.889' W	***Hard rocks*** (few) _ few epifaunal specimens (1) Nunc ***POR*** (1) Nunc ***CNI*** (?): (as VP 70) (1) Nunc ***MOL:*** 1 bivalve (1) K100 ***POR***: bluish-black slime sponge ***Sediment***

DR 79 ***SM***	13.08.2001 on bottom: 23:13:00 h 2412.0 m 0°25.001‘ N 88°41.755‘ W off bottom: 00:15:00 h 2333.0 m 0°24.820‘ N 88°41.484‘ W	***Hard rocks*** (few) _ few epifaunal specimens Nunc ***BRY:*** 1x3 cm piece of plane colony ***VP 103*** ***no*** sediment
DR 80 ***SM***	14.08.2001 on bottom: 05:27:30 h 1656.8 m 0°01.433‘ S 88°30.974‘ W off bottom: 06:18:00 h 1555.0 m 0°01.561‘ S 88°30.802‘ W	***Hard rocks*** (many) _ few epifaunal specimens (1) Nunc ***POR*** (1) Nunc ***POL*** (1) Nunc ***CRU: VP 109*** (1) Nunc ***BRY*** (1) Nunc ***BRA*** (1) Nunc thin ***trees*** (1) K 50 ***POR*** ***Sediment*** (very little)
TVG 82a	14.08.01 on bottom: 17:47:53 h 2662,1 m 0°18.795' N 87°48.511' W grab: 18:12:36 h 2663,2 m 0°18.761' N 87°348.364' W	***Sediment*** (macrofauna) (1) K 50 brown sediment (1) K 50 white sediment (1) K 100 ***DIV:*** from TVG sediment (1) K 500 ***SIP:*** 1 large (1,5 x 12 cm) Sipunculida + 1 large slimy tube with unknown content ***Sediment*** (meiofauna)
MDR 82b	14.08.01 on bottom: 19:35:00 h 2658,4 m 0°18.804' N 87°48.503' W off bottom: 20:53:30 h 2661,3 m 0°18,75' N 87°48.34' W	***Sediment*** - Foraminifera: many - Plathelminthes (?) 1* - Nematoda: many - Nematoda (long tail) 15* - Desmoscolecida: many - Gastrotricha (?) 4* - Sipunculida 2* - Polychaeta 23* - Oligochaeta 3* - Tardigrada 5* - Copepoda: many - additional Crustacea 8*
KG 82c	14.08.01 start: 22:23:40 h 2659,2 m 0°18,82' N 87°48.537' W on deck: 00:08:00 h 2659,6 m 0°18.827' N 87°48.457' W	***Sediment***
DR 83 ***SM***	15.08.2001 on bottom: 07:01:30 h 1428.9 m 0°18.901‘ S 88°23.270‘ W off bottom: 08:19:00 h 1213.8 m 0°19.139‘ S 88°22.935‘ W	***Hard rocks*** (some) _ few epifaunal specimens (1) Nunc ***POR:*** thread-like sponge (1) K 50 ***POR*** (1) K 50 ***BRA*** ***Sediment*** (very little)

DR 84 ***SM***	15.08.2001 on bottom: 13:04:20 h 1780.0 m 0°22.503‘ S 87°49.520‘ W off bottom: 14:13:30 h 1639.8 m 0°22.792‘ S 87°49.173‘ W	***Hard rocks*** (some) _ few epifaunal specimens (1) Nunc ***POR*** (1) Nunc ***BRA*** (1) Nunc ***BRY:*** fan-like colony + VP 70 ***no*** sediment
DR 85 ***SM***	15.08.2001 on bottom: 18:23:00 h 1384.2 m 0°21.240‘ S 87°40.799‘ W off bottom: 19:38:00 h 1411.0 m 0°21.230‘ S 87°40.830‘ W	***Hard rock*** (single) _ few epifaunal specimens (1) Nunc ***POR:*** small "onion-sponge" ***VP 110-114*** (1) Nunc ***BRA*** (in ETOH) (1) Nunc ***BRY*** (1) Nunc ***disk:*** white disks (1) K 50 ***POR*** ***Sediment*** (some)
DR 85a ***SM***	15.08.2001 on bottom: 21:10:27 h 1421.0 m 0°20.104‘ S 87°39.710‘ W off bottom: 22:06:33 h 1316.0 m 0°20.318‘ S 87°39.531‘ W	***Hard rocks*** _ some epifauna (1) Nunc ***???:*** "double towers" ***VP 115*** (1) Nunc ***POR: VP 117*** (1) Nunc ***POL*** (1) Nunc ***BRY*** (1) Nunc VP 70 (1) Nunc ***disk***s (1) K 50 ***POR*** (1) K200 ***CNI:*** Alcyonacea (?), see TVG 75a (9) K 750 ***POR***: "cloth-sponge" from dredge bag ***no*** sediment
DR 86 ***SM***	16.08.2001 on bottom: 02:35:00 h 1778.5 m 0°35.152‘ S 87°31.131‘ W off bottom: 03:59:30 h 1661.2 m 0°35.415‘ S 87°30.804‘ W	***Hard rocks*** (some) _ few epifaunal specimens (1) Nunc ***keratoid*** tube (1) Nunc ***POR:*** small sponges (1) Nunc ***MOL*** (1) Nunc ***POL*** (1) Nunc ***BRA*** (in Formalin!) (1) Nunc ***BRY*** (1) Nunc ***ECH*** (1) Nunc ***basis*** (1) Nunc ***disk*** (10) Nunc ***tubes*** (11) Nunc unidentified ball ***VP 119*** (12) K 50 ***POR*** (13) K 50 ***BRA*** (in ETOH), ***VP 118*** (14) K 50 ***POL*** (15) K 100 ***POR*** sponge on stone ***Sediment***
DR 87 ***SM***	16.08.2001 on bottom: 09:07:00 h 1153.1 m 1°05.461‘ S 87°30.196‘ W off bottom: 10:24:00 h 969.5 m 1°05.806‘ S 87°29.936‘ W	***Hard rocks*** (some) _ few epifaunal specimens (1) Nunc ***POL*** (1) Nunc ***CRU*** (1) Nunc ***disk*** (1) Nunc VP 70 (1) K 50 ***POR*** (1) K 50 ***???: VP 120***: unknown internal structures (1) K 50 ***???:*** piece of "christmas tree-sponge", VP ***121*** (1) K 100 ***ECH*** (9) 5 l cont.***POR*** (?): "christmas tree-sponge" + 1 Decapoda ***Sediment*** (very little)

APPENDIX VI: MACROFAUNA OCCURRENCE

For station locations see Appendices III and V.

Abbreviations:

DR: Chain bag dredge
TVG: TV-grab
MDR: Meiofauna dredge
KG: Box corer
*: Dredge station with rocks, but *without* epifauna
R: Dredge contained rocks
no: Dredge contained no rocks
S: Biological stations, sediment only
SM: Dredge station on seamount
GSC: Dredge station on GSC (MOR)

POR: Porifera
CNI: Cnidaria
MOL: Mollusca
POL: Polychaeta
CRU: Crustacea
BRY: Bryozoa
BRA : Brachiopoda
ECH: Echinodermata
disk: disk-like organism/colony
tube: dwelling tubes

Station	SM/ GSC	rocks	POR	CNI	MOL	POL	CRU	BRY	BRA	ECH	disk	tube	others
DR 02	SM	R	1		1								
DR 03*	GSC	R											
DR 05	SM	no											
DR 06	GSC	R						1	1				1
DR 07*	GSC	R											
DR 08	GSC	R	1			1			1	1			1
DR 09*	GSC	R											
DR 10	GSC	R	1						1				
DR 11*	GSC	R											
DR 12*	GSC	R											
DR 13	GSC	R	1			1	1						
DR 14	GSC	R	1			1		1	1				
DR 15*	GSC	R											
DR 15b*	GSC	R											
DR 16*	GSC	R											
DR 17	GSC	R						1					
DR 18	GSC	R	1										
DR 19*	GSC	R											
TVG 20a		S											
MDR 20b		S											
KG 20c		S											
DR 21	GSC	R	1					1					
DR 22	GSC	R	1			1		1					
DR 23*	GSC	R											
DR 24*	GSC	R											
DR 25	GSC	R								1			

Station	SM/ GSC	rocks	POR	CNI	MOL	POL	CRU	BRY	BRA	ECH	disk	tube	others
DR 26*	GSC	R											1
DR 27*	GSC	R											
DR 27a*	GSC	R											
DR 28	SM	R	1			1		1					
DR 29	GSC	no											
DR 29a*	GSC	R											
DR 30	SM	R	1			1			1	1			1
DR 31	GSC	R	1			1							
DR 32*	GSC	R											
DR 33	GSC	R	1	1			1	1		1			3
DR 34*	GSC	R											
DR 35*	GSC	R											
DR 36*	GSC	R											
DR 37	GSC	R	1		1	1		1					1
DR 38	GSC	R	1										
DR 39	GSC	R		1									
DR 39a*	GSC	R											
DR 40	GSC	R	1	1				1	1				
DR 41	SM	R				1				1			1
DR 41a	SM	R		1	1	1				1			1
DR 41b	SM	R	1	1	1		1	1		1			1
DR 42	SM	R											1
DR 43	SM	R				1						1	
TVG 44a		S										1	1
MDR 44b		S											
KG 44c		S											
DR 45	SM	no											
DR 46	SM	R											1
DR 46a	SM	R	1			1		1	1			1	3
DR 47	SM	R	1	1	1	1	1	1	1				2
DR 47a	SM	R						1					1
DR 48	GSC	R					1						
DR 49	GSC	R				1			1			1	
DR 50	SM	R			1			1				1	
DR 51	SM	no											
DR 52	SM	no											
DR 52a	SM	no											
DR 53	GSC	R	1	1		1							
DR 54*	GSC	R											
DR 55	SM	no											
DR 56	GSC	no											

Station	SM/ GSC	rocks	POR	CNI	MOL	POL	CRU	BRY	BRA	ECH	disk	tube	others
DR 57	SM	no											
DR 58	SM	R						1					
DR 58a	SM	no											
DR 58b	SM	R	1	1	1	1		1	1		1		
DR 60	SM	R						1					
DR 60a*	SM	R											
DR 61	SM	R	1	1		1	1	1					1
DR 62	SM	R	1	1		1			1		1		
DR 63*	SM	R											
DR 64	SM	R		1	1			1	1				
DR 65	SM	R	1	1	1	1	1	1	1	1		1	3
DR 66	SM	no											
TVG 67a		S	1	1		1	1						
MDR 67b		S											
KG 67c		S											
DR 68	SM	R	1	1		1	1	1		1			
DR 69	SM	R	1				1	1	1				1
DR 70	SM	R	1		1	1			1		1	1	2
DR 71	SM	no											
DR 71a	SM	R	1	1		1	1	1					
DR 72	SM	R	1						1			1	1
DR 72a	SM	R											
DR 73*	SM	R											
DR 74	SM	R	1	1	1	1	1	1	1	1	1	1	2
TVG 75a		S											
MDR 75b		S											
KG 75c		S											
DR 77	SM	R	1	1				1	1	1			
DR 78	SM	R	1	1	1								
DR 79	SM	R						1					
DR 80	SM	R	1			1	1	1	1				1
DR 81	SM	no											
TVG 82a		S											2
MDR 82b		S											
KG 82c		S											
DR 83	SM	R	1						1				
DR 84	SM	R	1					1	1				
DR 85	SM	R	1					1	1		1		
DR 85a	SM	R	1	1				1	1		1		
DR 86	SM	R	1		1	1		1	1	1	1	1	2
DR 87	SM	R	1			1	1				1		

APPENDIX VII: LIST OF VIDEO SEQUENCES AND VIDEO PRINTS

For station locations see Appendices III and V. Please notice that only successful macrofauna stations are listed in the following.

Abbreviations

BRA : Brachiopoda
BRY: Bryozoa
CNI: Cnidaria
CRU: Crustacea
ECH: Echinodermata
MOL: Mollusca
DIV: various organisms and structures preserved together
NEM: Nematoda
POL: Polychaeta
POR: Porifera
PROT: Protozoa
SIP: Sipunculida
disk: disk-like organism/colony

Video-Print Nr.	Dredge Station Nr.	Video-Sequence from	Video-Sequence to	Magnification: B = Stereo-microscope M = Microscope	Taxon-Abbre-viation	Remarks
VP 4	3	00:00	00:30		***PROT***	Foraminifera
VP 1	2	00:30	00:58	M 2,5 x	***POR***	„onion-like sponge“
VP 2	2	00:58	02: 27	M 6,3 x	***POR***	„tree-like sponge“
VP 3	2	02:28	02:38	B 12 x	***MOL***	Polyplacophora
VP S1	5	---	---	M 10 x	***NEM***	Nematode ?, see VP S3 (DR 16), from sediment
VP S2	5	---	---	M 10 x	***POL (?)***	Polychaeta or Pogonophora (?)
VP 5a	6	02:40	03:46	B 10 x	***BRY***	stalked Bryozoan colony
VP 6	6	03:47	04:00	B 12 x	***BRA***	Brachiopoda
VP 5b	6	04:00	04:36	M 2,5 x	***BRY***	sympodial Bryozoan stem
VP 7	10	---	---	B 7 x	***POR***	„membraneous sponge“
VP 8	13	---	---	B 6 x	***POL***	Polychaete in its dwelling tube
VP 9	14	00:48	05:52	B 9 x	***BRA***	Brachiopoda
VP 10	14	---	---	B 9 x	***BRY***	disk-like colonyies of Bryozoa
VP S3	16	05:55	06:30	M 25 x	***NEM***	Nematode ? see. VP S1, from sediment
VP 11 a-c	TVG 20	---	---	M 10-25x	***PROT***	Foraminifera, from sediment
VP 12	25A	06:30	07:14	M 25 x, Ph		fine sediment from rock holes
VP 13 a-c	25A	07:14 08:12	08:12 09:01	B 6 x B 18 x	***CRU***	Crustacea: Amphipode (?), hind and front part
VP 14	28	09:01 10:30	10:30 11:04	B 6 x B 20 x	***POL***	Polychate in tube
VP 15	28	11:04	11:44	B 6 x	***POL***	Polychate tube
VP 16	28	11:45	12:07	B 6 x	***POR***	glass sponge (?)
VP 17	30	12:05	13:08	M 2,5x M 6,3x	***ECH***	distal end of rhizoid from Crinoid
---	30	13:08	13:26	M 6.3x	***POL (?)***	Polychaeta (?)

Video-Print Nr.	Dredge Station Nr.	Video-Sequence from	Video-Sequence to	Magnification: B = Stereo-microscope M = Microscope	Taxon-Abbre-viation	Remarks
---	**30**	13:26	14:03	M 6.3x M 2.5x	***ECH***	distal end of rhizoid from Crinoid
VP 18	**33**	14:04	16:06	M 2.5x M 6.3x	***CNI***	Hydrozoa: tree-like colony + polyp + unknown structure
VP 19	**33**	16:06	17:03	M 2.5x	***CNI***	2 different Hydrozoan colonies
VP 20	**33**	17:03	18:00	M 6.3x	***CNI***	same as VP 19, enlarged
VP 21	**33**	18:00	18:35	M 2.5x	***BRY***	Bryozoa
VP 22	**33**	18:35	19:53	M 6.3x	***BRY***	as VP 21, enlarged
VP 23	**33**	19:53	20:29	M 6.3x	***CNI***	Hydrozoa: polyp
VP 24	**33**	20:29	20:44	B 12x	***SIP***	Sipunculida (ca 12mm)
VP 25	**33**	20:45	21:31	M 2.5x M 6.3x	***???***	brown Porifera-like mats
VP 26	**33**	21:32	21:56	B 6x	***POR ???***	20cm long sticks with lateral „buttons", white calcareous axis and a layer of sklerites under a cuticle
VP 27	**33**	21:56	22:27	B 9x B 12x	***POR ???***	„button" dissected, showing internal structures (+ artefacts from the video printer)
VP 28	**33**	22:27		M 32.5	***POR ???***	sklerite layer + cuticle
VP 29	**33**			M 2.5x	***POR ???***	sklerite layer
VP 30	**33**			M 10x	***POR ???***	single sklerite
VP 31	**33**		23:55	M 10x	***POR ???***	sklerites
VP 32	**37**	23:52	24:04	B 12x	***MOL***	mussel (ETOH fixiert !)
VP 33	**37**	24:04	25:18	B6x, B9x	***POL***	Polychaete in tube
VP 34	**37**	25:18	27:10		***VERT. (?)***	Fish-embryoes (?); gelatineous layer with yellow spots, from stone
VP 35	**37**	27:10	27:27	B 25x	***POR***	membraneous sponge: sklerites
VP 36	**37**	27:27	27:57	B 15x	***POR***	basis of a sponge (?)
VP 37	**37**	27:57	28:16	B 22x	***BRY***	disk-like Bryozoan colony
VP 38	**37**	28:16	28:52	B 22x	***POL***	Polychaeta: *Spirorbis*-like tube
VP 39	**37**	28:52	29:25	B 18x	***PROT***	Foraminifera (from hole in a rock)
VP 40	**39**	29:25	30:24	M 2.5x	***CNI***	Hydrozoan colony
VP 41	**39**	30:24	30:34	M 6.3x	***CNI***	As VP 41, enlarged
VP 42	**40**	30:34	30:49	B 25x	***BRY***	Bryozoan colony
VP 43	**40**	30:49	31:40	B 18x	***BRY***	2 different types of Bryozoans
VP 44	**40**	13:40	32:20	B 8x	***POR (?)***	ca 5 mm high „columns on stones, body wall with sklerites
VP 45	**41 A**	32:16	32:27	B 6x	***DIV.***	Polychaete dwelling tubes
VP 46	**41 A**	32:27	32:57	B 6x	***POL***	Polychaete, without tube

Video-Print Nr.	Dredge Station Nr.	Video-Sequence from	Video-Sequence to	Magnification: B = Stereo-microscope M = Microscope	Taxon-Abbre-viation	Remarks
VP 47	**41 B**	32:57	34:05	M 2.5, 6.3	***MOL***	mussel, collected from stone
VP 48	**41 B**	34:05	35:00	M 32.5x	***CNI***	coral pieces, collected from stones
VP 49	**41 B**	35:00	35:20	B 9x	***CNI***	„tree-like coral"
VP 50	**41 B**	35:20		B 9x	***CNI***	„fan-shaped coral „
VP 51	**41 B**		36:24		***CNI***	as VP 50, enlarged
VP 52	**41 B**			B 6x	***CNI (?)***	piece of a tall *Gorgonia*-like colony
VP 53	**41 B**			B 9x	***CNI (?)***	single „button" of VP 52
VP 54	**41 B**		38:06	B 18x	***CNI (?)***	same enlarged, with sklerites
VP 55	**46**	38:06		B 6-25x	***ENT***	Enteropneust (!?)
VP 55	**46**		39:08	B 25x		„
VP 56	**46 A**	39:08	39:45	B 12 x	***POR***	
VP 57	**46 A**	39:45	40:13	B 6 x	***???***	egg masses?
VP 58	**46 A**	40:13		B 6 x	***POL***	calcareous tube with worm
VP 59	**46 A**		42:06	B 25x	***„***	„ „ „
VP 60	**46 A**	42:06	42:25	B 11x	***POR***	sphaeric sponge
VP 61	**46A**	42:25	43:10	B 22x	***POR***	Bryozoan-like sponge (?)
VP 62	**49**	43:11	343:42	B 6x	***???***	transparent long and thin dwelling tube
VP 63	**47**	43:42		B 6x	***POR***	
VP 64	**47**		45:20	B 18x	***POR***	
VP 65	**47**	45:20	46:03	B 6/18x	***CNI***	
VP 66	**47**	46:03	46:15	B 6x	***POR***	on a piece of stone
VP 67	**Seawater filter**	46:21	$7:05	B 6x	***CRU/ CNI***	barnacle and hydrozoan
VP 68	**„**	47:05	47:35	B 6x	***CRU***	goose barnacle
VP 69	**„**	47:35	48:30	B 6x	***CRU***	barnacles
VP 70		48:30	49:25	B 18 x	***CNI (?)***	
VP 71	**58**	49:30	49:40	B 25 x	***BRY***	tree-like Bryozoan colony
VP 72	**58**	49:40	50:10	B 50 x	***BRY***	show up of VP 71
VP 73	**42**	50:10	51:27	B 6x, B 10x	***ECH-URIDA***	Echiurida, or what else ?
VP 74	**42**	51:27	52:14	M 25 x	***NEM***	Desmoscolecida from sediment
VP 75	**58 B**	52:14	52:30	B 18 x, 22 x	***POR.***	tiny pretty glass sponge
VP 76	**58 B**	52:30	53:28	B 22 x, B 40 x	***CNI or BRY (?)***	quite common on rocks from dredge holes
VP 77	**58 B**	---	---	B 6 x	***POR (?)***	brownish sediment tube (see VP 44)
VP 78	**58 B**	53:28	54:45	B 9 x	***POL***	Polychaete in its tube
VP 79	**58 B**	54:45	54:52	B 18 x	***disk***	white disk with unusual relief

Video-Print Nr.	Dredge Station Nr.	Video-Sequence from	Video-Sequence to	Magnification: B = Stereo-microscope M = Microscope	Taxon-Abbre-viation	Remarks
VP 80	**58 B**	54:52	55:40	B 18 x	***CNI (?)***	stolons
VP 81	**61**	55:40	56:44	M 6.3	***???***	„thin stick coral" (?)
VP 82	**61**	56:44	57:09	B 18 x/B 24 x	***???***	„thin stick coral" (?)
VP 83	**61**	57:09	58:20	B 18 x	***???***	„thin stick coral" (?)
VP 84	**61**	58:320	1:00:18	B 6 x/B 15 x	***???***	„bamboo stick coral" (?)
VP 85	**61**	1:00:18	1:02:09	B 6 x/B 35 x	***CRU (?)***	worm-shaped animal with articulated antennae
VP 86	**67a**	1:02:09	1:02:35	B 32 x	***PROT***	Foraminifera: from TVG-sediment
VP 87	**69**	1:032:35	1:03:40	B 6 x	***???***	white round solid cushion with protrusions
VP 88	**68**	1:03: 24	1:04:17	B 16 x	***CRU***	Cirripedia
VP 89	**68**	1:04:18	1:05:31	B 6 x / B 30 x	***POR***	„candelabrum-sponge"
VP 90	**68**	1:05:31	1:06:09	B 18 x	***POR***	"balloon-sponge"
VP 91	**68**	1:06:09	1:06:29	B 6x	***POR***	"feather-like sponge"
VP 92	**68**	1:06:30	1:07:01	B 8 x	***POR***	"tree-like sponge"
VP 93	**68**	1:07:00	1:08:00	B 9 x / B 25 x	***POR***	"garland-sponge"
VP 94	**68**	1:08:00		B 12 x	***BRY (?)***	disk-shaped colony. back side,
VP 95	**68**		1:09:25	B 12 x	***BRY (?)***	same as VP 94, lateral view
VP 96	**68**	1:09:25	1:10:11	B 12 x / B 15 x	***BRY or CNI***	"dwarf coral"
VP 97	**71 A**	1:10:11	1:11:05	B 6 x	***CNI***	Anthozoa?: "yellow-scarlett coral"
VP 98	**74**	1:11:00	1:11:12	B 6 x	***BRY ?***	
		!:11:12	1:11:51	B 24 x	***BRY ?***	
VP 99	**74**	1:11:51	1:12:55	B 6 x / B 25 x	***POR ?***	"garland-sponge" (compare VP63/64)
VP 100	**74**	1:12:55	1:13:40	B 10 x	***POR***	"peacock feather-sponge"
VP 101	**74**	1:13:40	1.!4:37	B 10 x / B 50 x	***PROT ?***	Foraminifera ?
VP 102	**74**	1:14:37	1:15:35	B 10 x / B 25 x	***CNI ?***	"sack-shaped Anthozoan"
VP 103	**79**	!:15:39	1:17:22	B 8 x / B 22 x	***BRY***	as VP 70
VP 104	**75 a**	!:17:32	1:!7:48	B 6 x	***MOL***	Thecasomata (before referred to as "Pteropoda")
VP 105	**75 a**	1:17:56	1:19:40	B 6 x / B 25 x	***CNI***	Alcyonacea (?)
VP 106	**75 a**	1:19:45	1:20:50	B 6 x / B 18 x	***CNI***	"red sea feather"
VP 107	**75 a**	1:20:56	1:24:45	B 6 x / B 0 x	***SOL***	Solenogastres (?)
VP 108	**75 a**	1:24:45	1:25:40	B 6 x / B 50 x	***BRY***	plane Bryozoan colony
VP 109	**80**	1:25:45	1:26:50	B 25 x / B 40 x	***CRU***	
VP 110	**85**	1:26:50	1:27:30	B 8 x	***POR***	"sack-shaped sponge"
VP 111	**85**	1:27:30	1:27:50	B 8 x	***POR***	"candle-sponge"
VB 112	**85**	1:27:50	1:28:00	B 8 x	***POR***	"onion-sponge"

Video-Print Nr.	Dredge Station Nr.	Video-Sequence from	Video-Sequence to	Magnification: B = Stereo-microscope M = Microscope	Taxon-Abbre-viation	Remarks
VP 113	**85**	1:28:00	1:28:45	B 25 x	***POR***	"cone-sponge"
VP 114	**85**	1:28:45	1:29:25	B 12 x	***POR***	"pile-sponge"
VP 115	**86**	1:29:25	1:30:00	B 6 x	***???***	"double tower"
	86	1:30:06	1:31:04	B 6 x	***???***	"double tower", backside
VP 116	**86**	1:30:04	1:32:26	B 35 x / B 45 x	***BRY***	
	86	1:32:326	1:33:18	"	***BRY***	
VP 117	**86**	1:33:18	1:34:38	B 11 x	***POR***	"mushroom-sponge" with Foraminifera
VP 118	**86**	1:34:44	1:35:11	B 18 x	***BRA***	open Brachiopod shell
VP 119	**86**	1:35:15	1:35:27	B 12 x	***???***	undefined ball
VP 120	**87**	1:35:31	1:36:34	B 6 x	***???***	piece with internal structures

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