



Legal and Technical Commission

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Report on activities in 2008-2009 within the framework of the German training programme

I. Introduction

1. The German exploration contract includes a training programme that has been defined to allow participation of International Seabed Authority selected personnel in exploration cruises. The programme includes the following training component, which is the subject of the present report: participation in an exploration cruise and subsequent post-cruise training for four trainees.

II. Cruise participation in 2008

2. In 2008, the Federal Institute for Geosciences and Natural Resources (BGR) had organized its first exploration cruise to the licence area using the research vessel *Kilo Moana*. The cruise took place from 15 October to 22 November 2008, and started and ended in Honolulu, Hawaii, United States of America. BGR had offered four trainee positions for participation in this campaign. Following an application and selection process of candidates of several countries, which was conducted by the International Seabed Authority, with the advice of its Legal and Technical Commission and in consultation with BGR, the four positions were filled by the following four candidates:

- Yaya M. Djire, from the Direction nationale de la géologie et des mines in Mali
- Suzan Mohamed El Gharapawy, from the National Institute of Oceanography and Fisheries in Egypt
- Heliarivonjy Rakotondramano from the Institut et observatoire de géophysique d'Antananarivo in Madagascar
- Nesha Nurse, from the Natural Resources Department of the Ministry of Finance, Economic Affairs and Energy in Barbados

3. Four to five months prior to the cruise, BGR got in contact with the four trainees and invited them to participate in the upcoming cruise. Support was offered to get the necessary visas to travel to Hawaii, United States. BGR made travel arrangements for the four trainees from their home localities to Hawaii and back again. All four candidates arrived safely and on time and participated in the cruise named "Mangan-2008". Costs for participation in the cruise and for travelling were covered by BGR.

4. In preparation for the cruise, an initial meeting was conducted to inform all participants on cruise objectives and the planned cruise schedule. Trainees were then instructed on all issues regarding shipboard safety and shipboard operations.

5. The scientific party defined a plan to ensure a continuous work flow for the time of the cruise (24-hour operations). All participants agreed on a watch plan covering 24 hours. The trainees were also assigned individual shifts to participate in the daily work on-board the vessel. The overall scheme of this approach was:

(a) Seafloor sampling during daytime (using instruments to sample nodules and sediments);

(b) Mapping and sea floor surveying during the night using geophysical methods.

6. Thematically, the training of the four candidates covered the following particular topics:

(a) Instructions in vessel navigation techniques;

(b) Planning of surveys and selection of sampling sites;

(c) Instructions in the use of geophysical survey techniques regarding:

(i) Swath bathymetric mapping for establishing a digital model of the sea floor topography;

(ii) Mapping of backscatter data for the evaluation of sea floor surface characteristics;

(iii) Compilation of data on sediment thickness using a hull-mounted 3.5 kHz sediment echosounder system;

(iv) Magnetic profiling for the reconstruction of crustal ages and plate tectonics;

(d) Instruction in the use of the conductivity, temperature, depth (CTD) system for the acquisition of data on water properties;

(e) Instructions in the use of geological sampling instruments (sea floor surface sampling with a box corer and a chain sack dredge, sediment coring with a multi-corer and a gravity corer);

(f) Analytical sample treatment, including the determination of nodule element composition, sediment shear strength measurements, pore water recovery and microfossil composition;

(g) Conservation of samples for different usage in home laboratories.

7. The trainees then took part in all scientific activities during the cruise. Following instruction sessions for all significant systems operated during the cruise (e.g., multibeam swath mapping system, 3.5 kHz sediment echosounder,

magnetometer array), the trainees participated in “watch-going” and supervising systems, ensuring proper operation and data acquisition.

8. Trainees also took part in the sampling activities. These included deployment of box corers and multi-corers to recover sea floor sediments and Mn nodules. A typical box corer session included describing the recovered sediment and Mn nodules, subsampling the sediment sequence, and measuring and archiving Mn nodules, selected geochemical analyses of nodule subsamples and proper conservation of nodules for further analyses in home laboratories.

9. These activities were supported by the entire shipboard party.

10. For further instructions and as a follow-up to the cruise, the four trainees were invited to BGR home facilities in Hannover, Germany, to participate in the post-cruise work on the samples and data.

III. Post-cruise training in Hannover (2009)

11. The post-cruise stay took place from 2 to 30 June 2009. BGR had invited the four trainees, made arrangements for their flights and accommodations and assisted in getting the necessary visas for their stay in Hannover. The four trainees all arrived on time. After a first welcome and introduction to the colleagues and an initial guided tour through the institution and its facilities in Hannover, the training programme started. The training programme focused on marine survey and sampling methods and on laboratory work on samples and data previously acquired during the sea campaign in 2008. It included the following topics:

- (a) Compilation of cruise data;
- (b) Preparation of a cruise report;
- (c) Initial interpretation of results;
- (d) Introduction in interpretation of seismic data;
- (e) Training of micropaleontological methods;
- (f) Planning of further investigations;
- (g) Training in the microbiological laboratory facilities at BGR;
- (h) One-day visit of the Center for Marine Environmental Sciences (MARUM) in Bremen, Germany.

12. For most of the programme, the trainees formed two groups (of two persons), which participated in different sessions. This approach allowed the session to be better adjusted to the individual backgrounds of the participants. The initial plan for the training programme and its sessions is set out in the table contained in the annex to the present document.

13. The introduction to marine geological work included theory and discussion of practical problems around sampling devices used for taking sea floor samples. Advantages and inherent problems of individual technical solutions were discussed, such as of instruments like box corers, multi-corers, gravity corers, piston corers, vibro corers (for shallow water) and autoclave corers. Further instructions dealt with the selection of the appropriate instruments for specific tasks and the necessary framework for deployment (planning a deployment on-board a vessel). The previous

exposure to practical work on-board a vessel clearly helped to promote understanding.

14. With regard to treatment of the samples of the cruise, laboratory instructions dealt with the necessary methods for sample treatment (sediment and nodules) and considerations for establishing a flow line; methods applied included washing, drying, sieving, grinding, preparing grain mounts, and working with binoculars (investigation of sand fraction).

15. For nodules and subsamples of these, the following highly specific methods of investigation were introduced: XRF (X-ray fluorescence) for bulk geochemical analyses, and SEM (scanning electron microscope) for extremely fine-scale investigations of the internal structure of, for example, nodules and microprobes for high-resolution geochemical analyses. The sessions included introducing the preparative needs for being able to apply these methods.

16. Sediment samples were chosen to give an introduction to the use of marine micropaleontological work mainly for stratigraphic purposes. In addition, microfossil assemblages were used to demonstrate definition of the sedimentary environment (benthic communities) and primary conditions of the surface water (planktonic species). Issues of carbonate dissolution of tests in deep water conditions were included.

17. Microbiology sessions included introduction to the principles of microbiological work, the fundamental importance of accurate and clean laboratory work, aspects of isolating specific cultures and problems of the timeline, specifically when working with poorly known deep marine (exotic) communities.

18. Geophysical survey methods included the needs and advantages of marine survey methods, such as single-channel seismics, multichannel seismics and outline of refraction seismics, and a variety of so-called sediment echosounder methods (“3.5 kHz”, shallow penetration). The session included dealing with practical examples of seismic profiles, the needs and advantages of data processing and the interpretation of a training data set. The session aimed at providing a principle geoscientific understanding of what marine seismic data could be used for.

19. We included a session on bathymetric data. This included an introduction to the time-consuming “cleaning” of digital bathymetric raw data, as provided by a hull-mounted system on-board a vessel. Further instructions addressed the processing of a bathymetric map and the potential limitations to its spacial resolution. Bathymetric data were fed into an ArcGIS project in order to allow interpretation of bathymetric data following specific needs, such as defining areas with a predefined slope inclination.

20. The programme also included two visits to Bremen and Berlin. In Bremen, the trainees toured MARUM. They attended lectures on selected marine research topics and a guided tour through the technical department with state-of-the-art technology for deep-sea research. MARUM examines the significance of the oceans within the framework of global change, quantifies interactions between the marine geosphere and biosphere, and provides information for sustainable use of the ocean.

21. The excursion to Berlin went to the BGR dependency, which is housing a major core and sample repository from historic and recent drill holes all over Germany. Introduction of the facilities included a tour through the samples from historic type localities.

Annex

Table
Instructions and training schedule as defined for the four-week stay

<i>Calendar week</i>	<i>Period</i>	<i>2 trainees (Group 1)</i>	<i>2 trainees (Group 2)</i>
23rd week	2-5 June	Microbiology (Zoch, Schippers)	Marine geology (instruments, equipment) (Wiedicke/Lückge/Bruns Mühr/Goergens)
24th week	8-12 June	Microbiology (Schippers, Zoch) and geochemistry/ sample treatment	(beginning 5 June) labs: sample preparation thin section, SEM, microprobe, XRF, etc. (Oberthür/Rutkowski/Schwarz-Schampera/Melcher/Lehmann)
25th week	15-19 June	Marine geophysical exploration methods and instructions on interpreting seismic data (Keppler and colleagues)	
26th week	22 and 23 June	Marine geology (laboratory, sample treatment, analyses, data handling) (Wiedicke/Rühlemann/Lückge)	Bathymetric data of cruise “Mangan-2008”/Introduction ArcGIS (Ladage/Reinhardt/Romy)
	24-26 June (without 25 June)	Micropaleontology (methods, objectives, chances) (Weiss)	Bathymetry/ArcGIS (continued) (Ladage/Reinhardt/Romy)
	25 June	BGR (location in Berlin) core and sample repository (Weiss)	
27th week	29 June	Discussions, outlook	
	30 June	Departure of trainees (Bruns/Wiedicke/Seidler)	

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