

TOWARDS A WEST AFRICAN SCIENCE LOGISTICS CENTRE IN CAPE VERDE

Report of the Cape Verde Workshop
8-10 June 2004

Foya Branca Resort
São Vicente, Cape Verde



Financial Support: Volkswagen Stiftung

Organised by:

Leibniz Institut für Meereswissenschaften, Kiel, Germany (IFM-GEOMAR)

Max-Planck Institut für Biogeochemie, Jena, Germany (MPIB)

Instituto Nacional de Desenvolvimento das Pescas, São Vicente (INDP)

Instituto Superior de Engenharia e Ciências do Mar, São Vicente (ISECMAR)

Instituto Nacional de Meteorologia e Geofísica, São Vicente (INMG)

1. EXECUTIVE SUMMARY

A 3-day workshop was held in Mindelo, Cape Verde, in order to evaluate future cooperation between IFM-GEOMAR (Kiel), the Max-Planck Institut für Biogeochemie (Jena), 3 research and educational institutions in Cape Verde as well as institutions in West African nations (including Mauritania, Guinea-Bissau, Guinea and potentially Senegal). Representatives from the Azores, the Canary Islands and the USA also attended. The goal would be to establish a self-sustaining Science Logistics Centre in Cape Verde which would support world-class research in the critical tropical Atlantic region and link West African nations to the international scientific community in the areas of marine and atmospheric science and geology. Regional educational and training needs associated with the development of such a centre were evaluated. During the workshop an excellent spirit of cooperation prevailed. Two major approaches to establishing the Centre were identified:

1. Joint development of long-term scientific activities and projects within Cape Verde and the West-African sub-region. The projects would allow for improved contact between Cape Verde and West African scientists and the international scientific community. They would also raise the profile of Cape Verde as a logistics base. Training opportunities would be developed in the context of the projects. A number of specific project areas were developed, including establishing long-term atmospheric and oceanic monitoring; making inventories of biological resources; and interdisciplinary study of seamounts. In several cases, project proposals that were introduced on the basis of 'northern' interests were found to have unexpected relevance and spin-off benefits addressing 'southern' needs.
2. Joint development of educational infrastructure in Cape Verde that will be of use to the West African region as a whole. Two main activities were proposed: (A) the hosting of summer schools on techniques and approaches that will allow scientists from West African nations to better characterize and understand their environment and marine resources. (B) establishment of local educational opportunities up to Masters level in marine science and fisheries. There is no such training available in the entire West African region. A suitable educational program that serves the needs of these countries could be established in Cape Verde.

Follow-up to the workshop will include writing of joint science proposals to several national and European agencies. Specific suggestions for follow-on support from the Volkswagen Stiftung include: initial support for a Site Manager/Logistics Coordinator; travel support and studentships for joint projects; funding of regional summer schools in Cape Verde; matching funds for critical infrastructure for the Logistics Centre; support for further development of a Masters level education in Cape Verde.

2. GOALS OF THE PROJECT:

The overall goals behind the Workshop were outlined in the Workshop proposal, which is appended to this report (Appendix 5). They are summarised here:

Short-Term: Our initial goal is to develop a scientific collaboration between Germany and the Cape Verde Islands in the context of long-term research projects of the IFM-GEOMAR (Kiel) and the MPIB-Jena. Included in the collaboration would be training activities of three types:

- on-site involvement of Cape Verde scientists and students in the research projects. This would include participation in marine research expeditions and on-island field campaigns as well as assistance with surveys and long-term measurement programs
- selection of junior academics and students from Cape Verde and regional partners for further academic training and research in Kiel and/or Jena (students would be registered at the University of Kiel).
- Training activities (e.g. practical classes, lecture series), including thematic ‘Summer schools’ to be conducted in the Cape Verde Islands.

We envision the collaboration being centred on the Cape Verde Islands for both scientific and logistical reasons but the program would also develop networks with other countries in the region based initially on existing regional collaborations and the needs of individual projects. The initial collaboration would extend to the following West African Nations with which scientific and educational links already exist:

- Mauritania
- Senegal
- Gambia
- Guinea Bissau
- Guinea

Long-Term: Our longer-term vision is to start building on the existing Cape Verde expertise in marine science, and the unique scientific and logistical value of Cape Verde itself, to establish a Science Logistics Centre for the support of oceanographic, climate, atmospheric, geological and biological research in the West African region. Our models for the long-term development of the Science Logistics Base include the Bermuda Biological Station for Research (www.bbsr.edu), the Canadian Polar Continental Shelf Project Centre in Resolute Bay, N.W.T (http://polar.nrcan.gc.ca/index_e.html), and the

Ny-Ålesund International Arctic Environmental Research and Monitoring Facility, Svalbard, Norway (<http://npolar.no/nyaa-lsf/>).

There is a severe lack of such logistics and long-term monitoring facilities in critical tropical regions such as West Africa. We consider that the Cape Verde Islands could fill this gap and become both a regional and international resource. Cape Verde, in particular, has some significant advantages due to its location: it is well-situated for monitoring regional atmospheric and oceanic conditions. The intention would be that Cape Verde scientists and technicians both maintain such a base, and play significant roles in the associated research projects. With respect to this longer-term goal, additional international support and long-term funding would be required

As a first step towards these goals, a workshop involving participants from Cape Verde, Germany and several other nations, was held in Mindelo during June 8-10, 2004.

3. Goals of the Workshop

The specific goals of the workshop were to:

- outline the scientific interests of the German partners (IFM-GEOMAR and MPIB-Jena) concerning research in the tropical eastern Atlantic region.
- identify opportunities, including educational opportunities, for Cape Verde and other West African scientists to interact and participate in these projects.
- evaluate the possibilities for setting up long-term research infrastructure and collaboration in Cape Verde.
- discuss/plan broader educational and training needs and opportunities, including the possibility of using Cape Verde as a science logistics base for international researchers and as the core of a training network in modern environment-related science for West Africa.

4. TIMETABLE FOR THE WORKSHOP



The workshop was held in conjunction with a visit to Mindelo by the IFM-GEOMAR's research vessel, FS *Poseidon*. *Poseidon* is a multi-disciplinary, medium-size vessel (60.8 m, 12 scientists, 18 crew).

1. FS *Poseidon* arrived in Mindelo on May 31
2. A training course in fishery biology, basic oceanography and marine ecology took place on board FS *Poseidon* from 2 June to 6 June for local scientists and students
3. On June 7 the IFM-GEOMAR hosted a reception for local and government officials on board Poseidon.
4. The workshop was held from June 8 through lunchtime on June 10. Following the workshop, a tour of Sao Vicente was organised for the international participants and participants shared an evening meal together. Most participants departed Mindelo on June 11.
5. Prior to and following the workshop, atmospheric scientists interested in establishing an atmospheric monitoring site in Cape Verde toured the islands with the aim of locating a suitable long-term monitoring site. Geologists also took the opportunity to visit several field sites in the company of local scientists.

5. TRAINING COURSE

The training course on FS Poseidon was funded primarily by IFM-GEOMAR through the provision of ship-time, personnel and equipment. FS Poseidon arrived in Mindelo, Porto Grande, on 31st of May. As the training course was scheduled from the 02nd to 5th of June, 1st of June was used for local arrangements and provided Cape Verde Scientists that were not participating in the course with the opportunity to visit the ship. The training course was split into three day trips covering the coastal regions of Sao Vicente and Santo Antao islands and a two day trip to Santa Lucia, an area that is well known by local fishermen for high fish densities (Figure 1). Due to the great interest in the course, a combination of two and one day trips was organised to enable the exchange of participants from day to day. A list of participants in the training course is appended as Appendix 1.

Due to funding limitations, the course programme was restricted to physical oceanography (CTD casts and ADCP current measurements), planktology (Bongo sampling) and pelagic fisheries. During the five days of the training course continuous current measurements were run and a total of 20 CTD casts were performed. These data are presently being evaluated by IFM-GEOMAR scientists and will be used to describe local current patterns with implications for fish stock recruitment in the frame of a PhD project with a student from Cape Verde. Bongo samples were collected on 11 stations and a first inspection of the zoo- and ichthyoplankton community by the course participants was undertaken directly on board. Afterwards samples were preserved in formalin and will be used by ISECMAR for training in

Marine Biology. The success of training in Fisheries Biology was limited due to sampling problems and the loss of the gear already during the third haul. Draught and size of FS Poseidon as well as the lack of precise maps of the area did not allow us to enter the coast near areas known for high fish density. Taxa of the few mainly meso-pelagic fishes and cephalopods collected during the first two trawl sets were identified and samples preserved for demonstration purposes.

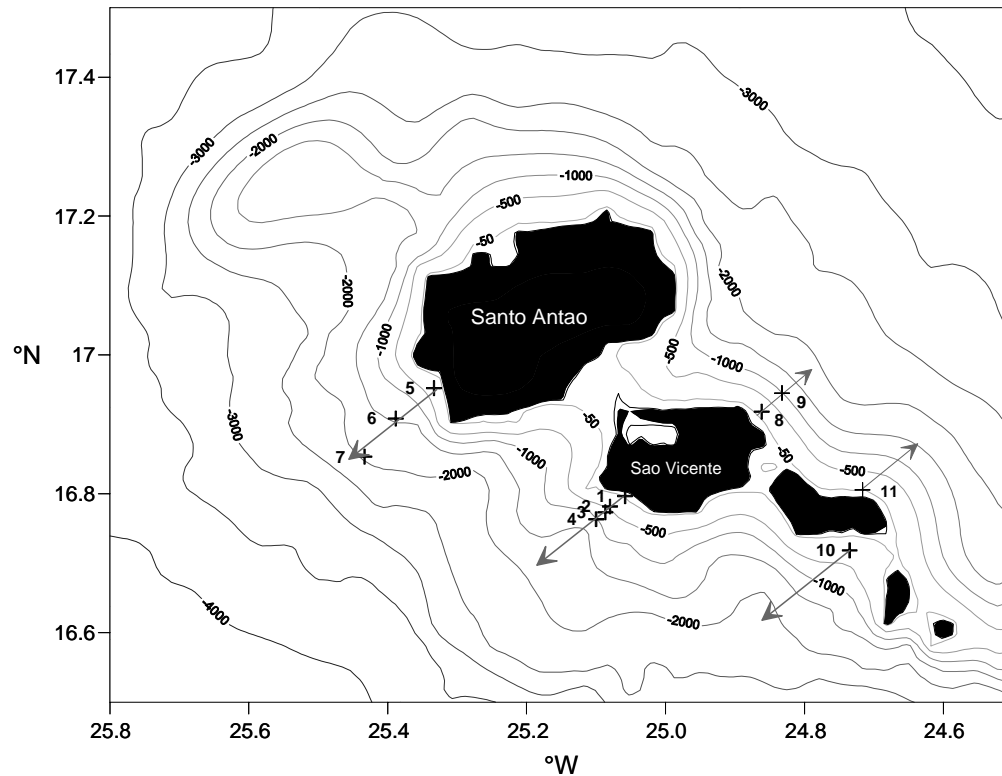


Figure: Station map of the Training course on FS Poseidon.

A list of participants in the training course is appended as Appendix 1.

6. RECEPTION ON BOARD POSEIDON

There is considerable interest amongst Cape Verde government officials in the proposed project. We welcome such interest, and had already made some contacts via diplomatic and official channels (e.g. a visit to Kiel in November 2003 by the Secretary of the Cape Verde Embassy in Berlin). We therefore hosted a reception on board FS *Poseidon* that allowed for an informal presentation of project ideas for government officials on Monday June 7, prior to the start of the workshop.

To this reception, we invited:

- Government officials
- Institution heads

- International scientists (from Azores, West Africa and the USA)
- Local port officials
- Representatives of airlines and other local companies.
- Scientists involved in the project.
- The Captain and Officers of FS Poseidon.

A full list of invitees to the reception is provided in Appendix 2.

7. WORKSHOP

The workshop was held at the Foya Branca resort which is located about 12 km from Mindelo.

International participants stayed on-site, all participants ate lunch together, and each evening a small reception was held to encourage additional discussion and interaction. The workshop itself commenced with an opening ceremony which was attended by a wide range of local politicians and officials, including the Mayoress of Mindelo, and at which the Minister for Environment, Agriculture and Fisheries welcomed the participants and expressed her strong support for the project. Her remarks are reproduced in Appendix 3. This was followed by presentations of the Volkswagen Stiftung's program by Dr. Detlef Hanne and an introduction to the project and workshop by Prof. Doug Wallace.

The workshop proper commenced with introductions of the partner institutions, which was followed by presentations concerning the areas of potential scientific cooperation. Based on this preparation, the further organisation of the workshop was discussed, including the establishment of working groups that might best meet the needs of both the “Northern” and “Southern” participants in the workshop. A set of working groups then met and made specific recommendations. The working group reports and their recommendations are one of the major outputs of the workshop are provided in Appendix .

A full list of workshop participants together with email and telephone information is provided in Appendix 4.



Photo: Dr. Mamoudou Aliou Dia (National Centre for Fishery and Oceanographic Research, Nouadhibou, Mauritania); Dr. Douglas Wallace (IFM-GEOMAR, Kiel, Germany); Mrs. Virginia Pires Correia (Centro de Investigação Pesqueira Aplicada, Bissau, Guinea-Bissau); Mr. Samba Tenin Diallo (Centre National des Sciences Halieutiques de Boussoura, Conakry, Guinea).

8. AGENDA CAPE-VERDE WORKSHOP

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|-------------|-------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| | Day 1: Tuesday 8 June | |
| 08:30-09:00 | <i>Registration</i> | <i>(for workshop participants)</i> |
| 09:00-09:30 | Welcoming Remarks | Dr. Maria Madalena Brito Neves Minister for Environment, Agriculture and Fisheries |
| 09:30-09:50 | Knowledge for Tomorrow - Cooperative Research Projects in Sub-Saharan Africa | D. Hanne (Volkswagenstiftung) |
| 09:50-10:15 | Towards a West African Science Logistics Centre in Cape Verde: Workshop Background and Goals | D. Wallace (IFM-GEOMAR) |
| | <i>Coffee Break (and late registration)</i> | |
| 11:00-11:05 | Workshop Organisation and Logistics | |
| 11:05-11:25 | VERY BRIEF Self-Introduction of Participants | |
| 11:25-12:10 | Introduction of Cape Verde Project Partners: ISECMAR INDP | Institution Chairmen M. Almeida O. Melicio |
| 12:10-12:40 | Introduction of German Project Partners IFM-GEOMAR, Kiel MPIB, Jena | P. Herzig (IFM-GEOMAR) M. Heimann (MPIB) |
| 12:40-14:00 | <i>Lunch Break</i> | |
| 14:00-14:20 | Theme I: Climate, Satellites and Dust | A. Macke (IFM-GEOMAR) I. Tegen (MPIB) |
| 14:30-14:50 | Theme II: Geology, Vulcanology and Hazards | K. Hoernle / T. Hansteen (IFM-GEOMAR) |
| 14:50-15:15 | INMG and Cape Verde Partner Perspectives | B. Faria and J. Moreno (INMG) |
| 15:15-17:00 | Tour of the INDP, INMG and ISECMAR | Workshop Participants |
| 18:30 | <i>Informal Reception (Hotel)</i> | <i>Workshop Participants</i> |

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|-------------|----------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
| | Day 2: Wednesday 9 June | |
| 09:00-09:05 | Organisation and Logistics | |
| 09:05-09:35 | Introduction of International Partners The University of the Azores The University of Massachusetts | J. Gonçalves B. Rothschild |
| 10:05-10:35 | Theme III: Fish and Fisheries Science | R. Hanel / G. Krauss (IFM-GEOMAR) |
| 10:35-11:00 | <i>Coffee Break</i> | |
| 11:00-11:30 | Cape Verde Partner Perspectives | A. Medina (INDP) |
| 11:30-11:40 | Discussion and Response from German Partners | |
| 11:40-12:05 | Theme IV: Atmospheric Science and Monitoring | M. Heimann (MPIB) |
| 12:05-12:15 | Cape Verde Partner Perspectives | E. Brito (INMG) |
| 12:15-14:00 | <i>Lunch Break</i> | |
| 14:00-14:20 | Theme V: Marine Ecology | M. Wahl (IFM-GEOMAR) |
| 14:20-14:30 | Cape Verde Partner Perspectives | C. Almeida (ISECMAR) |
| 14:30-17:00 | Working Group Meetings Working Group 1: Geology and Geophysics Working Group 2: Atmospheric Science Working Group 3: Marine Science | |
| 17:00 | End of Second Day | |
| 18:30 | <i>Informal Reception (Hotel)</i> | <i>Workshop Participants</i> |

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|-------------|--------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| | Day 3: Thursday 10 June | |
| 09:00-09:05 | Organisation and Logistics | |
| 09:05-10:30 | Working Group Meetings Working Group 4: Education and Training Working Group 5: Seamount Studies | |
| 10:30-11:00 | <i>Coffee Break</i> | |
| 11:00-13:00 | Plenary: Working Group Reports and Discussion | WG Leaders |
| 12:45-13:00 | Closing Remarks | D. Wallace (IFM-GEOMAR); D. Hanne (VW Stiftung) O. Melicio (INDP) |
| 13:00-14:30 | <i>Lunch</i> | |
| 15:00-19:00 | Tours of Sao Vicente and Farewell Dinner | |



Photo: The Education and Training Working Group.

9. Overall Summary, Recommendations and Financing

This section mainly summarizes the results of the Working Groups. Detailed outcomes of the Working Groups are provided in Appendix 5. Recommendations arising from these discussions are presented.

Attainment of Goals

The workshop clearly attained its specific goals, viz:

The scientific interests of the German partners were explained in a series of presentations that were followed by presentations and responded by Cape Verde and West African science.

In the discussion groups, which were structured mainly according to scientific themes, a number of specific projects were discussed and many possibilities for cooperation and Cape Verde / West African involvement were identified. From these discussions, clear interdisciplinary enthusiasm for studies of regional seamounts emerged. Specific project ideas are listed in the Working Group 4 report in Appendix 5.

Long-term infrastructure required for forming the basis of future scientific work was also proposed. In the case of atmospheric monitoring, a suitable site for long-term monitoring was identified by the MPIB and INMG, and this monitoring program is likely to commence in the near future. In the case of ocean monitoring, a time-series site was proposed and the necessary infrastructure and logistical support was identified. The combined ocean and atmosphere monitoring can potentially serve the needs of a wide range of international programs as well as provide valuable information for the region.

An important outcome of the workshop was the identification of major educational and training needs within the entire West African region. The possibility of developing educational resources in Cape Verde that could address these needs was an unexpected but potentially highly significant outcome of the workshop. Specific steps required to move towards this goal were identified and are discussed in detail in the report of Working Group 5 (Appendix 5).

An extended regional network for marine science was proposed that would cover the coastal states of West Africa from Mauritania to Guinea. Development of this network could be based on the existing active network of fishery scientists, but should be extended to other marine-science relevant fields. The network would be established by compiling a listing of regional marine expertise, and would be sustained and strengthened through a series of summer schools and, hopefully, joint projects.

Specific Needs and Recommendations for the Future:

The long-term goal of establishing a Science Logistics Centre in Cape Verde has, as its underlying scientific motivation, a recognition of the unique location of the Cape Verde Archipelago for Earth System research. The goal is ambitious and attainment of the goal will require considerable effort and depends critically on making Cape Verde an attractive and convenient location to perform scientific

research. Meeting the goal also requires that the partners be realistic about their motivations and self-interests. The workshop organizers came to the realization during the workshop that the self-interests of the “Northern” and “Southern” partners coincide in the area of scientific research in this region. It was therefore proposed to build the Logistics Centre on the basis of developing shared scientific and educational activities, including

- 1) Establishment of long-term scientific activities in the region that can act as a magnet for additional international scientists;
- 2) Improvement and extension of the regional infrastructure for scientific research;
- 3) Strengthening the ability of regional scientists to participate in and lead such projects;
- 4) Raising the awareness of the international scientific community concerning the research possibilities in Cape Verde and the West African region.

Some specific recommendation addressing activities 1) and 2) are:

Long-term atmospheric monitoring: an ideal site was identified on Sao Vicente at Praia da Ceilada do Calhau. Once basic monitoring for atmospheric gases has been established, it should be possible to use this site as a basis for additional atmospheric science campaigns. Because the monitoring relies on the absence of local pollution and should be long-term, **this pristine site should be secured and actively protected for scientific purposes.**

Ocean monitoring: **a long-term program of ocean monitoring** would be a complementary activity that would also form the basis for a science logistics centre. This time-series site could be located offshore, and upwing of Sao Vicente. **The refurbishment and repair of the INDP research vessel Islandia is a necessary pre-requisite for this activity** as well as for interdisciplinary research on seamounts (see below). Outside projects should reimburse the INDP for use of this vessel, but for this a charging policy for recovering ship costs will be required.

Biodiversity, genetic resources: An **inventory of the living resources of the region** is a necessary basis for future biological research as well as for decisions on sustainable management of natural resources and installation of protective measures (e.g. Marine Protected Areas).

Scientific research into geological and ecological aspects of seamounts will require a high-resolution bathymetric survey of the region. German research vessels could conduct this survey in cooperation with Cape Verde authorities. A first cruise to work towards this goal is “*Meteor*” cruise M 62/3 in September 2004. Initial inventories of biological resources and a routine biological monitoring could make use of the refurbished local INDP vessel.

Activity 3 can best be addressed by: the establishment of a **regional network of marine-related scientists in West Africa**; within-project training; **hosting of summer schools** designed to educate regional scientists; and the **establishment of regional marine science education programs**. Working Group 5 specifically recommended the development of an **international master's course in Marine Sciences and Fisheries** in Cape Verde. This would build regional capacity to manage the area's rich marine resources in the face of increasing international pressures.

Activity 4 will be best-addressed if the regional science projects are successful and high-profile. However additional methods of "marketing" Cape Verde and the region are available and should be supported. These include: **hosting of summer schools for international scientists** such as the proposed Summer School for SOLAS (Surface Ocean Lower Atmosphere Study; www.solas-int.org). Such training schools expose Cape Verde and the regional scientific possibilities to the next generation of global environmental scientists: i.e. the potential users of the future Logistics Centre.

Future Financing and the Role of the Stiftung:

The Volkswagen Stiftung's support for the workshop was extremely valuable and greatly appreciated by the participants. The initial funding allowed the scope, direction and mutual interests associated with the project to become better defined. It also became clear that the Volkswagen Stiftung alone cannot support such an ambitious long-term project. The individual Working Groups therefore identified a range of additional funding sources that could prove useful in pushing towards the project's overall goals. These include German and international funding agencies (e.g. EU, DFG, BMBF as well as sources in other countries) as well as the DAAD. Workshop participants are already exploring these funding sources and in some cases, proposals have already been formulated to initiate aspects of the planned work. One example, is that a German national SOLAS proposal to the BMBF will propose a long-term measurement site at Cape Verde. A related proposal is being promoted by the UK SOLAS program. Such activities fit well with the already-established plans of the MPIB (Jena) to establish long-term measurements.

However these individual projects cannot be expected to support the larger goal of sustainable logistics and educational activities in Cape Verde. We therefore see a continued role for the Volkswagen Stiftung in matching the individual projects to the overall, larger goal, via:

- coordination of project activities
- raising awareness of the international scientific community
- building regional networks (e.g. via summer schools and establishment of a new Masters level course in marine science)
- support for critical, general purpose infrastructure to attract international science

Specifically, we suggest that the Stiftung should consider financial support in the following areas:

- 1) Appointment and training of a Science Logistics Centre Coordinator/ Site Manager.
- 2) A travel and logistics fund for hosting Summer Schools designed for, and open to, scientists from the West African sub-region.
- 3) Studentships and training visits for personnel from the West African network and travel funds for joint North-South proposal development.
- 4) Upgrading of Cape Verde's scientific infrastructure and thereby enhancing its attractiveness and sustainability as a Logistics Centre. Specifically, we suggest: establishment of key facilities (e.g. an atmospheric monitoring station on Sao Vicente) and rapid refurbishment of the INDP research vessel. Such funding could be offered in the form of matching grants with other partners, including MPIB as well as national (Cape Verde or German) and European bodies.
- 5) Development of an international master's course in Marine Sciences and Fisheries in Cape Verde that will be taught by local and visiting lecturers to 20-40 students from the West-Africa region.



Photo: Three Institution Directors during a visit to the INDP in Mindelo: Martin Heimann (Director, MPIB, Jena, Germany); Oscar Melicio, President, INDP, Mindelo, Cape Verde; Peter Herzig (Director, IFM-GEOMAR, Kiel, Germany)

APPENDIX 1: LIST OF TRAINING COURSE PARTICIPANTS

| | Wed | Thu | Fri | Sat | Sun |
|------------------------|------------|------------|------------|------------|------------|
| <i>Aníbal Medina</i> | xxxxxxxxxx | xxxxxxxxxx | xxxxxxxxxx | xxxxxxxxxx | xxxxxxxxxx |
| | | | | | |
| <i>Sônia Merino</i> | xxxxxxxxxx | xxxxxxxxxx | xxxxxxxxxx | xxxxxxxxxx | xxxxxxxxxx |
| | | | | | |
| <i>Vanda Monteiro</i> | xxxxxxxxxx | xxxxxxxxxx | xxxxxxxxxx | xxxxxxxxxx | xxxxxxxxxx |
| | | | | | |
| <i>Oksana Pastor</i> | xxxxxxxxxx | xxxxxxxxxx | xxxxxxxxxx | xxxxxxxxxx | xxxxxxxxxx |
| | | | | | |
| <i>Márcia Costa</i> | xxxxxxxxxx | xxxxxxxxxx | xxxxxxxxxx | | |
| | | | | | |
| <i>Vito Ramos</i> | | | | | |
| | | | | | |
| <i>Ester Brito</i> | | xxxxxxxxxx | | | |
| | | | | | |
| <i>Corrine Almeida</i> | xxxxxxxxxx | xxxxxxxxxx | xxxxxxxxxx | xxxxxxxxxx | xxxxxxxxxx |
| | | | | | |
| <i>Raquel Santos</i> | xxxxxxxxxx | xxxxxxxxxx | xxxxxxxxxx | xxxxxxxxxx | xxxxxxxxxx |
| | | | | | |
| <i>Nuno Almeida</i> | xxxxxxxxxx | | xxxxxxxxxx | | |
| | | | | | |
| <i>Ivanice</i> | xxxxxxxxxx | xxxxxxxxxx | xxxxxxxxxx | | |
| | | | | | |
| <i>Gizela</i> | xxxxxxxxxx | xxxxxxxxxx | xxxxxxxxxx | | |
| <i>Denis</i> | xxxxxxxxxx | xxxxxxxxxx | xxxxxxxxxx | | |
| | | | | | |
| <i>Jose Ramos</i> | | | xxxxxxxxxx | xxxxxxxxxx | xxxxxxxxxx |

APPENDIX 2: RECEPTION ON BOARD POSEIDON: INVITEES

Invitees From Cape Verde:

Sua Excelência a Ministra do Am. Ag. e Pescas – Eng^a. *Madalena Neves*
Presidente da Câmara Municipal de SV- *Dra. Isaura Gomes*
Dir. Geral Enapor – *Dr. Franklim Spencer*
Del. TACV – SV -
Dir. Geral ANV – *Dr. José Malaquias*
Pres. Ass Armadores de CV – *Sr. Nelson Atanasio*
Del. MAAP –SV – Eng^a *Alcidia Rodrigues*
Del. MEVRH – SV – *Dra. Rosa Santiago*
Pres. do INDP – Eng.^o *Oscar Melicio*
Pres. do ISECMAR - Eng.^o *Manuel Fortes*
Pres. do INMG – Eng.^o *José Moreno*
Dir. Geral das Pescas - *Dra. Edelmira Carvalho*
Dir. Geral Marinha e Portos- Eng.^o *Zeferino Fortes*
FOPECA – Eng.^o *Aguido Cabral*
Dir. Foya Branca – *Dr. João Rego*
Dr. Aníbal Medina - INDP
Dr. Nuno Almeida - ISECMAR
Dra. Vanda Monteiro - INDP
Dra .Oksana Pastor - INDP
Dra .Márcia Costa - INDP
Dra. Sônia Merino - INDP
Dra. Corrine Almeida - ISECMAR
Dra. Raquel Santos - ISECMAR
Eng^a. *Ester Brito* - INMG
Dr. Vito Ramos - INDP
Dr. Jorge Nascimento - INDP
Eng.^o *José Ramos* - ISECMAR

Invitees from Germany:

Dr. Detlef Hanne - Volkswagenstiftung
Prof. Dr. Peter Herzig (IFM-GEOMAR)
Prof. Dr. Kaj Hoernle (IFM-GEOMAR)
Prof. Dr. Douglas Wallace (IFM-GEOMAR)
Prof. Dr. Reinhold Hanel (IFM-GEOMAR)
Rabea Diekmann (IFM-GEOMAR)
Christoph Petereit (IFM-GEOMAR)
Dirk Jarosch (IFM-GEOMAR)
Prof. Dr. Arne Körtzinger (IFM-GEOMAR)
Dr. Gerd Kraus (IFM-GEOMAR)
Prof. Dr. Karin Lochte (IFM-GEOMAR)
Frau Ute Weidinger (IFM-GEOMAR)

Prof. Dr. *Martin Heimann* (MPIB-Jena)

Invitees from West Africa:

Dr. *Mamoudou Aliou Dia* (CNROP, Mauritania)

Mrs. *Virginia Pires* (CIPA, Guinea-Bissau)

Other International Invitees:

Prof. *Brian Rothschild* (U. Mass. Dartmouth, USA)

APPENDIX 3: INTRODUCTORY REMARKS OF THE MINISTER FOR ENVIRONMENT, AGRICULTURE AND FISHERIES:

(Sua Excelência a Ministra do Am. Ag. e Pescas – Eng^a. Madalena Neves)

Your Excellency, The Mayor
The Director of IFM - GEOMAR
The Director of the Max - Planck Institute for Biogeochemistry
The Representative of the Volkswagen Foundation
The Representatives of national and international institutions of Research and Higher Education
The Representatives of Public and Private Institutions
Dear Guests and Delegates
Ladies and Gentlemen

First of all I would like to warmly welcome the distinguished delegates from Germany, the United States of America, the Azores, the Canary Islands, Guinea-Conacri, Guinea-Bissau, Mauritania, Senegal and the Volkswagen Foundation.

May I take this opportunity to express, on behalf of the Cape Verde government and in my own name, how honoured we feel by the selection of Cape Verde, and Sao Vicente in particular, for the stage of such a relevant event.

I strongly believe that, by carrying out this "Towards a West African Science Logistic Centre in Cape Verde" workshop, a significant step is being taken in the process of integrating Cape Verde in a research network aimed at building expertise in the atmospheric and marine science.

Regarding the sea as an essential element for our country's strategic development is one of the basic guidelines of our government programme. It is our goal to transform Cape Verde, by valorizing its resources and promoting its strengths, especially at the level of human resources.

My satisfaction results from all this, as well as from the fact that Cape Verde has been selected as the location of this important regional project, providing conditions for the integration of our country in the West African sub - region.

Sao Vicente, known by its maritime and fishery tradition, with its potentiality for training and research in the area of maritime science, will be able to mobilize the strength of its history and all required determination not only for offering the "morabeza" of these Atlantic Islands, but also for ensuring the success of this project.

Ladies and Gentlemen
Distinguished Delegates

The main purpose of this meeting is to launch a strategic project in the area of scientific research and higher education applied to atmospheric and marine science, based on the collaboration between institutions and researchers from various countries.

It will also give place to other initiatives not only in the context of our sub-region, but also turned to the geographic area of Macaronesia.

It is a project open to new partners, setting up the adequate framework for valorizing technical and scientific potentialities of important national and international institutions and, above all, for the integration and use of science and technology as essential elements of development.

Ladies and Gentlemen

I assure the engagement of the Cape Verde government in order to ensure the implementation of the components attributed to us in the context of this initiative.

Encouraging the involvement of experts in joint research projects, promoting academic and scientific education, facilitating knowledge transfer, are, among others, in our opinion, strategic and opportune goals for promoting science and technology in their diverse branches.

Cape Verde is developing initiatives aimed at the research and preservation of marine biodiversity and, among these, we would like to mention the project developed through the cooperation with the authorities of the Canary Islands and the E.U., integrated in the INTERREG programme, financed by the Netherlands government, which will be executed by WWF and national institutions. Other initiatives will be developed in the framework of the U.S. Millennium Challenge Account programme. It should also be stressed a range of training and capacity-building activities for operators in the Industrial fishery sector, in progress at ISECMAR.

Thus, our government regards the long-term establishment of an inter-disciplinary Centre for Oceanographic Research within West Africa and the Tropical and Equatorial Atlantic Ocean, as an important strategic initiative, which will allow the integration in modern tendencies of organization, scientific development and applied research.

The existence of similar fruitful initiatives, in other regions of the world, is another factor of increased motivation.

At the moment in which the reflection on the Cape Verde University, is moving to a new stage, I strongly believe that the developments resulting from this initiative will contribute significantly to the successful materialization of important measures of our national strategy for development

In the context of this meeting, we all assume increased responsibilities. During the technical sessions, we will be able to define, in a pragmatic way, the institutional and scientific agreements for pursuing the activities, having always in mind the results and obvious benefits not only for Cape Verde but also for all the partners involved.

I count on your engagement to make this dream come true.

To finish, I wish an enjoyable stay in Mindelo to all the distinguished delegates and guests.

I formally declare the "Towards a West African Science Logistic Centre in Cape Verde" workshop open.

Thank you for your kind attention

APPENDIX 4: WORKSHOP PARTICIPANTS

Participants from Germany

- Volkswagenstiftung
Dr. Detlef Hanne
- Leibniz-Institut für Meereswissenschaften, Kiel (IFM-GEOMAR)
Prof. Dr. Peter Herzig (Director)
Prof. Dr. Kaj Hoernle (Deputy-Director)
Prof. Dr. Douglas Wallace (Deputy-Director)
Dr. Peter Croot
Dipl.-Biol. Rabea Dieckmann
Prof. Dr. Reinhold Hanel
Dr. Thor Hansteen
Dirk Jarosch
Prof. Dr. Arne Körtzinger
Dr. Gerd Kraus
Prof. Dr. Karin Lochte
Prof. Dr. Andreas Macke
Christoph Petereit
Dr. Lothar Stramma
Prof. Dr. Martin Wahl
Ute Weidinger
- Max-Planck Institut für Biogeochemie, Jena (MPIB)
Dr. Martin Heimann (Director)
Dr. Corinne LeQuéré
Dr. Andrew Manning
Dr. Ina Tegen

Cape Verde Participants

- Instituto Nacional de Desenvolvimento das Pescas, São Vicente (INDP)
Dr. Oscar Melicio
- Instituto Superior de Engenharia e Ciências do Mar, São Vicente (ISECMAR)
- Instituto Nacional de Meteorologia e Geofísica, São Vicente (INMG)

Participants from West Africa

- National Centre for Fishery and Oceanographic Research, Mauritania (CNROP)
Dr. Mamoudou Aliou Dia
- Centro de Investigação Pesqueira Aplicada, Guiné-Bissau
Mrs. Virginia Pires
- Centre National des Sciences Halieutiques de Boussoira, Guiné (CNSHB)
Mr. Samba Tenin Diallo

Other International Participants:

- Graduate School of Marine Sciences and Technology, University of Massachusetts, Dartmouth, USA
Prof. Brian Rothschild (Univ. Massachusetts, Dartmouth, USA)
- Department of Oceanography and Fisheries, University of the Azores, Portugal
Prof. João Gonçalves (Univ. Azores, Portugal)
- Instituto Canario de Ciencias Marinas, Gran Canaria, Spain
Prof. Nieves González (Deputy-Director)

WORKSHOP PARTICIPANT CONTACT INFORMATION:

Note: since this list was prepared 6-digit Cape Verde telephone numbers have been introduced

| <i>Name</i> | <i>Institution</i> | <i>E-mail</i> | <i>Phone</i> |
|------------------------|---------------------|------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
| Nuno Almeida | ISECMAR | nunoduartealmeida@hotmail.com | (238)2977982 |
| Zeferino Fortes | DGMP | dgmp@cvtelecom.cv | (238)2328199 |
| Iolanda Brites | DGP | yolandab@ma.gov.cv | (238)2615716 |
| Emilio Sanches | INDP -Praia | egsanches@hotmail.com | (238)2929350 |
| Georgino Cruz | DGMP | georginocruz@hotmail.com | (238)2925329 |
| Kaj Hoernle | IFM-GEOMAR | khoernle@ifm-geomar.de | (49)431-6002642 |
| Detlef Hanne | Volkswagen Stiftung | hanne@volkswagenstiftung.de | (49)511-8381-389 |
| Peter Herzig | IFM-GEOMAR | pherzig@ifm-geomar.de | (49)431-600-2800 |
| José Moreno | INMG | institutometeo@cvtelecom.cv | (238)2914826/2411276 |
| Anibal Medina | INDP | anibal.medina@uqar.qc.ca | 418-7246261 |
| Denis Rocha | ISECMAR | denislevyrocha@hotmail.com | (238)2935590 |
| Gisela Cruz | ISECMAR | gisa2379@hotmail.com | (238)2327769 |
| Ivanice Monteiro | ISECMAR | ivanice81@yahoo.com.br | (238)2312986 |
| José Ramos | ISECMAR | jmlramos@hotmail.com | (238)2328944 / 2321129 |
| Vito Ramos | INDP | vitolomelo10@yahoo.com / vito@indp.cv | (238)2321373 /2978065 |
| Martin Wahl | IFM - GEOMAR | mwahl@ifm-geomar.de | (49)4316004577 |
| Reinhold Hanel | IFM-GEOMAR | rhanel@ifm-geomar.de | (49)4316004556 |
| Rabea Diekmann | IFM-GEOMAR | rdiekmann@ifm-geomar.de | (49)4316004559 |
| Christoph Petereit | IFM-GEOMAR | cpetereit@ifm-geomar.de | (49)4316004559 |
| Gerd Kraus | IFM-GEOMAR | gkraus@ifm-geomar.de | (49)4316004557 |
| Mamodou Aliou Dia | IMROP | malioudia@yahoo.fr / madia@imrop.mr | (222)5749035 (222)6486440 |
| Virgínia Pires Correia | CIPA | cruzpires01@yahoo.com.br cipacr@hotmail.com | (245)204211 |
| Corrine Almeida | ISECMAR | corrinealmeida@isecmar.cv | (238)2314865 / 2324196 |
| Andreas Macke | IFM-GEOMAR | amacke@ifm-geomar.de | (49)4316004057 |
| Peter Croot | IFM-GEOMAR | pcroot@ifm-geomar.de | (49)4316004207 |
| Ina Tegen | MPI-BGC | itegen@bgc-jena.mpg.de | (49)3641576270 |
| Lothar Stramma | IFM-GEOMAR | lstramma@ifm-geomar.de | (49)4316004103 |
| Thor Hansteen | IFM-GEOMAR | thansteen@ifm-geomar.de | (49)4316002130 |
| Bruno Faria | INMG (CV) | vigil.isecmar@cvtelecom.cv | (238)2329040 |
| Ester Araujo de Brito | INMG (CV) | inmgdsv@cvtelecom.cv / ester_brito@hotmail.com | (238)2324021 (238)2914895 |
| Amiro Faria | Private | amirodefaria@cvtelecom.cv | (238)2321822 (238)2912664 |
| Karin Lochte | IFM-GEOMAR | klochte@ifm-geomar.de | (49)4316004250 |
| Corinne Le Quéré | MPI-BGC | lequere@bgc-jena.mpg.de | (49)3641576217 |
| Nieves González | ICCM | ngonzalez@iccm.rcanaria.es | (34)928132900 ext. 211 |
| Martín Heimann | MPI-BGC | martin.heimann@bgc-jena.mpg.de | (49)3641576350 |
| Brian Rothschild | UMASS | brothschild@umassd.edu | (1)5089998193 |
| Arne Körtzinger | IFM-GEOMAR | akoertzinger@ifm-geomar.de | T (49)4316004205 F (49)4316004202 |
| João Gonçalves | DOP- Univ. Açores | j.goncalves@notes.horta.uac.pt | T (35)1292200400 F (35)1292200411 |
| Andrew Manning | MPI-BGC | kiwi@paris.org | - |
| Sonia Elsy Merino | INDP | soniaelsy@yahoo.com | (238)2321373 F: (238):321616 |
| Oksana Tariche Pastor | INDP | otariche@hotmail.com otariche@yahoo.es | T (238) 2321373 F (238)2321616 |

| | | | |
|---------------------------|--------------|----------------------------------------------------------------------------------------------------------------|------------------------------|
| Raquel Lopes dos Santos | ISECMAR | raquysantos@hotmail.com | (238)323525 (238)926090 |
| Vanda Marques | INDP | vamarmont@hotmail.com | (238)321373 |
| Marcia P. Valadares Costa | INDP | marcia_valadares@hotmail.com | (238)321373 (238)321374 |
| Maria Helena Vieira | DGP | MariaV@ma.gov.cv | (238)615716 |
| Maria de Fátima Almeida | APROCVITA | faalmeida33@hotmail.com | (238)321507 (238)945902 |
| Douglas Wallace | IFM-GEOMAR | dwallace@ifm-geomar.de | (49)4316004200 |
| Vera Cristina Gominho | INDP - Praia | vgominho@yahoo.com.br | (238)612865 F (238)612502 |
| Maria Edelmira Carvalho | DGP - MAAP | mariac@ma.gov.cv | (238)615716 |
| Oscar David F. Melicio | INDP | oscar@indp.cv omelicio@yahoo.com | (238)321370 (238)951072 |
| Antunio Barbosa | ISECMAR | antunio@yahoo.com | (238)924762 |
| Manuel Fortes Almeida | ISECMAR | mefalmeida@cvtelecom.cv | (238)919012 |
| Dirk Jarosch | IFM-GEOMAR | djarosch@ifm-geomar.de | (49)4316004565 |
| Emanuel Soares | INMG | efisso@portugalmail.com | (238)938505 |
| Jorge Nascimento | INDP | Jorgemnascimento2002@yahoo.com | (238)977927 |
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Appendix 5: WORKING GROUPS REPORTS AND RECOMMENDATIONS

WORKING GROUP 1: GEOLOGY AND GEOPHYSICS:

| | |
|---------------|------------|
| Bruno Faria | INMG |
| Kaj Hoernle | IFM-GEOMAR |
| Thor Hansteen | IFM-GEOMAR |
| Amiro Faria | Private |

This small working group identified three main projects that are of joint relevance to the “Northern” partner and to Cape Verde.

Project 1) Assessment of Volcanic Hazards in the Cape Verde Islands: Geochemical Evolution of Geothermal Systems and Remote Sensing of Volatile Fluxes

Project Outline

Fogo:

- a) Regular sampling of fluids and temperature measurements of fumaroles.
- b) Measurement of volcanic degassing (sulfur flux) with mini-DOAS.
- c) Analyses of fluid composition (CO₂, SO₂, H₂S, S, HCl, HF, HBr, N₂, O₂, CO, H₂, CH₄, Ar, He, Ne and light hydrocarbons) and stable isotopes of O, H, C, S.
- d) Calculation of other volatile fluxes.
- e) Evaluation of correlations between seismic activity and tilting of the volcano’s flanks.
- f) Assessment of magma movements and crack development in the volcanic edifice.
- g) Hazard assessment.

Santo Antao:

- a) Sampling of fluids and temperature measurements of hot springs.
- b) Analyses of fluid composition (CO₂, SO₂, H₂S, S, HCl, HF, HBr, N₂, O₂, CO, H₂, CH₄, Ar, He, Ne and light hydrocarbons) and stable isotopes of O, H, C, S.
- c) Determination if magmatic signal is present.
- d) Evaluation of correlations between seismic activity (contingent upon establishment of a seismic network on Santo Antao).
- h) Hazard assessment.

Potential Sources of Funding

VW – Equipment (fumarole sampling assembly; mini-DOAS), travel funds (for Cape Verde scientist to come to Germany), part-time salary to pay someone to carry out regular fumarolic sampling on Fogo.
DFG – Ph.D. position, travel (for doctoral student and German scientists to go to Cape Verde and attend conferences) and analytical funding.
DAAD – If a qualified candidate from Cape Verde could be found, Ph.D. funding could be applied for through DAAD.

Available Infrastructure

Seismic network and tilt meters on Fogo.
Scientist and staff to maintain network and evaluate geophysical data.

Training of Cape Verde Scientists/Personel

- a) for fumarole sampling
- b) for remote sensing
- c) evaluation of data

Benefits to Cape Verde Partners

- a) training of Cape Verde Scientists/Personnel
- b) fumarole sampling/monitoring and remote sensing equipment
- c) volcanic hazard assessment

Project 2) Temporal and Geochemical Evolution of Volcanism on the Cape Verde Islands

Project Outline

- a) Field studies including determination of volcanic stratigraphy and sampling.
- b) Ar/Ar and U-series age dating.
- c) Major element trace element and isotopic analyses.
- d) Evaluation of petrological and geochemical evolution of the Cape Verde archipelago.
- e) Evaluation of age progression.
- f) Determination of geochemical zonation in time slices.
- g) Assessment of possible future volcanic activity.

Sources of Funding

DFG – Ph.D. position for age dating, travel (field work on Cape Verde and scientific conferences) and analytical funding.

DAAD – Ph.D. student for petrology/geochemistry from Cape Verde.

Available Infrastructure

Logistical support from Cape Verde personnel during field work.

Training of Cape Verde Scientists/Personel

Ph.D. student to do petrological/geochemical studies.

Benefits to Cape Verde Partners

Better understanding of the evolution of the Cape Verde archipelago and contribution to assessment of future volcanic activity.

Project 3) Chemical Composition and Age of Magmatic Rocks in Uplifted Mesozoic Ocean Crust in the Cape Verde Islands: Implications for the Role of the Cape Verde Plume in the Breakup of Pangaea and Alteration of Mesozoic Seafloor

Project Outline

- a) Field studies and sampling of uplifted Mesozoic Ocean Crust on Maio and Santiago
- b) Age dating and geochemistry of samples
- c) Evaluation of geochemistry to determine if a plume signature is present in the Mesozoic ocean crust and if this signature is similar to Tertiary volcanic rocks on the Cape Verde Islands
- d) Evaluation of alteration (lateral and vertical chemical gradients) in the uplifted ocean crust

Sources of Funding

DFG – Ph.D. position for age dating, travel (field work on Cape Verde and scientific conferences) and analytical funding. DAD – Ph.D. student from Cape Verde if qualified student can be found

Available Infrastructure

Logistical support from Cape Verde personnel during field work.

Training of Cape Verde Scientists/Personel

Ph.D. student if qualified person can be found.

Benefits to Cape Verde Partners

Better understanding of the role of the Cape Verde Archipelago in causing the breakup of Pangaea and the formation of the North Atlantic.

WORKING GROUP 2: ATMOSPHERIC SCIENCES:

| | |
|-----------------|-------------------------|
| Ester Brito | INMG |
| Douglas Wallace | IFM-GEOMAR |
| Martin Heimann | MPIB |
| Ina Tegen | MPIB |
| Jose Moreno | INMG |
| Andreas Macke | IFM-GEOMAR |
| Peter Croot | IFM-GEOMAR (Rapporteur) |
| Andrew Manning | MPIB |
| Antonio Barbosa | ISECMAR |

The atmospheric sciences working group also identified and developed a number of projects:

Project 1) Clouds; Dust And Solar Radiation

Interest from Jena and Kiel lies in studying the effect of clouds and dust on radiation transfer to the tropical oceans. For these purposes it is proposed to establish a Pyranometer (for measuring solar radiation) on Sal which can potentially be maintained by INMG personnel. During the discussions, it was noted that the INMG is about to receive a Meteosat receiving station but requires training in its operation. A Meteosat station has recently been installed at the IFM-GEOMAR in Kiel, and it became clear at the workshop that it would be possible for IFM-GEOMAR to provide a short course for INMG personnel. A Meteosat station can provide 'Nowcasting' capabilities for the arrival of dust storms. The sudden onset of low visibility with the arrival of a dust storm can be dangerous for local fisherman and for other inter-island transport.

Project 2) Atmospheric Gas Monitoring

The Max-Planck Institut für Biogeochemie in Jena (MPIB) had previously identified the Cape Verde Islands as an ideal location for long-term monitoring of a range of climate-relevant gases, including CO₂, O₂, N₂O, CO and some other species. In collaboration with the INMG, this monitoring could start in 2004 with weekly collection and shipping of flask samples. Installation of in-situ measurement systems could commence in late 2005. Funding for such a monitoring program exists, and the monitoring is envisioned to be long-term (>30 years in duration). The monitoring activities requires a certain level of local support and maintenance. The data to be collected are relevant to the global-scale behaviour of the carbon cycle and are not necessarily of the highest direct relevance to Cape Verde or West Africa. On the other hand, the monitoring would bring Cape Verde into closer contact with the international scientific community, and there would be opportunities to work collaboratively on the data collected. Perhaps more significantly, the establishment of such a program is likely to stimulate other groups to conduct measurements in the same location, and therefore could form an important foundation of a Science Logistics Centre.

A potential site for the monitoring was identified on Sao Vicente at Praia da Ceilada do Calhau. An additional site could be established on Monte Verde in order to sample air at the top of the marine boundary layer. The Praia da Ceilada do Calhau site appears to be perfect, with a clear line of sight to the ocean and no local sources of contamination. Concern was expressed as to ownership of this site and whether there may be commercial development at this site in the future. In order for this site to be suitable for long-term monitoring, it should be protected from development so that non-contaminated measurements can be assured long into the future.

Project 3) Aerosol and Rainwater Chemistry

Cape Verde is particularly well-located for studying chemical processes associated with the atmospheric aerosol, including dust. These chemical processes in turn have potential implications for delivering nutrients to tropical oceanic ecosystems. There is therefore interest in establishing a station suited to the long-term measurement of the chemical composition of dust and the marine aerosol. At the same time, measurements of the chemical composition of rainfall would also be useful. Some local infrastructure would have to be established, including a high volume aerosol sampler and possibly an ion chromatograph for rainfall chemistry measurements. Once again, these projects would offer training possibilities for Cape Verde students. The site at Praia da Ceilada do Calhau would also seem to be well-suited to this study.

WORKING GROUP 3: MARINE SCIENCES

The initial group was very large and therefore split into two smaller groups: one to deal with the open ocean and the other to deal with benthic and other non-pelagic issues.

A. PELAGIC (OPEN OCEAN)

This sub-group determined that a major need of Cape Verde and other West African nations was to be able to identify 'what they have' (i.e. biological diversity and resources) with respect to pelagic marine ecosystems. To this purpose a number of specific activities were proposed by the working group:

Project 1) Compile an inventory of available knowledge on open ocean pelagic ecosystems

This compendium should cover the region within the triangle Cape Verde – Mauritania – Guinea. Such a book could serve as a reference for biological studies in the region and would allow identification of major knowledge gaps.

Project 2) Strengthen the regional network for marine sciences

There is an existing well-established network of expertise that deals with regional fisheries issues. This network could be used as the basis for establishing a more general network of expertise that relates to marine environmental and resource issues in the region. Steps towards this would include:

- Conducting a “Census of marine expertise” in order to identify and link regional expertise.
- Identifying regional infrastructure and research resources and making this available to the whole region
- Operating summer schools that address identified gaps in knowledge and provide required training to regional scientists & technicians in modern methods

Project 3) Build on and improve the local infrastructure on Cape Verde with a view to establishing a science logistics centre.

Specific steps include:

- The local research vessel “Islandia” should be repaired and upgraded to be available to the local, regional and international research community.
- The excellent, modern INDP building should be equipped to serve as a central laboratory to support various research projects (i.e. adopt model of Bermuda Biological Research Station)

Based on this infrastructure, a long-term ocean time-series site should be established, with:

–Mooring component: Monitor the physical (T , S , currents, mixed layer depth) and biogeochemical state (oxygen, CO_2 , dust) of the upper water column from *in-situ* sensors on long-term moorings.

–Ship-based component: Monitor biological (phyto-, zoo-, ichthyoplankton) and biogeochemical (nutrients, N_2O , etc.) parameters from short regular (e.g., monthly) cruises to the time series site.

The time-series site will require the establishment and training of local scientific & technical capacity to run a time-series programme.

In turn, the the time-series infrastructure (regular ship visits, mooring) can be used as a basis for integrative studies on the pelagic ecosystem (bottom up vs. top down control) and cooperative small scale projects (master, PhD) can be developed in its context.

An important aspect of the project is that the science logistics centre be marketed to the regional network and the wider international scientific community (“Bermuda model”).

B. BENTHIC, DEMERSAL

The working-group dealing with benthos and demersal species also identified the compilation of bioinventories in terms of taxonomy and the distribution of species and communities as a required basis for future scientific work as well as for sustainable coastal zone and fisheries management. Important prerequisites for taxonomic and ecological work in the region were identified and turned out to be the same as for pelagic systems, i.e.:

- A compilation of an inventory of available knowledge on benthic and demersal taxa and communities in combination with a completion of libraries in selected institutions in the area.
- Renovation of the local research vessel RV Islandia, which seems to be a suitable vessel concerning size and manoeuvrability for coastal ecological and fisheries research
- Capacity building in terms of establishing international education programs such as international master courses and international summer schools

Additional specific project ideas, of common interest for West African and German partners, came up during the discussion:

Project 1) Summer School on Cape Verde Benthic Species Diversity

Participants:

Students from the region

Lecturers from Cape Verde, Mauritania, Senegal, Guinea, Guinea-Bissau

Taxonomists/Ecologists from Germany, France, West Africa

Duration:

3-4 weeks, preferably in August (holidays in D & CV) or September (holidays in D, exam repeat period in CV)

Sources of Funding: VW-Stiftung & DAAD, World Bank?

Program:

Analysis of communities settled on tiles during the previous 9 months and of motile components caught in traps exposed during the summer school

Identification of animal and algal species

Analysis of community types

Assessment of a diversity distribution pattern around the Cape Verde islands

Required equipment:

Collection of material: tiles, dGPS, boat, divers, UW digital camera, traps

Identification: literature, dissecting microscopes (INDP), tanks with flow through water (INDP), vials + formalin for vouchers, herbarium paper for vouchers

Project 2) Stock Identification for selected species

Participants: Anibal Medina (INDP), Virginia Pires Correia (Guinea-Bissau), Mamodou Aliou Dia (Mauretania), Reinhold Hanel (IFM-GEOMAR)

Material: selected demersal fish (groupers, morays, seabreams) and lobsters

Question: Do demersal fish and invertebrate species show specific population structures within Cape Verde and between different fishing grounds along the West-African coast? The identification of

separated stocks was seen as the absolute prerequisite for a sustainable management of fisheries resources. To identify unique genetic resources would further allow to argue for protective management tools like Marine Protected Areas.

Approach: population genetic analyses based on mitochondrial DNA sequences

Project 3) Lobster study

Participants: Maria Edelmira Carvalho (DGP-MAAP, CV) or Sonia Elsy Merino (INDP, CV), Virginia Pires Correia (Guinea-Bissau), Mamodou Aliou Dia (Mauretania), Martin Wahl (IFM-GEOMAR), Reinhold Hanel (IFM-GEOMAR)

Material: 'deep' (100-200m) lobster *Polynurus charlestoni* (CV), *P. mauretanicus* (Mauretania)

Question: Will captured and released females-with-eggs survive despite the pressure stress?

Approach: Mark & recapture. Tag by injection of fluorescent dye (Helgoland technique)
Sensor & logger monitoring of behaviour?

WORKING GROUP 4 INTERDISCIPLINARY STUDY OF SEAMOUNTS

During the earlier working group discussions it became clear that a wide range of participants shared a common interest in studying the important seamounts of the Cape Verde Archipelago. The interest was shared by geologists and biologists. This group had little time to discuss detailed planning, but identified several key project ideas of mutual interest:

Two main project areas were identified:

Project 1) Biodiversity at seamounts

Project Outline

This project requires the production of good bathymetric maps based on regional swath bathymetry mapping using large vessels, as well as seamount-top mapping using smaller boats. On the basis of this bathymetry, the seamounts can be classified according to: morphology, depth of summit, size and structure of summit area. A detailed study would be made of a selection of seamounts, including monitoring and comparison of seamounts that intersect the euphotic zone with deeper seamounts and comparison of seamounts that are heavily fished with some that are not. Chemical and physical fronts over seamounts will be documented. Strong links exist to future projects concerning biological processes associated with rock-water interfaces.

Possible sources of funding

- VW 1) Investigating populations from several seamounts; are there several stocks within the Cape Verde region? Includes sampling, comparative morphometrics, analyses
- VW 2) Looking at gut contents of one fish species over several seamounts (Masters thesis)
- Funding from the CV government?
- Census of marine life: Bioinventory of seamounts; good position to write larger proposal
- OASIS (EU-program)
- Interreg program, Germany, Portugal and Spain involved; CV one possible target.
- Ph.D studentships (DAAD)

Benefits to Cape Verde Partners

Training of Cape Verde Scientists/Personnel

Location and topography of Cape Verde seamounts is not well known;

The study would provide key information on Cape Verde's fishing grounds

Biodiversity knowledge

Better understanding of available economic resources for the stability of the CV

Cost-effective measures for better organization and management of fisheries

Contribute to enforcement of legal fishing

Better assessment of fish catch potential

2) Distribution, Density, Structure, Age and Chemical Composition of Submarine Volcanism in the Cape Verde Archipelago

Project Outline

This project also requires high-resolution bathymetry and classification of seamounts. This to be followed by geological sampling of seamounts and island flanks, including age-dating of the seamounts and chemical analysis of seamount rock samples. Hydrothermal plumes and evidence of recent volcanic activity would be sought. Strong links exist to projects concerning seawater-rock interactions.

The project would seek to determine the age progression of submarine volcanism in the region and whether this is similar to sub-aerial evolution. Similarly, the chemical zonation of submarine volcanism in the region is compared with sub-aerial geochemical zonation.

Sources of Funding

Meteor/Merian funding from the DFG for the field work.

A Ph.D. position for post-cruise analytical work.

Benefits to Cape Verde Partners

- a) Provide information on location of seamounts and fish habitat.
- b) Identify recent submarine volcanic and hydrothermal activity, contributing to the assessment of volcanic hazards.
- c) Determine the location of landslide scars and deposits, allowing assessments of future landslide hazards.
- d) Provide better understanding of the geological evolution of the Cape Verde archipelago.

WORKING GROUP 5: EDUCATION AND CAPACITY BUILDING

(F. Almeida, V. Pires Correia, R. Lopes dos Santos, Corine Almeida, M. Fortes Almeida, E. de Brito, K.Lochte, I. Tegen, L. Stramma, M. Wahl, C. Petereit, A. Macke, A. Koertzinger, M. Heimann, G. Kraus, A. Manning, C. LeQuere, D. Hanne, Mamodou Aliou Dia, Samba Diallo)

Present situation of education in Marine Biology in the West Africa region:

Cape Verde: In the Republic of Cape Verde (CV) students can attend a 3 years course in Marine Biology finishing with a Bachelor Degree at the ISECMAR. Higher education is not possible and therefore the students have to go abroad (mostly to Portugal, sometimes to Brazil) to obtain their Licenciante with 2 additional years (1st year theory, 2nd year research + thesis writing). Due to financial constraints such a 2 year stay abroad is often not possible due to high cost. Students who have obtained a foreign degree often return to CV and have the possibility to become teachers at the ISECMAR. The teaching load is very high (12 to 15 h/wk), often one person teaches up to 4 different subjects and the teachers are in part insufficiently qualified for so many subjects. If a teacher wants to obtain a Master's or PhD degree, he or she can get a reduction of teaching load (lowering it to 4 h/wk) or can go abroad, keeping the salary. This puts an additional stress on the remaining teachers who have to compensate. There is a serious and increasing shortage of teachers. Therefore, as a first priority a training of teachers and technicians is needed. As a second step, the installation of an international master's course in marine sciences at ISECMAR and in conjunction with the planned University of the Republic of Cape Verde is desired.

Guinea-Bissau: There are only High Schools and no universities. Students have to go to other countries after school. Because of the additional costs, only few can afford to study abroad. These students are generally financed by cooperations between countries as there are no scholarships available from their own country. For example, in respect to training in fisheries, a cooperation with Brazil exists. The few scientists of the country are only engaged in research as there are no institutions providing an infrastructure for teaching. Thus, a minimum of potential teaching staff would be available in the country, if the infrastructure could be created.

Republic of Guinea: There are many universities in the Republic of Guinea, both governmental and private. Biology is taught at the undergraduate and postgraduate level up to Master degree. To obtain a PhD the students have to go abroad. There is no school and no teaching in Marine Sciences, but a professional school for fisheries (Berufsschule).

Further Information:

In Senegal only a professional School for fisheries exists. (This information needs to be checked.) There seem to be no links between the West African and North African Countries in respect to higher education in Marine Sciences, nor any links to other African Countries (e.g. South Africa).

Conclusions: There are no higher education facilities in Marine Sciences and Fisheries in the West African Sub-region as far as could be established in this meeting. All African participants stressed the need for better education and research in physical oceanography, marine biology, marine chemistry, fisheries and environmental protection. The lack of a facility for higher education has so far hindered the development of Marine Sciences in the West African Countries despite the fact that many of their resources are marine.

Capacity Building for West African Education in Marine Sciences

Based on the above, the establishment of a centre for higher education and training for Marine Sciences and Fisheries for the whole of the West African Sub-region was identified as the long-term goal. The education provided should lead to a Masters degree. At the end of the development period the centre has to be self-sufficient and independent of import of international teaching capacity. The best option for the

establishment of such a centre appears to be in Cape Verde using and expanding upon the existing facilities. The following steps are suggested to achieve this goal:

1. Evaluation of the current curriculum in marine sciences in Cape Verde. Establish ECTS credit points for existing courses to enable international exchange of students. Identify additional courses needed to bring the curriculum up to international (EU) standard for Master degree..
2. Training of teachers by summer schools in Cape Verde (funding sought from VW-foundation). Further training of teachers is needed to obtain a Master or PhD degree. This can be achieved by DAAD-sponsored visits (3-6 months) to an appropriate German university followed by the research for the thesis work in Cape Verde.
3. Develop an international master's course in Marine Sciences and Fisheries using the Namibia Biodiversity course for SADC-countries as a model: 2-years of teaching on Cape Verde by local and visiting lecturers to 20-40 students from West-Africa. Students must be able to understand, speak and write scientific English. Teaching could be done in 2-week modules. The research project for the Masters thesis is carried out during the 3rd year preferably abroad (Germany or West-Africa) under the tutorship of one of the (visiting) lecturers. Preparatory phase: 2 years. Planned start: September 2006. Expected duration for external support: 5-10 years, then transition to autonomy. Funding sought from VW foundation and DAAD.
4. Adapt an e-learning scheme to the requirements for the international master's course.
5. Required from Cape Verde partners:
 - Revise existing curriculum in marine sciences.
 - Establish personal and institutional links with West African countries.
 - Conduct market research on numbers of students (and lecturers) to be expected for the planned international course.
 - Identify needs in respect to buildings etc. required for the establishment of the suggested centre