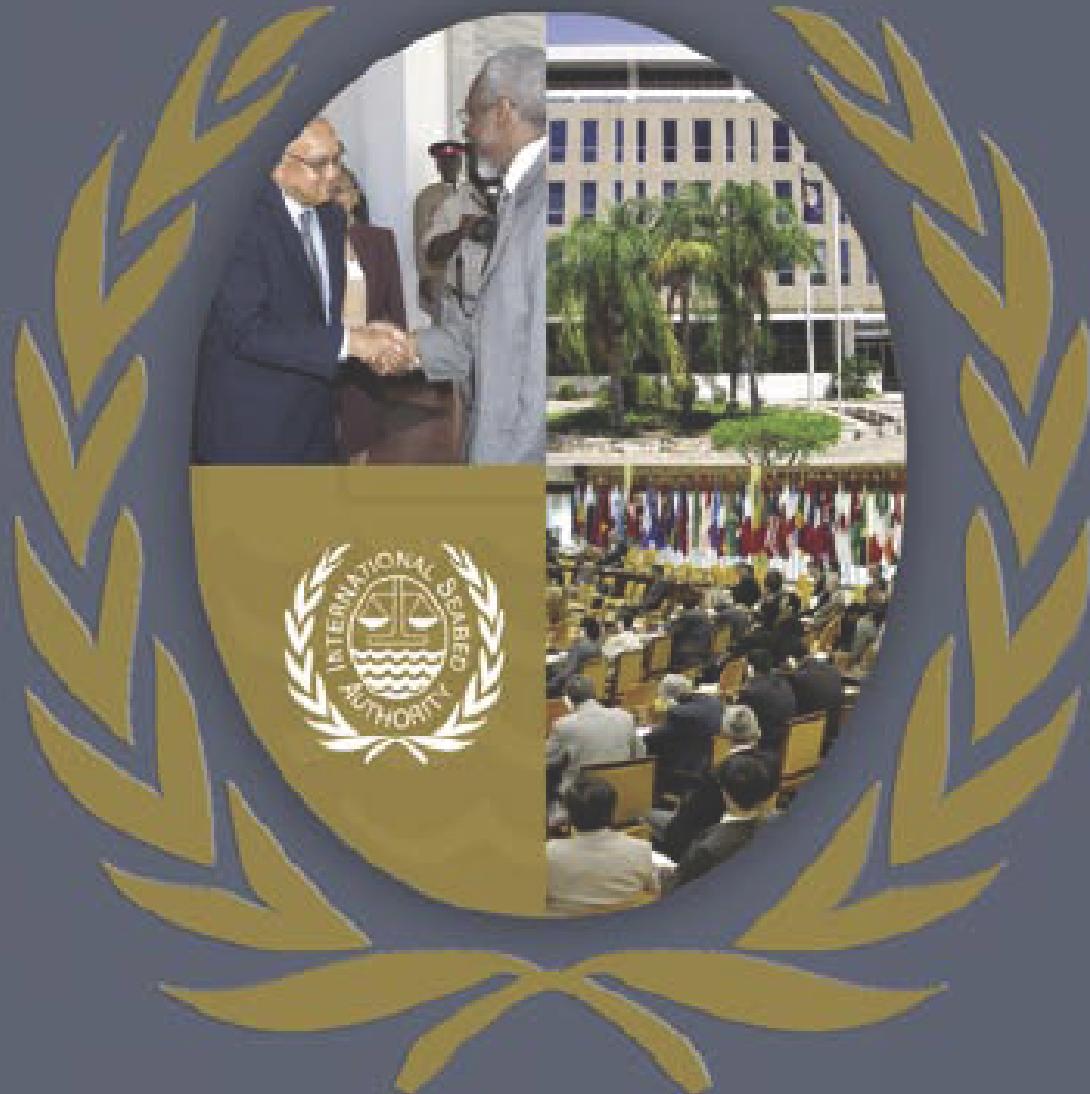


PROCEEDINGS OF THE  
TENTH ANNIVERSARY COMMEMORATION  
OF THE ESTABLISHMENT OF THE  
INTERNATIONAL SEABED AUTHORITY



**PROCEEDINGS OF THE  
TENTH ANNIVERSARY  
COMMEMORATION OF THE  
ESTABLISHMENT OF THE  
INTERNATIONAL SEABED  
AUTHORITY**

*Kingston, Jamaica  
25-26 May 2004*



© International Seabed Authority

ISBN: 976-95155-0-7

## CONTENTS

---

	PREFACE	vii
I.	<b>OPENING OF THE SPECIAL SESSION OF THE ASSEMBLY BY H.E. MR. DENNIS FRANCIS, TRINIDAD AND TOBAGO, PRESIDENT OF THE ASSEMBLY</b>	1
II.	<b>STATEMENTS</b>	
1.	Satya N. Nandan, Secretary-General, International Seabed Authority	2
2.	Most Hon. P.J. Patterson, O.N., P.C., Q.C., M.P., Prime Minister of Jamaica	7
3.	Message from H.E. Kofi Annan, Secretary-General of the United Nations delivered by Mr. Ralph Zacklin, Representative of the Secretary-General	10
4.	Judge L.D.M. Nelson, President of the International Tribunal for the Law of the Sea	11
5.	Judge José Luis Jesus, Chairman, Preparatory Commission for the International Seabed Authority and for the International Tribunal for the Law of the Sea	19
6.	Message from H.E. Ambassador Tommy Koh (Singapore), President of the Third United Nations Conference on the Law of the Sea	23
7.	Message from Hon. Joseph Warioba, Former Prime Minister of Tanzania, First Chairman of the Preparatory Commission for the International Seabed Authority and for the International Tribunal for the Law of the Sea	25
8.	Statements by Chairpersons of five regional groups (representatives of Africa, Asia, Western Europe and Other States, Eastern Europe and Latin American and the Caribbean States)	

(A) <i>Sandile Nogxina, representative of South Africa, on behalf of the African States</i>	28
(B) <i>Dr. Jung, Hai-Ung, representative of Republic of Korea, on behalf of the Asian States</i>	30
(C) <i>Mr. Olav Myklebust, representative of Norway, on behalf of the Western European and Other States</i>	32
(D) <i>Dr. Antonin Parizek, representative of the Czech Republic, on behalf of the Eastern European States</i>	33
(E) <i>H.E. Ambassador Cézar de Souza Lima Amaral, representative of Brazil, on behalf of the Latin American and Caribbean States</i>	35

### III PANEL PRESENTATIONS

*PANEL I: A Review of the Achievements of the Authority (Moderator: Mr. Baïdy Diène of Senegal, President of the Council)*

A. Establishment of the Institutions of the Authority <i>H.E. Ambassador Hasjim Djalal (Indonesia)</i>	39
B Work of the Legal and Technical Commission from 1997 – 2004 <i>Ms. Inge Zaamwani (Namibia)</i>	52
C Administering the Polymetallic Nodule Resources of the Deep Seabed <i>Dr. Yuri Kazmin (Russian Federation)</i>	57
D Status of Activities of Contractors and Prospects for Mining – Status and Prospects for COMRA's Exploration and Investigation in the Area and Related R & D Activities <i>Mr. Mao Bin (China)</i>	91

E	Status of Activities of Contractors and Prospects for Mining : Polymetallic Nodules Programme – An Indian Perspective <i>Dr. Harsh K. Gupta (India)</i>	103
<b><i>PANEL II: Future Directions and Prospects (Moderator: Mr. Albert Hoffmann, South Africa, Chairman of Legal and Technical Commission)</i></b>		
A	The Role of the International Seabed Authority as an Institution of the Law of the Sea <i>H.E. Ambassador Felipe Paolillo (Uruguay)</i>	119
B	Status and Prospects for Deep Seabed Mineral Resources <i>Prof. Chris R. German (United Kingdom)</i>	130
C	The Deep Ocean Environment and the Protection of Its Biodiversity <i>Dr. P. John Lambshead (United Kingdom)</i>	146
D	The Deep Ocean Environment and the Protection of Its Biodiversity: High-seas Habitats – Biodiversity, Exploitation and Conservation <i>Dr. Brian Bett (United Kingdom)</i>	154
E	Future Directions for the Authority <i>Prof. Dr. Tullio Scovazzi (Italy)</i>	162

## PREFACE

---

The year 2004 marked the tenth anniversary of the establishment of the International Seabed Authority, which came into existence upon the entry into force of the 1982 United Nations Convention on the Law of the Sea on 16 November 1994. The Authority celebrated this event on 25-26 May 2004 during its tenth session by holding a two-day commemorative session. This publication contains the statements and presentations made during this commemorative session.

The commemorative session was divided into three parts: the ceremonial part of the session, a panel discussion on the achievements of the Authority in the past ten years, and a panel discussion on the future direction of the Authority.

The ceremonial part of the session was opened by H.E. Ambassador Dennis Francis (Trinidad and Tobago), President of the Assembly for 2004, and addressed by Mr. Satya N. Nandan, the Secretary-General of the Authority; the Most Honourable Mr. P.J. Paterson, the Prime Minister of Jamaica; H.E. Mr. Kofi Annan, the Secretary-General of the United Nations through Mr. Ralph Zacklin, Assistant Secretary-General and the then Acting Legal Counsel; H.E. Judge Dolliver Nelson, President of the International Tribunal for the Law of the Sea and Judge Jose Luis Jesus, also of the Tribunal and the second Chairman of the Preparatory Commission for the International Seabed Authority and the International Tribunal for the Law of the Sea (“the Preparatory Commission”). Messages were also received from H.E. Ambassador Tommy T.B. Koh of Singapore, the President of the Third United Nations Conference on the Law of the Sea (1980-1982) and H.E. Mr. Joseph Warioba, former Prime Minister of the United Republic of Tanzania and the first Chairman of the Preparatory Commission (1983-1987), which were read by Mr. Nii Allotey Odunton, Deputy to the Secretary-General of the Authority and Interim Director-General of the Enterprise. Statements were also made by the Chairmen of the Regional Groups: Mr. Sandile Nogxina of South Africa on behalf of African Group, Dr. Jung Ha-ung of the Republic of Korea on behalf of the Asian Group, Mr. Olav Myklebust of Norway on behalf of the Western European and Other States Group, Dr. Antonin Parizek of the Czech Republic on behalf of the Eastern European States Group, and H.E. Cézar de Souza Lima of Brazil on behalf of the Latin American and the Caribbean States Group.

The first panel discussion on the 10-year achievements of the Authority was moderated by Mr. Baïdy Diène of Senegal, President of the Council for 2004. Panellists were H.E. Ambassador Hasjim Djalal of Indonesia, the first President of the Assembly of the Authority, who spoke on the establishment of institutions of the Authority; Ms. Inge Zaamwani of Namibia, former Chairperson and current member of the Legal and Technical Commission, who reviewed the work of the Commission from 1997 to 2004; Dr. Yuri Kazmin of the Russian Federation, who made a presentation on administering the polymetallic nodule resources of the deep seabed; Mr. Mao Bin, Secretary-General of the China Ocean Mineral Resources Research and Development Association, who spoke on China's initiatives and investments in deep ocean mineral exploration; and Dr. Harsh Gupta, Secretary of the Department of Ocean Development of India, who spoke on the activities of India in deep ocean mineral exploration.

The second panel discussion on future directions and prospects for the Authority was moderated by Mr. Albert Hoffman of South Africa, Chairman of the Legal and Technical Commission. Panellists were H.E. Ambassador Felipe Paolillo, Permanent Representative of Uruguay to the United Nations and Co-Chairman of the United Nations Informal Consultative Process on Ocean Affairs, who made a presentation on the history of the negotiations relating to Part XI of the Convention and the establishment of the Authority; Prof. Dr. Chris German of the Southampton Oceanography Centre, the United Kingdom, who made a presentation on the status and prospects for deep seabed mineral resources; Professor John Lambshead of the British Natural History Museum in London, who made a presentation on the research being carried out on deep seabed biodiversity in the nodule provinces of the Pacific Ocean; Dr. Brian Bett of the Southampton Oceanography Centre and of the Census of Marine Life, who made a presentation on the deep-ocean environment and the protection of its biodiversity; and Professor Tullio Scovazzi of the Faculty of Law, University of Milano-Bicocca, Milan, Italy, who offered a legal perspective on the future direction of the Authority and the uncertainty of the applicable law concerning deep seabed biodiversity and the need for clarifying this law.

Some of the presentations were made using PowerPoint slides. These were subsequently transcribed and edited by the Secretariat. §

## I. OPENING

---

### **Opening of the Special Session of the Assembly by H.E. Ambassador Dennis Francis, (Trinidad and Tobago), President of the Assembly**

It is indeed a great honour and pleasure for me to welcome you this morning to this Special Session celebrating the tenth anniversary of the establishment of the International Seabed Authority.

As we gather on this auspicious occasion, it is worthy of note that the Authority has made significant contributions to the development of modern law of the sea. In this regard, it is fitting to report that it's the only institution in the international society charged with the responsibility to administering mineral resources of the seabed and the ocean floor beyond the limits of national jurisdiction for the benefits of mankind as a whole. The signature of the principle and indeed the goal of the common heritage of mankind therefore lies at the very heart of this work and time will judge its achievements by the extent to which it has been able to give substantive form and content to this solemn responsibility. During its formative years the administrative and organizational matters were completed and its work has now entered a crucial phase of undertaking the operational aspects of exploration for mineral resources from the deep seabed. Rules and regulations for prospecting and exploration of polymetallic nodules have been adopted and the regulations for other new resources are currently under consideration.

In dealing with these very complex technical issues, the Authority has not only received the support of its members, but highly importantly from a strategic aspect it has also benefited immeasurably from the cooperation of the scientific community to whom we are all grateful for their continuing collaboration.

I take this opportunity on behalf of all delegations to congratulate the Authority on its success and on the outstanding progress it has made in implementing its mandate over the past ten years. I am confident that all the delegations will join me in wishing it continued success in the future. §

## **II. STATEMENTS**

---

### **1. Mr. Satya N. Nandan, Secretary-General of the International Seabed Authority**

I would like to join the President in welcoming you to this tenth anniversary commemorative session of the International Seabed Authority. I am particularly pleased that His Excellency, the Prime Minister of Jamaica, the Most Honourable P.J. Patterson, has graciously agreed to participate in today's proceedings. Apart from his long standing interest and support for the Authority, he has the distinction of being a co-chair person with the then Secretary-General of the United Nations, at the inaugural meeting of the Authority in this very hall on 16 November 1994. We feel very honored with your presence, Mr. Prime Minister.

This year we also celebrate the tenth anniversary of the entry into force of the 1982 United Nations Convention on the Law of the Sea which gave birth to the Authority. The 1982 Convention has been a remarkable success. It is widely supported and universally applied. It establishes principles and norms which constitute the modern international law of the sea. It has had far reaching impact on the sovereignty and jurisdiction of States and on the rights and duties of States in maritime areas. It has settled many of the rules of international law of the sea which had remained uncertain or undefined for centuries and had often given rise to disputes and conflicts. The disputes that arise today relate more to the interpretation and application of the provisions of the Convention than on the principles of law that apply to a particular situation. The Convention has also established three new institutions concerned with the implementation and application of its provisions. These are: the International Tribunal for the Law of the Sea, based in Hamburg, Germany, the Commission on the Limits of the Continental Shelf which meets in New York and the International Seabed Authority which is headquartered here in Kingston, Jamaica. All three institutions are now established and are functioning.

The past ten years have been formative years for the Authority as it has been for the other institutions. The period has been particularly challenging for the Authority given the history of discord and dissent that accompanied the adoption of the Convention in 1982 because of the controversy surrounding the

regime for the deep seabed contained in Part XI of the Convention. The Authority is a central part of that regime.

The controversy continued for over 12 years during which the North and the South had remained divided over the Convention. There was only one country, namely Iceland, from the industrialized group which had ratified the Convention as we approached the required 60 ratifications for entry into force. It was not until the adoption of the 1994 Agreement to implement the provisions of Part XI of the Convention on the eve of the entry into force that the controversy was finally put to rest and the Convention as a whole became universally acceptable.

Given this background, the most important task of the Authority since its inception has been to build the confidence of the international community in the institution and the system established for the governance of the resources of the deep seabed. These resources have been declared "*the common heritage of mankind*". From the development of these resources, mankind as a whole is to benefit. The task of confidence building required a careful and practical approach in the setting up of the institutions of the Authority. This had to be done in a manner that would promote consensus rather than confrontation. We have largely succeeded in achieving this. The Authority has so far taken decisions on all matters of substance on the basis of consensus. This in itself is a remarkable achievement given the nature of the issues, and their past history. It reflects the cooperative and harmonious spirit that exists among its members throughout its various organs and bodies.

Establishing a new international organization with global membership has its own challenges. Though the Authority is relatively small in size, it is an autonomous body. Its basic trappings including the internal administrative regulations and rules are substantially the same as that of a large international organization. Considerable effort was devoted in the early years towards the setting up of the internal administrative regulations and rules and towards the establishment of the three main organs of the Authority, the Assembly, the Council and the Secretariat, as well as two subsidiary bodies, the Legal & Technical Commission and the Finance Committee. It was essential to first establish the Council which has a central role in the functioning of the Authority. The composition of the Council is very complex because of its chambered system in which different interest groups are represented. This is coupled with the requirement for an equitable geographical representation

overall. The election of the first members of the Council was complicated and a time consuming process and could only be concluded following negotiations over two sessions. The end result was that arrangements had to be made for the sharing of a number of seats in order to achieve consensus. We must acknowledge the patience, perseverance and wise leadership of Ambassador Hasjim Djalal of Indonesia, the first President of the Assembly for forging the agreement. Once the Council was constituted, the Authority could proceed to establish the other institutions as well as to adopt the internal rules and procedures for those bodies. It is gratifying to note that all institutions of the Authority have worked smoothly and their members have discharged their responsibilities with diligence and dedication.

One of the basic principles in the 1994 Agreement is that all organs and subsidiary bodies to be established under the Convention and the Agreement shall be cost effective. Furthermore, the Agreement states that the setting up and functioning of the organs and subsidiary bodies of the Authority shall be based on an evolutionary approach, taking into account their functional needs in order that they may discharge effectively their respective responsibilities at various stages of the development of the activities in the international seabed area. In setting up the Authority these guidelines have been fully taken into account. The present stage of development of the Authority reflects the fact that commercial seabed mining of minerals from the deep seabed is not imminent and that the present pace of exploration is relatively slow. This is also reflected in its relatively small complement of staff members and the frequency and duration of its meetings.

Organizing and staffing an international Secretariat, especially with scientific and technical qualifications has proved to be highly challenging. It has not been easy to attract and retain good staff for a number of reasons. I would like to take this opportunity to express my sincere gratitude to the staff of the Authority whose dedication and enthusiasm have facilitated the work of the Authority over the past decade. The organization can be justifiably proud of their efficiency and productivity. I would be remiss if I were not to also acknowledge, with appreciation, the invaluable contribution that our colleagues from the Conference Servicing Division of the United Nations make to the work of the Authority, not only those who come to Jamaica and service our meetings, but also those who provide support from New York before, during and after our meetings, especially the translators. Through a relationship agreement with the United Nations, we maintain a very cooperative relationship with various

substantive and service rendering Divisions in the UN. We are very appreciative of that.

Among the important administrative matters that had to be dealt with in the establishment of the Authority was the location of the headquarters of the Authority and the conclusion of a Headquarters Agreement with the host country. The Headquarters Agreement was concluded in 1999 and a Supplementary Agreement to give effect to the Headquarters Agreement was concluded in December 2003. With the execution of the Supplementary Agreement the establishment phase of the Authority was finally concluded. I would like to take this opportunity to thank you personally, Mr. Prime Minister, and also the government and people of Jamaica for facilitating the establishment of the Authority's headquarters in your beautiful country. The Authority currently enjoys the best of relationships with the government of Jamaica. We are appreciative of the facilities that have been provided and of the efforts that are being made to ensure that we operate in safe and secure surroundings. I would like to thank the Minister for Foreign Affairs & Trade, the Honourable K.D. Knight, the Permanent Secretary for Foreign Affairs, Ambassador Douglas Saunders, the Under Secretary for Multilateral Affairs, Ambassador Raymond Wolfe, the Commissioner of Lands, Ms. Elizabeth Stair, the Commissioner of Mines, Mr. Coy Roach, His Worship the Mayor of Kingston and St. Andrew, Councillor Desmond McKenzie, the Commissioner of Police, Mr. Francis Forbes and the Urban Development Corporation for their assistance and cooperation.

The substantive work of the Authority reached an important milestone when the Regulations for Prospecting and Exploration for Polymetallic Nodules were adopted in 2000. These Regulations which are functional in nature and reflect the current state of deep sea mineral exploration, completed and gave effect to the regime laid out in Part XI and Annex III of the Convention and in the Implementation Agreement. The adoption of the Regulations enabled the Authority to issue to the seven former registered pioneer investors fifteen year contracts for exploration, thus bringing the pioneer investors within the single and definitive regime established by the Convention and the Agreement. By entering into these contracts and by allocating areas of the seabed in the global commons for the exclusive use of the individual contractors, the Authority took the first tangible and highly significant step in the exercise of its unique responsibility under the Convention to administer the deep seabed area and its resources on behalf of mankind and for their benefit. The terms of the contracts require the contractors to provide annual reports on their activities to the

Authority. I would like to record the appreciation of the Authority for these reports which are regularly examined by the Legal and Technical Commission, and also to thank the contractors for their cooperation in support of various scientific and technical activities of the Authority.

The Authority is currently engaged in developing further regulations that would deal with the prospecting and exploration for polymetallic sulphides found on sea ridges and cobalt-rich crusts deposited on seamounts. One of the difficulties in regulating these resources lies in the fact that we have inadequate knowledge of these types of deposits which were first discovered only in 1979.

It is starkly evident from our own limited experience that man's knowledge of the ocean environment is at a very rudimentary stage. There is an urgent need to enhance efforts in research and exploration of the oceans. In order to draw attention to this need, at the last session of the UN General Assembly I had proposed to the Assembly the adoption of a declaration in support of ocean research and exploration. Without adequate scientific knowledge, management of the oceans cannot be based on objective facts. This difficulty that confronts states in the management of their national areas will continue to confront the Authority as it endeavors to discharge its responsibilities in the international areas.

It is for this reason that the Authority has embarked on a series of scientific and technical workshops on the resources of the deep seabed and its marine environment as well as on the state of technology development for the exploration and exploitation of mineral resources in the deep seabed. These workshops are attended by scientists and experts with first-hand research experience. Their presentations and exchange of views have provided invaluable information which would not have been otherwise available. They are of immense assistance to the work of the Authority, in particular, that of the Legal and Technical Commission. As a result of these workshops the Authority has developed important guidelines for the monitoring of the environment during the exploration phase of polymetallic nodules. The Authority is also associated with a project initiated by a group of international scientists and institutions for the study of gene flow of significant organisms in the deep ocean in order to assess the distribution of these organisms, especially in the Clarion Clipperton Zone where the Authority has issued six exploration contracts. The result of this study would enable the Authority to better assess the environmental standards required of contractors engaged in activities in that

zone. A workshop on the establishment of a geological model for polymetallic nodule deposits in the Clarion Clipperton Zone has led the Authority to establish a programme for the development of a geological model in the nodule province of the Clarion Clipperton Zone in order to assist prospectors and contractors by providing a broad perspective of a geological and geophysical features of the wider area. Such a model would also be of great assistance to the Authority in its administration of the area. The Authority will promote similar studies in the future with respect to polymetallic sulphides and cobalt-rich crusts.

In its short life the Authority has come a long way from being a distant concept to a reality. It is an infant organization which requires to be carefully nurtured. It has great potential as an organization destined to administer the vast deposits of valuable minerals in the deep ocean. For now we can be certain that these deposits do exist. What we cannot say at this time is when these resources will be recovered commercially. The current state of the metal market and the lack of development of the required technology are major obstacles. The time between now and the advent of commercial exploitation can best be used in gaining a better knowledge of the ocean environment by encouraging more research and exploration. This is a necessary first step and that is the path on which the Authority is currently headed.

Once again, I would like to thank you all for participating in this commemorative session. Some of our distinguished invitees who had hoped to be here with us and to partake in the ceremony, unfortunately could not make it at the last minute because of other pressing demands on them. I am, nevertheless grateful to them for the messages they have sent. §

---

**2. Statement by Most Honourable P. J. Patterson, O.N., P.C.,  
Q.C., M.P., Prime Minister of Jamaica**

---

It is with sense of accomplishment and the satisfaction of seeing a vision realized that I extend a warm welcome to Jamaica to this distinguished gathering.

We meet here today to commemorate the tenth anniversary of the coming into force of the United Nations Convention on the Law of the Sea and the establishment of the International Seabed Authority.

Over the past ten years, Jamaica has sought to justify the trust placed in us by the international community by making Kingston the home of the International Seabed Authority. In all modesty, I think we can claim to have fulfilled our mandate.

Twenty-one years ago the international community ushered in an era of effective management and regulation of the resources of the ocean, the magnitude of which was unparalleled in modern history. This was accomplished in a climate of significant ideological, political and economic changes which had engulfed the world and, for the very first time saw the interests and needs of developing countries taken into consideration.

The International Seabed Authority has made an indelible mark on the way we conduct affairs with respect to resources of the world's oceans. In so doing, it has created the bedrock (no pun intended) for cooperation between the developed and developing States and a nexus between the countries of the industrialized North and those of the developing South.

The work of the Authority over the past ten years has been arduous. The many meetings, dominated by proposals, counter-proposals, drafts, redrafts, heated debates and other exchanges, coupled with long hours have all been worthwhile. This is manifested not only in the presence of the many representatives here today, but also in the quality of the work accomplished.

During that period, the International Seabed Authority has called Jamaica home. We have done all we can to ensure that it settled into its new home easily and comfortably. The signing of the Headquarters Agreement in 1999 and the completion of a Supplementary Agreement, slated to be presented at these deliberations during this Assembly, is a strong signal of our long-term commitment and dedication.

I pause here, Mr. Chairman, to pay tribute to the many representatives of the Legal and Technical Commission, the Finance Committee and the staff of the Secretariat for their commitment, skill and the sense of purpose which has characterized the work of the Authority. Permit me also to pay special tribute

to the first Secretary-General of the International Seabed Authority, His Excellency Satya Nandan, under whose leadership the achievements of these ten years have been realized.

Today, because of the tremendous work by the Authority, *Regulations on Prospecting and Explorations for Polymetallic Nodules* have been adopted, which by its own account has enabled the Authority, for the first time, to finally enter into legally binding contracts with pioneer investors, thereby incorporating them under the umbrella of a practical, tangible and organized regime - a specific intent of the Convention.

In the majority of instances, the work of the Authority is pioneering and requires extensive marine scientific research. To this end, we applaud the decision of the Authority to establish international collaboration in marine scientific research, and the establishment of a series of workshops and seminars on specific issues related to deep seabed mining.

These activities will increase the level of knowledge and understanding of deep sea ecology, redounding to the benefit of generations to come.

A major challenge facing many developing States is that of taking full advantage of the opportunities to help in the policy direction. The Voluntary Trust Fund, which was established to assist in this regard, is a step in the right direction and a signal of the further strengthening of a partnership for development between developed and developing States. We would like to encourage those States which can contribute to the fulfillment of the dream, to take on board the interests of the vulnerable.

Mr. Chairman, ten years ago we were all parties to a memorable achievement. Today we commemorate the perpetuation of that vision, ensuring that the future must continue to serve the interests of mankind as a whole.

Since the entry into force of the Convention on the Law of the Sea in 1994, Jamaica has pursued a maritime policy concordant with these new international regulations. The country now has in place a National Council on Ocean and Coastal Zone Management mandated, among other things, to provide the conditions of governance required for effective integrated coastal zone management. To this end, the Council has finalized a Policy, which was

approved by Parliament in 2004, and continues to give advice on ocean and coastal matters, in furtherance of the goal of integrated management.

The establishment of the Maritime Authority of Jamaica is another link in our maritime development strategy, geared towards effectively regulating and developing the marine activities of the island. To secure the boundaries of our territorial waters and Exclusive Economic Zone, we continue our efforts to increase our fleet of patrol vessels to better manage our maritime space. Jamaica is committed to preserving the “common heritage” and will continue to play its part in any capacity necessary to achieve this end.

On behalf of the Government and People of Jamaica, I express our delight in having been bestowed with the singular honour of welcoming to these warm shores, the many delegations and participants these past years, and stress our willingness to continue in the role of host for as long as it is the desire of the international community for us to do so.

We remain committed to providing the most suitable and appropriate environment for the Authority to conduct its work in the years ahead. §

---

**3. Message From H.E. Mr. Kofi Annan, Secretary-General of the United Nations delivered by Mr. Ralph Zacklin, Assistant Secretary-General For Legal Affairs and Representative of the Secretary-General**

---

It gives me great pleasure to send my greetings to this commemorative meeting.

The United Nations Convention on the Law of the Sea is a constitution for the world’s oceans, and as such is a milestone for the rule of law and for the United Nations. Since its adoption in 1982, and its entry into force in 1994, the Convention has provided both unique legal legitimacy and a solid practical framework for guiding state behaviour in the world’s oceans, managing the diverse challenges associated with ocean space and its uses, and settling the disputes that inevitably arise.

The International Seabed Authority has played a key role in these efforts. As one of three important institutions established by the Convention, along with the International Tribunal for the Law of the Sea and the Commission on the Limits of the Continental Shelf, the Authority is the only institution through which States Parties organize and control activities -- in particular the exploration and exploitation of mineral resources -- in the area beyond the limits of national jurisdiction. These resources are, under the Convention, the "common heritage of mankind", and thus the Authority has strived to ensure that they benefit all people. The Authority has also focused on environmental protection and conservation, since the more we learn about the areas covered by the Authority, the more we see that they are rich in marine biodiversity.

This ceremony would be incomplete without a word of tribute to Mr. Satya Nandan, the distinguished international lawyer and first Secretary-General of the Authority. His contribution to the codification and development of the modern law of the sea is significant and outstanding. And it was he who initiated the dialogue that overcame problems that had hindered the participation of industrialized countries in the Convention.

Ocean affairs continue to be a critical part of the world's quest to achieve sustainable development. On this occasion, I would like to congratulate the International Seabed Authority for its diligent and inspiring work over the past decade, and for showing that multilateral approaches to global challenges can be effective, equitable and enduring. Please accept my best wishes on this anniversary. §

---

#### **4. Statement by Judge L. Dolliver M. Nelson, President of the International Tribunal for the Law of the Sea**

---

I feel deeply honoured and indeed privileged to address this special session of the Assembly of the International Seabed Authority on the occasion of the tenth anniversary of the establishment of the Authority.

Together with the International Seabed Authority and the Commission on the Limits of the Continental Shelf, the International Tribunal for the Law of the Sea is an institution created by the 1982 Convention on the Law of the Sea.

The Tribunal is a crucial forum for settling disputes concerning the interpretation and application of the Convention and therefore plays an important role in the development of the law of the sea.

The Tribunal is composed of 21 members enjoying, in the words of its Statute, “the highest reputation for fairness and integrity and of recognized competence in the field of the law of the sea”. The composition of the Tribunal ensures the representation of the principal legal systems of the world and equitable geographical distribution. The application of the principle of equitable geographical distribution has resulted in the Tribunal having proportionally more judges from developing countries than is the case with the International Court of Justice. The composition of the Tribunal thus seems more representative of the international community and in a sense reflects the widespread participation in the Conference.

Although the Tribunal finds its origin in efforts sponsored by the United Nations, it is not, unlike the International Court of Justice, an organ of the United Nations. It is one of the institutions created by the 1982 Convention on the Law of the Sea. An important consequence is that the expenses of the Tribunal are borne not by the United Nations but by the States Parties to the Convention and in the fullness of time, it is hoped, by the Authority. The relevant provision states that “[t]he expenses of the Tribunal shall be borne by the States Parties and by the Authority, on such terms and in such a manner as shall be decided at meetings of the States Parties” (article 19 of the Statute).

### **Choice of Procedure for the Settlement of Disputes**

As is by now well known, the Convention (in article 287) provides that when signing, ratifying or acceding to the Convention or at any time thereafter, a State may choose, by a written declaration, any one or more of the following means for the settlement of disputes concerning the interpretation or application of the Convention:

- (a) the International Tribunal for the Law of the Sea
- (b) the International Court of Justice
- (c) an arbitral tribunal
- (d) a special arbitral tribunal for disputes relating to (i) fisheries, (ii) protection and preservation of the marine environment, (iii) marine scientific research, or (iv) navigation, including pollution from vessels and from dumping.

This user-friendly, flexible mechanism – the embodiment of the so-called Montreux formula – is the distinctive feature of the dispute settlement in the Convention. It reflects the trend of modern international law with its diversity and flexibility of response in terms of the peaceful settlement of disputes tailored to meet the needs of present-day international society. When the parties to a dispute have accepted the same dispute settlement procedure, it may be submitted only to that procedure. When they have not accepted the same procedure, it may be submitted only to arbitration. In addition, a State Party which is a party to a dispute not covered by a declaration in force shall be deemed to have accepted arbitration. Arbitration has therefore an important function. A most recent case in point is the submission of the dispute between Barbados and the Republic of Trinidad and Tobago relating to the delimitation of their exclusive economic zones and continental shelves to an Annex VII arbitral tribunal. That is why it is important that States Parties should at least consider making declarations with regard to their choice of means for settlement of maritime disputes as has been recommended by GA resolutions, since arbitration can indeed be an expensive procedure.

### **Jurisdiction**

The Tribunal has a seemingly wide jurisdiction. It has jurisdiction over all disputes concerning the interpretation and application of the 1982 Convention on the Law of the Sea. It has also jurisdiction over any dispute concerning the interpretation and application of an international agreement related to the purposes of the Convention, which is submitted to it in accordance with the agreement (article 288), e.g., the Fish Stocks Agreement (1995) and the Convention on the Protection of the Underwater Cultural Heritage (2001). This competence is limited. It arises “where no settlement has been reached by recourse to section 1” and is subject to the limitations and exceptions contained in section 3, in particular articles 297 and 298. Disputes which are excluded from compulsory procedures are those concerning fisheries and marine scientific research in the exclusive economic zone (article 297). An important cluster of disputes is also excluded namely a) maritime boundary disputes; b) disputes concerning military activities and c) disputes in respect of which the Security Council is seized. The Seabed Disputes Chamber has jurisdiction over all disputes with respect to activities in the international seabed area (Area).

The Tribunal does have, what may be termed, a residual compulsory jurisdiction with respect to the prompt release of vessels (article 292) and the prescription of provisional measures under article 290[5]. It is hardly surprising that the majority of disputes which have been submitted to the Tribunal fell under these two headings: the prompt release of vessels and the prescription of provisional measures.

### **Prompt Release of Vessels**

A State Party is entitled to submit to the Tribunal in certain specific circumstances the question of release from detention of a vessel flying its flag where the authorities of another State Party have detained the vessel and “it is alleged that the detaining State has not complied with the provisions of the Convention for the prompt release of the vessel or its crew upon the posting of a reasonable bond or other financial security”.

The Tribunal, to date, has had to interpret and apply the provisions on prompt release in six cases: the M/V “Saiga” (1997), the “Camouco” (2000), the “Monte Confurco” (2000), the “Grand Prince”, (2001), the “Chaisiri Reefer 2” (2001) and the “Volga” (2002). In all these prompt release cases the Tribunal has been primarily engaged in clarifying and refining the notion of what is meant by a reasonable bond in the relevant provisions of the Convention. It is essentially a process related to the interpretation and application of the Convention on the Law of the Sea, which is the central task of this specialised international tribunal. It is of some interest to remark that four of these cases, the “Camouco”, the “Monte Confurco”, the “Grand Prince” and the “Volga”, raised important questions with respect to the problem of illegal, uncontrolled and undeclared (IUU) fishing in the Southern Ocean.

### **Provisional Measures**

The Tribunal has a special residual compulsory jurisdiction with respect to the prescription of provisional measures. It has the power, under certain circumstances, to prescribe such measures “[p]ending the constitution of an arbitral tribunal to which a dispute is being submitted ... if it considers that *prima facie* the tribunal which is to be constituted would have jurisdiction and the urgency of the situation so requires” (Article 290, paragraph 5, of the Convention). Here the Tribunal is called upon to prescribe provisional measures pending the final decision to be given not by the Tribunal itself, but by an

arbitral tribunal yet to be constituted to which a dispute has been duly submitted – where the merits and indeed questions of jurisdiction and admissibility may have to be decided. This procedure has already been invoked in the Southern Bluefin Tuna cases, the MOX Plant case, and the Land Reclamation case.

In these cases which dealt primarily with the protection of the marine environment, the Tribunal laid emphasis on the duty to cooperate. “The duty to cooperate”, it said, “is a fundamental principle in the prevention of pollution of the marine environment under Part XII of the Convention and general international law” (The MOX Plant Case, Order of 3 December 2001, paragraph 82). It also stressed the importance of exercising “prudence and caution” when undertaking activities which may cause harmful effects. The emphasis laid by the Tribunal both on the duty to cooperate and the notion of “prudence and caution” seems to signify that these decisions go beyond the mere prescription of provisional measures and in fact may contribute to the development of the international environmental law.

In the prescription of these provisional measures the Tribunal has taken fully into account the necessity to prescribe practical measures which would assist the parties to find a solution. With reference to the provisional measures prescribed by the Tribunal in the Southern Bluefin Tuna Cases, for instance, Professor Crawford, who acted as counsel in the Southern Bluefin Tuna Cases, had this to say:

“There, the Tribunal’s intervention at the stage of provisional measures played a very significant role in bringing the parties – Australia, New Zealand and Japan – back to negotiations with each other... the eventual result was that the Southern Bluefin Tuna Commission was revitalized. It is now functioning well.” (Prof. James Crawford, The “Volga” Case, ITLOS/PV.02/02, 12 December 2002)

This in my view is an important consequence.

A case is still pending on the docket, the Case concerning the Conservation and Sustainable Exploitation of Swordfish Stocks in the South-Eastern Pacific Ocean (Chile/European Community), which was submitted to a chamber of the Tribunal. The time-limit for making preliminary objections with

respect to the case was extended at the request of the parties to enable them to reach a settlement.

### **Seabed Disputes Chamber**

#### *Composition*

The Seabed Disputes Chamber is the chamber formed within the Tribunal which is designed to deal with disputes arising from activities in the international seabed area. It is composed of 11 members, selected by a majority of the members of the Tribunal. In selecting the members of the Chamber, the representation of the principal legal systems of the world and equitable geographical distribution were to be assured. It may be noted that in the case of the election of the members of the Seabed Disputes Chamber the Assembly of the International Seabed Authority may make recommendations of a general nature with respect to the representation of the principal legal systems of the world and equitable geographical distribution. No such recommendations have yet been made. It will be remembered that the Seabed Disputes Chamber was originally an organ of the Authority and it was the Assembly of the Authority which elected its members. The members of the Chamber are now “selected” by the Tribunal, although this specific link with the Authority is maintained.

#### *Jurisdiction*

The Seabed Disputes Chamber has jurisdiction, as has already been stated, over disputes with respect to activities in the international seabed area. That jurisdiction is mandatory [see article 287, paragraph 2].

The Chamber has jurisdiction over disputes between States Parties concerning the interpretation or application of Part XI and the relevant annexes. In such cases the dispute can be submitted at the request of the parties to the dispute to a special chamber of the International Tribunal for the Law of the Sea to be formed in accordance with Annex VI, articles 15 and 17, or at the request of any party to the dispute to an *ad hoc* chamber of the Seabed Disputes Chamber to be formed in accordance with Annex VI, article 36.

This procedure, as one commentator has said, reconciled “the necessity of ensuring the uniform interpretation and application of Part XI, stressed by the Group of 77, with the need for a certain choice of procedures emphasised by

some industrialised States". It gives the parties a certain freedom of choice of means of settling disputes, which is, of course, the hallmark of the dispute settlement system as contained in the Convention.

#### *Disputes with regard to contracts*

The Authority, in exercising its functions, will necessarily have to enter into contracts with States Parties and state enterprises and natural or juridical persons. In the case of disputes concerning the interpretation or application of a contract, the Convention provides that such disputes shall be submitted, at the request of any party, to binding commercial arbitration. But it makes the important reservation that a commercial arbitral tribunal to which the dispute is submitted shall have no jurisdiction to decide any question of interpretation of the Convention. That question shall be referred to the Seabed Disputes Chamber for a ruling. If the arbitral tribunal determines, either at the request of a party or *proprio motu*, that its decision depends upon a ruling of the Seabed Disputes Chamber, the arbitral tribunal shall refer the question to the Chamber for such a ruling. This compromise procedure was designed to preserve the unity of interpretation of the provisions of Part XI.

#### *Disputes between a State Party and the Authority*

The jurisdiction of the Chamber also includes disputes between a State Party and the Authority concerning acts or omissions of the Authority or of a State Party alleged to be in violation of Part XI or the relevant Annexes, or of rules, regulations and procedures of the Authority, and acts of the Authority alleged to be in excess of jurisdiction or a misuse of power. It may here be noted that the Convention itself has imposed some limitations on the jurisdiction of the Chamber with respect to decisions of the Authority.

*The Seabed Disputes Chamber shall have no jurisdiction with regard to the exercise by the Authority of its discretionary powers in accordance with this Part; in no case shall it substitute its discretion for that of the Authority. Without prejudice to article 191, in exercising its jurisdiction pursuant to article 187, the Seabed Disputes Chamber shall not pronounce itself on the question of whether any rules, regulations and procedures of the Authority are in conformity with this Convention, nor declare invalid any such rules, regulations and procedures. Its jurisdiction in this regard shall be confined to deciding claims that the application of any rules, regulations and procedures of*

*the Authority in individual cases would be in conflict with the contractual obligations of the parties to the dispute or their obligations under this Convention, claims concerning excess of jurisdiction or misuse of power, and to claims for damages to be paid or other remedy to be given to the party concerned for the failure of the other party to comply with its contractual obligations or its obligations under this Convention.* [article 189].

This provision was meant to ensure that the Authority had full freedom “to discharge its important and innovative responsibilities on behalf of ‘humankind’ as a whole”. However, it has been roundly criticised for being “contradictory and confusing”.<sup>1</sup> For instance, how can the Seabed Disputes Chamber decide claims that the application of any rules, regulations and procedures of the Authority in individual cases would be in conflict with the obligations of the parties to the dispute under the Convention without at times pronouncing itself on the question whether these rules, regulations and procedures are in conformity with the Convention. But, as has been said, “there is no doubt that the vagueness of article 189 was intentional and designed to conceal the substantive divergences separating the negotiators”. This brings to mind these wise observations of Professor Johnson:

*Anyone familiar with the procedures of international conferences must realize that to expect from them the elegant standards of Lincoln’s Inn is to cry for the moon. At the same time, if there is anything that the individual commentator can do to help to clarify a confused situation, it would seem to be his clear duty to try.* (Prof. D.H.N. Johnson, *The Nationality of Ships*, Indian Yearbook of International Affairs, 1959, pp. 3-15 on p. 11).

#### *Advisory opinions*

The Seabed Disputes Chamber has another important function. It shall give an advisory opinion at the request of the Assembly or the Council on legal questions arising within the scope of their activities. Such opinions shall be given as a matter of urgency. [See also article 159, paragraph 10].

This is a complex and elaborate system – the result of a series of compromises which has not yet been tested by practice. The Seabed Disputes

---

<sup>1</sup> Lucius C. Caflisch, The settlement of disputes relating to activities in the international seabed area. In: C.L. Rozakis and C.A. Stephanou (eds), *The New Law of the Sea*, 1983, pp. 303-344, on p. 315.

Chamber is, however, ready and prepared to play its role in the resolution of deep seabed disputes whenever they may arise.

Mr. President, this brings me to the end of my brief presentation – an aperçu – of the work of the Tribunal and its links with the Authority. May I end by saying that the Tribunal continues to seek the moral and material support of the international community as a whole for the successful achievement of the objectives underlying its establishment. §

## **5. Statement By Judge José Luis Jesus, Former Chairman of the Preparatory Commission for the International Tribunal on the Law of the Sea and for the International Seabed Authority**

---

Mr. President, it is for me a great pleasure and, indeed, an honor to participate in this commemorative session dedicated to the 10th anniversary of the International Seabed Authority.

I thank the Secretary-General, Satya Nandan, for the invitation he extended to me to be here today, in my capacity as former Chairman of the Preparatory Commission for the International Tribunal for the Law of the Sea and for the International Seabed Authority (“the PrepCom”) and to be able to share with you the joy of this organization that has grown older and wiser as a Law of the Sea Convention institution.

Mr. President, gone are the days we gathered in the PrepCom, session after session, in this very hall, discussing, at times with a great deal of passion that has characterized over decades the law of the sea negotiations, issues we believed to be of great interest to mankind and to each of our nations.

For most of us involved, back then, in the negotiations of the rules, regulations and procedures of the Authority and of its various organs, though important a work as it was, it seemed to be more an exercise of an intellectual or abstract nature. We could then hardly see how this institution would turn out to be in concrete terms and what kind of a viable future it could realistically claim for itself against the background of lofty goals and expectations assigned to it by the drafters of the Convention.

Today, as we stand here and address this Assembly, we have a different feel. A feel that we have gone from an abstract design of the Authority, as envisaged in the Conference and in the PrepCom, to a concrete organization which has been able to translate into today's reality the larger hopes of the past and built into the system the flexibility needed to accommodate the mood of modern times and the various constraints its work faces.

Indeed, the work of the PrepCom had already shown the uncertainties and the elusiveness of deep seabed minerals exploitation. This was also already felt, to some extent, in the corridors of the Law of the Sea Conference when delegates crafted the international seabed regime. The huge technological challenge posed, the economics of the mammoth venture of seabed resources exploitation, as well as the environmental considerations ever more sensitive in today's world were already pretty much on the table in the PrepCom as they are today.

Early in the Conference, many believed the resources of the area to be an exploitable enterprise in a predictable time-frame and a bonanza for countries especially for resource-stripped developing nations. The mind-frame and excitement generated then has not unfortunately matched so far the reality. As things turn out to be the seabed exploitation is an enterprise for the future, one whose viability requires perseverance, craftiness and time, as well as a good share of luck to build the foundations of the machinery that might one day turn hard and cold deep seabed minerals into hot money in the nations coffers.

But while the prospect of commercial exploitation of the seabed mineral resources is awaiting a better future, activities being pursued, especially by the registered pioneer investors, in the fields of technological research and development, environmental studies and data analysis, augur well for the future of this organization.

Fortunately the Authority has shown over its ten years of existence that it has what it takes to build a solid foundation, laying the grounds for the exploitation of the resources in the future.

As reflected in the Secretary-General's report, the Authority has been able to finish its internal organization and has demonstrated the necessary flexibility to adjust to the situations as they develop.

In this regard, we are glad to note that the work done for 12 years by the PrepCom to facilitate the entry into function of this organization, has been ably and successfully carried on by the Authority where we left off.

It is therefore a matter of satisfaction to us to see that most of the regulations, including the first set of regulations on prospecting and exploration for polymetallic nodules in the Area prepared by the PrepCom have been of some use to the Authority in dealing with its internal organization and regulatory work.

I congratulate the Authority for the good work accomplished in this regard, knowing the difficulties that some of the settled matters naturally raise.

We are also very much pleased to see that the work done by the PrepCom on the implementation of the pioneer regime has been a solid basis for the substantive work so far undertaken by the Authority. I believe it to be a significant accomplishment of this organization to have been able to approve the plans of work for exploration and the respective contracts, with the seven registered pioneer investors.

In doing so, and by implementing some obligations of such investors, this institution has made a good contribution towards putting in place some of the core elements of the machinery that will enable it to ensure the commercial exploitation of the seabed mineral resources when and if the time comes.

One can say that, bearing in mind the known difficulties posed by the seabed resources exploration and exploitation, much has been accomplished by this body at this stage.

Mr. President, the International Seabed Authority is, in a way, the standard-bearer of an international seabed negotiating agenda that started almost forty years ago with the preparations leading to the Law of the Sea Conference. From the Conference days, to the PrepCom and to the Authority, a great deal of effort has been made by generations of negotiators from the world over to establish and create the conditions that might make it possible, one day, to exploit the international seabed mineral resources for the benefit of all nations.

All along these negotiations, spanning a period of almost 40 years, the issue of commercial exploitability of the seabed mineral resources has been at the centre of everybody's concerns. It was so in the Conference, it became later an even more acute concern in the PrepCom and as shown in the Secretary-General's last report it continues to be so today.

The entry into force of the Law of the Sea Convention and the consequent entry into function of this organization, 10 years ago, was seen, notwithstanding, as a major step on the road to bring the commercial exploitation of the seabed resources closer to previous expectations, to the extent that it would help promote, in an institutionalized way, the technological developments, expertise and scientific knowledge required for the seabed venture.

Since then, as mentioned before, this Authority seems to have put its energies to a good use and has made progress in the implementation of its mandate in this regard. The progress achieved has been made, of course, at the pace and within the limits allowed by prevailing circumstances, but undoubtedly it has brought the possibilities of commercial exploitation of the seabed mineral resources a step closer to reality.

All those that, at various levels, have made this result possible deserve our praise.

Amongst them allow me to congratulate the Secretary-General, Satya Nandan, for his commitment and contribution.

Mr. President, the results so far achieved in the work of the Authority have another important dimension. In our view these achievements have also contributed much to the affirmation of the Law of the Sea Convention. Together with the Law of the Sea Tribunal, these two major law of the sea institutions established by that Convention have, step by step, been able to implement their mandate and assert their important roles assigned to them by the Convention. Their success is undoubtedly the success of the Convention and strengthens substantially the prospects of its longevity and usefulness.

To those that, in the secretariat or as representatives of member countries are and will be engaged in bringing the Authority to a stage it was meant to be at, our word of encouragement is: "continue the good work".

Finally, let me say that it has been for me a great pleasure to make it to Jamaica again. My former positions as representative of my country and as Chairman of the PrepCom gave me the opportunity to come here many times and to get to know a most beautiful country and a wonderful and friendly people. I am most blessed to have had this opportunity.

I thank you all. §

**6. Message from H.E. Ambassador Tommy Koh (Singapore),  
President (1981-82) of the Third United Nations  
Conference on the Law of the Sea Delivered by Mr. Nii  
Odunton, Deputy to the Secretary-General of the  
International Seabed Authority**

---

This is a double celebration. We celebrate the 10th Anniversary of the entry into force of the 1982 UN Convention on the Law of the Sea. We also celebrate the 10th Anniversary of the International Seabed Authority. I wish to touch on three points in my message.

First, I wish to make the point that prior to the 1982 Convention, there were many uncertainties and ambiguities in the applicable law. There were therefore many legal disputes between and among states. The disputes were over limits, boundaries and resources. In some cases, the disputes escalated into violence, such as the Cod War between Iceland and the United Kingdom. The crowning achievement of the 1982 Convention is that it has replaced legal chaos with legal certainty. It has made a major contribution to world peace and to the rule of law in the world.

Second, I wish to pay a tribute to the International Seabed Authority. In the past, seabed minerals were a focal point of debate and division between North and South. The 1994 compromise represents a new approach to international cooperation for development. The new approach emphasises partnership in management and participation in a market-based development. The International Seabed Authority is the venue for functional collaboration in resource management, creating a new basis for participation in the development of ocean resources so that all nations may benefit.

I would also like to commend the International Seabed Authority for its approach, professional, quiet and consistent, in building its base of information and crafting its rules and regulations. The approach is also inclusive, as the Authority has consulted with legal and technical experts all over the world. As a result of its approach, the International Seabed Authority has succeeded in building trust and respect among all the parties and professions. Inclusion and outreach have been important both to the quality of the work of the International Seabed Authority and to the trust that countries and companies place in it. In short, the International Seabed Authority has been admirably successful. I regard it as a role model.

Third, I would like to pay a sincere tribute to the distinguished Secretary-General of the International Seabed Authority, Ambassador Satya Nandan. Ambassador Nandan and I have been friends for over 30 years. We spent many years together during the Third United Nations Conference on the Law of the Sea. His invaluable role in resolving disputes, in forging consensus, and in crafting texts, has not been sufficiently recognised. I would also like to mention the leadership roles he played in negotiating the 1994 compromise on Part XI of the Convention and in forging the agreements on two of the issues which the Convention failed to resolve, i.e., highly migratory species of fish; and straddling fish stocks. I believe that one of the secrets for the success of the International Seabed Authority is its Secretary-General and his unique style of quiet, professional and consensus-building diplomacy.

Finally, I wish the International Seabed Authority every success in the coming years. §

**7. Message from Hon. Joseph Warioba, Former Prime Minister of Tanzania and First President of the Preparatory Commission for the International Seabed Authority and for the International Tribunal for the Law of the Sea Delivered by Mr. Nii Odunton, Deputy to the Secretary-General of the International Seabed Authority**

---

Dear Secretary-General,

Circumstances beyond my control have made it impossible for me to attend the session. I really wish I could be in Kingston during the session, if only to relive those nostalgic moments of the more than thirty-six years. As I gaze in the past memories flood and capture moments of youthful energy and hope.

It is thirty-six years since the Permanent Representative of Malta, the distinguished Ambassador Arvid Pardo, placed the Seabed item on the agenda of the United Nations General Assembly. Soon thereafter preparations for the Third Nations Conference on the Law of the Sea were initiated and the Preparatory Committee was established.

It is thirty years since the Conference formally opened in 1974 in Caracas, Venezuela. The Conference opened without a coherent working text. Instead, before it was a multitude of proposals which were not exactly in workable form and many of them were contradictory to each other. Few people were optimistic that a sensible agreement could be reached. However with determined efforts and good leadership in the person of the late Ambassador Amerasinghe and Ambassador Tommy Koh, and with sustained political will, the international community reached agreement.

It is twenty-two years since the Convention was signed in 1982 at Montego Bay and ten years since it came into force in 1994. It is twenty-one years since the Preparatory Commission opened its proceedings in Kingston. Its function was to establish the operational rules and the key institutions. The problems which dogged the Conference resurfaced in the PreCom. In addition some key members of the international community

declined to participate in the proceedings of the PrepCom. As a result the PrepCom experienced enormous problems and took a longer time than the Conference to complete its work. The operational rules were, however, established, so were the key institutions.

No single state, no single group of states was completely satisfied with all the provisions of the Convention. That is not surprising because it is the normal characteristic of any constitution – for the Convention is the constitution for the Oceans. Despite the weaknesses that exist in the Convention, it is an instrument in which all groups of states, developing and developed can point to a contribution of an item. It is truly a universal document.

Implementation of the Convention is not easy but again this is not surprising. No one believed it was going to be easy. We should however acknowledge that the principal objective, which was to bring order in the oceans, has been achieved or is being achieved. The rules on various ocean activities such as navigation, fishing, scientific research, the environment, etc, are establishing order in the oceans. The establishment of the exclusive economic zone has averted serious conflicts among states and ushered in a regime that encourages cooperation in the administration and management of its uses and resources.

Above all the principle and concept of the common heritage of mankind has been firmly established. The provision of Part XI of the Convention have been diluted and weakened by later action but there is no denying the fact that the Convention put a stop to the colonization of the seabed beyond areas of national jurisdiction and established global management and administration under the Authority.

Some people believed the institutions established through the Preparatory Commission would remain on paper or whither away quickly. The International Tribunal for the Law of the Sea is functioning well and gaining high respect despite the enormous problems facing it. No one can dispute the fact that in its short existence the Tribunal has contributed significantly to the correct interpretation and application of the Convention.

The International Seabed Authority has done a decade. It has been a difficult time. It is serviced by a Secretariat which is starved of resources, both human and financial. But the staff has worked with extra-ordinary commitment and success. It deserves strengthening in all aspects. The Authority as a whole has also functioned in similar circumstances but it is surviving. It is steadily contributing to ocean governance, more especially in the administration of the common heritage of mankind.

Ten years is not a long time to make a firm assessment. But we can say that the establishment of the Authority was in itself a success and its ten years as a functioning institution is also a success. Its existence is intrinsically linked with the maintenance and sustainability of order, peace and security in the oceans.

While observing the anniversary let us therefore all re-dedicated our commitment to taking steps to strengthening the Authority and also renewing our commitment to the practical realization of the common heritage of mankind. Lastly let us pay tribute to the City of Kingston, the Government and people of Jamaica for the hospitality and contribution that have made it possible for the Authority to function.

I wish you, the staff and the International Seabed Authority a bright future. §

**8. Statements by Chairpersons of the Five Regional Groups  
(Africa, Asia, Western Europe and Other States, Eastern Europe and Latin American and Caribbean States)**

---

*(A) Statement by Mr. Sandile Nogxina (South Africa), on behalf of the African Group*

It is indeed a tremendous honour for me to address this august meeting today on the occasion of the Special Session of the tenth anniversary of the International Seabed Authority.

The 16 of November 1994, will go down in the annals of history as one of the most important milestones in the evolution of international law and international relations in general. It was indeed, on this date that the collective human effort to uphold the notion of common heritage of mankind found legal expression in the coming into effect of the United Nations Convention on the Law of the Sea and the concomitant formal establishment of the International Seabed Authority.

Today as we mark the tenth anniversary of this epoch-making event, Africa's breast swells with pride for having been one of the midwives in the birth of this international institution. We would like to take this opportunity to salute all those who spent long hours facilitating and negotiating the process, their efforts have, in no small way, contributed to the maintenance of global peace and security. The outcome of their painstaking and protracted efforts was undoubtedly the establishment of certainty and predictability in the regimes for oceans and the Law of the Sea.

In the face of ideological political and economic differences and adversity, the adoption of the Convention and the Agreement relating to the implementation of Part XI thereof have provided the international community with the way forward towards a just and equitable dispensation with regard to the utilization and distribution of the oceans and its resources.

The drafters of the "Constitution for the Oceans", some who have honoured us with their presence on this occasion, have bequeathed to posterity a legal framework that will facilitate the governance of the deep seabed and its

resources which has been declared the common heritage of mankind, and from which all mankind must benefit.

It is also with a sense of pride that we consider and reflect upon the numerous accomplishments of the last decade. The Authority not only succeeded in setting itself up as an autonomous international organization that would enable it to meet the challenges and to fulfil the mandate provided by the Convention, but has been able to adopt a regulatory regime for the prospecting and exploration of polymetallic nodules in the Area and in this regard has signed exploration contracts with seven registered pioneer investors- making the prospect of seabed mining a reality. It is also currently in the process of finalizing regulations for other minerals such as cobalt-rich ferromanganese crusts and polymetallic sulphides.

As we today celebrate the 10 years of this international institution we must not lose sight of the challenges that will be posed by the intensification of the utilization of our marine resources as new technologies develop. As human kind continues to interact with nature in pursuit of their economic development it is important that it should be done with due regard to the future well-being of our planet by ensuring protection and preservation of the marine environment. In so doing we should be guided by the principles of sustainable development as enacted in the Brundtland Report and further enunciated in the Rio Declaration and the more recent Johannesburg Plan of Implementation.

The concept of sustainable development is a principle which the African group embraces because it is within these principles that we find the balance between environmental protection and socioeconomic development.

As we move towards facing future challenges in the Area it is imperative that we increase our knowledge and understanding of the deep ocean environment and its biodiversity. The Convention bestowed on the Authority the responsibility to promote and encourage the conduct of marine scientific research in the Area and to disseminate the results of such research. There is also a specific duty on the Authority to ensure the effective protection of the marine environment from harmful effects that may arise from activities in the Area. In order to effectively manage future activities in the Area and to prevent or minimize negative impacts of such activities to the marine environment it is essential that the Authority would seek the widest possible

collaboration and coordination with the international scientific community and related organizations.

Mr. President, the first decade of the Authority focused on the establishment of the institutional framework, positioning the Authority as an independent multilateral and policy development institution. The future challenge for the Authority lies in its continued effectiveness going forward. We believe that the wide spectrum of issues articulated in the Convention will be the development of a sound and clear implementation strategy.

We as the African group would like to take the opportunity of this occasion to rededicate ourselves to the attainment of the objectives stated in the Convention. §

*(B) Statement by Dr. Jung, Hai-ung (Republic of Korea), on behalf of the Asian Group*

---

On behalf of the Asian Group, I would like to express our high appreciation for the messages from the Most Honourable P.J. Patterson, Prime Minister of Jamaica, Judge L.D.M. Nelson, President of the International Tribunal for the Law of the Sea and other eminent speakers.

Today, we are celebrating the tenth anniversary of the establishment of the International Seabed Authority, which is an embodiment of the sublime idea of the common heritage of mankind espoused by almost all States of the world during the Third United Nations Conference on the Law of the Sea.

Since its establishment in 1994, the Authority has been developing toward a universal regime, guided by the aspiration for the common prosperity of humanity and the spirit of harmonious international cooperation. In this regard, the Asian Group welcomes the decision of the Republic of Burkina Faso to become State Party to the United Nations Convention on the Law of the Sea and the Agreement for the Implementation of Part XI of the Convention. The Asian Group countries hope that other States which remain non-Parties to the Convention will become parties in the near future so the universality of the regime under the Convention will be attained.

The Asian Group has a particular interest in harmonious development of the Authority, for several reasons: first, the Asian Group encompasses both developed and developing countries; second, the region covers the Indian Ocean and the Pacific Ocean where most of the cobalt-rich crusts are found; third, the region has several pioneer investors.

At present we cannot foresee exactly when commercial exploitation of the seabed minerals will start. Nevertheless, this does not weaken the *raison d'être* of the International Seabed Authority, because it is always good to strengthen the institution framework before real issues arise. In particular, members of the Authority have been successful in putting it into full operation and in producing necessary mining codes. As such, the Authority is well prepared to govern the seabed activities in an orderly and harmonious way, whenever commercial exploitation may commence. Such a good institutional preparedness has been rare in the history of the international society.

Ten years after the conclusion of the United Nations Conference on the Law of the Sea celebrated at Montego Bay, the international community has adopted another sublime principle by universal consensus at the United Nations Conference on Environment and Development held at Rio de Janeiro in 1992. That is the Principle of Sustainable Development. This principle had already been embedded in the regime at the International Seabed Authority. However, the Authority should make further efforts to derive concrete rules therefrom so as to maintain the balance between the exploitation of seabed minerals and the preservation of the marine environment. For this, I am convinced that the precautionary approach set out in Agenda 21, chapter 17, should be applied to the seabed activities.

Being guided by the ideology of the New International Economic Order, the intra-generational equity is already well rooted in the international seabed regime in an effort to narrow down the disparities in standards of living among the peoples of the world. In addition, the concept of Sustainable Development provides us with another guiding principle in elaborating the international seabed regime. That is to say, the seabed minerals should be exploited in the respect of inter-generational equity, taking into account the needs of future generations for these non-renewable resources.

Before concluding, I would like to express, on behalf of the Asian Group, a sincere gratitude to His Excellency Satya Nandan for his admirable

devotion to the consolidation of the regime of the International Seabed Authority in its initial stage. Also, on behalf of the Asian Group, I would like to highly appreciate the full support of the Government of Jamaica for the successful functioning of the International Seabed Authority.

Thank you. §

*(C) Statement by Mr. Olav Myklebust (Norway), on behalf of the Western European and Other States Group*

---

It is a great honour for me to make this statement on this occasion on behalf of the Western European and Other States Group.

This Special Session of the Assembly to mark the Tenth Anniversary of the International Seabed Authority provides a particular vantage-point in order to measure the huge advances made in building the international legal order of the oceans.

We would be remiss if we did not pay tribute to those who contributed to the truly global effort of establishing the basis for the Authority and indeed to those who have made sure that the Authority is fully operational. They deserve our deepest respect and gratitude.

Mr. Kofi Annan, Secretary-General of the United Nations, has described the United Nations Convention on the Law of the Sea as “ambitious in scope and comprehensive in purpose.” That is undoubtedly true. And even more satisfying it is to see how successful the ambitious project has been, while at the same time measuring the remaining issues of implementation. With its 145 parties, the Law of the Sea Convention provides the global legal framework for all activities in the oceans and seas. The Agreement relating to the Part XI has facilitated universal participation in the Convention.

The three bodies established through the Convention, the International Seabed Authority, the International Tribunal for the Law of the Sea in Hamburg and the Commission on the Limits of the Continental Shelf, have all been entrusted with crucial tasks in order to implement and support the Law of the Sea regime.

The International Seabed Authority can already be credited with important accomplishments in its 10 years history, including the adoption of regulations on prospecting and exploration for polymetallic nodules in the Area. Further preparation for future activities in the Area continues and will be adopted in due course.

Ambassador Satya Nandan has ably served as Secretary-General of the Authority since 1996. He has indeed provided crucial leadership. The accomplishment of the Authority would not have been possible without the best efforts of Secretary-General Nandan and his staff. We also thank the Government and people of Jamaica for their warm hospitality here in Kingston.

With its responsibility for the management of the common heritage of mankind in the Area, for the benefit of mankind as a whole, the International Seabed Authority will continue to play a vital role in the Law of the Sea regime for decades to come. We are confident that the Authority will continue to prove itself more than capable of fulfilling its important mandate. §

*(D) Statement by Dr. Antonin Parizek (Czech Republic), on behalf of the Eastern European States Group*

---

At the outset, please allow me, on behalf of the East European countries and on this significant occasion of the 10th anniversary of the establishment of the Authority, to greet all the guests present at this Special Session of the Assembly.

As representative of the Czech Republic which is presently chairing the Eastern European States Group and Chairman of the Interoceanmetal Joint Organisation (“the IOM”) Council, I would like to briefly recapitulate the active participation of the Eastern European States Group in the works of International Seabed Authority and their exploration activities in the area allocated to IOM at the Clarion/Clipperton Fracture Zone in the north-western Pacific.

Following its registration as pioneer investor in 1991, IOM faithfully fulfilled its obligations under Resolution II, including, inter alia, to relinquish 50% of the pioneer area to revert to the Area and to report periodically, through its respective certifying State, to the PrepCom on activities in the Area. IOM had also fulfilled its obligation to provide training to trainees at all levels

designated by the PrepCom, including those from South Korea, Sudan, Pakistan and Belarus within the period between 1994 and 1995.

On 19 August 1997, IOM joined other six registered pioneer investors in submitting to the Secretary-General of the Authority application for approval of plans of work for exploration, pursuant to the Part XI Agreement. On 27 August 1997, the Council, acting on the recommendation of the Legal and Technical Commission, noted that, in accordance with the Part XI Agreement, the plans of work for exploration submitted by the seven registered pioneer investors were considered to be approved, and requested the Secretary-General to take necessary steps to issue the plans of work in the form of contracts. With the adoption of regulations on prospecting and exploration for polymetallic nodules in the Area by the Assembly of the Authority in July 2000, the IOM and Yuzhmorgeologia of the Russian Federation became the first two amongst the seven pioneer investors to conclude with the Authority a 15-year contract for exploration by signing their respective contracts with the Secretary-General of the Authority on 29 March 2001.

While taking the floor, I would also like to mention a joint international environmental research project known as "Benthic Impact Experiment" which has been conducted by IOM together with scientists of Russia, the United States, Japan and China. This project, aiming at a rational utilization of deep sea nodules of the world oceans, has been carried out in compliance with the unified methodologies and technologies in order to find out the impact of a simulated mining activity on the benthic fauna. Results obtained from this environmental research will serve as the basis for elaboration of ecological studies by the existing contractors as required by the Authority, and that of the geological, technical and mining conditions of the deposits. They will also serve as the basis for choice of the mining unit with optima parameters to protect the deep-sea environment from the least possible disturbances.

The Eastern European States Group has been actively participating in all aspects of the work of the Authority since its establishment in 1994. Their experts and representatives were elected into various bodies of the Authority. For instance, those elected into Legal and Technical Commission include Dr. Glumov from Russian Federation, Profs. Kotlinski from Poland and Scipcov from Ukraine; and those elected into the Finance Committee include Mrs. Dragun-Gartner from Poland, Mrs. Ivanova from Russian Federation and Mr. Dreisetl from the Czech Republic. Prof. Galicki of Poland was for several times

nominated as member or Chairman of working groups on drafting the relevant basic institutional documents of the Authority. In 1998 Mr. Bachleda-Curush of Poland was elected as President of the Assembly and in 2003 Mr. Franzen of Slovakia was elected for the same position. The representatives of Russian Federation, Poland, Czech Republic and Ukraine took an active part in other activities of the Authority. This broad participation in the activities of the organization reflects the positive attitudes the Group of East European countries towards the Authority and its contributions to the works of the Authority.

To conclude, I would like to once again wish the Authority even greater success in the future.

Thank you for your attention. §

---

(E) *Statement by H.E. Ambassador Cézar De Souza Lima Amaral (Brazil), on behalf of the Latin American and Caribbean States Group*

---

The celebration of the tenth anniversary of the establishment of the International Seabed Authority constitutes a special opportunity to review the achievements the Authority has made, and to reflect about the future we envisage with regard to issues related to the Area.

The adoption of the United Nations Convention on the Law of the Sea and the establishment of the International Tribunal for the Law of the Sea constituted giant steps in the long journey of mankind to discipline and organize the maritime universe. These efforts, however, would not bring satisfactory results if it lacked in the world scenario an institution that could answer to the concern of the international community related to the seabed dimension.

The short span of life of the Authority is a history of achievements and challenges. As the Secretary-General pointed out in his annual report, when the Authority held its inaugural session from 16 to 18 November 1994, it was not clear how the complex provisions of the Convention and the Agreement would be applied in practice and how the Authority would carry out its substantive functions given the unpredictable time for commencement of deep seabed mining.

Since its establishment as an autonomous international organization, the Authority conducted successive elections to its various organs, adopted rules of procedure, implemented financial and staff regulations and concluded its Headquarters' Agreement.

For the region I represent, the Latin American and Caribbean, it is a pride and satisfaction to see the Authority having been headquartered in one of our countries, Jamaica, a nation already associated, since the Montego Bay Meeting, with the codification and development of maritime laws. The very proposal of choosing a developing country to host the Authority reveals one of the pillars of our organization: reconcile different interests within a framework of a shared interest, which is built upon the principle of common heritage of mankind.

This session also marks an opportunity to reflect about the future of our organization. It is an appropriate occasion for the Assembly to review the progress the Authority has made to date in carrying out the functions and responsibilities mandated by the Convention and the Agreement. It is also an opportunity for us to address the future direction of the Authority's programme of work.

Once the organizational phase of the Authority is over, it is time to foster and intensify its substantive work, create conditions to stimulate the participation of the States Parties and review the working methodology of the Authority's main bodies.

While exploration work is proceeding at a very slow pace and deep seabed mining remains uncompetitive compared to land-based mining activities, there is a vast potential for marine scientific research in the Area and dissemination of the results of such research. Information gathering and the establishment and development of unique databases of scientific and technical information with a view to obtaining a better understanding of the deep ocean environment should also be fostered.

It is also important for the Authority to strengthen coordination with regional and international fora in order to keep updated its information on the present concerns of the international community. There is, for instance, an increasingly important debate on the harvesting of genetic resources from the Area and the protection of biodiversity on the high seas. This concern will

dominate most of the important international debates in the coming years and the Authority shall be prepared to contribute to the debate.

Mr. President, I would also like to seize this opportunity to congratulate the Secretariat for the work in support of the activities of the Authority in the past ten years. At the same time I would like to remind of the need for regional representation in terms of composition of the staff in the Secretariat in order to reflect that in the membership of the organization.

The overall evaluation of the 10-year works of the Authority is highly positive. As the only international body with the responsibility of administering a global commons for the benefit of mankind, the Authority has succeeded in overcoming the highest hindrance in its history with regard to both its institutional and substantive works. It is our duty to strengthen its structures and implement its agenda. It's our obligation to keep the Authority working for the protection of our common heritage and to assure our future generations of their sharing of this heritage. §

### **III. PANEL DISCUSSIONS ON THE AUTHORITY**

---

Two panels were set up to present the work of the International Seabed Authority. The Panels consisted of a broad range of experts from scientific and legal institutions and contractor entities with 15-year exploration contracts with the Authority.

Panelists of Panel 1 made presentations on the Review of the Achievements of the Authority whereas Panelists of Panel 2 made presentations on the Future Directions and Prospects of the Authority.

## PANEL 1: REVIEW OF THE ACHIEVEMENTS OF THE AUTHORITY

---

Moderator:	Mr. Baidy Diène (Senegal), President of the Council
Panelists:	(A) H.E. Ambassador Hasjim Djalal (Indonesia)
	(B) Ms. Inge Zaamwani (Namibia)
	(C) Dr. Yuri Kazmin (Russian Federation)
	(D) Mr. Mao Bin (China)
	(E) Dr. Harsh K. Gupta (India)

### (A) *ESTABLISHMENT OF THE INSTITUTIONS OF THE AUTHORITY* *Prof. Dr. Hasjim Djalal (Indonesia)\**

---

As of 29 February 2004, the United Nations Convention on the Law of the Sea (“the Convention”) had already been ratified or acceded to by 144 States and 1 Entity (European Community). It is expected that this number will continue to rise as years go by, as indicated by Burkino Faso yesterday. All States Parties to the Convention are *ipso facto* members of the International Seabed Authority. States or entities that ratified the Convention subsequently are required at the same time to accept the 1994 Part XI Agreement (“the Agreement”), and vice versa; in the sense that those who ratified the Agreement are also deemed to have accepted the Convention. As of 29 February 2004, of all States that have ratified the Convention, 28 States still have not accepted or ratified the Agreement, (including Viet Nam in Southeast Asia), although those States are *ipso facto* members of the Authority.

Pending the entry into force of the Agreement, States or entities which had not ratified the Convention can become provisional members of the Authority. This modality was one of the effective ways of trying to make the Authority as universal as possible, and to avoid duplication of rules, namely those who accepted the Convention and the Agreement regimes and those who did not.

---

\* First President of the Assembly and currently Chairman of the Finance Committee.

The Convention entered into force on 16 November 1994 while the Agreement entered into force on 28 July 1996. States which have accepted and signed the Agreement but not yet the Convention, were accepted as provisional members of the Authority for 2 years, namely until the entry into force of the Agreement. Thus on 28 July 1996, the provisional membership in the Authority as a result of the Agreement, terminated. Yet, those who had been provisional members before the entry into force of the Agreement can continue to be provisional members for another 2 years, namely until 16 November 1998, pending their ratification of either the Convention or the Agreement if they informed the depositary of the Convention or the Agreement to that effect before 16 November 1996.

Thus, the legal basis for the establishment of the institutions of the Authority would be the 1982 Convention and the 1994 Part XI Agreement. In this connection, the institutions or organs of the Authority would be the “principle organs” (Assembly, the Council, and the Secretariat), plus the Legal and Technical Commission, the Economic Planning Commission (EPC), and the Finance Committee. “The commercial organ” of the Authority would be the Enterprise, while the “subsidiary organs” may be established by the Authority as may be found necessary. Thus, basically, there would be seven main institutions of the Authority.

### **The Assembly**

a. All members of the Authority, including the provisional members, are members of the Assembly, which is the “supreme organ” of the Authority (article 160 paragraph 1). During the first ceremonial session of the Authority in 1994, the Assembly was chaired by the UN Secretary-General and the Prime Minister of Jamaica. I was elected by acclamation to be the First President of the Assembly of the Authority on 27 February 1995, and served as pro-tem President during the second session in 1996. The Assembly always has 4 Vice Presidents which, together with the President, represent the 5 regional groups in the Assembly, namely Africa, Asia, Eastern Europe, Western Europe and Other States Group (WEOG), and the Latin American and Caribbean States Group (GRULAC).

b. So far, with the adoption of “rotational system” among the regional groups to become President of the Assembly, and due to the fact that it was up to the regional group concerned to submit its candidate, the issues of

electing the President every year has generally been “non-controversial”. Depending on the progress of the deliberation in the Assembly, the Assembly could also form a Working Group which generally consisting of representatives of regional groups to deal with specific issues, such as a Working Group on Rules of Procedure that was established in 1995. This mechanism has also generally been non-controversial and has generally been effective. Thus, the establishment of the Assembly of the Authority and the election of its President are generally not controversial.

c. The problem now is, however, the “quorum” of the meetings of the Authority in order to be able to make decisions. According to article 159 paragraph 5 of the Convention, the quorum of the Assembly is the majority of its members, which now means about 73. Yet it has become increasingly difficult now to maintain the attendance of at least 73 States in the Assembly, particularly those from developing States.

d. Several measures have been proposed or attempted to overcome this matter, including :

(i) The proposal to hold the session of the Authority every 2 years in order to cut the budget and to encourage participation from the relatively poor developing countries. This proposal was difficult to implement, because there was no assurance that the span of 2 years would increase the participation from the developing countries. On the contrary, with such a long span of time, the interest to attend the session of the Authority may in fact be reduced.

(ii) Another proposal was to hold the Meeting of the Assembly outside of Jamaica, such as at the UN Headquarters in New York. The difficulty with this proposal was that it was regarded by some members as contradictory to the Convention because the Convention stated specifically that “the seat of the Authority shall be in Jamaica” (article 156 paragraph 4), although it did not specifically mention that all the Sessions of the Authority must be held at the seat of the Authority. In fact, article 159 paragraph 3 stated that “Sessions of the Authority shall take place at the seat of the Authority unless otherwise decided by the Assembly”. Indeed, there had been occasions when a special meeting took place in New York in order to meet the quorum for the Assembly to make decisions. It should be noted,

however, that the host country (Jamaica) does not necessarily support the holding of any session of the Authority outside of Jamaica, although under exceptional circumstances, special meeting of the Authority, such as on the decision of the Authority to accept the recommendation of the Council and the Legal and Technical Commission or to approve the budget proposed by the Finance Committee, was held once in New York.

(iii) Another modality that could or has been attempted to solve this problem was to shorten the sessions of the Assembly. But, again, by shortening each session drastically it might not solve the problem either, because it might not be able to take decision before elaborate deliberations took place, and the shortening of the session might not be efficient for countries, especially developing countries, that came from far distant places.

(iv) Another solution that was established last year was to create a Special Trust Fund to support the participation of certain developing countries that meet certain criteria. Last year, following the recommendation of the Finance Committee, the Assembly had authorized the Secretary-General to draw up to US\$ 75,000 from the funds administered and available to him for the purposes of defraying the cost of certain members of the Legal and Technical Commission and the Finance Committee from developing States, upon certain conditions. I hope that this modality could be strengthened and that State members who are able to do so should contribute more generously to this Special Trust Fund.

e. To conclude, there seems to be no substantial difficulties in establishing the Assembly anytime the Authority needs, except that the Assembly may not make decisions unless it has the quorum.

### **The Council**

(a) The Council is the “executive organ” of the Authority (article 162 paragraph 1). Thus, it has the power of making recommendations to the Assembly. In fact there are issues that the decision of the Assembly would depend upon the recommendation of the Council, particularly those that involve financial implications. According to the Convention and the Agreement,

the Council has 36 members elected by the Assembly, representing 4 specific interests, namely:

- 4 members representing countries which are main importers or consumers of the categories of minerals to be derived from the international seabed area (Group A) provided that it includes one state from East Europe having the largest economy, meaning the Russian Federation. It can therefore be said that the Russian Federation would be the only "Permanent Member" of the Council for a foreseeable future.
- 4 members representing the 8 largest investors in sea-bed mining activities (Group B).
- 4 members representing the largest exporters of the same minerals produced in areas under their jurisdiction, including at least 2 from developing states (Group C).
- 6 members representing 6 special interests among the developing countries (Group D), namely: (1) "large population", (2) "land-locked and geographically disadvantaged states", (3) "island states", (4) "major importers of the minerals", (5) "potential producers", and (6) "least developed states".
- 18 members elected to assure equitable geographical distribution of the 5 regional groups in the Council (Group E), provided that at least one member of the Council is elected from each regional group on the basis of this qualification.

(b) While the procedures for the election had been established in the Council and in the Assembly, in reality it has not been easy to do so, at least initially. It took us seven weeks of informal consultations and the first Council could not be established until 24 March 1996, almost one-and-a-half years after the entry into force of the Convention and the establishment of the Authority.

(c) As President of the Assembly at that time, I encountered, *inter alia*, the following problems:

(i) How to determine which states fulfilled the criteria for membership in Group A to D. For instance, there have been cases that some members are exporters of the minerals which were not mined in the areas under their national jurisdiction. They are simply traders which imported the materials and later exported them again. Should they be included in the categories of Importers (Group A) or Exporters (Group C) or neither?

(ii) There was also a perception that there were degrees of significance of being members of the Group A, B, and C, primarily because they were assumed to have more powers in the Council than the other members, since any 3 states in each of the Group A, B, and C could “veto” any decision of the Council on certain questions of substance because certain decisions of the Council could be rejected by the majority in any of the 5 Groups (Section 3 paragraph 5 of the Annex to the 1994 Part XI Agreement, which stated that the decisions of the Council on questions of substance... shall be taken by 2/3 majority of members present and voting provided that such decisions are not opposed by a majority in any one of the 4 Chambers referred to in Paragraph 9 of Section 3 of the Annex. According to Paragraph 9, each one of Groups A, B, and C in the Council shall be treated as a chamber for the purpose of voting in the Council, while developing States within Groups D and E shall be treated as a single chamber for the purpose of voting in the Council.)

(iii) The procedure for nomination by each group of the required members of the candidates to be elected to the Council. Generally there have been intense debates and competitions in each group to elect their members that will sit in the Council, particularly those that will represent Group A, B, and C.

(iv) Luckily, this problem has generally been solved by applying the principle of “rotation” in the group itself, generally by dividing the 4 years term of office to be rotated by a 2-years period for each member, and in some cases even for 1 year each, in the sense that the 4-year period could be divided among 4 members.

(v) The need to assure equitable geographical distribution in the Council is also perplexing in the beginning, since this would

depend to certain extent on the selection or election of the members from the other 4 categories or groups.

(d) As the pro-tem President of the Council at that time, I had found that there had been general agreement that in the Council of 36 members, based on balanced representation of States and the interests of each group, the distribution would be : Africa, (10) Asia (9), WEOG (8), Eastern Europe (3), and GRULAC (6). Although the distribution would depend on the number of States in each group, this rule does not always apply in view of so many cross-sectoral interests involved. GRULAC originally felt strongly that it was difficult for it to accept the number of its representation in the Council (6) which was less than the WEOG (8) since the number of its members in the Assembly exceeded that of WEOG States in the Assembly. At the same time, GRULAC also had 7 members that were eager to be elected to the Council from the beginning. Yet, while it showed substantial amount of compromise, it insisted on at least 7 representations in the Council. For this reason, as President of the Assembly and pro-tem President of the Council, I was grateful to the regional groups which finally agreed to rotate and sacrifice one of their seats each year, except Eastern Europe (since their seats in the Council should not be less than 3), to be filled by the GRULAC. The rotation was decided by alphabetical order among the regional groups, excluding Eastern Europe. The rotation among the 4 regional groups also corresponded to the 4-year term appointment of the members of the Council.

(e) The First Council met in August 1996 and elected its first President, Mr. Lennox Ballah from Trinidad and Tobago. Since then, the President of the Council has been elected every year without serious problems, representing the rotation among the 5 regional groups. While the distribution of seats in the 36 members Council was originally very controversial, this problem has generally been solved satisfactorily and the rotation of memberships among the various groups (A, B, C, D, and E) have been generally manageable. For the moment, to fill the vacancies in the Council as a result of the rotation, the Assembly has elected or re-elected 17 new members for a 4-year period from 1 January 2003, subject to specific understanding in the regional and interest groups as follows: Group A (Russian Federation, Italy), Group B (Germany, France), Group C (Australia, Indonesia), Group D (Egypt, Fiji, Jamaica); and Group E (Cameroon, Chile, Cote d'Ivoire, Honduras, Myanmar which will relinquish its seat in 2004, Nigeria, Republic of Korea and Saudi Arabia).

### **The Legal and Technical Commission**

a) The Legal and Technical Commission (LTC) is not an organ of the Assembly but of the Council (article 163 paragraph 1(b)). The members of the LTC are therefore elected by the Council, not by the Assembly (article 163 paragraph 2). According to the article, the LTC shall consist of 15 members elected on personal qualifications. Yet, there is a possibility to increase the number of the LTC if the Council so decides. In fact, during the first election to the LTC in 1996, there were 22 candidates. In view of the difficulties that might be encountered in electing 15 members out of the 22 candidates, the Council at that time simply decided to expand the membership and elected all the 22 candidates to the LTC. This was made possible due to the fact that the members of the LTC, as indicated above, were theoretically elected on the basis of personal qualifications although “account shall be taken” on the need for equitable geographical distribution and the representation of special interests as stipulated in article 163 paragraph 4. Again, in the election to the LTC in 2001, there were 24 candidates. Again at that time the Council simply expanded the membership of the LTC and elected all the 24 candidates to the LTC. The current members elected in 2002 will serve for 4 years from 1 January 2003 to 31 December 2006.

b) There has been some concerns expressed with regard to the expansion of the membership of the LTC by the Council, particularly with regard to the need to maintain equitable geographical distribution and the representation of special interests, as these 2 criteria were not fully observed in the 2 times expansion of the LTC membership. The current 24 members of the LTC consists of Africa (6), Asia (8), WEOG (5), Eastern Europe (1), and GRULAC (4).

c) Yet, generally there have not been many serious controversies with regard to the composition of the LTC, although there were some difficulties with regard to nature of the meetings of the LTC and with regard to the attendance by LTC members from the developing countries. With regard to the nature of LTC meetings, there were considerable concerns expressed over the “close nature” of most LTC meetings. Yet this problem has generally been solved in the sense that the non-members of the LTC could under certain situation be allowed to attend the meetings of the LTC without participating in the decision making. With regard to the non-attendance of some members

from developing countries, it is hoped that the problems would be solved by the establishment of the Special Trust Fund. Generally speaking, the LTC has been able to carry out its works relatively successfully.

### **The Secretary-General**

a) According to the Convention, the Secretariat shall comprise of a Secretary-General and such staff as the Authority may require. According to article 166 of the Convention, the Secretary-General shall be elected for 4 years by the Assembly and he shall be the Chief Administrative Officer of the Authority. During the first election in 1996, there were 4 candidates coming from 3 regional groups, namely Mr. S. Nandan of Fiji from the Asian Group, Mr. Joseph Warioba of Tanzania from the African Group, Mr. Luis Preval of Cuba and Mr. Kenneth Ratttray of Jamaica, both from the GRULAC. They were all from the regional groups of developing countries. In view of the difficulties in conducting the election out of the 4 candidates for the Secretary-General, all being friends of one another, as President of the Assembly, I undertook intensive consultations with the candidates and the various regional groups concerned. Two of the candidates later withdrew, leaving Mr. Nandan and Mr. Warioba as the 2 competing candidates. Both Mr. Nandan and Mr. Warioba were extremely capable and very knowledgeable with regard to the Convention and the works of the Authority. None of the 2 candidates was willing to withdraw. Yet, it was also felt that open election may cause rift and division in the Assembly and this was not regarded as auspicious for the Assembly, especially during its first years of operation. As the President of the Assembly at that time, I conducted a number of serious consultations with the candidates themselves as well as with all regional groups. While both of them seemed to agree on the need to maintain the cohesion in the Assembly, none of them wanted to withdraw. We finally agreed to a secret "indicative" voting, by which the member States of the Assembly would express their preference secretly and the ballots would be counted by the President only in front of the 2 candidates. The candidate who gained the lesser votes was expected to withdraw gracefully so that the remaining single candidate would be elected by acclamation. Through this process, after the President counted the indicative votes in front of the 2 candidates, Mr. Warioba withdrew and Mr. Nandan was elected by acclamation to be the first Secretary-General in 1996. He was re-elected in 2000 for another 4-year term through 2004. I felt that through this modality the issue of the election of the Secretary-General has been handled in a less confrontational and less divisive manner. Up to now, it remains a secret

as to how big the difference of votes in the secret indicative voting was and which member States voted for whom. I would recommend that this experience and the modality be considered by the President of the Assembly in future election of the Secretary-General.

b) Since then, the Secretary-General has established a Secretariat which has generally functioned professionally and in my estimation has been satisfactory to the members of the Authority.

#### **The Finance Committee**

a) The Finance Committee was not ordained or stipulated in the Convention but in the 1994 Part XI Agreement. The significance of the Finance Committee was originally highlighted by the developed countries which conditioned their acceptance or ratification of the Convention on the establishment of a Finance Committee to “control” the financing and financial management of the Authority. At this moment, the Finance Committee consisted of 15 members elected by the Assembly for a period of 5 years, taking into account equitable geographical distribution among regional groups and representation of special interests. The members of the Finance Committee should have qualifications relevant to financial matters (Section 9 paragraph 1 of the Annex to the Agreement). In addition, the 4 special interest groups in the Council (Consumers/Importers, Investors, Exporters/Producers, and Developing Countries) should be represented by at least 1 member in the Finance Committee. Moreover, the 5 largest financial contributors to the budget of the Authority should also be represented, namely France, Germany, Japan, United Kingdom and the United States (now the composition of the largest financial contribution has changed somewhat, particularly since the United States was no longer a provisional member of the Authority). At present, the 15 members of the Finance Committee (until 31 December 2006) are from Italy, Indonesia, Germany, Czech Republic, Myanmar, Russian Federation, Japan, China, Uganda, France, Lebanon, UK, Jamaica, India, and Nigeria. The member from Indonesia currently serves as the present Chairman of the Finance Committee.

b) While there used to be some difficulties with regard to the composition and the election of the members of the Finance Committee, by now this matter has generally been settled, and the Finance Committee has functioned relatively well. There have been some difficulties with regard to attendance of meetings of the Finance Committee by its members from the

developing countries, yet, hopefully this could also be overcome, at least partially, by the establishment of the Special Trust Fund to financially facilitate their participation in the meetings of the Committee.

### **Economic Planning Commission**

a) Article 163 and 164 of the Convention also stipulate the establishment of the Economic Planning Commission (EPC) consisting of 15 members elected for a 5-years term by the Council. Yet, the 1994 Part XI Agreement later stipulated in paragraph 4 Section 1 of its Annex that for the time being the function of the EPC shall be performed by the LTC “until such time as the Council decides otherwise or until the approval of the First Plan of Work for Exploitation”. So far, although a number of plans of Works for Exploration have been approved by the Council, no Plan of Work for Exploitation has been approved by the Council.

b) Therefore, there has been no need to establish the EPC. Whatever role the EPC is supposed to play, it could be carried out for the time being by the LTC.

### **The Enterprise**

a) During the early years of the Law of the Sea Conference in the early 70s, there was a “euphoria”, particularly among developing countries, that the exploitation of the resources of the Common Heritage in the International Seabed Area by the Enterprise would contribute to the world economy, particularly to improve the conditions of the poor developing countries. This euphoria was strengthened by the assumption at that time that the need for the seabed minerals worldwide, particularly nickel from the nodules, would increase by about 6% yearly due to global industrialization and the development in science and technology, particularly space technology, and that the price of those minerals produced would compete with the minerals produced from land-based and areas under national jurisdiction. It was assumed that the problems of mining technology would be overcome and that the problem of marine environmental impacts of seabed mining would also be handled satisfactorily. The seabed commercial mining was presumed to start some time around 1985.

b) The Enterprise was therefore to be established as the commercial organ of the Authority, and would conduct businesses under the

direction of the Authority, namely the Council. The Enterprise “shall carry out activities in the area” (article 170, paragraph 1), meaning that it can conduct exploration and exploitation on its own of the seabed resources that are reserved for the Enterprise. It can also conduct transporting, processing, and marketing of the minerals recovered from the international seabed area. Some Western countries originally criticized the Enterprise system as similar to State Companies operating under political direction of the State, in this case the Authority, and therefore regarded it as “socialistic” in its design.

c) Yet, before the Convention entered into force in 1994, the above euphoria did not materialized, mainly due to the fact that the price of the minerals did not grow as expected, although the research was continuing on the most effective technology for seabed mining and on the methods of minimizing the marine environmental impacts of the seabed mining.

d) In view of the above, when the Convention was about to enter into force in 1994, it was felt that there was no need at that time to establish the Enterprise, and all its functions could be implemented by the Secretariat of the Authority. Thus, Section 2 of the Annex of the 1994 Part XI Agreement stipulated that the function of the Enterprise shall be performed by the Secretariat until the Enterprise begins to operate independently of the Secretariat and that the Secretary-General shall appoint from within the staff of the Authority an interim Director General “to oversee” the performance of the functions of the Secretariat in regards to the Enterprise.

e) In my view, in the years to come, the Authority would still have to prepare for the establishment of the Enterprise independently of the Secretariat as designed by the Convention and the Agreement.

### **Factors Affecting the Works of the Authority**

There have been several factors that have been affecting the works of the Authority:

a) The long delay in seabed mining and the continued uncertain prospects of any form of commercial mining from the international seabed area. The delay, as indicated above, is basically the result of economic factors, particularly the price of the metals to be produced from the international seabed area. Consequently, there had been arguments in the Authority in the past

whether it would be useful to do anything serious now at the Authority, due to the fact that it was not a very urgent matter because the seabed mining may not take place during the next several years. On the other hand, many States consider that it would be important to prepare for an effective and efficient seabed mining regime in the future while we still have time to prepare it now, particularly with regard to its economic and environmental impacts. My feeling is that the second option has been the main motivation for the activities of the Authority within the last several years.

b) Thus, during the last several years, the Authority has concentrated on establishing and building up a workable organizational set-up and adopting the necessary rules of procedures for its various organs or bodies or adoption of rules for its organization and Secretariat. I felt that this organizational build-up has generally been achieved. In fact, the Secretariat has already engaged in various substantive works, such as in conducting various scientific workshops and seminars, and has already concluded several contracts with 7 contractors for the purposes of exploration. I would like to congratulate the Secretary-General and the staffs of the Secretariat for all those achievements. I visualize that in the next few years the Authority would conclude some contracts for exploitation when the conditions for that are ripe.

c) Lack of attendance or continuation of attendance of certain members of developing countries in the meetings of the Assembly and its organs are the problems. Some of these problems are the result of: (a) the financial difficulties in those countries; (b) the result of lack of urgency or priority to deal with the problems in view of the long delay in seabed mining as indicated above; and (c) due to lack of understanding in the governments of the developing countries concerned with regard to the scientific and technical knowledge involved in the nitty-gritty of the seabed mining activities and their implications. With regard to the first problem, beginning this year a Special Trust Fund to support the participation of members of the LTC and the FC from developing countries has been instituted, albeit in limited and restricted version. With regard to the second cause, there is not really much to do except to prepare all the necessary legal, technical, commercial, and environmental aspects of the sea-bed mining when it does come into reality in the years ahead. This approach has generally been accepted by the Authority. With regard to the third cause, the Authority has increasingly been paying attention to the technical, technological, and environmental aspects of the seabed mining by involving participation of more developing countries, and consequently more

and more activities of the Authority are dedicated to conducting various conferences, seminars, as well as workshops on those issues to accumulate as much knowledge and data as possible. Thus hopefully also increase the scientific basis among the developing countries, and hopefully sustain their attention and interests in the work of the Authority. §

(B) ***THE WORK OF THE LEGAL AND TECHNICAL COMMISSION***  
*Inge K. Zaamwani (Namibia)*

---

I have been asked to give an overview of the work of the Legal and Technical Commission (LTC) in twenty minutes. The views expressed here today are my personal views and not of the Legal and Technical Commission nor the Republic of Namibia. Any questions or queries should be directed to me personally.

The Legal and Technical Commission as you all know is an organ of the Council of the Authority. It is established in terms of article 163 of the United Nations Convention on the Law of the Sea and was formally constituted in August of 1996 with Ambassador Djalal as the head. The membership increased from 15 to 22.

*Figure 1: Members of the LTC at a regular session.*

The LTC is supposed to be an advisory body to Council on matters relating to the Authority's functions in the Area; it is therefore comprised of experts with appropriate experience and competences in the field of law, economic matters, environmental sciences and oceanography and also in field relating to prospecting and exploration and exploitation of mineral resources in the Area.



---

\* Former Chairwoman and current member of the Legal and Technical Commission.



*Figure 2: Scientists exchanged views at the workshop on Standardization in 2001.*

stipulate the way in which meetings and the proceedings are to be conducted. The rules were approved, with the exception of rules 6 & 58, by the Council at its fifth resumed session in 1999. Rule 6 was adopted in a closed meeting and Rule 58 was done with the participation of the ISA and entities carrying out activities in the Area. Without the input and support of the Secretariat, the work of the LTC would not be possible.



*Figure 3: Scientists and experts at the workshop on Standardization in 2001.*

#### **The support of the Secretariat revolves around the LTC**

Such support include, the preparation of the draft agendas for the approval of the LTC; initial drafts of rules, regulations or guidelines; organizing specialized workshops, facilitation and provision of appropriate expertise during meetings; liaison with recognized experts in relevant fields under consideration and from time to time, limited inter-sessionary communication with LTC members.

You all know that LTC operates within the framework of the provision of UNCLOS, Part XI of the 1994 Agreement. We also need to take into

consideration some recommendations made by Prep Com relating to pioneer investors.

Under this framework, the LTC had to take into account a number of interests such as:

- (a) The interests and political aspirations of the Authority;
- (b) The capacity & technology transfer issue of the Enterprise;
- (c) The financial issues of the pioneer Investor and Contractors;
- (d) The protection and preservation of the marine environment;
- (e) The marine scientific research in the Area;
- (f) Economic and financial parameters to make the Area attractive to potential investors.

As a team of experts, we are expected to maintain a balance between competing interests, in particularly, the principle of the common heritage of mankind. This states that activities carried out in the Area be for the benefit of mankind as a whole. It was envisaged that activities in the Area will result in financial and other economic benefits accruing to member States, and that the Authority will ensure equitable sharing of these benefits to mankind.

Since the forming of the LTC, it has completed some very substantive work. First and foremost, it has adopted the mining code, drafting of the environmental guidelines, the approval of the plan of work for the pioneer investors. The first task was to put in place the consideration of the Rules of Procedure, these were subsequently adopted by the Council in 1999. The mining code was the first substantial task which was put to the LTC in 1997. There was a lot of interest in this particular task from delegates. Observers were allowed to attend these sessions and it took over three years to complete the task.

### **The Deliberation of the Mining Code**

The initial draft was put together by the Secretariat based on precedents, experiences, practices from various land based mining jurisdictions as well as valuable real time observations and insights from scientists and pioneer investors.

The following were also taken into consideration:

- (a) The protection and preservation of the marine environment;
- (b) Confidentiality of data and information submitted to the Secretariat during prospecting and exploration;
- (c) Transfer of technology and training;
- (d) A provisional text of the draft code was finalized and circulated to Council on information basis for comments;
- (e) Comments were received and incorporated and a final draft submitted to Council for consideration at the end of the resumed fourth session.

The next project the LTC worked on was the Guidelines for the Assessment of Environmental Impacts in the Area. This was an important aspect of the Mining Code in accordance with Regulation 31. In order to give effect to Regulation 31, a workshop was convened in Sanya, Hainan Island, China in June 1998. The outcome of that workshop was a set of draft guidelines put together by the Secretariat. The draft was considered by the LTC and guidelines were subsequently developed taking into account the views of recognized experts in the field. They reflect the current state of scientific knowledge of the Area and are the only recommendations that contractors could follow with due regard to the various circumstances in their Areas.

Our next job was to look at the Plan of Work for the Pioneer Investors for exploration for polymetallic nodules. In terms of paragraph 6 (a) (ii) of Section 1 of the Annex to the Agreement, Pioneer Investors were to request the issuance of the Plan of Work with 36 months from the entry into force of the Convention. On 9 August 1997, the pioneer investors submitted their requests to the Secretary-General for approval of the Plan of Work. Following detailed review and evaluation of the Plan of Work, the LTC recommended to the Council the approval of the requests subject to the incorporation of outstanding obligations as per applicable laws, in particular those contained in Resolution II which deals with training of designated candidates from developing countries.

Following the approval of the Mining Code, in 2001 the Authority and all the pioneer investors, except India, entered into contract of work. India signed in 2002.

In reviewing the Annual Reports submitted by Contractors, it became evident that a standard format of reporting would be beneficial because the reports submitted were sometimes not comprehensive enough to fulfill their obligations. During the eighth session, the LTC designed and recommended a format and structure of reporting which was subsequently adopted. The format and structure is now being followed by all contractors.

A request was made by the delegation of the Russian Federation that the Authority formulate regulations for sulphides, during the sixth session. During the eighth session, the LTC began consideration of issues relating to a draft put together by the Secretariat. The LTC was divided into working groups to look at specific issues. These issues were the protection of the marine environment, the size of the exploration area and relinquishment requirements; form of work plans, type of arrangements between the contractors and the Authority, for example the parallel system.

As a member of the LTC, I have the following general observations:

- (a) The governing principle relating to the development of resources in the Area remains relevant and laudable;
- (b) A great number of achievement have been made since 1997;
- (c) The legal framework to regulate the conduct of activities in the Area is now in place;
- (e) The work of the LTC is critical to the implementation of the governing regime in the Area;
- (f) There is still limited knowledge and understanding of the seabed and its environment;
- (g) Prospecting and exploration in the deep sea is a highly capital and technology intensive business;
- (h) Given the limited knowledge and understanding of the Area, caution must be taken at every stage to avoid serious harm to the marine environment.

I also have some comments on Marine Scientific Research:

- (a) The Authority can do more to promote and encourage the conduct of marine scientific research in the Area;
- (b) The Authority should be proactive in the co-ordination and dissemination of the results of such research and analysis;

(c) Consideration should be given to funding of research.

We are here commemorating 10 years since the coming into force of the Agreement. This provides the opportunity for us to highlight the achievements but I also think that this provide the opportunity to plan the future and look forward.

The ongoing work on the draft regulations supports the view that a review of the effectiveness of the regime governing the development of resources in the Area may be overdue. The Authority needs to become more visible and take active parts in international forums to promote the Area. Also appropriate funding and capacity strengthening of the Secretariat is critical to the fulfillment of the Authority's mandate.

I think that the Secretariat needs to become more active in monitoring the activities of contractors. For example, more inspections need to be carried out. The re-enforcement of scientific and legal capacity is vital at the Secretariat, i.e. more high-caliber scientists are needed.

In concluding, I must say that the Legal and Technical Commission could assist in the advocacy work of the Secretariat but the part-time nature of involvement makes such contribution limited to participation at sessions and workshops. Frequent inter-sessionary communication between LTC and the Secretariat is recommended.

These are my personal views. Thank you. §

C) ***ADMINISTERING THE POLYMETALLIC NODULE RESOURCES OF THE DEEP SEABED***  
*Dr. Yuri B. Kazmin (Russian Federation)\**

---

### **Introduction**

According to the 1982 United Nations Convention on the Law of the Sea ("the Convention") and the Agreement relating to the Implementation of

---

\* Counsellor, Ministry of Natural Resources, Russian Federation.

Part XI of the Convention (“the Agreement”) the primary objective of the International Seabed Authority (“the Authority”) is to “organize and control activities in the Area with a view to administering the resources of the Area” (Paragraph 1 of Section 1 of the Annex to the Agreement).

The main types of mineral resources of potential economic value which occur at and beneath the deep seabed in the International Seabed Area (Area) at present are represented by:

- polymetallic nodules (also known as manganese nodules);
- cobalt-rich ferromanganese crusts; and
- hydrothermal polymetallic massive sulfides.

Although the Authority is engaged in the tasks of promoting and regulating the research and development of all three types of those resources, the major focus of its work over recent years has been concentrated on the polymetallic nodules.

Due to economic, environmental and technological factors the polymetallic nodules still remain the most promising type of mineral deposits in the Area. One should bear in mind also that in the history of international law of the sea major events and provisions of the present conventional law were to certain extent provoked by and connected with the interest of modern society in research and economic development of the polymetallic nodule resources of the deep seabed.

It should be remembered that these resources led to:

- (a) Adoption by the UNGA of the 1970 Declaration of Principles of International Law concerning Friendly Relations and Co-operation among States in Accordance with the Charter of the United Nations and establishment of the concept of the “Common Heritage of Mankind”;
- (b) Creation of Part XI of the 1982 United Nations Convention on the Law of the Sea;
- (c) Establishment of the International Seabed Authority;

(d) Commencement of Prospecting and Exploration of the Deep Seabed in History. Polymetallic nodules which may contain economically valuable concentrations of nickel, copper, cobalt and manganese raised rather high economic interest of industry in the mid-1960s, but due to the world market situation in the 1980s their deep sea mining happened to be uncompetitive compared with land-based deposits. However it is evident that the deep sea polymetallic nodules remain in situ in the international seabed area and have certain economic value for future development.

In spite of the fact that the market situation is not favourable, seven former registered pioneer investors have entered with the Authority into 15-year contracts for exploration of nodule deposits.

In view of the above, while marking the tenth anniversary of the establishment of the Authority it is timely and important to review the Authority's achievements in administering the polymetallic nodule resources of the deep seabed in the Area.

#### **Components of the Authority's Activities in Administering Nodule Resources in the Area**

The functions of the Authority during the initial period are defined in the Agreement. Paragraph 5 of Section 1 of the Annex to the Agreement specifies the functions on which the Authority shall concentrate, between the entry into force of the Convention and the approval of the first plan of work for exploitation.

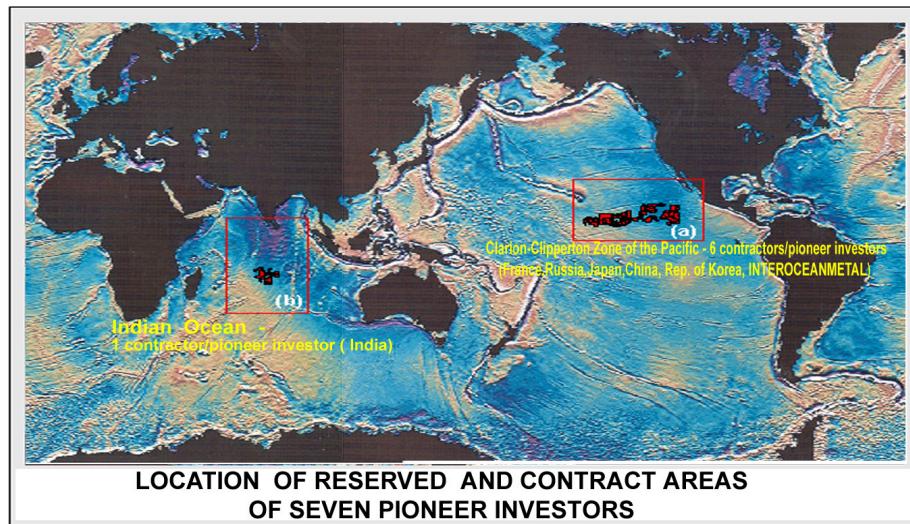
The most important achievement of the Authority to date with respect to administering polymetallic nodule resources have been the adoption of the rules and regulations on prospecting and exploration of these resources in the Area in 2000, approval of plans of work for exploration in 1997, and the subsequent issuance of contracts for exploration to seven registered pioneer investors in 2001-2002. That has been followed by the Authority's supervisory function with respect to the implementation of the issued contracts. Status of activities of contractors will be reviewed in other presentations at this session.

A very important function is an assessment of available data relating to prospecting and exploration for polymetallic nodules. Its basic component is an assessment of nodule resources primarily in areas reserved for the conduct of

activities by the Authority through the Enterprise or in association with developing States.

The second step includes assessment of the resource potential of the selected parts of the Area on a global scale. Nodules have been found in all the oceans, however the nodules of economic interest (in terms of nodule and metal concentration) are localized and occur in the Clarion-Clipperton Fracture Zone of the eastern equatorial Pacific Ocean, the Peru Basin in the south-east Pacific Ocean and the centre of the north Indian Ocean.

In the Clarion-Clipperton Fracture Zone of the Pacific the Authority has allocated the areas for exploration of nodule resources to six pioneer investors. One area was allocated for exploration under the contract in the Indian Ocean.



*Figure 1: Location of reserved and contract areas in the Pacific and Indian Oceans.*

The most interesting region is the Clarion-Clipperton Zone (CCZ) of the Pacific, which happened to be an area of the highest potential for the economic value of the nodules. That has been proved by the fact that out of seven pioneer investors six of them applied for exploration rights within the CCZ and most of other potential investors claimed their interest in this particular area (Figure 2).

Out of 27 areas reserved for the Authority 25 sites are located in the Clarion-Clipperton Fracture Zone.

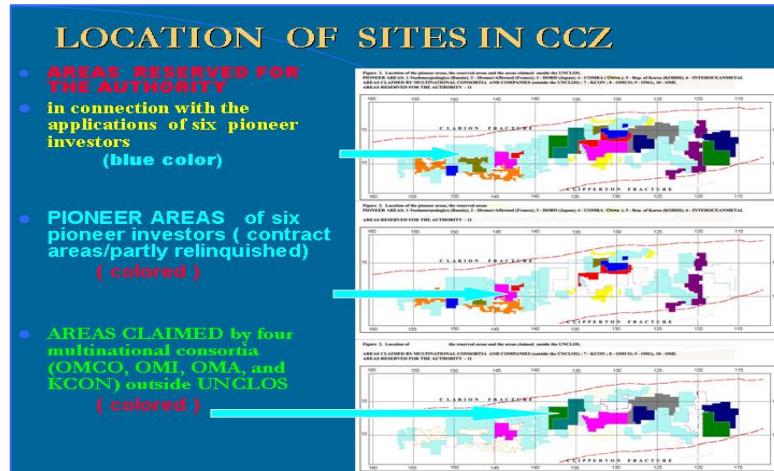


Figure 2: Location of nodule sites in the Clarion-Clipperton Zone.

The Clarion-Clipperton Zone itself is a global geographical and geological province of the ocean floor in the Pacific. The length of the zone is about 4,000 km, its width reaches up to 800 km. The water depth varies from 3.5 km in the East to 5.5 km in the West. By its dimensions it certainly should be considered as an area of a global nature and scale. Geologically the CCZ crosses important planetary features of the Earth's crust: the East Pacific Rise and the Pacific crystal plate. The oceanic crust of the CCZ dates from 65 in the west to 10-20 million years in the east. Geologically, the CCZ is also an important global structure of the ocean floor.

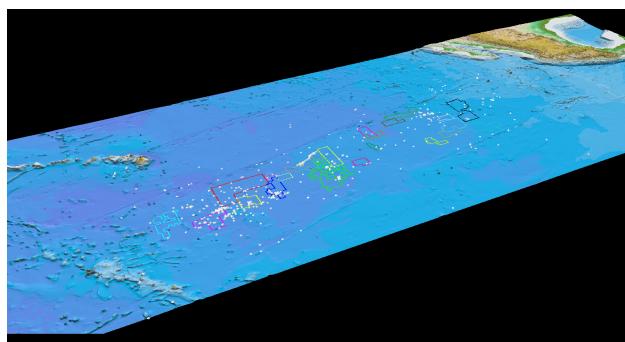


Figure 3: Bird's eye view of the Clarion-Clipperton Zone (from L.Parson, ISA Workshop, Nadi, 2003).

## Resource Assessment of the Reserved Areas

Resource assessment of the areas reserved for conduct of activities by the Authority through the Enterprise or in association with developing States (Reserved Areas/Sites) is a primary task of the Authority. According to the provisions of paragraph 1 of Section 2 of the Annex to the Agreement the Secretariat of the Authority shall perform the functions of the Enterprise until it begins to operate independently of the Secretariat. These functions include evaluation of information and data relating to areas reserved for the Authority.

After the establishment of the Authority the Secretariat created a database of polymetallic nodule resources in the reserved areas – POLYDAT. Utilizing this database the Secretariat undertook a preliminary resources assessment of the four metals (nickel, copper, cobalt and manganese) in polymetallic nodule deposits in the reserved areas.

In 1997 the Authority's Secretariat reviewed and analyzed the data submitted by the pioneer investors for the reserved areas (23 blocks) in the CCZ as contained in their applications. The available site-specific data on nodule abundance and metal content of manganese, nickel, copper and cobalt was computed into the Authority's database POLYDAT. This allowed the production of associated maps showing location of sampling sites, nodule abundance, and metal content of the four metals separately. A map showing spatial distribution of nodule deposits of various grades has been also compiled.

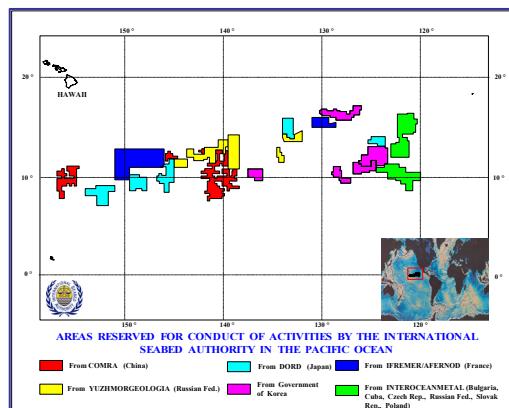
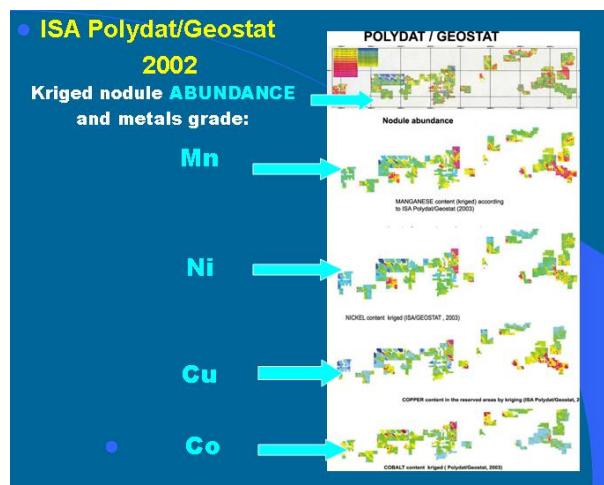


Figure 4: Location of the reserved areas in the Clarion-Clipperton Zone in the Pacific.

This work of the Secretariat was continued on the basis of geostatistical analysis.

The resource evaluation was undertaken utilizing conventional estimation techniques (polygons, inverse distance interpolation and inverse square distance interpolation) and geostatistical methods such as

kriging. The study revealed some anomalies in variations of nodule abundance and metal grades in various reserved blocks which either might be attributed to natural factors, or considered as discrepancies between data of different pioneer investors due to difference of sampling and analytical methods and techniques. Discussion of the problem revealed the need for consideration of various geological and oceanographic features to understand the nature of such variations by developing a geological model of the zone as a whole on the basis of available information.



*Figure 5: Kriged nodule abundance and metals concentrations (manganese - Mn; nickel - Ni; copper - Cu; cobalt - Co) within the reserved areas in the CCZ (according to POLYDAT/GEOSTAT, ISA Database, 2002).*

#### Nodule Abundance.

According to the ISA Secretariat's statistical analysis of the Polydat database, the abundance within the reserved areas has a wide range of values from 0 kg/m<sup>2</sup> to 30.19 kg/m<sup>2</sup> with an average of 6.12 kg/m<sup>2</sup>. The histogram of abundance indicates that over 7.5% of the stations have abundance values of 0.0kg/m<sup>2</sup> and that over 14% of all stations have very low abundance values.

The spatial distribution of nodule abundance in Figure 6 indicates that the nodules with the abundance more than 10 kg/m<sup>2</sup> are concentrated in the areas in the remote east of the CCZ, in the central region and in the remote west of the CCZ. The highest average abundance levels are typical for the areas located between 128°W and 135°W and between the 118°W and 124°W. Even in the areas with high average abundance there is local variability.

Any analysis of nodule abundance in different reserved areas should take into account the fact, that sampling density varies greatly from one block to another. The achieved results for different blocks shall be looked at from the point of view of a confidence factor i.e. the reliability of statistical calculations due to the density of original data.

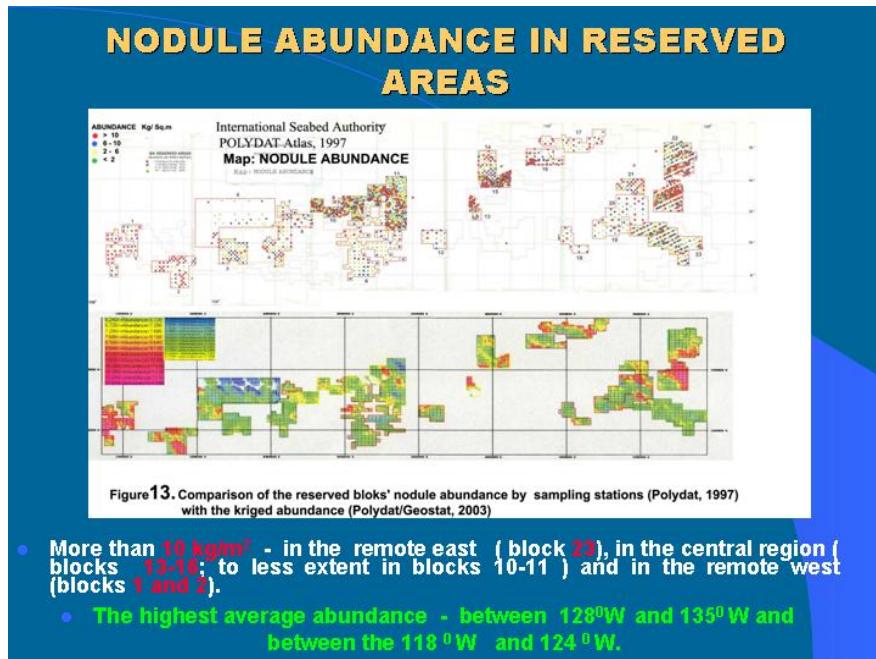
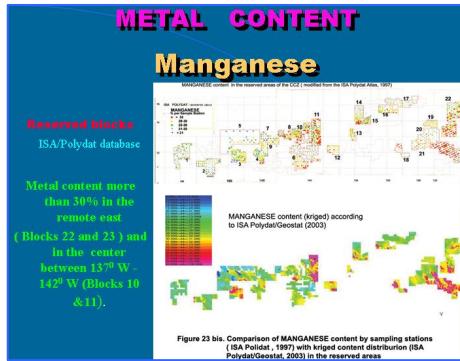


Figure 6: Nodule abundance in the reserved areas of the CCZ (from ISA Polydat/Geostat database, 2002).

#### Metal Content

**Manganese.** In the areas reserved for the Authority manganese content of nodules varies between 4.14% and 33.5% of dry weight with an average 26.83%. The low values are confined to the north of the CCZ near the Clarion fracture (Figure 7). High values of manganese (more than 30%) are typical for almost all reserved blocks.

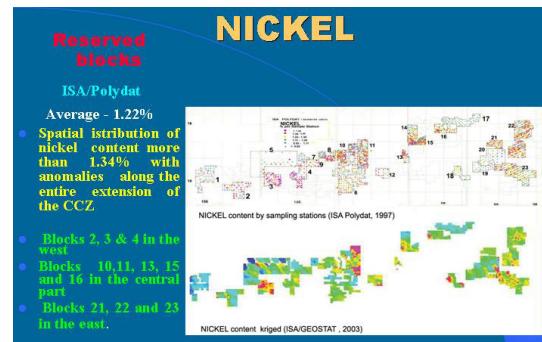
The spatial distribution of manganese content in this figure shows that manganese anomalies with metal content more than 30% are confined to the remote east of the CCZ and to the centre of the CCZ between 137°W - 142°W.



*Figure 7: Nodule manganese content in the reserved areas of the CCZ (from ISA Polydat/Geostat database, 2002).*

**Nickel.** The nickel content of the nodules in the areas reserved for the Authority varies between 0.15% and 1.87% of dry weight with an average 1.22%.

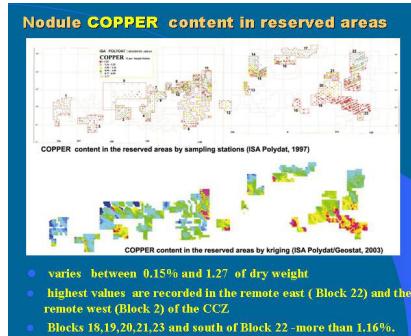
The map of nickel content in the reserved blocks from the ISA/Polydat database (Figure 8) shows that the spatial distribution of nickel concentrations with the content more than 1.34% is characterized by presence of nodules nickel anomalies along the entire extension of the CCZ.



*Figure 8: Nodule nickel content in the reserved areas of the CCZ (from ISA Polydat/ Geostat database, 2002).*

**Copper.** The copper content of the nodules in the areas reserved for the Authority varies between 0.15% and 1.87% of dry weight with an average 1.22%. The highest values of copper are recorded in the remote east (Block 22) and the remote west (Block 2) of the CCZ.

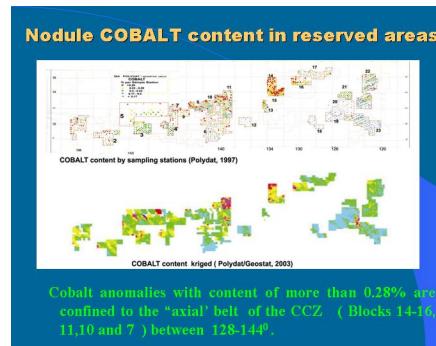
According to the ISA/Polydat map of copper content in the reserved blocks (values per sampling stations) in the eastern part of the CCZ is characterized by high value of copper concentration in nodules (more than 1.16%). High grade nodule copper anomalies of less size are reported in the central part of the CCZ.



*Figure 9: Nodule copper content in the reserved areas of the CCZ (from ISA Polydat/Geostat database, 2002).*

**Cobalt.** In the reserved areas cobalt concentration in nodules varies between 0.02% and 0.7% of dry weight with an average of 0.22%.

According to the ISA/Polydat database cobalt anomalies with content of more than 0.28% are confined to the “axial” belt of the CCZ between 128-144° (Figure 9).



*Figure 10: Nodule cobalt content in the reserved areas of the CCZ (from ISA Polydat/Geostat database, 2002).*

### Nodule deposits

One of the most important geological parameters of polymetallic nodule is their ability to form nodule concentrations with high abundance and metal content, which can be considered as nodule deposits with certain cut-off grades, which may be potential for economic development in future.

For the purpose of locating such deposits in the reserved areas the Secretariat carried out in 1997 the study of estimating resource potential of the reserved areas (Figure 11).

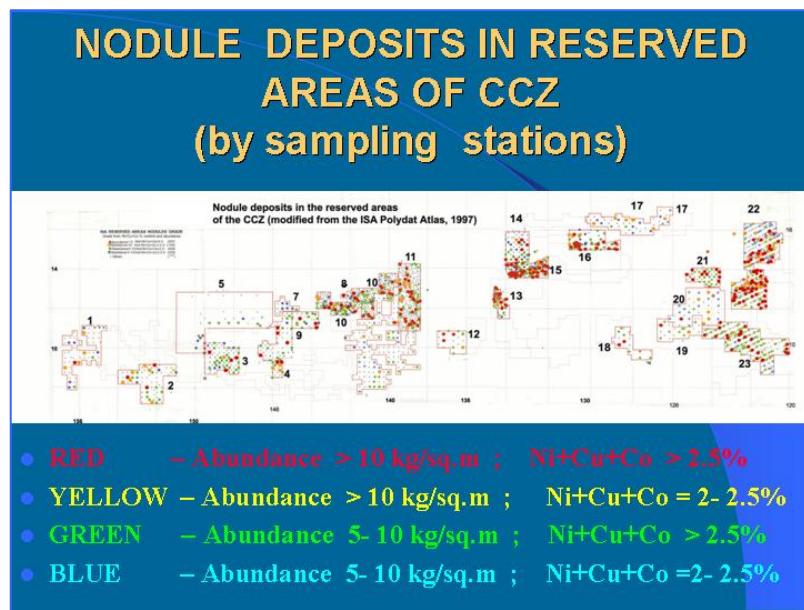


Figure 11: Possible nodule deposits in the reserved areas in the CCZ (ISA Polydat database, 1997).

The eastern and central regions seem to be more favourable, than the Western region, for the location of possible nodule deposits with higher grade. This may be due to the greater size of the areas with high nodule abundance in the centre and in the east, and location of rather extended copper anomalies in the east between 120-125° W and cobalt anomalies in the northern part of the central region. Another important reason may be the negative correlation

between nodule abundance and metal grade which appears in the CCZ to the west of 140-145° W.

At this stage of processing of available data, two areas may be identified as target areas favourable for further exploration to delineate nodule deposits in the reserved areas, which may become the first generation mine sites with nodules having abundance more than 10 kg/ m<sup>2</sup> and Ni+Cu+Co metal content more than 2.5%. The first area is located in the central zone and is composed of blocks reserved in connection of the applications by France, Japan and Russian Federation (blocks 13, 14, 15 and 16). The second area is located in the remote east and is represented by the area reserved in connection with the application of the Interoceanmetal Joint Organization (block 22).

#### **Resource Assessment of the Clarion-Clipperton Zone by Developing a Geological Model of the Zone**

Development of a geological model of the CCZ was proposed to establish the spatial trends in nodule distribution and grades due to natural factors along the CCZ and to facilitate a better understanding of the interrelationship between geological processes and formation of nodule deposits. The model should help to facilitate nodule assessment in the areas with scarce data by means of analogy or mathematical simulations (by conventional or geostatistical methods) on the basis of interpolation of available data. Moreover, the geological model of the CCZ will be important not only for the purpose of establishing the interaction between geological and related parameters and nodules resources in the reserved areas in the CCZ, but also for the purpose of understanding the geological processes and environment which has led to the development of the most prominent polymetallic nodule province on a global scale.

A concept of a geological model of the Clarion-Clipperton Zone is to be considered in connection with nodule resource assessment of the CCZ on a global scale. The concept may be understood through the analysis of factors influencing such nodule parameters as growth of nodules, supply and concentration of manganese, nickel, copper, cobalt and other economic metals, and accumulation of high-grade and high-abundance nodules which leads to the formation of deposits.

Therefore, as a first step the needed polymetallic nodule parameters for the zone as a whole (not only for the reserved sites) shall be derived from the data and information for both reserved and other areas as a result of analysis and processing of the existing database, which should include the available data in public domain as well as unpublished information accumulated in the Secretariat and by the contractors.

As a next step, a review of the known relevant factors shall be carried out in order to establish their relationship with the above parameters in order to establish their interrelationship and to select the factors which have influenced the formation of the nodule resources of the CCZ.

Once such a relationship is established, it will serve as a basis for variations of mathematic models which may be constructed for the purpose of possible quantitative and numerical evaluations of the controlling role of various factors

Mathematical simulation may be constructed for the areas with different density of information in order to understand the predominant trends in the CCZ as a whole and to facilitate the resource comparison of various reserved sites.

The basic parameters of polymetallic nodules in the CCZ shall constitute an integral part of a geological model. They include primarily:

- Nodules population, nodules abundance and their spatial distribution.
- Contents of metals of economic interest (nickel, copper, cobalt and manganese) in nodules.
- Existence and spatial distribution of nodules deposits with high-grade and high-abundance nodules.

### **Polymetallic Nodules in the Clarion-Clipperton Zone**

The Authority's task of administering the nodule resources requires both the resource assessment of the reserved areas and the resource assessment of the Clarion-Clipperton Zone as a most promising region of the Area. Besides, even for the assessment of nodule potential of all reserved sites we should consider a geological model of the Clarion-Clipperton Zone on a global scale, since the reserved sites are located within the total extension of the zone.

In identifying nodule parameters of the CCZ as a whole the Authority is faced with a problem of availability of necessary data and information and their possible sources. Although some data may be found in academic institutions and in public domain, the main sources of data for a geological model are still the registered pioneer investors/contractors and other industrial entities (four multinational consortia), which were previously engaged actively in nodule research and prospecting within the CCZ.

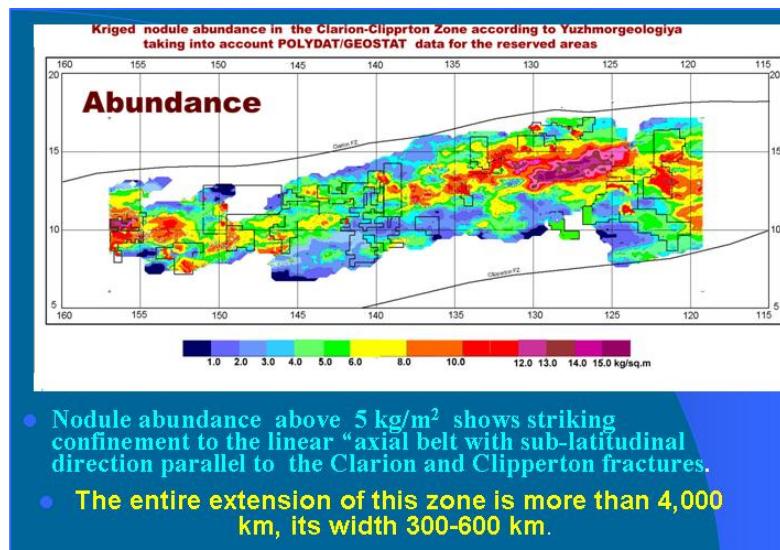
So far, the most important database, which is at the disposal of the Authority, contains data of the six pioneer investors, which were submitted for the reserved areas at the time of their registration. In addition, for reserved areas in the central region some additional information was provided by IFREMER/AFFERNOD; DORD and YUZHGORGEOLOGIYA in 1991 in their report on the preparatory work in these areas. In 2001-2003 additional data and information were provided by IFREMER/AFFERNOD and COMRA. At present the Authority's database contains 3,718 sampling station data, mostly for the reserved areas.

With regard to other parts of the CCZ the most elaborated attempt to analyze spatial distribution of nodule parameters of the CCZ on a global scale is represented by a series of schematic maps compiled in 2003 by Yuzhmorgeologiya Enterprise of the Russian Federation. These maps are based on the analysis of data of 10,500 sampling stations and cover the most part of the CCZ.

#### Nodule abundance

A natural phenomenon of the CCZ is that polymetallic nodules are continuously distributed over large areas throughout its entire length (from 110°W to 160°W) between the Clarion and Clipperton transform faults. They cover the entire ocean floor surface of the CCZ abyssal plain with its highs and lows. Naturally, the continuity of nodule coverage is interrupted by certain gaps but nodule still populates large fields, generally of longitudinal or sub-longitudinal extension. Nodule abundance varies from 1-2 to 20-30 kg/m<sup>2</sup> but in general it averages 5-10 kg/m<sup>2</sup>, although nodules with concentration of more than 15-20 kg/m<sup>2</sup> are found in all parts of the CCZ.

Figure 12 represents a sketch map of kriged nodule abundance in the CCZ according to Yuzhmorgeologiya (courtesy of Yuzhmorgeologiya) which was modified by the author to take into account the ISA Polydat/Geostat data for the reserved areas. This map emphasizes a linear spatial distribution of nodule fields above 5 kg/m<sup>2</sup> abundance level in the “axial” belt of the CCZ approximately in the middle part between the Clarion and Clipperton fractures that can be clearly visualized west of 123°W. The belt extends throughout the entire CCZ in the NW-N direction parallel to the Clarion and Clipperton Fracture. The highest abundance in that zone is confined to the nodule population between 123-133 °W.



*Figure 12: Kriged nodule abundance in the CCZ according to Yuzhmorgeologiya (courtesy of Yuzhmorgeologiya) taking into account the ISA Polydat/Geostat data for the reserved areas.*

Within this global belt there are several isolated huge fields or sub-zones of nodules with the abundance level above 10 kg/m<sup>2</sup>. The largest one is located in the central-eastern region between 12-14°N and 123-130° W. The length of this sub-zone is more than 600 km, its width 100-250 km.

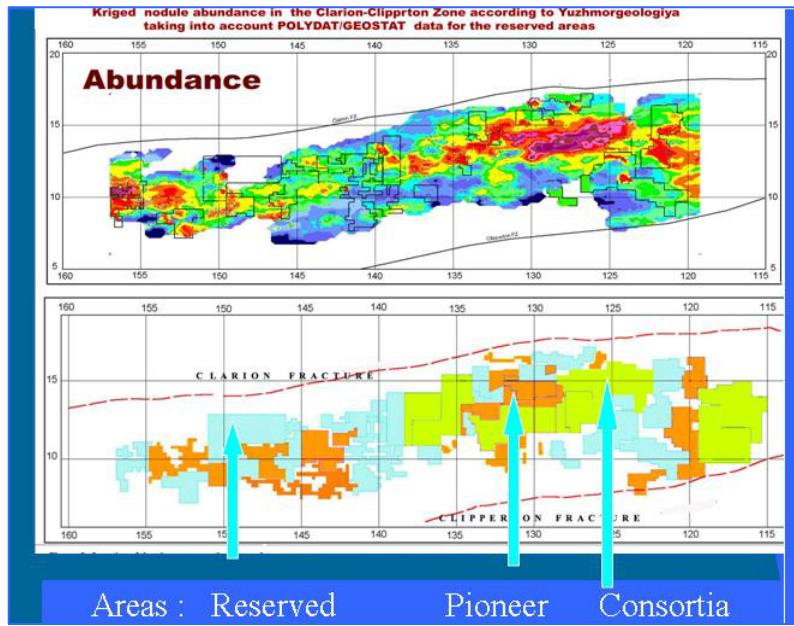


Figure 13: Kriged nodule abundance in the CCZ and location of sites (reserved, pioneer investors, consortia).

Figure 13 represents an attempt to analyze location of various types of sites (reserved, pioneer investors, consortia) with respect to the spatial distribution of nodule anomalies along the entire extension of the CCZ.

#### Metal Content

**Manganese.** A sketch map (Figure 14) of kriged manganese content in the CCZ according to Yuzhmorgeologiya (courtesy of Yuzhmorgeologiya) and modified on the basis of Polydat/Geostat data for the reserved areas shows that nodules with manganese content more than 30% occupy vast areas in the eastern part of the CCZ east of 125° W. Small anomalies with manganese content more than 30% area distinguished between 138° – 148° W.

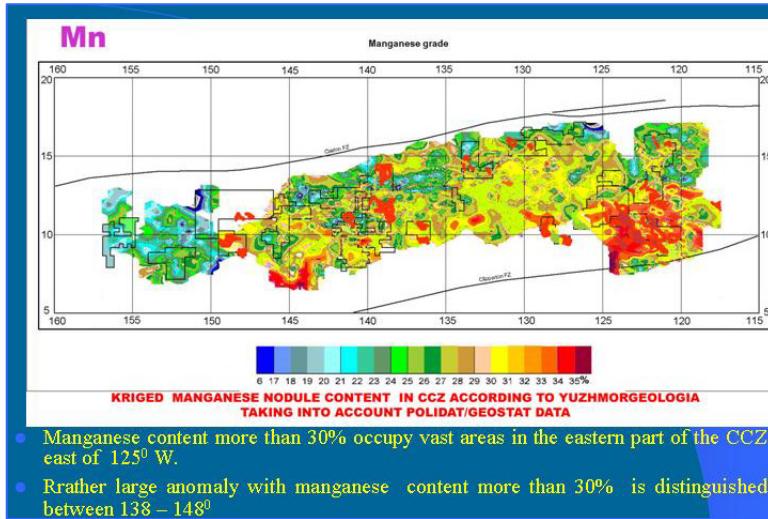


Figure 14: Kriged nodule manganese content in the CCZ according to Yuzhmorgeologiya (courtesy of Yuzhmorgeologiya) taking into account the ISA Polydat/Geostat data for the reserved areas.

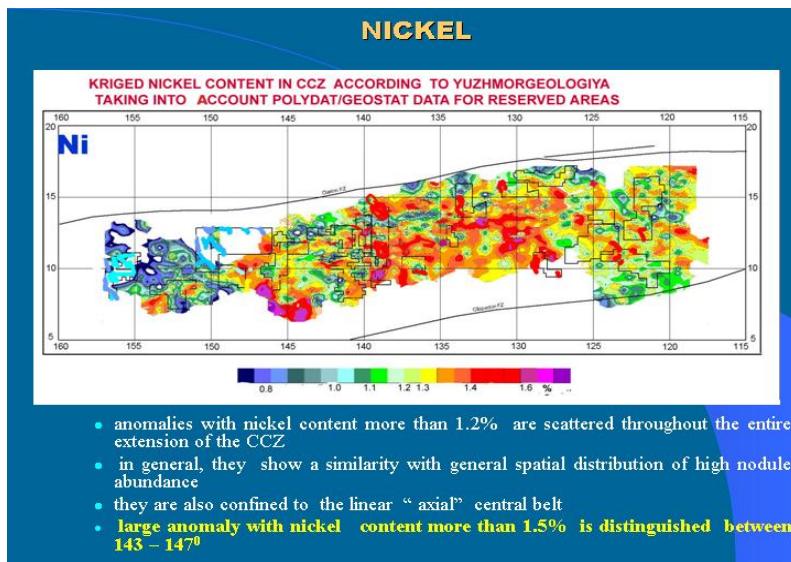


Figure 15: Kriged nodule nickel content in the CCZ according to Yuzhmorgeologiya (courtesy of Yuzhmorgeologiya) taking into account the ISA Polydat/Geostat data for the reserved areas.

**Nickel.** As it can be seen in Figure 15 the anomalies with nickel content of more than 1.2% are scattered throughout the entire extension of the CCZ and, in general, show a similarity with general spatial distribution of high nodule abundance. While it is not necessarily a coincidence that the distribution areas of nickel anomalies are overlapping with those of the high abundance nodules, the nickel anomalies with the metal concentration of more than 1.2% are also confined to the linear “axial” central belt of sub-latitudinal ( $70^{\circ}$ - $80^{\circ}$ ) direction. A global positive correlation between abundance and nickel anomalies can generally be detected in most part of the CZ, except some areas in the east.

**Copper.** Anomalies with copper content of more than 1.16% are scattered throughout the entire extension of the CCZ along the “axial” belt, but the largest anomalies are confined to the southern regions which are separated from the Clarion Fracture by a zone with lower copper concentration (Figure 16). The highest copper content is typical for the east of the CCZ between  $120^{\circ}$ - $125^{\circ}$ W in the vicinity of the Clipperton Fracture.

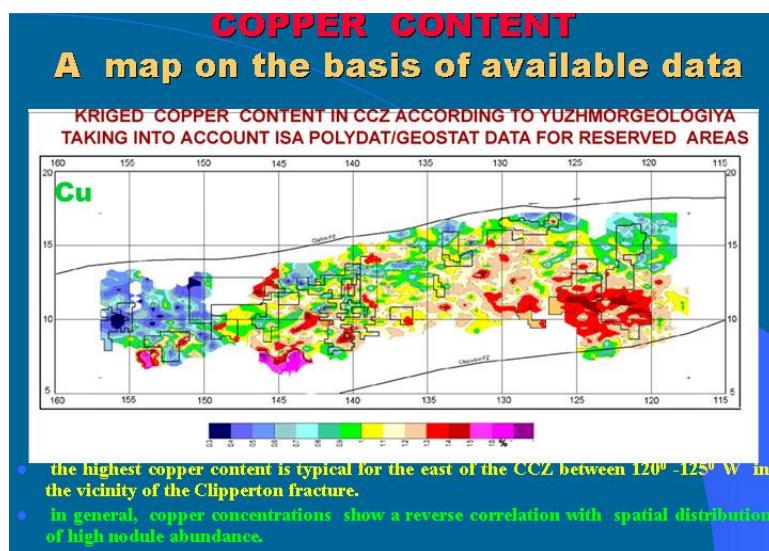


Figure 16: Kriged nodule copper content in the CCZ according to Yuzhmorgeologiya (courtesy of Yuzhmorgeologiya) taking into account the ISA Polydat/Geostat data for the reserved areas.

**Cobalt.** Figure 17 indicates that anomalies with cobalt content of more than 0.26% occupy vast areas in the eastern and central part of the CCZ between 125-140° W and are confined to the north of the CCZ in the vicinity of the Clarion Fracture. However cobalt with a value of more than 0.22% is typical throughout the “axial” zone along the entire extension of the CCZ.

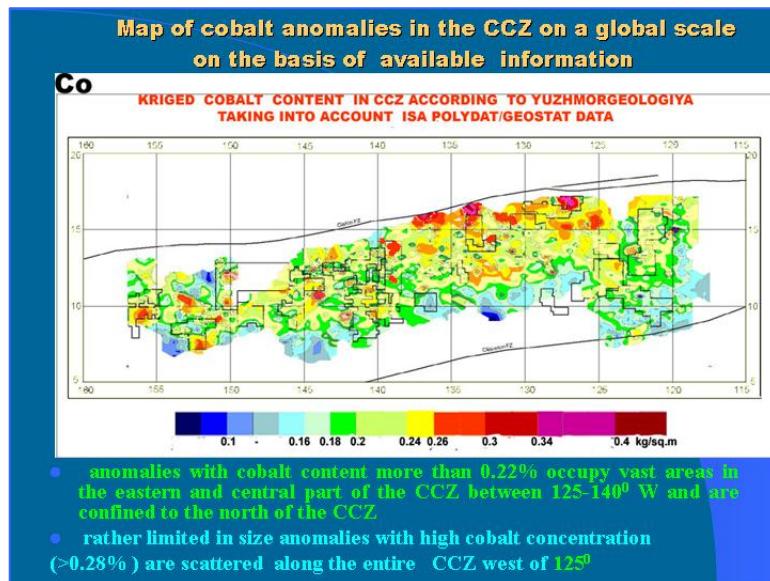
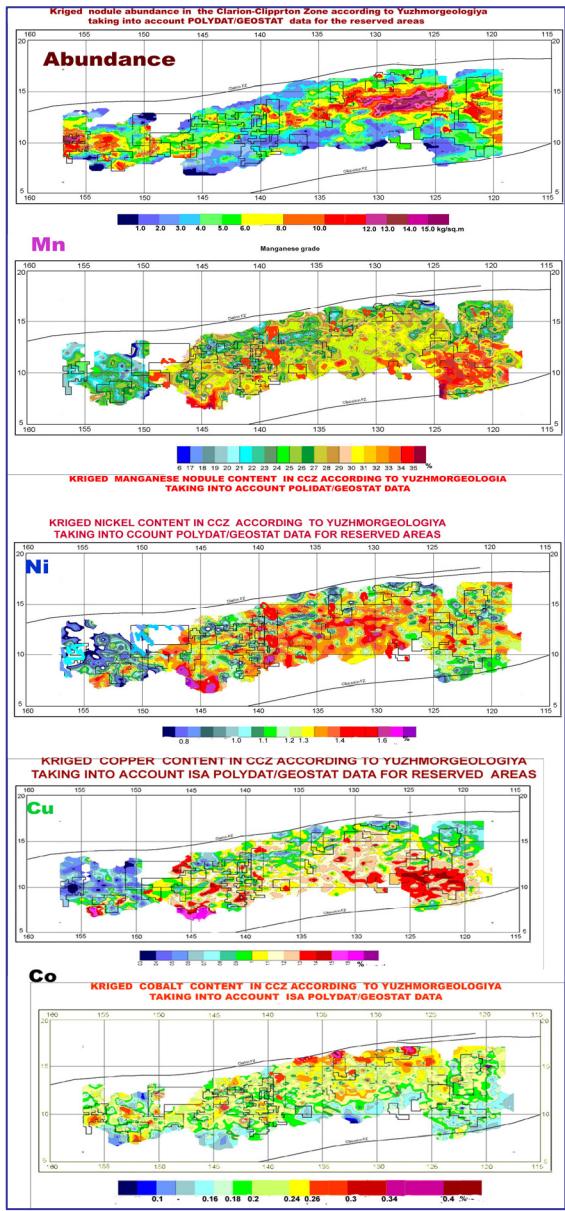


Figure 17: Kriged nodule cobalt content in the CCZ according to Yuzhmorgeologiya (courtesy of Yuzhmorgeologiya) taking into account the ISA Polydat/Geostat data for the reserved areas.

**Comparison.** Figure 18 allows a comparison between nodule abundance along the CCZ and nodule content of manganese, nickel, copper and cobalt.



*Figure 18: Comparison of kriged nodule abundance and metal content.*

There seems to be an inverse correlation between nodule abundance and manganese content. There is no correlation between manganese and nickel content in the CCZ on a global scale. Our comparison of the manganese and copper anomalies has revealed a distinct positive correlation between manganese and copper content (Figure 19).

In general, a negative correlation may be established with respect to correlation between manganese and cobalt

concentration within the CCZ on a global scale. While there is a positive correlation between nickel and copper content in nodules on the western part of the CCZ, in the eastern part of the CCZ such correlation is negative.

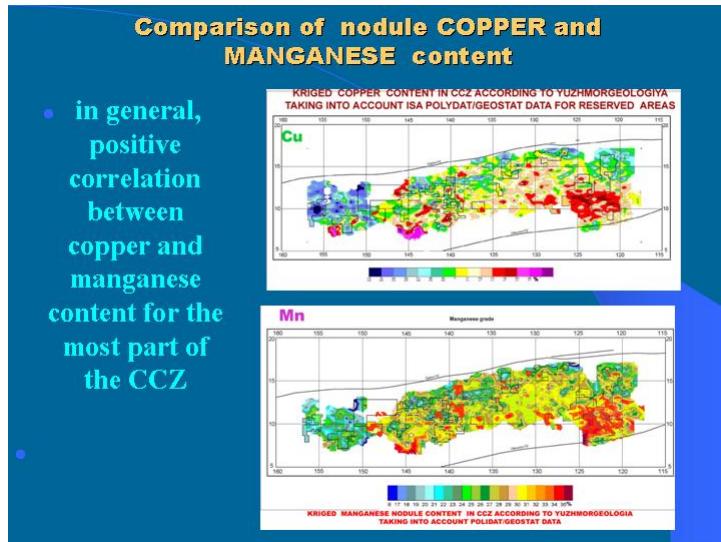


Figure 19:  
Comparison of kriged nodule copper and manganese content.

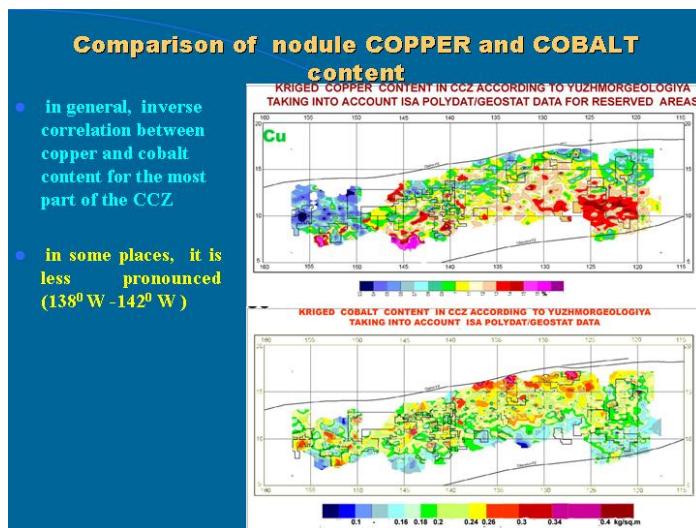


Figure 20:  
Comparison of kriged nodule copper and cobalt content.

As reflected in Figure 20 the inverse correlation between copper and cobalt content is typical for most part of the CCZ.

## **Natural Factors Related to Formation of Polymetallic Nodules and their Metal Content**

The components of a geological model will be primarily defined by the Authority through the process of assessing the polymetallic nodules potential of the CCZ as a part of the Area in general and of the reserved sites in particular. They should include natural factors which have impact on such nodule parameters such as growth of nodules, supply and concentration of manganese, nickel, copper, cobalt and other economic metals, and accumulation of high-grade and high-abundance nodules which lead to the formation of deposits.

Most important components of the geological model for the aforementioned purposes should include factors relevant to formation of nodule deposits. These factors were discussed during the meeting of scientists convened by the Authority in Kingston from 13 to 18 January 2003. They were further elaborated at the ISA workshop on the geological model of the CCZ held in Nadi, Fiji from 13 to 20 May 2003.

Such natural factors include: nodule genesis; global and regional topography; crustal history, tectonics and volcanism; composition and thickness of sediments, sedimentation history; paleo-environment and export productivity; water column characteristics; ocean currents.

In this presentation the author merely intends to draw attention to the importance of some geological and oceanographic factors related to the nodules formation and accumulation of metals in the CCZ.

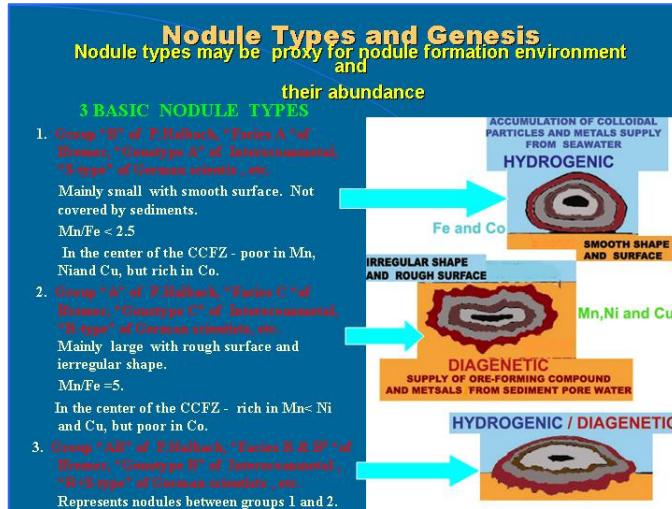
***Nodule genesis.*** Polymetallic nodules which cover the entire ocean floor surface of the CCZ abyssal plain with its highs and lows are different in size, composition and metal content. This is directly related to their genesis (Figure 21).

Nodules are originally formed in the environment of a low rate of sedimentation through both two processes: (1) a hydrogenous process in which concentrations are formed on the surface of sediments by slow precipitation of colloidal particles from near bottom seawater; (2) a diagenetic process in which concentrations are formed in sediments by supply of ore-forming material from sediment pore water. Of course a combination of hydrogenic and diagenetic processes took place.

The larger (5-10 cm and more) regular shaped nodules are mainly grown by the diagenetic process. In the centre of the CCZ they are rich in manganese, nickel and copper, but poor in cobalt. In the east of the CCZ their copper grade is higher than nickel. The hydrogenic nodules are mainly small (2-4 cm) clustered and aggregated ones of irregular shape and smooth surface. In the centre of the CCZ they are poor in manganese, nickel and copper, but rich in cobalt.

*Figure 21. Nodule types and genesis.*

Nodule growth is one of the slowest and most time-



consuming geological phenomena. The age of the CCZ nodules is estimated at 2-8 million years.

**Sediments.** Many researches consider this as a major factor, which controls nodule population and grade. Low rate of sedimentation is favourable for nodule formation. Sediment facies constitute a major factor for the control of nodule population and metal content.

It is established that siliceous sediments and red clay are proxy for low rate. Therefore polymetallic nodules are affected by and associated with siliceous ooze and deep-sea clays (Figure 22). Sedimentary column with a thickness of 50-150 m is most favourable for nodule formation.

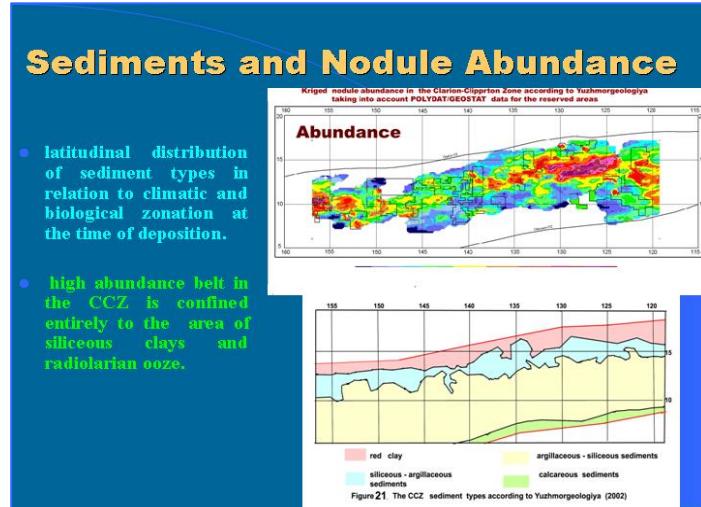


Figure 22: Sediments and nodule abundance in the CCZ.

**Physical and geochemical structure of the water column.** A major factor is a vertical physical and geochemical structure of the water column which is stratified with respect to temperature, salinity, density, dissolved oxygen, concentration of  $\text{CaCO}_3$  and other parameters (Figure 23).

An important layer is the *Oxygen Minimum Zone (OMZ)*, in which oxygen content is less than 1.0 ml/L. The depth of the upper boundary of the OMZ varies from 100 to 500 m. The OMZ is a reservoir of high manganese content in the ocean water. Manganese contained in sinking biomass products starts to dissolve when the oxygen content is less than 2.0 ml/L and is removed from sediments.

The *Carbonate Compensation Depth (CCD)* is a critical layer for metal enrichment in nodules and their distribution and abundance on the seafloor. This level corresponds approximately to the content of 10%  $\text{CaCO}_3$  in bottom sediments. The quantity of dissolved carbonate particles is equal to supply of such particles from the upper levels of the water column. The CCD is a layer of oxygen maximum. In the CCZ it is located at a depth of 4500-5100 m in the west, 4700-4950m in the central part, 3900-4300 m in the east.

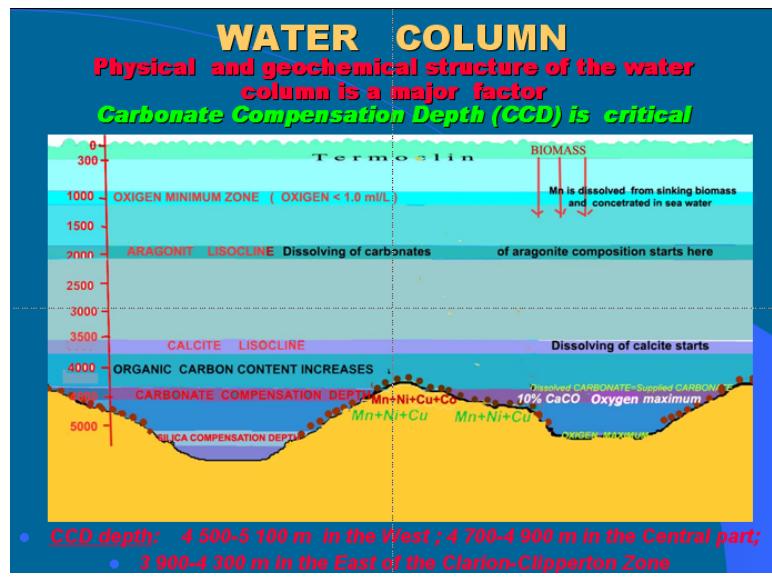


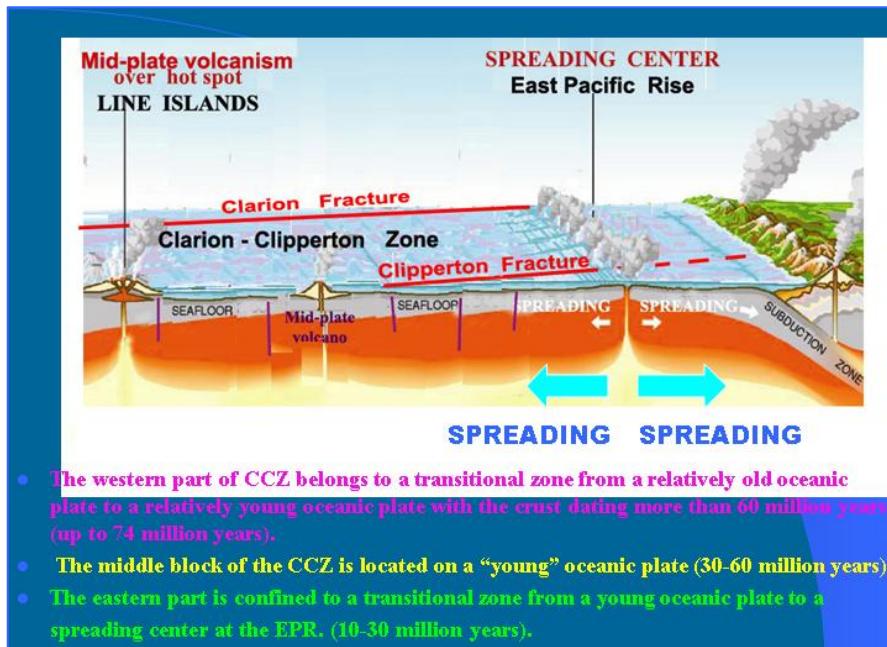
Figure 23: Physical and geochemical structure of the water column in the CCZ.

There is a relationship between the layers and intervals in the water column and nodule formation. The upper limit of the OMZ is the upper limit of the ferromanganese crust formation. Nodules are formed both in the 400 - 500m interval directly above the CCD and just below this level in the layer of 300-500m.

**Tectonics and volcanic activity.** The factor of tectonics, including fractures and faults as well as volcanic activity, is the major factor to be considered from the point of possible source and supply of metals

Two major primary sources are considered to be: volcanic and hydrothermal activity on the ocean floor; and terrestrial sources from landmass.

Many scientists relate the nodule grade and abundance to the major fracture systems, and consider that high concentrations and high grade nodules are confined to their proximity to active spreading ridges, major fracture systems, and active volcanism that provide sources of metals and nuclei for nodule growth (Figure 24).



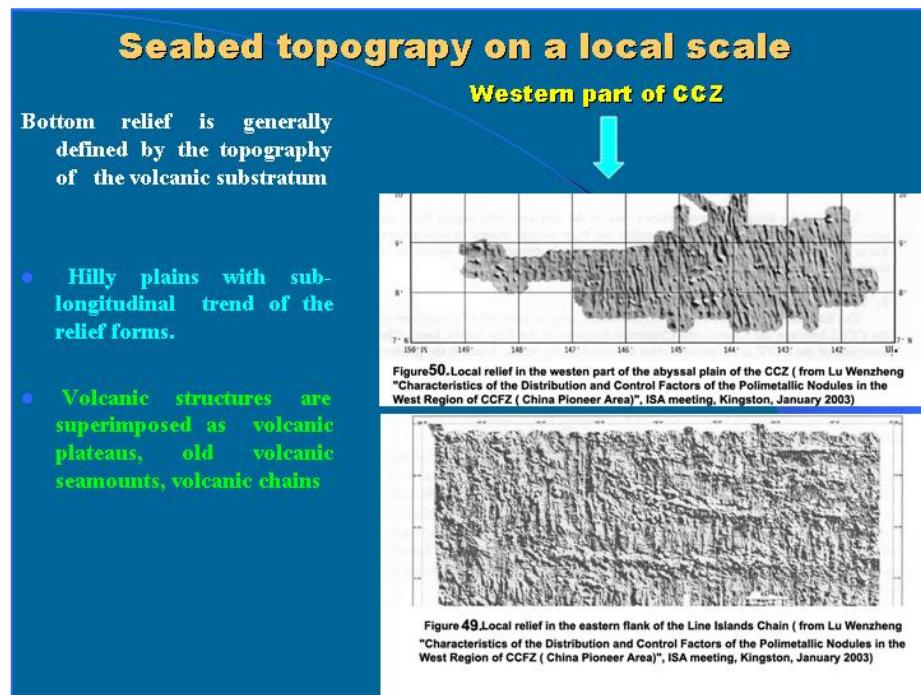
*Figure 24: A sketch representing the tectonic position of the CCZ.*

In the CCZ, substratum has a volcanic origin, formed as a result of seafloor spreading processes at the East Pacific Rise (EPR). Volcanic structures have been superimposed on the primary seafloor fabric as volcanic plateaus, old volcanic seamounts, volcanic chains, and mountain ridges. In the remote eastern part of the CCZ, within the western flank of the EPR, the volcanic chains and ridges may represent volcanic structures typical for extinct spreading centres. In the remote west near the Line Islands Volcanic Chain volcanism may be different from the volcanic activity in the east and may belong to the processes of formation of volcanic ridges over a hot spot.

The CCZ is a unique zone on a planetary scale and was formed as a result of activities of the Clarion and Clipperton transform faults. The Clarion and Clipperton Fractures themselves may be responsible for supply of various metals. As it has been mentioned above, an analysis of the cobalt grade distribution over the CCZ shows that highest grades are confined to the areas in the northern part of the CCZ in proximity to the Clarion Fracture. At the same time it is interesting, that highest copper concentrations are confined to the remote east, in close vicinity of the Clipperton Fracture.

Besides the Clarion and Clipperton transform faults themselves, the CCZ is characterized by regional faults and fractures parallel or sub-parallel to the East Pacific Rise and generated during the normal processes of seafloor spreading.

The sub-longitudinal fault system is responsible for predominant regional and local morphological landscape of the CCZ---a classic horst and graben structure of basaltic basement (Figures 25 & 26).



*Figure 25: The sub-longitudinal horst and graben structure of bottom relief in the western part of the CCZ (from Lu Wenzheng, "Characteristics of the Distribution and Control Factors of the Polymetallic Nodules in the West Region of CCFZ (China Pioneer Area)", ISA scientific meeting, Kingston, 2003).*

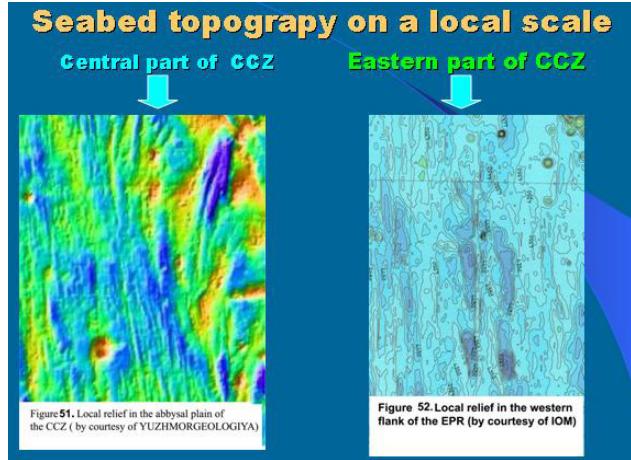


Figure 26: The sub-longitudinal horst and graben structure of bottom relief in the central and eastern part (by courtesy of Yuzhmorgeologiya and Interoceanmetal.

An important role is played by the faults system of fractures and faults of

the SE and E-SE direction. One major system on global scale is traced as the E-SE extension of the Hawaiian volcanic ridge system (Figure 27). It is clearly marked by the location of earthquake epicentres registered in 1999.

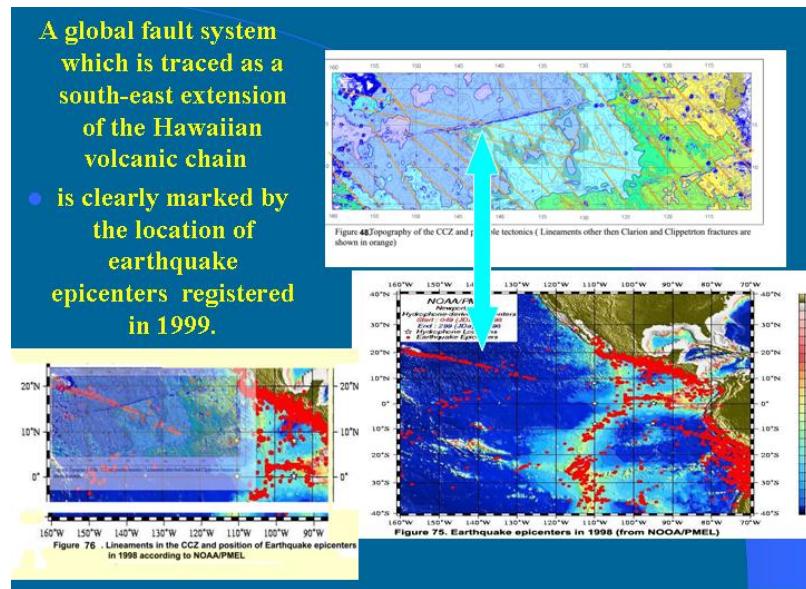


Figure 27: A global fault system at the E-SE extension of the Hawaiian volcanic ridge system.

## **Work Programme**

An important step in the Authority's function in administering the nodule resources in the Area will be a development of a geological model of the CCZ. The following work programme for that project (which may take 3-4 years) should include:

1. Identification, acquisition of necessary data and information.
2. Construction of bathymetric model of the CCZ (including compilation of a digital bathymetric chart series maps of the CCZ on scales between 1:500 000 – 1:1,000, 000).
3. Establishment of nodule parameters (nodule abundance and metal content) on the basis of available information.
4. Establishment of geological factors related to nodule deposits: tectonic framework; sedimentation (including sedimentation history, presence of hiatuses, erosion and re-deposition, seismostratigraphic units such as the transparent layers, etc.); geochemical layers of water column and reconstruction of the level of the carbonate compensation depth---CCD and its variations along the CCZ; currents patterns; reconstruction of the biological paleo-productivity, etc.
5. Construction of mathematical models to establish possible numerical evaluation of factors controlling nodule concentration, metal accumulation and formation of nodule deposits.
6. Construction of various mathematical models to create mathematical simulations of nodule parameters and nodule fields for the areas with low density of available data.
7. Construction of various mathematical models to enable potential resource assessment of areas with insufficient actual data and information.
8. Development of a Prospector's Guide.

## **Selected Bibliography**

AFFERNOD, DORD, and YUZHGORGELOGIYA, *Preparatory Work in the International Seabed Authority's reserved area. Report to the*

*Preparatory Commission for the International Seabed Authority and the International Tribunal for the Law of the Sea*, 1991.

- Andreev, S. I., *Metallogeny of ferromanganese formations of the Pacific Ocean*. Nedra, St.Petersburg, 1994, 191p. (in Russian).
- Andreev, S. I. and Gramberg, I. S. (Ed.), *Metallogenic zonation of the World Ocean*. VNIIookeangeologia, St.Petersburg, 1997, 172 p. (in Russian).
- Andreev, S. I. and Gramberg, I. S. (Ed.), *Geodynamics and ore genesis of the World Ocean*. VNIIookeangeologia, St.Petersburg, 1999, 209 p. (in Russian).
- Andreev, S. I., Anikeeva, L. I. and Alexandrov, P. A., Talassochemistry and Ore Genesis of the Ocean. In: *Minerals of the Ocean*, conf. abstracts, VNIIookeangeologia, St.Petersburg, 2002, pp. 46-54.
- Baturin, G. N., *Geochemistry of ferromanganese nodules of the World Ocean*. Nauka, Moscow, 1986, 325 p. (in Russian).
- Bezrukov, P. L., Andruschenko, P.F., *On the geochemistry of ferromanganese nodules of the Indian Ocean*, Poceedings of USSR Ac. Sc., geol. series, no.9, 1973, pp.18-37.
- Cronan, D. S. and Tooms, J. S., The geochemistry of manganese nodules and associated deposits from the Pacific and Indian Oceans, *Deep-Sea Research*, 16, 1969, p.335.
- Cronan, D. S., *Underwater minerals*. Academic Press, London, 1980, 362 p.
- Cronan, D. S., Review of Geochemical Impacts of Polymetallic Nodule Mining. In: *Deep-Seabed Polymetallic Nodule Exploration: Development of Environmental Guidelines. Proceedings of the AUTHORITY Workshop held in Sanya, China, 1-5 June 1998*. International Seabed Authority, Kingston, Jamaica, 1999, pp.118-154.
- Demidova, T. A., Kontar, E. A., and Yubko, V. M., Benthic current dynamics and some features of manganese nodule location in the Clarion-Clipperton province, *Oceanology*, 36, 1996, p.94.
- Demidova, T., The Physical Environment in Nodule Provinces of the Deep Sea. In: *Deep-Seabed Polymetallic Nodule Exploration: Development of Environmental Guidelines, Proceedings of the AUTHORITY Workshop held in Sanya, China, 1-5 June 1998*. International Seabed Authority, Kingston, Jamaica, 1999, pp.79-116.

- Elderfield, H., Manganese fluxes to the oceans, *Marine Chemistry*, 4, 1976, p.103.
- Frazer, J. Z. and Fisk, M. B., Geological factors related to characteristics of seafloor manganese nodule deposits, *Deep Sea Res.*, 28, 1981, p.1533.
- Glasby, G. P. (Ed.), *Marine Manganese Deposits*. Elsevier, Amsterdam, 1977.
- Gramberg, I. S. et al., Vertical zonation of ore-forming components of ferromanganese nodules in the Ocean. *Sovetskaya Geologiya*, Vol.3, Moscow, 1987, pp.15-21 (in Russian).
- Gramberg, I.S. et al., Carbonate system and hydrochemical structure of the Ocean. In: *Lithosphere of oceans: composition, structure, forecast and appraisal of mineral resources*. VNIIOKeangeologia, St.Petersburg, 1995, pp.114-116 (in Russian).
- Gross, G. A. and McLeod, C. R., Metallic Minerals on the Deep Seabed. *Geological Survey of Canada*, 86/21, 1987, p.65.
- Halbach, P., Ozkara, M. and Rehm, E., *Untersuchungen von manganknollen und sedimentproben der VA 13/1. Ergebnisse der manganknollenfahrt VA 13/1 (Zentraler Pazifischer Ozean, 1976)*. Fachlicher Bericht, Hannover, 1977 (BGK0, 35 s).
- Halpern, D., Observations of upper ocean currents at DOMES Sites A, B, and C in the tropical central North Pacific Ocean during 1975 and 1976. In: Bischoff. and Piper, (Eds.), *Marine Geology and Oceanography of the Pacific Manganese Nodule Province*. Plenum Press, New York, 1979, p.43.
- Hein, J. R. et al, Mineralogy and diagenesis of surface sediments from DOMES areas A, B, and C. In: Bischoff and Piper, eds., *Marine Geology and Oceanography of the Central Pacific Manganese Nodule Province*, Plenum Press, New York, 1979, pp.365-396.
- Huh, C. A. and Ku, T. L., Radiochemical observations on manganese nodules from three sedimentary environments in the north Pacific, *Geochimica et Cosmochimica Acta*, 48, 1984, p.951.
- International Seabed Authority, *Analysis of Discrepancies between the Data Sets Submitted by the Pioneer Investors*, Working paper by the AUTHORITY secretariat for Meeting of representatives of the registered pioneer investors, 26-30 March 2001, Kingston, 2001.

- Kazmin, Y. B. (Ed.), *Ferromanganese Nodules of the World Ocean*. Nedra, St.Petersburg., 1984, p.175 (in Russian).
- Kazmin, Y. B., Andreev, S. I., et al, *Trends in distribution of ferromanganese nodule ore types in the Pacific Ocean*. Abst. of XXVII Geol. Congress, Vol.IX, Part.2, Nauka, Moscow, 1984, pp.127-128 (in Russian).
- Klinkhammer, G. P. and Bender, M. L., The distribution of manganese in the Pacific Ocean, *Earth and Planetary Science Letters*, 46, 1980, p.361-384.
- Knoop, P. A., Owen, R. M., and Morgan, C. L., Regional variability in ferromanganese nodule composition: Northeastern Tropical Pacific Ocean, *Marine Geology*, 147, 1998, pp.1-12.
- Korsakov, O. D. (Ed.), *Formation Environment and Distribution Trends of Ferromanganese Nodules of the World Ocean*. Nauka, Moscow, 1987, p.287 (in Russian).
- Kotlinski, R., Metallogenesis of the World's Ocean Against the Background of Oceanic Crust Evolution. *Polish Geological Institute Special Papers*, no.4. Warszawa, 1999, p.58.
- Kotlinski, R. and Zadornov, M., *Peculiarities of nodule ore potential of the eastern part of the Clarion-Clipperton Field (Prospecting area of JO "Interoceanmetal")*, *Minerals of the Ocean*, conf. Abstracts. VNIIookeangeologia, St.Petersburg, 2002, pp.28-31.
- Krishnaswami, S. and Cochran, J. K., Uranium and thorium series nuclides in oriented ferromanganese nodules: growth rates, turnover times, and nuclide behavior, *Earth and Planetary Science Letters*, 40, 1978, pp.45-62.
- Ku, T. L., Rates of accretion. In: Glasby, G. P. (Ed.), *Marine Manganese Deposits*, Elsevier, Amsterdam, 1977, Chapter 8.
- Lenoble, J. P., Les nodules polymétalliques: bilan de 30 ans de travaux dans le monde. *Chronique de la Recherché Minière*, n 524, 1996, pp.1-29.
- Li, Y. L., Inter-element relationships in abyssal Pacific ferromanganese nodules and associated abyssal sediments, *Geochimica et Cosmochimica Acta*, 46, 1982, p.1053.
- Martin, J. H. and Knauer, G. A., Manganese cycling in the northeast Pacific waters, *Earth and Planetary Science Letters*, 51, 1980, p.266-274

- Martin, J. H. and Knauer, G. A., Lateral transport of Mn in the north-east Pacific Gyre oxygen minimum, *Nature*, 314, 1980, p.524-526.
- Menard, H. W. and Frazer, J., Manganese nodules of seafloor, inverse correlation between grade and abundance, *Science*, 199, 1978, p.969
- Mero, J. L., *The Mineral Resources of the Sea*. Elsevier, Amsterdam, 1965.
- Morgan, C. L., Nichols, J.A., Selk, B. E., Toth, J., and Wallin, C., Preliminary analysis of exploration data from Pacific deposits of manganese nodules, *Marine Georesources and Geotechnology*, 11 (1), 1993, p.1-25.
- Morgan, C. L., Resource Estimates of the Clarion-Clipperton Manganese Nodule Deposits. In: Cronan, D. S., (Ed.), *Handbook of Marine Mineral Deposits*. CRC Press, Boca Raton, Fla., 2000, pp. 145-170.
- Murton, B .J., Parson, L. M., Nunter, P. and Miles, P., *Global Non-Living Resources on the Extended Continental Shelf: Prospects at the Year 2000*, ISA Technical Study: No.1, Kingston, 2001.
- Piper, D. Z. and Blueford, J. R., Distribution, mineralogy, and texture of manganese nodules and their relation to sedimentation at DOMES Site A in the equatorial North Pacific, *Deep Sea Research*, 29(8A), 1982, p.927.
- Reigh, V. and von Graftenstein, R., Sedimentological and geochemical trends in deep sea sedimentation of the Clarion-Clipperton block southeast of Hawaii since the early Miocene. *Geol.Jb.*,1987, p.71.
- Skornyakova, N. S., Andrushchenko, P. F., *Morphology and internal structure of ferromanganese nodules// Ferromanganese nodules of the Pacific ocean*. Proceed. Int. School on. Oceanology, v.108, Nauka, Moscow, 1976 (in Russian).
- Shnukov, E. F., Beloded, P. M. and Tzimko, V.P., *Mineral Resources of the World Ocean*. Naukova dumka, Kiev, 1979, p.255.
- Skornyakova , N. S., Gordeyev, V. V., Anikeyeva, L. I., Chudayev, O. V., and Kholodkevich, I. V., Local variations in nodules of the Clarion-Clipperton ore province, *Oceanology*, 25, 1985, p.488.
- Von Stackelberg, U. and Beiersdorf, H., The formation of manganese nodules between the Clarion and Clipperton fracture zones southeast of Hawaii. In: Crook, K. A. W., (Ed.), *The Geology, Geophysics and Mineral*

Resources of the South Pacific; *Marine Geology*, 98, (2-4), 1991, pp.411-423.

Wenzheng, Lu, *Characteristics of the Distribution and Control Factors of the Polymetallic Nodules in the West Region of CCFZ (China Pioneer Area)*, ISA scientific meeting, Kingston, 2003.

Wyrtki, K., Circulation of water masses in the eastern equatorial Pacific Ocean. *Int J. Oceanol. Limnol.*, 1 (2), 1967, pp.117-147.

Yubko, V. M., Korsakov, O. D. and Gorelik, I. M., Composition and structure of ferromanganese nodules. In: *Formation Environment and Distribution Trends of Ferromanganese Nodules of the World Ocean*, Nauka, Moscow, 1987, pp.132-144. (in Russian).

Yubko, V. M. and Gorelik, I. M., Age estimates of manganese nodules on the basis of geological data. In: *Geology of ocean and seas. Abstracts of the 10<sup>th</sup> International school on marine geology*. Vol.3, Russ. Ac. Sc., *Int. Oceanology*, 1992, p.107 (in Russian). §

(D) ***THE STATUS AND PROSPECTS FOR COMRA'S EXPLORATION AND INVESTIGATION IN THE AREA AND RELATED R & D ACTIVITIES***  
*Mr. Mao Bin (People's Republic of China)*

---

**General Review**

(a) **China's initiatives and investment for exploration of deep seabed resources**

China initiated its activities in the Area under the international legal framework of the UNCLOS for the peaceful use of the deep seabed resources.

(b) **International legal framework**

The United Nations Convention on the Law of the Sea (UNCLOS) is by far the most comprehensive and influential international convention on the

---

\* Secretary-General, China Ocean Minerals Resources Research and Development Association (COMRA).

governance of the seas and oceans. The uniform regime for seabed areas established by the Convention under the spirit of the principle of the common heritage of mankind has created a new era of peaceful utilization of the mineral resources on the seabed. China conducts its activities in the Area under the international legal framework of the UNCLOS for the peaceful use of the deep seabed resources.

(c) The purpose of China's application for the seabed area

China is rich in land-based mineral resources, but its per capita possession of mineral resources is much lower than that of the world average because of its large population. China's own supply of manganese, copper and cobalt has been falling short of the country's demand for a long time. With the development of the national economy, shortage of the above resources has become a serious problem for China. The purpose for China to apply for the seabed area is to develop, under the principles set out in the United Nations Convention on the Law of the Sea, new sources of mineral resources so as to meet a certain portion of a long-term need of the country, and also to make a contribution to the mankind as a whole in exploration of the international seabed.

(d) China's initiatives and investment of conducting deep seabed activities

China commenced exploration for mineral resources on the deep seabed in the mid - 1970s by various institutions and departments. The total expenditure incurred up to 1984 in this activity was at least US\$30 million (United States dollars calculated in constant dollars relative to 1982), more than 10% of which has been expended in the field exploration. However, at that time, the area was not sufficient to be delineated as an application area. Thus, after China signed the United Nations Convention on the Law of the Sea, a national programme was established for survey, research and development of deep sea mineral resources.

Since then, tens of survey cruises have been conducted in the Pacific Ocean with a total surveyed area of more than 2,000,000 km<sup>2</sup>, and a total of US\$60 million was expended for field exploration. As a result, an application area of China totaling 300,000 km<sup>2</sup> was delineated at the south of the Clarion-Clipperton Fracture Zone in the Pacific Ocean, which is of sufficient estimated commercial value to allow two mining operations.

(e) Institutional Arrangement : Establishment of COMRA

In order to efficiently conduct exploration in the Area, the State Council of China decided to establish the China Ocean Mineral Research and Development Association (COMRA) to organize and coordinate China's activities in the Area. COMRA is a state-owned enterprise to which 5 universities and 21 research institutions are affiliated. It has been sufficiently supported and effectively controlled by the State Oceanic Administration, the then Ministry of Geology and Mineral Resources, Ministry of Metallurgical Industry and China National Nonferrous Metals Industry Corporation. It has independent capacity of juridical person to conduct exploration activities of deep ocean mineral resources.

(f) COMRA was registered as Pioneer Investor

On 20 August 1990, the Permanent Representative of the People's Republic of China to the United Nations submitted, on behalf of the Chinese Government to the PrepCom, the Application of the Government of the People's Republic of China for Registration of the China Ocean Mineral Resources Research and Development Association (COMRA) as A Pioneer Investor under Resolution II of the Third United Nations Conference on the Law of the Sea.

(g) A short-term and a mid-term national plans for conducting activities in the Area

The Chinese Government attached great importance to carrying out the activities in the Area. It set up a 15-year mid-term plan for conducting the activities in the Area starting from 1991. This mid-term programme was divided into 3 Five-Year programmes. Since then, COMRA has been actively conducting deep seabed activities in its pioneer area, and considerable achievements have been made in the exploration, R & D activities and technical development.

(h) COMRA fulfilled its obligation of relinquishing 50% of the pioneer area to revert to the Area

Eight years after its registration as Pioneer Investor, in 1999, COMRA fulfilled its obligation of relinquishing 50% of its pioneer area.

(i) **COMRA entered into contract with the International Seabed Authority**

In May 2001, COMRA entered into contract with the International Seabed Authority, thus, COMRA's plan of work for exploration was approved in the form of contract and since then COMRA has been conducting its exploration in its contract area in accordance with the plan.

**Status of COMRA's exploration and investigation in the Area and R&D activities**

(a) **Resources Exploration and Assessment**

(i) *For Polymetallic Nodules*

COMRA has been conducting resources exploration and assessment, and environmental survey in its contractor area in accordance with the Contract after entering into contract with the International Seabed Authority (ISA) in 2001, and since then, 3 cruises have been carried out in the contractor area.

(ii) *For Other Resources*

Since early 1990s, COMRA has been engaged in exploration, assessment and studies for other resources including cobalt-rich crusts, polymetallic massive sulphides and bio-genetic resources.

(b) **Environment Investigation and Assessment**

COMRA always attaches great importance to the protection of the seabed environment. It started to carry out the studies on the Natural Variability of Baseline (NaBaBa) in 1995. In addition to the field survey, 14 research projects have been carried out. The field survey items mainly included:

(i) *Biological baseline*

Surveyed items included chlorophyll a, primary production, plankton, megafauna, macrofauna, meiofauna and chloroplastic pigment in sediment.

(ii) *Chemical baseline*

Chemical parameters included pH, DO, PO<sub>4</sub><sup>3-</sup>-P, SiO<sub>3</sub><sup>2-</sup>-Si, NO<sub>3</sub>N, NO<sub>2</sub>N, total alkalinity, TOC and oxygen isotope.

(iii) *Physical baseline*

Physical parameters included sea current, temperature and salinity.

(c) Characteristics of Surface Sediment Geotechnics

Geotechnics parameters include shear strength, water content and density of soil, etc.

(d) Meteorology and Ocean Wave

The surveyed parameters of meteorology and ocean wave included wave height, wind speed, wind direction, air temperature, air pressure, relative humidity and surface water temperature.

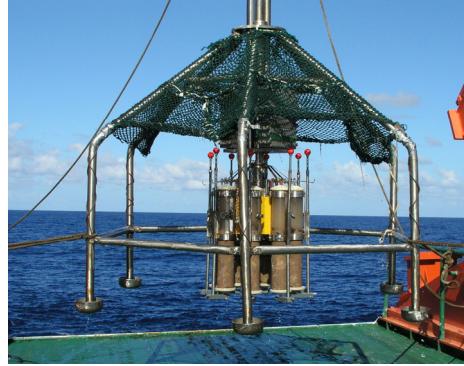
**Equipment Used For The Survey**

The equipment used for the survey included seabeam, deep-tow video and photo camera system, CTD with a rosette system, ADCP, near-bottom mooring with current meters, multiple corer, box corer, triangular benthos trawl and plankton net, etc.



Figure 1: CTD + ADCP + Water Sampler.

*Figure 2: Multicorer with sediments.*



*Figure 3: Sediment trap.*

#### **Studies of Environment Protection and Impact Assessment**

The studies of environment impact assessment of mining, processing and metallurgy of polymetallic nodules are conducted so as to follow the principle that resources development and environment protection are equally important.

The studies were made mainly on the following items:

- (a) Marine environment impact possibly caused by deep seabed mining;
- (b) Form and amount of wastes from mineral processing and metallurgy;
- (c) Disposal process of residues from mineral processing and metallurgy.

## Scientific Research

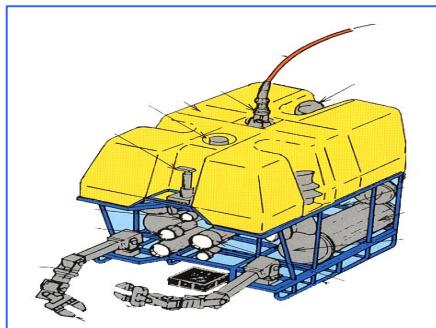
COMRA has been carrying out a number of scientific research programmes focusing on deep seabed exploration, marine environmental protection, marine biodiversity and resource development. These programmes have been undertaken by various universities and research institutions all over the country with the financial support of COMRA.

### (a) Study on Geological Model

In response to the ISA's initiative to establish a geological model of polymetallic nodules of the CCZ, COMRA has set up a group of experts to study the building of the geological model so as to have a better understanding of the geological process in the zone, and also to make an input to the building of the geological model initiated by the International Seabed Authority.



*Figure 4: Deep seabed exploration technology development –Autonomous underwater vehicle.*



*Figure 5: A number of equipment for deep seabed exploration has been developed, including Automatic Underwater Vehicle (AUV), Remote Operation Vehicle (ROV) and Human Operated Vehicle (HOV).*

## **Technical Development**

### **(a) Mining System Development**

The following tasks had been carried out by the end of 2003 for preparing 1000m mining sea trial:

- (i) The conceptual design of the subsystems, the detail design of components and verification of testing for the design, and purchasing some components of the subsystem;
- (ii) The virtual reality research for the mining system to determine forces and parameter of the mining system based on the previous engineering practice, and virtual test of the integrated mining system;
- (iii) Working out a working plan and relevant management strategy for the 1000m mining sea trial;
- (iv) Design of the surface supporting subsystem;
- (v) Determination of the technical specification of some key parts of the system.



*Figure 6: Leaching facilities.*



*Figure 7: Configuration of solvent extractions.*

(b) Extractive Metallurgy of polymetallic nodules

- (i) Pre-pilot tests of metallurgical processes;
- (ii) Studies of the new metallurgical technologies for polymetallic nodules;
- (iii) Comparison tests on metallurgical processing of polymetallic nodules;
- (iv) The direct utilization of nodules;
- (v) Studies of the nodules' characteristics in the adsorption and degradation of organics in waste water.

(c) Establishment of China Deep Ocean Data and Information Database

In order to provide scientists and research programmes with data and information obtained from the activities in the Area, COMRA has established the China Deep Ocean Data and Information Database. Scientists have access to the database through internet.

### **Capacity Building**

(a) Institutional Arrangement and Reformation of S & T Research System

- (i) strengthen integration of manpower and resources among the associates;
- (ii) strengthen support to key projects;
- (iii) strengthen training of young scientists;
- (iv) sustainable development of the activities.



Figure 8: Research vessel Da Yang Yihao under innovation in the shipyard.



Figure 9: A new look of Da Yang Yihao after innovation.



Figure 10: Da Yang Yihao's back deck and 10/25 tons A-Frame hydraulic lift.



Figure 11: Da Yang Yihao's multi-beam system.



Figure 12: Da Yang Yihao's network information integration system.

(b) R/V Dayang Yihao Renovation

R/V Dayang Yihao, owned and operated by China Ocean Mineral Resources R&D Association (COMRA), is the major ocean-going research ship engaged in exploration in the Area. To meet the requirement of exploration undertakings, COMRA had the ship renovated in 2002. In addition to refitting the ship itself, the renovation mainly includes: providing the ship with a dynamic positioning system and key investigation equipments.

(c) Construction of a Sample Repository and Establishment of R & D Centres

*The China Ocean Sample Repository*

Under the support of the First Institute of Oceanography, SOA, Qingdao, China, the construction of the repository started in 2002 and is

expected to be accomplished by the end of 2004. In the meantime, an ocean mineral sample property database has been developed:

- (a) A visional pc version data search sub-system has been developed and put into use;
  - (b) All the property data of the samples collected have been inputted in the system;
  - (c) A corresponding logic structure of the data system has been designed under the support of ORACLE system.
- (d) A deep ocean bio-genetic resources R&D centre

It has been established and co-housed in the Third Institute of Oceanography, SOA, Xiamen, China, with a view to research and develop the utilization of deep ocean bio-genetic resources.

- (e) A technology R&D centre

It has been established and co-housed in the Second Institute of Oceanography, SOA, Hangzhou, China to develop necessary technology and equipment required for conducting exploration and deep sea mining.

### **Prospects**

Though it is hard to predict when the commercial mining of the deep seabed resources will commence, it is the final goal of the activities in the Area.

At present, COMRA's activities in the Area focus on resources exploration and assessment, environment research and protection, and technology development. In the meantime, COMRA is carrying out some activities related to scientific research and technical development for deep sea mining.

- (a) Prospects – COMRA's activities in the next 15 years

COMRA is working out the second mid-term national plan for conducting the activities in the Area (2006-2020)

(b) The plan mainly includes:

- (i) continuing to carry out the Plan of Work for Exploration specified in the Contract;
- (ii) exploration of other resources;
- (iii) economic and technical assessment of the resources;
- (iv) environmental impact study and environment protection, including the environment protection of metallurgical process; metallurgy of polymetallic nodules;
- (v) completing a mining system sea trial at a depth of 1000m;
- (vi) technology development;
- (vii) international cooperation, including continuing participation in the programmes initiated by ISA.

Thank you. §

(E) ***STATUS OF ACTIVITIES OF CONTRACTORS AND PROSPECTS FOR MINING: POLYMETALLIC NODULES PROGRAMME – AN INDIAN PERSPECTIVE***  
*Dr. H.K. Gupta (India)\**

---

#### **India and the Sea**

India with a population of 1.05 billion, accounts for about 16.66% of world population. It has a land area of about 3.3 million sq. km, amounting to about 2.2% of the total land area of the world.

Arabian Sea on the west of India and Bay of Bengal on the east side have 3% of the world ocean area and receive about 9% of global run off. About 37% population of India derives benefits from the oceans. India with an Exclusive Economic Zone of 2.02 million sq. km. and a coast line of 7500 km produce annually 2.83 million metric tones of marine fish in addition to oil, gas, minerals, etc. Resources from seas are important to India. Geographically, India shares maritime boundaries with Sri Lanka, Maldives, Myanmar, Thailand & Indonesia.

---

\* Secretary, Department of Ocean Development, Government of India.

India's Ocean Policy Statement of 1981 and the Vision Statement of 2002 guide policies for devising ocean related programmes. The Department of Ocean Development (DOD) is the nodal agency for implementing these programmes with participation by various Ministries, Departments, Government Agencies and private sector organizations.

We have dedicated research institutions to work on research programmes and necessary infrastructure such as ocean going research vessels equipped with facilities for carrying out physical, chemical and oceanographic studies, a variety of data buoys and a dedicated ocean satellite and related facilities. Major programmes pertaining to oceans are fully funded by Government of India.

#### **India and the Law of the Sea**

India actively participated in the deliberations leading to the formulation of United Nations Convention on Law of the Sea ("the Convention"). India conducted several surveys and related necessary activities pertaining to the research on Polymetallic Nodules available at the sea bottom. In April, 1982 United Nations recognized India as the Pioneer Investor. The Convention was opened for signature in December, 1982. Subsequently, in August, 1987, India was allocated the Pioneer area of 1,50,000 sq. km in Central Indian Ocean Basin.

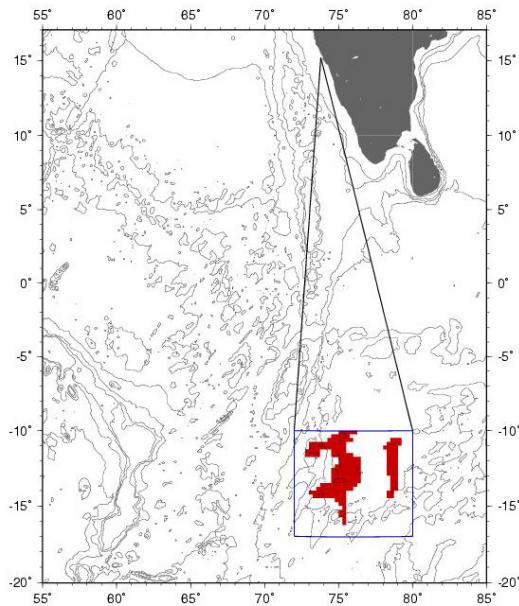
Consequently, India registered as Pioneer Investor with the United Nations along with IFREMER/AFERNOD (France), Deep Ocean Research Development Company Ltd. (Japan), Yuzhmorgeologiya, USSR (Russian Federation) and Germany. This was followed by registration of China Ocean Mineral Resources and Development Association (China), Inter-Ocean Metal Joint Organization [Bulgaria, Cuba, Czech and Slovak Federal Republic, Poland, USSR (Russian Federation)], and Government of the Republic of Korea. In June 1995, India ratified the Convention and the Agreement for implementation of Part XI of the Convention.

#### **India and the Authority**

Following establishment of International Seabed Authority at Kingston, Jamaica in November 1994, India was elected as a member in Group B of the Council in 1996. India has relinquished 50% of the area to the Authority in

three phases. India also provided the training to the nominated personnel of developing member states. India has fulfilled all the obligations pertaining to relinquishment and training. In March, 2002, India signed a 15 year contract with the Authority.

India has been actively participating in all the decision making organs of the Authority. India has been a member in the 36 member Council in Group B category for six years (1997-98, 2001-04) out of first eight years. India has been a member in Legal and Technical Commission and Finance Committee since their inception. India has already devised a plan of work for 15 years for carrying out developmental work in areas approved by the Authority. Accordingly, under Regulation 23(2) on prospecting and exploration of Polymetallic Nodules in the Area, a contract was signed between India and Authority on 26 March, 2002.



*Figure 1: The area allotted to India in the Indian Ocean.*

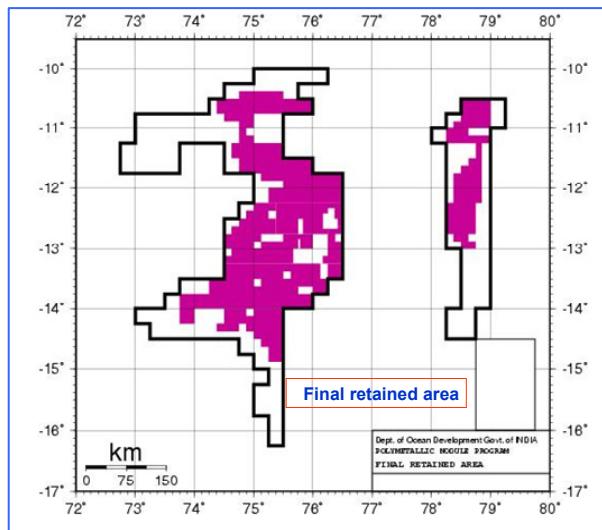
The Polymetallic Nodules Programme of India consists of 4 components, viz. Survey & Exploration, Environmental Impact Assessment, Technology Development (Mining), and Extraction Technology (Metallurgy).

## Survey & Exploration

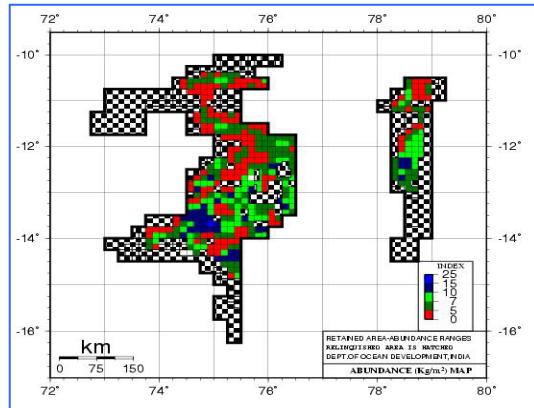
India has been carrying out Survey & Exploration primarily for development of area in the Central Indian Ocean Basin (CIOB). About 4 million sq. km area has been surveyed in this region.

*Figure 2: The area allotted to India in the Indian Ocean.*

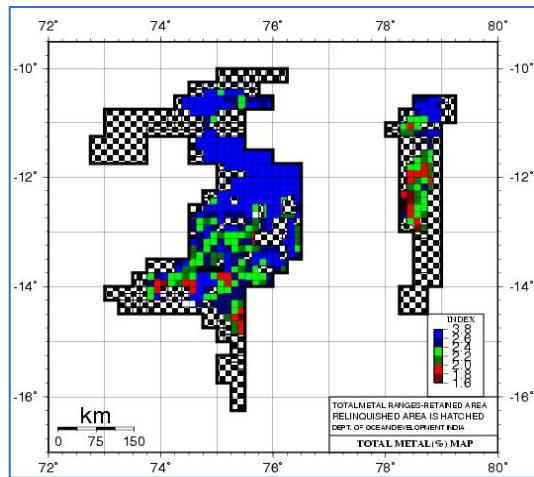
During this process, samples were collected at different grid interval by using Free Fall Grab (FFG), Van Veen Grab, Okean Grab exhaustively. Nodules have been sampled along with photographs from over 2500 locations with 5 to 7 FFG at each stations. Subsequently, close-grid sampling at 12.5 km interval has been completed in the Pioneer Area. Further sampling work is in progress at a closer grid in the retained blocks. Additional deep tow photography were also carried out in the area. The entire Pioneer Area has also been surveyed with the help of multibeam system.



Abundance range in the retained area varies between 5 to 10 kg/m<sup>2</sup>. The metal content, specifically Copper, Nickel and Cobalt is more than 2.5%. The proposed first generation mine site shall be based on additional survey results.

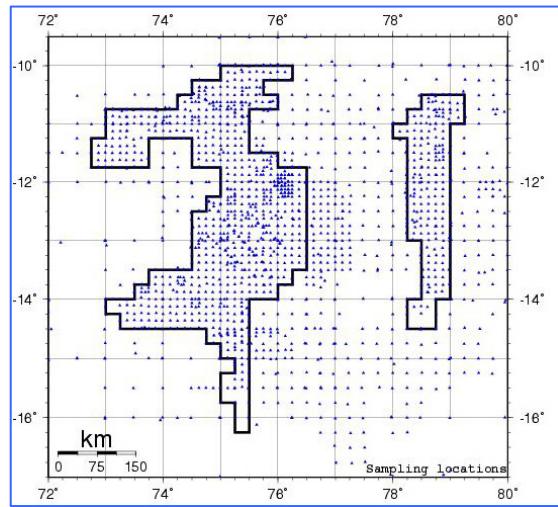


*Figure 3: Abundance ranges in the retained area of India.*

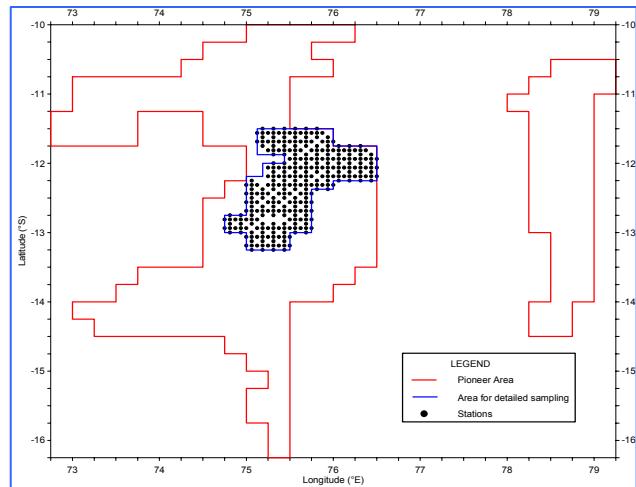


*Figure 4: Total metal content in the retained area of India.*

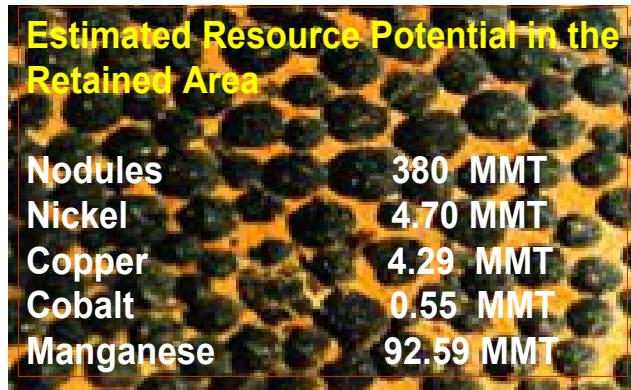
The estimated resource potential in the retained area, of the polymetallic manganese nodules is about 380 million metric tones which contains 4.70 million metric tones of Nickel, 4.29 million metric tones of Copper, 0.55 million metric tones of Cobalt.



*Figure 5: Quantum of sampling.*



*Figure 6: Proposed first generation mine site in India's retained area. Stations to be covered by close – grid sampling (92 blocks, 316 stations), (Sampling interval 6.25 km)*



*Figure 7: Estimated resource potential in retained area of India.*

#### Environmental Impact Assessment Studies

Comprehensive Environmental Impact Assessment Studies were commissioned by India in CIOB mine site in various phases. In phase I, baseline data were collected, followed by Benthic disturbance in phase II and impact assessment. Subsequently, in phase III, monitoring of post disturbance restoration, modeling of plume and creation of environmental database are envisaged. Various geological, biological, physical and chemical parameters have been analyzed. These include:

- a) seafloor, sediment thickness, topography, sediment sizes, porewater and sediment chemistry, geotechnical props and stratigraphy under geological investigations.
- b) surface productivity, microbiology, biochemistry, meiofauna, macrofauna and megafauna under biological investigations.
- c) currents, temperature, conductivity and meteorology under physical investigations.
- d) metals, nutrients, DOC, POC under chemistry have been studied.

The observations pertaining to various parameters in different phases of post-monitoring have been provided vis-à-vis pre disturbance environment. Benthic impact experiments as carried out by several other organizations, viz. DISCOL (Germany), NOAA (USA), JET (Japan), IOM (Inter Ocean Metal), have been compared with those carried out by India.

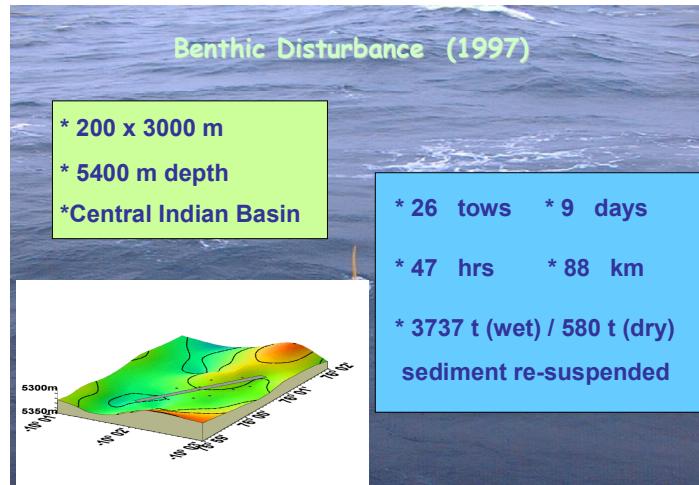


Figure 8: Benthic disturbance (1997).

Parameter	Pre-dist. (1997)	Post-dist. (1997)	Mon-I (2001)	Mon-II (2002)	Mon-III (2003)
<b>Sediment sizes</b>					
Clay content (%)	35	40	62	62	56
<b>Geotech. prop.</b>					
Water cont (%)	544	563	463	567	616
Sh. Str. (Kpa)	2.08	0.75	3.47	3.35	2.47
<b>Geochem. Prop.</b>					
Org. carbon (%)	0.35	0.46	0.28	0.35	0.37
Nitrogen (%)	0.084	0.093	0.085	--	--
Phosphorus (%)	0.008	0.008	0.013	0.013	0.01
(continued.....)					

Figure 9: Results of different parameters in different phases.

<u>Parameter</u>	<u>Pre-dist.</u> <u>(1997)</u>	<u>Post-dist.</u> <u>(1997)</u>	<u>Mon.-I</u> <u>(2001)</u>	<u>Mon-II</u> <u>(2002)</u>	<u>Mon-III</u> <u>(2003)</u>
<u>Microbial</u> ATP. $\mu\text{g g}^{-1}$	22.5	3.47	1.44	0.00	9.45
adenosine triphosphate (ATP)					
<u>Total Count.</u> $\text{g}^{-1}$	$10^9$	$10^6$	$10^7$	$10^6$	$10^6$
<u>Biochemical</u> ( $\text{mg.g}^{-1}$ )					
Chlorophyll	0.16	0.18	0.10	0.07	0.10
Proteins	0.42	0.08	0.52	0.55	0.87
Lipids	0.29	0.21	0.02	0.01	--
LOM (Labile Organic Matter)	0.88	0.42	0.66	0.83	--
<u>Meiofauna</u> (no. $10 \text{ cm}^{-2}$ )					
Abundance	46	23	11	6	11
No. of groups	11	4	9	6	10
<u>Macrofauna</u> (no. $\text{m}^{-2}$ )					
Abundance	244	80	266	--	100

Figure 10: (Continuous table of Figure 9) : Results of different parameters in different phases.

The main focus on the current and future activities involves:

- a) development of predictive models.
- b) identification of key parameters for marine impact assessment.
- c) creation of environmental database on marine mineral deposits.
- d) evaluating the biogeochemical coupling of biota with marine minerals; and
- e) development of protocols for mining of marine minerals.

### Technology Development – Mining

This is an important and critical component of Polymetallic Nodules Programme which involves development of a mining module for 6000 m depth in various stages. The components of the mining modules include:

- a) crawler based collector;
- b) crusher;
- c) positive displacement pump; and
- d) flexible riser system.

A mother ship would be used for carrying out preventive maintenance.

The chosen approach would be to connect 3-4 mining machines to a mother station from where the nodules would be transferred to a barge/ore ship.

The presence of multiple mining machines, flexible riser system instead of rigid riser system and a single positive displacement pump instead of multiple centrifugal pumps are the main differences of this system compared to pipe-lift systems.

### **Advantages**

The major advantages in this project pertain to continuity of one of the two machines and minimize the technical and financial risk on development work for a single mining machine. In case of storms, the mother station would be disconnected from mining system leaving the umbilical attached to a buoy. The planned developmental phases include the demonstration of flexible riser concept at 400-500 m water depth for sand mining operations in phase I, nodule collection pick up and crusher systems using underwater mining system in phase II, followed by development of flexible riser concept of manganese nodule mining operations at 6000 m depth using one mining machine and flexible riser system.

*Figure 11: Ocean research vessel, Sagar Kanya*





*Figure 12: Launching of underwater mining system.*



*Figure 13:  
Underwater mining system in water.*

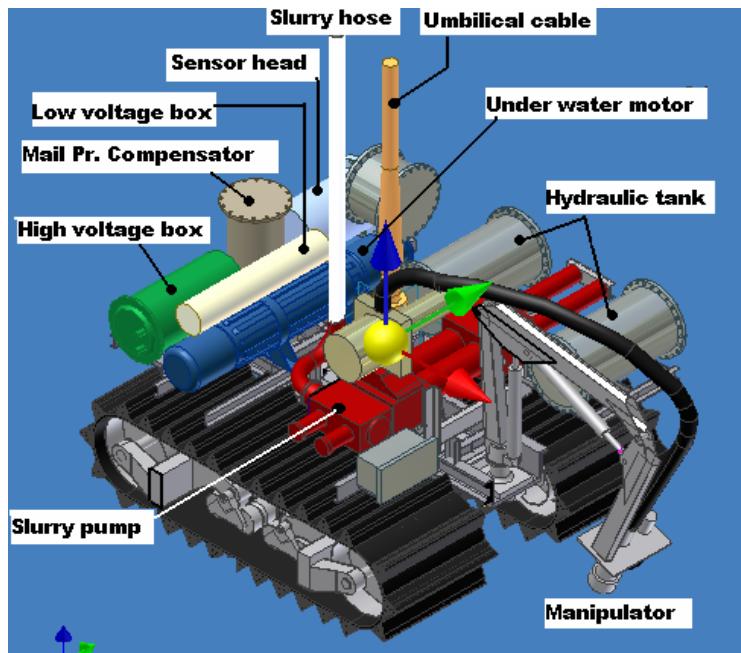
### **Progress of Work**

The specifications of under water mining system have been finalised. Four demonstration tests have been carried out pertaining to under water mining system, with the help of Oceanographic Research Vessel (ORV) *Sagar Kanya* in the Arabian Sea and Bay of Bengal. The under water mining system was launched to reach ocean floor at 410 m depth and pumping tests for a duration of 40 minutes with operations at a discharge rate of 10-45 m<sup>3</sup>/h of slurry have been carried out. The maximum density of slurry pumped was 1170

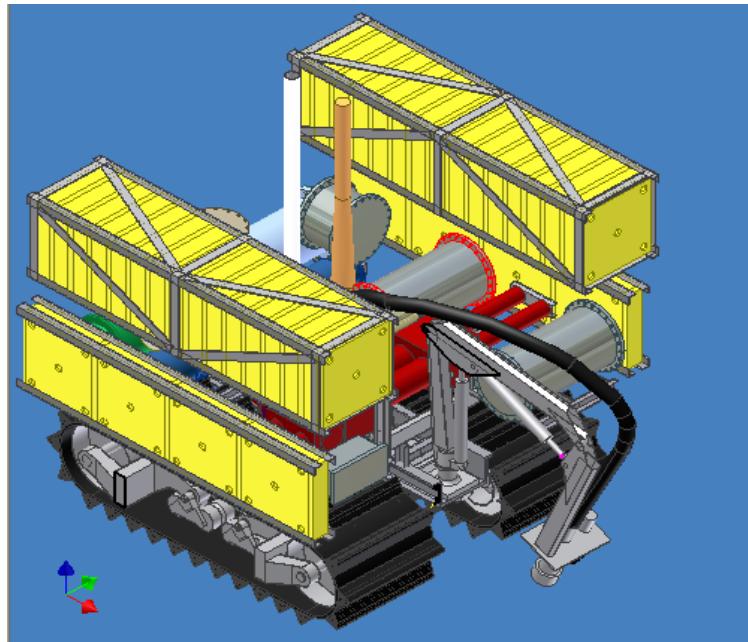
kg/m<sup>3</sup> with maximum concentration of 22% by weight. Presently, the ORV Sagar Kanya is being augmented with dynamic positioning system. This will ensure that the crawler is not dragged during operations. The crawler has been re-configured with additional buoyancy package. The system would be re-demonstrated to gain further confidence and to improve the capability of the system for longer duration.

Other major activities include:

- a) assessment of in-situ soil bearing and shear strength at the sea bottom essential for design of 6000 m system;
- b) development of an in-situ tester has been taken up; and
- c) development of a special cone and a vane.



*Figure 14: Re-configured crawler for better stability.*



*Figure 15: Crawler modified with additional buoyancy.*

Further, Remotely Operated Vehicle (ROV) for 6000 m water depth is also being developed which would be having the following components:

- a) Hydraulic manipulators;
- b) 5 cameras;
- c) combination of Halogen, HID & LED lamps;
- d) multibeam forward & bottom scanning sonar;
- e) doppler velocity log;
- f) inertial navigation system;
- g) unique accurate acoustic positioning system; and
- h) sound velocity profiler & deep sensor.

## Activities in Progress

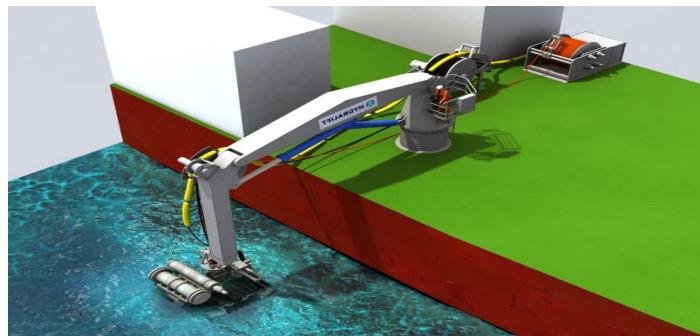
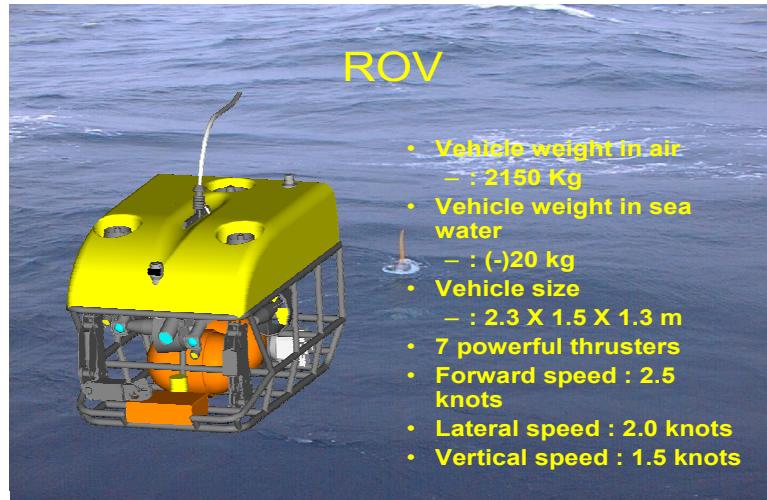


Figure 16: Animated view of proposal crawler launching system.



Figure 17: New research vessel, Sagar Nidhi of India.

We are also in process of acquiring a new research vessel for demonstration of the mining system, Remotely Operated Vehicle(ROV) with an overall length of 104.20 m, breadth of 19.20 m, draft of 4.8 m, speed of 13.5 knots, endurance of 45 days. This is expected to be acquired by 2007. This development work has been taken up to support maintenance and other related work of the mining system module.



*Figure 18: Remote operation vehicle.*

#### **Technology Development - Metallurgy**

Under this component considerable progress has been made in India. Several feasibility studies have been undertaken and a total 15 process routes primarily based on pyrometallurgical and hydrometallurgical process routes have been examined for extracting metal values from nodules. The extensive studies carried out include:

- a) Ammoniacal Sulphur Dioxide Leach process;
- b) Reduction Roast Ammonia Leach process; and
- c) Sulphuric Acid-Starch Leach process.

A semi-continuous pilot plant of 500 kg per day input capacity for extracting metals has been set up in Udaipur to validate the process package developed by our laboratories following Ammoniacal Sulphur Dioxide Leach process. Various critical equipments available in the Pilot plant include:

- a) Hammer Crusher, Ball Mill;
- b) Autoclaves, Reactors;
- c) Ammonia Recovery Unit;
- d) Mixer-Settlers;
- e) Electro-Winning Cells;

- f) Cooling Tower;
- g) Compressor, etc.

Nodules treated in the pilot plant contains:

Copper - 1.28%  
 Nickel - 1.21%  
 Cobalt - 0.13%  
 Manganese - 23.03%  
 Iron - 7.27%  
 Zinc - 0.21%



Figure 19: PMN Pilot plant at HZL, Udaipur, India.

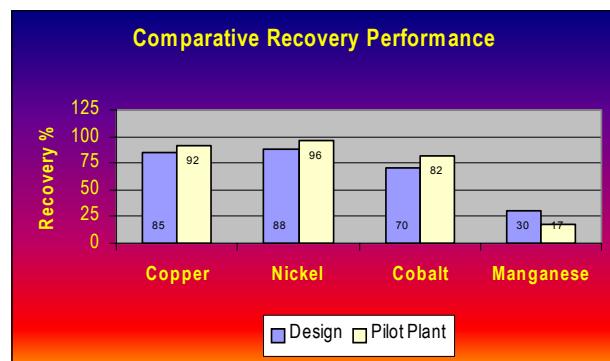


Figure 20: Comparative recovery performance.



*Figure 21: Cathode Sheets from Pilot Plant.*

As per the presently available trend at the Pilot Plant, the recovery performance of Copper, Nickel and Cobalt has been significantly encouraging.

#### **Recommendations**

- i. Considering the cost-intensive nature of the programmes, we need to collaborate jointly with other pioneer investors to develop technologies. This would avoid duplication of efforts and save upon the cost.
- ii. Further, there is a need for exchange of data so as to facilitate technology development and private sector participation. This would be significant considering the potential in the Gas Hydrate exploration, Cobalt crust and Sulphide mining. In this context, I may emphasize that India has already taken up identifying Cobalt rich areas ahead of formulation of rules and regulations in this regard by the Authority.

May I assure you that we would continue to generate synergies with the Authority and other State Parties as in the past. With this assurance, I conclude my presentation. Many Thanks. §

## **PANEL 2: FUTURE DIRECTIONS AND PROSPECTS**

---

Moderator: Mr. Albert Hoffmann (South Africa), Chairman of the Legal and Technical Commission

Panelists:

- (A) H.E. Ambassador Felipe Paolillo (Uruguay)
- (B) Dr. Chris German (the United Kingdom)
- (C) Dr. John Lambshead (the United Kingdom)
- (D) Dr. Brian Bett (the United Kingdom)
- (E) Professor Dr. Tullio Scovazzi (Italy)

---

(A) ***THE ROLE OF THE INTERNATIONAL SEABED AUTHORITY AS AN INSTITUTION OF THE LAW OF THE SEA***  
*H.E. Ambassador Felipe Paolillo (Uruguay)\**

---

The report of the Secretary-General, Mr. Satya Nandan, to the tenth session of the Assembly of the International Seabed Authority provides a detailed biography of the Authority. Thus, we learn that during its first 10 years, which we are celebrating today, the Authority completed the initial phase of its work. The Authority has adopted all the decisions and taken all the organizational steps necessary to begin carrying out the important and complex activities entrusted to it by the Convention and the 1994 Agreement.

The Authority is now able to embark on a new stage and take on the more substantive work required to ensure the efficient administration of the international area.

Thus, there is good cause to be happy that the Authority, under the leadership of Mr. Nandan and the competent staff working in Kingston, has had a happy and uneventful childhood.

---

\* Permanent Representative of Uruguay to the United Nations and Co-Chairman of the United Nations Informative Consultation Process on Ocean Affairs. The original transcript of this presentation was in Spanish.

The Authority has not only had a happy childhood, however. It has also moved on from childhood to adolescence, and from adolescence to adulthood without any serious slips or accidents – all in the short span of ten years.

There is a remarkable contrast between this rapid succession in the life cycles of the Authority and the long and tortuous stage of its conception and its difficult birth.

Long and tortuous indeed. Long, because it took the Conference nine years of practically uninterrupted negotiations to bring the baby to full term – nine years, not counting the years of consultations and negotiations in the Seabed Committee. And tortuous, because the establishment of the Authority and the definition of its competence and powers became the most difficult and complex issues dealt with by the Conference, and the last to be resolved.

There are two reasons for this. In the first place, what was at stake was access to and control of the vast wealth represented by manganese nodules, which would be enough to meet the global demand for certain minerals for decades, perhaps even centuries. This seemed particularly important during the years when the Conference was in progress. At that time, we were being told that exploitation of manganese nodules had to begin before the end of the twentieth century, i.e., within the next 20 years, because global demand for metals such as copper and manganese could not be met by land-based producers, and the world would surely face a crisis of incalculable proportions.

Secondly, the difficulties that were hindering efforts to reach agreement on the establishment of the Authority and of an overall legal regime for the Area stemmed from the confrontation between opposite and seemingly irreconcilable ideologies. The interests represented on the First Committee of the Conference were diametrically opposed to each other, not only with regard to the philosophy on which the system for exploitation of the international area and its resources should be based, but also with regard to each and every detail of the new institution to be established.

At the risk of oversimplifying the issue, we might say that while one group in the Conference proposed that the administration and exploitation of the Area should be based on the most orthodox principles of mercantile

liberalism, the other sector advocated a system of state or rather, interstate intervention or leadership.

The private sector and the industrialized countries, feeling that exploitation of the resources of the Area should be started as soon as possible, advocated the adoption, as a matter of urgency, of a system for ensuring that private companies would be guaranteed direct access to the Area's resources and that they would be allowed to proceed with their exploration and exploitation activities without interference, especially from an intergovernmental agency.

The efficient exploitation of seabed resources by private companies would increase the supply of cheap raw materials and reduce the vulnerability of certain industrialized countries had to depend on countries that were producers of land-based minerals. This group held that the Authority should only be responsible for ensuring that activities in the Area could be carried out in a peaceful and orderly fashion. The Authority should be responsible for issuing operating permits almost as a matter of routine. Thus, the advocates of this approach proposed proven traditional institutional structures and operating methods that would not call for much thought or extensive negotiations and could therefore be implemented without delay.

However, the majority of those present at the Conference thought otherwise. At the time, the developing countries were keen to establish a new world economic order that would be governed by laws designed to ensure a more equitable distribution of the benefits of progress among all members of the international community. The establishment of a system for exploiting the resources of the Area, which had already been declared part of the common heritage of mankind, would provide a unique opportunity to ensure that the principles underlying the long-awaited new international economic order would become a reality.

Under the proposal put forward by the developing countries, the Authority should be a vehicle that would enable them to participate effectively in the exploitation of the Area's resources to which they did not have access because of their lack of financial and technological resources. The developing countries wanted to play an active role in operations in the Area rather than be passive recipients of the profits of its exploitation. The main objective of the Authority should be to give all nations of the world, independently of their political system and economic and technological capacity, the opportunity to

participate in conquering the last frontier on the earth and to ensure that it was exploited in a manner that would be beneficial to all countries and not just the few that had the means to start exploitation operations.

Consequently, the future Authority should have the monopoly in regard to activities in the Area. It should be granted broad powers and act with full autonomy with respect to States.

The two positions seemed to be irreconcilable, and during the early stages of negotiations, neither side seemed willing to make concessions on matters of principle. The negotiations went on year after year with no prospects for a solution that would be acceptable to all. At times it seemed that the Conference was making no progress, and that it was at a standstill, particularly in the First Committee, which was responsible for the seabed question.

The task was truly a gigantic one, and some people suggested that the Conference should lower its expectations and confine itself to negotiating a convention to regulate the traditional aspects of the law of the sea on which there was a real possibility of reaching agreement. In other words, they felt that the work of the Conference should be limited to codifying the existing and accepted norms of the law of the sea. Thus, any attempt to regulate the seabed beyond national jurisdiction would be beyond the scope of what would amount to a mini-convention, given that the Convention was proceeding at such a slow pace that the work of the First Committee had come to a halt.

The Conference continued to meet year after year, alternating its venue between Geneva and New York; every session lasted several weeks, with no visible sign of progress (the Conference met for a total of 93 weeks). This standstill apparently caused *New York Magazine*, in 1978, to include the Third Conference on the Law of the Sea among the ten most boring places to be in New York, along with the Dendur Temple room at the Metropolitan Museum and Roosevelt Island, among others.

The Conference, especially the First Committee, might indeed have seemed boring to the occasional tourist on a quick guided tour of United Nations Headquarters or to a curious journalist stopping by to listen to some of the debates. The Conference would have seemed like a giant motionless machine only to those who looked in from the outside.

Those of us who were on the inside were not bored for a minute of the many years and the innumerable sessions of the Conference. On the contrary, from the time it began and right up to the adoption of the Convention, in December 1982, the Conference was the setting of a fascinating and enriching intellectual experiment that ended up radically changing the legal system that governs two thirds of the area of the planet.

Behind the endless debates and the quiet negotiations, which might have seemed boring to an uninitiated observer, behind the apparent lack of movement, the Conference had become a cauldron in which a rich stream of original ideas were boiling, a continuous exchange of proposals and counterproposals, an amazing display of creativity. And above all, it demonstrated the firm determination of all participants to ensure a successful outcome.

The Convention was not only the outcome of an intellectual exercise; above all, it was the product of imagination and creativity. The novelty and complexity of the issues involved, the multiplicity of opposing interests, the desire to find solutions based on consensus, the need to reconcile radically different interests – all these factors led the negotiators to move away from existing conceptual models and resort to new, often revolutionary ideas.

This was particularly true of the First Committee. Part XI of the Convention and its annexes embody many new ideas and innovations. Many antagonistic and seemingly irreconcilable positions that had clashed during discussions on the regime of the international area were merged in a final compromise formula that is referred to as the "parallel system" – a middle path between the "progressives" who wanted a strong monopolistic organization with discretionary powers to administer the Area, and the "traditionalists" who saw the Authority as an entity that should routinely issue exploitation permits.

One might ask which of the two positions prevailed. At first glance, it might appear that the first position, that of the progressives or revolutionaries, prevailed over the traditionalist position. In actual fact, the ideas that prevailed in the legal regime adopted for the Area and in establishing the Authority are closer to those of the traditional or conservative school. The spirit that inspired the compromise might be summarized, in my opinion, as follows: The Authority was invested with broad competencies but limited powers.§

Indeed, as far as the membership, overall structure and operation of the Authority are concerned, they follow the traditional model of international organizations. The Authority is an intergovernmental organization that is based on the principle of sovereign equality of its members. Its framework is often extremely detailed and casuistic, allowing for only minimal discretionary powers and independent decision making. The decision-making procedures in the main bodies of the Authority are such that no important decision can be made without the consent of certain groups of States with shared interests or sometimes even of a single State.

It was therefore quite surprising that during the final stages of negotiations in the Conference, and especially after the adoption of the Convention, critics of the Authority should have called it, among other things, a super-State exercising prerogatives over a vast space, an intergovernmental structure with vast jurisdiction, a supranational institution with the power to directly tax private companies which has "subjugated" the global mining industry, or a sinister regulatory power which is at the same time a competitor that threatens the operations of other firms.

Clearly, the Authority is none of the above. The fear that a Leviathan may have been created is completely unfounded. Considering the nature of the duties assigned to the new institution, it should have been endowed with a more supranational character and greater autonomy. But the international community was not prepared to extend to the structures of the organization the revolutionary principles that inspired the definition of its purposes and duties. No government accepted, or even understood, the logical consequences of entrusting the Authority with responsibility for administrating the Area and its resources. The idea had been to grant it freedom of action and the capacity to adopt binding decisions that would be in the interests of mankind, independently of the interests of individual States. The idea of a highly integrated and autonomous Authority was quickly eliminated from the debate at the Conference. The form was not made to fit the pattern of the duties assigned to it.

In many ways, however, the Authority is a unique institution within the family of international organizations. It has a number of innovative features, including the composition of the Council, an executive body based on the representation of interests; the establishment of the Enterprise, the operational body of the Authority; and the dispute-settlement procedures relating to acts of

the Authority, which have made it possible to establish a system for monitoring the lawfulness of the Authority's decisions. This is the only such system existing in a global agency.

But above all, the nature of its objectives and its duties as a representative of mankind are what make the Authority a unique institution. Its creation represents a significant, almost revolutionary development in the history of international organizations in general and of the law of the sea in particular.

With regard to the first aspect, namely, the impact on the development of international organizations: Since the creation of the first international unions during the second half of the nineteenth century, the sphere of competence of international agencies has been extended, steadily and inexorably, to areas that had traditionally been considered to fall strictly under the domestic jurisdiction of States.

With a few exceptions, this development has occurred gradually, without causing any major upsets. The establishment of the League of Nations after World War I was definitely an exception to this trend, as it represented the first attempt to replace the system of conferences that had prevailed during the nineteenth century with a legal, permanent and universal political system that had been agreed to by all or almost all States, one that was not imposed by the will of the most powerful ones. The United Nations Organization, a new, more elaborate and sophisticated undertaking, was established on the basis of the errors and shortcomings of its predecessor. But despite the notable improvements in its conception, it did not represent a qualitative change in the history of international organizations.

We are now at the threshold of a new chapter in the history of international organizations. With the establishment of the Authority, the sphere of competence of an international organization is again extended to cover an area of human activity that heretofore had been beyond the scope of international regulation.

The Authority is the first – and so far, the only – worldwide intergovernmental organization that is operational in nature and whose purpose is the production and marketing of economic goods and the equitable distribution of the profits of such activities. The Authority has been given

power to regulate and carry out the exploitation and marketing of minerals in the Area, and to distribute among all States the profits obtained from such activities. For the first time in the history of international law, a global international organization will be involved in industrial and commercial activities, competing with public and private enterprises in the field of marine mining.

The Authority represents the interests of mankind, and its goal is to satisfy those interests. This singleness of purpose means that States Parties will need to show a more cooperative attitude than that required of other international organizations. The fact that an international agency now exists to represent the common interests of mankind has altered the traditional pattern of relationships prevailing in other international institutions. In this case, it is not a matter of achieving balance between the conflicting interests of member States, but rather of subordinating those interests to the higher interests of mankind as a whole.

Thus, the Authority should not be seen simply as a forum where States meet to coordinate their interests and enforce their rights with respect to the seabed and its resources. It is also an agent that executes the will of the international community on questions relating to the exploitation of those resources and the distribution of the profits thereof. The Authority will begin to make distributive justice a reality; this is an effort which at the international level has not gone beyond mere rhetoric. Accordingly, the Authority has been given the power to exercise direct jurisdiction over a vast geographic space, to prescribe how States should act with regard to the Area, and to organize and conduct marine mining activities. In no other sector of international law has the idea of distributive justice been endowed with such concrete content and such political power.

In a way, the Authority will personify a new concept of international law. The role of international law has traditionally been to maintain social order in the international community by setting limits on the sovereignty of States and reconciling antagonistic national interests on the basis of reciprocity. More recently, in addition to being an instrument of social control, international law has become an instrument of social direction: not only does it regulate and monitor issues that arise in inter-State relations, but it has begun to impose obligations in terms of what States must do. International law not only orders States to respect the limits imposed on their sovereignty, but it requires

them to assume responsibilities and to cooperate in solving common problems that affect the wellbeing and development of every nation in the world.

With regard to the second aspect, namely, the impact of the Authority on the development of the law of the sea, it should be noted that until recently, the law of the sea, like many other branches of international law, was a non-institutionalized legal order or, in the best of cases, a legal order with very rudimentary and sketchy institutions. The law of the sea has been, and to a large extent still is, a decentralized legal order, made up of legal norms that are enforced and monitored by those who created the norms. Thus, in the law of the sea, there was what a French jurist has called *dédoubllement fonctionnel*. In the absence of institutions, States dictated rules, bound themselves to them and monitored their application.

This decentralization of the law of the sea was a logical consequence of the fact that for more than three centuries, the behaviour of States with regard to the oceans was governed by a highly permissive legal regime that was based on the principle of freedom of the seas. The oceans were open to everyone, and there were virtually no restrictions on the exploitation of their resources, which were thought to be inexhaustible. In a legal order based on such premises, institutions did not seem necessary.

From the late nineteenth century onward, however, as the use of oceans and the exploitation of their resources increased, nations became aware of the need to create international agencies to deal with issues relating to the sea. Many different initiatives were launched in public and private forums, beginning in 1889, when the Committee of the Conference of Maritime Associations of the North recommended the creation of an international maritime commission to promote the standardization and harmonization of maritime regulations.

After World War I, proposals to establish international organizations to deal with maritime issues increased in frequency and boldness. Up until World War II, however, such ideas were not popular. While it is true that some such agencies, especially in the private sector, began to operate in the early twentieth century, none of them had broad competencies that would justify saying that the institutionalization of the Law of the Sea had begun.

It was not until after the creation of the United Nations that intergovernmental institutions with competence in maritime affairs began to develop and expand. In that regard, it is worth mentioning the Food and Agriculture Organization of the United Nations, the Intergovernmental Oceanographic Commission, the World Health Organization, the United Nations Environmental Programme, the International Atomic Energy Agency, and a number of regional fisheries commissions. Although these agencies do not have regulatory powers, they have helped strengthen cooperation in regard to the use of oceans and the exploitation and conservation of marine resources. They have developed more as consultative bodies than as operational agencies, and they have been engaged mainly in promoting international cooperation, obtaining and disseminating information, conducting research and providing assistance to governments. Only in exceptional cases have they been endowed with legislative powers, and then only in specific technical areas.

The Convention led to the establishment of permanent institutions to deal with issues relating to the Law of the Sea. For the first time in history, international institutions are an integral part of the new regime of the Law of the Sea. The importance attached to institutional questions in the new Law of the Sea is evident in the number of articles in the Convention that deal with this issue. Thirty-nine of the 58 articles of Part XI, on the Area, deal with institutional questions relating to the Authority. Annexes II, IV and VI are devoted entirely to the creation of the Commission on the Limits of the Continental Shelf, the Enterprise of the Authority and the International Tribunal for the Law of the Sea.

The establishment of the Authority marks the first step towards institutionalizing a legal order that up to then had been developed and enforced without needing a permanent institution. With the Authority, the principles of centralization and hierarchy were introduced into the Law of the Sea. If the maturity of a legal order is measured by the sophistication of its organizational structures, it might be said that the Law of the Sea reached maturity with the entry into force of the Convention.

The operation of the Authority is essential to the development and effective enforcement of this legal order. From now on, the creation and application of the law governing the Area will be centralized in the Authority. To use the terminology of Professor Dupuy, it could be said that the Convention marks the beginning of the transformation of the Law of the Sea from a *droit*

*relationnel*, whereby relations between States are regulated on the basis of coordination, to a *droit institutionnel*, whereby States relate to each other on the basis of power structures based on subordination.

The expectations expressed by the President of the Conference, Mr. Amerasinghe, to the effect that the Authority would change the spirit and the tone of international relations by promoting a transition from a situation of differences and conflict to one of brotherhood and enduring cooperation may now seem too optimistic. Under the present circumstances, the most we can expect is that States will not pass up the opportunity to strengthen international solidarity which this innovative institution offers them.

Thus, it is up to States to make the Authority an instrument for advancing towards greater integration of international society and the achievement of a more equitable distribution of the world's resources. The institutional and legal means for achieving this have been established, and under the leadership of Mr. Satya Nandan, they have been set up and are ready to be used. As in most organizations, the Authority will be what its member States want it to be.

In his report, the Secretary-General informs us that exploration work in the Area under contracts with the seven pioneer investors is proceeding at a very slow pace, that exploitation of deep seabed minerals still cannot compete with land-based mining, and that it will take several years for exploitation of the Area's resources to become commercially competitive.

In the near future, the Authority will be faced with new challenges arising from recent discoveries and technological developments; it will be faced with tasks that perhaps were not envisaged at the time of the Conference. For the short term, the Authority will have an important role to play in addressing new problems arising from the confirmed discovery of abundant mineral resources other than those contained in the manganese nodules but belonging to the Area, and the intensification of scientific research activities and bioprospecting of biogenetic resources associated with the Area. That appears to be the major challenge for the next few years. We hope that the international community will assign the Authority the responsibilities that belong to it in this area. I have no doubt that the Authority will fulfil those tasks with the same level of excellence it has demonstrated up to now. §

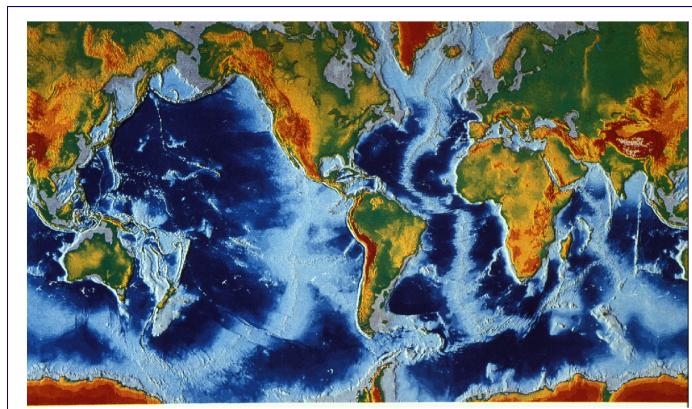
(B) ***STATUS AND PROSPECTS FOR DEEP SEABED MINERAL RESOURCES***

*Professor Chris R. German (United Kingdom)\**

This morning I am going to speak to you specifically about a particular area of future resources development and that is seafloor hydrothermal deposits and their role in generating polymetallic sulphide deposits under the new areas for the future of the International Seabed Authority.

I am not just going to speak in an independent capacity, but also as a member of two separate international research communities both of those being “*Interidge*” which is the international governing of research scientists interested in all aspects and all processes active in mid-ocean releasing including polymetallic sulphide formation and which for the last seven years, I have been acting as chairman of their working group targeting exploration for new scientific seafloor hydrothermal activity around the world’s deep oceans.

The other is the Census of Marine Life, another programme that I have been co-chairing for the last two years in a particular section investigating chemosynthetic ecosystem communities specifically understanding the biogeography and the biodiversity of animals which are unique to polymetallic sulphide deposits on the deep sea floor.



*Figure 1: Global mid-ocean ridges. 55,000 - 60,000 km of volcanic ridges that may host vents. Less than 10% have been explored for vent activity.*

\* Challenger Division for Seafloor Processes, Southampton Oceanography Centre, the United Kingdom.

### The danger of the future of exploration

This exploration slide shows the seafloor of the ocean ridges. There are 55,000 or 60,000 km of deep ocean ridges around the sea floor. Twenty-five years after the first discovery of seafloor hydrothermal venting, less than 10% of these ridges so far have been investigated systematically to find out where hydrothermal activity exists and where it does not. By definition it means that there is another 90% (some tens of thousand kilometers) which remain uninvestigated.

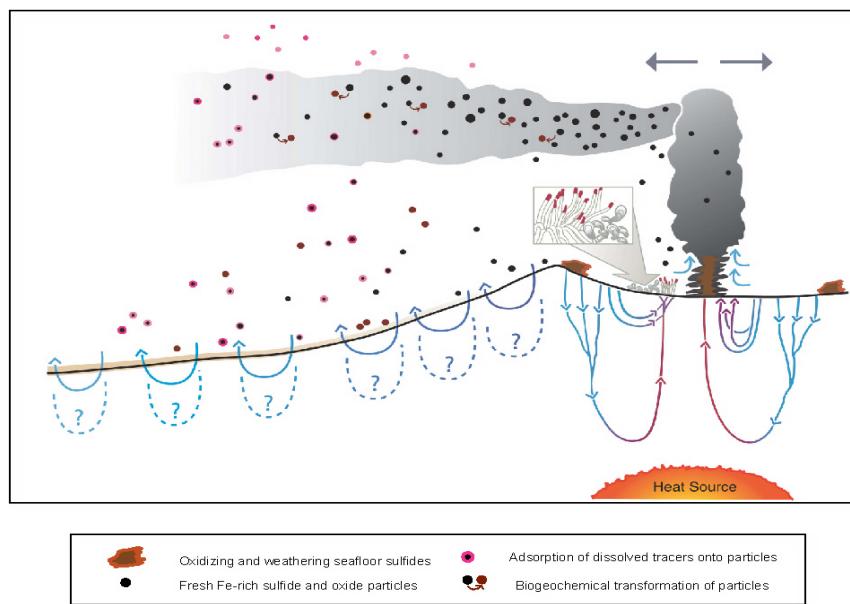


Figure 2: Latest discovery: 300% more vents than predicted since 1996.

The International Seabed Authority together with Interidge and Census of Marine Life all have a mutual beneficial interest to carry out more explorations. It is very difficult for example, to invent or introduce policy if you don't know how many hydrothermal vents there might be on the seafloor, or if we don't have a clear understanding of where the most valuable deposits are going to be, and no knowledge of which individual vent sites are unique and don't exist anywhere else. These are therefore very valuable and precious resources for all mankind and which we need to protect.

As a final part of that, what I'll also tell you is that one of the reasons I've been involved in such explorations is that there are large parts of the seafloor that have not been investigated. Our most recent work based on what we have conducted so far indicates that there could be about three times as much hydrothermal activity and three times as many individual vents sites on the deep ocean floor as has been predicted. This has become increasingly convincing throughout the last decade. Since 1996, we have had very little understanding about how much hydrothermal activity there should be. Recent works suggest that this has been underestimated 3-fold, so the international science community, not just the International Seabed Authority, remain poorly informed so far.

Before I go any further, what I thought I would quickly do is recap what was known ten years ago before the International Seabed Authority was formed. I will then go on to what we've achieved in the last decade. Ten years ago as it was like any new science which has very few data and very little information to constrain it; scientists were pretty confident that they already understood everything there was to know about seafloor hydrothermal activities. There were very few vent sites actually known at that time worldwide, nearly all of them in the Eastern Pacific Ocean and the received wisdom was that it was the only place that one could expect to find hydrothermal activity.

I was taught for example as an undergraduate that one shouldn't look in the Atlantic Ocean for seep or hydrothermal vent sites because they couldn't exist there. It was also understood that all vents sites were pretty much the same as each other and that after the first three or four there was no real need to go exploring any further because we wouldn't find anything new.

Over the past decade, some of the main achievements were the establishment of systematic exploration methods which work. The first two vents sites were found entirely by accident. In the first case, an expedition set off from Miami, Florida and chose to dredge from west to east across the entire Atlantic seafloor. As they crossed the ridge they happened to find the first black smoker vent site. Two years later the second site was found by The International Ocean Drilling Programme who chose to go and drill a second part of the mid ocean ridge, and purely by luck and by chance as they lowered their cameras on their drill strings to the bottom of the ocean to start drilling, they found a black smoker hydrothermal vent. Despite this, the received

wisdom insisted that such venting was very rare in the Atlantic and that concentration remained in the Pacific Ocean.

Over the past ten years, we also found that had we explored more systematically not only could we be able to demonstrate the presence of at least one hydrothermal site in every ocean basin on the Planet, we would also find a much wider geo-diversity of hydrothermal vent-sites. Although every vent site looks the same, when we explore new areas we do find new settings which are important to this organization.

There are three areas of research that I want to introduce as future directions in which the programme is going.

1. New techniques and automation for deep-sea exploration. If we are going to explore much larger areas of the deep sea floor we are going to need more effective techniques.
2. The importance of all of the Atlantic, Indian and Artic Oceans for wealth generating mineral deposits maybe more profitable than the Pacific for hydrothermal polymetallic sulfide deposits.
3. The need not to lose sight of vent biogeography, biodiversity and the non-mineral resources that are available around hydrothermal vent sites.



*Figure 3: Seafloor hydrothermal venting.*

This is actually what we are here to discuss today. These are the black smoker hydrothermal vents and the processes that generate polymetallic sulphides. These systems lie all along the worlds mid-ocean ridges we predict, and what happens is the cold seawater percolates down into the bare rock and gets heated up to temperatures in excess of 350°C, approaching 400°C. The only

reason the fluid doesn't boil is because of the high pressures at these depths. These fluids are very acidic and full of various toxic substances like hydrogen sulphide and methane. They also carry very high concentrations of precious metals, copper and zinc and lead and concentrations of platinum, gold and silver ore.

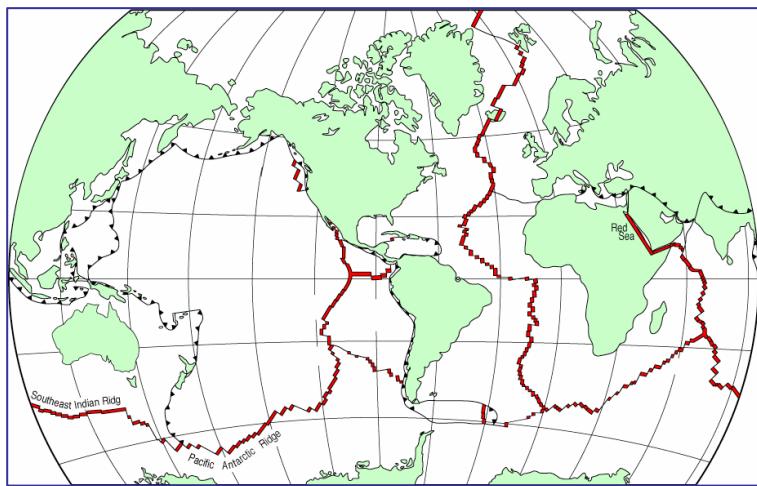


Figure 4: Mid-ocean ridges. Spreading rates range from ~1cm/yr to >10cm/year.

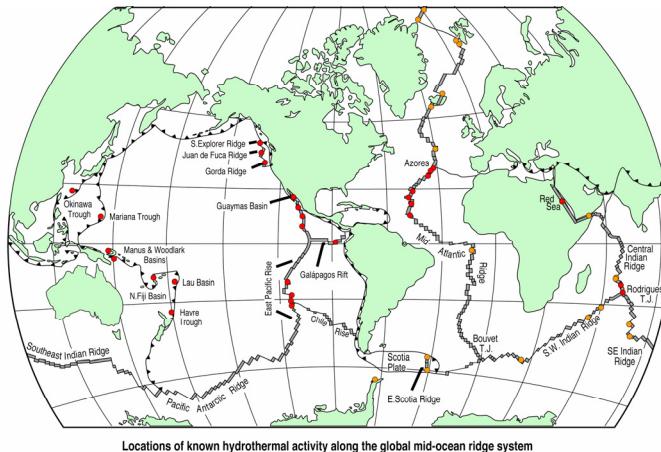
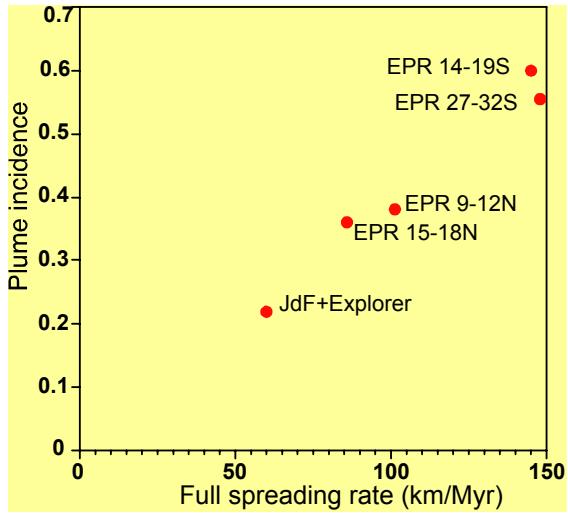
The particular system (Figure 4) we are looking at is probably 20 centimeters wide. What I've shown in red is the delineation of the world's mid-ocean region and the question should be, should we expect to find polymetallic sulphides and hydrothermal deposits everywhere along these ridges? One of the issues we have to remember that not all these ridges behave the same. The rate in which they are spreading varies from about one centimeter a year opening in the Arctic Ocean or the south-west Indian Ocean to ten times faster, about ten centimeters or faster a year, in the Pacific Ocean.

The variation in the spreading rate derives directly from the rate of supply of lava from below the sea floor. A first hypothesis was that the amount of hydrothermal activity we would expect to see should be related directly to the rate of supply of lava from below the sea floor which meant that the fastest spreading ridges should be where we expect to find the most hydrothermal activity.

*Figure 5: Diagram showing spreading rate of ridges in the Pacific Ocean and frequency of hydrothermal vents and activities.*

Figure 5 shows the first apparent verification of that hypothesis. What is shown on the bottom axis is the spreading rate

of different ridges with sections of the Pacific Ocean where the first hydrothermal vents have been found. These were actually dated some 10 years ago. It was about the time of the founding of the International Seabed Authority. The vertical axis measures how frequently one can find hydrothermal vents along axis or how abundant hydrothermal activity occurs. As you can see statistically, one can quite easily project a straight line correlation between the two, and see that it is indeed a fact that the highest level of hydrothermal activity or the highest abundance of hydrothermal activity is found on the fastest spreading ridges.



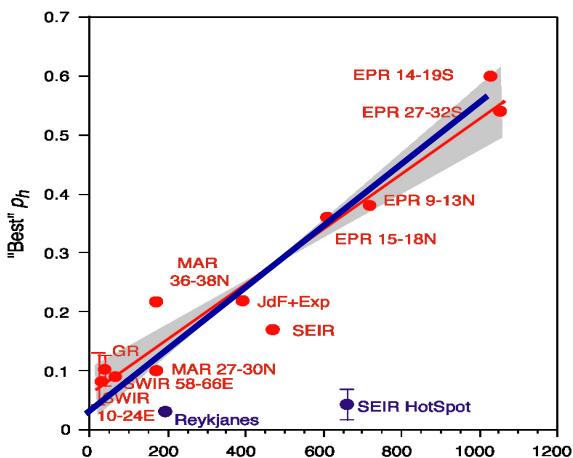
*Figure 6: Venting in all oceans.*

The logic I was taught ten years ago was that if one extrapolated down to the slower spreading ridges that the straight line would continue downwards to having zero hydrothermal activity on the slowest ridges. But what is missing from this diagram are the systems that are spreading at less than 15,000 kilometers per million years or 5 centimeters a year. It represents more than half of all the world's mid-ocean ridges so that would be 25,000 to 30,000 tons of mid-ocean ridge which if you took that prediction at face value, you would say, a completely uninteresting, we shouldn't even go and look to examine whether or not there are valuable resources there. That is really what we have been investigating these last ten years.

To cut to the chase, a very simple representation to bring you up to speed is to show that wherever we have been in the last ten years through our Interidge activities, in various ocean basins wherever we have conducted a systematic study in different areas, we have found new sites of hydro-thermal activity. The net result of that is wherever we have gone into the North Atlantic Ocean, up to the Arctic or down to the Antarctic through to the Indian Ocean, we have found hydrothermal vent signals in all these different ocean basins.

Even the slowest spreading ridge in the Arctic Ocean, which has a spreading rate of 1.5 centimeters per year to not spreading at all, show an abundance of hydrothermal activity. Everywhere we go we should expect to see some hydrothermal resources.

*Figure 7: Current understanding (2004): Magmatic control and fault-controlled vent-site.*



This is a more modern, updated version from a report that we published for our InterRidge programme for the last ten years. What is shown in the red zones (Figure 7) are different sites where we have investigated slower spreading ridges and the amount of hydrothermal activity found there. The red straight line shows what a statistical straight line would be if you wanted to accept that there was a single correlation of explained hydrothermal activity. But what I think is more important because it is more than statistical as it includes geological explanation and understanding of the system is the blue line. It is a reprojection of the same line I showed you earlier, which would be what we would predict for hydrothermal activity if the only thing that was important was the amount of volcanic activity that was driving that hydrothermal circulation. As you can see that line fits all the past ridges very well and there is also at least one site on a slow section of the mid-Atlantic ridge that fits on that line. What you find there though is that most of the data on slow spreading ridges lies above the line. There isn't just magmatic control of hydrothermal activity and it isn't just dependent on volcanism, although that is an important factor, but as you go to slower ridges there are additional hydrothermal sites that occur.



Figure 8: A vent site.

This is an example of one of those additional sites. What we have found on the mid-Atlantic ridge, which is the area we have studied best so far, is that in addition to volcanic systems which have lots of hydrothermal

activities, there are hydrothermal activities distant from any recent volcanic activities that are controlled by a penetrating force which crack down and penetrates into the ocean crusts. So there is no recent injection of hot lava close to the earth's surface that these deep faults penetrate down into the earth's interior where the rocks are hot and then mine out hydrothermal activity from there. Independently in terms of numbers of individual vent sites these may not prove to be very important but what we have found is that the heat output from one of these sites, (this is the Rainbow vent site which is south of the Azores for example) on any given day is an order of magnitude greater than any of the typical vent sites in the Pacific Ocean on top of volcanoes previously.

In the Pacific Ocean, we understand that individual vent sites are active for about a century. This is the amount of time in which to generate a single sulphide deposit on the seafloor which one might want to exploit in the future. At the Rainbow vent site in contrast, we have evidence that it has been active for 10,000 years, a hundred times longer, so if we put the two together, what we think it will come to is to argue that any individual vent site in the Atlantic, in terms of the sulphides deposits generated could easily be up to three orders of magnitude greater than the hydrothermal vent sites found in the Pacific Ocean. It might be much easier to find a vent site over a new section of the East Pacific Rise but in terms of the rewards for future sulphide extraction, one should be really looking at the slower ridges in future. This was something that was completely unknown to us ten years ago at the outset of the International Seabed Authority.

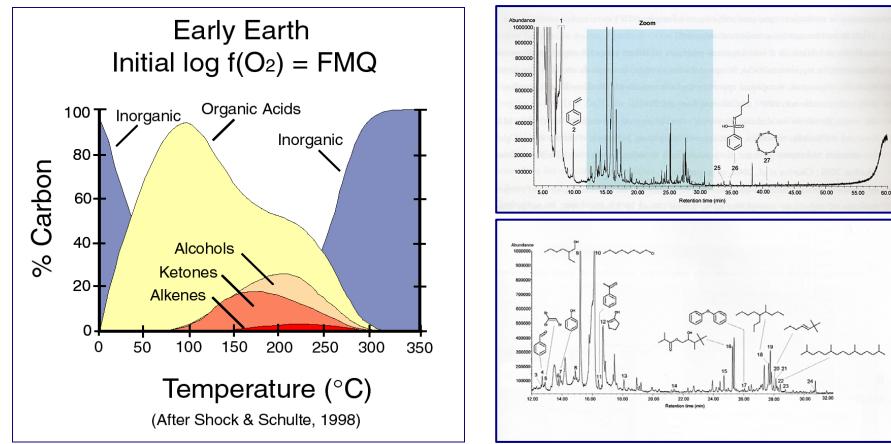
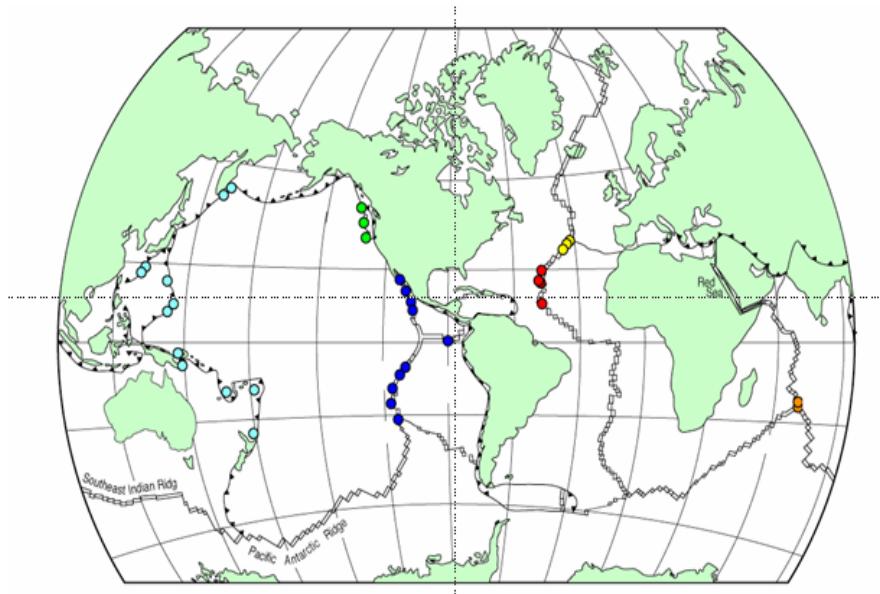


Figure 9: Unique characteristics of the slow spreading ridges.

The slow spreading ridges have unique characteristics. Ever since the hydrothermal vents were first discovered, it was argued whether or not they represented a valid natural laboratory in which to investigate the origins of life on the planet. Largely, they do not. The reason being that the ecosystem of hydrothermal vents requires the ocean to already be oxidizing, to already have oxygen in it, and to be carrying carbon dioxide because they can't synthesize organic materials from scratch.

The Rainbow vent site and two other fault controlled systems like the Rainbow site that we have since found in the north Atlantic fit an important part of the missing jigsaw. The slide on the left (Figure 10) is actually a prediction published in the Journal of Geophysical Research in 1998 before the Rainbow vent site fluids had been measured and it's actually predicting what should have happened on theoretical hydrothermal sites on the early earth on Mars or Mars in the past and Europa today.

The prediction was high temperature circulation of fluids through the appropriate rock types. If hydrothermal activity occurred in those rock types, this would actually generate abiotic organic synthesis so you could take carbon dioxide, mix with these rocks at these high temperatures and as these fluids cool down, 100% of inorganic carbon present in those fluids would be converted to organic carbon molecules. Armed with that information we were able to go straight back out to the Rainbow vent sites because we knew that these deep penetrating faults that drove the hydrothermal systems also uplifted exactly these rock types to the sea floor. Here was a natural laboratory where there is a hydrothermal vent site which is carrying out exactly the reactions that were predicted. Figure 10 also shows scans from my colleagues Nils Holm from Stockholm and Jean Luc Charlout from IFREMER in France which show that there are very high concentration of quite complex organic molecules present in these hydrothermal fluids at Rainbow even though they were taken from waters 362°C and had a pH of between two and three, so acidic solutions. We found these results by going back to more typical volcanically hosted hydrothermal vent sites and confirmed that they are completely sterile. We haven't proven this abiotic organic synthesis yet but it has shown that you can have organic synthesis in vent fluid systems.



*Figure 10: Globally-visited vent-sites.*

I will bring you to an area I have worked with the Census of Marine Life because if we believe that these systems are very important to the origins of life then we also need to understand what controls what lives at these hydrothermal vents today. This slide (Figure 11) has fewer points on it than the one I showed you earlier because this is the sub-set of the known hydrothermal sites for anybody who has actually visited with a submersible or remotely operated vehicle (ROV) and carried out a detailed analysis of the fauna that are living around these sites. Only a hundred sites or less have been visited thus far and already we have identified 5 different bio-geographic provinces. In fact over 25 years of hydrothermal exploration more than 450, and closer to 500 new species, previously unknown to science have been discovered. That represents an average discovery rate of about one new species every two weeks which has been sustained for about a quarter of a century. Even though there are so many parts of the ocean we haven't even been to yet, you can understand there is no sign of slowing down in our rate of discovery.

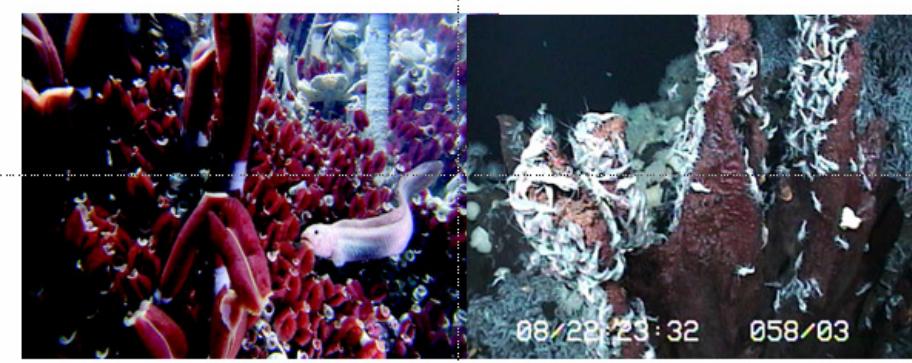


Figure 11: Hydrothermal vent-fauna.

The Census of Marine Life programme is targeted now to understand what causes the variations in the biology among different vent sites.

This gives you a flavour of what the differences can be from one ocean to another. On the left (Figure 11) are tube worms which can be two to three metres in length and mostly surrounded by a tube of chitin material. They have plumes or gills which extend out of these tubes and are bright red in colour because they are actually full of hemoglobin, the same as there is in human blood. The specific adaptation of these systems is that they can both absorb dissolved oxygen from seawater and hydrogen sulphide from hydrothermal vents. They can stop the two reacting with each other by locking them in different parts of hemoglobin molecule, transporting them into their gut and using them to feed a cultivation of bacteria which then oxidize the sulphide, react the sulphide and oxygen together, and use that to fix carbon from the sea water for the growth of both the bacteria and the animal themselves. In the Atlantic, the same process is carried out by millions of shrimp that are two centimeters long, it is the same chemical process, the same geology and yet completely different biological adaptation to the same geological process. One of the most bewildering questions is why that should be the case why there are only two solutions to the problems or is it that every time we go to a new ocean we find out new discoveries or new animals that we don't know about yet.

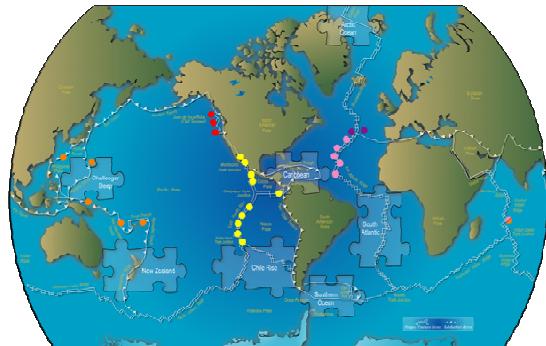


Figure 12: of Census of Marine Life Programme (2002-2010).

That is really what the Census of Marine Life Programme is about over the next five to ten years. We don't believe that we will find every vent site and that we will understand everything in that time but what is shown here (Figure 12) are missing pieces of the jigsaw - key areas that we think if we go to these particular different parts of the globe, we will find particular answers to particular questions. For example, the South of South America is a very important oceanographic gateway with very strong ocean currents which advect from the South Pacific to the South Atlantic Ocean so it would be very interesting to study hydrothermal vents in the South Pacific, off Chile, and also in the Antarctic gateway to see there are animals there and whether there is evidence that animals are being advected from one site to the other and to see if that is an oceanic gateway that allows animals to get from the South Pacific to the South Atlantic Ocean. The other area of interest is in the Arctic Ocean.

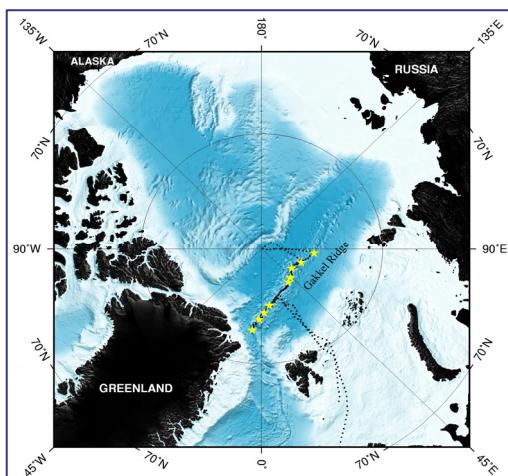
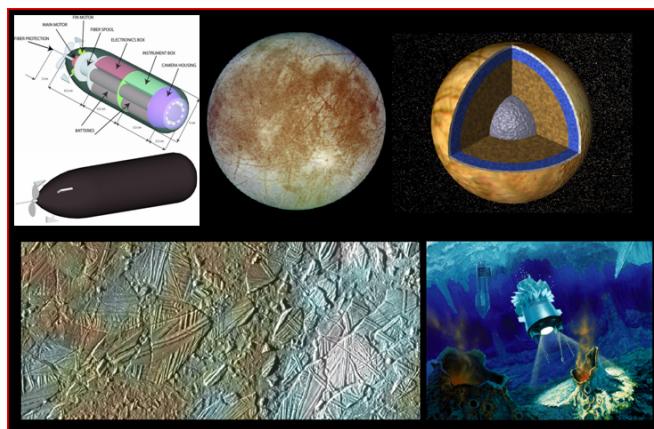


Figure 13: Gakkel Ridge, Arctic Ocean.

Figure 13 is one of our recent findings that was published in *Nature* last year. We have been to the mid-Atlantic ridge and found the chemical signals that tell us

there are hydrothermal vents in this ocean basin although we haven't been there yet. But what one might predict is that first of all because this is a very slow spreading ridge, at least some of the vents sites in this ocean should be of those very large sulphide generating forms with the organic synthesis taking place. We also notice that in the Arctic Ocean basins there is only one very narrow deepwater gateway to the rest of the outside world. The potential therefore for completely isolated evolution is very strong, although the case to study an ocean covered with ice is much more difficult logistically.



*Figure 14: Illustration of hydrothermal vents in ice-covered oceans on Europa – one of the moons of Jupiter. All images from NASA/JPL (Galileo Mission) except for top left (microbot): F.Bruhn et al. (*J. Ocean Engineering*, in press, 2004)*

This is an area that isn't just of interest to people caring for oceanography on this Planet. This slide (Figure 14) comes from a NASA website on the Galileo space mission. And it turns out that they too are interested in exploration for hydrothermal vents in ice-covered oceans. Not here on earth but on Europa, one of the moons of Jupiter. Fortunately, because you've been listening to my talk you would be well enough educated to know that the picture at the bottom right hand corner is a very poor illustration of what a hydrothermal vent looks like. Because that was the best NASA could come up with, and also because I recognised their design for a deep-sea robot submarine to go and do the exploration was not very well designed, I took it upon myself to contact them and asked to go and speak with them.

Happily we have entered into some fruitful collaboration with their organization and these are guidelines for a new microrobot from a paper we are just publishing together with the jet propulsion laboratory explaining what a new miniature submarine for carrying out independent unmanned exploration of the seafloor and not attached to any ship should like like. Now you might worry that this is beginning to sound like science fiction that doesn't have much relevance to the International Seabed Authority.



*Figure 15: An artist's impression (1994) of an important driver for future automated seafloor exploration.*

of our organizations ever receive enough funding. We might argue, however, that NASA has not lacked for funding in the past and so one position one can take is to argue that we can use this as an important driver to help develop a new technology for automated seafloor exploration that all of us would benefit from.



*Figure 16: A working model (2004) of a driver for future automated seafloor exploration.*

And to show how far we've come in the last decade this is a slide (Figure 15) showing an artist

expression that I saw hanging in one of the hallways when I joined the Southampton Oceanography Centre of the ambition of what would happen in the coming decade to build a driver that could go and carry out exploration of the deepsea and because it would not be tied to a ship, it could even swim under the icecap and come back out to report what discoveries it had made.

We are pleased to report that ten years on, such vehicles now exist. For example this is Autosub (Figure 16), a vehicle made at the Southampton Oceanography Centre. It has a range of about 1000km and can dive to a few hundred metres. We are however, building one that will go to deep ocean depths although there are others that already have that capability. This will soon be taken for its second season working under the icecaps off Greenland.

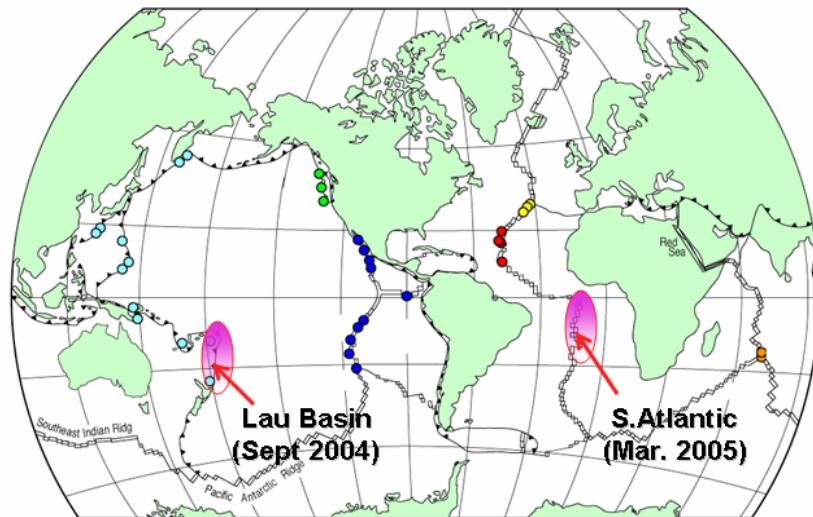


Figure 17: First autonomous underwater vehicle exploration for vent sites.

To close, I want to show you that technology has all the capability that we want to go and carry out hydrothermal vent exploration. In terms of carrying out further exploration in remote parts of the world's oceans, it is definitely going to be an important technology to develop for the future. We actually have projected plans this year and the next in the West Pacific and the South Atlantic where the expeditions I am involved in are going to be going out for the first time using exactly this kind of autonomous vehicle technology,

equipped with appropriate sensors, to carry out independent automated discovery of new vent sites in different parts of the ocean for the first time. §

(C) ***DEEP OCEAN ENVIRONMENT AND THE PROTECTION OF ITS BIODIVERSITY***

*Dr. P. John Lamshead (the United Kingdom)\**

---

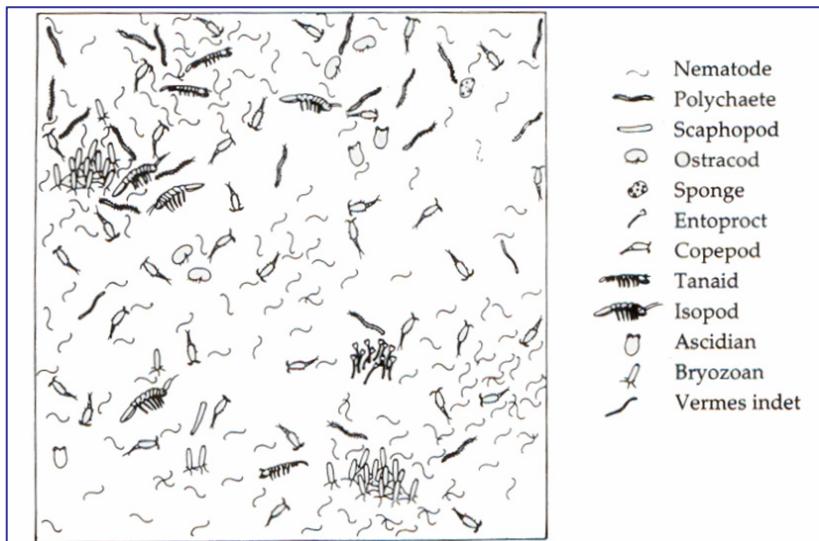
I was very interested in hearing the talk of the Prime Minister yesterday about what Jamaica has given the world. I just like to point out before I start that the Natural History Museum is part of the British Museum and the British Museum started here in Jamaica so Jamaica has also given the British Museum to the world.

Now my function is what you may call a blue skies research scientist. I am not concerned with anything practical. My job is to think about the evolution of life on earth and how it interacts with global climate change and to try and understand the processes that control biodiversity.

I was invited by the ISA a few years ago to comment on the monitoring of biodiversity in the deep sea, and this is one of the subjects I will talk to you about today. I would like to show you when practical things come in - what I call scientific spiral. The International Seabed Authority really, is monitoring protocols for practical purposes. So when they consult people like me, we tend to go through a policy of looking at what they require. Often we have to go back to original research to find the basic knowledge which will answer their questions. We then move to monitoring research which means we try and take that knowledge and apply it, and then we offer advice on how to produce monitoring protocols. But the point is that this spiral goes round and round- it's not a one-off.

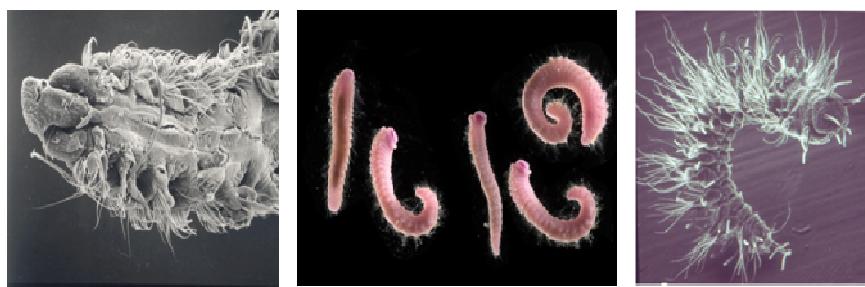
---

\* Head of Nematology, The Natural History Museum, London, the United Kingdom.



*Figure 1: Some of the deep-sea animals living in the sediments.*

Most animals of the deep-sea live in the sediments and are invisible to cameras. If you take a piece of deep-sea mud, this is what you see when the mud is stripped away (Figure 1). You get all these various animals, you see, including Vermes Indet which means unknown worm. Now this is quite important. You will see the most common animals such as the Nematode and Polychaete worms. Now if you are a marine biologist studying marine biology, what it teaches you about the mind of God is “an inordinate fondness of worms”.



*Figure 2: Polychaetes worms.*

These scanned electron pictures, magnified many times are those of polychaete worms which are large worms. The tube worms that Professor German was showing us previously evolved from these.



Figure 3: Nematodes.

These are the most abundant animals on earth. And what I work on, something like 80 or 90% of all animals on the earth are worms. So as we say in my business, at the first approximation, four-fifths of all animals are Nematodes, one-fifth Beetles and the rest are too rare to worry about.

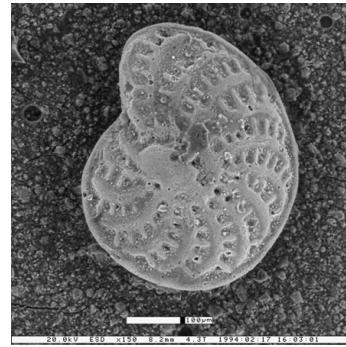
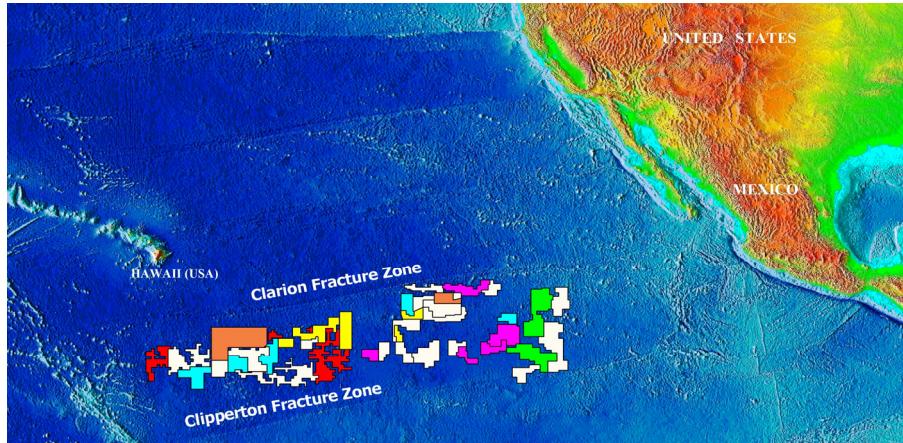


Figure 4: Benthic Foraminifera.

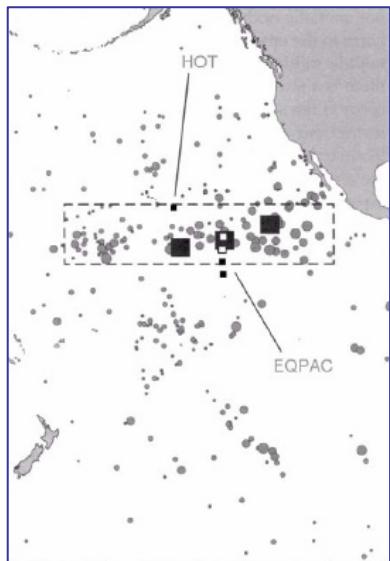
Figure 4 incidentally is magnified 400 times. These are small animals. And lastly, the Kaplan Project which includes small animals called foraminifera which are also very important in deep sea sediments.

When I first came here to the International Seabed Authority, I was asked what we knew about deep-sea biodiversity. This is important if we are going to monitor and conserve the animals living in this environment with regard to mining. We said “taxonomy”, which is the classification and identification of the organisms. I told them that they would be dealing with 10 million animals with each covered on few kilometre ranges. We told them we didn’t understand the biodiversity processes and we had no idea about the effects of mining because we had never tried.



*Figure 5: Clarion-Clipperton Fracture Zone.*

The main mining area in the Pacific is Hawaii, Mexico and those blocks depict mining zones. Now I told the officials that we knew next to nothing about the biodiversity of this region, but it was a long time before I actually saw a map. I am not an oceanographer, I am a nematologist, and I am never thinking in terms of global maps. But when I saw the map, I was quite astonished because something had happened.

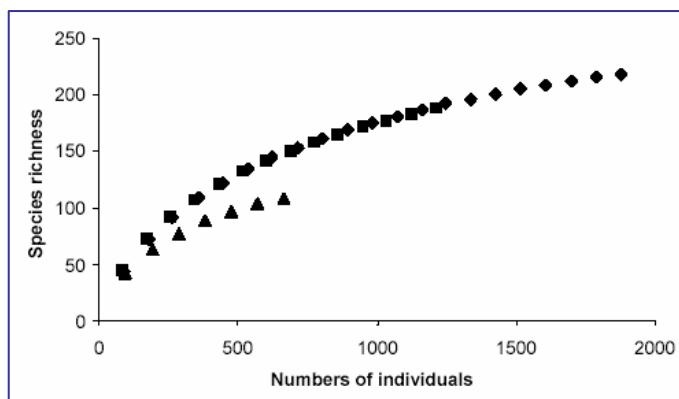


*Figure 6: Eqpac Project – 3000km study across the CCFZ.*

This is the Eqpac Project led by the University of Hawaii which Natural History Museum participated in, and we had two PhDs, one in nematodes and one in polychaetes. We drove a 3,000 kilometer transect for purely science ecological reasons. The data was not in any useable form because it had been taken for an entirely different purpose so when I discovered this I started writing the data putting it into new format and I came up with new analytical methods

which we could use to analyze the data and answer the International Seabed Authority's questions. The results I got were incredible, and are shown in the mathematical analysis graphed in Figure 7.

*Figure 7: Species Accumulation Curves – approx. 70% species in common across 300km.*



Why is this a species accumulations curve? You move from zero to 3,000 kilometers, you count the number of individuals and then you pull out the increased new species. This was not easy because these are all unknown animals and the data had to be cross-referenced so that we knew whether the animals are the same in one sample or samples some thousands of kilometers away. The curve covers 3,000 kilometers and indicates species accumulation showing 250 species. Could you imagine this being extrapolated across the world! You can see why I was absolutely astonished and why this became one of my two major research projects.

We also found that across the 3,000 kilometers transact, around 70% of the species were exactly the same at each of the transact. These had ranges that were in the thousand of kilometers. Why it is so important? It showed the entire theory of what the deep sea looked like was wrong, and that's why the blue skies scientists got very excited by the International Seabed Authority's problem.

The first thing we do as scientists is that we get results and these results are published. Nothing is real in the scientific literature until it is published in a peer-group-reviewed international journal, which means it is sent out to a reputable journal which then sends it to experts in the field. The experts check if the material is of a good standard, the level of interest and that it meets the scientific standards. The first paper we published was simply a description - I

basically showed a graph with the description of the animals and how we got there. I was invited by the Journal of Biogeography to write a guest editorial and at this point I brought in the Paris Museum. This was really spreading now because I had a lot of deep sea data while they had personal data. We did a comparison of marine nematode, deep-sea biodiversity - hyperdiverse or hype? (*Journal of Biogeography* 30 (4): pp.475-485), and discovered that with the data we had, the highest diversity was the English Channel, the second highest was the Tropical Reefs of the New Caledonia and the deep-sea came way behind - totally against ecological biodiversity theory!

Our initial conclusions sent back to the International Seabed Authority was that the Authority was dealing with millions of species. These species have large ranges. Why they are so important is that if you have a narrow range you are on the edge of extinction. I work in evolution, and for me, narrow range equals extinction. A large range of species means that they are going to be robust to things like deep-sea mining. This is an important fact. Our results however, were based on using light-microscope studies to magnify 1,000 times using the very latest and artificial imagery. We were criticized arbitrarily using light microscope studies, and we were asked whether our taxonomy and identification was good enough.

The problem was that if we wanted to use light microscope for monitoring of these organisms, it will not work. It takes too long. We are talking about microscopic animals, each of which has to be extracted from the mud, prepared, mounted on a glass slide and studied under a 35,000-pound microscope for about half an hour. Furthermore, you may have to study 10,000 to do a monitoring exercise. The cost is incredible because you are using highly trained specialists and there are only 20 people in the world who can do it. There are not enough people even to train people. And those 20 people are pure scientist like myself, who frankly have other things to do instead of training people.

What's the solution to a pure science problem to check whether we are right and to developing a monitoring method? The solution is to use new technology. We call it molecular bar-coding. I am not going to bore you with details as it is full of acronyms. It's similar to bar-coding in the supermarket except you use the DNA of the organism, the molecule of life to barcode the organism. This is a new idea for the Natural History Museum and can be used as an identification procedure. What we've done is we go out to the pure

scientist research bodies (e.g., NERC) to develop the methods to bar-coding. We started with the British coastal animals because we know about them. We basically work on the tree of life for these organisms. We get a grant from a mining company in which they take samples for us as part of their monitoring exercises to allow us to develop these methods and move them into deep sea animals. We also got a grant from the Kaplan Foundation (a group of pure scientists) to test our previous morphological studies by going back to the Pacific and taking new molecular friendly samples because they're designed for molecular analysis. And we're going to bar-code nematodes, polychaetes and foraminifera right across the CCZ mining area.

What is the advantage of a new technology? It's cheap compared to using highly paid experts. It's very fast. You can do the entire sample in 48 hours whereas it used to take 3 months to examine a sample under light microscope. The skills are used globally. Every country in the world, (developing or developed) has molecular labs. And where exact skills are not available, people can be trained easily. The objective in a legal sense is that each time you specify a certain chemical probe, you specify what the law allows and what people have to do so that every time you do it you get the same answer for the same samples, so it is wonderful for legislation. When we finish doing the bar-coding, we will have one of the most effective, efficient, sophisticated and

totally globally distributed monitoring network. It will be the best that ever been devised for anything and will be absolutely cutting edge technology.

Immediate Partners	 <small>THE NATURAL HISTORY MUSEUM</small>
<ul style="list-style-type: none"> <li>• British Antarctic Survey</li> <li>• Museum Nationale d'Histoire Naturelle</li> <li>• Plymouth Marine Lab</li> <li>• Southampton Oceanography Centre</li> <li>• The Natural History Museum</li> <li>• University of Edinburgh</li> <li>• University of Hawaii</li> <li>• University of Oslo</li> </ul> <p>Plus many others including Oceanographic Research Vessels from France, Korea and Japan.</p>	

*Figure 8: Immediate Partners.*

We are working with the British Antarctic Survey's molecular biologists, Paris Museum,

who are experts in identification, Plymouth Marine Labs' ecologists, SOC's molecular barcoding experts, University of Hawaii, one of the best Oceanography Institutes in the world, University of Oslo. Also, France, Korea and Japan have given us time on their boats. This multi-national project has allowed us to hitch a ride on their oceanographic vessels.

The next generation of my papers from the molecular barcoding and Oslo modeling are now “in press”. Pure science ends with modeling, prediction of the future and the mathematicians of the University of Oslo have just lately moved onto the project for which I have just submitted a paper to the journal *Science*.

What does the future hold? Our objective is to develop a cost-effective monitoring strategy to protect deep-sea biodiversity. It means more turns on the scientific spiral, more pure research grants from NERC UK, NSF USA and CNRS France and more publications. The killer paper (key paper) on deep-sea biodiversity is going to be produced by the end of June for the Royal Society Journal. After that we have to go for international development grants. This is different from pure research grants and that’s where I start to slide out of the picture and other people move in because they will be for technology development training and dissemination.

What’s the take-home message from this talk? You have a group of some of the best pure research scientists in the world in places like the Paris Museum and the University of Hawaii. The reason why these pure scientist labs have been involved are the very simple questions that the International Seabed Authority set a few years ago which has turned out to have incredible repercussions for our basic knowledge of global biodiversity.

The International Seabed Authority’s work has started to cause a revolution in the paradox about what we think we know about the evolution of life. This is very important, because if the deep-sea turns out to be different from the way we thought, it means our understanding of the evolution of biodiversity is different from the way we thought. And this isn’t just the deep-sea, we may have to look at the rain forests again. The deep sea and rain forests are rather similar. That is why I have been so excited by this project as the whole career of a pure research scientist depends on publishing papers. I don’t get paid to develop methodology, it has nothing to do with me. My career depends on those published papers and yet this is one of the most exciting projects I have been involved with in the past 10 years. The fact that so many other research labs are also involved shows the importance. So the International Seabed Authority deserves congratulations because by asking the right questions, they have stimulated a revolution of science. And that’s what science is about: asking the right questions. Asking a stupid question gets a stupid answer but ask

a fundamental question and you start to overturn your knowledge. I think this is the point where I leave you guys.

Thank you for the attention.

### **Research Publications**

- Lambshead PJD, Brown CJ, Ferrero T., Mitchell N, Hawkins LE & CR Smith (2003) Biodiversity of nematode assemblages from the Clarion-Clipperton Fracture Zone, an area of commercial mining interest. *BMC Ecology* 3:1
- Lambshead PJD, Boucher G. (2003) Marine nematode deep-sea biodiversity – hyperdiverse or hype? *Journal of Biogeography* 30 (4): 475-485
- Rogers AD, Lambshead PJD (*in press*) Molecular studies of nematode diversity; past, present and future. In: Cook, R. & Hunt, D.J. (Eds). *Proceedings of the Fourth International Congress of Nematology*, 8 - 13 June 2002, Tenerife, Spain. *Nematology Monographs and Perspectives* 2, in press
- Ugland KI, Lambshead PJD, Gray JS (*submitted*) Modelling species abundance distributions; niche theory, complexity and dimensionality. *Science*. §

---

**(D) THE DEEP-OCEAN ENVIRONMENT AND THE PROTECTION OF ITS BIODIVERSITY: HIGH-SEAS HABITATS: BIODIVERSITY, EXPLOITATION AND CONSERVATION**

*Dr. Brian J. Bett (the United Kingdom)*

---

### **Introduction**

This presentation continues the deep-ocean environment and the protection of its biodiversity theme, examining high-seas habitats: their biodiversity, exploitation and conservation. As a starting point I will use a document I presented at a Law of the Sea meeting in New York in 2001<sup>1</sup>. In

- 
- DEEPSEAS Benthic Biology Group, George Deacon Division, Southampton Oceanography Centre, Empress Dock, Southampton SO14 3ZH UK. Tel. +44 23 80596355, Fax +44 23 80596247, E-mail bjb@soc.soton.ac.uk, Web <http://www.soc.soton.ac.uk/GDD/index.html>

that document my colleagues and I identified a number of deep-sea areas, that we variously termed geographic features, habitats and biological communities that have particular scientific, societal or commercial interest (see Box 1).

**Box 1: Deep-sea areas, geographic features, ‘habitats’ and biological communities of scientific, societal or commercial interest.**

- Cold seeps and pockmarks
- Deep-sea trenches
- Deep-sea ‘coral reefs’
- Gas hydrates
- Hydrothermal vents
- Polymetallic nodules
- Seamounts
- Submarine canyons

### **High Seas Habitat Types**

A number of these ‘habitats’ are, however, of rather limited (if any) occurrence in high-seas areas. Cold seeps and pockmarks, deep-sea trenches, gas hydrates and submarine canyons are typically features of continental margins and are, therefore, likely to occur within national EEZs. For the purposes of this presentation there are four high-seas habitats of particular significance: deep-sea ‘coral reefs’, hydrothermal vents, polymetallic nodules and seamounts.

In considering hydrothermal vents, it is sensible to also include mid-ocean ridge environments more generally. Indeed, in terms of the nature of the habitat and the appropriate means of study, mid-ocean ridge and seamount habitats can be grouped together. To further simplify matters, in terms of high-seas areas, the occurrence of deep-sea coral reefs is primarily associated with seamount and mid-ocean ridge habitats.

---

<sup>1</sup> Baker, M.C., Bett, BJ, Billett, DSM and Rogers, AD, 2001. Part 1. An environmental perspective. In: (Eds WWF/IUCN/WCPA). The status of natural resources on the high seas. WWF/IUCN, Gland, Switzerland.

The final habitat of interest, polymetallic nodules, is one that should be considered with the encompassing habitat of deep-sea mud itself. Although lacking in obvious complexity and often lacking in obvious animal life, deep-sea mud provides critical ecosystem services and is a storehouse of biological diversity that should certainly not be ignored in any assessment of high-seas habitats<sup>2</sup>.

In summary, there are then two primary high-seas habitat types to consider further (Box 2). The polymetallic nodules and deep-sea mud habitat can be characterised as a primarily soft substratum habitat<sup>3</sup> that is home to many species of worm. The vents, ridges and seamounts, in contrast, are primarily a hard substratum habitat and they are home to many exotic and charismatic forms of marine life. The presence of these exotic and charismatic life forms, e.g. vent life and deep-sea coral reefs, is an important political consideration – these habitats are likely to engage more public concern and more attention by non-governmental organisations.

Box 2: High-sea habitat types	
<b>Habitat type 1:</b>	Hydrothermal vents + mid-ocean ridges Seamounts
<b>Character:</b>	Primarily a hard substratum habitat, and home to many exotic and charismatic forms of marine life
<b>Habitat 2:</b>	Polymetallic nodules + deep-sea mud
<b>Character:</b>	Primarily a soft substratum habitat, and home to many species of worms

---

<sup>2</sup> Baker, M.C. & Bett, B.J., 2001. Deep-Sea Mud. Section 2.12, pp. 77-87. In: Gubbay, S., 2002. The Offshore Directory. Review of a selection of habitats, communities and species of the North-east Atlantic. WWF-UK.

<sup>3</sup> Polymetallic nodules do provide a hard substratum habitat, but it is not of a scale or character equivalent to that found on mid-ocean ridges and seamounts.

## Protecting High-Sea Habitats

Having identified the habitat types of interest, is there a need for concern? Do we need to be considering protective measures for these high-seas habitats? There are three tests that can be applied (Box 3). Is there something worth protecting; initially, this is a question for the scientific community, although ultimately this has to be answered by the wider community – hopefully guided by scientific advice. Secondly, we need to establish that there is a real threat and finally, there are the practical considerations – are there appropriate legal instruments to enable protective measures and what the practical realities are of enforcing a protective regime on the high seas?

Considering whether high-seas habitats are worth protecting, we need to acknowledge the limitations of our current knowledge and understanding of these environments. That could lead us to a number of general principals that are already incorporated in the Law of the Sea and in the work of the International Seabed Authority. Concepts such as “global stewardship” and the “precautionary principle” come to mind.



*Figure 1: High seas habitats under threat.*

What is the reality of threats to these high-seas habitats? There can be a threat from intensive scientific study – this problem is already acknowledged by the scientific community in the case of hydrothermal vents and a voluntary code of practice exists to mitigate this impact. “Bioprospecting” – the search for and exploitation of animals for pharmaceutical, genetic and other biotechnological gain, is certainly a threat. In the high-seas case the microbial communities at hydrothermal vents and long-lived sessile organisms, such as sponges and corals, on mid-ocean ridges and seamounts are certainly targets for bioprospecting. And there are of course potentially exploitable mineral resources – polymetallic sulphides and cobalt crusts found on mid-ocean ridges and seamounts. And finally there is the very real danger from high-seas

fisheries. Bottom trawling is highly destructive and has already severely depleted deep-sea fish stocks and destroyed fragile biological communities. As a result, several nations are now implementing protective measures within their EEZ limits (e.g. UK, Portugal / Azores, New Zealand, Canada, United States etc).

<b>Box 3: The need for protection?</b>
<b>1. Something worth protecting</b>
Limited scientific knowledge and understanding
Global stewardship
The precautionary approach
<b>2. Something under threat</b>
Threat from intensive scientific study
Threat from 'bioprospecting'
Threat from mineral resource exploitation
Threat from high-seas fisheries
<b>3. Something that can be protected</b>
Tragedy of the commons
Practicalities
Article 192: General obligation. States have the obligation to protect and preserve the marine environment.

As noted above, some individual nation states are now beginning to protect their own deep-water habitats. Are similar protective measures possible on the high-seas? As a commons resource, the high-seas are subject to the "tragedy of the commons"<sup>4</sup>; avoiding such a tragedy requires a common (i.e. global) approach to environmental management on the high-seas. There are undoubtedly practical difficulties to implementing and policing a high-seas-wide environmental policy. However, the United Nations, the International Seabed Authority and the Law of the Sea provide a natural starting point.

---

<sup>4</sup> Hardin, G., 1968. The tragedy of the commons. *Science*, **162**, 1243-1248.

Article 192 of the Law of the Sea indicates a general obligation on states to “protect and preserve the marine environment”. The use of the term “environment” suggests that this protection should be afforded to both species and habitats. Article 194, although related to marine pollution also indicates the need to “protect and preserve rare or fragile ecosystems as well as the habitat of depleted, threatened or endangered species and other forms of marine life”. The United Nations Department of Economic and Social Affairs Agenda 21<sup>5</sup> specifically considers the “protection of the oceans” and the “conservation of marine living resources on the high seas”.

### The Study of High Seas Habitat

As indicated above, our current knowledge and understanding of high-seas habitats is somewhat limited. There is a need to further assess the structure and function of high-seas habitats and to examine the nature and effect of potential threats to these habitats. The International Seabed Authority has already served as a focus and driver for such research in the polymetallic nodules (and deep-sea mud) habitat, what of hydrothermal vent / mid-ocean ridge / seamount habitats?

There are a number of national, regional and international initiatives that are currently targeting research to these high-seas habitats. Key among these is the Census of Marine Life (CoML). The Census is a growing global network of researchers in more than 50 countries engaged in a ten-year initiative to assess and explain the diversity, distribution, and abundance of life in the ocean and explain how it changes over time. In the case of high-seas habitats, there are two current CoML projects that are particularly relevant:

#### *Hydrothermal vents - ChEss: Biogeography of Chemosynthetic Ecosystems*

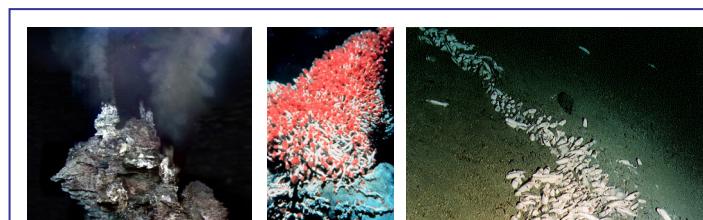
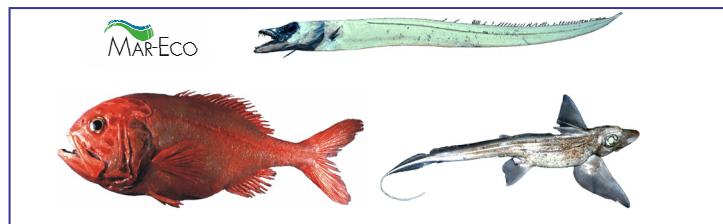


Figure 2:  
Hydrothermal  
vents.

<sup>5</sup> Chapter 17, Section C.

The aim of ChEss is to improve our knowledge of the diversity, abundance and distribution of vent and seep species at a global scale and to understand the processes driving these ecosystems.

#### *Mid-ocean ridges - MAR-ECO: Mid-Atlantic Ridge Ecosystem Project*

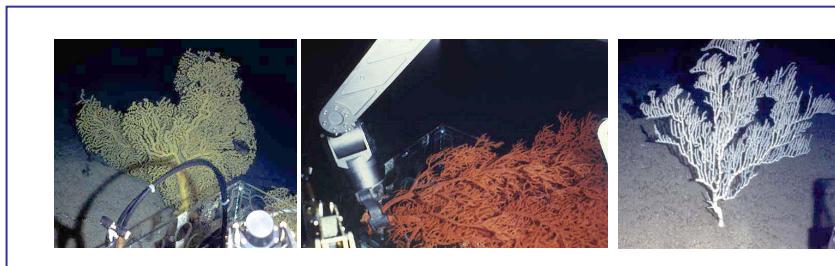


*Figure 3: Mid-ocean ridge organisms.*

MAR-ECO aims to describe and understand the patterns of distribution, abundance and the trophic relationships among the organisms inhabiting the waters over and around the mid-Atlantic Ridge.

#### *CoML Seamount Programme*

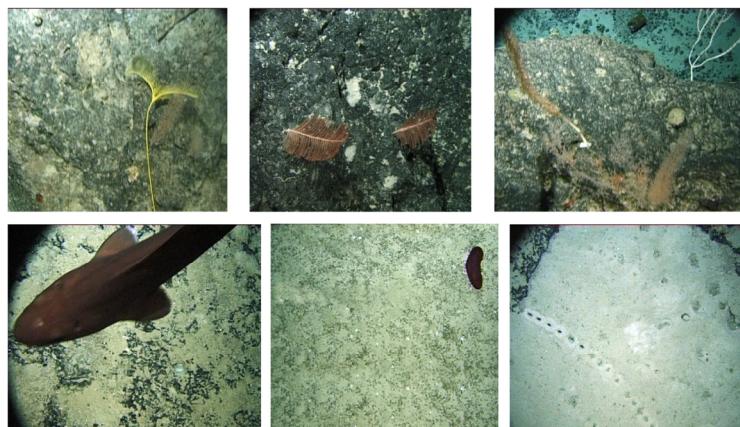
The CoML project on seamounts is currently at the planning stage. Other international seamount projects are already in progress include the OASIS Study.



*Figure 4: Seamounts may play a key role in maintaining biodiversity because they have high levels of endemism and may serve as stepping-stones for trans-oceanic dispersal, as refugia for species with contracting ranges, and as "hot spots" of speciation.*

### *OASIS – Oceanic Seamount: an Integrated Study*

OASIS is a European Community funded integrated, multidisciplinary study of two North Atlantic Seamounts (Seine and Sedlo). This project includes a specific objective concerning the “application of scientific knowledge to practical conservation”.



*Figure 5: Oceanic seamounts – an integrated study.*

### **Summary**

<b>High-Seas Habitats: biodiversity, exploitation and conservation</b>	
<b>Biodiversity</b>	is not well understood is the subject of active international research programmes
<b>Exploitation</b>	is current and has future potential is likely to require management
<b>Conservation</b>	will require global scale cooperation the UN / International Seabed Authority has a key role to play

## **Supporting Resources**

Southampton Oceanography Centre, [www.soc.soton.ac.uk/](http://www.soc.soton.ac.uk/)  
The Status of Natural Resources on the High-Seas,  
[www.iucn.org/themes/marine/pdf/highseas.pdf](http://www.iucn.org/themes/marine/pdf/highseas.pdf)  
UNCLOS, [www.un.org/Depts/los/convention\\_agreements/texts/unclos/closindx.htm](http://www.un.org/Depts/los/convention_agreements/texts/unclos/closindx.htm)  
Agenda 21, [www.un.org/esa/sustdev/documents/agenda21/index.htm](http://www.un.org/esa/sustdev/documents/agenda21/index.htm)  
Census of Marine Life, [coml.org/coml.htm](http://coml.org/coml.htm)  
ChEss, [www.soc.soton.ac.uk/chess/](http://www.soc.soton.ac.uk/chess/)  
MAR-ECO, [www.mar-eco.no/](http://www.mar-eco.no/)  
Seamounts, [seamounts.sdsc.edu/](http://seamounts.sdsc.edu/); [www.rzz.uni-hamburg.de/OASIS/welcome.htm](http://www.rzz.uni-hamburg.de/OASIS/welcome.htm) §

---

### **(E) SOME CONSIDERATIONS ON FUTURE DIRECTIONS FOR THE INTERNATIONAL SEABED AUTHORITY**

*Tullio Scovazzi \**

---

#### **1. Introduction and Summary**

Ten years after the entry into force of the United Nations Convention on the Law of the Sea (Montego Bay, 10 December 1982), the International Seabed Authority is undergoing a critical phase.

Despite the signature of seven contracts for exploration activities, the date on which commercial exploitation of mineral resources from the Area can start appears for economic reasons much more remote than it was believed at the time of the negotiations for the United Nations Convention on the Law of the Sea (UNCLOS). Other mineral resources, such as cobalt crusts and polymetallic sulphides, may offer more promising, albeit still uncertain, prospects.

On the contrary, the exploitation of genetic resources, which is likely to become the most immediate and profitable activity taking place on the deep seabed, falls outside the mandate of the International Seabed Authority (the Authority).

---

\* Professor of International Law, Faculty of Law, University of Milano-Bicocca, Milan, Italy.

This paper elaborates on the innovative scheme of common heritage of mankind embodied in the UNCLOS for the Area and its subsequent adaptation to meet further political and economic realities. It emphasizes that, despite the present uncertain situation, the International Seabed Authority's mandate is already broader than it is commonly believed. The legal condition of the space (the Area), its being the common heritage of mankind, may have an attraction also on matters and activities that (though different from minerals and mining activities) are located in that space. For instance, while bioprospecting is not specifically regulated by the UNCLOS, there is an inextricable factual link between the protection of the deep seabed environment, including its biodiversity, marine scientific research and bioprospecting. This means that the Authority, the principles that it represents, as well as its already existing competences and responsibilities, need to be taken into consideration when States decide to fill the legal gap of bioprospecting. The role of the Authority could be expanded in the future to meet new objectives under commonly agreed cooperative schemes.

## **2. The Original Idea of Common Heritage of Mankind**

The main innovation included in the UNCLOS, with respect to the previous law of the sea regime, is the idea of the common heritage of mankind. This idea presupposes a third kind of regime which is different from both the scheme of sovereignty, which applies in the territorial sea, and the scheme of freedom, which applies on the high seas.

The idea of the common heritage of mankind was launched in a memorable speech made at the United Nations General Assembly on 1 November 1967 by the representative of Malta, Mr. Arvid Pardo. The practical opportunity for proposing a completely new regime was given by the technological developments which were expected to lead in a relatively short time to the commercial exploitation of polymetallic nodules lying on the surface of the deep seabed and containing minerals such as manganese, nickel, cobalt and copper .

The application of the scheme of sovereignty was likely to lead to a series of competitive extensions of the limits of national jurisdiction on the sea bed. The application of the scheme of freedom was likely to lead to a rush towards the exploitation of economically and strategically valuable minerals falling under the regime of freedom of the high seas ("first-come-first-served"

rule). According to Mr. Pardo's speech, the consequences of both possible scenarios would have been equally undesirable. They would have ranged from political tension to economic injustice and risks of pollution. In a few words, "the strong would get stronger, the rich richer".

The word "heritage" itself, which renders the idea of the sound management of a resource to be transmitted to the heritors, was preferred to the word "property", as the latter could have recalled the *jus utendi et abutendi* (right to use and misuse) that private Roman law gave to the owner. The basic elements of the regime of common heritage of mankind, applying to the seabed beyond the limits of national jurisdiction, are the prohibition of national appropriation, the destination of the Area for peaceful purposes, the use of the Area and its resources for the benefit of mankind as a whole with particular consideration for the interests and needs of developing countries, the establishment of an international organization entitled to act on behalf of mankind in the exercise of rights over the resources.

### **3. The Transposition of the Original Idea in the UNCLOS**

All the elements mentioned above can be found in Part XI of the UNCLOS ("The Area"). The Area and its resources are the common heritage of mankind (Art. 136). No State can claim or exercise sovereignty over any part of the Area, nor can any State or natural or juridical person appropriate any part thereof (Art. 137, para. 1). The Area is open to use exclusively for peaceful purposes (Art. 141). All rights over the resources of the Area are vested in mankind as a whole, on whose behalf acts the Authority, the international organization created by the UNCLOS (Art. 137, para. 2). Activities in the Area are carried out for the benefit of mankind as a whole, irrespective of the geographical location of States, whether coastal or land-locked, and taking into particular consideration the interests and needs of developing States (Art. 140, para. 1). The Authority provides for the equitable sharing of financial and other economic benefits derived from activities in the Area through an appropriate mechanism (Art. 140, para. 2).

The UNCLOS regime allows for mining activities by the Enterprise, States parties, State enterprises, natural or juridical persons which possess the nationality of State parties or are effectively controlled by them or their nationals, when sponsored by such States (Art. 153, para. 2). The key element of the regime is the reservation of areas (Art. 8 of Annex III), according to

which applications shall cover a total area divided into two parts of equal estimated commercial value to allow two mining operations. The Authority designates which part is to be reserved solely for the conduct of activities by the Authority through the Enterprise or in association with developing States.

However, the concrete translation of the idea of common heritage of mankind into the written text of UNCLOS does not fully reflect all the aspects included in the original proposals by Malta. Under the draft ocean space treaty elaborated by Malta in 1971, all the natural resources, whether living or non living, existing in the international ocean space beyond the 200-mile limit would be managed by the International Ocean Space Institutions, to ensure the equitable sharing by all States of the benefits derived from the development of these resources and taking into particular consideration the interests and needs of poor countries, whether land-locked or coastal (Art. 91, para. 7). Within the 200-mile limit, corresponding to the national ocean space (or, according to the present terminology, the exclusive economic zone), the coastal State would be bound to make contributions to the international community in exchange for the financial benefits derived from the extension of its rights on the resources contained therein .

These aspects of the Maltese proposal were not retained in the UNCLOS regime for the Area. The resources to which the principle of common heritage applies are limited to the mineral resources. The contributions that the coastal State is called to make through the Authority regard the exploitation of the non-living resources of the continental shelf beyond (and not within) the 200-mile limit (Art. 82).

The differences between the proposal by the promoter State and the regime resulting in the UNCLOS do not detract from the importance of the ideal achievement embodied in the concept of common heritage of mankind. For the first time in the historical development of international law of the sea a regime based on the management of resources by an international organization was included in a treaty of codification. The UNCLOS regime is a major departure from the usual approaches based on the opposing schemes of either freedom or sovereignty. The common heritage of mankind is a third conceptual option, a *tertium genus*, which applies to a particular kind of resources located in a specific marine space. It does not eliminate the traditional notions of freedom and sovereignty for the remaining resources and the remaining marine spaces. But it provides for a completely innovative and much more equitable approach.

#### **4. The Transposition of the Original Idea in the 1994 Agreement**

The UNCLOS entered into force on 16 November 1994, twelve months after the date of deposit of the sixtieth instrument of ratification or accession (Art. 308, para. 1). As at May 2004 the parties to the UNCLOS are 145, namely 144 States and one international organization (the European Community).

However, the text of the UNCLOS was not adopted by consensus. It was submitted to vote after all efforts to reach consensus had been exhausted. It received 130 votes in favour, 4 against and 17 abstentions. Many developed States were among those which cast a negative vote or abstained.

The main criticisms were addressed to the regime of the Area. According to many industrialized States, the UNCLOS regime would have discouraged mining activities by individual States and private concerns, unduly favoured the monopoly of activities by the Enterprise, burdened the contractors with excessive financial and other obligations relating also to the field of transfer of technology, and disregarded the interests of industrialized countries in the decision-making procedures of the Council, the executive organ of the Authority.

In 1994 it was clear that the UNCLOS was expected to enter into force formally without the participation of many developed countries that is the only States having the technological and financial capability required to engage in deep seabed mining activities. To avoid the substantial failure of the regime based on the principle of common heritage of mankind, the United Nations promoted a new negotiation on Part XI of the UNCLOS. It resulted in the Agreement Relating to the Implementation of Part XI of the UNCLOS, which was annexed to Resolution 48/263, adopted by the General Assembly on 17 August 1994.

Resolution 48/263, while reaffirming that the Area and its resources are the common heritage of mankind, recognizes that political and economic changes, including in particular a growing reliance on market principles, have necessitated the re-evaluation of some aspects of the regime for the Area and its resources.

The prudent label of "implementing agreement" covers the evident reality that in 1994 further aspects of the original concept of common heritage of mankind were changed in their form and substance to meet the hope for universal participation in the UNCLOS. The provisions of the 1994 Implementation Agreement and those of Part XI of the UNCLOS are to be "interpreted and applied together as a single instrument" (Art. 2). However, in the event of any inconsistency between the 1994 Implementation Agreement and Part XI, the provisions of the former prevail.

Several aspects of the 1994 Implementation Agreement show its market-based approach. For instance, the obligation of State Parties to finance deep seabed mining operations of the Enterprise is abrogated and the independent operating of the Enterprise is delayed until it is able to conduct mining operations through joint-ventures. A contractor who has contributed a particular area to the Authority as a reserved area has the right of first refusal to enter into a joint-venture arrangement with the Enterprise for exploration and exploitation of that area. If the Enterprise does not submit an application for a plan of work for activities with respect to a reserved area within 15 years, the contractor who contributed the area is entitled to apply for a plan of work for that area, provided that it offers in good faith to include the Enterprise as a joint-venture partner. It is provided that the system of payments to the Authority shall be fair both to the contractor and the Authority, subject to periodic revision in the light of changing circumstances and based on rates of payments within the range of those prevailing in respect of land-based mining of the same minerals. The Enterprise and developing States wishing to obtain technology for deep seabed mining shall seek to obtain it on fair and reasonable commercial terms and conditions on the open market or through joint-venture arrangements. The decision-making procedure by the Council is modified by the introduction of the rule that, if all efforts to reach consensus have been exhausted, decisions on questions of substance are taken by a two-thirds majority, provided that such decisions are not opposed by a majority in any one of the chambers. This means that any of the five chambers of States established under Part XI of the UNCLOS (for example, the chamber composed of four from among the major consumer or importer States) can veto the taking of decisions by the Council.

Following the adoption of the 1994 Implementation Agreement, the UNCLOS has achieved an almost universal participation. However, the exception of the United States remains. The main industrialized country and

the main potential investor in the field of deep seabed mining is not yet a party to the UNCLOS as modified by the 1994 Implementation Agreement (even if the prospects of ratification have increased in recent times).

While again adapted (or, under a less optimistic perspective, diluted) to meet further concerns and the political and economic realities, the principle of common heritage of mankind still applies. It is still a major source of inspiration for a codification treaty which was designed to: “*contribute to the realization of a just and equitable international economic order which takes into account the interests and needs of mankind as a whole and, in particular the special interests and needs of developing countries, whether coastal or land-locked*” (6th preambular paragraph of the UNCLOS).

## 5. The Present Uncertain Situation

For the time being, the organs of the Authority have started and developed their work. On 13 July 2000 the Assembly approved the Regulations on Prospecting and Exploration for Polymetallic Nodules in the Area (the so-called Mining Code). This has enabled the Authority to sign contracts for exploration with seven pioneer investors.

The exploration for mineral resources different from polymetallic nodules is also being considered. In 1998 the Russian Federation asked the Authority to develop regulations for hydrothermal polymetallic sulphides and cobalt-rich ferromanganese crusts, which seem more promising for their economic potentialities than the polymetallic nodules themselves. Specific rules, regulations and procedures for the exploration of sulphides and crusts are being drafted by the Legal and Technical Commission of the Authority. Huge concentrations of methane hydrates are also found in the Area and may fall in the future under the regulatory powers of the Authority.

However, the prospects for commercial mining of the deep seabed appear far less optimistic than they were in the past. As pointed out in the report submitted in 2002 by Mr. Nandan, Secretary-General of the International Seabed Authority, (*despite optimistic predictions made in the 1970s and 1980s, a number of factors have inhibited progress towards commercial exploitation of polymetallic nodule deposits. These factors include the hostile environment in which exploration and mining will take place both as regards the open-ocean surface environment and the great depths at which polymetallic nodule deposits*

*occur, the high costs involved in research and development of mining technology, and the fact that, under current economic conditions, deep seabed mining remains uncompetitive compared to land-based mining. As a result of these factors, the interest of the international consortia that were active in the 1970s in deep sea exploration has waned and the only entities that are currently actively conducting exploration activities are the seven contractors, mainly financed through government funding by sponsoring or participating States. In view of these factors, most of the efforts of the contractors are directed at technological research and development, long-term environmental studies and the collection and analysis of baseline data. Although a significant amount of basic and applied research has been carried out in the past or is still in progress, it is broadly accepted that the current level of knowledge and understanding of deep sea ecology is not yet sufficient to allow conclusive risk assessment of large-scale commercial seabed mining. Meanwhile, the prospects for commercial mining of the deep seabed remain uncertain).*

Yet a third and more equitable scheme (that is the common heritage of mankind), different from the schemes of either freedom or sovereignty has actually been conceived and has already been put in place under an international regime (the UNCLOS) to manage certain marine economic resources. But what seems to be missing now are the resources themselves to which it was intended to apply!

## **6. The Broad Mandate of Authority**

The question of the mandate of AUTHORITY deserves a closer scrutiny, especially if it is to be understood not only as an entity involved in marine mining activities in competition with others, but as the international organization which bears the main responsibility to realize a just and equitable economic order of the oceans and seas. In fact, it appears that the mandate of the Authority is already broader than it is commonly believed. Besides the main field of competence, it already encompasses matters which are more or less directly related to mining activities, such as the protection of the underwater cultural heritage, the protection of the marine environment, marine scientific research.

The term "activities" in the Area is narrowly defined in the UNCLOS referred to "*all activities of exploration for, and exploitation of the resources of the Area*" (Art. 1, par. 1). The resources of the Area are limited to "*all solid,*

*liquid or gaseous mineral resources in-situ in the Area at or beneath the sea-bed, including polymetallic nodules*" (Art. 133, a). But the space itself, i.e. the Area, is and remains the common heritage of mankind (Art. 136). This explains why the legal condition of the space, its being the common heritage of mankind, may have an attraction also on matters and activities that (though different from minerals and mining activities) are located in that space. Some notable instances are given hereunder.

(a) *Protection of the Underwater Cultural Heritage*

Archaeological and historical objects are definitely not "*resources*" of the Area. Far from being mineral natural resources, they are man-made objects. Nevertheless, when they are found in the Area, they are subject to a specific regime, provided for by Art. 149 of the UNCLOS: "*All objects of an archaeological and historical nature found in the Area shall be preserved or disposed of for the benefit of mankind as a whole, particular regard being paid to the preferential rights of the State or country of origin, or the State of cultural origin, or the State of historical and archaeological origin.*"

Article 149 may appear vague in its content and devoid of details that could ensure its practical application. It however shows a preference for those uses of archaeological and historical objects that promote the "*benefit of mankind as a whole*". Private interests, such as the search for, and use of, the objects for trade and personal gain are given little weight, if any.

Some categories of States which have a link with the objects (namely, the State of cultural origin, the State of historical and archaeological origin, the State or country of origin tout court) are given preferential rights, although Article 149 does not specify the content of these rights and the manner in which they should be harmonized with the concept of "*benefit of mankind as a whole*".

The recent Convention on the Protection of the Underwater Cultural Heritage (Paris, 2 November 2001), adopted within the framework of the United Nations Educational, Scientific and Cultural Organization (UNESCO), specifies (Article 12) how to achieve the objective of the benefit of mankind as a whole in this field. It sets forth a procedure of consultations between the Authority and the States that have a verifiable link to the heritage on how best to ensure its protection.

In this field, the legal condition of the Area has an attraction on non-mineral objects. Instead of being the property of those who found them ("first-come-first-served" rule, resulting from the principle of freedom of the sea), the underwater cultural heritage of the Area must be preserved or disposed of for the benefit of mankind as a whole.

(b) *Protection of the Marine Environment*

Several provisions of the UNCLOS show that the Authority has an important role to play in relation to the protection of the marine environment.

Under Article 145, the Authority shall adopt appropriate rules, regulations and procedures for inter alia:

- (a) the prevention, reduction and control of pollution and other hazards to the marine environment including the coastline, and of interference with the ecological balance of the marine environment, particular attention being paid to the need for protection from harmful effects of such activities as drilling, dredging, excavation, disposal of waste, construction and operation or maintenance of installations, pipelines and other devices related to such activities;
- (b) the protection and conservation of the natural resources of the Area and the prevention of damage to the flora and fauna of the marine environment.

The regulatory powers granted to the Authority are not limited to the harmful effects of those mining activities which belong to the typical field of competence of this organization. On the contrary, such powers are enlarged to encompass the protection and conservation of every kind of natural resource and all the fauna and flora which can be found in the Area.

Other provisions of the UNCLOS and the 1994 Agreement confirm the competence of the Authority in the field of the protection of the marine environment. The Mining Code devotes several provisions and the whole Part V to the protection of the marine environment. For instance, the precautionary approach has been included in the Code by a reference to the 1992 Rio

Declaration on Environment and Development and subject to the specific recommendations to be made by the Legal and Technical Commission.

On 4 July 2001 the Legal and Technical Commission approved the Recommendations for the Guidance of Contractors for the Assessment of Possible Environmental Impacts Arising from Exploration for Polymetallic Nodules in the Area. The Recommendations, *inter alia*, specify what kind of data the contractor should gather on natural conditions before exploration begins (so called baseline data), what information should be provided by the contractor to the Authority and what observations and measurements should be made by the contractor while performing a specific activity and after its performance.

As remarked by the Secretary-General of the Authority in a statement made on 27 November 2001 before the General Assembly of the United Nations, *"the objective of the reporting requirements under the contracts and the recommendations is not to unduly burden the contractors with unnecessary requirements, but to establish a mechanism whereby the Authority, and particularly the Legal and Technical Commission, can be provided with the information necessary to carry out its responsibilities under the Convention and the Agreement to ensure the protection of the marine environment from harmful effects arising from activities in the Area."*

Particularly interesting is the part of the Recommendations devoted to environmental impact assessment (EIA), which is based on two lists of activities. On the first list figure the activities "which have no potential for causing serious harm to the marine environment" and do not require an EIA. On the second list figure the activities which require prior EIA, as well as an environmental monitoring programme to be carried out during and after the specific activity.

Again, the legal condition of the space has an attraction in granting to the Authority broad competences relating to the protection of the environment of the Area as a whole. Such competences are not exclusive, as Article 209, para. 2, binds also States to *"adopt laws and regulations to prevent, reduce and control pollution of the marine environment from activities in the Area undertaken by vessels, installations, structures and other devices flying their flag or of their registry or operating under they authority, as the case may be."* However, such national legislation shall be no less effective than *"international rules, regulations and procedures established in accordance with Part IX"* that is the

regime established by the Authority. This means that the latter is granted a preferential role as regards the protection of the environment in the Area.

But, rather than insisting on legal intricacies, it is more useful to provide some information about what kind of environment can be found in the depth of the Area. Until recently, most human knowledge had been confined to the shallow waters of coastal zones. Now, humankind begins to have the technical possibilities to overcome the difficulties posed by activities in the deep-sea. Oases of life exist also on the deep seabed, which is not a desert despite extreme conditions of cold, complete darkness and high pressure. It is the habitat of diverse forms of life associated with typical features, such as hydrothermal vents, cold water seeps, seamounts or deep water coral reefs.

For instance, in 1977 it was discovered that some animal communities live in the complete absence of sunlight in the seabed where warm water springs from tectonically active areas (so called hydrothermal vents). Several species of microorganisms, fish, crustaceans, polychaetes, echinoderms, coelenterates and mollusks have been found in hydrothermal vent areas. Many of them were new to science. These communities, which do not depend on plant photosynthesis for their survival, rely on specially adapted micro-organisms able to synthesize organic compounds from the hydrothermal fluid of the vents (chemosynthesis). The discovery of hydrothermal vent ecosystems has given rise to a new theory as to how life originated on earth.

At the 2002 meeting of the Authority, delegates attended a seminar during which marine geologists and biologists presented the latest findings about polymetallic sulphides and cobalt-rich crusts and their environment. A biologist, Prof. Juniper, told of the unique characteristics of the fauna living exclusively in the sulphur-rich waters around underwater hot springs and to the risks to which it could be exposed: *"more than 500 new animal species have been described from deep-sea hydrothermal vents since their discovery in 1977. Deep-sea vents have a high scientific value because they contain a large number of endemic and unusual species and are refuges for close relatives of ancient forms of life. Because they are visually spectacular, extreme environments, vent ecosystems have generated widespread public interest and are a resource which can be used to inform the public about earth processes and the way in which scientists work. It is not currently possible to predict how rapidly vent sites may recover from mining operations. Some organisms will be directly killed by mining machinery, while others nearby risk smothering by material settling"*

*from plumes of particulate matter. Individuals surviving these perturbations would be subject to a radical change in habitat, and the exploited sites will have a lesser scientific and educational value. Long-lived vent fields that host the largest mineral deposits are likely to be the most ecologically stable and have the highest biodiversity. A concentration of mining activities at such sites could produce regional effects on biological processes and organisms abundance, to the point where the survival of some species could become an issue.”*

Besides mining, threats to seabed ecosystems may derive from a number of activities, such as marine scientific research, bioprospecting, oil and gas exploitation, geothermal exploitation, and tourism.

The unique characters of some seabed ecosystems (hydrothermal vents, cold water seeps, seamounts and deep water coral reefs) call for the application of Article 194, para. 5, of the UNCLOS, according to which the measures taken to protect and preserve the marine environment "*shall include those necessary to protect and preserve rare or fragile ecosystems as well as the habitat of depleted, threatened or endangered species and other forms of marine life.*" This obligation has a general scope of application and covers any kind of vulnerable marine ecosystems and species, wherever they are located, including the bed of the high seas.

Due to its competences, the Authority would be in the best position to participate in the establishment of a system of marine protected areas in the seabed beyond the limits of national jurisdiction. Under Article 162, para. 2, x, of the UNCLOS the Council of the Authority may disapprove areas for mining exploration in cases where substantial evidence indicates the risk of serious harm to the marine environment. The Mining Code provides that a contractor who applies for exploration rights shall propose areas to be set aside and used exclusively as impact reference zones and preservation reference zones (Reg. 31, para. 7).

(c) *Marine Scientific Research*

Despite recent discoveries, we know very little about the deep sea. There is an evident need to improve the status of scientific knowledge of a space which, covering one third of its surface, provides the largest habitat on earth. Under article 256 of the UNCLOS, marine scientific research in the Area is free

for all States and competent international organizations, in conformity with the provisions of Part XI.

Para. 1, of Article 143 (the relevant provision of Part XI), sets forth the general principle that "marine scientific research in the Area shall be carried out exclusively for peaceful purposes and for the benefit of mankind as a whole, in accordance with Part XIII" (Marine Scientific Research). This provision refers to any kind of marine scientific research and is not limited to research on mineral resources.

The second paragraph of Article 143 provides that the Authority, besides carrying out marine scientific research concerning the Area and its resources, shall promote and encourage the conduct of research and co-ordinate and disseminate the results and analysis when available. Paragraph 3 of Article 143 grants to the States the right to carry out scientific research in the Area and binds them to promote international co-operation in this field by:

- (a) participating in international programmes and encouraging co-operation in marine scientific research by personnel of different countries and of the Authority;
- (b) ensuring that programmes are developed through the Authority or other international organizations as appropriate for the benefit of developing States and technologically less developed States with a view to:
  - (i) strengthening their research capabilities;
  - (ii) training their personnel and the personnel of the Authority in the techniques and applications of research;
  - (iii) fostering the employment of their qualified personnel in research in the Area;
- (c) effectively disseminating the results of research and analysis when available, through the Authority or other international channels when appropriate.

Also this provision refers to any kind of marine scientific research in the Area.

Article 143 contradict the easy assumption that there is an absolute freedom to carry out scientific research in the Area. In this respect, the traditional concept of freedom of the sea ("first-come-first-served" rule) and the innovative idea of common heritage of mankind have to be harmonized in the light of the objective that marine scientific research in the Area shall be carried out for the benefit of the mankind as a whole. Once again, the legal condition of the space has an attraction in granting to the Authority a number of broad competences relating to the field of scientific research to be conducted in the Area. These competences have a cooperative, and not exclusive, character.

Because of the physical characteristics of the deep seabed and the high financial cost of exploration activities, "very few States, including multinationals from those States, have the technical, financial and human resources to access and exploit deep marine areas." It appears today that in the Area "no single nation has the financial, technological and intellectual capacity to undertake a global programme of scientific research of the magnitude that is required". The studies which are presently being carried out "are all essentially sectoral studies and there is no global oversight mechanism in terms of determining priorities, mobilizing the necessary political and financial commitments and sharing the benefits of such work".

As stated in the Report of the Secretary-General of the Authority for the year 2003, (*the Authority will not only benefit from close collaboration with those who are already conducting scientific research on hydrothermal vents, but also has the potential to provide a central clearing house for exchange of information about research activities on hydrothermal vents sites and at the same time a forum for the discussion and development of principles for the better implementation of the existing legal regime for marine scientific research in the Area and the management of biodiversity in the Area*).

More generally, (*prospects for the development of seabed mineral resources continue to be doubtful. At the same time, however, it is apparent that existing knowledge about the deep ocean environment and especially the potential consequences of mining activity is highly uncertain. In these circumstances, the most constructive and useful work the Authority can do at the present time is to develop its capacity as a depositary of available data and information about the mineral resources of the Area and to promote and*

*encourage new research on these resources and on the deep ocean environment in genera).*

## 7. Bioprospecting

Only today we discover that the remote environment of the deep seabed supports biological communities that present unique genetic characteristics. The ability of some deep seabed organisms to survive extreme temperatures (thermophiles and hyperthermophiles) and other extreme conditions (extremophiles) makes them of great interest to science and industry. Due to their genetic material, these species, in particular the microorganisms, present great interest for biotechnology. The possibility to use the genetic material that make hydrothermal vents species able to survive in extreme conditions opens new horizons in the field of genetic engineering and offers prospects of promising economic implications. It is reported that some biotechnology companies are currently actively involved in collaborating with public research institutions with a view to product development from derivatives of thermophiles and hyperthermophiles found around hydrothermal vents.

But what is the present international regime of bioprospecting for the genetic resources found in the Area? Any tentative answer to the question has to address a number of thorny legal problems relating to both the UNCLOS and the Convention on Biological Diversity (Rio de Janeiro, 5 June 1992).

The first problem to be faced is to determine what activity is bioprospecting and what the difference is between it and other kinds of activities. The UNCLOS does not specifically address either marine genetic resources or bioprospecting. In a study on the relationship between the CBD and the UNCLOS with regard to the conservation and sustainable use of genetic resources on the deep seabed, prepared in 2003 by the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA), bioprospecting is considered as "the exploration of biodiversity for commercially valuable genetic and biochemical resources" or "the process of gathering information from the biosphere on the molecular composition of genetic resources for the development of new commercial products".

What is the relationship between this kind of activity and other activities which, instead, are regulated by the UNCLOS?

(a) *Bioprospecting and Fishing*

Both fishing and bioprospecting presuppose the taking of living resources from the sea. However, what is important for the fishermen are the whole bodies of the exploited resources or tangible parts of them (for example, the fin of a shark), to harvest them for consumption. In most cases, fishing activities exploit large quantities of given living resources to produce the maximum yield from the harvested species.

The purpose of those who look for genetic material is different. Here the bodies of the species are considered as receptacles of their genes. It is important to seize the functional units of heredity to determine whether and how they can be used or stored waiting for a future commercial use. For this kind of non-consumptive and almost "intangible" activity there is normally no need of large quantities of living resources, as quality and difference are much more significant for laboratory research than quantity and similarity. Unlike the case of fisheries, the added value of the work on genetic material is tremendous and issues of patents and protection of intellectual property are likely to arise. While also the search for, and collection of, organisms for genetic purposes may cause a risk to the preservation of biodiversity in the deep seabed, it would be illogical to apply to activities directed at the genetic material of the sea the rules of the UNCLOS relating to fishing and conservation and management of the living resources of the high seas (Articles. 116 to 120).

Nor is it fully convincing to consider the deep seabed organisms as "sedentary species", as they are defined in Article 77, para. 4, of the UNCLOS (*"organisms which, at the harvestable stage, either are immobile on or under the sea or are unable to move except in constant physical contact with the seabed or its subsoil"*). Yet elements of analogy can be drawn between the regime of sedentary species of the continental shelf, which fall under the sovereign rights of the coastal State, and a future regime of the living organisms found in the Area. But the notion of sedentary species, which has its own historical background, is linked to the traditional purpose of fishing for consumption and has little in common with the new and more sophisticated challenges posed by bioprospecting. The conclusion that the Authority has a role to play also in the field of bioprospecting can be more firmly grounded on other elements.

(b) *Bioprospecting and Scientific Research*

It is much more difficult to make a distinction between bioprospecting and marine scientific research, an activity regulated in detail, but not defined, by the UNCLOS (Part XIII).

Under a widespread opinion, reflected also in the above mentioned study by SBSTTA, (*marine scientific research activities are characterized by their transparency and openness, the obligation to disseminate information and data obtained therefrom, as well as the subsequent publication of results of the research. Marine scientific research has, therefore, to be distinguished from other investigative marine activities with any kind of commercial component, such as prospecting, exploration, or fish stock assessment, which may involve confidentiality or proprietary rights. Under the United Nations Convention on the Law of the Sea, marine scientific research is primarily aimed at furthering mankind's knowledge of the marine environment, its resources and various phenomena, and is not a vehicle for searching for natural resources for commercial purpose*).

In other words, (*in the absence of a formal definition, marine scientific research could be defined as an activity that involves collection and analysis of information, data or samples aimed at increasing mankind's knowledge of the environment, and is not undertaken with the intent of economic gain. Since the object is the enhancement of knowledge, marine scientific research is characterized by openness, dissemination of data, exchange of samples, as well as publication and dissemination of research results as provided for in Part XIII*).

The beginning of the second passage quoted above conceals a terminological, if not logical, contradiction: if there is an "absence of a formal definition" in the UNCLOS, how can marine scientific research be defined under the UNCLOS? In reality, what is proposed in the SBSTTA's study is not a definition, but an interpretation of the notion of marine scientific research used in the UNCLOS. This interpretation is based on the assumption of the absence of the intent of economic gain. But other interpretations may be proposed as well, considering that nowhere in the UNCLOS the condition of the absence of the intent of economic gain is evoked.

The widespread opinion about the UNCLOS notion of marine scientific research leaves some room for doubt. It is true that the place where the

UNCLOS gets closer to a notion of marine scientific research in article 243, where "the efforts of scientists in studying the essence of phenomena and processes occurring in the marine environment and the interrelations between them" are mentioned. But it is also true that article 246, which applies to the exclusive economic zone and the continental shelf, makes a clear distinction between two kinds of marine scientific research projects, namely those carried out "to increase scientific knowledge of the marine environment for the benefit of all mankind" (para. 3) and those "of direct significance for the exploration and exploitation of natural resources, whether living or non-living" (para. 5, a).

This distinction provides some credibility to the opinion that, under the UNCLOS regime, also research directly related to the purpose of commercial exploitation of resources falls under the general label of "marine scientific research". Without trying to give here any definite answer to such a difficult question, it is sufficient to say that some doubt may exist about the content of the implicit UNCLOS notion of marine scientific research. Any kind of marine scientific research in the Area, including what is called bioprospecting, might fall under the general obligation to ensure the benefit of mankind as a whole, as required by article 143, para. 1.

But what is particularly difficult to accept are the consequences of the widespread opinion that any intent of economic gain automatically changes the nature of a marine scientific research activity under the UNCLOS regime. It would follow that, any time there are prospects of profit, the regime of freedom of the sea (that is the "first-come-first-served" rule) would immediately apply to the exclusive benefit of the very few entities which have the financial and technological capacity to reach the deep seabed. Would this be, in the case of bioprospecting, "the just and equitable international economic order which takes into account the interests and needs of mankind as a whole and, in particular the special interests and needs of developing countries", as set forth in the preamble of the UNCLOS? The question deserves at least some discussion.

But there is something even stranger, if it is taken for granted that any intent of economic gain automatically changes the nature of a marine scientific research activity under the UNCLOS regime. If this were the case, the role of the Authority and States would be to cooperate for the carrying out of scientific research for the benefit of mankind as a whole, as provided for in Article 143, para. 1, and then, of course, to disseminate information, provide the data obtained and publish the results of the research, in a spirit of full transparency

and openness. At this point, the very few entities which have the financial and technological capacity to reach the deep seabed could come into play and freely start their bioprospecting activities taking advantage of the scientific knowledge gathered by others and, if their activities are successful, get the relevant commercial profits. Would this precisely be what is intended under the expression "benefit of mankind as whole" used in article 143, para. 1, of the UNCLOS? Or would this rather be a mechanism under which "the strong would get stronger, the rich richer", to repeat the words pronounced by Mr. Pardo? Again, the question deserves at least some discussion.

While evident by themselves, two matters of fact need now to be stressed.

First, there is an inextricable factual link between the protection of the deep seabed environment, including its biodiversity, marine scientific research and bioprospecting. The preservation of biological diversity and its components is a prerequisite for any future activity of marine scientific research or bioprospecting. A research endeavour organized with the intent to increase human knowledge may well result in the discovery of commercially valuable information. It is impossible to establish a clear-cut distinction between one activity and the other and between one purpose and the other.

Second, at the time when the UNCLOS regime on marine scientific research was being drafted, very little was known about the genetic qualities of deep seabed organisms. For evident chronological reasons, the potential value of genetic resources was not considered by the UNCLOS negotiators. When they were discussing about research of significance for natural resources, they had consumptive goods such fish, oil, polymetallic nodules and little else in mind. The lack of regulation for the search of the almost "intangible" units of heredity of seabed organisms has arisen "by accident rather than design". But this kind of activity calls today for a specific legal framework which puts it in an appropriate context.

(c) *Bioprospecting and Conservation of Biological Diversity*

Besides the UNCLOS, bioprospecting activities are also linked to the CBD. While not defining bioprospecting, the CBD refers to "genetic material", defined as "any material of plant, animal, microbial or other origin containing

functional units of heredity", and to "genetic resources", defined as "genetic material of actual or potential value" (article 2).

The CBD applies to components of biological diversity in areas within the limits of national jurisdiction of the Parties and to processes and activities carried out under the jurisdiction or control of a Contracting Party beyond the limits of national jurisdiction (article 4, b). This includes bioprospecting activities carried out in the Area.

While some of the articles of the CBD presuppose a "country of origin of genetic resources" and consequently do not apply to areas beyond the limits of national jurisdiction, most of its provisions have a broad scope of application, which covers also the deep seabed. The same can be said as regards the general objective of the CBD, namely: *the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over these resources and to technologies, and by appropriate funding* (article 1) .

A few provisions of the CBD explicitly refer to areas beyond national jurisdiction. For example, under article 3 States have "*the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment (...) of areas beyond the limits of national jurisdiction*". Article 5 provides a general obligation of cooperation in the following terms: *Each Contracting Party shall, as far as possible and as appropriate, cooperate with other Contracting Parties, directly or, where appropriate, through competent international organizations, in respect of areas beyond national jurisdiction and on other matters of mutual interest, for the conservation and sustainable use of biological diversity*.

The issue of the relationship between the CBD and other treaties (including, although non explicitly mentioned, the UNCLOS) is addressed by article 22 of the CBD:

- The provisions of this Convention shall not affect the rights and obligations of any Contracting Party deriving from any existing international agreement, except where the exercise of those rights and

obligations would cause a serious damage or threat to biological diversity.

- Contracting Parties shall implement this Convention with respect to the marine environment consistently with the rights and obligations of States under the law of the sea.
- A similar provision on the same issue can be found in the UNCLOS (article 237, para. 2).
- Specific obligations assumed by States under special conventions, with respect to the protection and preservation of the marine environment, should be carried out in a manner consistent with the general principles and objectives of this Convention.

It does not seem that conflicts between the CBD and the UNCLOS are likely to occur. As already remarked many provisions of the UNCLOS aim at the protection of the marine environment and generally apply also to the conservation of marine biological diversity of the deep seabed. The CBD carefully avoids the expression "*common heritage of mankind*" and, in the preamble, states that "*the conservation of biological diversity is a common concern of humankind*." But the CBD principle of "*the fair and equitable sharing of the benefits arising out of the utilization of genetic resources*" goes in the same direction as the UNCLOS principle of common heritage of mankind.

(d) *A Gap to Be Filled*

While some general principles can be drawn from both the UNCLOS and the CBS, the present gaps as regards a specific regime for the search for, and use of, seabed genetic materials need to be filled, in order to put this important subject in an appropriate legal context. As remarked in a resolution approved in 1997 by the European Council of Environmental Law (ECEL): (*The technical ability to conduct marine scientific research in the international area is in the hands of a limited number of actors in technologically advanced States. Some of these actors are already conducting research directed at the genetic resources in or on deep sea vents. Some of them, having identified specific resources and their potential commercial value, have already taken out patents related to them. The trend in the applicable patent law is to ensure appropriation by patentees of all the benefits connected with the commercialization of patented substances deriving from genetic resources. This runs counter to the underlying principles of the UNCLOS and the spirit of the CBD, which aim at establishing an international legal order which will be just and equitable and enable utilization*

*and conservation of marine living resources on a sustainable basis for the benefit of present and future generations).*

According to the 2004 report by the United Nations Secretary-General on oceans and law of the sea, (*as legitimate as the protection of private data and proprietary interests through intellectual property rights may be, a balance needs to be struck between private benefits and benefits to humankind as a whole through the advancement of scientific knowledge*).

Sooner or later the gaps left by the UNCLOS and the CBD will be filled. Also in this field, it is likely that the abstract application of the principle of freedom of the sea (that is the "first come, first served" rule) would lead to hardly acceptable consequences and new cooperative schemes have to be envisaged at the international level. Since the final objective is to achieve a sustainable management of the deep ocean space as a whole, sectoral approaches are not likely to lead to coherent and cost-effective results. All the stakeholders should play a role in the game, including of course the Authority, which is already entitled to exercise a broad range of preferential or cooperative responsibilities in the field of marine scientific research and protection of the environment. Once again, the legal condition of the Area, its being the common heritage of mankind, may have an attraction also on certain activities (though they are different from mining) which take place in that space.

This does not mean that the Authority shall become the overarching regulatory body in the field of bioprospecting. Nor does it mean that the merits acquired by public and private entities which have made consistent investments and developed a sophisticated technological capacity in the field of bioprospecting shall be neglected. It simply means that the Authority, the principles that it represents, as well as its already existing competences and cooperative role, need to be taken into consideration when the States and the other relevant entities decide to fill the legal gap of the regime of deep seabed genetic resources.

For the time being, in the light of its already existing responsibilities, nothing prevents the Authority from playing a cooperative role consistent with the general principles it represents. It would be unacceptable if those involved in mining were subject, as they are, to the Authority's regulatory powers to ensure protection of seabed biodiversity, while those involved in other activities could escape any measures. As recently pointed out by the Authority's

Secretary-General, *it is practically impossible to distinguish between marine scientific research, including bioprospecting, and prospecting for minerals, since both may encompass the identification of biological diversity and its components. There seems little point, therefore, in trying to develop more precise definitions or in trying to create a new definition for 'bioprospecting' or 'genetic resources'. As far as environmental protection is concerned, it follows that one set of rules, protocols or practices must apply to all types of research activities. In this respect, I should mention that ISA is equipped to and could elaborate a code of conduct for marine scientific research and prospecting in the deep seabed, to include steps to protect the marine environment and its biodiversity. Such a code could well be based on the sort of voluntary code that is presently being applied by researchers.*

## **8. Conclusion**

The 2004 report by the United Nations Secretary-General on oceans and law of the sea suggests that the legal lacuna as regards commercially-oriented research on the biological resources of the deep seabed "should be filled in order to conserve these biological resources and provide for their sustainable use". The United Nations General Assembly, under Resolution 58/240 adopted on 23 December 2003, has invited the relevant global and regional bodies, in accordance with their mandates, to investigate urgently how to better address, on a scientific basis, including the application of precaution, the threats and risks to vulnerable and threatened marine ecosystems and biodiversity in areas beyond national jurisdiction; how existing treaties and other relevant instruments can be used in this process consistent with international law, in particular with the Convention, and with the principles of an integrated ecosystem-based approach to management, including the identification of those marine ecosystem types that warrant priority attention; and to explore a range of potential approaches and tools for their protection and management.

As regards the particular question of conservation and sustainable use of genetic resources on the deep seabed, the already mentioned study prepared in 2003 by the SBSTTA, suggests that there are three available options to deal with the question, namely:

- (a) Maintaining the status quo;
- (b) Application of the regime under Part XI of the United Nations Convention on the Law of the Sea, currently limited to the management of mineral resources;
- (c) Application of the regime of conservation and sustainable use of genetic resources under the Convention on Biological Diversity.

The study points out that the last two options are not mutually exclusive and could be integrated. It also adds that any enlargement of the mandate of the Authority to cover marine genetic resources would require amending the UNCLOS, under the procedure set out in Art. 312. The advantages of making use of the Authority are summarized as follows: *“Making use of the International Seabed Authority would be advantageous in two respects. The institution is already operational and has already a mandate relating to the protection and preservation of the Area’s marine environment. Moreover, enlarging the institution’s scope to include genetic resources would allow an integrated management of the Area, as called for under the Jakarta Mandate in respect of marine and coastal biodiversity. The institution may be granted responsibility to manage deep seabed genetic resources through modalities defined by the Parties to the Convention on Biological Diversity and the United Nations Convention on the law of the Sea, such as marine protected areas, or a licensing system for extraction and exploitation. It could also monitor activities undertaken, and act as a clearing-house for international cooperation in deep seabed scientific research through dissemination of data and research results. The mechanisms of operation and the principles according to which it is to operate would need to be clearly defined in order to accommodate all Parties to the Convention on Biological Diversity and the United Nations Convention on the law of the Sea, some of which may be Parties to one but not to the other.”*

For the time being it is doubtful whether all States would be immediately able to accept a proposal for such an expanded Authority mandate. But this does not detract from the main purpose of this paper, that is to show that the Authority, which can rely on a very innovative ideal background, can also be called to play preferential or cooperative responsibilities in new kinds of activities taking place on the deep seabed. §

