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DSMOBSERVER

Deep Sea Mining News & Resources

Research Missions Explore Deep Seabed

Exploring some of the world's most remote ocean regions is no small task, especially when the mission includes investigation of benthic habitats and features on the forefront of interest to the deep seabed mining industry. Yet a slurry of such expeditions has recently been undertaken, launching headlines around the world and contributing to our scientific understanding of the ocean floor.

In February, China embarked on a mission to explore polymetallic sulphides in a deep-sea rift in the northwest Indian Ocean. The four month expedition, hosted by the ship *Xiangyanghong 09*, used the manned Jiaolong submersible to conduct some 30 dives in the region. The mission gathered data in advance of China's application to the International Seabed Authority for mining rights in that area.

Also in the Indian Ocean, the Geological Survey of India (GSI) recently completed a three-year expedition to generate 181,025 square kilometres of high-resolution seabed

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At the Helm

AN INTERVIEW WITH NEW ISA SECRETARY-GENERAL MICHAEL W. LODGE

Last July, the International Seabed Authority (ISA) met for its 22nd Session in Kingston, Jamaica and elected Michael W. Lodge of the United Kingdom as the new Secretary General of the Authority. Secretary General Lodge began work on his four-year term on 1 January 2017 and succeeds Mr. Nii Allotey Odunton of Ghana, who had been Secretary-General since 2009.

No newcomer to the deep seabed mining community, Secretary-General Lodge has been active in the ISA since its inception in 1996, serving as Legal Counsel to the Authority through 2003 and then returning to that post in 2007. Beyond deep seabed mining policy,

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IN THIS ISSUE

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DSM Observer is a free online resource for deep sea mining professionals, providing access to the latest news and information about the industry in a single place. Our monthly e-newsletter features updates on technology, business news, deep sea science, environmental issues and policy.

Submissions of guest editorials and multimedia content are welcome and will be considered on a case by case basis.

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JOB OPPORTUNITIES

International Seabed Authority:
Data Entry Assistant
Deadline: 31 July 2017

Soil Machine Dynamics:

- Electrical Control Systems Engineer
- QHSE Technician
- Mechanical Design Engineer
- Software Design Engineer

For more information on these opportunities, visit:
DSMobserver.org/careers

To post a job here, contact:
info@DSMobserver.org

At the Helm

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Mr. Lodge has 28 years of experience as a public international lawyer, a strong background in the field of Law of the Sea and 10 years' judicial experience in the UK and South Pacific. During his years in the South Pacific, Mr. Lodge served as one of the lead negotiators for the South Pacific Island States on the 1995 UN Fish Stocks Agreement. He is an expert on fisheries, environmental and international law and has consulted broadly on these topics throughout Europe, Asia, the South Pacific, and Africa.

He most recently served as deputy to the Secretary-General of the Authority since 2011.

DSM Observer sat down with Secretary-General Lodge to discuss his first six months on the job and his views on the on-going development of the Mining Code.

DSM **How would you describe your six months as the Secretary General of the ISA? What lessons have you learned?**

ML Extremely busy, but also a lot of fun. I've learnt that you can't change everything overnight (which I knew already, but I keep trying), but I've also learnt that the majority of people are open to new challenges and have hidden talents. A lot of energy has gone into reorganizing the secretariat to make it more efficient and to make best use of the talent that we have. There's been quite a lot of turnover in the staff, but I consider myself fortunate now to have an excellent technical and administrative staff that are well equipped for the challenges ahead.

DSM **You've been involved with the ISA since the beginning. What is your outlook on it now compared to its inception in 1996? Has its role or significance changed much?**

ML In 1996 it was touch and go whether ISA would be able to survive as an independent organization. Would countries pay their financial contributions? Would the system for deep seabed mining be accepted by States? Would the organization be able to establish its credibility and independence? Would we be able to attract good staff and would we be able to establish all the necessary agreements with the UN and other bodies to function effectively. In fact, it was not until 2000 that the initial administrative work was done, rules of procedure for all the governing bodies were agreed and the first set of exploration regulations was agreed. Only then would the existing 'pioneer investors' (entities from Japan, France, Russia, China, Korea and Inter-oceanmetal Joint Organization) come on board and agree to enter into binding contracts with ISA in place of the previous interim arrangements that had applied prior to the entry into force of UNCLOS. Since then ISA has continued to evolve as it begins to implement all the aspects of its broad mandate for marine scientific research, capacity building and regulation of seabed mining. Having said that, there is still a long way to go. In particular, we need to do a better job of communicating ISA's work to the wider world, including the general public in our host country of Jamaica, most of whom have little concept of what ISA does.

DSM **From your perspective, what does the future of deep sea mining look like? What are the opportunities? The challenges?**

ML DSM offers a fantastic opportunity for the world to meet increased long-term demand for minerals in a sustainable manner. Sustainable development is all about turning natural capital (deep sea minerals) into sustainable

Courtesy United Nations Department of Public Information via the ISA. **PAGE 1:** *Courtesy Michael W. Lodge, ISA.*

financial, human and physical capital that can lead to sustainable consumption and well-being for future generations. The [Common Heritage of Mankind] CHM principle in the [United Nations Convention on the Law of the Sea] UNCLOS allows us to do this in a way that ensures access for all and equitable distribution of the benefits. The challenge for ISA of course is to implement the principles in a way that ensures intra-temporal and inter-temporal equity, and protects environmental resources from harmful effects. This means adopting regulations that ensure that environmental impacts are controlled and minimized. It also means that we need to establish mechanisms for long-term monitoring of environmental impacts as well as to establish 'no mining' zones at an appropriate scale. As mining comes closer to reality, there is more interest and the ocean conservation lobby has become very active. There is also a great deal of legitimate concern about environmental impact. However, I do think we need to keep matters in proportion. Only a very, very small fraction of the seabed is ever likely to be exploited for minerals and then under conditions that minimize the environmental impact. In this regard, some of the lurid and attention-seeking headlines that I have seen recently—phrases such as an 'invisible land grab', 'machines the size of buildings literally destroying the systems that keep us alive', 'clear-cutting the ocean floor' and so on, are not helpful. In fact, they are blatant misstatements. Similarly, comparisons to disasters such as the *Deepwater Horizon* incident, which involved a volatile compound totally different in character to deep sea minerals, are wholly misleading and inappropriate. The discussion needs to become better informed and more mature. As a starting point, I think we need to make a realistic assessment of the likely scale of impacts from deep seabed mining during, say, the first 15 years of industrial operations. And then we also need to start looking at the other major piece of the puzzle, which is how the benefits from DSM can be shared for the benefit of the developing countries.

DSM **What lessons might deep sea mining in the Area learn from policies applied to national jurisdictions?**

ML Neither land-based mining or offshore oil and gas development are new activities. There is plenty of good industry and environmental practice to draw from in these and other industrial sectors, such as dredging, which has been carried out for centuries. We should study best practice flowing from these regimes and, where there are gaps, ISA should bridge those gaps by developing deep seabed mining-specific technical standards based on sound scientific evidence, but taking account of appropriate technical and economic constraints.

DSM **What is your vision for The Mining Code? What might it look like once implemented?**

ML People tend to overcomplicate the question of the Mining Code. Actually, most of the fundamental rules and procedures are already built into UNCLOS and the 1994 Part XI Agreement. A lot of valuable work was also done by the Preparatory Commission prior to entry into force of the Convention. What we are dealing with are subsidiary regulations that allow us to implement the system prescribed in UNCLOS. In the short term, the Mining Code will be a set of regulations that establish the process for applying for exploitation rights, including the process for environmental impact assessment, the content of the contract between ISA and deep sea miners and the respective rights and duties of each party to the contract. Over time, the Code will be supplemented by detailed technical guidelines, recommendations and processes covering every aspect of the industrial process. In this regard, it will be a living document and will continue to evolve as we gain more experience.

DSM **You were recently in Uganda, a land-locked nation. What was your message there and what significance does the Mining Code have for any developing nation without a significant interest in seabed mining? What reception did your message receive in Uganda?**

ML We were in Uganda and we were regally entertained by Ambassador Duncan Laki and his colleagues. Ambassador Laki has been a long-time supporter of ISA's work and we were delighted to hold the first ever ISA event in a landlocked developing country. The main reason we went to Uganda was to emphasize that UNCLOS also benefits landlocked countries, by guaranteeing them access to the sea, amongst other things,

and that the Part XI regime [the DSM regime] contains provisions that are specifically designed to benefit landlocked developing countries. This includes preferential rights to financial benefits from DSM, rights to a share in the proceeds from continental shelf exploitation under Article 82 of UNCLOS, and equal rights as any other coastal State to acquire a contract from ISA for DSM in the international seabed Area. There are 32 landlocked developing countries (LLDCs), most of them disadvantaged in some way, and they are therefore an important constituency for the sake of the integrity of UNCLOS. In general, attendance of LLDCs at ISA events is poor, and we were therefore working with the African Minerals Development Centre (AMDC), based in Addis Ababa, and GRID Arendal, a technical agency based in Norway, to raise awareness of the opportunities for LLDCs, including Uganda. The workshop was well received, but also demonstrated that there is a tremendous need for capacity building in Africa, and that there is a general lack of awareness at all levels about the offshore resources of the continental shelf and the international seabed. As a direct result of this workshop we were able, together with AMDC, to register a Voluntary Commitment with the UN Conference on implementation of Sustainable Development Goal 14 to undertake a focused programme of capacity-building in Africa. We now have to go out and look for funding for this much-needed initiative.

DSM **From your perspective, what role does the ISA play in the broader development of high seas policy? Will the development of The Mining Code play an important role in influencing the outcome of parallel UN process such as the development of a governance framework for ABNJ?**

ML The ISA must play a role in the broader development of high seas policy because the seabed, for which there is a comprehensive legal regime in place, lies beneath the high seas. Therefore, any new measures that might be introduced for the high seas must be considered in terms of their impact, if any, on the legal regime for the seabed. In particular, new high seas measures must not conflict with rules applicable to the seabed and (to use an unfortunate pun) must not undermine the measures adopted by ISA. The bottom line is that there already is a rather comprehensive governance framework for one of the areas beyond national jurisdiction and we need to consider rather carefully the extent to which new measures add value to what we already have.

DSM **What's your biggest challenge moving forward as Secretary-General? What would you most like to achieve?**

ML My goal is to see the Mining Code come to fruition. Whether or not mining takes place is beyond my control, as it is influenced by so many external conditions, but I would like to think that our task is to put the rules in place so that contractors can move to exploitation if commercial and economic conditions are right. I would also like to see us put in place regional management plans for the areas of interest for mineral exploitation, including those 'no mining' zones that I mentioned earlier. I think the biggest challenge in the coming years is likely to be resourcing the secretariat sufficiently to manage DSM going forward.

DSM **What advice do you have for contractors in terms of their engagement in the ISA process?**

ML I think the only advice I need to give to contractors is to continue their good level of cooperation with the Authority and to continue to work closely with the secretariat and Legal and Technical Commission in particular as we move forward with developing our new data management strategy. The contractors are doing very important work as far as improving our understanding of deep sea resources, processes and ecosystems is concerned and they need to be supported in this. You have to bear in mind that most of this work, which is extremely expensive to perform, would not be taking place at all if not for the existence of exploration contracts with the ISA, so this work, and ISA's efforts to organize the data and make it available to the outside world, is an important contribution to marine science. I am very pleased that our member countries have given us the financial support to build a global database for deep seabed resources and environmental data—indeed, this is going to be our flagship project for 2017–2018—and I look forward to contractors' support in helping us populate the database for everyone's benefit.

DSM **Who is the Michael Lodge outside the ISA? What are your passions and interests? How do you spend your free time?**

ML What free time? With 3 college kids and ISA to manage I hardly have any. But in all seriousness, I'm a Chelsea FC supporter, a music lover (everything, but currently exploring Miles Davis electric period and Beethoven late quartets), a home baker, a tennis player and I'm currently trying to read the *Dream of Red Chamber* and get through the pile of books on my nightstand, as well as keep up with the *New York Review of Books* every two weeks. I also like watching all sports except motor racing, golf, basketball and anything with American in the title. Ok, I guess that means I like to watch cricket, rugby and football. I would really like to support the West Indies at cricket, but they don't make it easy for me!!

The Rising Profile of ISA Financial Regulations

The development of Financial Regulations to address the benefit sharing aspects of the Mining Code has recently moved to the forefront of ISA business. Per International Seabed Authority (ISA) Assembly agreement, the whole of Mining Code cannot go into force without a financial regime in place. In short, this means mining operations cannot begin until such financing mechanisms are agreed upon and adopted by the State Parties of the ISA. With the possibility of industry readiness in the near future, contractors are now showing increasing commitment towards moving forward with the development of these Financial Regulations.

The background of financing goes back to the original international framework for deep seabed mining. The 1982 United Nations Convention on the Law of the Sea (UNCLOS) and its 1994 Implementing Agreement relating to deep seabed mining designate the Area as "common heritage of mankind". As such, UNCLOS stipulates that the Authority shall provide for the equitable sharing of financial and other economic benefits derived from activities in the Area via rules, regulations and procedures recommended by the Council. It also calls for particular consideration to be made to the interests and needs of developing States, as well as peoples who have not attained full independence or other self-governing status. All of this, naturally, must be balanced with the inherent interest of contractors to see a return on investments and to benefit economically from any mining ventures on the Area.

Broad discussion on the development of financial regulations began in earnest in 2015 with the publication of an ISA Discussion Paper on the Development and Implementation of a Payment Mechanism for the Area. Since then, discussions have increasingly focused on an ad valorem royalty scheme.

This past 19–21 April, contractors and other ISA stakeholders gathered in Singapore at the Grand Copthorne Waterfront Hotel for the 3rd Deep Seabed Mining Payment Regime Workshop. Prior meetings had been held in 2016 in both San Diego (USA) and London, all with a focus on exploring key elements of an ISA payment mechanism and financial regulations for seabed mineral exploitation in the Area, and particularly for polymetallic nodules. The Singapore workshop provided an opportunity for participants to continue efforts to develop a working financial model (for both cost and revenue) to share with the ISA's Legal and Technical Committee (LTC). While additional work still needs to be done, the group was able to explore additional issues important to consider in the development of any working payment regime—for instance, accounting for ISA's administrative costs. The meetings were facilitated by RESOLVE, an independent non-profit organization specializing in building solutions to environmental, social, and health challenges via collaborative engagement of community, business, government, and NGO leaders.

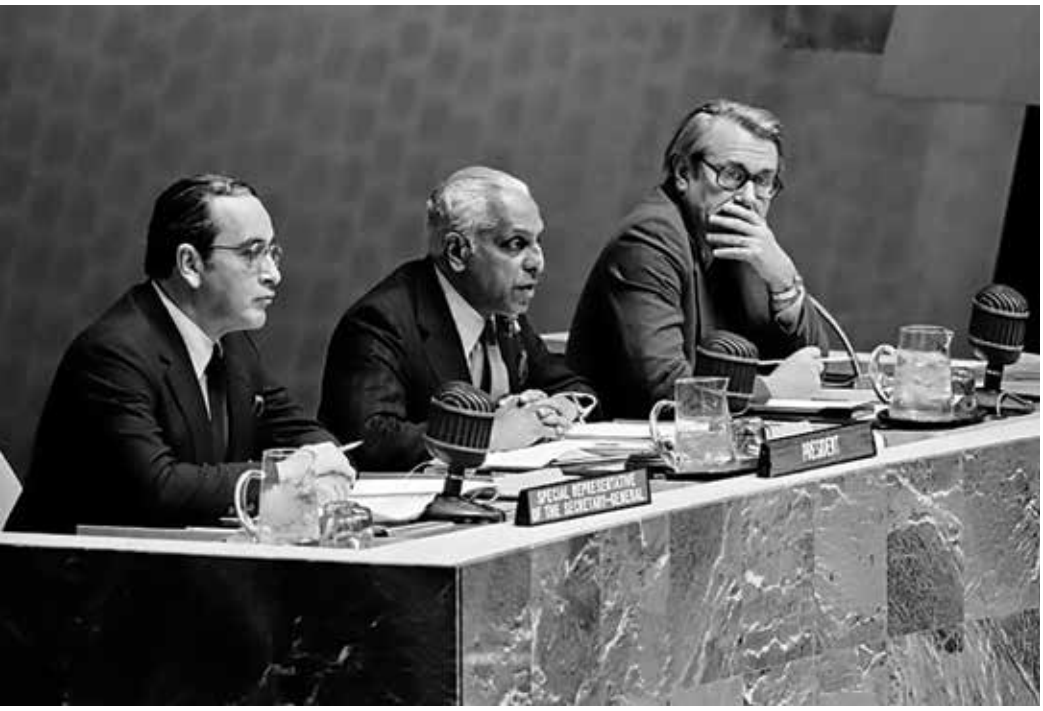
Sunset over the Central Pacific Basin. Ocean resources beyond national boundaries are considered the Common Heritage of Mankind. *Image courtesy of the NOAA Office of Ocean Exploration and Research, Mountains in the Deep: Exploring the Central Pacific Basin.*

As we move towards the Authority's Annual Meeting, the ISA is reviewing and refining the draft financial model that was finalized at the Singapore workshop. As part of this process, the ISA may seek additional input from contractors on their estimated costs and revenues. Next steps will include consideration of potential payment regimes by the LTC and ISA Member States. Throughout this process it will be important to ensure broad stakeholder input on the financial rules and regulations for deep seabed mining.

Stakeholders interested in learning more about the Singapore Payment Regime Workshop can access the final meeting report and other documents at: http://www.resolv.org/site-dsm/dsm-payment-regime-workshop-3/

A Glance at the Mining Code

As the International Seabed Authority (ISA) gets ready to begin its 23rd Annual Meeting this August in Kingston, it's a noteworthy reflection point to consider the progressing state of the "Mining Code". "Mining Code" is the term used by the ISA to describe the entire body of rules, regulations and procedures that will regulate prospecting, exploration and exploitation of marine minerals in international waters (referred to as "the Area").



3 March 1980 – Opening of the Ninth Session of the Third United Nations Convention on the Law of the Sea, United Nations Headquarters, New York (from left to right): Mr. Bernardo Zuleta, Special Representative of the Secretary-General to the Conference; Mr. H. Shirley Amerasinghe, President of the Conference; and Mr. David L. D. Hall, Executive Secretary of the Conference. © *UN Audio Visual Library of International Law*

The Mining Code is still under development, but once complete will cover all environmental, financial, reporting and regulatory obligations incurred by seabed mining operations (called "contractors" due to their contractual relationship with the ISA) and the Authority itself. **No mineral exploitation can occur until all elements of the Mining Code are finalized.**

The general legal framework under which the Code is being developed was established in Part XI of the 1982 United Nations Convention on the Law of the Sea (UNCLOS) and its 1994 Implementing Agreement relating to deep seabed mining. UNCLOS establishes the ISA as the main convening and regulatory authority governing mineral extraction from international waters. Additionally, in contradiction to the historical open access tradition of freedom of the high seas, the framework designates the Area as the "common heritage of mankind", to be administered for the benefit of mankind as a whole. The guidelines for implementing "common heritage of mankind" are found in UNCLOS articles 133–143 and essentially ensure that the resources in the Area belong to mankind as a whole; that no person, State or entity can make claim to them otherwise; that all mining and mineral recovery must be in accordance with UNCLOS and the rules adopted by the Authority; that activities including mining and marine scientific research are to be carried out for the benefit of mankind as a whole; and that the Authority shall provide for the equitable sharing of financial and other economic benefits derived from activities in the Area.

UNCLOS also requires measures for the protection of the marine environment. This requirement authorizes the Authority to develop rules to prevent, reduce and control pollution and other hazards; conserve natural resources and prevent damage to flora and fauna; require State actors to have rules governing waters within national jurisdiction as effective as those developed for international waters; and establishes an obligation for all States "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."

… "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."

Much of the Mining Code has been put in place already over the 23-year existence of the ISA. This is particularly true for rules governing prospecting and exploration of minerals in the deep seabed. In 2013 the Authority began to develop regulations to govern the future exploitation of seabed minerals, starting with polymetallic nodules. The full body of existing regulations, recommendations and guidance contributing to the Mining Code include:

- Regulations on Prospecting and Exploration for Polymetallic Nodules in the Area, adopted 13 July 2000, amended in 2013 and 2014
- Regulations on Prospecting and Exploration for Polymetallic Sulphides in the Area, adopted 2010, amended in 2013 and 2014
- Regulations on Prospecting and Exploration for Cobalt-rich Ferromanganese Crusts in the Area, adopted 2012, amended in 2013
- Environmental Management Plan for the Clarion-Clipperton Zone, Adopted 2011 and 2012
- Recommendations for the guidance of contractors for the assessment of the possible environmental impacts arising from exploration for marine minerals in the Area, amended in 2013.

The exploration regulations in place establish a system under which State Parties apply to the Authority for contracts that ensure 15-year exclusive rights to explore a specific area. To receive such contracts the State Parties must submit work plans and be able to demonstrate that they are financially and technically capable of fulfilling their obligations. The work plans must include a proposed exploration program as well as oceanographic and environmental baseline studies that enable an assessment of potential environmental impacts. Contractors are expected to use best environmental practices, follow the Precautionary Principle, and work with the Authority to develop programs for monitoring and evaluation of impacts. States are likewise legally required to exercise "due diligence" when sponsoring mining entities to ensure that the entity they sponsor remains compliant with UNCLOS and the regulations adopted by the Authority.

Final Regulations for Exploitation of mineral resources in the Area is the ultimate regulatory phase in developing the common heritage of mankind and implementing the Mining Code in its entirety. While these are still under development, the Authority has made significant progress since 2013. Activities in recent years have included a Stakeholder Survey, issuance of consultation documents including a Draft Regulatory Framework, discussion papers and targeted workshops related to the development of specific areas of the Exploitation Code.

A major focus in 2017 moving forward are key components contributing to the environmental and financial aspects of the exploitation rules. Currently in development by the Authority's Legal and Technical Commission are the guidance of contractors on the assessment of environmental impacts of exploration for polymetallic nodules. The development of Financial Regulations, discussed in another article in this issue of *DSM Observer*, are also underway and will eventually define a payment regime for exploitation contracts.

The Mining Code will ultimately be a "living" document, subject to amendment and refinement as new technologies, scientific awareness and situations arise. However, once the Exploitation Regulations are adopted, the overarching framework of the Mining Code will be complete and the industry will be able to move forward with mining operations.

UPCOMING EVENTS

ISA Legal & Technical Commission Meeting
31 July – 4 August 2017
Kingston, Jamaica
DSMobserver.org/event/isa-legal-technical-commission-meeting

23rd Session of the International Seabed Authority
7–25 August 2017
Kingston, Jamaica
DSMobserver.org/event/23rd-session-of-the-isa

DOSI Open Meeting with a focus on Deep-Sea Mining
27 August 2017
Woods Hole, Massachusetts USA
DSMobserver.org/event/dosi-deep-sea-mining

6th International Symposium on Chemosynthesis-Based Ecosystems (CBE6)
27 August – 1 September 2017
Woods Hole, Massachusetts USA
DSMobserver.org/event/cbe6

Oceans '17 MTS/IEEE Anchorage
18–21 September 2017
Anchorage, Alaska
DSMobserver.org/event/oceans-17-mtsieee-anchorage

46th Underwater Mining Conference
24–29 September 2017
Berlin, Germany
DSMobserver.org/event/46th-underwater-mining-conference

To see all upcoming events, visit:
DSMobserver.org/events

NEW RESOURCES

The Growing Role of Minerals and Metals for a Low Carbon Future,
The World Bank (June 2017)
http://dsmobserver.org/wp-content/uploads/2017/07/117581-WP-P159838-PUBLIC-ClimateSmartMiningJuly.pdf

Research Missions Explore Deep Seabed

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morphological data within their Exclusive Economic Zone. Using the research vessels Samudra Ratnakar, Samudra Kaustabh and Samudra Saudikama, the expedition documented millions of tons of lime mud, the presence of phosphate sediment in various locations, gas hydrate off the Tamil Nadu coast, cobalt-bearing ferro-manganese crust from the Andaman Sea and micro-manganese nodules around the Lakshadweep Sea.

Of specific interest to several ISA contractors are the recent NOAA missions to the Central Pacific Basin. The U.S.' NOAA Office of Exploration and Research has completed three exploration cruises this year to this under-explored region, and a fourth is underway. The expeditions are part of a three-year Campaign to Address the Pacific monument Science, Technology, and Ocean NEeds (CAPSTONE), a foundational science initiative to collect deepwater baseline information to support science and management decisions in and around U.S. marine protected areas in the central and western Pacific.

Beginning in February 2017, NOAA and partners conducted two cruises on NOAA Ship *Okeanos Explorer* to collect critical baseline information of unknown and poorly known deepwater areas in American Samoa, Samoa, and the Cook Islands.

Then, from 27 April – 19 May, 2017, *Okeanos* traversed the vast Pacific area between Pago Pago, American Samoa and Honolulu, Hawai'i as part of the ***Mountains in the Deep: Exploring the Central Pacific Basin*** expedition. During *Mountains of the Deep*, the science team conducted near daily remote operated vehicle (ROV) dives both in U.S. waters and on the high seas.

The high seas portion traversed the **Clarion-Clipperton Fracture Zone (CCZ)**, a region of interest to the deep seabed mining community for its abundance of polymetallic nodules. This feature is among the longest tectonic structures on Earth, extending some 7,000 kilometers (4,350 miles) from the Line Islands to the Clipperton Transform on the East Pacific Rise. In comparison, this is greater than the distance from The CCZis over 100 million years old and, like other fracture zones in the deep ocean, has high potential for the presence of seeps and deposits of manganese nodules.

On 8 May, *Okeanos* deployed the ROV *Deep Discoverer* along the far westernmost edge of the Fracture Zone, diving to abyssal depths up to 4,500 meters (~14,765 ft), the greatest depth attempted on the expedition. Biological highlights on the seafloor included black coral; "bamboo corals including the second deepest ever collected; several holothurians (sea cucumbers); bryzoans; anemones; chitons; carnivorous tunicates (sea squirts); brisingid sea stars; crinoids; scale worms (polynoid polychaete); tube-dwelling fanworms (sabellid polychaete); sea stars; a carnivorous starburst sponge; shrimp; chimera; and a deep ocean lizardfish with highly reflective eyes." The team also noted aggregations of small sediment-colored spheres or spherules on the seabed, a feature they had previously observed on expedition to the Marianas.

As part of the *Mountains of the Deep* Expedition, NOAA collaborated with broader scientific and management communities through telepresence-based exploration. Using a high-bandwidth satellite connection that was also made accessible to the public, shore-based scientists were able to help guide operations—as well as share their enthusiasm on social media—in real time.

Biologist Astrid Leitner of the University of Hawaii at Manoa was one of the participating scientists on the expedition. She noted that because of the interest in deep sea mining on the Fracture Zone it is all the more important to understand the ecology of the region in advance of any potential mining. One anecdote she shared had to do with our pre-existing notions of abyssal plains and actual biological patterns that are beginning to come clear:

"There seems to be an interesting biogeographic story behind the distribution of abyssal fishes throughout the CCZ and across the Pacific, which we are just beginning to understand. Classically, abyssal plains have been considered to be expansive, homogeneous, and monotonous habitats. However, as we continue to explore the abyssal plains, interesting features—such as fracture zones, abyssal hills, and seamounts—and interesting ecological patterns are beginning to emerge. For example, it seems that rattail fishes are gradually replaced by cusk eels as you move westward across the Pacific."

Geologic observations were a key component of the Clipperton dive. However, these observations, as well as samples obtained throughout the expedition, are still under analysis and will be reported on more fully at a later time.

This NOAA mission to the CCZ followed closely behind three European marine research campaigns led by JPI Oceans on the RV Sonne, which in 2015 visited several license areas and two Areas of Particular Environmental Interest (APEIs) in the CCZ. That research effort, dubbed 'MiningImpact' reported a strong link between polymetallic nodules and biodiversity, and predicted that disturbance impacts would be ecosystem-wide and last for decades.

Since the *Mountains in the Deep* expedition, the *Okeanos* has deployed again, this time to the deepwater areas around Johnston Atoll, where they will be exploring seafloor habitats and geology through 2 August.

All of these expeditions are helping to establish foundational information and will catalyze further exploration, research, and management activities.

Deep Discoverer grabs a manganese-crusted rock sample near a brisingid sea star at about 2,400 meters depth at a site near the Cook Islands. *Image courtesy of the NOAA Office of Ocean Exploration and Research, Mountains in the Deep: Exploring the Central Pacific Basin.* **PAGE 1:** ROV *Deep Discoverer* explores the Clipperton Fracture Zone. This was the deepest dive on the expedition. *Image courtesy of the NOAA Office of Ocean Exploration and Research, Mountains in the Deep: Exploring the Central Pacific Basin.*

JOINT CALL PREANNOUNCEMENT: IMPACTS OF DEEP-SEA NODULE MINING

On 1 August 2017, a number of JPI Oceans member countries will launch a joint call for preproposals to study the environmental impacts and risks associated with seabed mining.

This call is being conducted as a follow-up of the Joint Action Joint under the framework of JPI Oceans. It calls for cruise proposals for the RV SONNE in early 2019 in the Clarion-Clipperton Fracture Zone (CCZ), subequatorial eastern Pacific. Interested participants are invited to express their interest in submitting a pre-proposal or joining a consortium.

For more information visit: DSMobserver.org/2017/07/impacts-of-deep-sea-nodule-mining

RECENT PRESS HEADLINES ON DEEP SEA MINING

Geologists strike seabed gold in peninsular India.
The Times of India, 17 July 2017

Why the First Complete Map of the Ocean Floor is Stirring Controversial Waters
Smithsonian.com, 13 July 2017

'Make new rules' to save the oceans
BBC News, 12 July 2017

Deep Sea Mining and the Controversial Solwara 1 Project in Papua New Guinea
Huffington Post, 11 July 2017

The Impacts of Deep Ocean Mining Will 'Last Forever', Scientists Warn
Gizmodo, 27 June 2017

To see all recent headlines with links to the news articles, visit: dsmobserver.org/category/in-the-news

Nautilus Minerals Commence PNG Submerged Trials

At the recent Annual General Meeting of Nautilus Minerals Inc., Chairman Russell Debney, announced to gathered shareholders in Toronto that submerged trials for their completed Seafloor Production Tools (SPTs) had begun in Papua New Guinea (PNG). This announcement came shortly after news that the Nautilus Launch and Recovery System (LARS) had arrived at the Mawei Shipyard in China, where construction of their Production Support Vessel (PSV) is still underway.

The success of these products will determine the viability of Solwara 1, Nautilus' pioneering deep sea mining prospect in PNG's Bismarck Sea. Solwara 1 was the world's first mining lease and corresponding environmental permit to explore polymetallic seafloor massive deposits, from which Nautilus is aiming to produce copper, gold and silver. The operation will occur 30 km at sea in 1600m of water.

The much talked about Nautilus SPTs combine existing subsea trenching technology from the offshore oil and gas sector with rock cutting technologies used in land-based operations. There are three distinct tools: the Auxiliary Cutter, the Bulk Cutter and the Collecting Machine. All were designed and built at Soil Machine Dynamic's facility in Newcastle Upon Tyne, UK.

These three robotic tools will work in unison, with the Auxiliary Cutter and the Bulk Cutter disaggregating rock on the seafloor and leaving cut material for collection by the Collecting Machine. The two cutting machines excavate material by a continuous cutting process like that of coal, in which the Auxiliary Cutter preps rough terrain, creating benches for the Bulk Cutter to work on with higher cutting capacity. The Collecting Machine then draws material (sand, gravel, silt) in a seawater slurry with internal pumps and pushes it through a flexible pipe to a Riser and Lifting System (RALS), which is still under production by primary contractor GE Oil and Gas. Integration is anticipated at a later date with delivery of the riser transfer hoses targeted for the last quarter of 2017.

The submerged trials are taking place at a facility on Motukea Island, near Port Moresby in PNG, where the SPTs arrived this past April. The trials are providing Nautilus a submerged demonstration of the fully assembled Tools and involve submerged testing of:

1. Control systems operations and feedback
2. Hydraulic functions
3. Collection system functions
4. Survey and visualization systems

During the trial phase, all three SPTs will be deployed in an existing excavation on Motukea Island. The Tools will not enter the ocean during this phase and a representative from Nautilus states that no discharge of cut material into the environment will occur. The manufacturers from Soil Machine Dynamics are on site with Nautilus, and the team is training local Papua New Guineans to be the first operators of the equipment. Government officers from the PNG Mineral Resources Authority (MRA), the Conservation & Environment Protection Authority (CEPA), and both New Ireland and East New Britain Provincial

Governments have been invited to participate in the tests as well, allowing local representation the opportunity to confirm that the mining equipment will operate in the way it has been designed and described via Nautilus outreach. These trials are estimated to put over PGK 7 million into the local economy.

A visualization depicting the deployment of Nautilus' Auxiliary Cutter using the Launch and Recovery System (LARS). **AT LEFT:** The Nautilus Seafloor Production Tools (SPTs) from left to right, the Collecting Machine (CM), the Bulk Cutter (BC) and the Auxiliary Cutter (AC). All three were designed and built at Soil Machine Dynamic's facility in Newcastle Upon Tyne, UK. © *Nautilus Minerals*.

Actual deployment of Nautilus' SPTs will take place from the PSV using the newly arrived LARS, now at China's Mawei shipyard. This LARS consists of very large A-frames, lift winches, hydraulic power units and deck control cabins, and was built by AxTech under the Nautilus' fabrication contract with Soil Machine Dynamics. Its key function will be to launch and stabilize the SPTs during deployment from the vessel down to the seafloor and during retrieval back up to the vessel. An animation of how it works can be viewed online at: http://www.nautilusminerals.com/IRM/content/video/The_LARS_movie.mp4

"It is very exciting for us to see our equipment start to arrive at the Mawei shipyard in China," stated Mike Johnston, Nautilus CEO. "The next step for the LARS will be its integration onto the Production Support Vessel, commencing June after import/customs clearances and minor re-assembly. The LARS' installation marks the start of our equipment integration onto the PSV, and will be undertaken by Mawei shipyard personnel with support from Nautilus and the equipment vendors. The vessel build remains on schedule, and we look forward to seeing more of the equipment arrive for integration over the coming months."

The first steel for the construction of the PSV was cut in September 2015. The vessel is being built by Fujian Mawei Shipbuilding Ltd. (FMSL), based in Fujian province in south-eastern China. FMSL was contracted by Marine Assets Corporation (MAC), a marine solutions company based in Dubai specializing in the delivery of new build support vessels for the offshore industry. MAC holds a charter agreement with Nautilus for the Solwara 1 Project in which MAC will own and operate the PSV, built under Nautilus' specifications.

FMSL has awarded several other contracts for the PSV.

PACKAGE	TO WHOM	COMMENTS
Engines & thrusters packages	Rolls Royce Marine, Norway	The order secures the main engines, azimuth and tunnel thrusters.
Cargo handling equipment	Bedeschi SPA, Italy	The cargo handling equipment will be used to transfer the dewatered mined material into four storage holds in the PSV and then to recover the material from the storage holds where it will be transferred directly on to Handimax vessels for transhipment to our processing partner in China, Tongling Nonferrrous Metals Group Company, Limited.
Vessel deck mounted cranes	MacGregor, Norway	The order for the cranes consists of two knuckle boom units. Both cranes will be used to load stores, spares and support the maintenance of shipboard SPTs and other items of production equipment during mining operations. The larger crane will also be capable of deploying and recovering various items of mining equipment directly to and from the seafloor.
Electrics for the PSV	Siemens International Trading (Shanghai) Ltd., a wholly owned subsidiary of Siemens AG.	This contract is for the entire electrical installation for the PSV.
Integrated control system	Kongsberg Maritime, Norway	This contract is for the vessel integrated control system (including dynamic positioning and navigation systems).

(Table content courtesy Nautilus Minerals)

Additional equipment will continue to arrive for integration in Mawei over coming months, with the launch of the PSV targeted for early 2018. Nautilus maintains that, subject to financing, commencement of operations at the Solwara 1 project site will begin in the first quarter of 2019.

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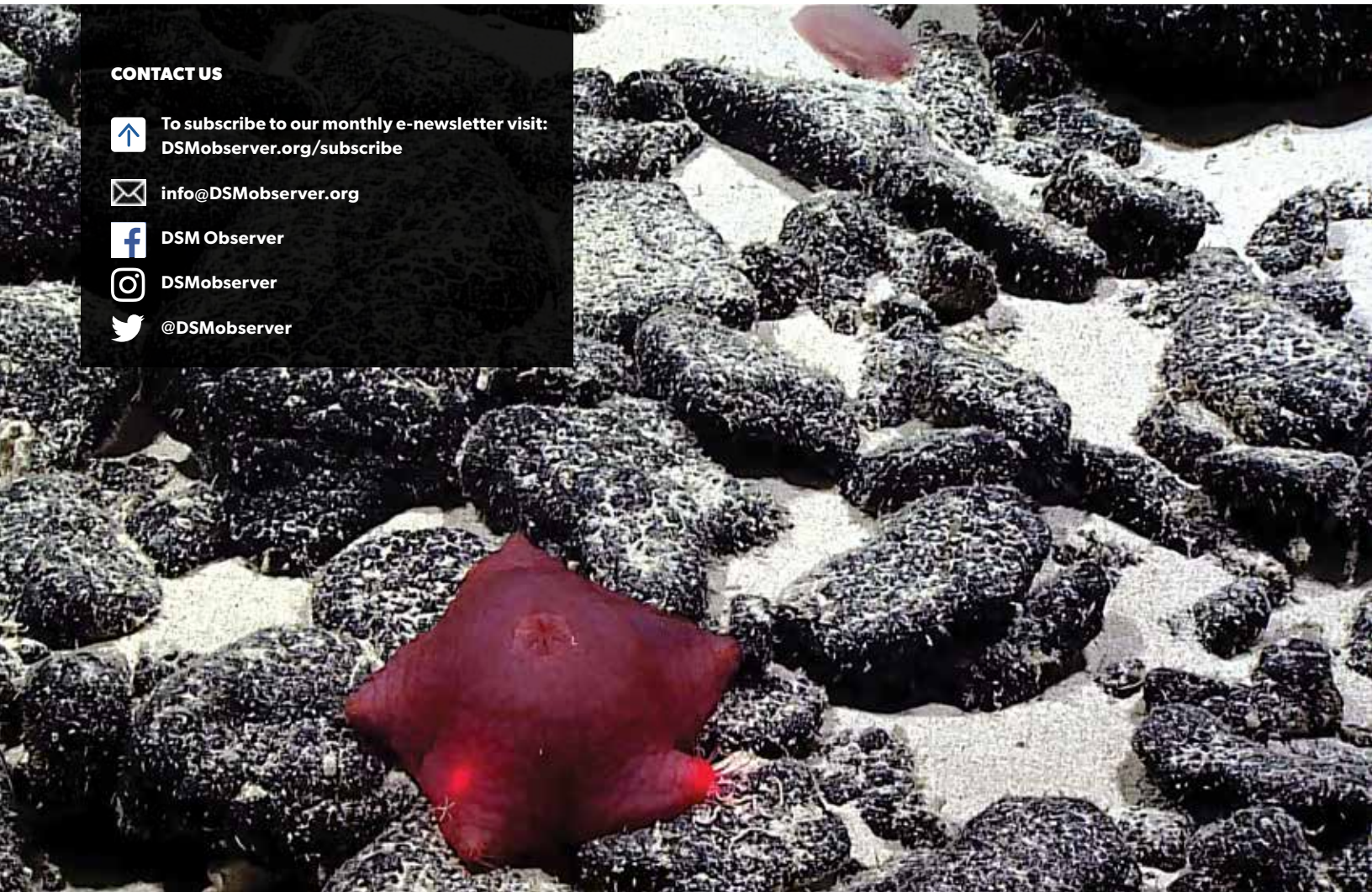
PHOTO: A red sea star amidst rounded black pieces of manganese-encrusted basaltic rubble. *Image courtesy of the NOAA Office of Ocean Exploration and Research, Mountains in the Deep: Exploring the Central Pacific Basin.*



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