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## **INDEEP Phase 2 Report (No. 1) to the Total Foundation**

### **January – December 2014**

#### **1. PROJECT DETAILS**

**Title:** INDEEP – International Network for Scientific Investigations of Deep-Sea Ecosystems

#### **Principal Investigators**

Dr Lenaick Menot, Ifremer-Brest (France)

Dr Maria C. Baker, University of Southampton (UK)

Dr Eva Ramirez-Llodra, Norwegian Institute for Water Research (Norway)

Dr Bhavani E. Narayanaswamy, Scottish Association for Marine Science (UK)

#### **Oversight Committee**

Prof Paul Tyler, University of Southampton, (UK) – Chair

Prof Craig Smith, University of Hawaii (USA)

Dr Malcolm Clark, National Institute of Water and Atmospheric Research (NZ)

Prof Robert Carney, Louisiana State University (USA)

Prof Myriam Sibuet, Institut Océanographique de Paris (France)

#### **Working Group Leads**

Dr Adrian Glover, Natural History Museum, London (UK) – WG1

Dr Tammy Horton, National Oceanography Centre (UK) – WG1

Dr Tim O'Hara, Museum Victoria (Australia) – WG2

Dr Derek Tittensor, Dalhousie University (Canada) – WG2

Dr Anna Metaxas, Dalhousie University (Canada) – WG3

Dr Eva Ramirez-Llodra, Norwegian Institute for Water Research (Norway) – WG3

Dr Andrew Thurber, Oregon State University (USA) – WG4

Dr Andrew Sweetman, International Research Institute Stavanger (Norway) – WG4

#### **Hosting Institutions**

IFREMER, France & University of Southampton, National Oceanography Centre, UK

## Project Outline

INDEEP will develop and synthesise our understanding of global deep-sea biodiversity and functioning, providing the framework to bridge the gap between scientific results and society. INDEEP will develop as a service provider for industry, policy makers, NGOs and society, facilitating the increasing demand for the development of guidelines based on robust data for sustainable use of marine resources and conservation.

## Participants

The INDEEP network has attracted great interest during its first 4 years of life, as reflected by the registered **667 participants from 40 countries**.

## 2. WORKING GROUP Activities 2013-2014

### WG1- Taxonomy & evolution (leads: Adrian Glover & Tammy Horton)

➤ **INDEEP World Register of Deep-Sea Species:** Three successful projects addressing gaps in the INDEEP World Register of Deep-Sea Species (WoRDSS) – Asellote Isopoda, Holothuroidea & Polychaeta. In February 2014, a call was made through LifeWatch and The Flanders Marine Institute (VLIZ, who hosts of the World Register of Marine Species database, WoRMS) to financially support projects to address gaps in WoRMS. The INDEEP project application was successful and INDEEP provided matched funding to support three projects with a focus to address specific gaps in WoRDSS. The deliverables were to:

- Provide taxonomic editorship to WoRMS
- Provide original description references, depth distribution data and/or confirmation of exclusion or inclusion in the WoRDSS for proposed taxon
- Provide identification resources including explanatory notes for each reference
- Provide the best available image for all family level taxa and higher if not already included in the deep-sea ID iOS app.

Three projects have now been completed and have together added 30 newly published species to WoRMS, added 1391 new deep-sea distributions to WoRDSS, linked or added over 122 identification references to WoRMS and WoRDSS (not including the many original descriptions & context sources added) and made available 74 good quality images for use on WoRDSS and the iOS app. (For further detail see article in Deep-Sea Life Issue 4).

Additionally, work with the Data Management team at VLIZ has allowed 1257 species from the 24 papers in the thematic volume 'Deep-sea Fauna of European Seas: An annotated species

check-list of benthic invertebrates living deeper than 2000 m in the seas bordering Europe. Invertebrate Zoology. Vol.11. No.1: 1–291’, to be matched with WoRMS. 301 new taxa were flagged as deep-sea taxa. References were added as the context source for those 301 taxa and for 821 others that did not have a context source or that had the context source OBIS. There are now an impressive **24,941 species listed** in the INDEEP WoRDSS taxonomic database.

- **INDEEP Special Session at World Conference on Marine Biodiversity, Qingdao, China, October 2014: “Evolution in the Deep Sea: Origins, Adaptation and Diversity”:** The session was successful in attracting 14 oral presentations and an audience of 60-80 people for the entire duration. The session was organised and co-chaired by Dr Adrian Glover (Natural History Museum, UK), Dr Moriaki Yasuhara (University of Hong Kong, China) and Dr Holly Bik (University of Birmingham, UK). The concept of the meeting was to bring together palaeontologists, molecular systematists and deep-sea biologists to focus on the fundamental question of the origin, age and adaptation of deep-sea fauna over evolutionary time. INDEEP-sponsored Keynote presentations were made by Prof Yukio Isozaki (University of Tokyo), Prof Andy Gooday (National Oceanography Centre, UK), Dr Moriaki Yasuhara, Dr Holly Bik and Dr Adrian Glover. Thanks to the sponsorship of INDEEP, partially-supporting attendance of these speakers, the event was extremely well attended and the talk programme completely filled. For further meeting details, see article in [Deep-Sea Life Issue 4](#). A review paper is planned.
- **Taxonomic Keys:** Current efforts are directed towards providing keys to the 2000 family-level taxa within WoRDSS in association with the main taxonomic editors of each group. Work is continuing in conjunction with the WoRMS data management team, to improve methods of displaying and searching for such resources on WoRDSS and WoRMS to enhance user experience.
- **INDEEP deep-sea ID App:** [Deep Sea ID](#), an iOS field guide app to the marine life of the deep sea, became available for free download for iPhone and iPad from 14<sup>th</sup> March 2013. This has been an unprecedented success for INDEEP and has been downloaded by 16,600 users from launch as of 30 November 2014. Users range from ~100 countries around the world, showing that there is public and scientific interest in deep-sea life from countries in the developing world. It allows offline access to WoRDSS and currently stores on your device the taxonomic information for almost 25,000 deep-sea species, ~ 500 high-resolution photographs of deep-sea specimens as well as links to online taxonomic tools, sources and important references. An Android version, and further updates and additional features to the current iOS version are now underway and should be completed by summer 2015.

- **Listing of deep-sea taxonomic experts – further updates:** A list of experts in the field of deep-sea taxonomy covering major taxa has been compiled by WG1 lead Dr Tammy Horton, and is constantly being updated and is available on the [INDEEP website resources page](#). The number of experts included currently runs to 289.

## **WG2 – Global biodiversity and biogeography (leads: Tim O’Hara & Derek Tittensor)**

- **Global map of ophiuroid species richness:** soon to be published (details of data gathering and analytical processes are described in previous INDEEP reports). This map will constitute important testing and updating of the biogeographic hypotheses posed by the GOODS report (UNESCO, 2009).
- **ISA Atlas of abyssal megafauna morphotypes of the Clarion Clipperton Fracture Zone:** Following a workshop co-funded by INDEEP and the ISA last year, “Workshop to Standardise Megafaunal Taxonomy for Exploration Contract Areas in the Clarion-Clipperton Fracture Zone”, an [atlas of megafauna](#) is now available online.
- **Crustacea publications referencing INDEEP:** Four new papers on crustacean taxonomy and referencing INDEEP have been published. (References upon request).
- **Expedition proposal:** A proposal was submitted to the Australian National Marine Facility for ship time to survey the abyssal biodiversity off Australia’s east coast in 2015-6. The proposal for 35 days surveying from Brisbane to Hobart at 2500 and 4000 m was put together by INDEEP scientists such as Tim O’Hara (Chief investigator and lead of INDEEP WG2) and Adrian Glover (lead of WG1), Ashley Rowden, and Thomas Schlacher. The proposal was successful although the trip will have been postponed until the end of 2017 due to delays in delivering the ship.
- **Schmidt Ocean Expedition Proposal:** A pre-proposal has been submitted (December 2014) for an INDEEP project entitled: “Sequencing the High Seas: an international collaborative study to explore abyssal biodiversity using advanced genomics”.

## **WG3 – Population connectivity (leads: Anna Metaxas & Eva Ramirez-Llodra)**

- **Further INDEEP frame deployments, recoveries and analysis:** Analysis (following standardized protocols for sample processing developed by WG3 leads) is now underway of some of the first INDEEP frames recovered from the deep. The North Atlantic samples are currently being analysed at the National Oceanography Centre in Southampton (UK) by Drs Andrew Gates, Jon Copley, Maria Baker and Dan Jones. The samples from off Vancouver Island (from 2013 and 2014) will be the base of an MSc project supervised by Dr. Anna Metaxas

(Dalhousie University). Six frames deployed on the margin and deep basin off Brazil have been collected and are being analysed by a student of Dr Angelo Bernardino and Dr Paulo Sumida (Universidade Federal do Espirito Santo). In September 2014, a new collaboration was established between INDEEP and BP for the deployment of two frames on the DELOS observatory on the African margin off Angola (Deep-ocean Environmental Long-term Observatory System, [www.delos-project.org](http://www.delos-project.org)). The recovery is planned for September 2015. Following the departure of our initial contact in Transocean, efforts continue to be made to re-establish new contacts to take the frame deployment on oil rig BOPs programme forward.

- **Key paper submitted November 2014:** Ana Hilario, Anna Metaxas, Sylvie Gaudron, Kerry Howell, Annie Mercier, Nelia Mestre, Rebecca Ross, Andreas Thurnherr and Craig Young (submitted). Estimated dispersal distance in the deep sea: challenges and applications to marine reserves. *Frontiers in Ecology and Evolution and Marine Science*. .
- **Namibia capacity-building workshop:** Planning well underway for capacity-building workshop (2016) on population connectivity (and broader) skills. The idea is to introduce African scientists and managers to a scientific skill set useful in decision making and advising for the sustainable exploitation of marine mineral resources.

#### **WG4 – Ecosystem function (lead: Andrew Thurber & Andrew Sweetman)**

- **Freezer Science project:** So far, over 100 samples from around the world have had their DNA extracted and sequenced resulting in a total of 9.7 million sequences of the 16s rRNA gene. We are currently seeking additional samples to add to this initial run and have recently put out a further call to the community. A first draft of a manuscript looking at how community patterns relate to function is in progress.
- **Key paper now published:** Thurber, A. R., Sweetman, A. K., Narayanaswamy, B. E., Jones, D. O. B., Ingels, J., and Hansman, R. L (2014). Ecosystem function and services provided by the deep sea. *Biogeosciences* 11, 3941–3963: <http://www.biogeosciences.net/11/3941/2014/bg-11-3941-2014.pdf>

#### **Deep-Ocean Stewardship Initiative (DOSI) (leads: Maria Baker, Lisa Levin, Kristina Gjerde & Elva Escobar)**

DOSI replaces INDEEP WG5 from phase 1 on anthropogenic impact and science policy (see INDEEP Phase 1 report for details). DOSI has been progressing well and continues to engage deep-sea stakeholders through publications, workshops, discussions and statements, surveys, symposia,

webinars and other activities. Highlights this year are included in the additional activities sections below. In addition, two new DOSI working groups have formed, taking the total to 9:

- **WG 8. Deep-Sea Tailing Placement (DSTP):** Lead: Eva Ramirez-Llodra (NIVA, Norway). This group will provide an international platform to plan, design and develop specific activities and promote discussion and communication amongst stakeholders on issues related to deep-sea mine tailings placement. An initial workshop on DSTP has recently been awarded funding from the Norwegian Research Council and preparations for this event (to be held in 2015) are underway. Collaborations with a new Chilean DSTP programme already established through meetings held last year (one hosted by the INDEEP office at NOCS) and with the and the International Maritime Organisation – London convention/London Protocol secretariat.
- **WG 9. Deep-Water Oil and Gas:** Lead, Erik Cordes, Temple University, USA. This group will discuss a range of issues such as those that have stemmed from the Deepwater Horizon incident in the Gulf of Mexico related to the need for baseline data, the designation of setback distances, the value of and ecosystem services provided by deep-sea ecosystems and, in general, the best practices for the stewardship of deepwater oil and gas development. These and many other issues will apply to other EEZs, the developing activity in the Arctic, and in some cases to international waters. One of the first actions of the working group will be to collect various case studies from the interested parties representing a variety of stakeholders and compare the regulations of different nations relative to offshore oil and gas development.

**Case study: To provide knowledge needed for Good Environmental Status (GES) of deep-sea habitats in the Gulf of Biscay in the framework of the European Marine Strategy Framework Directive (lead: Lenaick Menot)**

- **Catalogues and keys of deep-sea corals:** Online interactive keys for the identification of deep-sea coral species from images are under development. The interactive keys will provide both a catalogue of species and a way to standardize identifications of image-based Operational Taxonomic Units. The catalogue and keys are developed using [Xper](#). Xper is a biodiversity collaborative management platform licensed under the Creative Commons, which allows storing, editing, and sharing taxonomic information online. The software comes with an interactive identification module. The first step has been to develop a key for the identification of deep-sea cnidarians at low taxonomic resolution, down to Order level. The key is intended to be used by non-taxonomic experts working on images. The characters have been chosen to be

as straightforward as possible. A beta version of the deep-sea coral key is available, which will be tested and improved by the INDEEP community before release.

The next step is to develop catalogues and keys for each main order of deep-sea corals. The catalogue and key for antipatharians is under construction. A beta version should be available in the course of January 2015.

### 3. ADDITIONAL ACTIVITIES

#### Stakeholder engagement tools/ outreach

- **Website:** [www.indeep-project.org](http://www.indeep-project.org) - The INDEEP website is regularly updated with new community and outreach resources, information on working group activities and upcoming events. In addition, the INDEEP website hosts webpages for two associate programmes to which we are closely linked: [DOSI](#) (as described above) and [VentBase](#).
- **INDEEP and Twitter:** The INDEEP office is now a regular tweeter of relevant information concerning INDEEP activities and other activities relevant to the deep-sea community. We currently have 450 followers.
- **Deep-Sea Life publication:** Deep-Sea Life is an informal publication for the deep-sea biology community. This newsletter aims to deliver current news regarding projects, new papers, meetings and workshops, cruises, student progress, jobs and training opportunities, opinion pieces and other useful information for the science community and all interested parties. Deep-Sea Life is edited by Dr Maria Baker at the INDEEP Office. In 2014, two further issues have been produced and all four issues can be downloaded from the INDEEP resources webpage: <http://www.indeep-project.org/documents>. This publication has been very well received by the community and so it will continue in the foreseeable future. Deep-Sea Life was advertised in the Marine Scientist Magazine in February 2014.
- **Webinar Series:** A series of webinars were produced by INDEEP and DOSI which informed members of the deep-sea community (including a wide variety of stakeholders) about deep-ocean stewardship activities underway via various organizations. The goal of the webinar series was to inform each other in the deep-sea community, avoid duplication of stewardship efforts and create opportunities for partnership and collaboration. The webinar series aired bi-weekly from May through to July 2014. Each webinar featured a short presentation followed by moderated and in-depth discussion. In total, 12 deep-sea initiatives were presented and discussed: International Union for the Conservation of Nature (IUCN) – Kristina Gjerde, Deep-

Ocean Stewardship Initiative (DOSI) – Kristina Gjerde & Jeff Ardron, Institute for Advanced Sustainability Studies (IASS) – Jeff Ardron, Deep-Ocean Observing Strategy (DOOS) – Eric Lindstrom, Conservation of Biological Diversity ESAs (CBD) – Pat Halpin, International Seabed Authority (ISA) – Sandor Mulsow, Managing Impacts of Deep-Sea Resource Exploitation (MIDAS) – Philip Weaver, Secretariat of the Pacific Community (SPC-SOPAC) – Hannah Lily, World Ocean Commission (WOC) – Paul Holthus, Deep-Sea Conservation Coalition (DSCC) – Matt Gianni, Global Ocean Biodiversity Initiative (GOBI) – David Johnson and the Global Ocean Commission (GOC) – Kristian Teleki. The webinars were well-attended and are available online for post-webinar listening via the INDEEP website: (<http://www.indeep-project.org/deep-ocean-stewardship-initiative>). A further industry-based series is being planned.

- **Science Policy Forum May 2014:** DOSI members published an article in [Science magazine's Policy Forum](#) that calls for improving the stewardship of the deep ocean through precaution, research and integrated management Mengerink KJ, Van Dover CL, Ardron J, Baker MC, Escobar-Briones E, Gjerde K, Koslow A, Ramirez-Llodra E, Lara-Lopez A, Squires D, Sutton T, Sweetman AK, Levin LA (2014) A call for deep-ocean stewardship. *Science* 344: 696-698. Media attention included radio interviews (from Russia to the USA) with Maria Baker, Lisa Levin and Kathryn Mengerink.
- **Deep-sea Experts Database:** The INDEEP deep-sea experts database ([www.deepseaexperts.org](http://www.deepseaexperts.org)) is growing and is being used by all stakeholders to help bridge the gap between accurate scientific information and management of our deep oceans. The database currently has over 200 respondents.
- **Deep-sea Data Repository Listing:** Compilation and provision of an [online searchable listing](#) of all known open-access deep-sea data repositories for the deep-sea biology community. The INDEEP office has started work on this and the first iteration is now available on the resources page of the INDEEP website.
- **Deep-sea Interest Groups Listing:** Compilation of a comprehensive listing of national and international groups, programmes, institutions etc. with an interest in the deep-sea (and hence potentially INDEEP and DOSI). This listing is being used to enhance communication within the wider community.
- **Deep-sea Videos Online – Searchable Listing:** INDEEP/DOSI have created a comprehensive listing of online videos relating to the deep sea that will be of interest to the INDEEP and DOSI communities. There are links to over 250 videos specifically related to the deep sea on subjects such as climate change, ocean acidification, hypoxia, circulation, disposal (CO<sub>2</sub>, dredge spoil,

litter, munitions, nuclear waste, plastics, sewage, ship wrecks and debris), exploitation (fishing, mining, oil and gas, pipelines, cables, acoustics, contamination) and exploration (biodiversity, vents, seamounts, seeps, corals, canyons, continental margins, trenches, technology, marine life). Many of these videos will be useful for teaching purposes and teachers can search by subject area to see if there is any material relevant to their specific course. Other useful information is also listed and searchable such as video title, presenter, affiliation, series type, duration and upload date.

- **Potential deep-sea science funding sources:** A list of potential funding sources for use by the community, with details of deadline dates and funding strategies.
- **Speaking textbook:** DOSI and INDEEP have initiated a comprehensive free online deep-sea ecology and stewardship “speaking textbook” aimed at all stakeholders. This will be available on a dedicated YouTube channel shortly.
- **NOC Open Day March 2014:** INDEEP and DOSI were showcased during the annual National Oceanography Centre, Southampton, UK open day.
- **Popular Article:** [Weather.com article](#) mentions INDEEP and DOSI projects – Who owns the ocean floor?
- **INDEEP newsletter** March 2014
- **2nd DOSI newsletter** March 2014
- **Blue Marvel Ocean Mysteries Challenges Talk:** In January 2014, Dr Lisa Levin presents DOSI and issues of deep-ocean stewardship during a popular webinar series entitled: [Challenges to Deep-Ocean Biodiversity in the 21st Century](#).
- **INDEEP article** in MIDAS newsletter April 2014.
- **Marine Knowledge Gate:** INDEEP have contributed information to the STAGES Marine Knowledge Gate programme and are listed in their [database](#). This is a searchable inventory of marine science and technology projects and their knowledge outputs:

#### **Participation/organisation of international symposia, meetings and workshops (in date order)**

- **The Economist World Ocean Summit 2014**, San Fransisco, USA, February 2014. Five DOSI Advisory Board members introduced DOSI during this prestigious meeting (<http://www.economistinsights.com/sustainability-resources/event/world-ocean-summit-2014/speaker>).

- **AAAS Meeting (Ocean Industrialization)**, Chicago, USA, February 2014. Promotion of DOSI aims and objectives during special DOSI session generated significant [press coverage](#) about the need for deep-ocean stewardship.
- **EMODNET Traits discussion meeting**, IFREMER, Paris, February 2014. INDEEP WG1 leads Tammy Horton and Adrian Glover taking forward INDEEP initiatives (<http://www.emodnet-biology.eu/project/workshops>)
- **DOSI/INDEEP workshop on: Defining “Significance” in Environmental Impact Assessment for Deep-Sea Mining**, Scripps, USA, March 2014. ([Link to report](#)) – paper currently in prep.
- DOSI presented during **MIDAS meeting**, London, UK March 2014 (Lisa Levin)
- DOSI presented at the **Deep-Sea Mining Summit**, London, UK, March 2014 (Hannah Lily)
- **INDEEP/Ocean Networks Canada partnership development workshop**, Victoria, Canada, April 2014 (funded by ONC) ([Link to report](#)).
- **VentBase 2014**: The objectives were to identify practical spatial management and mitigation strategies for the mining of SMS deposits and to further the development of a ‘primer-type’ document on conservation genetics at deep-sea SMS deposits. INDEEP members attended this meeting and outputs will be open access (supported by INDEEP). ([Link to Report](#)).
- Patricio Bernal (coordinator for IUCN High Seas Biodiversity Initiative) and Leonel Sierralta (coordinator for new **Chilean mining research programme**) visited the INDEEP office at NOC (3 June 2014) to give a presentation on the goals and objectives of a new Chilean research program that plans to look into the risks associated to discharging copper mine tailings into the deep ocean. New DOSI DSTP WG set up as a result and first WG workshop funded by Norway.
- **Ocean Global Change Biology (Gordon Conference)**, New Hampshire, USA, July 2014. DOSI presented.
- **3<sup>rd</sup> International Marine Conservation Congress**, Glasgow, Scotland, August 2014. INDEEP & DOSI members presented on deep-sea issues.
- **DOSI tele-conference** to discuss ways forward for programme – DOSI Advisory Board members, September 2014.
- **International Ocean Summit on the Blue Economy**, Brest, France, October 2014. Deep Ocean Biodiversity Challenges, Linwood Pendleton and others attended on behalf of DOSI
- **World Conference on Marine Biodiversity**, Qindao, China, October 2014. INDEEP WG1 Special Session on Evolution ([Link to Report](#)). INDEEP-supported session on “Anthropogenic impacts on deep-sea biodiversity and their consequences”. Chris Pham funded to attend (reg fee). These sessions once again insured the visibility of INDEEP (and Fondation Total) to the

wider ocean research community. A presentation and discussion on DOSI was also given during the WCMB by Lisa Levin and concentrated on how to engage China.

- **Ocean Summit Forum**, Qindao, China, October 2014. Presentation on DOSI given by Lisa Levin.
- INDEEP & Deep-Sea Biology Society skype meeting, September 2014 to discuss INDEEP interaction with potential new society.
- **2nd International Ocean Research Conference**, Barcelona, Spain, November 2014. DOSI presented to 600 participants during discussions on ocean governance and capacity building issues.
- **International Seabed Authority Workshop**: “standardized taxonomy for macrofauna associated with polymetallic nodule deposits” workshop, Korea, November 2014. INDEEP PI and WG lead taking part in this cross-sector workshop.
- **Deep-Sea Challenges Conference**, Haifa, Israel, November 2014. DOSI presented.
- DOSI presented during the **COP 20** at the Oceans Pavillion, and Voice for Climate, December 2014, Lima, Peru.
- **High-Seas Meeting, Monaco**, December 2014. DOSI presented.
- **World Parks Congress**, Sydney, Australia, November 2014. DOSI presented.
- **MARLISCO** meeting, London, UK, December 2014. INDEEP/DOSI to engage with this community in terms of deep-sea litter.
- DOSI members are organizing a **SEAMAR** workshop (Towards a Strategic Environmental Assessment for mineral mining along the Mid-Atlantic Ridge) for October 2014 (Leads: L. Menot, A. Colaco).
- **14th Deep-Sea Biology Symposium**, Aveiro, Portugal, August 2015. Currently planning and coordinating INDEEP and DOSI sessions and activities for this key 3 yearly meeting.

### **Participation in international initiatives (coordinated from the office: Dr Maria Baker, Uni. Southampton, UK)**

INDEEP is now recognised as a major body for deep-sea scientific information and links with all other stakeholders and, as such, has been involved in global initiatives establishing links with a wide array of partners (e.g. GOBI, IUCN, WOC, GOC, UN, DEFRA). New and ongoing involvement of INDEEP in international initiatives:

- **UN World Ocean Assessment**: Following on from the successful call from the INDEEP office for members of the deep-sea science community to become actively involved in the “World Ocean

Assessment”, the [pool of experts](#) comprises many deep-sea experts who have contributed towards this important process. INDEEP has also now called for expert reviews of the 58 WOA chapters. Reviews should be complete early 2015 and the WOA published by May 2015.

- **The [Global Ocean Commission \(GOC\)](#):** INDEEP and DOSI have had important interactions with the GOC and have had significant input to their high-seas policy papers. Interactions continue. In March 2014, DOSI submitted a brief to the Global Ocean Commission outlining priority issues for the deep sea. DOSI has advised the Global Ocean Commission during process of compiling their [Mission Ocean rescue package](#).
- **International Seabed Authority (ISA):** Several INDEEP members play important roles at the ISA, including the Legal and Technical Commission (Dr David Billett, Dr Elva Escobar) and Research experts (Dr Craig Smith, Uni. Hawaii; Dr Chuck Fisher, Pennsylvania State Uni.; Dr Cindy Van Dover, Duke Uni., Dr. Tammy Horton, NOC, Dr. Lenaick Menot, Ifremer). INDEEP has close links with the ISA biological activities. DOSI submitted a brief to the ISA Legal and Technical Commission in March 2014 requesting support for a multi-disciplinary workshop to develop an environmental management strategy for The Area. DOSI also compiled and forwarded [responses](#) to an ISA Stakeholder consultation in advance of developing draft regulations for the exploitation of polymetallic nodules. The consultations include issues relating to the environmental management of deep-sea mining. DOSI submitted a public statement to the International Seabed Authority concerning a need for holistic, internationally coordinated research on ecosystem structure and function in advance of deep-sea mining operation. This was endorsed by 93 leading scientists and 18 organizations concerned with the deep ocean. INDEEP and DOSI feature in ISAS report by secretary General in June 2014 (see ISA folder email) – formal recommendation to work with INDEEP.
- **IUCN Theme Group on Ecosystem Management and Deep-Sea Mining ([Link](#))** has recently been established in 2014. The group is led by Dr Malcolm Clark (NIWA, NZ and INDEEP Oversight Committee) and has the participation of other INDEEP members (e.g. Ashley Rowden, Eva Ramirez-Llodra).
- **[IABO \(International Association of Biological Oceanography\)](#):** This association is being re-vamped and updated and INDEEP WG1 lead, Adrian Glover, is involved in this initiative and will be able to directly involve INDEEP in the new activities.
- **[WoRMS \(World Register of Marine Species\)](#):** WG1 lead, Tammy Horton, is on the WoRMS Steering Committee and Editorial Board.

- **IUCN Theme group Red List of Ecosystems:** INDEEP co-PI Eva Ramirez-Llodra participates in this group and will attend a first meeting in March 2015.
- **Working Group on Deepwater Ecology of the ICES:** INDEEP members Ana Colaço, Lenaick Menot, and Maria Baker contributed their expertise on chemosynthetic ecosystems to this working group. This role involved helping to compile information and formulate advice statements. There is a general international call to map and provide guidance on protective measures. ICES has an obligation to provide advice to governments and intergovernmental bodies on this issue. The final report of the ICES/NAFO Joint Working Group on Deep-water Ecology (WGDEC 2013) is available at WGDEC 2013. Further ICES products are underway.
- **VentBase:** VentBase is a forum where academic, commercial, government and other stakeholders can develop a consensus on the best way to manage the mining of seafloor massive sulfide (SMS) deposits. VentBase produces best-practice documents to inform stakeholders, and highlight state of the art science to underpin effective management. INDEEP has been involved in this initiative since the first meeting in Galway 2012. VentBase 2014 will be held in NZ in April. I'm hoping the genetics paper from VentBase will be submitted to Ocean and Coastal Management early in the New Year.
- **Panel on exploration guidelines for vent sites:** INDEEP member Patrick Collins is now on the liaison for this panel in collaboration with invited NGOs and industry for InterRidge. These guidelines will be similar to the Code of Conduct developed a few years ago, but more outward-looking to all stakeholders, rather than just scientists. INDEEP will report on this progress.
- **DEFRA valuing the deep report:** Engaged with DEFRA project Delphi Study on marine genetic resources.
- **INDEEP is now a partner with the Marine Ecosystem Services Partnership (MESP),** having joined together with them to coordinate and execute a webinar series on deep-ocean stewardship.
- **MOOC on “Exploring our Oceans”:** INDEEP and DOSI are featured (in week 6) in this Massive Online Open Course developed by the University of Southampton which was broadcast in February 2014 and again in November/December 2014 owing to popular demand. Almost 9000 people from across the globe took the course (<https://www.futurelearn.com/courses/exploring-our-oceans>)