



## WORKSHOP ON ENHANCING IMAGE-BASED BIODIVERSITY ASSESSMENTS TO ADVANCE DEEP-SEA TAXONOMY

12-14 October 2021, Online

### ANNOTATIONS TO THE PROVISIONAL AGENDA

#### INTRODUCTION

1. In accordance with the UN Convention on the Law of the Sea (“the Convention”) and 1994 Agreement relating to the implementation of Part XI of the Convention, the International Seabed Authority (ISA), on behalf of the States Parties to the Convention, is mandated to administer the mineral resources in the Area and to control and organize current exploration activities, as well as future mining activities, in the Area for the benefit of mankind as a whole. The Authority is also mandated to take necessary measures with respect to activities in the Area to ensure effective protection for the marine environment from harmful effects and to adopt appropriate rules, regulations and procedures for, *inter alia*, the prevention, reduction and control of pollution and other hazards to the marine environment, 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<sup>1</sup>.

2. In addition, the Authority is required to promote and encourage the conduct of marine scientific research in the Area, and coordinate and disseminate the results of such research and analysis when available<sup>2</sup>. The importance of this mission was highlighted by the Strategic Plan of ISA for the period 2019-2023, adopted by the Assembly at its twenty-fourth session in 2018<sup>3</sup>. Especially through the strategic direction 4 (“Promote and encourage marine scientific research in the Area”), the members of ISA have established the vision in this regard, which is being implemented according to the High-level Action Plan for 2019-2023 adopted by the Assembly at its twenty-fifth session in 2019<sup>4</sup>.

3. In 2017, the United Nations Decade of Ocean Science for Sustainable Development from 2021 to 2030 was proclaimed by the United Nations General Assembly in its resolution 72/73. In December 2020, the ISA Assembly adopted the Action plan of the International Seabed Authority in support of the United Nations Decade of Ocean Science for Sustainable Development<sup>5</sup> to formalize and organize its contribution to the implementation of the United Nations Decade, building on the strategic directions, high-level actions and associated outputs set out in the abovementioned Strategic Plan and the High-level Action Plan.

4. Among six strategic research priorities identified in the action plan, the following priorities highlight the importance of expanding deep-sea knowledge base and standardizing taxonomic

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<sup>1</sup> United Nations Convention on the Law of the Sea, art.145

<sup>2</sup> United Nations Convention on the Law of the Sea, art.143

<sup>3</sup> [ISBA/24/A/10](#), annex, para. 29

<sup>4</sup> [ISBA/25/A/15](#)

<sup>5</sup> [ISBA/26/A/17](#)

information: i) advancing scientific knowledge and understanding of deep-sea ecosystems, including biodiversity and ecosystems functions, in the Area; and ii) standardizing and innovating methodologies for deep-sea biodiversity assessment, including taxonomic identification and description, in the Area.

5. In pursuance of the strategies and priorities identified above, ISA, in collaboration with the Ministry of Oceans and Fisheries of the Republic of Korea (MOMAF) and the National Marine Institute of Korea (MABIK), organized an online workshop on Deep-sea Taxonomic Standardization: strategic approaches for collaboration, from 15-16 September 2020. The workshop successfully identified key needs, priorities, and collaborative approaches for increasing deep-sea taxonomic knowledge, which are being further developed and consolidated into a roadmap to promote effective integration of deep-sea taxonomic information into ISA's efforts towards facilitating activities in the Area in an environmentally responsible manner.

6. Building on the results of the abovementioned workshop on deep-sea taxonomic standardization, ISA, in collaboration with MOMAF and MABIK, is organizing an online workshop on Enhancing Image-based Biodiversity Assessments to Advance Deep-sea Taxonomy from 12-14 October 2021. In response to the needs and priorities identified during the previous workshop, this workshop aims to identify technical means and key elements for a standardized model necessary to facilitate effective sharing and use of image data within the context of ISA, with a view to enhancing deep-sea species identification and quantification, as well as increasing capacity and literacy in deep-sea taxonomy.

7. The workshop will be conducted in two separate sessions: technical session for invited experts from 12-13 October 2021 and open session for registered participants on 14 October 2021. The technical session will focus on topics related to: i) archiving and utilizing images for the development of species identification methods and facilitation of machine learning for automatic image recognitions on which future Artificial Intelligence-powered tools can rely; ii) standardizing image annotation methodologies and tools; iii) improving methods for image acquisitions and analyses; and iv) innovating image data products and outreach activities using deep-sea taxonomy image platform. The open session will focus on: i) providing updates on the results of the technical session; ii) presenting the roadmap to promote effective integration of deep-sea taxonomic information into ISA's efforts towards facilitating activities in the Area in an environmentally responsible manner; and iii) exploring potential ways and means to enhance collaboration among members and stakeholders of ISA, including the scientific community, contractors, and decision-makers, for effective generation, use and sharing of deep-sea taxonomic information.

8. The outcomes of the workshop will provide the ISA secretariat with the necessary elements to develop a practical model of sharing images, as well as optimizing and standardizing the application of images for biodiversity assessments, in support of the work of ISA. The workshop is also expected to support members, contractors, and other relevant stakeholders of ISA in exploring opportunities to collaborate on innovating image-based deep-sea species identifications, increase the awareness of associated methodologies, and promote capacity-building efforts in the field of deep-sea taxonomy.

9. A list of documents for the workshop is contained in annex I.

10. The ISA secretariat has made available online an information note for participants<sup>6</sup> containing logistics details to facilitate their participation, including information on how to join the online workshop and navigate different functions of the online meeting platform. The workshop will be conducted in English.

11. The workshop will commence with the technical session at 6:00 a.m. (Jamaica; GMT-5) on Tuesday, 12 October 2021.

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<sup>6</sup> <https://www.isa.org.jm/files/2021-08/Info-note-participants-workshop-enhancing-image-based-assessment-oct2021-rev.pdf>

## **I. PART I: TECHNICAL SESSION (12-13 OCTOBER 2021)**

12. Kerry Howell (University of Plymouth, UK) is invited as the chair to moderate the workshop deliberation.

### **ITEM 1. OPENING OF THE WORKSHOP**

13. The Secretary General of the International Seabed Authority, the Deputy Minister, Marine Policy Office of the Ministry of Ocean and Fisheries (MOMAF) of the Republic of Korea, and the President of the National Marine Biodiversity Institute of Korea (MABIK), will open the workshop at 6:00 a.m. (Jamaica; GMT-5) on Tuesday, 12 October 2021.

### **ITEM 2. WORKSHOP BACKGROUND, SCOPE AND EXPECTED OUTPUTS**

14. Under this item, participants will have before them following documents: (i) action plan of the International Seabed Authority in support of the United Nations Decade of Ocean Science for Sustainable Development; and (ii) report of the Workshop on Deep Sea Taxonomic Standardization: Strategic Approaches for Collaboration (15-16 September 2020).

15. Luciana Genio (ISA secretariat) will provide a presentation on workshop background, scope and expected outputs.

16. Participants will be invited to ask questions and exchange insights, views and suggestions on the workshop scope and outputs, in response to the presentation above.

### **ITEM 3. IMAGE DATA FLOW: ARCHIVING, CATALOGUING, PROCESSING, AND SHARING IMAGE DATA AND INFORMATION**

17. Under this item, Kerry Howell (University of Plymouth, UK) will deliver a theme presentation on the image data flow from archiving and cataloguing images to processing and sharing data and information collected from images.

18. Participants will be invited to ask questions and exchange insights and views, in response to the presentation above.

### **ITEM 4. IMAGE ACQUISITION: NEEDS AND REQUIREMENTS FOR BIOLOGICAL IMAGE SURVEYS AND LABORATORY STUDIES**

19. Under this item, a panel discussion will be organized with the following experts, who will deliver brief presentations on different approaches to image acquisition:

- a) Daniel Jones (National Oceanography Centre, UK) on image surveys of benthic communities;
- b) Dhugal Lindsay (Japan Agency for Marine-Earth Science and Technology, Japan) on image surveys of pelagic communities; and
- c) Daniela Zeppilli (L'Institut Français de Recherche pour L'Exploitation de la Mer, France) on microscopic observations, including 3D imagery.

20. Participants will be invited to ask questions and exchange insights and views, in response to the ideas, examples, and experiences presented by the panelists.

### **ITEM 5. INFRASTRUCTURE NEEDS FOR IMAGERY DATA ARCHIVING AND EXCHANGE**

21. Under this item, a panel discussion will be organized with the following experts, who will deliver brief presentations on infrastructure needs for imagery data archiving and exchange:

- a) Sheldon Carter (ISA secretariat) on the ISA DeepData database;
  - b) Pieter Provoost (IOC-UNESCO) on the Ocean Biodiversity Information System (OBIS) database; and
  - c) Kakani Katija (Monterey Bay Aquarium Research Institute, USA) on the FathomNet database.
22. Participants will be invited to ask questions and exchange insights and views, in response to the ideas, examples, and experiences presented by the panelists.

#### **ITEM 6. IMAGE ANNOTATIONS: STANDARD REFERENCE CATALOGUE**

23. Under this item, a panel discussion will be organized with the following experts, who will deliver brief presentations on different software for image annotations and classification:
- a) Timm Schoening (GEOMAR Helmholtz Centre for Ocean Research Kiel, Germany) on *Biigle* and other annotation tools;
  - b) Candice Untiedt (Commonwealth Scientific and Industrial Research Organization, Australia) on *CATAMI* classification scheme; and
  - c) Kirsty McQuaid (Plymouth University, UK and the South African National Biodiversity Institute, South Africa) on *SMarTaR-ID* framework.
24. Participants will be invited to ask questions and exchange insights and views, in response to the ideas, examples, and experiences presented by the panelists.

#### **ITEM 7. IMAGE DATA PRODUCTS: KEYS, GUIDES, AND OUTREACH MATERIALS**

25. Under this item, a panel discussion will be organized with the following experts, who will deliver brief presentations on various image data products:
- a) Kamila Mianowicz (Interoceanmetal Joint Organization, Poland) on Atlas of Megafauna;
  - b) Adrian Glover (Natural History Museum, UK) on DeepSea ID and Clarion-Clipperton Zone (CCZ) species list; and
  - c) Youngdawng Moh and Jinwook Back (National Marine Biodiversity Institute of Korea, Republic of Korea) on image platform for public outreach.
26. Participants will be invited to ask questions and exchange insights and views, in response to the ideas, examples, and experiences presented by the panelists.

#### **ITEM 8. SUMMARY AND CONCLUSION**

27. The workshop chair will provide a summary of the workshop results, including a standardized model of image-based biodiversity assessments for effective generation, use and sharing of image data and information to advance deep-sea taxonomy.
28. Participants will be invited to consider the workshop results and provide comments and suggestions.

#### **ITEM 9. CLOSURE OF THE WORKSHOP**

29. The workshop is expected to close at 10:00 a.m. (Jamaica; GMT-5) on Wednesday, 13 October 2021.

## **II. PART II: OPEN SESSION (14 OCTOBER 2021)**

30. Kerry Howell (University of Plymouth, UK) is invited as the chair to moderate the workshop deliberation.

### **ITEM 1. OPENING OF THE WORKSHOP**

31. The Secretary General of the International Seabed Authority, the Deputy Minister, Marine Policy Office of the Ministry of Ocean and Fisheries (MOMAF) of the Republic of Korea, and the President of the National Marine Biodiversity Institute of Korea (MABIK), will open the workshop at 6:00 a.m. (Jamaica; GMT-5) on Thursday, 14 October 2021.

### **ITEM 2. WORKSHOP BACKGROUND, SCOPE AND EXPECTED OUTPUTS**

32. Under this item, participants will have before them following documents: (i) action plan of the International Seabed Authority in support of the United Nations Decade of Ocean Science for Sustainable Development; and (ii) report of the Workshop on Deep Sea Taxonomic Standardization: Strategic Approaches for Collaboration (15-16 September 2020).

33. Luciana Genio (ISA secretariat) will provide a presentation on workshop background, scope and expected outputs.

34. Participants will be invited to ask questions and exchange insights, views and suggestions on the workshop scope and outputs, in response to the presentation above.

### **ITEM 3. ENHANCING IMAGE-BASED BIODIVERSITY ASSESSMENTS TO ADVANCE DEEP-SEA TAXONOMY**

35. Under this item, Kerry Howell (University of Plymouth, UK) will deliver a presentation on key outcomes of the technical session of the workshop held from 12-13 October 2021.

36. Participants will be invited to ask questions and exchange insights and views, in response to the presentation above.

### **ITEM 4. ROADMAP TO PROMOTE EFFECTIVE INTEGRATION OF DEEP-SEA TAXONOMIC INFORMATION INTO ISA'S EFFORTS TOWARDS FACILITATING ACTIVITIES IN THE AREA IN AN ENVIRONMENTALLY RESPONSIBLE MANNER**

37. Under this item, Luciana Genio (ISA secretariat) will deliver a presentation to introduce the roadmap to promote effective integration of deep-sea taxonomic information into ISA's efforts towards facilitating activities in the Area in an environmentally responsible manner.

38. Participants will be invited to ask questions and exchange insights and views, in response to the presentation above.

### **ITEM 5. IDENTIFYING PARTNERS, DONORS, AND RELEVANT INITIATIVES FOR THE EFFECTIVE GENERATION, USE AND SHARING OF DEEP-SEA TAXONOMIC INFORMATION**

39. Under this item, the following experts will be invited to deliver brief presentations on ongoing and future initiatives that will contribute to the effective implementation of collaborative activities to advance deep-sea taxonomy:

- a) Ward Appeltans (IOC-UNESCO);
- b) Tammy Horton (World Register of Marine Species);
- c) Muriel Rabone (Natural History Museum of UK);

- d) Daniela Zeppilli (L’Institut Français de Recherche pour L’Exploitation de la Mer); and
- e) Aurore Maillet (European Commission).

40. Participants will be invited to ask questions and exchange insights and views, in response to the ideas, examples, and experiences presented by the panelists.

#### **ITEM 6. SUMMARY AND CONCLUSION**

41. The workshop chair will provide a summary of the workshop results, including suggested approaches to promote coherent, collaborative and scientifically robust ways and means for enhancing taxonomic knowledge of biodiversity in the Area.

42. Participants will be invited to consider the workshop results and provide comments and suggestions.

#### **ITEM 7. CLOSURE OF THE WORKSHOP**

43. The workshop is expected to close at 10:00 a.m. on Thursday, 14 October 2021.

*Annex I*

**LIST OF DOCUMENTS FOR THE WORKSHOP**

<i>Prepared by</i>	<i>Title</i>
ISA secretariat	Provisional agenda
ISA secretariat	Annotations to the provisional agenda
ISA secretariat	Action plan of the International Seabed Authority in support of the United Nations Decade of Ocean Science for Sustainable Development (ISBA/26/A/17)
ISA secretariat	Report of the Workshop on Deep Sea Taxonomic Standardization: Strategic Approaches for Collaboration (15-16 September 2020)

*Annex II*

**PROPOSED ORGANIZATION OF WORK**

**Part I: Technical meeting for invited experts (12-13 October 2021)**  
**Chair: Kerry Howell (University of Plymouth, UK)**

**Day 1 – Tuesday, 12 October**

Time (Jamaica; GMT-5)	Workshop activities
6.00 - 6.30 am	<p><b><i>Agenda item 1. Opening of the workshop</i></b></p> <ul style="list-style-type: none"> <li>• Secretary-General of the International Seabed Authority</li> <li>• Deputy Minister, Marine Policy Office of the Ministry of Ocean and Fisheries, Republic of Korea</li> <li>• President of the National Marine Biodiversity Institute of Korea</li> </ul>
6.30 - 6.50 am	<p><b><i>Agenda item 2. Workshop background, scope and expected outputs</i></b></p> <ul style="list-style-type: none"> <li>• Workshop background, scope and expected outputs                             <ul style="list-style-type: none"> <li>○ Luciana Genio (ISA Secretariat)</li> </ul> </li> </ul> <p><b><i>Q&amp;A</i></b></p>
6.50 - 7.30 am	<p><b><i>Agenda item 3. Image data flow: archiving, cataloguing, processing, and sharing image data and information</i></b></p> <ul style="list-style-type: none"> <li>• Theme presentation (20 min)                             <ul style="list-style-type: none"> <li>○ Kerry Howell (University of Plymouth, UK)</li> </ul> </li> </ul> <p><b><i>Plenary Discussion</i></b></p>
7.30 - 8.15 am	<p><b><i>Agenda item 4. Image acquisition: needs and requirements for biological image surveys and laboratory studies</i></b></p> <p><i>Guiding question:</i></p> <p><i>What are the common key considerations of image data acquisition to characterize deep-sea biological communities?</i></p> <ul style="list-style-type: none"> <li>• Panel Discussion (5min each)                             <ul style="list-style-type: none"> <li>○ Daniel Jones (National Oceanography Centre, UK) – image surveys of benthic communities</li> <li>○ Dhugal Lindsay (Japan Agency for Marine-Earth Science and Technology, Japan) – image surveys of pelagic communities</li> <li>○ Daniela Zeppilli (L’Institut Français de Recherche pour L’Exploitation de la Mer, France) - microscopic observations, including 3D imagery</li> </ul> </li> </ul> <p><b><i>Plenary discussion</i></b></p>

8.15 - 9.45 am	<p><b>Agenda item 5. Infrastructure needs for imagery data archiving and exchange</b></p> <p><i>Guiding question:</i></p> <p><i>How can imagery data and associated data be stored (local vs centralized) and exchanged between DeepData and other databases?</i></p> <ul style="list-style-type: none"> <li>• Panel discussion (5min each) <ul style="list-style-type: none"> <li>○ Sheldon Carter (ISA secretariat) - DeepData database</li> <li>○ Pieter Provoost (IOC-UNESCO) – Ocean Biodiversity Information System (OBIS) database</li> <li>○ Kakani Katija (Monterey Bay Aquarium Research Institute, USA) – FathomNet database</li> </ul> </li> </ul> <p><b>Plenary discussion</b></p>
9.45 - 10.00 am	<b>Wrap-up</b>

**Day 2 – Wednesday, 13 October**

<b>Time (Jamaica; GMT-5)</b>	<b>Workshop activities</b>
6.00 - 7.45 am	<p><b>Agenda item 6. Image annotations: standard reference catalogue</b></p> <p><i>Guiding questions:</i></p> <p><i>How can classification systems and image analysis vocabularies be standardized and shared between users?</i></p> <p><i>What is necessary to promote and develop remote annotation as well as human and machine learning?</i></p> <p><i>What are the required steps for quality assurance and control?</i></p> <ul style="list-style-type: none"> <li>• Panel Discussion (5min each) <ul style="list-style-type: none"> <li>○ Timm Schoening (GEOMAR Helmholtz Centre for Ocean Research Kiel, Germany) – <i>Biigle</i> and other annotation tools</li> <li>○ Candice Untiedt (Commonwealth Scientific and Industrial Research Organization, Australia) – <i>CATAMI</i> classification scheme</li> <li>○ Kirsty McQuaid (Plymouth University, UK and the South African National Biodiversity Institute, South Africa) - <i>SMarTaR-ID</i> framework</li> </ul> </li> </ul> <p><b>Plenary discussion</b></p>
7.45 - 8.45 am	<p><b>Agenda item 7. Image data products: keys, guides, and outreach materials</b></p> <p><i>Guiding questions:</i></p>

	<p><i>What are the common key considerations for effective image data dissemination and outreach?</i></p> <ul style="list-style-type: none"> <li>• Panel Discussion (5min each) <ul style="list-style-type: none"> <li>○ Kamila Mianowicz (Interoceanmetal Joint Organization, Poland) - Atlas of Megafauna</li> <li>○ Adrian Glover (Natural History Museum, UK) – DeepSea ID and CCZ species list</li> <li>○ Youngdawng Moh and Jinwook Back (National Marine Biodiversity Institute of Korea, Republic of Korea) – Image platform for public outreach</li> </ul> </li> </ul> <p><b><i>Plenary discussion</i></b></p>
8.45 - 9.00 am	<b><i>Health break</i></b>
9.00 - 10.00 am	<p><b><i>Agenda item 8. Summary and conclusion by Chair</i></b></p> <p><b><i>Agenda item 9. Closing of the workshop</i></b></p> <p><b><i>Group photo</i></b></p>

**Part II: Open meeting (14 October 2021)**  
**Chair: Kerry Howell (University of Plymouth, UK)**

**Day 3 – Thursday, 14 October**

<b>Time (Jamaica; GMT-5)</b>	<b>Workshop activities</b>
6.00 - 6.30 am	<p><b><i>Agenda item 1. Opening of the workshop</i></b></p> <ul style="list-style-type: none"> <li>• Secretary-General of the International Seabed Authority</li> <li>• Deputy Minister, Marine Policy Office of the Ministry of Ocean and Fisheries, Republic of Korea</li> <li>• President of the National Marine Biodiversity Institute of Korea</li> </ul>
6.30 - 6.50 am	<p><b><i>Agenda item 2. Workshop background, scope and expected outputs</i></b></p> <ul style="list-style-type: none"> <li>• Workshop background, scope and expected outputs <ul style="list-style-type: none"> <li>○ Luciana Genio (ISA Secretariat)</li> </ul> </li> </ul> <p><b><i>Q&amp;A</i></b></p>
6.50 - 7.30 am	<p><b><i>Agenda item 3. Enhancing image-based biodiversity assessments to advance deep-sea taxonomy</i></b></p> <ul style="list-style-type: none"> <li>• Key outcomes of the technical meeting of the workshop <ul style="list-style-type: none"> <li>○ Kerry Howell (University of Plymouth, UK)</li> </ul> </li> </ul> <p><b><i>Q&amp;A</i></b></p>

7.30 - 8.00 am	<p><b><i>Agenda item 4. Roadmap to promote effective integration of deep-sea taxonomic information into ISA's efforts towards facilitating activities in the Area in an environmentally responsible manner</i></b></p> <ul style="list-style-type: none"> <li>• Introduction of the roadmap <ul style="list-style-type: none"> <li>○ Luciana Genio (ISA Secretariat)</li> </ul> </li> </ul> <p><b><i>Q&amp;A</i></b></p>
8.00 - 8.10 am	<p><b><i>Health break</i></b></p>
8.10 - 9.30 am	<p><b><i>Agenda item 5. Identifying partners, donors, and relevant initiatives for the effective generation, use and sharing of deep-sea taxonomic information</i></b></p> <ul style="list-style-type: none"> <li>• Ongoing and future activities <ul style="list-style-type: none"> <li>○ Ward Appeltans (IOC-UNESCO)</li> <li>○ Tammy Horton (World Register of Marine Species Steering Committee)</li> <li>○ Muriel Rabone (Natural History Museum of UK)</li> <li>○ Daniela Zeppilli (L'Institut Français de Recherche pour L'Exploitation de la Mer)</li> <li>○ Aurore Maillet (European Commission)</li> </ul> </li> </ul> <p><b><i>Plenary discussion</i></b></p>
9.30 - 10.00 am	<p><b><i>Agenda item 6. Summary and conclusion by Chair</i></b></p> <p><b><i>Agenda item 7. Closing of the workshop</i></b></p> <p><b><i>Group photo</i></b></p>