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## Seventy-eighth session

Item 77 (a) of the preliminary list\*

**Oceans and the law of the sea: oceans and the law of the sea**

### **Report on the work of the United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea at its twenty-third meeting**

#### **Letter dated 30 June 2023 from the Co-Chairs of the Informal Consultative Process addressed to the President of the General Assembly**

Pursuant to General Assembly resolution [77/248](#), we were appointed as Co-Chairs of the twenty-third meeting of the United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea.

We have the honour to submit to you the attached report on the work of the Informal Consultative Process at its twenty-third meeting, which was held from 5 to 9 June 2023 in person, with additional interaction online during the panel segments. The outcome of the meeting consists of our summary of issues and ideas raised during the meeting, in particular with regard to the topic of focus “New maritime technologies: challenges and opportunities”.

In line with past practice, we kindly request that the present letter and the report be circulated as a document of the General Assembly, under item 77 (a) of the preliminary list.

(Signed) Elina **Kalkku**  
Viliani Va‘inga **Tōnē**  
Co-Chairs

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\* [A/78/50](#).



## **Twenty-third meeting of the United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea**

**(5–9 June 2023)**

### **Co-Chairs' summary**

1. The United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea held its twenty-third meeting from 5 to 9 June 2023. Pursuant to General Assembly resolution [77/248](#), the Informal Consultative Process focused its discussions at the meeting on the theme “New maritime technologies: challenges and opportunities”.
2. The following supporting documentation was made available to the meeting: (a) report of the Secretary-General on oceans and the law of the sea on the topic of focus of the twenty-third meeting of the Informal Consultative Process ([A/78/67](#)); and (b) format and annotated provisional agenda of the meeting ([A/AC.259/L.23](#)).

### **Agenda items 1 and 2**

#### **Opening of the meeting and adoption of the agenda**

3. The Co-Chairs, Elina Kalkku, Permanent Representative of Finland to the United Nations, and Viliami Va'inga Tōnē, Permanent Representative of Tonga to the United Nations, appointed and re-appointed, respectively, by Csaba Kőrösi, President of the General Assembly at its seventy-seventh session, opened the meeting.
4. Opening remarks were delivered by the Under-Secretary-General for Legal Affairs and United Nations Legal Counsel, João Miguel de Serpa Soares, the Assistant Secretary-General for Policy Coordination and Inter-Agency Affairs, Maria-Francesca Spatolisano, and the Director of the Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States, Heidi Schroderus-Fox.
5. Delegations adopted the format and annotated provisional agenda and approved the organization of work.

### **Agenda item 3**

#### **General exchange of views**

6. A general exchange of views took place at the plenary meeting held on 5 June 2023. Some delegations, including one group of States, highlighted the importance of the Informal Consultative Process, which they considered to be a useful forum for discussing issues related to oceans and the law of the sea. One delegation noted that the multiplicity of ocean issues necessitated many different global, regional and sectoral forums, and highlighted the unique value of the Informal Consultative Process as a platform for exchanges among Governments, scientists, stakeholders and innovators. Delegations expressed their gratitude to the Co-Chairs and to the Division for Ocean Affairs and the Law of the Sea of the Office of Legal Affairs for organizing the twenty-third meeting of the Informal Consultative Process. Appreciation was also expressed to the Secretary-General for his report on oceans and the law of the sea on the topic of focus of the meeting ([A/78/67](#)).
7. Delegations welcomed the decision to focus the discussions of the meeting on the topic “New maritime technologies: challenges and opportunities”, noting that it provided a valuable opportunity to share knowledge, experiences and best practices and promote greater international cooperation in that area.

8. Several delegations affirmed the importance of the United Nations Convention on the Law of the Sea as the legal framework within which all activities in the oceans and seas must be carried out, and expressed the view that the Convention framework provided sufficient flexibility to accommodate new and emerging technologies. One delegation recalled that part XIII of the Convention set out specific rules for the conduct of marine scientific research and that any activities involving the collection of marine scientific data in situ in the waters under the jurisdiction of a coastal State should be subject to those provisions. Some delegations noted that a regulatory approach to marine autonomous surface ships was under development at the International Maritime Organization (IMO) within the framework of the Convention, with one delegation emphasizing that specific aspects of the use of that technology required an approach rooted in the Convention. Some delegations welcomed the finalization of the text of the agreement under the United Nations Convention on the Law of the Sea on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction, and a view was expressed that the agreement would lead to more equitable sharing of benefits arising from marine scientific research in areas beyond national jurisdiction.

9. Some delegations, including one group of States, underscored the serious threats that the ocean was facing, including the impacts of climate change, sea-level rise, ocean acidification, environmental degradation, pollution, including from marine litter, habitat destruction, biodiversity loss, overfishing and illegal, unreported and unregulated fishing.

10. New maritime technologies were highlighted by some delegations, including a group of States, as presenting opportunities to address those threats. Such technologies were noted to offer opportunities to facilitate ocean observing, build resilient oceans and coastal communities, mitigate the impacts of climate change, decarbonize the shipping sector, counter pollution, develop renewable energy sources and improve data collection to enhance marine science and achieve the goals of the United Nations Decade of Ocean Science for Sustainable Development. New maritime technologies were also highlighted as significant tools for the conservation and sustainable use of natural resources and for meeting the targets of the 2030 Agenda for Sustainable Development, in particular Sustainable Development Goal 14. One delegation and a group of States emphasized the particular challenges faced by small island States and the importance of new maritime technologies in that regard, with another delegation drawing attention to the inequitable access to new technologies.

11. Despite the many potential benefits to be derived from new maritime technologies, several challenges with respect to their introduction and use were outlined, including potential adverse impacts on marine living resources, biodiversity, maritime safety and security, and the protection and preservation of the marine environment. Data protection and privacy considerations and concerns relating to dual-use technologies were also raised. It was noted that, while knowledge of the ocean and technological advancements had increased significantly, much was not yet understood; a precautionary approach should therefore be applied, taking into account traditional knowledge, which should be appropriately protected. An observer delegation noted that new maritime technologies could not be a panacea for all the threats that were faced, but could complement the multiple solutions needed to address them.

12. Delegations noted the crucial importance of targeted capacity-building in the development and deployment of new maritime technologies, as well as the ability to sustain and retain local capacity, to enable developing States to benefit from the opportunities presented by new technologies and address the threats that were faced. Some delegations, including one group of States, identified key elements of effective

capacity-building, such as operational knowledge, training, the maintenance of technology, financing and the development of partnerships. Some delegations noted that the final text of the agreement on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction included important obligations relating to capacity-building and the transfer of marine technology. One delegation suggested that a harmonized approach should be taken to capacity-building and the transfer of marine technology under relevant international instruments.

13. Delegations highlighted the vital role of national, regional and international cooperation in ensuring that all States could benefit from the sustainable development of the ocean, including through capacity-building and the transfer of marine technology. One delegation noted the importance of promoting cooperation mechanisms to ensure the transfer of marine technology in response to the needs of developing States. Another delegation suggested exploring ways to enhance cooperation in research, information-sharing and the transfer of marine technology, in order to facilitate access to new maritime technologies for developing countries on most favourable or preferential terms.

14. Delegations highlighted projects and programmes adopted nationally and regionally to develop and promote the sustainable use of new maritime technologies, including with respect to smart fishing tools, energy-efficient vessels, ocean observing and modelling technologies, data-gathering and ocean mapping, including through uncrewed systems, shipping decarbonization, including on-board harnessing of wind and solar energy sources for long-distance maritime transportation, and the development of evidence-based solutions to address challenges faced by coastal and marine ecosystems arising from climate change.

15. Recalling the importance of the voluntary trust fund established pursuant to General Assembly resolution [55/7](#) for the purpose of assisting developing countries, in particular least developed countries, small island developing States and landlocked developing States, in attending the meetings of the Informal Consultative Process, one delegation noted that it had made a contribution to the trust fund and urged other delegations in a position to do so to also make contributions. The Secretary provided an update on the status of the trust fund, noting that the General Assembly, in its resolution [77/248](#), had expressed its continued serious concern regarding the lack of resources available in the trust fund. The Secretary urged delegations to consider making additional contributions.

### **Topic of focus**

#### **New maritime technologies: challenges and opportunities**

16. In accordance with the format and annotated provisional agenda, the discussion panel on the topic of focus was organized in two segments structured around the following: (a) new maritime technologies: the technologies, their uses and their contributions to sustainable development; and (b) international cooperation and coordination in promoting new maritime technologies for sustainable development. The panellists gave presentations, after which discussions were held.

#### **1. New maritime technologies: the technologies, their uses and their contributions to sustainable development**

##### *Panel presentations*

17. In the first segment, an Algae Specialist at SeaH4, a South African start-up, Sebastiaan de Vos, spoke about the use of *Ulva*, a genus of seaweed, as a biofuel feedstock and its potential as a high-yield source of bioliquefied natural gas, as well as the corresponding need for capital investments. The founder and Secretary-General of the Zero Emissions Ship Technology Association, Madadh MacLaine, delivered a

presentation on zero-emission ship technologies, highlighting technologies and projects that met the definition of absolute zero greenhouse gas emissions established by IMO, while emphasizing the technological and commercial maturity of existing solutions such as electric and hydrogen-fuelled vessels. The Chair of the Science Committee of the International Council for the Exploration of the Sea, Jörn Schmidt, spoke about the Council's work, through its scientific reports, expert groups and guidance documents, on new maritime technologies, as exemplified by projects on ocean observation and technological developments in research. The Deputy Director of the National Data Buoy Centre at the National Weather Service of the National Oceanic and Atmospheric Administration (NOAA) of the United States of America, Kathleen O'Neil, illustrated the advantages and challenges of deploying uncrewed maritime system technologies, which were increasingly replacing traditional moored buoys and platforms. An Adjunct Professor in the Department of Biology at Dalhousie University in Canada and Senior Ocean Noise Expert and Policy Consultant for OceanCare, Linda Weilgart, gave a presentation on the best available technologies for mitigating noise sources in shipping, seismic airgun surveys and pile driving. Such technologies aimed to decrease sound at source as an efficient way to reduce the environmental impacts of underwater noise. The Director of FiberSense and Chief Technology Officer at AtlasEdge, Mark Sokol, highlighted technological developments in distributed acoustic sensing, which offered significant benefits for owners and operators of submarine fibre-optic cables, such as increased resilience of critical infrastructure, broadened environmental monitoring capabilities and the ability to harness the economic benefits of digital transformations.

18. The Deputy Director of the National Centre for Hydrometeorological Forecasting of Viet Nam, Nguyen Ba Thuy, emphasized the significance of international cooperation initiatives in addressing challenges faced by developing countries in forecasting marine natural hazard events, including those due to a lack of sufficient data, human resources and necessary technology. He stressed the link between efficient marine weather forecasting and the capacity of States to adapt to climate change impacts and achieve sustainable marine development goals. The founder and Chief Executive Officer of Silverstream Technologies, Noah Silberschmidt, delivered a presentation on the company's air lubrication technology, which reduced net fuel consumption and emissions of large ocean-going vessels. He explained the system's efficiency and its potential to reduce the carbon footprint of the shipping industry. A Senior Business Development Manager of Ocean Science at Kongsberg Discovery, Peer Fietzek, delivered a presentation on shaping the future of the ocean observing and services market. He gave an overview of the recent dialogues with industry as part of the Ocean Decade and emphasized that maturing the ocean observing and services market was crucial for growing the blue economy and achieving the Sustainable Development Goals. The Scientific Lead of the International Programme on the State of the Ocean, Natalie Andersen, discussed the crucial role of oceans in mitigating climate change. She emphasized the need for a precautionary approach before incorporating emerging maritime geoengineering technologies into marine governance and decision-making owing to the potential significant risks involved. The Secretary-General of the International Windship Association, Gavin Allwright, explained the potential and the importance of wind propulsion in commercial shipping in building a climate-friendly and resilient shipping industry. The Director of the Lagrangian Drifter Laboratory of the Scripps Institution of Oceanography and Principal Investigator of the Global Drifter Programme, Luca Centurioni, spoke about the importance of ocean monitoring and observation for climate models, early warning systems, the blue economy and the 2030 Agenda. He noted that the international legal framework needed to support continued open access of ocean data as new technologies were added to existing observing networks.

19. The Director of the NOAA Ocean Acidification Programme, Elizabeth Jewett, spoke about the role of marine technologies in the implementation of marine carbon dioxide removal in a carbon-negative manner, including the potential negative impacts and the importance of robust governance structures. A Professor of Coastal Engineering in the Laboratory of Wave Engineering, Department of Cybernetics, School of Science, Tallinn University of Technology and President of the Estonian Academy of Sciences, Tarmo Soomere, shared insights into the potential of analysing ship wakes to estimate a ship's speed, location and direction, offering a cost-effective and environmentally conscious approach to managing shipping activities, recognizing ships and identifying harmful wave production. A Distinguished Professor Emerita at the Scripps Institution of Oceanography, University of California San Diego, Lisa Levin, described the potential of the high seas and deep ocean as a source for addressing global crises and highlighted the need for interdisciplinary collaboration, technological advancements and scientific research to ensure sustainable ocean management. The Director of the Ocean Prediction Centre at the NOAA National Weather Service, Arthur John Reiss, shared his perspective on the transformation within the maritime industry to adapt to more sustainable shipping practices and the importance of critical ocean observations in building better earth system prediction models of the marine environment for optimal fuel-efficient routing and greenhouse gas reduction. A Professor at the University of California Santa Barbara, Adjunct Professor at the University of California, Berkeley and the Director of Benioff Ocean Science Laboratory, Douglas McCauley, gave a presentation on leveraging new marine technologies and data science to identify and prioritize regions for protection in areas beyond national jurisdiction and on using artificial intelligence to synthesize large volumes of data, including traditional knowledge. An Endowed Professor of Ocean Conservation Science, Institute for Ocean Conservation Science, School of Marine and Atmospheric Sciences, Stony Brook University, Ellen Pikitch, shared insights into the benefits of environmental DNA (eDNA) sampling methods for ocean observation as being more cost-effective and less labour-intensive and having a smaller carbon footprint than other traditional sampling methods, such as bottom trawling.

#### *Panel discussions*

20. The discussions held after the presentations focused, inter alia, on challenges for developing countries in implementing new maritime technologies; the possibility of retrofitting such technologies for existing processes; regulatory assistance to allow new and sustainable technologies to compete economically with older, unsustainable technologies; regional factors in algae farming; the effectiveness of new technologies compared with traditional long-established systems; the environmental impacts of underwater noise pollution and incentives to reduce it; the use of acoustic fibre sensing technology; the role of regulators in creating incentives for new marine technologies; the importance of marine observation data in decision-making and scientific modelling; the need for synergies and obstacles to be overcome in the utilization of new technologies, including through new legal frameworks; the need to balance the development of new maritime technology and the sustainability of the deep seabed ecosystem; wind propulsion systems for vessels; the importance and value of open access data from ocean observation; the application of the precautionary approach with respect to marine geoengineering; the effectiveness of ocean-based climate interventions; the potential of the large-scale deployment of carbon dioxide removal technologies; the transfer of scientific knowledge and capacity development; the role of citizen science in supporting ocean conservation efforts and the accountability of Governments and international organizations; the accessibility of open data sources and tools; the effective implementation of protection measures in different regions; the integration of the traditional knowledge of Indigenous Peoples

and local communities into conservation, mapping and planning exercises; gaps in ocean and marine observations; and challenges related to data availability and interdisciplinary cooperation.

21. In response to questions from the Co-Chair on the main obstacles to the implementation of the new technologies that had been presented, in particular in developing countries, Mr. de Vos noted that access to capital was needed to expand production, Ms. MacLaine observed that regulation was needed to level the playing field with regard to polluters, and Mr. Schmidt suggested that technology transfer, investment in infrastructure, the building and retention of human capacity and sustained budgeting were required. With respect to a query on shipping, Ms. MacLaine noted that, with the right regulation, there could be a shift to mass production of renewable energy, especially hydrogen-based energy, in the southern hemisphere, with significant economic opportunities and new business models, which would include renewable energy infrastructure along trans-Pacific routes.

22. One delegation enquired whether it was possible to retrofit ships and infrastructure for zero greenhouse gas emissions, to which Ms. MacLaine responded that, while all the technologies that had been presented were retrofittable and zero-emissions shipping was attainable, especially in the context of offshore renewable energy production, investments in infrastructure and people would be necessary.

23. When asked about policy measures, Mr. Schmidt responded that greater and inclusive cooperation, especially between policymakers and scientists, was needed. Ms. MacLaine observed that a high level of ambition and market-based measures at the international level through IMO would be instrumental in that respect, noting that emissions trading schemes and initiatives could be helpful for industry and that a tax could potentially be used to establish a fund that would assist least developed countries in gaining access to technology and building infrastructure.

24. An observer delegation raised a question about the importance of data in relation to ocean noise. Ms. MacLaine noted that electric vessels were much quieter than those with combustion engines and that new technologies would allow for improved data gathering.

25. In response to a question by a delegation regarding the opportunities and risks of seaweed farming in the Pacific, including the spread of invasive species, Mr. de Vos noted that, in the Pacific, seaweed had greater potential as fertilizer or animal feed than biofuel owing to geospatial and logistical factors and that challenges with respect to invasive species generally stemmed from dumping. In response to another question, Mr. de Vos noted that producing two thirds of the liquefied natural gas required for the shipping industry would require seaweed farms on an area of approximately 60,000 square kilometres. An observer delegation asked about sargassum blooms in tropical regions, in response to which Mr. de Vos indicated that the inconsistent nature of sargassum blooms made them unsuitable for biofuel production, which required a constant supply of biomass, but that they could be more suitable for fertilizer production.

26. In response to a question received online about hydrogen bunkering infrastructure in developing States, Ms. MacLaine noted that knowledge transfer was being explored and that, in principle, facilities would not be different than elsewhere, while emphasizing that the States would own their own energy source, stimulating investment in the corresponding infrastructure.

27. Responding to a question about the main environmental and ecosystem consequences of underwater acoustic pollution, Ms. Weilgart outlined different stress effects that had been documented for more than 100 marine species, such as interference in feeding, foraging and reproduction, the masking of sounds of interest,

developmental delays, impacts on nutrient availability and higher mortality rates in plankton. Addressing a question about whether systems with limited frequencies, which were replacing traditional airguns in seismic surveys, could be equally effective, Ms. Weilgart explained that using a controlled sound source such as marine vibroseis allowed for a cleaner signal and could thus better achieve the aims of seismic surveys.

28. In response to a question about how fibre-optic cables could detect ships that had turned off their automatic identification system transponders, Mr. Sokol explained that distributed fibre sensing allowed for the detection in the cables of disruptions in waveforms, which were caused by vessel noise. Addressing a question about how to reconcile the storage and analysis of data from distributed acoustic monitoring of vessels with national security concerns, Mr. Sokol noted that all deployment of acoustic fibre sensing technology was conducted with licensed local operators of submarine cables and that the data ultimately resided with the cable operators.

29. One delegation asked about the increasing replacement of traditional moored platforms with uncrewed maritime systems, noting that moored platforms had reliably and efficiently provided observations for decades. In response, Ms. O'Neil pointed out that operating uncrewed maritime systems in place of moored platforms avoided expensive maintenance, damage to the environment by mooring operations and the costly retrieval of failed moorings. She added that oceanographic and meteorological sensors on uncrewed maritime systems were at a high level of readiness, and underscored the benefit of added mobility in piloted platforms and the potential of uncrewed maritime systems to significantly increase ocean observations in the future.

30. In response to a question relating to the potential legal and regulatory barriers to the operation of unpiloted or non-biodegradable uncrewed maritime systems in marine protected areas, Ms. O'Neil noted that policies could be adopted to limit the use of certain types of uncrewed maritime systems or to mandate their retrieval before entering a marine sanctuary, while weighing risk management strategies against the opportunity to gain valuable additional ocean observation data.

31. Responding to a question about economic incentives for reducing underwater noise, Ms. Weilgart gave examples from the shipping sector, noting the economic savings of reducing steaming speed and also referring to certain ports that offered significant reductions in port fees for quiet ships.

32. Responding to an online question about noise generated from potential industrial activities in the deep sea, Ms. Weilgart expressed reservations about proceeding with deep-sea mining, especially in the light of the limited knowledge of the deep-sea environment and the difficulties in assessing the potential impacts.

33. In response to an online question about the causes of existing data gaps in ocean observing, Ms. O'Neil highlighted the fact that data collection entailed high costs, which were prohibitive for a number of developing States. She voiced the hope that further diversification of the marketplace would reduce costs and contribute to the collection of more ocean observation data in the future.

34. In response to a question concerning the need for incentives for the uptake and scaling of new technologies, including through carbon pricing and emissions regulations, Mr. Silberschmidt stressed the important role of regulators in creating industry change, for example through emissions cap-and-trade systems, in particular for smaller operators that might not have the capacity to explore the benefits of new technologies.

35. One delegation asked how new tools and scientific inputs could be used by government authorities to support decision-making processes, including the



prevention of and adaptation to weather events and the identification of sensitive marine areas. In response, Mr. Thuy highlighted the importance of technical equipment needed for ocean observation data, including marine buoys and radars to collect data on sea-level rise and forecast weather events, and remote sensors on vessels to measure salinity and ocean temperature. He also emphasized the importance of ocean observation data for use in prediction models.

36. Some delegations asked about synergies in and obstacles to the use of new technologies on vessels, including the need for solutions for the harmonization of data collection. Mr. Silberschmidt stressed the importance of integrating new technologies into vessel operations in a holistic way to ensure that industry received all available benefits and optimizations. Mr. Fietzek noted obstacles due to different standards in data formatting and software for marine observation data, and to different permissions from coastal States on data collected from coastal zones. Mr. Fietzek also noted the importance of open systems, education and training in the collection and sharing of data, and support and assistance from Governments for training and industry innovation as part of a maturing environment for ocean observation and data services. He highlighted in that context the importance of the findable, accessible, interoperable and reusable principles and of creating incentives for private and public entities to collect and share data as a public good. The importance of overcoming legal barriers due to intellectual property issues through industry cooperation and good practices was also highlighted.

37. In response to a question about the efficiencies of numerical models in forecasting weather events, Mr. Thuy stressed the importance of marine data in verifying and improving the efficiencies of scientific models, as well as the need to assimilate data from different sources.

38. One delegation raised a question about whether the installation of new technologies to improve fuel efficiencies of marine vessels was economically viable for existing vessels. In response, Mr. Silberschmidt observed that the return on investment in new technologies typically depended on economies of scale, which underscored the importance of regulations and financial assistance for small operators to invest in new technologies, including through carbon taxes.

39. Some delegations asked about the potential benefits for the marine environment of new technologies, for example reduced ocean noise and increased ocean albedo. Mr. Silberschmidt explained some of the potential benefits of air lubrication technology in shipping, in particular reduced propeller and engine noise and antifouling, and noted the need for more testing and research.

40. A delegation announced the completion of an ocean climate action plan, which had advanced commitments to achieve zero-emission shipping by 2050 by accelerating research, developing and deploying green fuels and technology in vessels and ports, creating green shipping corridors, incentivizing zero-emission fuels and technologies in the shipping industry, and revolutionizing ship construction.

41. A delegation raised concerns about the impacts of climate change on the oceans, noting that such impacts were no longer remote and stressing the need for urgent solutions. That delegation also emphasized the need for investment in wind propulsion in the shipping industry, as it was a tested, abundant and clean energy source that had been available for 5,000 years.

42. In response to questions about the optimization of wind propulsion technologies for varying routes and vessel sizes, Mr. Allwright noted that technology providers and, increasingly, consultants and ship classification organizations were providing such optimization services. He indicated that a massive amount of data for assessing routes, as well as weather and wave data, was openly available from the Copernicus

programme of the European Union. He also noted the need to reintroduce natural green corridors such as the trade winds to reduce fuel emissions in shipping. A delegation praised the use of wind propulsion in large vessels that could travel at 10 knots and the efficiency of rigid sails.

43. In response to concerns about the efficiencies and safety of fixed or rigid sails on vessels in extreme weather conditions, Mr. Allwright explained that wind propulsion systems were designed to be retractable or removable and followed strict guidelines on stability, emergency procedures and materials. In response to a question about how the systems performed in zero-wind conditions, Mr. Allwright explained that most systems did not have drag or could be put in a passive position for minimal drag.

44. A delegation asked about the need for new training for crews to operate wind technology in the shipping sector. Mr. Allwright explained that some training was required for small vessels with traditional sail systems, but most systems on large vessels were heavily automated, and training was needed only for maintenance, optimization and emergency procedures and would amount to approximately one day of crew time.

45. In response to a question about whether ships powered by wind could capitalize on carbon credits, Mr. Allwright explained that one of the hurdles for wind-powered ships to using carbon credits was that the scoping costs were too high for credit allocations for individual ships. Standardized approaches were therefore being developed whereby carbon credits would be apportioned for applying the technology without the need to scope individual ships. Mr. Allwright indicated that carbon credits under voluntary systems were currently low in value, but noted that, under the European Union Emissions Trading System, carbon credits for wind propulsion were considerably higher and would help to incentivize wind propulsion. He added that innovation or tax credits at the global level could help to support upfront investment in the costs of system installation and noted in that regard the potential of market-based measures at IMO.

46. In response to a question about the challenges of ensuring open access to ocean observation data, Mr. Centurioni noted that most coastal States understood the benefits of the data collected within their exclusive economic zone by ocean drifters that were part of a network endorsed by the World Meteorological Organization and the United Nations Educational, Scientific and Cultural Organization (UNESCO), as long as the data were openly accessible for global weather forecasting activities. Improvements in that regard were amply documented in peer-reviewed scientific journals. He expressed concerns about recent trends in the commercialization of ocean data and the inconsistency between the profit motivation in private industry and the need to ensure open access to the data by all countries. Such concerns included the collection of data from private foreign companies within the exclusive economic zone of coastal states and the possible restrictions on unlimited global distribution for weather forecasting purposes enforced by Governments or by the private companies that collected the data for a profit and needed to charge multiple customers for the same observations. In response to a question about whether more public funding or better regulation were needed to improve data access, Mr. Centurioni responded that both were needed but that it was unclear in what proportion because the amount of data needed was unknown. While more funding was important, there was a need for efficiency in deploying resources with the goal of investigating and improving the use of data in models, which was a very important goal because having more data by itself did not automatically translate into improved forecasts.

47. A delegation highlighted the need to apply the precautionary approach with respect to marine geoengineering, as emphasized by Ms. Andersen, and noted the

challenges posed by innovative climate change solutions that had unknown impacts on important ocean processes. In response to a question about whether and how those potential impacts could be studied, Ms. Andersen noted that, in the context of artificial processes that sought to replicate natural processes, it was very difficult to quantify carbon dioxide drawdowns, which made it difficult to assess the full extent of the impacts of those processes. She highlighted the need for more funding for science that was independent of extractive agendas.

48. One delegation raised a question with regard to achieving balance between the sustainable development, exploration and exploitation of deep-seabed mineral resources and the preservation of the deep-sea ocean ecosystem. In response, Ms. Levin acknowledged the delicate nature of the topic, noting that new maritime technologies could aid in spatial planning by identifying areas that could be explored and areas where destructive practices were occurring. She pointed out the importance of exploration in both revealing valuable resources and identifying areas that required protection, and the need for scientific research to keep pace with human activities in the deep ocean.

49. A question was raised regarding the effectiveness of ocean-based climate interventions compared with terrestrial interventions. In response, Ms. Levin emphasized the complex nature of the ocean as an interconnected, three-dimensional dynamic system and underscored the importance of further research, international collaboration and responsible governance in navigating the challenges and opportunities. In response to a related question about international governance of ocean-based climate interventions, Ms. Jewett emphasized the importance of sharing information and ensuring collective access to the best available knowledge as countries pursued those new technologies, as well as the need for strong regulatory frameworks to ensure equitable and responsible actions.

50. In response to a question regarding the scale, efficiency and adverse effects of technologies such as alkalinity enhancement, biotic cultivation and electrochemical stripping, Ms. Jewett noted the need for further research to determine the effectiveness and potential environmental impacts of those technologies before considering large-scale deployment.

51. One delegation asked about vessel detection, localization and identification based on wave measurement, the potential need for a ship signature database and the possibility of a ship's signature being interrupted by other waves. In response, Mr. Soomere highlighted the capabilities and limitations of the technology, pointing out that, if there was a cluster of ships in a particular area, the process of separating ship signals became more challenging. On a related question about whether wave characteristics could be detectable and predictable for the purpose of giving advance warnings to mariners, Mr. Reiss explained that advance warnings to mariners were currently possible depending on whether the vessel had the right equipment on board. However, he emphasized that conducting more observations in areas where data were needed would help the mariners to make more accurate predictions in time and space. Mr. Soomere added that wind direction and the subsequent wave propagation were changing rapidly because of climate change; under those conditions, it could potentially be difficult to provide timely warnings to mariners. He also noted that advanced models could predict wave conditions in the Baltic Sea several days in advance with an accuracy of only 10 per cent.

52. A question was asked about the need for new skills and capacities to bridge the gap between traditional biological and ecological expertise and the expertise required for operating emerging technologies. Highlighting efforts in regions that were lacking ocean observing technologies, Ms. Jewett noted a training programme for scientists from the Pacific on monitoring ocean acidification. She emphasized the need for

continued support and investment in developing better and more affordable equipment to collect high-quality measurements. In addition, Ms. Levin noted the importance of transferring scientific knowledge to the next generation in an equitable manner and highlighted capacity development efforts, such as the focus of the Deep Ocean Observing Strategy on early career researchers, and the challenges in supporting those efforts due to limited resources.

53. A question was raised about what the general public could do to support the goal to protect 30 per cent of the ocean by 2030. In response, Mr. McCauley suggested that citizen science could be a powerful tool for engaging the public, in particular young people, to contribute data and information to global databases. He also pointed out that the goal was not simply quantitative in nature; its achievement meant targeting the quality of the protected areas as well. Ms. Pikitch remarked that citizens could put pressure on their Governments and international organizations, and that meeting those targets was costly and required resources. Mr. Reiss added that, given that there would be pressure on the shipping industry to adopt more sustainable shipping practices, he encouraged the public to find out about industries and support them.

54. In response to a question about protection and management strategies for national waters, Mr. McCauley noted that interconnected marine ecosystems and straddling living resources did not recognize national boundaries. He also noted that large, strictly protected areas offered the most significant return on investment, with long-lasting effects, and highlighted the importance of considering climate resilience when designing protected areas, underscoring that the ocean's conditions would change over time.

55. In response to a question about the role of technology and data science in identifying potential geographical areas to be protected in each region and the type of protection required, Mr. McCauley noted that a full toolkit with various options would need to be explored when prioritizing protection areas in the high seas. On a related question about the integration of the traditional knowledge of Indigenous Peoples and local communities into conservation, mapping and planning exercises, Mr. McCauley affirmed the importance of their role throughout the decision-making process.

56. In response to a question about data accessibility, Mr. Reiss acknowledged that data access while out at sea was very limited because bandwidth was expensive. He suggested that improving satellite communications technologies could lower costs and enhance decision-making for smaller-scale users. Mr. Soomere added that the issue of data interoperability had always been a major challenge given its high cost and that it was dependent on the willingness of stakeholders to cooperate across various disciplines. He suggested extending ocean science collaboration to include basic sciences, citing genetic research as an example of practical results derived from an interdisciplinary approach.

57. In response to a question about best practices for integrating social and economic aspects when harnessing eDNA technologies, Ms. Pikitch agreed that using eDNA technologies on their own had limitations and they should not be the only mechanism used. Working together with Indigenous communities to address environmental challenges and find collaborative solutions was also important.

## **2. International cooperation and coordination in promoting new maritime technologies for sustainable development**

### *Panel presentations*

58. In the second segment, a Professor of Public International Law at the Buenos Aires University and Austral University, Frida Armas-Pfirter, gave a presentation on the legal framework for international cooperation in new maritime technologies as

reflected in the Convention and related instruments, as well as challenges and opportunities facing its implementation. A Researcher at the Research Centre on the Law of the Sea at the University of São Paulo, Júlia Schütz Veiga, spoke about the role of the soon-to-be-adopted agreement under the United Nations Convention on the Law of the Sea on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction, including the capacity-building and transfer of marine technology committee to be established thereunder, in ensuring the transfer of marine technology to achieve equity among States. A Senior Research Fellow at the Ocean Policy Research Institute, Masanori Kobayashi, offered insight into the enabling factors and challenges in promoting ocean-based renewable energy and its application to the fishery and maritime sectors in island countries and communities, referring to ocean energy thermal conversion and photovoltaics. The Director of International Relations and Senior Ocean Policy Expert at OceanCare, Nicolas Entrup, introduced a project aimed at developing real-time sperm whale detection and localization systems to reduce the risk of vessel strikes in the Mediterranean Sea, outlining challenges and the way forward, and highlighting the many environmental benefits of reducing vessel speed. The Chair of the Joint Task Force on Science Monitoring and Reliable Telecommunications (SMART) Submarine Cables and Research Professor at the University of Hawaii at Manoa, Bruce Howe, gave a presentation on the potential contributions of SMART cables to collecting essential ocean variables relating to climate change, disaster risk reduction and strategic environmental assessments to be conducted under the agreement on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction, including the current status of their deployment and the vision to create a global network of such cables. The Acting Director of the Global Ocean Observing System at the Intergovernmental Oceanographic Commission of UNESCO, Emma Heslop, spoke about the role of the private sector in expanding ocean observing and making it more fit for purpose, and the progress in a series of dialogues among Governments, the scientific community and industry to identify barriers and opportunities for the private sector in the Global Ocean Observing System.

59. A Marine Microbiologist at NOAA Ocean Exploration and the Omics Portfolio Manager at the NOAA Office of Oceanic and Atmospheric Research, Kelly Goodwin, gave a presentation on biomolecular ocean observations. She focused on eDNA analysis that enabled non-invasive monitoring of marine biodiversity, highlighting its potential to provide valuable insights into the deep ocean, while noting some challenges regarding data collection and processing. The Policy Officer for Environment and Oceans of the delegation of the European Union to the United Nations, Sylvain Gambert, underscored the importance of the provisions on capacity-building and the transfer of marine technology in the agreement on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction. He noted opportunities for their implementation, including through coordination, needs assessments and partnerships to facilitate international cooperation with existing initiatives and programmes, such as the project on tropical and South Atlantic climate-based marine ecosystem predictions for sustainable management and the Global Ocean Programme of the European Union. The Director of the Office of Environmental Management and Mineral Resources of the International Seabed Authority, José Dallo, gave a presentation on the role of the Authority in promoting new maritime technologies, including its action plan for marine scientific research and its technology road map, focusing on capacity development, the transfer of technology and the provision of widespread benefits. He emphasized the need to collaborate with various stakeholders in that regard. A Senior Fishery Resources Officer and Resilience Team Leader at the Food and Agriculture Organization of the United Nations (FAO), Kim Friedman, gave a presentation on

ocean technologies for people and the rest of nature, providing examples of technological advancements in managing the ocean for the benefit of nature and people. He discussed the changing trends in aquatic food production and food security, and the need for improved understanding of fish stocks and the environment. He emphasized the urgency of addressing the related challenges and called for collaboration, funding and governance to effectively use the potential of those technologies. The Programme Director of the Gordon and Betty Moore Foundation and member of the technology and innovation informal working group of the Ocean Decade, Jon Kaye, spoke about the role of philanthropy in supporting the development of technology. He discussed the need to assess and validate the effectiveness of relevant technologies in addressing scientific questions and conservation needs and highlighted the possible role of co-designed marine technology test beds bringing together various stakeholders. A Professor at Dalhousie University, Co-Chair of the Global Ocean Observing System Steering Committee of the Intergovernmental Oceanographic Commission, and the Scientific Director and Chief Executive Officer of the Ocean Frontier Institute, Anya Waite, gave a presentation entitled “An ocean of information”, addressing the consequences of new technologies that accelerated the delivery of data into the global system.

#### *Panel discussions*

60. The discussions held focused on how the agreement on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction would contribute to capacity-building and the transfer of maritime technology; major challenges facing such activities; the role of the public and private sectors and international organizations in financing such activities; and challenges and opportunities relating to the development of ocean-based renewable energy, SMART cables, autonomous underwater vehicles, eDNA research in the deep sea, sample collection processes and the funding of conservation projects.

61. Responding to a question about how other institutional arrangements under the agreement on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction, such as the Clearing-House Mechanism and the Implementation and Compliance Committee, could support capacity-building and the transfer of marine technology, Ms. Schütz Veiga noted the need for all institutional arrangements under the agreement to work together and for the Clearing-House Mechanism to work with existing information-sharing mechanisms. A conversation about how that could be done was needed, possibly before the first Conference of the Parties to the Agreement. A delegation commended the fact that the agreement combined legal and technical knowledge in a good way and, noting the role of the capacity-building and transfer of marine technology committee in addressing technical aspects of the implementation of the agreement, asked how and when that committee might be informed of the issues discussed during the current meeting and share that knowledge with States. In response, Ms. Schütz Veiga highlighted the importance of bringing policymakers and scientists together through the science-policy interface, which would be key to the success of that committee.

62. In response to a question regarding major challenges facing capacity-building and the transfer of marine technology, in particular in relation to new and emerging marine technologies, Ms. Armas-Pfirtner emphasized the importance of carrying out such activities within the international legal framework, while expressing optimism in view of the momentum generated by the Ocean Decade, developments within the International Seabed Authority and proceedings before international courts and tribunals in relation to sea-level rise. Ms. Schütz Veiga stressed the need to identify and assess needs and priorities for capacity-building and the transfer of marine technology, including existing gaps. Mr. Kobayashi highlighted the importance of a

co-benefits approach, cross-sectoral partnerships, start-up support and interdisciplinary knowledge, as well as the need to empower young professionals and future entrepreneurs. Recognizing the multidimensional nature of the subject, an observer delegation noted the need to draw upon good practices from relevant organizations and to identify case-specific solutions, as well as the importance of fostering mutual learning.

63. A delegation asked about the role of the public and private sectors in financing the transfer of marine technology, as well as the role of international organizations in promoting such financing. Mr. Kobayashi highlighted the need to promote public-private partnerships, shared insights into the role of debt swaps in generating funding for the development of ocean-based renewable energy and underscored the importance of multi-stakeholder partnerships and blended finance in ensuring the long-term sustainability of funding. Ms. Armas-Pfirter noted that the role of competent international organizations had been addressed in the Convention in various ways and that the issue of mobilizing funding from different sources was a cross-cutting issue addressed in the context of the Ocean Decade. Ms. Schütz Veiga highlighted the contributions of the agreement on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction to improving financing for the transfer of marine technology, acknowledged the potential challenges facing its implementation at the national level and stressed the essential role of the private sector as a holder of new technologies and significant financial resources.

64. In response to a question about the impacts of ocean thermal energy conversion systems on local ecosystems, Mr. Kobayashi noted that the environmental impact assessments that had been conducted had not uncovered any adverse impacts, but vigilance should be exercised in relation to any possible expansion of such systems. While welcoming the development of ocean-based renewable energy facilities such as offshore wind turbine installations and tidal energy sites, a delegation expressed its view that the legal aspects of such technologies would require comprehensive analysis, particularly with respect to the freedoms of the high seas, and that, for areas where maritime boundaries had not been delimited, establishing and operating such sites might further complicate existing maritime disputes.

65. A delegation asked about how SMART cables would compare with other technologies in terms of investment, maintenance and data quality. In response, Mr. Howe noted that the long-term costs of SMART cables would be low compared with traditional technologies and that such cables would be the sole, most accurate way to collect certain data in real time. In response to questions relating to the potential role of SMART cables in addressing illegal, unreported and unregulated fishing and in environmental impact assessments relating to seabed mining, Mr. Howe noted that work was ongoing to explore how those cables might be used for such purposes in view of their potential to serve as a monitoring system and collect additional data with added sensors.

66. Responding to a question about the status of the development and deployment of SMART cables, Mr. Howe drew attention to the experience of States in developing and deploying similar systems, and to the progress under way in deploying such cables in the Mediterranean Sea and the North Atlantic. In response to a question concerning the safety of such cables, Mr. Howe noted that any disturbance of SMART cables would likely be detected, for which optical fibre sensors could play a role. He also noted that data collected by such cables should generally be shared under the findable, accessible, interoperable and reusable principles, but each landing State would have a role in clarifying relevant protocols, including for data relating to military activities. Such protocols had been developed between States and could be shared with other interested States.

67. Noting that autonomous underwater vehicles would play a significant role in the future of navigation, marine scientific research, and exploration and exploitation activities, a delegation stressed the importance of considering an enabling and facilitating legal and regulatory framework in parallel to the advancement of technologies relating to such vehicles. Another delegation expressed its concern about the enjoyment by such vehicles of any immunity that was afforded to warships and called for a legal framework preserving States' interests in that regard.

68. One delegation asked about the process of conducting eDNA research in the deep sea, in particular on the deep seabed, its implications for understanding the deep seabed environment and its relevance to deep seabed mining. In response, Ms. Goodwin noted the challenges of identifying eDNA sequences, especially in microbial research, given the limited understanding of microbial diversity on Earth. In that regard, she highlighted the importance of filling gaps in relevant databases by adding more sequences and the need for standardized methods and continuous reassessment of sequences as knowledge expanded, with a view to establishing a baseline for biodiversity in the deep sea.

69. In response to a question regarding rules and conditions governing access to the database of DNA samples used as a reference for matching new samples, Ms. Goodwin highlighted three major databases in the United States, Japan and the European Union, which were interconnected and freely available. She also noted that efforts were ongoing to improve the reusability and interoperability of sequence data coupled with environmental data.

70. One delegation posed a question regarding the sample collection process and its challenges, including with regard to the use of uncrewed autonomous vehicles, the volume of samples that could be collected in a single mission and the preservation methods that were employed. In response, Ms. Goodwin explained that the third-generation sample processor, although not yet commercially available, had been miniaturized to fit into the payload of autonomous vehicles, whereas the second-generation processor was used on moored platforms. She agreed that contamination was a challenge but believed that it could be overcome.

71. In response to a question about the implementation of the provisions on capacity-building in the agreement on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction, Mr. Gambert noted strong confidence in the architectural structure of capacity-building and the transfer of marine technology under the agreement, and highlighted the fact that the agreement would bring transparency and guaranteed funding through its financial provisions.

72. One delegation raised a question about the timeline for broader implementation of the discussed technologies to inform policy and regulation decisions, and how it could be accelerated. Mr. Friedman highlighted the rapid advancements in various technologies and emphasized the need for increased investment to enable them to fully reach their potential. He also noted the need to support organizations such as United Nations offices and regional fisheries bodies in achieving those goals more broadly.

73. One delegation posed a question about the main pathways for the adoption of technologies in fisheries, whether through the private sector or States, and the role of regional fisheries management organizations in facilitating that process. In response, Mr. Friedman highlighted that investment in fisheries departments and national capacity was important for effective decision-making and long-term benefits for States. He highlighted that ongoing investment by the FAO fisheries assessment group in developing countries' capacity and utilizing new tools would be highly advantageous. He also mentioned that the availability of freely accessible



technological modelling systems and software could significantly enhance those efforts.

74. One observer delegation emphasized the need to scale the dissemination of technologies and databases and asked how to build and maintain trust through that process. In response, Mr. Kaye acknowledged the challenges and highlighted the role that transparency could play in establishing trusted relationships.

75. One observer delegation addressed public-private partnerships and the need to ensure that bad actors and misaligned agendas did not hinder progress and lead to wasted resources. Mr. Friedman highlighted the challenges of securing long-term investment for conservation projects and emphasized the need to reframe the language and perception regarding people's role in conservation. He advocated recognizing and appreciating the value of individuals, especially in developing countries, where capacity was limited.

76. One observer delegation asked whether FAO had conducted an assessment of the socioeconomic value of fisheries restricted areas and other measures aimed at fish stock recovery, and whether any studies or resources were available on that topic. In response, Mr. Friedman explained that, during the International Year of Artisanal Fisheries and Aquaculture, efforts had been made to emphasize their value. There were studies on the different values delivered through aquaculture and many resources and studies related to the socioeconomic value of fisheries. He emphasized the need for transparency in funding and investment, both from non-governmental organizations and Governments, and the importance of finding joint funding and cohesive connections between local efforts and global goals.

77. One observer delegation made a comment regarding the importance of involving communities, relevant administrations, government institutions, industry partners and science in collaborative initiatives. The concept of living labs as a framework for long-term collaboration beyond individual projects was also raised, and the need for alignment between research projects and development aid projects was noted. It was suggested that philanthropy could play a role in supporting initiatives and act as a catalyst for additional funding.

#### **Agenda item 4**

##### **Inter-agency cooperation and coordination**

78. The Under-Secretary-General for Legal Affairs and United Nations Legal Counsel delivered a statement in his capacity as focal point of UN-Oceans informing delegations of the activities of UN-Oceans since the twenty-second meeting of the Informal Consultative Process, including in relation to the topic of focus.

79. The United Nations Legal Counsel highlighted a successful side event that had been organized by UN-Oceans to showcase instances of effective inter-agency cooperation and coordination. He drew attention to the commemoration of the fortieth anniversary of the United Nations Convention on the Law of the Sea and the collaboration of UN-Oceans members on a publication demonstrating the Convention's contribution to the sustainable use of the ocean and its resources in the economic, environmental and social dimensions, including through the development of other ocean-related international instruments.

80. The United Nations Legal Counsel also mentioned the collaborative efforts between UN-Oceans and UN-Water to organize a joint side event at the United Nations Water Conference in 2023, emphasizing the importance of the ocean in the water cycle and the need for holistic and integrated management. He also emphasized that UN-Oceans was focusing on sharing information, promoting coordination and supporting the implementation of Sustainable Development Goal 14. He expressed

gratitude to UN-Oceans members for their valuable contributions and active engagement in the various activities conducted thus far.

**Agenda item 5****Process for the selection of topics and panellists so as to facilitate the work of the General Assembly**

81. Referring to paragraph 352 of General Assembly resolution [73/124](#), the Co-Chairs invited views and proposals on ways to devise a transparent, objective and inclusive process for the selection of topics and panellists so as to facilitate the work of the Assembly during informal consultations concerning the annual resolution on oceans and the law of the sea.

82. No statements were made under the item.

**Agenda item 6****Issues that could benefit from attention in the future work of the General Assembly on oceans and the law of the sea**

83. The Co-Chairs drew attention to a composite streamlined list of issues that could benefit from the attention of the General Assembly and invited comments from representatives.

84. The Co-Chairs also invited representatives to submit additional topics.

85. Some delegations suggested that, at its next meeting, the Informal Consultative Process could consider the topic of blue food. An observer delegation proposed the topic of facilitating the development of dual-purpose infrastructure for ocean observing, such as environmental sensing with SMART submarine cables. One observer delegation suggested the topic of ocean-based climate interventions.

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