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Oceans and the law of the sea

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Report of the Secretary-General**

Summary

In its resolution [78/69](#), the General Assembly decided that the United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea would focus its discussions at its twenty-fourth meeting on the theme “The ocean as a source of sustainable food”. The present report has been prepared pursuant to that resolution, with a view to facilitating discussions on the topic of focus. It is being submitted to the Assembly for consideration at its seventy-ninth session and to the States parties to the United Nations Convention on the Law of the Sea, pursuant to article 319 of the Convention.

* [A/79/50](#).

** Owing to word limits for reports mandated by the General Assembly, references for the material contained in the present report are to be found in the advance, unedited version, which includes comprehensive footnotes and is available on the website of the Division for Ocean Affairs and the Law of the Sea at www.un.org/depts/los/consultative_process/icp24/ICP2024AdvanceUneditedReportingMaterial.pdf.



I. Introduction

1. The ocean has long served as a source of food for human beings. Food from the ocean contributes to global food security, nutrition and sustainable development. It is an important source of sustenance, livelihood and cultural and social benefits for millions of persons around the world, in particular in coastal communities. As global food systems are increasingly challenged by population growth, ecosystem degradation and a triple planetary crisis of climate change, biodiversity loss and pollution, the importance of the ocean as a source of sustainable food is recognized more than ever. This is demonstrated by the 2030 Agenda for Sustainable Development and its ocean-relevant goals, in particular Sustainable Development Goal 2, to end hunger, achieve food security and improved nutrition and promote sustainable agriculture, and Goal 14, to conserve and sustainably use the oceans, seas and marine resources for sustainable development.

2. The legal and policy framework for the ocean as a source of sustainable food is drawn from a variety of binding and non-binding instruments. Of central importance among the binding instruments is the United Nations Convention on the Law of the Sea, which sets out the legal framework within which all activities in the oceans and seas must be carried out. The legal regime in the Convention is complemented by two implementing agreements, including the 1995 United Nations Fish Stocks Agreement, as well as a wide range of other instruments relating to the conservation and management of marine living resources, the protection and preservation of the marine environment, sustainable development, trade, food security and human rights. A third implementing agreement to the Convention, the 2023 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, is not yet in force.

3. The importance of maintaining and strengthening the role of the ocean as a source of sustainable food is underscored by the decision of the General Assembly, in its resolution 78/69 of 5 December 2023, that the twenty-fourth meeting of the United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea would focus its discussions on the theme “The ocean as a source of sustainable food”.

4. To facilitate discussions at the twenty-fourth meeting of the Informal Consultative Process, the present report provides an overview of the current role of the ocean as a source of sustainable food, identifies pressures on that role and highlights challenges and opportunities for strengthening the role. The report draws on the contributions submitted by Member States and relevant organizations and bodies,¹ as well as on other reports and studies related to the theme.

II. Current role of the ocean as a source of sustainable food

A. Background

5. The ocean provides various types of food that can be sourced sustainably (sustainable food), including fish, shellfish, cephalopods, crustaceans and other marine animals, as well as algae and other marine plants. Such foods can play an important role in addressing the increased demand for sustainable and nutritious food resulting from the continuous exponential growth of the global population. Indeed, the contribution of the ocean and its resources to global food security and nutrition

¹ The full text of the contributions is available from the website of the Division for Ocean Affairs and the Law of the Sea at www.un.org/depts/los/consultative_process/ICP24Contributions.htm.

has already been recognized, as it provides half of the world's population with a significant amount of animal protein and supplies macronutrients critical to human health for more than 3 billion people and essential micronutrients for 1 in 5 people. In 2020, about 89 per cent (over 157 million tons) of total fisheries and aquaculture production was utilized for direct human consumption.

6. The use of the ocean as a sustainable food source can also contribute to sustainable development, economic growth, poverty eradication and the development of climate-resilient food systems. Foods from the ocean can help improve food and nutrition security with a relatively low environmental footprint. However, the role of the ocean as a source of sustainable food requires the ocean and its resources to be conserved and effectively managed to ensure the continued sustainability of those resources.

B. Sources and types of sustainable food from the ocean

7. Capture fisheries in marine waters is the main source of marine animal production and the dominant method of production for several species, representing 44 per cent of the total fisheries production in 2020. The global capture fisheries production reached an estimated value of \$141 billion in 2020, including 78.8 million tons from marine waters, a decline of 4 per cent compared with the average of the previous three years. The world production of fisheries and aquaculture destined for direct human consumption totalled 157 million tons, against 20 million tons for non-food purposes, including fish meal and fish oil.

8. While fish production experienced a 4.5 per cent decline in 2019 and a further 2.1 per cent decline in 2020, world capture fisheries production is projected to increase in the coming decades, reaching 96 million tons in 2050, as a result of recovering stocks of certain species owing to improved resource management, growth in catches of underfished resources, and reduced discards, waste and losses. However, since 1980, the number of wild fish stocks that are caught unsustainably has more than doubled, with 35.1 per cent of the total capture fisheries being overfished, and 52 per cent fully exploited.

9. Recent studies have shown that effective fisheries management and the rebuilding of overfished stocks could increase fisheries production by up to 16.5 million tons a year. Moreover, improvements in the fisheries supply chain, including to minimize bycatch and discards and food waste, could also increase the overall yield from existing fisheries.

10. Mariculture, or marine aquaculture, continues to grow worldwide, being one of the fastest growing agrifood sectors globally. In 2020, global production of marine and coastal aquaculture was 68.1 million tons, including 33.1 million tons of aquatic animals and 35 million tons of algae. By 2030, aquatic food production is forecast to increase by another 15 per cent, driven largely by increases in sustainable aquaculture.

11. The cumulative contribution of aquaculture to the production of fisheries and aquaculture has shown a steady increase comparable to capture fisheries, from 13.4 per cent in 1990 to 49.2 per cent in 2020. With the increased demand for fish and fishery products for human consumption, mariculture is increasingly recognized as holding potential for sustainably addressing the challenges of food and nutrition security.

12. The guidelines for sustainable aquaculture, which were approved by the Sub-Committee on Aquaculture of the Food and Agriculture Organization of the United Nations (FAO) at its twelfth session, in 2023, show how aquaculture can improve and better support the growing needs of the international community.

Sustainable mariculture includes actions aimed at restoring ecosystem structure and function to support food provisioning, minimizing pollution, invasive alien species, waste and the emergence of diseases. Certain types of aquacultures, such as bivalve shellfish and seaweed production, can also provide ecosystem services, such as mitigating the impacts of excess nutrients, ocean acidification and habitat loss.

13. Aquaculture systems and methods may be more resilient, as they have the potential to manage effectively environmental conditions, including through the cultivation of selectively bred and cultured organisms that are adapted to varying conditions, such as water temperature and pH levels.

14. With respect to algae and other marine plants, there are about 700 edible seaweed species that are rich in essential vitamins and minerals, producing digestible proteins, lipids and carbohydrates and that can be a source of human consumption. Seaweed and other algae are still underexplored as a source of food for human consumption, and there is insufficient data available on seaweed, microalgal production, including phytoplankton as a source of the long-chain omega-3 polyunsaturated fatty acids, and its utilization in most countries.

15. Seaweeds and microalgae are used for a variety of food and non-food products besides human consumption, including animal feeds, pharmaceuticals, nutraceuticals, textiles, biofertilizers, bio-packaging and biofuel.

16. Global production of algae has experienced a rapid growth in the past few decades, from 12 million tons in 2000 to 21 million tons in 2010. In 2020, the total global production of algae was 35 million tons, and trade in algae has reached \$1.1 billion in total value. Algae were produced by 36 countries out of 61 producing countries and territories reporting algae cultivation to the FAO production data, the equivalent of 98 per cent of the world production in 2020.

17. In some regions, algae production has been viewed as a contributor to nature conservation and restoration, climate change adaptation and restoration. Molluscs and algae farming could offer important ecosystem services, including carbon dioxide absorption and nutrients.

C. Importance of sustainable food from the ocean to food security and nutrition

18. To adhere to the four pillars of food security, it is necessary for seafood to offer nutritional value (“utilization”), to be consistently available in ample amounts (“availability”), be obtained by people at all times (“access”) and to have a stable supply to prevent price fluctuations or shortages (“stability”).

19. In terms of utilization and nutritional value, foods from the ocean serve as a rich source of protein and omega-3 fatty acids. They supply approximately 17 per cent of animal protein for the global population, and more than 50 per cent in several developing countries. Foods from the ocean are also unique and diverse providers of micronutrients, including calcium, iron, zinc and selenium, which are essential for preventing malnutrition, improving maternal health and supporting cognitive and physical health at critical stages during early childhood. Consuming seafood can reduce the risk of stroke, depression and Alzheimer’s disease. In addition, omega-3 fatty acids contained in seafood are known to support the development of a child’s brain and nervous system. Enhanced seafood consumption is also linked to better neurological, cardiovascular and ocular health, as well as reduced cancer risk and lower incidence of neurodegenerative diseases.

20. Regarding availability, in 2020, global fisheries and aquaculture production surged to 214 million tons, up from 213 million tons in 2018, primarily driven by aquaculture expansion, notably in Asia. By 2030, 90 per cent of aquatic animal production will be designated for human consumption, marking a 15 per cent increase compared with 2020, with per capita consumption anticipated to rise from 20.2 kg to 21.4 kg, driven by heightened demand linked to growing incomes, urbanization, production expansion and dietary shifts. While seafood supply is projected to grow globally, concerns arise regarding declining per capita consumption in Africa, in particular in sub-Saharan Africa, posing challenges to food security.

21. The fisheries and aquaculture sectors play a vital role in providing access to seafood. Seafood can be a more affordable and accessible source of protein than other animal proteins. In low-income countries, people derive a higher proportion of protein from seafood compared with people in high-income countries, despite having much lower per capita consumption. Millions of people rely on fisheries for their livelihood and nutrition, including people in the coastal communities of low-income countries. Small-scale fisheries landings contribute between 90 and 95 per cent to the local communities' consumption. A similar contribution is also provided by the aquaculture sector, which produces foods that enhance nutrition for low-income populations, which is particularly important for mothers and young children.

22. In terms of stability, seafood pricing and supply fluctuate subject to a range of factors. It is estimated that income increase, population growth, robust demand, diminished supply and heightened production costs stemming from prices of inputs like feed, energy and fish oil will gradually result in a 33 per cent increase in price (nominal terms) of globally traded aquatic products by 2030.

23. A sustainable food system should be able to constantly provide sufficient economic and physical access to nutritious food for people to meet their dietary needs and preferences. A shift towards sustainable food systems is emphasized by global initiatives like the Sustainable Development Goals and the United Nations Food Systems Summit, aiming for healthier, equitable and more sustainable food systems.

D. Importance of sustainable food from the ocean to the three pillars of sustainable development

24. A sustainable ocean food system is one that can make a positive or neutral impact on the environment, generate benefits for society and allow a shift towards a blue economy that helps to diversify sustainable economic activities for its stakeholders. A just and sustainable blue transition is crucial to ensuring that the ocean can continue to contribute to sustainable development by delivering economic, social and environmental benefits to current and future generations.

25. The importance of sustainable fishing and aquaculture on the economy is demonstrated through their role in providing income and employment for more than 10 per cent of the world's population. The two sectors create 58.5 million jobs in the primary sector and support 600 million livelihoods. Fish are also one of the world's most traded commodities. Ocean food systems also provide social and cultural benefits to fishers and coastal communities, including Indigenous peoples. Sustainable ocean food systems also provide environmental benefits, as living marine resources used for food are key components of marine ecosystems, critical to their health and resilience. Seafood production systems have the potential to generate lower greenhouse gas emissions and be more sustainable compared with many land-based animal proteins.

III. Pressures on the current and future role of the ocean as a source of sustainable food

26. To benefit both current and future generations as part of a stable and reliable food system, foods sourced from the ocean must be sustainably and efficiently utilized. Current pressures on the role of the ocean as a source of sustainable food include unsustainable exploitation practices, other pressures on the marine environment and value and supply chain constraints.

A. Unsustainable exploitation practices

27. Unsustainable exploitation practices include overexploitation; overcapacity; illegal, unreported or unregulated fishing; pollution from fishing activities; and destructive fishing practices. Other practices that can have a negative impact on fishers and the fishing sector – including abusive labour practices, gender inequality and insufficient protections for the rights of small-scale and artisanal fishers – may also have long-term ramifications on the ocean as a source of sustainable food.

28. The effective management of fisheries and aquaculture in accordance with applicable legal instruments, including the Convention, the 1995 United Nations Fish Stocks Agreement and related instruments, is key to preserving the productivity of the ocean. Effective fisheries management systems address environmental, social and economic objectives.

29. The sustainability of marine living resources is undermined by overexploitation – overfishing in the case of fisheries. The Convention and the Agreement require States to prevent overfishing and maintain or restore populations of harvested species at levels that can produce the maximum sustainable yield. Target 14.4 of the 2030 Agenda set a clear commitment to end the overfishing of marine fisheries by 2020, but world fisheries are moving away from achieving that target. Sustained overfishing may lead to a loss of trillions of dollars of natural capital if allowed to continue. Causes of overfishing include illegal, unreported or unregulated fishing; overcapacity; poorly managed or unmanaged fisheries; and knowledge or capacity gaps, in combination with external stressors that affect stocks status. Overfishing, both directly and indirectly, contributes to the decline of fishery resources. Although there is a decreasing trend of overfishing observed for some stocks, more than one third of the world's stocks remain overfished.

30. Overcapacity is an important contributory factor to overfishing. However, regulating fishing capacity is complicated by periodic improvements in fishing efficiency. Harmful subsidies within the fisheries sector are a key factor in supporting overcapacity, and such subsidies, including fuel subsidies in the fisheries sector, contribute to overfishing and illegal, unreported or unregulated fishing more generally. The World Trade Organization Agreement on Fisheries Subsidies, when it enters into force, will help address some of those concerns, by increasing systemic transparency and phasing out harmful fisheries subsidies.

31. Illegal, unreported or unregulated fishing poses a threat to the sustainable exploitation of fish resources, as it undermines the effectiveness of fisheries conservation and management measures and other efforts to conserve and manage fish stocks.

32. Bycatch in capture fisheries, including landings of bycatch, discards and pre-catch losses, is a major concern. Bycatch and discards constitute a sustainability threat in the fisheries sector through undue mortalities and food waste, which jeopardize food security and the livelihoods of coastal communities. Bycatch affects

marine ecosystems and poses a major threat to biodiversity. Fisheries also severely affect birds and marine mammals caught as bycatch. Mitigation measures, including technical measures and modelling, can improve sustainability. For example, reducing marine mammal bycatch improves ecosystem health and can aid in the recovery of endangered and threatened species, including target stocks.

33. Destructive fishing practices affect marine living resources and the marine environment more broadly. The General Assembly has addressed the impacts of bottom fishing on vulnerable marine ecosystems and the long-term sustainability of deep-sea fish stocks. In addition, although in 1992 the General Assembly called for a moratorium on large-scale pelagic drift-net fishing on the high seas owing to its adverse impact on marine living resources, the practice still exists, albeit more limited. Other destructive fishing practices, such as blast fishing, have negative environmental impacts, affect biodiversity and result in habitat destruction.

34. Capture fisheries and aquaculture are also associated with various practices or consequences that affect marine living resources and damage the marine environment. Abandoned, lost or otherwise discarded fishing gear, or “ghost gear” is the most harmful form of marine plastic pollution for marine animals and habitats and threatens aquatic life and fragile marine ecosystems, as well as constituting a threat to fisheries sustainability and livelihoods of fishers. Carbon emissions from fishing fleets also contribute to climate change.

35. Mariculture provides an opportunity to supplement capture fisheries and increase food security, as well as providing ecosystem services such as mitigating the impacts of excess nutrients, ocean acidification and habitat loss. However, the sustainability of the sector may be compromised by issues such as habitat degradation, disruption of trophic systems, depletion of natural seedstock, transmission of diseases, introduction of alien invasive or genetically modified species and reduction of genetic variability. There are also potential impacts on small-scale fisheries present in the same area.

B. Other pressures on the marine environment

36. The ocean and its living resources are under immense pressure, with recent studies indicating that more than 90 per cent of global aquatic food production faces substantial risks from environmental changes.

1. Climate pressures and ocean acidification

37. Regarding ocean warming and extreme weather events, as global warming continues to accelerate owing to anthropogenic emissions, leading to increasing concentrations of greenhouse gases in the atmosphere, ocean temperatures have reached record levels in recent years, and marine heatwaves have become more frequent. Ocean warming has been linked to extreme weather events as increasing seawater temperatures provide more energy for storms and could potentially affect ocean current patterns.

38. The impact of climate change on aquatic foods is a complex issue owing to their diversity – more than 3,000 species of marine and freshwater animals and plants are used for food. Since each species and system has unique sensitivities and responses to various stressors, environmental changes can present both challenges and opportunities. However, ocean warming makes fish stocks less productive overall and causes shifts in composition. From a socioeconomic perspective, those shifts may benefit the (often higher developed) regions at middle or moderately high latitudes at the expense of low-latitude regions, where many developing countries are located, and where small-scale, subsistence fishing is important for food security. This issue

is of particular concern for small island developing States. The changes in distribution and abundance of fish species also makes fisheries management more difficult.

39. Although climate change is a threat to all marine ecosystems, warm water coral reefs are particularly sensitive to higher water temperatures, which can cause mass coral mortalities owing to bleaching. Coral bleaching has already significantly damaged most coral reefs around the world and is projected to become more frequent and severe with climate change.

40. In the mariculture sector, climate change risks include losses of production and infrastructure due to extreme weather events, and increased risks of diseases, parasites and harmful algal blooms. Climate change may also affect the thermal tolerance of farmed fish and thus the choice of species available for breeding.

41. With respect to sea-level rise, ocean warming, ice loss from glaciers and ice sheets and changes in land water storage contribute to a continuous rise in the global mean sea level. Rising sea levels are projected to threaten coastal ecosystems with indirect effects on fisheries and aquaculture through adverse impacts on habitats, facilities and infrastructure. Sea-level rise also increases the risk of saline intrusion in low-lying coastal areas, which can trigger changes to the use of land or freshwater ponds, towards brackish or saline aquaculture, such as shrimp or rice-shrimp systems, with impacts on the environment, livelihoods and income stability.

42. Regarding ocean acidification, oceans are a major sink of carbon dioxide, having absorbed around 25 per cent of anthropogenic CO₂ emissions between 1960 and 2021. This has slowed the pace of global warming, but ocean uptake of carbon dioxide also changes the seawater chemistry, making it more acidic, in a process called ocean acidification. As a result, the physiology of many marine organisms is altered, making it more difficult for many species, such as corals, shellfish and marine plankton, to build their shells and skeletons. This poses a risk to wild and farmed species that are of interest to global food security, and negatively affects biodiversity and ecosystems.

2. Anthropogenic pollution

43. A wide variety of substances enter the marine environment from multiple marine and land-based sources, with the largest share of all marine pollution originating from land-based activities. Pollutants have a negative impact on marine habitats, ecosystems and biodiversity, as well as on food security and safety.

44. Some pollutants, such as toxic metals, chemicals, radioactive waste or plastics, may kill or harm marine fauna and flora directly. Pollutants may also destroy marine habitats, for example, through eutrophication caused by the excessive input of nutrients into coastal ecosystems, which leads to hypoxic or “dead zones” with low oxygen levels in surface water. Dead zones are linked with mass mortality events of fish and marine mammals. Eutrophication and deoxygenation also increase the occurrence of harmful algal blooms and pathogenic organisms in coastal areas, which affect both the quantity and quality of aquatic foods. Human health can be affected when seafood contaminated with pollutants, pathogens, hormones, antibiotics, microplastics or other hazardous substances is consumed.

45. A wide range of human activities, such as shipping, oil and gas exploration and extraction and the installation of underwater infrastructure, contribute to ocean noise. Noise in the marine environment may cause physical damage to marine mammals, fish and invertebrates, disrupt communication among animals and displace them from their preferred breeding, nursery or feeding grounds, with potential effects on their breeding success and survival. This may lead to a decline in catch rates in some commercially important species, thus affecting negatively revenues from fisheries.

3. Destruction of marine ecosystems and habitats

46. The various types of coastal ecosystems, such as mangroves, seagrass meadows, kelp forests, salt marshes, wetlands and coral reefs, provide breeding, nursery and feeding grounds and thus play a vital role in the reproductive cycles of many fish and marine species. However, many of those habitats are degrading owing to the cumulative effects of the pressures described above and other human activities, such as unsustainable coastal development and tourism. Furthermore, there are concerns about the potential impacts of the construction of underwater infrastructure or extractive activities on the marine environment.

4. Invasive alien species

47. Globally, about 2,000 marine species have been introduced outside their natural range because of human activities. In favourable conditions, alien species may become invasive and out-compete local marine species, which can have a negative impact on native biodiversity and ecosystem functioning, diminish fisheries and aquaculture production and even threaten human health if the alien species are human pathogens or create toxins.

C. Value and supply chain constraints

48. Aquatic food value and supply chains face several risks and constraints. Food loss and waste, including through discards, occur throughout the entire seafood value and supply chain, affecting the food quality and quantity. The third target of Sustainable Development Goal 12 seeks by 2030 to halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses. Similarly, FAO developed a code of conduct for food loss and waste, including aquatic food. One of the main factors of food loss is the inefficiency of value chains and, in particular, the lack of adequate infrastructure, services, knowledge and technologies.

49. Climate and environmental concerns are also among the factors behind the failure of the global food system to provide safe, nutritious, sustainable and equitable diets. Those challenges affect a wide variety of products, including those derived from low-trophic aquaculture. Initiatives exist to monitor such challenges and assess their impact on seafood production and resources, such as the International Atomic Energy Agency (IAEA) Environment Laboratories, which support the development of capabilities to detect and reliably measure contaminants in the marine environment and in seafood. It is equally important that the value and supply chains of aquatic foods promote environmental sustainability, including through increased transparency and traceability. In addition, alternative fuels and engines can be used to reach global, regional and national emission reduction objectives for the fisheries and seafood value chains. Decarbonizing the entire value and supply chain of aquatic food production, including fishing vessels and aquaculture practices, is an integral part of the just transition to renewable sources of energy and low-carbon practices. Developing countries and small island developing States face uniquely significant challenges, as many depend heavily on marine resources and are thus substantially vulnerable to the consequences of ocean degradation and climate change. As such, it is important to develop measures to protect the marine environment that take into account impacts on economic development and livelihoods so as to achieve a balanced and just transition.

50. The global growing consumption of seafood also has a direct impact on value and supply chains. This growth in consumption creates a greater reliance on imports in some States, as well as a burden on exporting countries, from capture to final

export. In addition, the products are expected to possess the qualities of healthy, safe and high-quality aquatic food. The burden may be even higher after natural disasters, crisis and emergencies, when the rehabilitation of the aquatic food value and supply chain is at stake. In this respect, the coronavirus disease (COVID-19) pandemic has caused challenges for the fisheries sector, including disruption of supply chains. Threats to maritime safety and security, such as piracy or armed robbery at sea, also have direct adverse effects on aquatic food production, affecting international trade and the global economy.

51. The value of the seafood chain relies on the respect of international labour standards. However, key labour issues effect resilience and sustainability in supply chains. Such issues may include child labour, health and safety issues, lack of inclusivity and gender inequality. In particular, women and girls face stigmas that prevent employment and they may suffer abuse within the sector.

IV. Opportunities for, and challenges to, strengthening the role of the ocean as a source of sustainable food, in particular through enhanced cooperation and coordination at the global, regional and subregional levels

A. Management approaches to human activities that affect the productivity of marine ecosystems and the safety of seafood

52. Effective management of the ocean and its resources is essential to maintaining and strengthening its role as a source of sustainable food.

53. Within the legal and policy framework for oceans described above, management approaches to human activities generally comprise not only processes that provide a framework for making decisions and implementing ocean policy, but also management tools that regulate and modify human activities affecting the marine environment and thus affecting the productivity of marine ecosystems and the safety of seafood.

54. Such decision-making processes are used by competent authorities to identify appropriate policy and management objectives in the development and implementation of management approaches and strategies. Management tools include both area-based approaches and non-area-based tools, and are used to govern human activity within a particular system.

55. Current approaches to ocean management thus cover a wide range of tools tailored to specific issues at various scales, as influenced by social, cultural, economic and governance contexts, including the norms and value systems that affect decision-making.

56. Management tools can also contribute to mitigating and adapting to climate change, such as networks of marine protected areas, which can enhance ecosystem resilience. Alongside area-based management tools, resilience-based management uses knowledge of current and future drivers that influence ecosystem function to prioritize, implement and adapt management actions that sustain ecosystems and human well-being, including through reduction of stressors, such as pollution and destructive fishing pressures.

57. With respect to fisheries, States and regional fisheries management organizations or arrangements reported on a range of priorities in the use of management measures, including to address illegal, unreported or unregulated fishing; overfishing; habitat destruction; chemical, metal, nutrient and plastic

pollution; and threats from invasive species, as well as to improve flag State control. States emphasized the need to promote maritime spatial planning and to take fisheries and aquaculture into account within the framework of integrated coastal zone management. States and such organizations or arrangements further highlighted the importance of ecosystem and precautionary approaches in the context of fisheries management.

58. States also reported on management measures for the sustainable use of fisheries and associated fauna, including on minimum catch sizes, bycatch and juvenile specimens, fishing areas and quotas or catch limits. One group of States has noted significant progress in the number of its sustainably managed fish stocks and reported on an action plan to protect and restore marine ecosystems for sustainable and resilient fisheries, including by reducing the impact of fishing activities on marine ecosystems, by-catch of sensitive species, marine food webs and the seabed.

59. One group of States reported on a strategy to implement the Kunming-Montreal Global Biodiversity Framework and a commitment to protect 30 per cent of its seas, including through marine protected areas, in order to protect fish spawning and nursery areas, reduce fish mortality rates and restore core areas for sensitive species and habitats. One State emphasized the need to establish marine protected areas and other area-based conservation measures as complementary tools, including employing biotechnology for the recovery of populations or stocks of overexploited fishing resources, promoting an ecosystem approach in the development and implementation of fisheries management measures and minimizing the environmental impact of maritime economic activities, including fishing, aquaculture, transportation and hydrocarbon-related activities.

60. FAO noted that effective fisheries management was needed to address ecological, social and economic objectives, with priorities including monitoring and reporting on the state of fisheries and supporting the development, implementation and promotion of fisheries management plans, strategies and measures. The North-East Atlantic Fisheries Commission reported on a range of measures to manage fisheries, including an ecosystem-based approach to fisheries, as well as improvements in monitoring, control and enforcement measures, highlighting cooperative arrangements with other organizations to protect vulnerable marine ecosystems from human activities other than fishing, including recent developments on other effective area-based conservation measures.

61. Regarding aquaculture, one State emphasized the need for integrated decisions on site selection and management, the selection of species and stocks adapted to the local environment, the types and sources of fish food, the use of veterinary medicines as well as the impacts on wildlife and aspects of the marine environment. It also highlighted the importance of restoring dead zones linked to a lack of oxygen by reducing land-based pollution. Another State noted that mariculture could contribute to restoring and conserving wild species and ecosystems in a productive and safe manner.

62. FAO highlighted that innovative technology and management could support the expansion of sustainable and resilient aquaculture systems. Governance frameworks were needed to increase preparedness to reduce impacts from, and support rehabilitation of, the aquatic food sector after natural disasters, crises and emergencies.

63. States and regional fisheries management organizations or arrangements highlighted the significance of sustainably managing fisheries in relation to the challenges posed by climate change, including climate adaptation solutions. States emphasized the importance of research to understand the effects of climate change on fish stock abundance and distribution and to develop more flexible, responsive and

adaptive management strategies. States also highlighted the implications of ocean acidification, ocean warming, sea level rise or extreme weather events on ocean resources, whether wild or farmed. One State noted that shifts in fish stocks caused by climate change reinforced the need for international cooperation in managing capture fisheries, in particular straddling fish stocks and highly migratory fish stocks. Another State noted that a comprehensive approach was required, taking into account the varied vulnerabilities and exposure of different species and production systems to a range of stressors.

B. Protecting and restoring the health, productivity and resilience of marine ecosystems

64. By its resolution [73/284](#) of 1 March 2019, the General Assembly declared the period 2021–2030 to be the United Nations Decade on Ecosystem Restoration and reiterated the linkages between ecosystem restoration and conservation and the implementation of the 2030 Agenda. More recently, in its resolution [78/69](#), the Assembly highlighted the need for an urgent response and the setting of priorities for management actions aimed at conserving ecosystem integrity.

65. In terms of taking a comprehensive, holistic and cross-sectoral approach to ocean management, approaches to ocean management have gradually evolved from single-sectoral to more integrated and cross-sectoral, with a view to addressing the impact of cumulative human activities on the ocean and its ecosystems.

66. Given the high dependency of the fisheries sector on healthy marine ecosystems, the sustainability of food from the ocean calls for a comprehensive, ecosystem-based approach, including by mainstreaming fisheries and aquaculture in the framework of integrated coastal zone management and maritime spatial planning. In a transboundary context, the large marine ecosystem approach shares the same goal of promoting ecosystem-based management of coastal and marine resources.

67. In terms of promoting international cooperation and coordination, to ensure truly holistic management of the ocean, it is crucial to promote cross-sectoral cooperation in different forums through the active engagement of all interested stakeholders, including States, intergovernmental organizations and civil society, and by leveraging the best available science along with traditional knowledge of the Indigenous peoples and local communities that rely on the ocean for their livelihoods. With a scope of application covering nearly two thirds of the ocean, and the incorporation of the ecosystem approach and an integrated approach to ocean management among its guiding principles and approaches, the new 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 promotes cross-sectoral cooperation through the establishment of specific mechanisms to implement its provisions and thus has the potential to affect profoundly the management of ocean activities towards more holistic and integrated approaches. The 2023 ocean and climate change dialogue under the United Nations Framework Convention on Climate Change confirmed the importance of strengthening institutional linkages between partners at the national and international levels and across United Nations mandates and processes, such as the Agreement and the Kunming-Montreal Global Biodiversity Framework, to enhance global ambition and action for a climate resilient ocean.

68. With respect to increasing scientific understanding and strengthening the science-policy interface, improving understanding of the impacts of climate change on fisheries and aquaculture is essential to supporting the resilience of the marine ecosystems. Concerned by the declining state of the ocean, the General Assembly

established the Regular Process for Global Reporting and Assessment of the State of the Marine Environment, including Socioeconomic Aspects, with the objective to provide an evaluation of the state of the global ocean, the services that it provides and the human activities that influence its state. Likewise, the proclamation of the period 2021–2030 as the United Nations Decade of Ocean Science for Sustainable Development, with the identification of the protection and restoration of ecosystems and biodiversity among its core challenges, can stimulate ocean science and catalyse new opportunities. Furthermore, in recognition of the need to strengthen the understanding of, and action on, ocean and climate change, the ocean and climate change dialogues were launched in 2019 under the United Nations Framework Convention on Climate Change, with the 2023 dialogue focusing on coastal ecosystem restoration, and fisheries and food security. The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services is also aimed at strengthening the science-policy interface for biodiversity and ecosystem services.

69. At the regional level, improving the understanding of the interactions between climate change and fisheries and aquaculture, and promoting the integration of broader climate change and biodiversity considerations in the work of regional fisheries management organizations or arrangements can inform policy decision-making and contribute to the adoption of adaptation and mitigation policies and biodiversity-related measures to support the resilience of fish stocks. Within that context, the North-East Atlantic Fisheries Commission relies on the International Council for the Exploration of the Sea for independent scientific advice, to assist it in the performance of its management and policy functions.

70. In terms of strengthening the relevant legal and policy framework, the FAO “Blue Transformation” road map for the period 2022–2030 provides a framework for maximizing the contribution of aquatic (both marine and inland) food systems to food security, nutrition and affordable, healthy diets for all, while addressing sustainability challenges. Reconciling conservation and the sustainable use of marine living resources and biodiversity is crucial for healthy and resilient marine ecosystems. The Agreement, along with the Kunming-Montreal Global Biodiversity Framework, is expected to contribute significantly to efforts to reverse the degradation of ecosystems and biodiversity loss. Building on the latter, in 2023, the European Commission adopted an action plan for protecting and restoring marine ecosystems for sustainable and resilient fisheries, aiming at reducing the adverse impact of fishing activities on marine ecosystems, while also delivering on the European Union Biodiversity Strategy for 2030.

71. Furthermore, cognizant of the threats posed by plastic pollution, the United Nations Environment Assembly decided in 2022 to task an intergovernmental negotiating committee to develop an internationally legally binding instrument on plastic pollution, including in the marine environment, with the ambition of completing its work by the end of 2024.

72. Regarding mobilizing additional funding, although the ocean covers more than 70 per cent of our planet and contributes to 2.5 per cent of the world’s gross value added, only 1.1 per cent of national research budgets were directed to ocean science on average between 2013 and 2021. Sustainable Development Goal 14 is in fact the most underfunded of the 17 Sustainable Development Goals, and international efforts must be concentrated on actions towards the conservation and sustainable use of the ocean, through the mobilization of additional financial resources and, where appropriate, public-private partnerships. The 2023 Ocean dialogue under the United Nations Framework Convention on Climate Change highlighted the need to increase, scale up and ensure stable and accessible finance flows to aid the implementation of sustainable fishing practices and management and restoration of coastal ecosystems. Responding to the same need, at the regional level, the West Africa Sustainable Ocean

Programme is a €59 million programme, aiming to reinforce ocean governance, including by supporting the management and monitoring of critical marine and coastal protected areas.

C. Potential roles of small-scale fisheries and aquaculture in global food security

73. The significance of small-scale and artisanal fisheries and aquaculture in global food security is becoming more acknowledged, in particular in the light of climate change. They are instrumental in ensuring food and nutrition security, act as vital sources of employment and income, especially for coastal communities, and are considered generally more sustainable. The adverse impacts of climate change and biodiversity loss have rendered small-scale fisheries vulnerable, adding to the need for holistic cross-sectoral solutions.

74. Yet the full contribution of small-scale fisheries and aquaculture is poorly understood owing to underreporting in national data systems and the limited resources and capacity available for monitoring and reporting. Owing to their informal and localized nature and, in some cases, seasonality, the contributions of small-scale fisheries to national fisheries are still often overlooked, hidden or narrowly measured. The vital role of traditional and local knowledge in maintaining the sustainability of small-scale and artisanal fisheries and aquaculture is often undervalued. The unique characteristics and data uncertainty of small-scale fisheries necessitate tailored management measures that align with their specific data, technical and enforcement capacities.

75. In response to these challenges, the FAO Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication further highlighted the importance of enhancing data collection systems, access to markets and trading opportunities for small-scale fishers and fish farmers, thereby enhancing their role in food security and socioeconomic growth. The International Labour Organization (ILO) is advancing decent work in the aquaculture sector and encouraging cooperative development among small-scale fish farmers to further enhance the socioeconomic aspect of small-scale fisheries in Latin America and the Caribbean.

76. Adaptive management measures are being implemented in some small-scale fisheries and aquaculture to mitigate climate impacts and enhance productivity, ensuring the long-term health of marine resources. To reduce the carbon footprint of fishing fleets, the secretariat of the United Nations Framework Convention on Climate Change reported that strategies such as using alternative fuels, cold storage, electrification and hybrid technology are being employed, as well as programmes to support small-scale coastal fleets in replacing their engines with more environmentally friendly alternatives by 2050.

D. Potential innovations in seafood production

77. Technological innovation can strengthen both the ability for the ocean to act as a source of food and improve the sustainability of the farming and harvesting of consumables, including by assisting with the application of the ecosystem approach. Technological advancement has the potential to uncover new food sources or help to stabilize and improve the status of dwindling resources, including through biotechnology, thereby aiding in the recovery of overexploited fish stocks.

78. In both the guidelines for sustainable aquaculture and FAO “Blue Transformation” road map, aquaculture has been called on to develop and innovate within the priority actions of the road map, which include the facilitation of climate-smart aqua-business; facilitation of investment in digital, technological and management innovations; facilitation of innovative data collection and management; and support of the sustainable use and development of genetic resources to improve supply of quality seed for enhanced production efficiency.

79. The potential for low trophic aquaculture, which focuses on species that are lower in the food chain, such as seaweed and bivalves, or multitrophic aquaculture has been put forward with technological advances that increase the potential for upscaling production sustainability, although challenges have also been identified. Seaweed in particular can be used for direct food consumption but also for aquatic animal and livestock feed and biofertilizers, among other non-food related uses. Macroalgae also need to be better understood and their usage optimized, including by examining their role as a food. In addition to production challenges, difficulties with consumer acceptance have been identified, including for algae and cell-cultured fish. It has been estimated that, with appropriate technological improvement and policy reform, edible seafood could increase by 36–74 per cent compared with current yields by 2050, particularly in the area of mariculture.

80. The FAO road map also calls for the support of enhanced technical innovation in fishing operations; in that regard, advanced technologies such as artificial intelligence to enhance monitoring, control and surveillance measures are being embraced. The need to decarbonize the entire fisheries value chain, as well as aquaculture practices, has been underscored in the 2023 ocean and climate change dialogue, and alternative fuel sources for fishing vessels have been identified, as well as alternative measures such as electric and hybrid engines and wind propulsion. Those and other aspects of decarbonizing fishing vessels, such as looking into cold storage, have been studied.

81. New marine technologies can also help to address pollution of the marine and coastal environment. IAEA has launched the Nuclear Technology for Controlling Plastic Pollution (NUTEC) initiative, which aims to develop marine microplastics identification and quantification methods and facilitate capacity-building for laboratories to monitor microplastics in the marine environment, including seafood.

82. In addition, innovative data collection and management at all scales, as well as improving access to data and information, is also called for, with the need for real-time access highlighted.

E. Value and supply chains

83. In the light of its health and nutritional benefits, at the national level, there are information campaigns to encourage seafood consumption and policies to promote the integration of ocean-sourced foods in daily diets, in particular in school meals. More broadly, States also seek to facilitate the inclusion of aquatic foods in national food security and nutrition policies, strategies and programmes, which may be supported through bilateral aid programmes or funding. Sustained investment, including from the private sector, is important for improving fisheries value and supply chains.

84. The collection of data and the analysis of marine food consumption and nutrient composition contributes to the ability to mainstream marine food consumption. At the global level, the United Nations Children’s Fund (UNICEF)-World Health Organization-World Bank Group joint child malnutrition estimates provide information on child nutrition, malnutrition and health and can be used to highlight

the local marine food species that would be most practical and affordable to catch or cultivate to meet nutritional needs.

85. Food security through marine food is also increasingly taken into account in global and regional fora. The UNFCCC and Convention on Biological Diversity require the incorporation of such foods into relevant national policies. Regional fisheries management organizations or arrangements may consider food security as an element in the determination of catch levels and quotas. International momentum, such as through the 2022 International Year of Artisanal Fisheries and Aquaculture or the European Union International Ocean Governance agenda and the World Food Summit, the 2023 United Nations Food System Summit +2 Stocktaking Moment and the 2024 Summit of the Future, offer opportunities to mainstream seafood and trigger cooperation for ensuring food security.

86. The opportunities of integrating aquatic blue foods into national policies and strategies, such as nationally determined contributions, national adaptation plans and the long-term low-emissions development strategies under the Paris Agreement, were noted. In total, 40 per cent of adaptation components of nationally determined contributions already refer to fisheries and aquaculture, and 47 per cent of long-term low-emissions development strategies considered significant potential in the restoration of peatlands and wetlands, including 19 per cent that made explicit reference to blue carbon. The resilience of coastal and ocean ecosystems and biodiversity is reflected as one of the key transformational adaptation priorities in the strategies submitted to the secretariat of the UNFCCC. One in five such strategies included measures for adapting ocean ecosystems, focusing on protecting and restoring blue carbon ecosystems (mangroves, seagrass beds) and coral reefs; creating marine protected areas; promoting synergies between mitigation and adaptation; providing education; and awareness-raising.² However, more effective integration requires building capacity at the national and local levels, including through training, education and the dissemination of best practices in sustainable fisheries and aquaculture management.

87. Ensuring the safety of seafood is a high priority, and work to strengthen the capacity of States to detect and reliably measure contaminants, including microplastics, in the marine environment and in seafood, was reported.

F. Capacity-building and technology transfer

88. Capacity-building and technology transfer will be crucial to ensuring that the ocean remains a source of sustainable food amid the many challenges the seafood industry faces. The need for capacity-building for Governments, along with skills development and training for fishing communities, was highlighted, as was the need to enhance the resilience of small-scale fisheries, including through the implementation of the FAO Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries.

89. The importance was noted of open-access education and technical training systems for the collection and exchange of observational data on the marine ecosystem. The need was highlighted for developing countries to have greater access to new technologies being introduced to improve compliance and enforcement, through training and technology transfer.

90. Some delegations emphasized the importance of empowering women and girls in the fisheries and aquaculture sectors, including for alleviating poverty, malnutrition and food insecurity. One delegation stated that the Informal Consultative Process

² See [FCCC/PA/CMA/2023/10](https://www.unfccc.int/publications/2023/10).

should consider capacity-building opportunities for women in the blue foods sector, with an emphasis on building climate resilience. ILO reported on its work to build the capacity of its constituents to promote decent work and enable a just transition to a sustainable future of work in the sector, as well as on workshops strengthening aquaculture cooperatives to advance decent work, promote formalization and improve productivity.

91. It was also noted that, in the absence of a wider application of human and social protection standards in the fisheries sector, the energy transition could have implications for the working conditions of fishers, and that investment in and use of modern technologies and protective equipment, beyond energy efficiency or energy transition, could contribute to reducing occupational hazards and accidents at sea. However, the introduction of modern technologies and practices required safety training and capacity-building programmes for fishers, in particular women. Trade in goods and services could enable a sound energy transition in fishing fleets by facilitating the transfer and acquisition of the latest technologies in energy efficiency, smart navigation, fishing systems, renewable fuels, and low-emission engines and vessels. The transfer of technology will also have a key role to play in improving livelihoods, including by making use of patent pools and preferential green licensing. The need was emphasized for access to cutting-edge technology, technology transfer and funding for new technologies, especially for mesopelagic fisheries, deep-sea fishing and aquaculture systems, to reduce fossil fuel intensity and emissions.

92. Targeted capacity-building is needed to address the impacts of climate change and ocean acidification on the ocean food system. Experimental research and capacity-building efforts to address those issues were ongoing.

V. Conclusions

93. The ocean has a significant potential to be a more sustainable, equitable and less environmentally impactful source of food for generations to come. In order to preserve and strengthen that role, it is necessary to ensure the sustainability of the resources that are currently utilized, ensuring that they remain accessible and further developing underutilized resources, protecting and preserving the marine environment and promoting awareness of the role and state of the ocean. Fully meeting the commitments set out in the 2030 Agenda and its ocean-relevant goals is more important than ever. Concerted efforts must be taken to strengthen the ocean food system in a sustainable way.

94. Improving the management of the ocean and its resources by ensuring that relevant international instruments are fully and effectively implemented at all levels would contribute significantly to this goal. However, additional steps must be taken to ensure the long-term sustainability of the ocean as the source of food. Raising awareness of the ocean's current and potential future role to maximize the global benefits of food from the ocean will be of utmost importance, including for improving food security and nutrition.

95. It is equally important to address factors that undermine effective management, such as illegal, unreported or unregulated fishing, lack of adequate scientific data and lack of capacity. The current and potential future impacts of the triple planetary crisis on ocean ecosystems and resources should be considered in management approaches, with a precautionary approach applied where information is uncertain, unavailable or inadequate. Eliminating fisheries subsidies that contribute to overfishing and to illegal, unreported or unregulated fishing, by bringing into force the Agreement on Fisheries Subsidies and concluding ongoing negotiations on outstanding issues, should remain a priority.

96. The yield of sustainable food from the ocean can be increased to meet future demand by allowing overexploited fisheries to recover, eliminating food waste, reducing by-catch and discards, improving food safety and streamlining value and supply chains. There is also potential to continue to develop underutilized resources, including through sustainable mariculture for algae, plants, fish and other marine living resources. The new FAO guidelines for sustainable aquaculture can promote aquaculture growth that is economically, socially and environmentally sustainable.

97. Finally, it is paramount to protect and preserve the marine environment and biodiversity to maintain the health, resilience and productivity of marine ecosystems, including through the full and effective implementation of the relevant provisions of the Convention. Some crucial steps in that regard may be bringing into force 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, implementing the Kunming-Montreal Global Biodiversity Framework, and concluding negotiations on an ambitious treaty to address plastic pollution, including in the marine environment. The third United Nations Ocean Conference, to be held in Nice, France, in June 2025 and the 2025 United Nations Food Systems Summit +4, can serve to catalyse further discussion and progress in that regard.
