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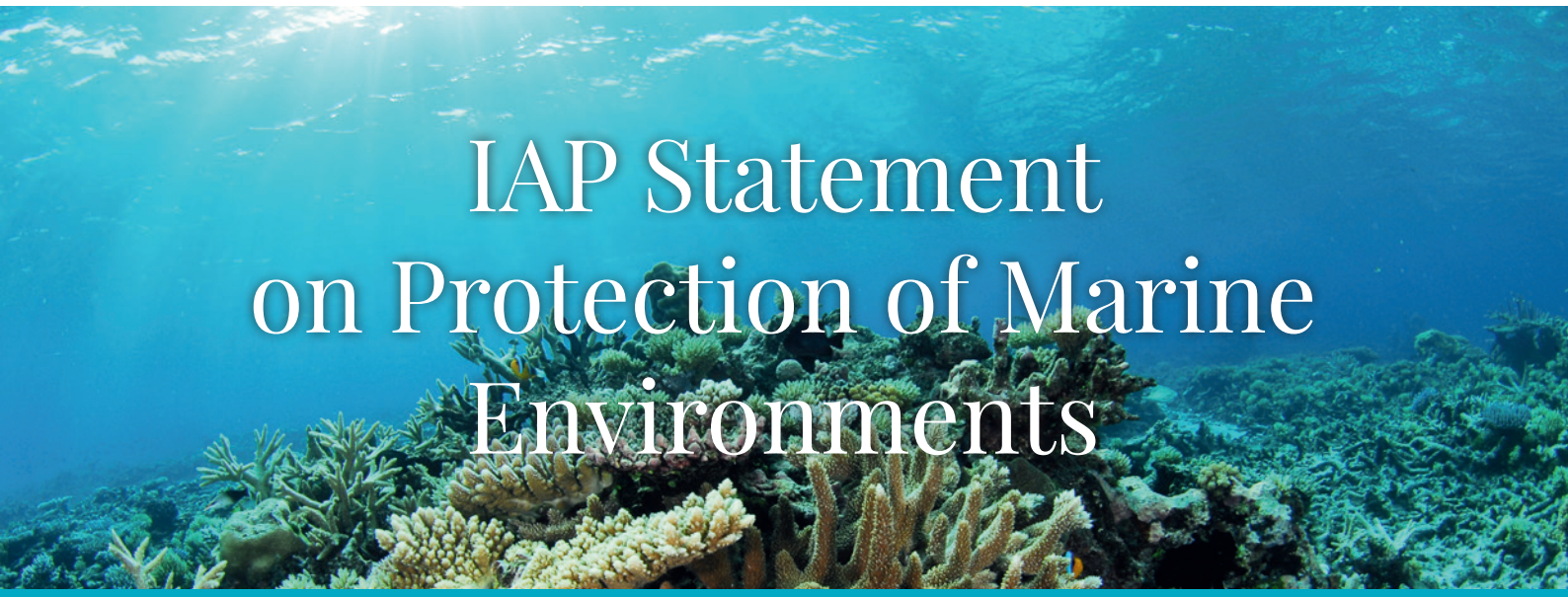

IAP Statement on Protection of Marine Environments

The ocean, connected over approximately 71% of the Earth's surface, supports humankind. Human well-being and our economy have benefited from the ocean for oxygen to breathe, fish and seafood to eat, leisure and healing places to visit, seaways for transportation, and the many jobs associated with ocean activities. However, unregulated and excessive human activities and recent climate change are causing the deterioration of the marine environment, reducing biodiversity and threatening its ecosystem services. Key areas of concern include:

- **A healthy ocean** is indispensable to human well-being and vitality and to the homeostasis of life on Earth. **Ocean health** is threatened by excessive human activities and has already been compromised on many levels. Facilitation of holistic ocean sciences and cooperation of diverse stakeholders are needed to understand complex processes in the marine environment and to implement solutions to protect and restore ocean health.
- The world's oceans are experiencing extensive **habitat destruction** due to both direct impacts (e.g. coastal development) and indirect impacts (e.g. climate change, invasive species, pollution). In particular, coastal areas, including coral reefs, kelp forests, mangroves, seagrass beds and intertidal mudflats, have suffered from massive habitat degradation and loss. This destruction increasingly extends to the deep sea. Multiple anthropogenic stressors damage ecosystem structure and function, as well as the capacity for marine habitats to provide ecosystem services. Most of these sensitive habitats are in need of immediate measures for protection, conservation and rehabilitation.
- Anthropogenic **environmental contaminants** continue to disrupt marine ecosystems. Accumulation of excessive nutrients, toxic chemicals, heavy metals, and marine debris including macro-, micro- and nano-plastics, destabilizes ecological processes, degrades natural resources and inflicts major economic losses. Strict controls for the management of environmental contaminants should be implemented immediately.

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- The ocean regulates the Earth's climate and provides a buffer to **climate change**. In return, the marine environment is subject to adverse effects of climate change. Ocean warming causes sea level rise, loss of dissolved oxygen, redistribution and alteration of marine life, and intensification of heatwaves and tropical cyclones. Excessive carbon dioxide emissions also cause ocean acidification. Interdisciplinary research on the ocean and the atmosphere and development of new management strategies will help mitigate and adapt to climate change.
- Marine fisheries are important contributors to human food and nutritional security. **Over-exploitation** of world fisheries is causing a rapid decline of fisheries resources. To meet current and future food requirements of the growing human population the recovery of depleted fish stocks through the implementation of extensive no take zones together with sustainable aquaculture production are needed.

1. Ocean health

Exploitative approaches to marine resources have led to declining ocean integrity. Consequently, a shared appreciation of ocean conservation is highly recommended. We have little time to nurture the ocean's resilience, remove threats and eliminate disruptions, especially because climate change has an increasing impact on ocean health. The recovery and protection of the ocean is contingent on the development of inclusive and integrated marine sciences, with public access to scientific data, information and knowledge.
A holistic approach to the ocean requires universal recognition of our common interest in and dependence on the status of the ocean. Marine interventions can have substantial ecological benefits. For example, Marine Protected Areas are accepted worldwide as an economically viable means of enhancing biodiversity, and maintaining and replenishing fish and shellfish stocks.

The UNESCO philosophy of Ocean Literacy for All seeks appreciation of the ocean at all levels throughout all cultures (UNESCO, 2020a). The objective is a large-scale behavioural transformation toward a global constituency that fully grasps the completeness of our reliance on the ocean and subscribes to the sustainable management and use of marine resources. Dynamic cooperation among interdisciplinary ocean-related sciences is essential.

2. Habitat destruction

Coastal areas have long been threatened by habitat destruction due to development (e.g. land reclamation, intensified agriculture and urban expansion) and human population growth. In addition to direct habitat loss, many sensitive ecosystems have been damaged by pollution, invasive species and climate change. Accordingly, critically important coastal habitats such as estuaries, seagrass beds, coral reefs, oyster reefs, tidal wetlands, and kelp and mangrove forests, have suffered ecologically with associated socioeconomic consequences. These impacts also threaten pelagic and deep-sea habitats. Coastal habitats contribute substantially to the maintenance of biodiversity and to the succession of generations of marine organisms (IPBES, 2019). Nursery areas in particular are substantial determinants of ocean health and biodiversity. Environmental integrity in these marine habitats must be protected and, in many cases, rehabilitated.

3. Environmental contaminants

Excess loading of nutrients and organic matters from terrestrial human activities and coastal aquaculture (eutrophication) causes algal blooms leading to the expansion of dead-zones, with mass mortality of fish and other marine life. Some algal species also produce toxins that may even lead to human casualties.

Photo: Unhyuk Yim

Biomagnification of toxic substances in mid-to-higher trophic levels can suppress the growth of marine organisms and inhibit their reproduction. Persistence and long-range transportation of chemical contaminants is problematic globally. Furthermore, bioaccumulation of persistent and toxic substances, including toxic metals, in commercial seafood threatens human health and causes economic loss in fisheries.

Poor solid waste management results in the accumulation of marine debris, including over 8 million tonnes of plastics in the ocean annually. Plastics, which account for up to 80% of marine debris, cause ecological impacts by

entanglement and ingestion by marine organisms, dispersion of pathogens and non-indigenous species, and compromised benthic habitats. In addition, marine plastic debris can result in economic losses due to decline of tourism, damage to fishing gear and boats, and obstruction of nautical propellers and cooling systems. Micro-

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and nano-plastics are everywhere in the marine environment, including marine food webs, and even in the human diet.

4. Climate change

The continuous increase in atmospheric greenhouse gases is recognized as a global threat that needs ambitious goals and international collaboration to combat the resulting climate change. The ocean has absorbed 30% of total anthropogenic CO2 emissions since the 1980s with enormous global impacts (IPCC, 2019). Climate change alters ocean circulation and mixing, biogeochemistry and ecosystems. These changes could interfere with the ocean's capacity for ecosystem services such as food supply, carbon storage, oxygen generation and climate stability. Global warming leads to melting of glaciers and polar ice caps as well as thermal seawater expansion. In turn, these processes lead to worldwide sea level rise that is threatening for the many people living in coastal areas. Ocean acidification threatens carbonate shell synthesis, respiration, reproduction, early development, and the growth and survival of innumerable marine animals. Expanding oxygen-depleted dead-zones are uninhabitable by aerobic organisms. The IPCC Special Report (2019) highlights the extreme urgency of prioritizing timely, ambitious and coordinated action to address unprecedented and enduring changes in the ocean. One obvious priority measure is the protection of seagrass beds, salt marshes and kelp and mangrove forests, which utilize excess nutrients, generate oxygen, and sequester carbon in the form of organic matter through photosynthesis, thereby moderating global warming.

5. Overexploitation

Most fisheries stocks are fully exploited: more than 90% of marine stocks are either overfished (34.2%) or fished at maximum sustainable levels (59.6%; FAO, 2020). Additional disruptions result from illegal, unreported and unregulated (IUU) fishing, habitat degradation, pollution and gear abandonment.

Capture fisheries yields plateaued in the late 1980s and are unlikely to increase. Maintaining even current yields (84.4 million tonnes in 2018) will require rethinking our husbandry of ocean ecosystems. The focused removal of organisms at one trophic level can destabilize marine ecosystems. For example, harvests of higher-value predatory species cause the loss of biodiversity and disruptive imbalances in marine communities. In addition, heavy harvests of young and otherwise unmarketable fish for agricultural and aquaculture feeds exert additional pressure on already-distressed marine ecosystems. IUU fishing is thought to be responsible for annual catches of up to 25.9 million tonnes (FAO, 2016) and has undermined sustainable fisheries management, threatening 4.3 billion people who depend on fisheries for nutrition (FAO, 2020).

Aquaculture production in aquatic environments (including fish, invertebrates and aquatic plants) reached 114.5 million tonnes in 2018, expanding at 5-6% annually (FAO, 2020). Aquaculture is already delivering 50% of the seafood we consume, and is expected to meet an increasing proportion of humanity's nutritional requirements. Refinement of culture

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practices toward sustainability and conservation-sensitivity is necessary to relieve pressure on wild, overexploited marine stocks.

6. Conclusions and Recommendations

Excessive exploitation of marine resources and products, the cumulative impacts of multiple stressors, and chronic disregard for marine ecosystems have left our oceans more in need of consideration than ever before. The ocean is subject to complex, poorly-understood problems, many of which interact with one-another, collectively threatening the integrity and continuity of life on Earth. Earlier misconceptions of the ocean as an immense realm with unlimited resilience are no longer valid. The fundamental challenge that policy-makers must address is how to achieve a sustainable use of the oceans (EASAC, 2016). This situation urgently calls for a comprehensive and pervasive new approach, and fresh commitments of current and future generations and nationalities to the health of the ocean.

The United Nations has urged cooperation among global communities to solve threats to the ocean by proclaiming the UN Decade of Ocean Science for Sustainable Development (2021-2030; UNESCO, 2020b). Advancement of 'ocean literacy' will raise consciousness about the vital importance of the ocean to humanity and the essential contributions of the ocean's ecosystem services.

Other international initiatives such as the Convention on Biological Diversity (CBD), the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), and Biodiversity Beyond National Jurisdiction (BBNJ) also seek the conservation of marine environments and biodiversity, while Sustainable Development Goal (SDG) #14 of the UN 2030 Agenda refers to 'Life Below Water' with seven specific targets.

Through this Statement, the InterAcademy Partnership calls on governments, NGOs and IAP member academies to:

- Share scientific information and data, build comprehensive understanding of the ocean, and develop an international ocean knowledge database that is equitably accessible, for devising solutions and making policies and decisions.
- Coordinate actions to protect and restore ocean health with expansion of research capacity development, ocean literacy and mechanisms to promote the exchange of information at the science-policy interface.
- Implement inclusive protection measures for coastal and other sensitive marine habitats.
- Assess sources of environmental contaminants, address their distributions, fates and impacts on ocean health, and develop means to eliminate entry of land-based contaminants into the ocean and to reduce their marine impacts.
- Mitigate and adapt to the impacts of greenhouse gases and climate change on the ocean ecosystem in acidification, deoxygenation and redistribution and change of marine life, thereby avoiding failure in the livelihoods of people who depend on the ocean.
- Ensure improved scientific management of capture fisheries, strengthen enforcement against IUU fisheries, and promote environmentally sensitive marine aquaculture.
- Increase ocean literacy, encouraging the global society to understand its intricate connection to the oceans and to respect the role of the oceans in maintaining Earth's biodiversity and habitability.

Photo: Deokbae Park

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The InteracAdemy Partnership

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Additional copies of this statement can be downloaded from: www.interacademies.org/statement/protection-marine-environments

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