Preamble

World leaders and representatives of 196 contracting states are joining the 15th Conference of the Parties (COP15) to the Convention on Biological Diversity (CBD) in Montréal to discuss strategies to stem global biodiversity loss. Worldwide, one million species are currently threatened with extinction from increasing anthropogenic impacts. Recently discovered species are predicted to have unusually high risks of extinction; many of these occur in biodiversity-rich marine environments such as coral reefs and the deep sea. Conservation of deep-sea species found in “areas beyond national jurisdiction” is particularly challenging because we know very little about them, and there is not yet an international framework to guide the implementation of conservation measures. Deep-sea ecosystems form the largest realm on Earth that harbour a vast number of species, but remain least explored. The deep sea and its unique and rich biodiversity play a key role in ecosystem services, such as food supply or regulating global climate by absorbing heat and sequestering carbon dioxide from the atmosphere. However, scientists estimate that about 90% of species in the oceans are not yet discovered or have no name.

We urge decision makers to further support species discovery, including deep-sea exploration activities. Protection of undescribed biodiversity must work alongside efforts to increase species information to ensure effective marine conservation.

Diving through the darkness

Species information is vital for effective marine conservation

by Stefanie Kaiser1 // Julia Sigwart1 // Aidin Niamir1 // Hanieh Saeedi1 // Chong Chen2 // Ana Hilário3 // Tammy Horton4 // Kerry Howell5 // Lisa Levin6 // Karen Osborn7 // Angelika Brandt1,8

Above: Diversity brought to light during a single deep-sea sampling campaign - the recent Aleut-Bio expedition to the Aleutian Trench on board RV Sonne (species not shown to scale).
The World’s largest realm, the deep sea, remains undiscovered

Most of the Earth’s surface is covered by the ocean, and the marine environment is the most important element of global climate and ecosystem processes. A large share of the global human population (2.4 billion) lives less than 100 kilometres from a coast, and depend directly on the oceans for their livelihood. Because deep-sea areas are often far from shore and practically out of sight, most people are unaware of the value they provide to human life and society. The deep sea, which extends from 200 to about 11,000 metres depth, is globally the largest realm comprising more than 95% of the ocean’s volume and supports a tremendous diversity of ecosystems and species.

Around 28,000 deep-sea species are currently described and named — according to the World Register of Deep-Sea Species (WoRDeep, see upper info box page 6). However, current estimates suggest that there are likely between 1 and 2.2 million species living in marine environments.

Human impact on deep-sea biodiversity is increasing

Accelerated environmental changes are increasingly threatening coastal areas (e.g., coral reefs) as well as deep-sea ecosystems and the species that live there. Deep-sea species are exposed to pollution, ocean acidification from increased carbon dioxide emissions, habitat destruction from oil and gas extraction, fishing and potentially deep-seabed mining. In addition, global warming, ocean deoxygenation, and rising human mobility increase the risk of invasion by non-native species even in the deep sea, which could cause dramatic changes in deep-sea biodiversity.

Deep-sea conservation starts with species

Effective conservation management of the deep-sea depends on understanding its species. Species are the primary units of biodiversity. Each species has different requirements and will react differently to changes in environmental conditions. Accurate information on species, including their diversity and ecology, is crucial to detecting ecosystem change and indicator species play a key role in environmental management.

Only a small fraction of deep-sea species has been named so far, and there are only few conservation measures in place to protect undescribed species. Current conservation criteria are to preserve vulnerable species and/or complex habitats. While much of the deep-sea floor consists of more or less uniform, wide sedimentary planes, they are among the most diverse communities on Earth.

Recently, more than 150 deep-sea species have been assessed as threatened or even critically endangered by the The IUCN (International Union for Conservation of Nature) Red List (see lower info box page 6). To enable IUCN Red List assessments species must have a name and some information on its distribution and life history. Most deep-sea species, however, still have no name and lack the information needed to qualify them for Red List assessment. It is predicted that more than half of the undescribed species are likely threatened with extinction.

Key messages

- The deep sea is the largest realm on Earth and a centre of biodiversity — the ocean is an open and interconnected system and as a whole plays a central role in ecosystem processes and human well-being.
- Most deep-sea species are undiscovered and have no name. These species are invisible to conservation measures and this undermines effective biodiversity conservation.
- Anthropogenic impacts increasingly affect deep-sea ecosystems and their species. Many species will become extinct before they are discovered.

Actions

- Prioritize conservation of deep-sea ecosystems and their species to sustain ocean health.
- Develop, endorse and finance international strategies, infrastructure and collaboration to improve information on deep-sea species.
- Adapt and implement conservation management plans for the deep sea to use best available data for biodiversity, while promoting discovery and naming of new species.
Deep-sea conservation requires species information

The deep sea is the largest realm on Earth and is home to a multitude of species. This species diversity is key to sustaining ecosystem processes that support ocean health and ultimately human livelihoods. Conservation measures need to be adapted to capture the many undescribed species found in the deep sea.

New species discoveries

Owing to its sheer size and poor accessibility, less than 1% of the deep sea has been explored. Each deep-sea sample can yield about 90% new species. Improving species discovery and description requires international collaboration leaving no one behind.

90% of marine species are not yet described

Deep-sea species provide:

- biochemical compounds for medicine / cosmetics
- cultural, inspirational and aesthetic values
- food
- economic values (e.g., fisheries)
- buffer against environmental changes

Deep-sea species:

- Metadasynemella sp.
  - Commercial value
  - A new nematode, or roundworm, species from the Chatham Rise, New Zealand.

- Tomopteris sp.
  - Mesopelagic
  - A new species of mesopelagic bristle worm recently being discovered from Central California, North Pacific.

- Grimpoteuthis imperator
  - Abyssopelagic
  - The Emperor dumbo octopus found in 2021 near the Emperor seamounts in the North Pacific.

- Dendromunna sp.
  - Abyssal
  - A new isopod crustacean species from the recently established NACES MPA in the North Atlantic.

- Epimeria sp.
  - Trench
  - A recently discovered amphipod crustacean species from the newly established NACES MPA in the North Atlantic.

- Advamina magnifica
  - Seamount
  - A recently named glass sponge from a seamount close to the Mariana trench.

- Chrysomallon squamiferum
  - Hydrothermal vents
  - The Scaly-foot Snail, the first deep-sea species assessed as Endangered by deep-sea mining on the IUCN Red List.

Deep-sea exploration

The deep ocean spans diverse habitats - from coral gardens, seamounts and hydrothermal vents to the vast sediment-covered abyssal plains and the deepest parts of the Earth, the hadal trenches, not to mention the extensive deep pelagic zones. Each of these support unique communities and species.

Diverse habitats

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Human impacts

- Deep-sea bottom fisheries
- Pollution (litter, noise, chemicals)
- Ocean acidification
- Resource exploitation (oil, gas, planned deep-sea mining)

The Greater Picture

Meeting the UN Sustainable Development Goals

SUSTAINABLE DEVELOPMENT GOALS

SDG14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development.

A Red List for the deep sea

Deep-sea species have rarely been considered for IUCN Red List assessment.

Marine biodiversity knowledge centres

OBIS

OCEAN BIODIVERSITY INFORMATION SYSTEM

Global knowledge centre managed by UNESCO-IOC to document and openly share data on diversity, distribution and abundance of all marine species.

WORMS

World Register of Marine Species

An online and open-access authoritative classification and catalogue of marine species names.

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Support conservation of the undiscovered biodiversity

The way forward for deep-sea conservation is to increase the understanding and appreciation of species. Many states have committed to protect ecosystem services through national laws and international commitments establishing Marine Protected Areas (MPAs) under the United Nations Sustainable Development Goal 14. When information on species is either not provided or known, these actions can fail. Biodiversity in areas beyond national jurisdiction (BBNJ) contributes much to global species richness, but a legally binding framework for the establishment of MPAs in such areas has not yet been implemented.

We call on all decision makers to recognize the importance and value of all deep-sea species, to ensure their consideration in aims to halt global biodiversity loss, and to prioritize the conservation of the deep sea. Effective management and conservation of the deep sea will benefit global ocean health by preventing the loss of hundreds of thousands of valuable and amazing species, before they are driven to extinction as a direct result of the activity of our own species. To provide the scientific basis for this critical task, we urge decision makers to establish and endorse international collaboration in deep-sea exploration and the discovery and description of species for the conservation of the World’s last great wilderness.

Global platforms for Biodiversity Information

The UN Decade of Ocean Sciences for Sustainable development (2021-2030) recognizes the deep sea as a frontier and has endorsed Challenger 150, a deep-sea science programme to thoroughly expand our knowledge on deep-sea species via a coordinated global field survey. Global biodiversity knowledge centres, in particular the Ocean Biodiversity Information System (OBIS) and the Global Biodiversity Information Facility (GBIF), pool our knowledge of species distribution and identify key knowledge gaps. The World Register of Marine Species (WoRMS) and its deep-sea component WoRDiSS, provide the biodiversity information backbone by making freely available all marine species names that have ever been described. Together these databases provide the framework for the integration and management of data on deep-sea species and their distribution.

A Red List for the deep sea

The IUCN Red List is the most effective tool to communicate the potential extinction risks of each species. In 2019, the Scaly-foot Snail (*Chrysomallon squamiferum*) became the first deep-sea species to be listed as globally endangered due to the threat of deep-seabed mining. Further efforts to compare the extinction risk of worldwide deep-sea species at hydrothermal vents showed that many are seriously threatened or critically endangered. Deep-sea species should be evaluated more frequently for the IUCN Red List – but to do so, they must first be described and named.

Further information

www.oceandecade.org/vision-mission/
www.challenger150.world/
www.dosi-project.org/resources/dosi-policy-briefs/
www.gbif.org/
www.isa.org.jm/sski
www.marinespecies.org/
www.obis.org/
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References


Liu, J., et al. (2022) Undescribed species have higher extinction risk than known species. Conservation Letters, e12876.


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