



Diving through the darkness

Species information is vital for effective marine conservation

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).

by Stefanie Kaiser¹ // Julia Sigwart¹ // Aidin Niamir¹ // Hanieh Saeedi¹ // Chong Chen² // Ana Hilário³ // Tammy Horton⁴ // Kerry Howell⁵ // Lisa Levin⁶ // Karen Osborn⁷ // Angelika Brandt^{1,8}

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.

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 (WoRDSS, 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.

The shrimp *Atlantopandalus propinquus* peers through corals of a *Lophelia* reef.
© Solvin Zankl

Keymessages

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 collaborations 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.

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

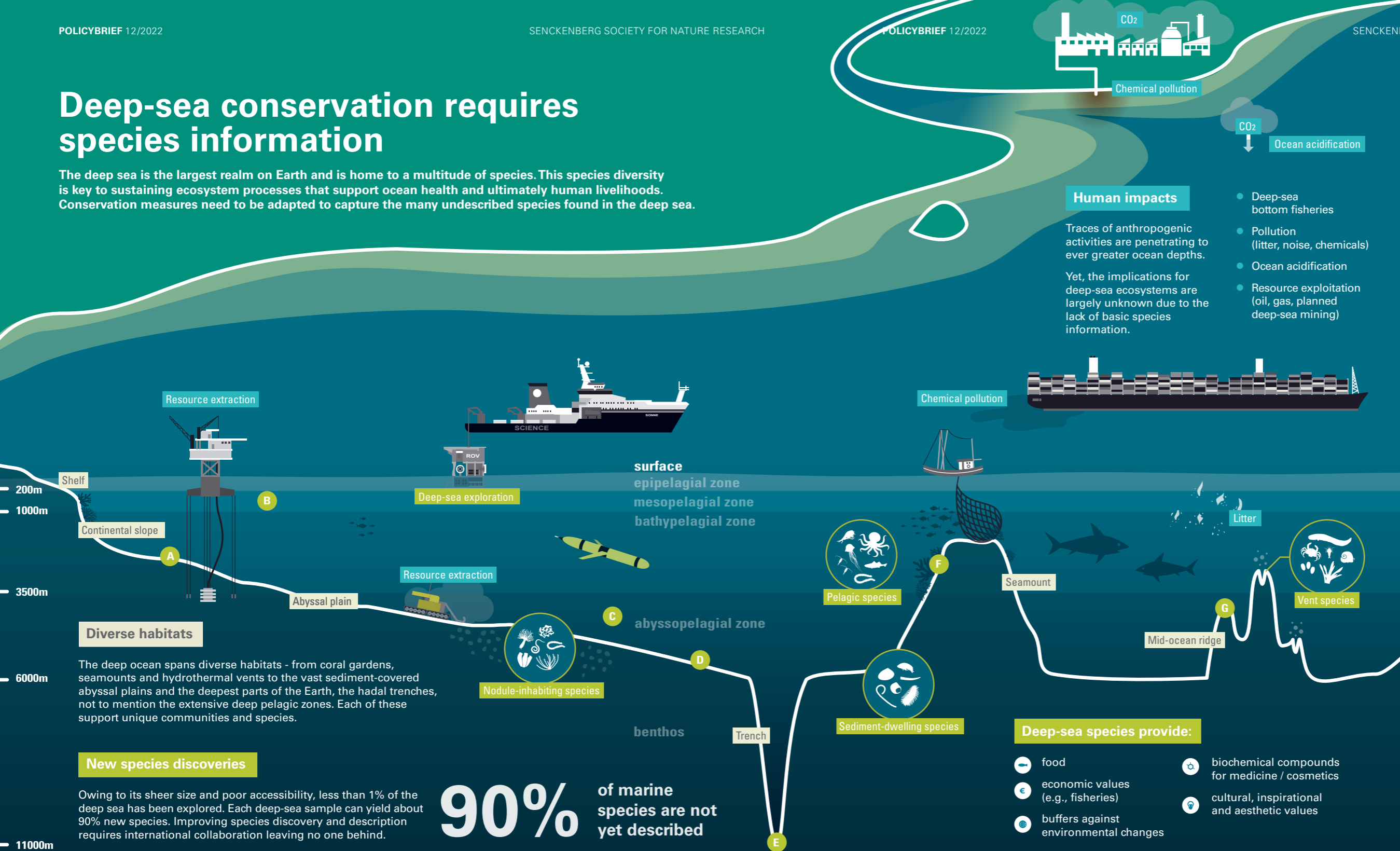
on species, including their diversity and ecology, is crucial to detecting ecosystem change and indicator species play a key role in environmental management.

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 a 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.

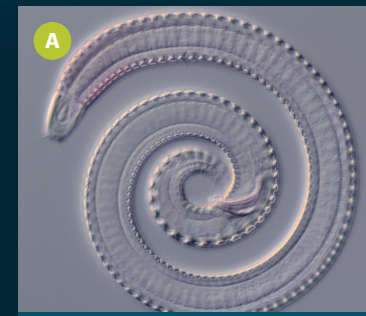
Deep-sea conservation requires species information

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.

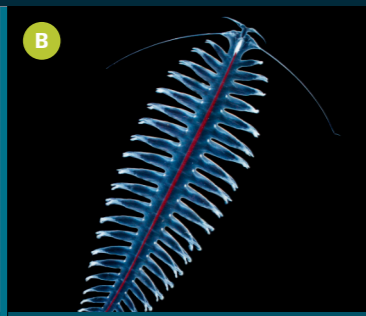


Diverse habitats
The deep ocean spans diverse habitats - from coral gardens, seamounts and hydrothermal vents to the vast sediment-covered abyssal plains and the deepest parts of the Earth, the hadal trenches, not to mention the extensive deep pelagic zones. Each of these support unique communities and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

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.



A
Metadasynemella sp.
Continental slope
A new nematode, or roundworm, species from the Chatham Rise, New Zealand.



B
Tomopteris sp.
Mesopelagial
A new species of mesopelagic bristle worms currently being described from Central California, North Pacific.



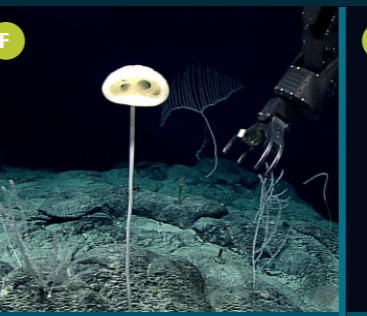
C
Grimpoteuthis imperator
Abyssopelagial
The Emperor dumbbo octopus found in 2021 near the Emperor seamounts in the North Pacific.



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



E
Epimeria sp.
Trench
A recently discovered amphipod crustacean species from the Aleutian trench, North Pacific.



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



G
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.

The Bigger Picture



2021-2030 United Nations Decade of Ocean Science for Sustainable Development

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



THE IUCN RED LIST OF THREATENED SPECIES™

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

Marine biodiversity knowledge centres



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



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

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.



A large sea snail (family *Buccinidae*), probably a new species, collected from hydrothermal vents on the Reykjanes ridge, North Atlantic Ocean. © Solvin Zankl

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 WoRDSS, 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.



A species of feather duster worms (Family Sabellidae) from the cold-water coral reef 'Lónðsjúp' off Iceland. © Solvin Zankl

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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Senckenberg Society for
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Senckenberganlage 25,
60325 Frankfurt am Main,
Tel.: +49 (0)69 7542 0

Overall responsibility

Prof. Dr. Klement Tockner

Editors

Dr. Stefanie Kaiser
Prof. Dr. Angelika Brandt
Thorsten Wenzel

Contact

Info@senckenberg.de

Picture credits

Title: Chong Chen,
Henry Knauber (SGN),
Anne-Helene Tandberg
(University of Bergen),
P 2,6,7 Solvin Zankl
(<https://solvinzankl.com/>)

Bottom of Infographic:
Chong Chen, Nicole
Gatzemeier (SGN),
Karen Osborn, WoRMS

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