

MAPMAKER: Marine Plankton Diversity Bioindicator Scenarios for Policy Makers



PROJECT SUMMARY

MAPMAKER will support global marine policy makers and:

- provide plankton diversity projections for the 21st century as a function of societal choices
- provide novel diversity metrics tailored for efficient transfer across the science-policy interface
- trigger an inter- and trans-disciplinary dialogue on the inclusion of quantitative marine plankton diversity indicators in policy making and conservation efforts

To this end, MAPMAKER will engage with stakeholders to:

- foster the co-design of scientific results for society
- tailor science-based communication tools for use in international decision making processes
- produce visualization tools for the transfer of knowledge across the science-policy interface
- disseminate targeted information to decision makers

Background

Climate change is causing changes in marine biodiversity and disrupting plankton ecosystems, with potential negative impacts on ocean ecosystem services. Initial findings suggest that specific aspects of plankton diversity account for vital ecosystem functions and the ocean's functional diversity, which in turn sustain commercial fisheries' harvest. Studies also show that diverse ecosystems are more resilient to perturbations and the effects of multiple stressors, such as ocean warming and acidification. Thus, the protection of global plankton diversity at the global scale in

international policy making decisions is vital for preserving ocean health, in line with the key Sustainability Development Goals SDG2 'no hunger' and SDG14 'life below water'. Yet, to date, climate change projections of marine plankton diversity and biogeography are not considered in global assessments, such as those conducted by the IPCC and IPBES. This is due to the lack of information on the biogeographic patterns and drivers of the vast diversity of marine plankton species that would allow for their extrapolation. Therefore, plankton biodiversity conservation has not yet been incorporated in marine strategy frameworks and international policy documents.

Vision and Concept

The **MAPMAKER project**, a collaboration between IUCN [Global Marine and Polar Programme](#) (IUCN) and ETH Zurich [Environmental Physics Group](#) (UP), with the support of the [Geneva Science-Policy Interface](#) (GSPI) aims to bridge this knowledge gap and enable data-driven decision-making on marine biodiversity protection at the international policy level. In order to do so, UP and IUCN will engage with a diverse range of stakeholders and enable an inter- and trans-disciplinary dialogue on the inclusion of marine plankton diversity indicators in relevant policy applications. We aim to build an interactive web tool, which will serve to transfer knowledge across the science-policy-society interface.



Scientific Methodology

Based on observational data and novel machine-learning algorithms, UP has mapped the biogeography of thousands of plankton species (Buitenhuis et al. 2013; Righetti et al. 2018, 2020; Benedetti et al. 2018). We will use this knowledge to quantify temporal and spatial shifts in ocean biomes (Hofmann-Elizondo et al., in rev.), to project future changes in plankton diversity, and to identify hotspots of change. We will translate projections into quantitative global impact metrics targeted at policy makers, and characterise ecosystem change as a function of future carbon emissions (Representative Carbon Pathways, RCPs).

Impact Strategy

MAPMAKER will engage with ocean and climate change experts at IUCN, international policy makers, and relevant stakeholders in Switzerland and beyond to co-design products fit for transfer across the science-policy interface. Stakeholders and researchers will interact via an online collaboration platform, where products will be developed in an iterative approach. The co-design of a software tool for the visualization of changes in plankton diversity and bioindicator metrics as a function of societal decisions on carbon emission pathways will allow for the efficient transfer of science-based knowledge to international decision makers. A strategic workshop will be held to identify key stakeholders and the project's impact strategy (February-March 2021). Second, stakeholders and scientists will interactively design and improve metrics and tools (March 2021). Third, the visualizations will be disseminated to all relevant policy-making fora (April – June 2021). The final outputs (visualization tool, IUCN Policy/Issues Brief and IUCN Multimedia story) will be showcased at [IUCN World Conservation Congress](#) in 2021, and disseminated to all relevant stakeholders using IUCN network with the support of GSPI.

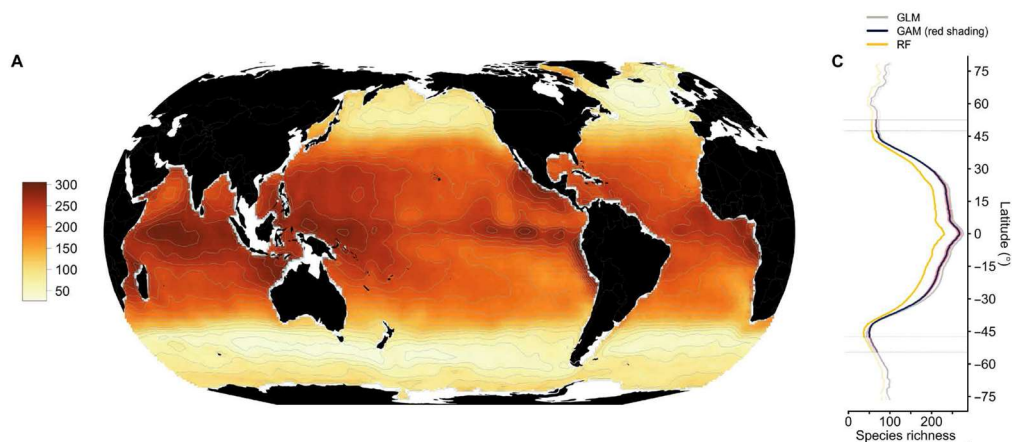


Figure 1: Present global marine phytoplankton diversity projections based observations and statistical species distribution models from Righetti et al. (2018; 2020). (A) Global map of phytoplankton diversity with hotspots in the Tropics. (C) Latitudinal pattern of phytoplankton diagnosed by three different species distribution models (GLM, GAM, RF).

Please reach out to the MAPMAKER team (meike.vogt@env.ethz.ch; aurelie.spadone@iucn.org).

References: Buitenhuis et al., 2013, doi: 10.5194/essd-5-227-2013; Benedetti et al. 2018, doi:10.1111/ddi.12857; Righetti et al. 2018, doi:10.1126/sciadv.aau6253; Righetti et al. 2020, doi:10.5194/essd-12-907-2020.

