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Marine Life 2030: Building Global Knowledge of Marine Life for Local Action in the Ocean Decade

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ABSTRACT

People depend on biodiversity—the heart of healthy ecosystems—in many ways and every day of our lives. Yet usable knowledge of marine life is a missing link in the way we have designed marine observing and information systems. We lack critical biodiversity information to inform sustainable development from local levels to global scales—information on Essential Ocean Variables such as how many types and how much plankton, seagrasses, macro-algae, mangroves, corals and other invertebrates, fish, turtles, birds, and mammals are in any location at any one time, the value we may derive from that combination of organisms, and how this is changing with time and why. Marine Life 2030 is a program endorsed by the Ocean Decade to develop a coordinated system to deliver such actionable, transdisciplinary knowledge of ocean life to those who need it, promoting human well-being, sustainable development, and ocean conservation. Marine Life 2030 is an open network that invites partners to join us with ideas and energy to connect communities, programs, and sectors into a global, interoperable network, transforming the observation and forecasting of marine life for the future and for the benefit of all people.



FIGURE 1. Marine Life 2030 logo ©. Artwork by Jason Mallett/ Consortium for Ocean Leadership.

Vision

The vision of Marine Life 2030 is that anyone, anywhere, will have access to information on marine species and ecosystems important to their local fisheries, culture, health, and livelihoods. People around the world will be able to diagnose how species are shifting with climate change, ocean uses, and management actions to achieve a sustainable future for nature and people.

The ocean we want hosts abundant and diverse life that supports humanity's needs for food, other natural products, and good livelihoods. Marine life is the engine of ecosystems that provide these benefits. To realize sustainable development we need reliable, accessible information on these species. This requires solving three challenges: (1) today, management of marine living resources relies mainly on proxy variables like temperature, salinity, and topography—generally without measuring biology itself because most marine species and great swaths of the ocean's ecosystems remain unstudied; (2) most existing data on ocean species are inadequately coordinated, not digitized, or are stored in different formats that are not interoperable and accessible by machines; they are of varying quality, and frequently largely inaccessible by any means; and (3) marine biodiversity science, observations, and knowledge are poorly linked to users and communities.

Viability

The science we need to achieve the ocean we want requires transformations in technology, in the culture of science, and in the scale and nature of global coordination. Marine Life 2030 will:

(1) work with other Ocean Decade Programs and convene stakeholders around the world to co-design, converge and coordinate on best practices and data and metadata formats, and work together to find resources for sustainable marine life observation and applications;

(2) leverage emerging innovation in 'omics, acoustics, imaging, remote sensing, and artificial intelligence to align monitoring of biodiversity with that of other ocean parameters; (3) integrate the critical missing pieces into a global, multi-disciplinary and interoperable ocean observation system; and (4) co-develop and co-deliver solutions to social and economic problems starting with the communities that need knowledge of marine life the most.

Marine Life 2030 is an open networking program. Core leadership comes from the Marine Biodiversity Observation Network (MBON), the U.S. Integrated Ocean Observing System and the Global Ocean Observing System (GOOS), UNEP World Conservation and Monitoring Centre (UNEP-WCMC), Ocean Biodiversity Information System (OBIS), Ocean Best Practices System (OBPS), Group on Earth Observations (GEO), the Future Earth Ocean Knowledge Action Network (Ocean KAN), POGO Biological Observations Working Group; and over 60 other partners. Marine Life 2030 welcomes new multi-sector collaborators that share this vision.

Advancing Science

Marine Life 2030 leverages emerging innovation to democratize marine life knowledge, using traditional observations of taxonomy, biomass, and production, new methods in remote sensing, acoustics, imaging, animal tracking, artificial intelligence (AI), and in 'omics including a growing sequence-based Ocean Biocode of global marine species. The program engages a broad range of partners, including social scientists as well as traditional ocean scientists, to incorporate and work with community science, including partnering with communities that maintain and use traditional knowledge in managing and sustaining marine life and resources. It will work across diverse efforts and Decade programmes to build out the global Ocean Biocode sequence-based library of ocean life. Marine Life 2030 emphasizes development of low-cost technology that can be widely shared and distributed to empower local stakeholders—and the integration of marine life information collected using a range of approaches and technologies (field instrumentation, automated platforms, uncrewed systems, and remote sensing technologies) with more traditional ocean observing systems. A critical conversation is around coordinated data flows that incorporate standards for data and metadata formatting, including curated keywords, semantics, and interlinked ontologies and data systems.



FIGURE 2. Diver with a school of fish, Cabo Pulmo. Credit: Jeff Hester/Ocean Image Bank (<https://www.theoceanagency.org/ocean-image-bank/people-and-ocean?img=YG86LhMAACIAuhK>).

Opportunities for International Participation and Collaboration

Marine Life 2030 will catalyze broad global participation and collaborative, jointly developed activities to foster global capacity for collecting and sharing the biodiversity data and knowledge. The drivers are sustainable development, conservation, and management through stewardship and wise policy. We will increase coordination among existing observing networks, and develop new links with user communities.

The Next Generation of Ocean Scientists, Engineers, and Technologists

Marine Life 2030 will accelerate the production of fundamental knowledge on the interactions between ocean life, the environment, and people through the power of networking of ocean observing and modeling programs, propelled by a new generation of skilled scientists, and inspired by society's grand challenges of managing climate change impacts, sustainable development, and ocean conservation. Our goal is to generate a convergence of multidisciplinary communities to formulate and to answer fundamental questions about marine life and interactions between organisms including humans and the environment, at different scales of biological organization, diversity, and complexity. We invite people to work together to achieve better predictive capability for biological responses and interactions under change, and to forecast how these in turn change the environment. A predictive capability is essential for human sustainability in the face of the large-scale changes that we are already seeing in the ocean. A significant activity will be coordinating among major formal and informal education, outreach, and extension groups and professional societies active in the network to co-develop science, solutions, and products; to converge on effective approaches for data collection and sharing; to ensure inclusion; and to engage early-career scientists and practitioners in co-development.

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