Technology and Innovation for Marine Protected Areas Management

Interactive portal supports marine protected area management and scientific research

Overview

The ocean is vital for life on earth. Covering more than two-thirds of the planet's surface, it is home to millions of species—an estimated 50-80 percent of all life on Earth. A healthy ocean not only benefits marine life and vulnerable habitats, it also regulates the climate, cycles fresh water, absorbs carbon and provides many other ecosystem goods and services including food security and livelihoods for billions of people.

Marine protected areas (MPAs) are an essential tool in the recovery and protection of our ocean and the vital services it provides, but management is often hampered by inadequate information to support decision-making. Failure to get data from those who produce it to those who use it often leads to lost opportunities to inform management decisions.

To help bridge that gap, Global Fishing Watch partnered with Dona Bertarelli Philanthropy to develop Global Fishing Watch Marine Manager, an innovative technology portal to support the effective design, management, and monitoring of MPAs and other effective conservation measures. This cutting-edge technology provides dynamic and interactive data on human-use activity, ocean conditions and biology in near real-time to support marine spatial planning, MPA management and scientific research.

Building a more resilient and healthy ocean

Today, human activities are putting enormous pressure on marine ecosystems as well as the goods and services they provide that are so fundamental to our well-being. Overfishing, marine pollution and climate change are together causing unprecedented shifts in the ocean that could irreversibly jeopardize the functioning and vitality of marine ecosystems.

In 2015, as one of its Sustainable Development Goals, the United Nations (UN) set a target of protecting 10 percent of the world's ocean by 2020. Today, only 2.4 percent of the global ocean is protected in what are classified as fully or highly-protected areas, according to the Marine Protection Atlas. Parties to the UN Convention on Biological Diversity are reviewing and adopting new goals as part of the post-2020 biodiversity framework.

Fully or highly protected MPAs are key to effectively protecting the critical habitats, species and ecological functions that are essential for the recovery and protection of biodiversity, as well as the productivity and resilience of the ocean. When implemented and managed properly, they can provide multiple benefits to the people whose livelihoods and traditions depend on them.

MPAs play a significant role in addressing the threats facing the ocean. Realizing their potential demands more and better data, along with innovation and collaboration to understand, monitor and model ocean conditions and develop adaptive and flexible management approaches to our changing ocean.

Our ocean is home to 50-80% of all life on Earth

"Marine protected areas are critical to help the ocean regenerate and build resilience against climate change and other threats. Marine reserves are a vital part of a sustainable blue economy, for the communities which rely directly on the ocean for their livelihoods and food security and, more widely, for humanity. I've partnered with Global Fishing Watch to develop a collaborative portal that supports the decision-making, management and monitoring of marine reserves, as well as advances ocean research, through innovative technology and clear, actionable, open data."

Dona Bertarelli, founder of Global Fishing Watch Marine Manager, founder of Sails of Change, Special Adviser for the Blue Economy to UNCTAD, Patron of Nature for IUCN

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The ocean data explosion

Effective implementation of MPAs is often impeded by a lack of timely, accurate and relevant information on the condition of ocean resources, and on human activities and their impacts. But in recent years an exponential increase in the number and variety of ocean observing systems and other new data sources have created the prospect of a digital ocean ecosystem.

The explosion in new data about the ocean, processing techniques, and visualization and analysis tools are rapidly changing our ability to understand marine ecosystems. The technology revolution presents parallel opportunities to both improve oversight of human activity at sea and maintain better stewardship of ocean resources.

Despite this, significant barriers exist when it comes to creating an equitable, open and accessible digital ecosystem for ocean management. Vast stores of ocean data are often unstructured, poorly consolidated and out of reach. An urgent priority is to ensure that these data and new technologies are available to decision-makers and translated into a form that is easily understandable and useful.

Harnessing the power of technology and innovation

Global Fishing Watch Marine Manager is a dynamic technology portal created to help transform area-based management and marine protection, from data collection through to implementation. The portal aims to make diverse ocean datasets accessible and translated into actionable information for decision-making.

The marine manager portal has been designed to empower managers and stakeholders to rapidly collate, assess and analyze scientific data that is integral to the governance of our ocean. Fishing vessel tracking data within a given area of interest will be made available in near real-time, on a 72-hour delay, focusing the portal's capabilities on historical patterns in human activity and informing the management of marine areas, as opposed to real-time monitoring or enforcement.

The marine manager portal is maintained and continually improved by Global Fishing Watch, building on the organization's expertise in big data processing, machine learning and data visualization. The work is supported by partnerships, with expertise from leading research institutions, to develop data inputs and assure scientific rigor.

Scientific collaboration on the project has included researchers from Dalhousie University; the University of British Columbia; Duke University; the University of California, Santa Barbara; the University of Queensland; University of Exeter; the University of California, Santa Cruz; and, University of Washington.

Making management robust and nimble

Global Fishing Watch Marine Manager combines and visualizes near real-time, dynamic and interactive data at high temporal and spatial resolutions across four categories: human use, oceanographic, biological and maritime zoning. Datasets and reference layers are available globally so any MPA manager or fisheries officer can create a workspace to visualize and analyze human activity at sea.
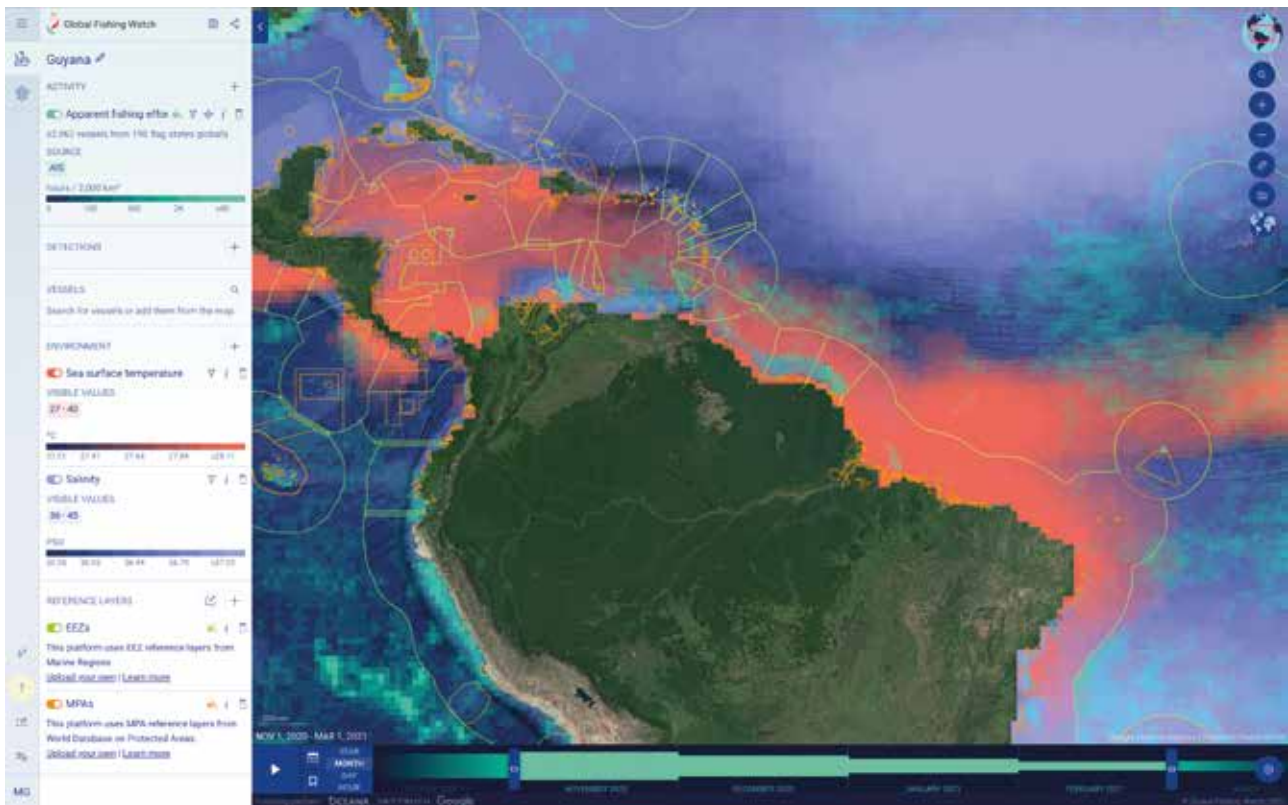
This screenshot taken from the portal shows the overlay of different datasets: sea surface temperature and salinity, along with fishing activity. The graphs show values of selected data over time, regulated with the time slider located in the lower right corner of the image. © Global Fishing Watch

Human-use data includes commercial fishing activity and non-fishing vessel activity, including those involved in offshore oil drilling, seabed mining, cargo transportation and fuel supply. Anyone can view events along vessel's track and ports a vessel visited after engaging in fishing activity.

Oceanographic data can be added to cover information like bathymetry and seamounts, as well as salinity and sea surface temperature data to understand climate change impacts over time. Biological and ecological data can be used to analyze primary biological productivity, such as chlorophyll a, and can help predict species habitat suitability or show important animal migration routes.

Advanced analysis can be completed to generate graphs that show when and where fishing activity takes place and how it changes over time, as well as view where activity has shifted following the implementation of new management measures.

Maritime zoning includes the boundaries of marine protected areas, exclusive economic zones, high seas boundaries, FAO major fishing areas, fishing grounds and the ability to upload other unique data specific to jurisdictions.

Tristan da Cunha is a globally important breeding site for the endangered northern rockhopper penguin.
© Andy Schofield / Royal Society for the Protection of Birds

The marine manager portal includes open, public dashboards and private, collaborative workspaces. The workspaces provide everyone with interactive tools to generate spatial and time-series analysis and data visualizations, upload static layers and time-series data, and download all data for advanced research techniques.

In the early stages of development, the portal was used across various sites to support management authorities. From the remote waters of Tristan da Cunha, home to the critically endangered Tristan albatross, to Guyana's mangrove-lined ocean, Marine Manager was piloted to visualize and analyze dynamic activity data and understand more about what is happening in our ocean. The portal was also used in the iconic Galápagos Islands, Ascension Island, Niue and Palau to support oversight of marine protected areas.

As we continue to expand our work across new geographic regions, governments and researchers, additional features, data and analytical capabilities will be integrated to increase the portal's reach and impact.

Ascension Island. © Umomos / Shutterstock

"Global Fishing Watch's marine manager portal enables us to harness the power of big data to monitor, understand and manage the entire 170,000 square miles of Ascension Island's marine protected area. Data has the potential to revolutionize our ability to protect marine environments, and with Global Fishing Watch's support, we now have the capability to capture and analyze such large amounts of information. Global Fishing Watch involved us from the beginning to ensure the portal's design meets our particular management needs. The outputs are so intuitive and beautiful that they serve not only as a vital management resource but also as a compelling engagement tool that connects the Ascension community and global public with one of the most remote areas of the ocean."

Diane Baum, director of conservation and fisheries, Ascension Island Government

How you can help

Governments, industry, academia, nongovernmental organizations, technology and data providers, and the philanthropic community all play a role in helping ensure the accessibility, cost-effectiveness and practical use of the portal in strengthening ocean stewardship.
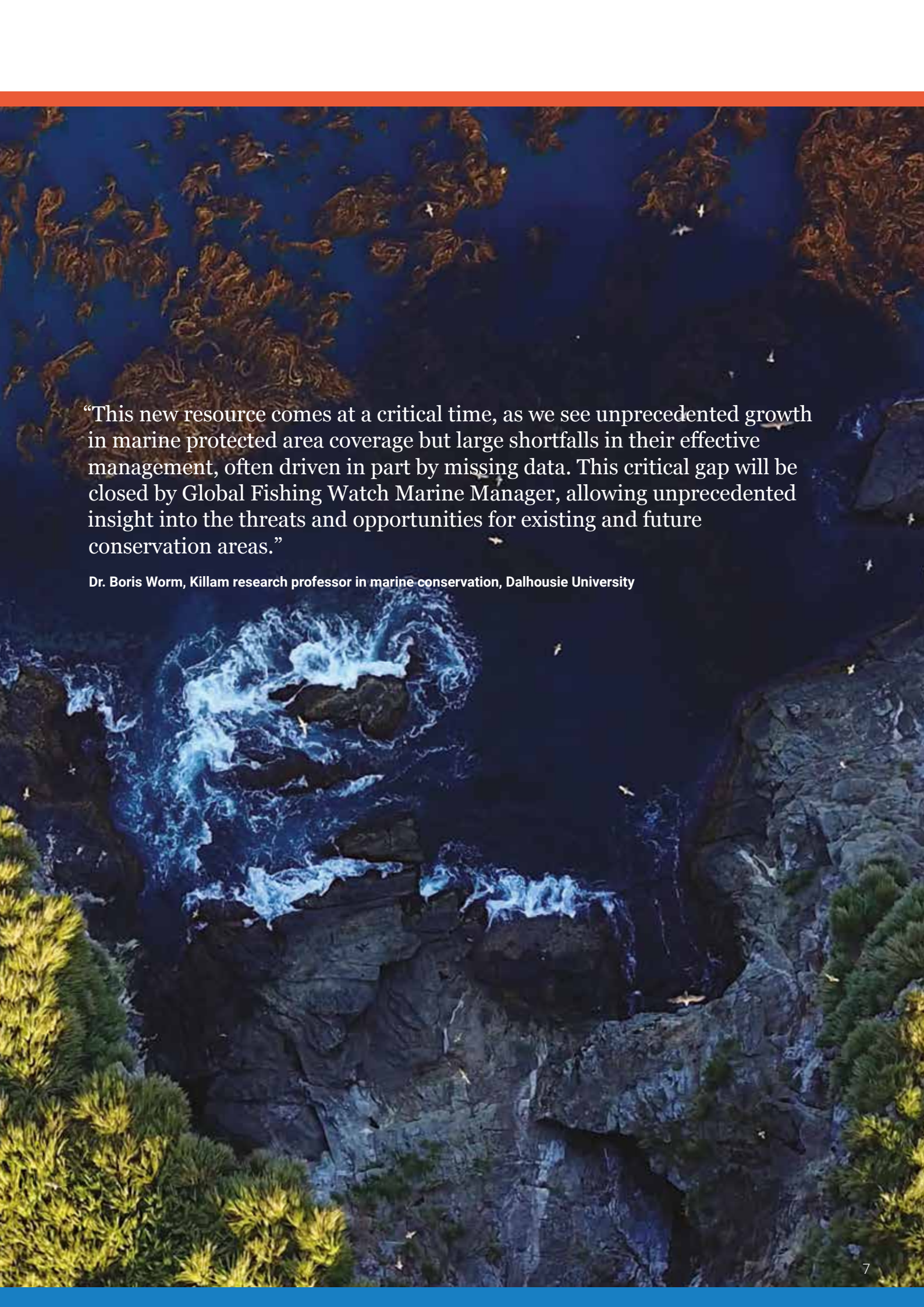
Share ocean data: make historical and current ocean data broadly and publicly available unless there are compelling security interests.

Support transparency in fishing activity: publicly share essential data on fisheries, including vessel tracking, registry information, ownership and licenses.

Invest in innovation: support the portal's development and provide long-term funding to add new functionality and invest in training, realizing the ambition of a public, global portal empowering all ocean stakeholders.

Tristan da Cuhna. © Pristine Seas / National Geographic

"This new resource comes at a critical time, as we see unprecedented growth in marine protected area coverage but large shortfalls in their effective management, often driven in part by missing data. This critical gap will be closed by Global Fishing Watch Marine Manager, allowing unprecedented insight into the threats and opportunities for existing and future conservation areas."

Dr. Boris Worm, Killam research professor in marine conservation, Dalhousie University

Contact

Global Fishing Watch Marine Manager is a freely available, innovative technology portal, founded by Dona Bertarelli. It provides near real-time, dynamic, and interactive data on ocean conditions, biology, and human-use activity to support marine spatial planning, marine protected area design and management and scientific research. Global Fishing Watch is an international nonprofit organization dedicated to advancing the sustainability of our ocean through increased transparency of human activity at sea. By creating and publicly sharing map visualizations, data and analysis tools, Global Fishing Watch enables scientific research and drives a transformation in how we manage our ocean. Dona Bertarelli is committed to securing ecologically significant and effective marine protected areas, and the responsible and regenerative use of the ocean, while preserving the health of its ecosystems.

Global Fishing Watch
MARINE MANAGER

DONA BERTARELLI
PHILANTHROPY