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# Project Eyes on the Seas

## Overview

Illegal fishing is a global concern that threatens the long-term health of our oceans, worsens the impact of overfishing on critical marine ecosystems, and costs up to an estimated \$23.5 billion annually. It accounts for 1 of every 5 fish taken from the world's seas and jeopardizes the livelihoods of tens of millions of people who depend on the oceans' resources.<sup>1</sup>

Traditionally, efforts to clamp down on illegal fishing have relied on aircraft and patrol vessels. But they are often prohibitively expensive for even the richest of nations, and the ocean is too vast for surveillance and enforcement at sea to be truly effective by itself. Protecting important marine areas, especially the reserves that guard some of Earth's most pristine ecosystems, requires a new approach and 21st-century technology.

To help meet this challenge, The Pew Charitable Trusts has partnered with the Satellite Applications Catapult to pioneer Project Eyes on the Seas, a cutting-edge technology platform that combines satellite monitoring and imagery data with other information, such as fishing vessel databases and oceanographic data, to help authorities detect suspicious fishing activity.

What makes the system distinctive is that it can synthesize and analyze multiple layers of data in near real time to monitor and identify suspicious vessels around the globe. The automated system then alerts authorities so they can investigate and take action.

The Eyes on the Seas system is designed to be a cost-effective global fisheries monitoring and enforcement tool for governments around the world, including the most resource-poor enforcement agencies, to monitor and detect illegal fishing and related activities.



The various sources of information help to create a layered view of fishing-related activity in any given ocean region.

## Information Gathering

The system draws on four key sources of information:

**Vessel tracking.** The system uses Automatic Identification System (AIS) data, which broadcast a vessel's identity, position, and other information to nearby vessels, coastal tracking stations, and low-orbiting commercial satellites that provide AIS tracking globally. Under the International Convention for the Safety of Life at Sea, all commercial vessels larger than 300 gross tons must use AIS, but it is not mandatory for fishing vessels unless a coastal state requires it for ships under its jurisdiction. The system also has the capability to incorporate, where appropriate, Vessel Monitoring System (VMS) data that is typically sent from a vessel to fisheries management authorities via secure satellite communications to indicate a vessel's location, course, and speed.

**Satellite imagery.** When AIS or VMS transponder data are inconsistent or unavailable, Synthetic Aperture Radar (SAR) images help track vessel activity. Satellites with SAR sensors circle the globe and produce images day or night, unaffected by weather. The system is also capable of incorporating optical satellite imagery, which provides higher-resolution images for smaller, targeted areas of ocean.

**Vessel databases.** Pew and its partners have begun to develop a credible and comprehensive global database of fishing vessels that combines international, regional, and national vessel registries with verified data sets. This repository contains records on a vessel's country of registration, aliases, and known history of illegal or unreported fishing. In addition, the database includes information on vessel owners and operators and any links they may have to other vessels, fleets or owners that have been flagged as bad actors. Combined with details on a vessel's current and historical movement and activity, databases provide in-depth, up-to-date dossiers on vessels and their owners. Other databases can be incorporated based on the user's needs.

**Automated analysis.** Computer algorithms detect vessels' movements and can spot patterns that indicate when boats are fishing or engaged in suspicious activity. The system can then alert authorities in a fraction of the time it would take a person to do the same analysis.

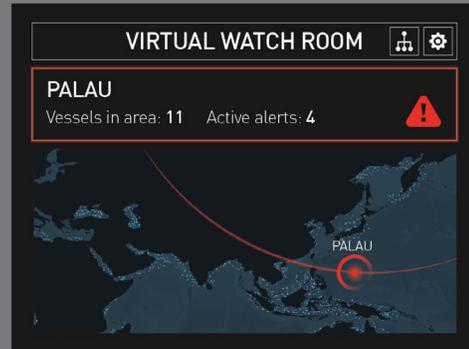
## Analysis

Project Eyes on the Seas offers efficient and cost-effective ways to solve problems related to ocean governance, enforcement, and monitoring.

One important use is to inform a Virtual Watch Room, a Pew initiative to help governments around the world protect marine reserves against illegal fishing. Here's how it works:

1. Using the Project Eyes on the Seas system, fisheries analysts in the Catapult's operations room in the U.K. monitor an area, such as a marine reserve or a country's exclusive economic zone for fishing activity and other maritime traffic.
2. The system cross-references multiple sources and types of satellite data, vessel tracking, and other specialized data, as well as international fishing and marine reserve boundaries and oceanographic variables such as depth and temperature.
3. If the system detects movement that indicates a vessel might be fishing, that two or more vessels are in close proximity (a possible sign of transshipment of fish), that a vessel has stopped signaling its position, or that it has entered a marine reserve or other restricted area, automatic alerts warn system analysts or other authorized users of suspicious activity.
4. Analysts then investigate by reviewing a dossier with the vessel's history to determine whether it or its owners are associated with previous illegal fishing and whether a regional fisheries management organization has blacklisted the vessel. The analysts determine if it has a lawful right to fish in the waters of the country where it is operating or if its activities violate national and regional fishery laws.
5. Analysts then notify relevant government enforcement personnel and can provide a "case package" with evidence for authorities to review. The case package includes maps with the vessel's last known position, its relevant tracking data, potential compliance issues, and other identifying information, including country of registration, owner, and known targeted species. Governments then may proceed with enforcement or other appropriate action.

The Virtual Watch Room uses cutting-edge technology to analyze critical data, including satellite imagery, proprietary fishing vessel databases, and maritime boundaries, to help authorities monitor seas across the globe.



The system greatly reduces the time and effort needed for analysts to detect vessels—from among the hundreds of thousands at sea at any given time—that may be acting illegally.



- Suspicious or illegal activity
- Requires analysis
- Low interest

## Enforcement

With up-to-date vessel dossiers, a country can immediately respond with patrol boats to intercept a suspicious ship. If law enforcement is unable to interdict the vessel, authorities contact its flag State and request assistance to prosecute and potentially fine the owners. If no satisfactory resolution is reached with the flag State, national authorities notify a relevant regional fishery management organization that can consider adding the vessel to illegal fishing blacklists.



The Project Eyes on the Seas platform can detect ship movements to identify specific at-sea operations such as transshipments.

### An unprecedented and cost-effective option

Pew and the Catapult are working with interested stakeholders to develop an equitable cost-model that would allow all nations, regardless of national resources, to use Project Eyes on the Seas. In addition to the global enforcement community, the system's inherent security features, rich datasets, and advanced analytical capabilities lend themselves to organizations interested in tracking and identifying the source of illegally caught fish. For example, seafood retailers could use the system to ensure that they are not purchasing from illegal fishing vessels. This application could create a market incentive for fishing vessels that operate in good faith and in accordance with international and national laws.

Project Eyes on the Seas is an unprecedented opportunity for governments around the world. It employs tested technology that is widely used in commercial shipping paired with a low-cost open access model favored by the nonprofit community. The system is informed by international fishing vessel databases and intelligence analysis. The project is unique because it:

- Uses multiple satellite technologies and vessel databases, rather than relying on a single source.
- Is being developed as a tool to assist governments with monitoring and enforcement.
- Is fully operational, employs live data, and is ready for immediate use.
- Can properly manage and secure nonpublic data as well as classified information.
- Encourages information-sharing among authorities and countries and can be used for enforcement and tracing seafood's route to market.
- Is inherently flexible and easily integrated with existing systems, allowing governments to deploy enforcement vessels and unmanned vehicles to areas where illegal activity has been identified, leading to greater efficiencies.
- Will eventually be able to incorporate crowd-sourced data and provide information to the public.

These features will help analysts narrow their focus from the thousands of vessels operating at sea to just the handful of fishing vessels that may be engaged in suspicious or illegal activity.

## Continuous evolution and inclusion of emerging technologies

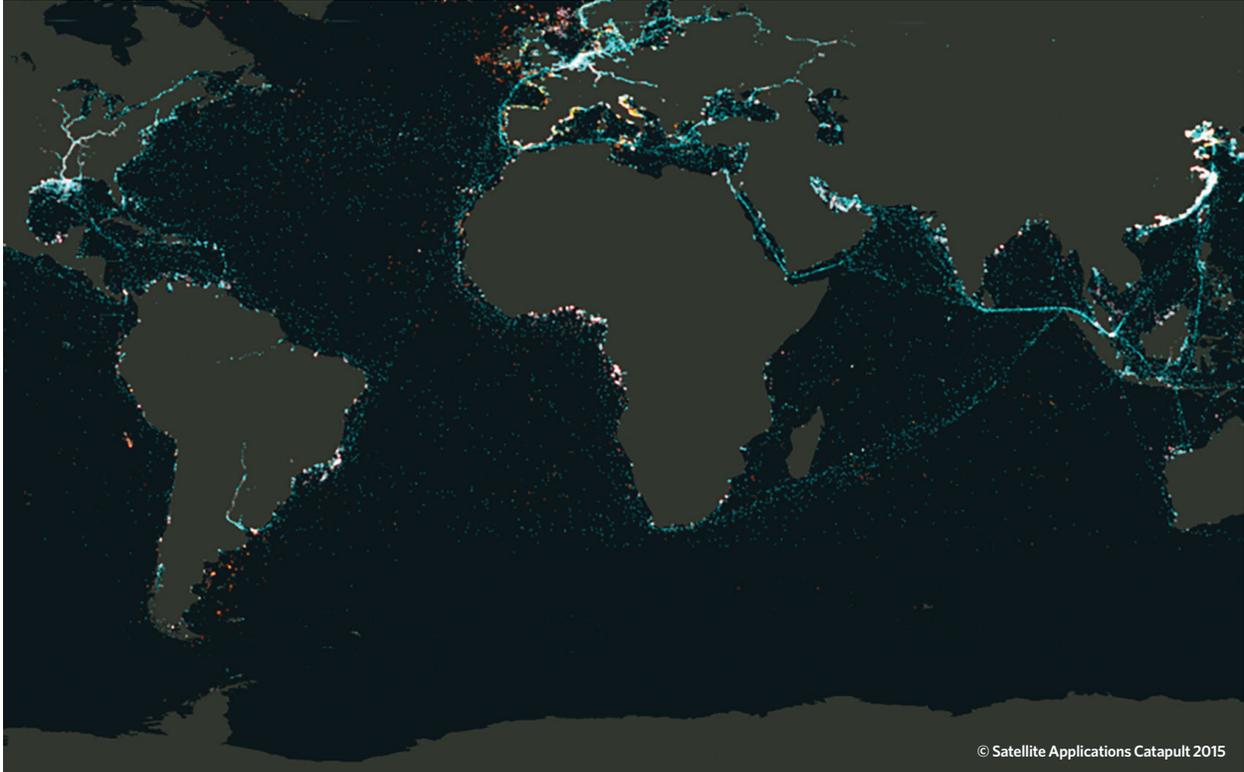
Pew and the Catapult are working with partners to build additional data sources and functionality into the system, including:

- Vessel Monitoring System data.
- GPS-tagged photos, or reports and other intelligence shared by fisheries agencies.
- Environmental computer programs that utilize historical data and forecasting to predict fishing areas.
- Computer systems that “learn” patterns and automatically identify types of fishing and vessels.
- Algorithms that predict vessels' locations based on last known position, speed, and course.

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A screen-grab from the Eyes on the Seas platform showing an overview of the world's vessel traffic.

As the system develops, new data sources and emerging technologies will be integrated to respond to evolving needs, including optical imagery, crowd-sourced photographs and sightings, near-infrared pictures from satellites and unmanned aerial vehicles, electronic signals such as ships' radar, and radio broadcasts.

There is no single solution to the problem of illegal fishing, but Project Eyes on the Seas will detect enough large rogue vessels to make a significant difference in protecting the world's oceans.

### About The Pew Charitable Trusts

Since 1993, The Pew Charitable Trusts has encouraged sustainable fisheries management and has worked to support marine conservation to protect global ocean habitat and reduce illegal fishing in the world's oceans. Pew's ending illegal fishing project supports advancement of the Port State Measures Agreement which seeks to close harbors to illegal fishing vessels, dedicates resources to investigate illegal fishing and associated crimes, encourages agreements among nations to share information and communicate about possible cases of illegal fishing and developed Project Eyes on the Seas.

### About the Satellite Applications Catapult

Established in 2013, the Satellite Applications Catapult is an independent innovation and technology company created to foster growth across the U.K. space sector. The Catapult helps organizations make use of and benefit from satellite technologies, and brings together multi-disciplinary teams to generate ideas and solutions in an open innovation environment. Based in Harwell, the Catapult was established by Innovate UK as one of a network of centers to accelerate the take-up of emerging technologies and drive economic growth.

## Endnotes

- 1 David J. Agnew et al., "Estimating the Worldwide Extent of Illegal Fishing," PLOS ONE 4, no. 2 (2009): e4570, <http://www.plosone.org/article/info:doi/10.1371/journal.pone.0004570>.

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### For further information, please visit:

[pewtrusts.org/endillegalfishing](http://pewtrusts.org/endillegalfishing)

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The Pew Charitable Trusts is driven by the power of knowledge to solve today's most challenging problems. Pew applies a rigorous, analytical approach to improve public policy, inform the public, and invigorate civic life.