

Using satellite technology to monitor illegal, unreported, and unregulated (IUU) fishing

Mark Richardson
The Pew Charitable Trusts
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The global threat of IUU fishing

- Illegal, unreported, and unregulated (IUU) fishing
- Accounts for up to \$23.5 billion, or 1 out of every 5 fish sold
- Undermines sustainable management of fish stocks
- Threatens economic and food security for developing nations
- Associated with other crimes including corruption, tax crime, drugs, human trafficking



Photos: CCAMLR, NOAA, EJF

Why IUU fishing persists

- Vast areas of ocean to monitor
- Limited capacity for fisheries monitoring, control, and surveillance (MCS)
- Weak or nonexistent laws
- Easy to conceal identity
- Lack of consistent port controls
- Nations unwilling or unable to control fleets

IUU = High profit \$\$ / Low risk



Photos: USCG, AFMA

Pew's Ending Illegal Fishing Project

A comprehensive approach including policy, technology, information sharing and enforcement:

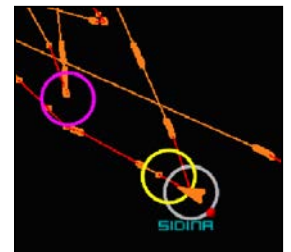
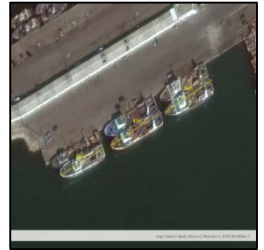
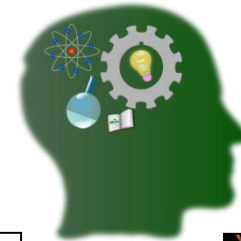
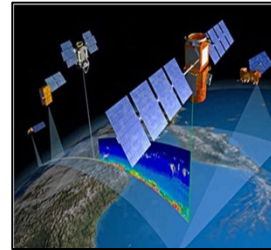
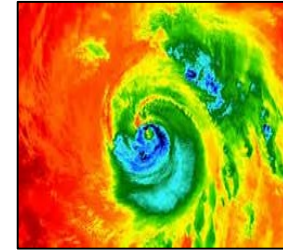
- Port State Measures Agreement
- Unique Vessel Identifiers (UVIs)
- INTERPOL Project Scale
- Regional collaboration: FISH-i Africa
- Fisheries intelligence analysis unit
- Technology: Project Eyes on the Seas

Technology to Monitor IUU Fishing



Information Sources

- Global ship tracking data
- Satellite Imagery
- Environmental data
- Verified fishing vessel databases
- Automated vessel behavior recognition tools
- Expert fisheries analysts



Automatic Identification System (AIS)

- VHF-based tool for safe navigation
- Signals detected by ship-based, land-based, and now satellite-based receivers
- Required by IMO for all commercial vessels > 300 GT
- Voluntary for fishing vessels, but many (~30k) carry it
- Operates as an open system, more vulnerable to hacking

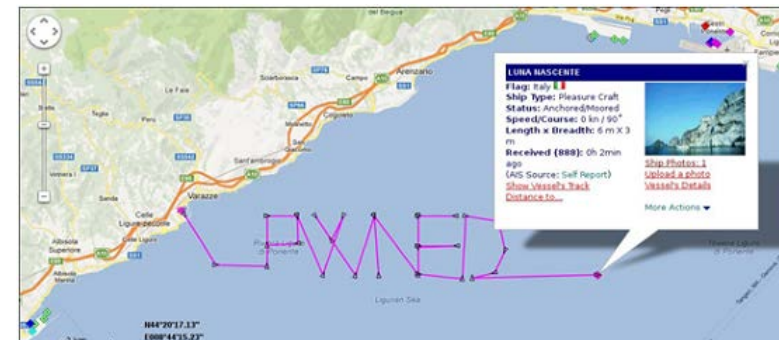


Photo: Trend Micro

Vessel Monitoring System (VMS)

- Important tool for monitoring fisheries and to deter IUU fishing
- Secure, two-way satellite communication between vessel and fishery authorities
- Nearly all RFMOs mandate VMS but requirements vary
- Data are often not publicly available
- AIS and VMS: different systems, but complementary for fisheries monitoring



Photo: USCG

A fact sheet from THE PEW CHARITABLE TRUSTS | May 2016

Vessel monitoring system

Navigation satellite
Fishing vessel
Communication satellite
Land earth station
National fisheries monitoring centers
Fisheries monitoring centers of other member states, third countries, and regional fisheries management organizations
Land-based inspectors
Port vessels and aircraft

Source: European Union, 1995-2016. © 2016 The Pew Charitable Trusts

Tracking Fishing Vessels Around the Globe

Vessel monitoring systems play a critical role

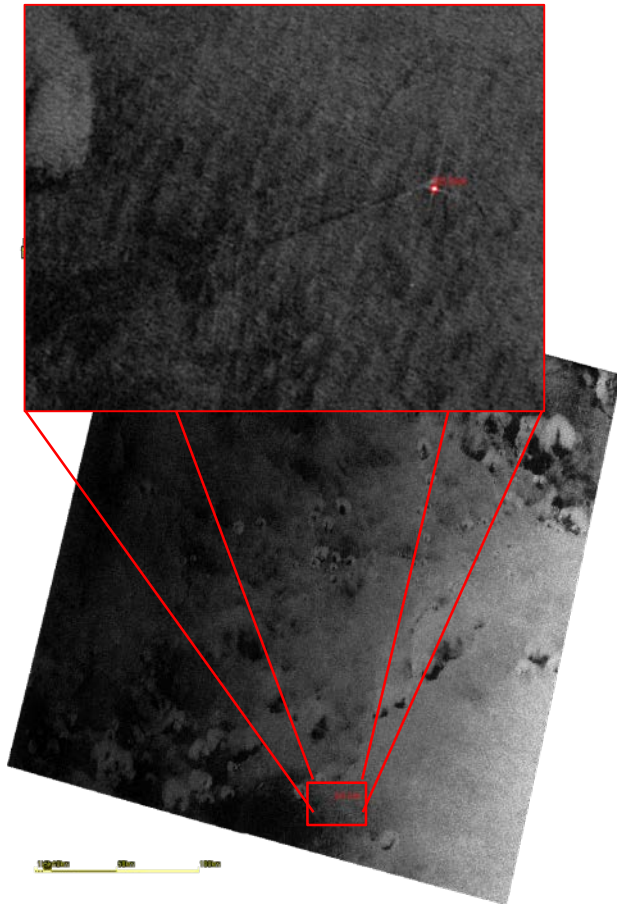
Overview

Vessel monitoring systems (VMS) are an essential tool for modern fisheries management. With proper implementation and appropriate sharing of data, these systems can also help detect, deter, and eliminate illegal fishing.

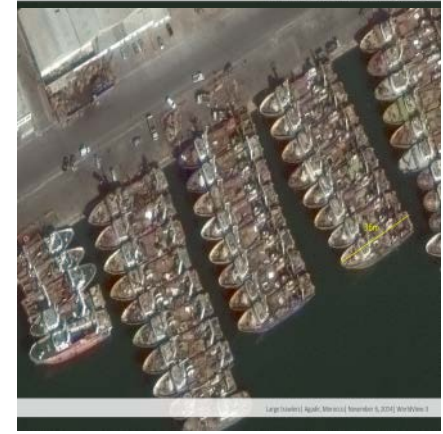
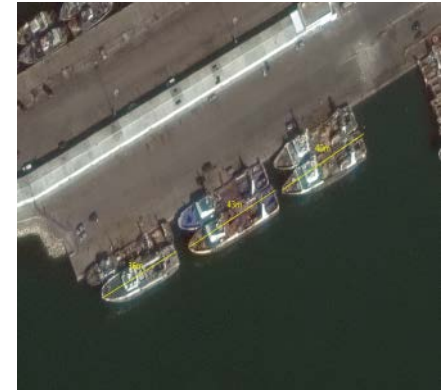
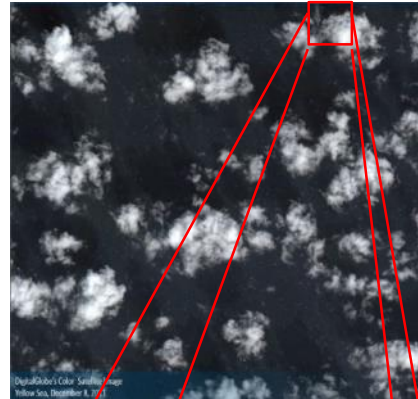
In the 1990s, fisheries managers began trials using satellites to track fishing vessel locations and movements.¹ In the years since, advances in technology have made these monitoring systems more sophisticated, though they

Satellite Image Data

RadarSat-2
Imagery Example



DigitalGlobe Constellation
Imagery Example



Satellite Image Data

Day 1

Day 2

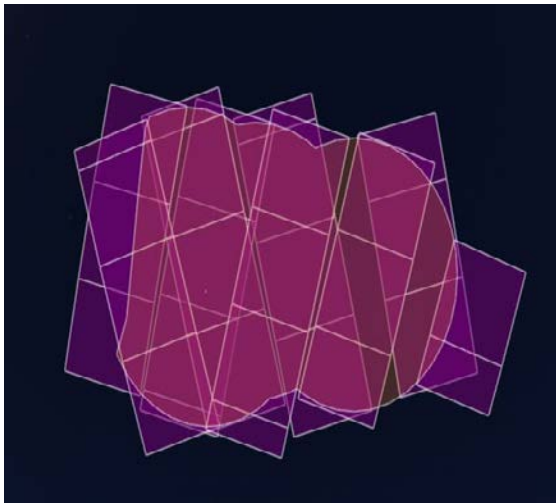
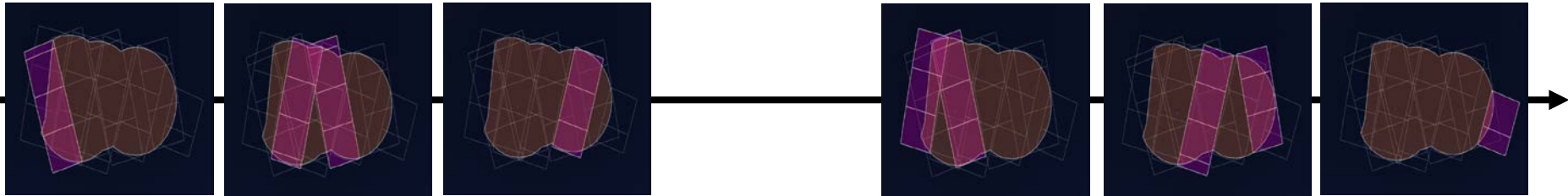
Day 3

Day 4

Day 5

Day 6

Day 7



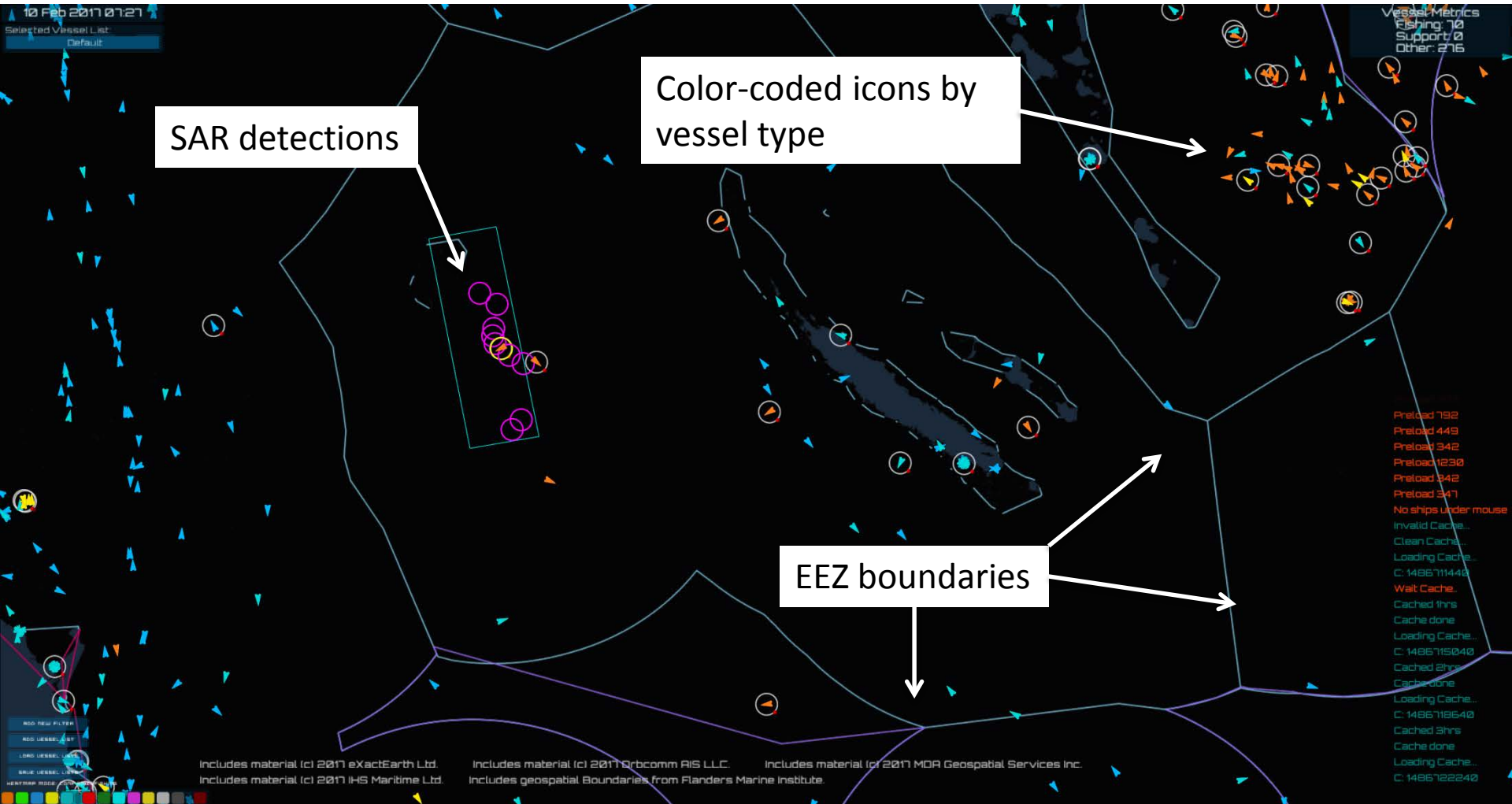
2 coverage of the area per week
~ 1.5m sqkm/w



UTC:	2015-03-14 23:35:28 UTC
Age:	9 days ago
Latitude:	46°10'35 S
Longitude:	60°03'44 W
Heading (Est.):	178.0° / 358.0°
Length (Est.):	106 meters
<hr/>	
Sensor:	RADARSAT-2
Beam:	EH6
Pol.:	2015-03-14T23:35:28

Only notified when something happens

Analytical Tools

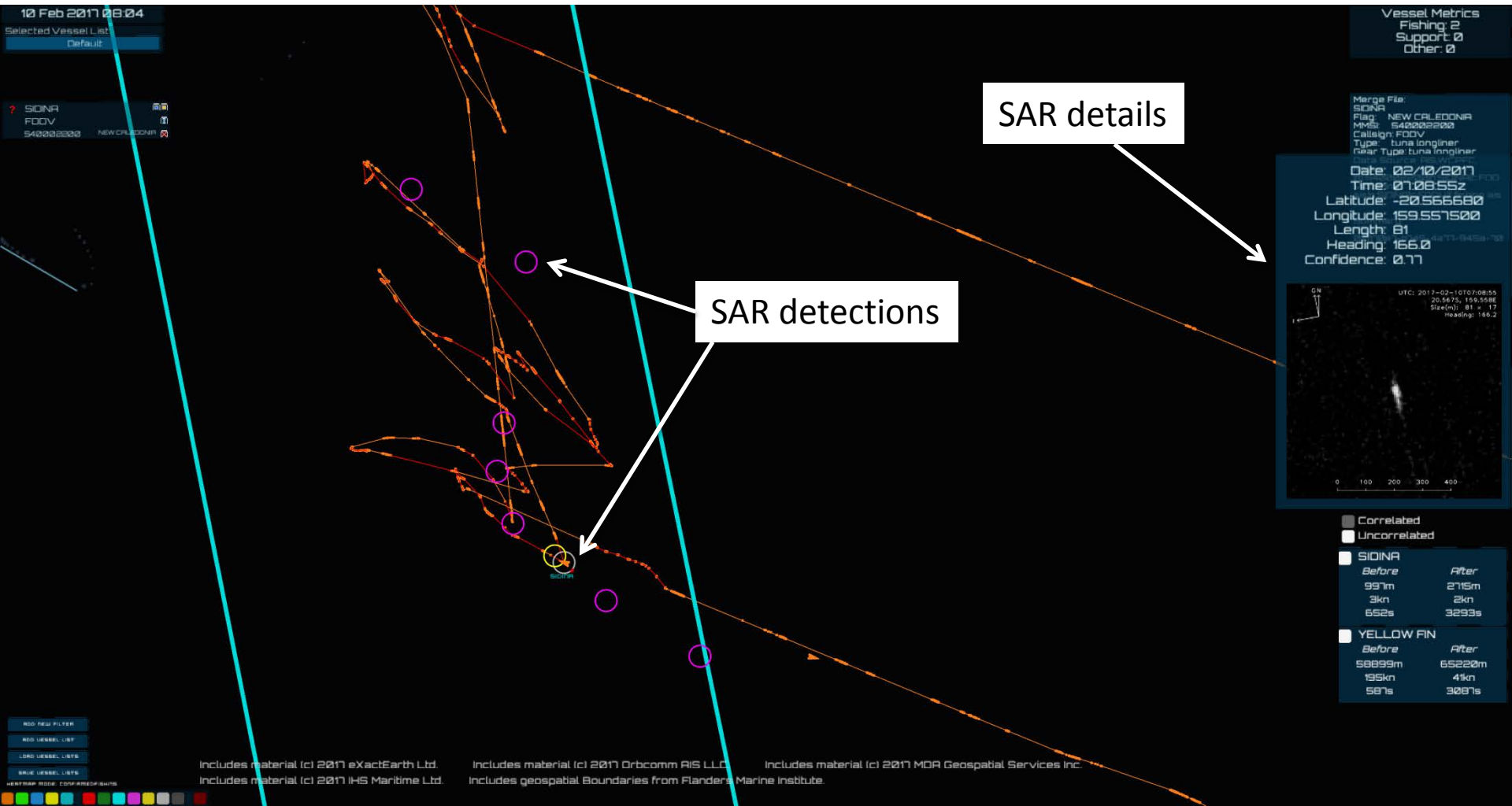


SAR detections

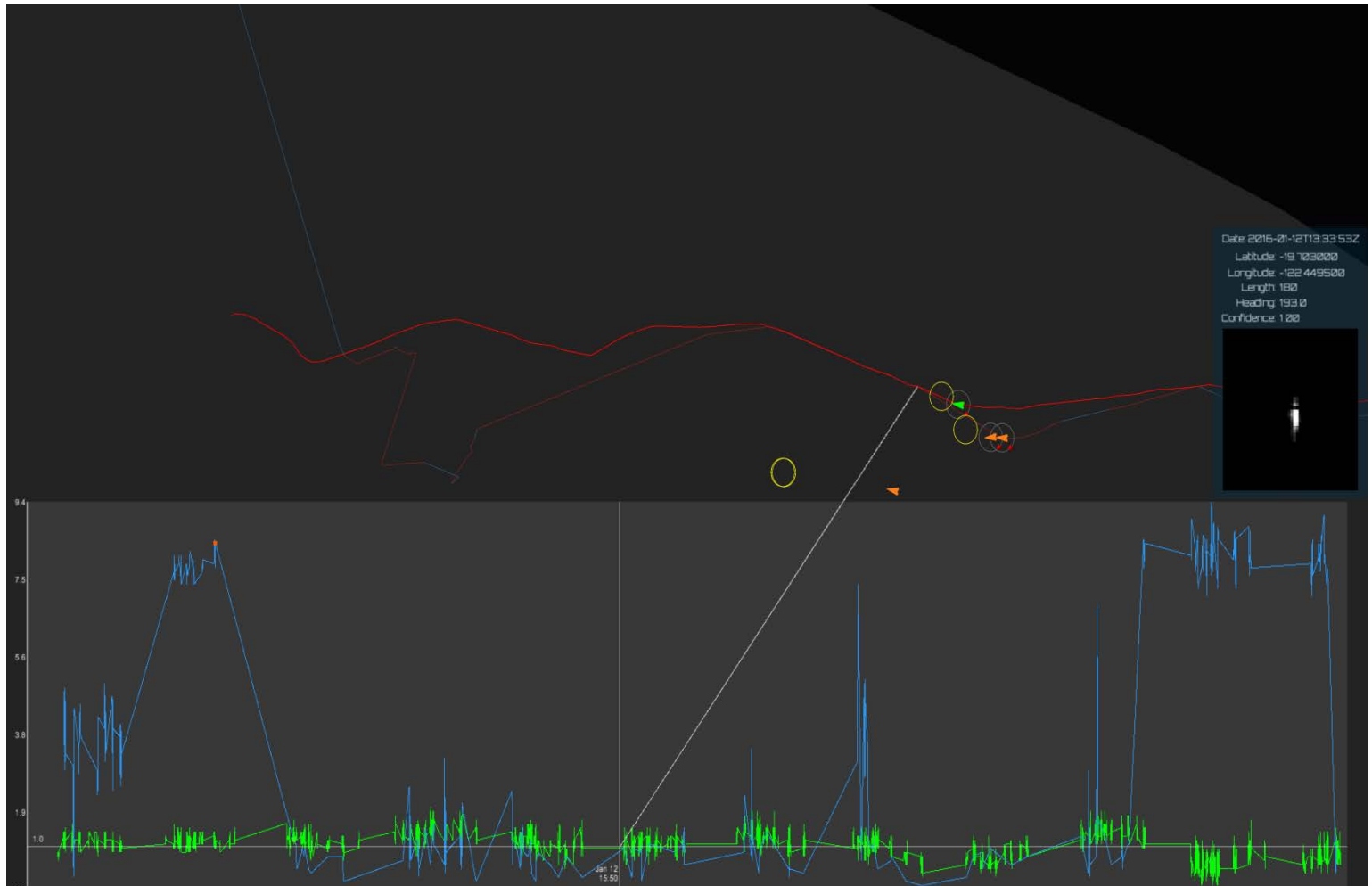
Color-coded icons by vessel type

EEZ boundaries

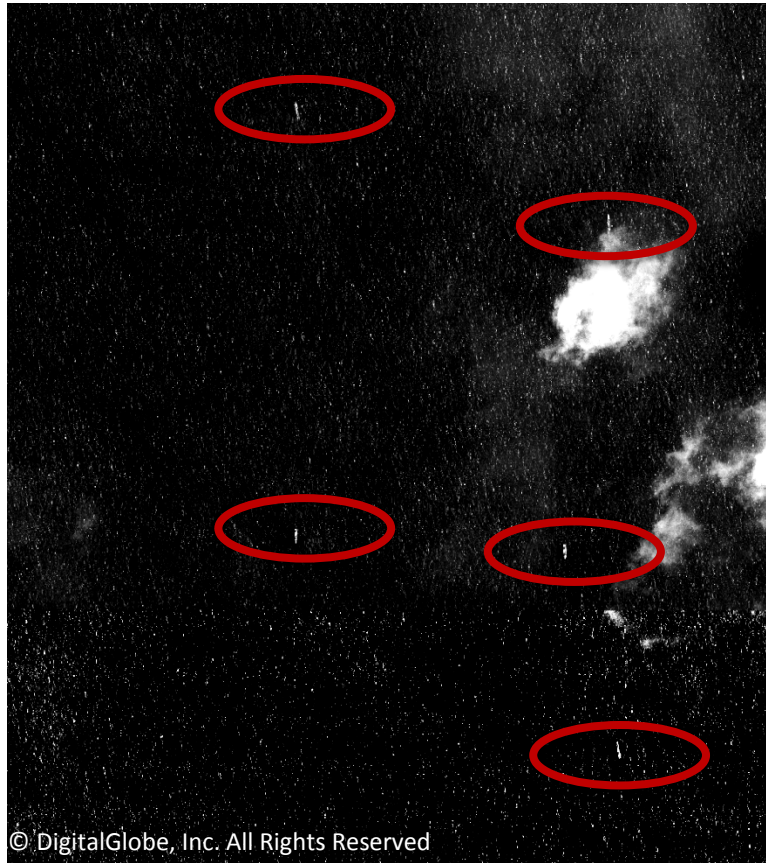
Analytical Tools



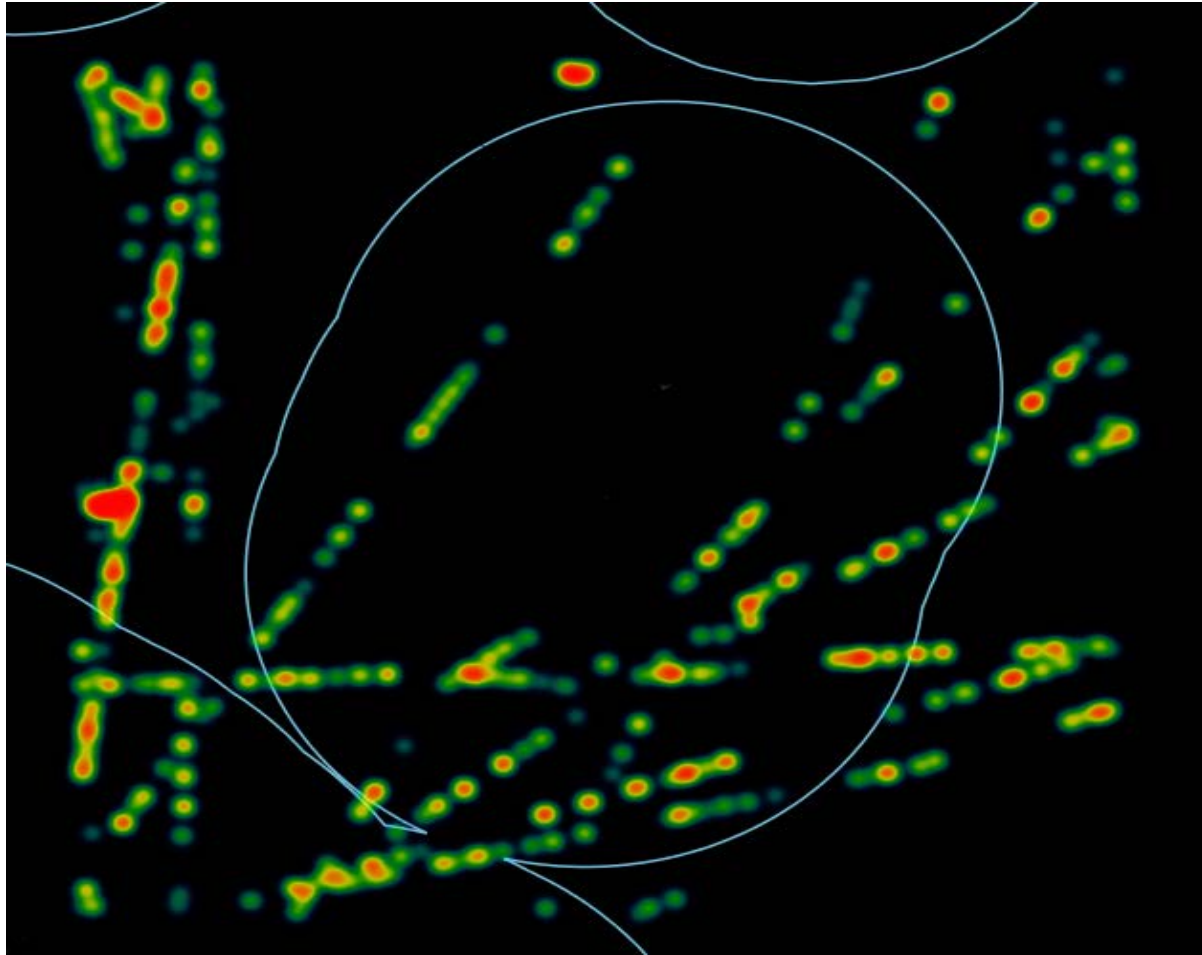
Detecting Dark Targets



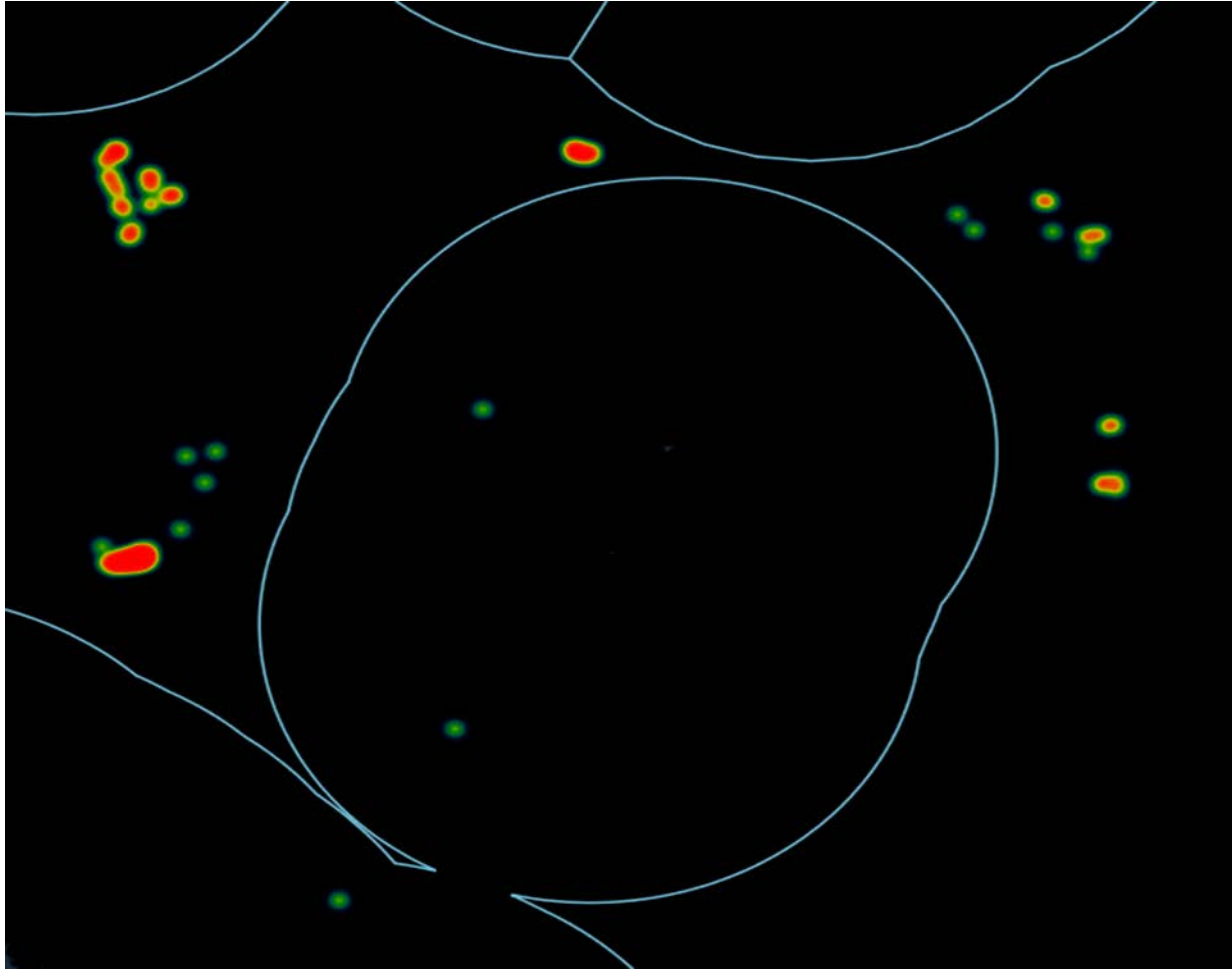
Who else is out there?



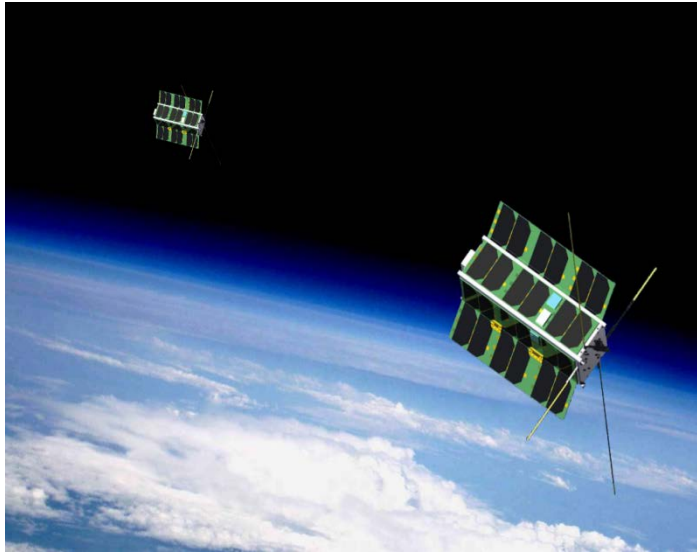
Heat Maps



Heat Maps



New and Emerging Data Sources



CubeSats



Infra Red

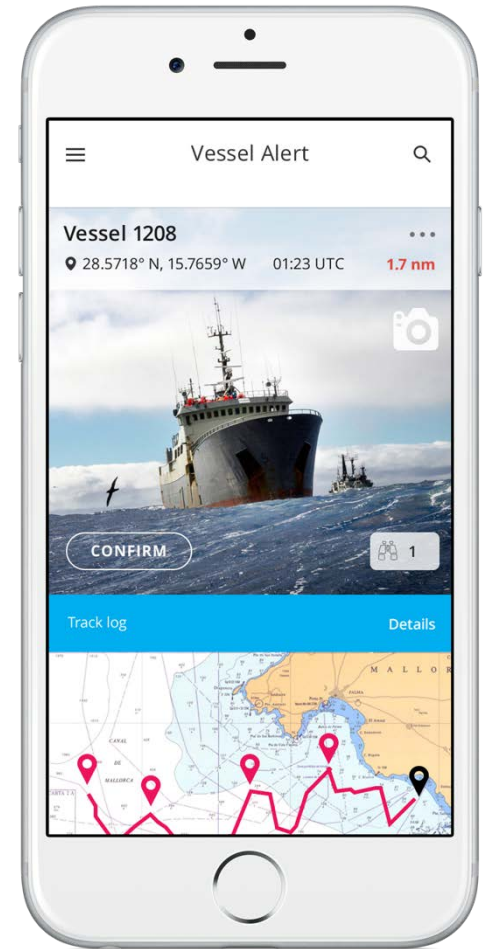


Photo Recognition

Real World Applications

Marine reserve monitoring

- 1 June 2015 – 30 May 2016
1 January 2017 - Present
Pitcairn Island EEZ – designated marine reserve



Regional monitoring

- 1 September 2015 – 28 February 2016
Polynesian Leaders Group (PLG) pilot project



Seafood industry projects

- 2016 – 2017
Seafood Task Force, Thailand



Thank You!

Mark Richardson

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Technology for Fisheries Monitoring and Surveillance:

<http://www.pewtrusts.org/en/research-and-analysis/fact-sheets/2014/02/19/technology-for-fisheries-monitoring-and-surveillance>

VMS/Tracking:

<http://www.pewtrusts.org/en/research-and-analysis/fact-sheets/2016/05/tracking-fishing-vessels-around-the-globe>

Eyes on the Seas Project:

<http://www.pewtrusts.org/en/multimedia/video/2015/project-eyes-on-the-seas>