

The
Maritime
Observatory



PROTECTING OUR FUTURE
MAST
Maritime Archaeology Sea Trust

A photograph of two divers in a dark underwater environment. They are illuminated by their own lights, which cast a bright glow on the sandy seabed. In the center, a large, cylindrical metal object, likely a shipwreck component, lies on the bottom. The divers are positioned on either side of the object, appearing to be inspecting or working on it. The overall atmosphere is mysterious and focused.

The Maritime Observatory: Satellite-Derived Intelligence in Shipwreck Monitoring



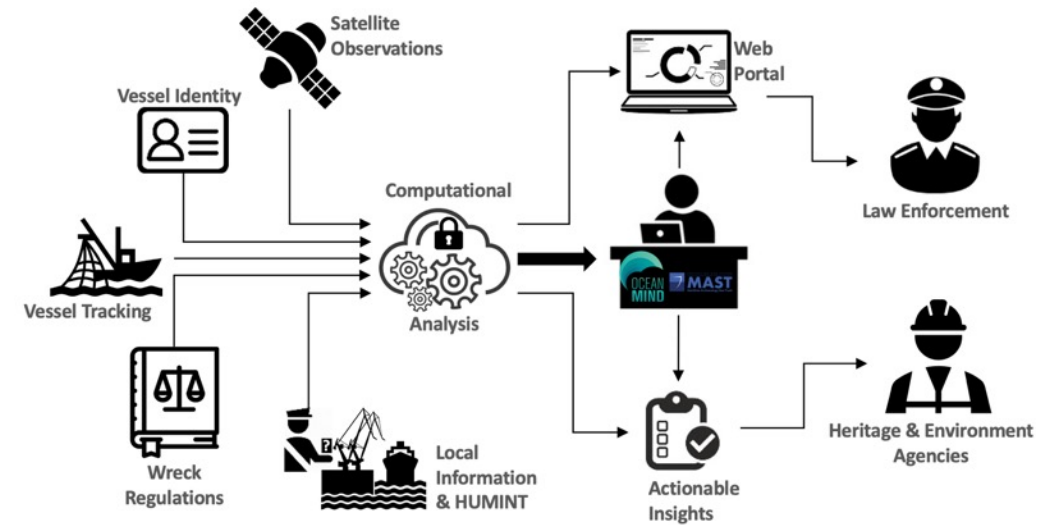
A Non-Profit
Partnership
Between



Aims to Protect the Environment, Safeguard our Heritage and Deter Illegal Activity

- Targets Illegal, Unreported and Unregulated (IUU) Activity at Sea
- Monitors Ecological and Environmental Impacts of Pollution
- Combines Satellite Observations and Vessel Tracking Data with Machine Learning to Produce Actionable Intelligence.
- Unbiased, Independent Monitoring and Verification

The Maritime Observatory Workflow: raw data is rapidly processed into actionable intelligence.



- The Maritime Observatory is a partnership between two charitable and not-for-profit organizations: MAST (Maritime Archaeology Sea Trust), champion for maritime heritage and advocacy; and OceanMind, experts in satellite-based surveillance and maritime domain awareness.
- We represent a turning point in the protection of underwater heritage. By using a combination of satellite, artificial and human intelligence we can detect and deter looting of historic shipwrecks and other sites on the seabed.

Our data sources include:

Tracking Systems

- Automatic Identification System (AIS)
 - Satellite and Terrestrial
- VMS (if available)

Synthetic Aperture Radar (SAR)

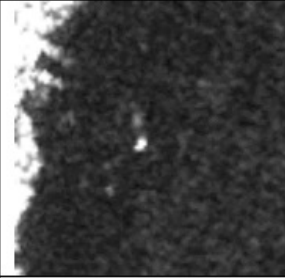
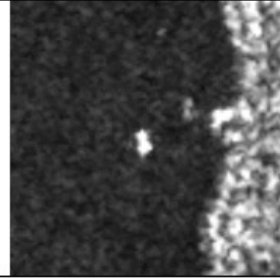
- Commercial & government
- Terrain mapping
- Vessel detection

Electro-Optical (EO)



- Commercial & government
- Vessel detection and ID

Visible Infrared Imaging Radiometer Suite (VIIRS)

- Worldwide

Detection 1	Detection 2
	
2015-10-18 23:53:17Z	2015-12-05 22:53:10Z
High confidence detection that matches the profile of a vessel at anchor.	High confidence detection that matches the profile of a vessel at anchor.

SAR Detections

Detection B	Detection C
	
2018-03-20 03:25:31Z	2018-03-05 03:26:19Z
Two high confidence detections both vessels that have the profile of a medium scale vessels and appear to be pair trawling.	Four high confidence detections, the vessels that have the profile of medium scale vessels and appear to be beam trawling parallel to each other.

EO Detections



AIS Tracks



VIIRS Detections

DEFINING THE THREAT 1 – SALVAGE



(L) HMS Queen Mary, a designated war grave from the 1916 Battle of Jutland, was looted by salvors in the North Sea (Source: Public Domain)

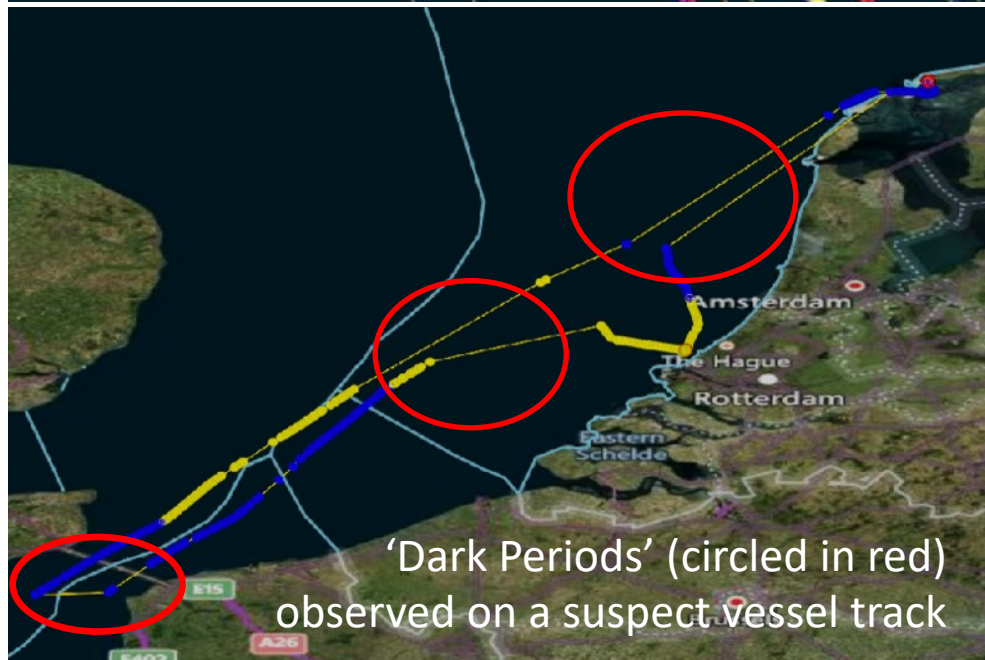
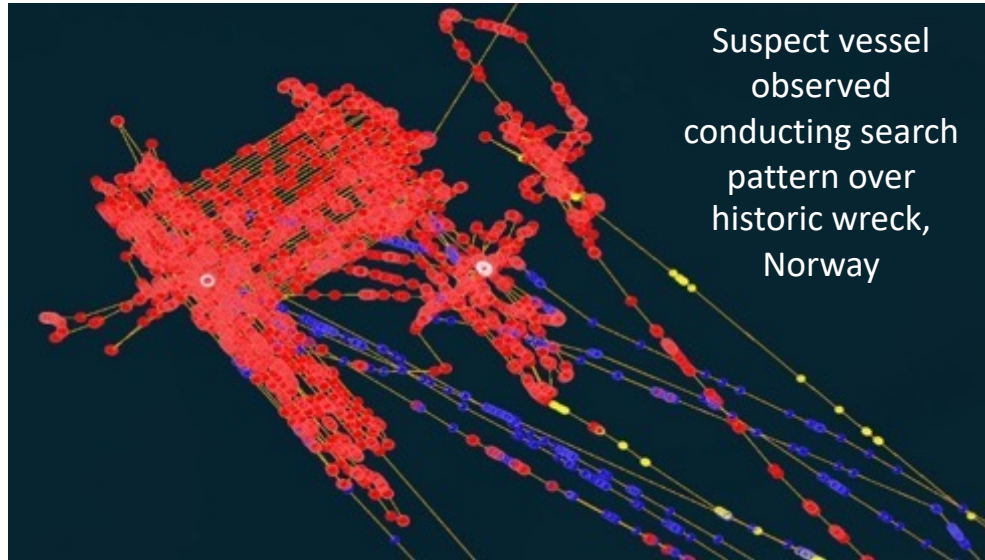


HAI WEI GONG 889 with wreckage of Dutch submarine O-16, one of over 50 WWII wrecks targeted in the Java Sea (Source: A local diver)

The unauthorised destruction of historic shipwrecks is a significant and increasing threat. Rising global demand for raw materials has made wrecks more profitable and attractive targets, while new technology has made previously inaccessible sites vulnerable to exploitation. Many protected sites around the world are poorly or inadequately monitored, affording criminals opportunity to loot with impunity, resulting in culturally important relics being lost, graves desecrated and the environment damaged.

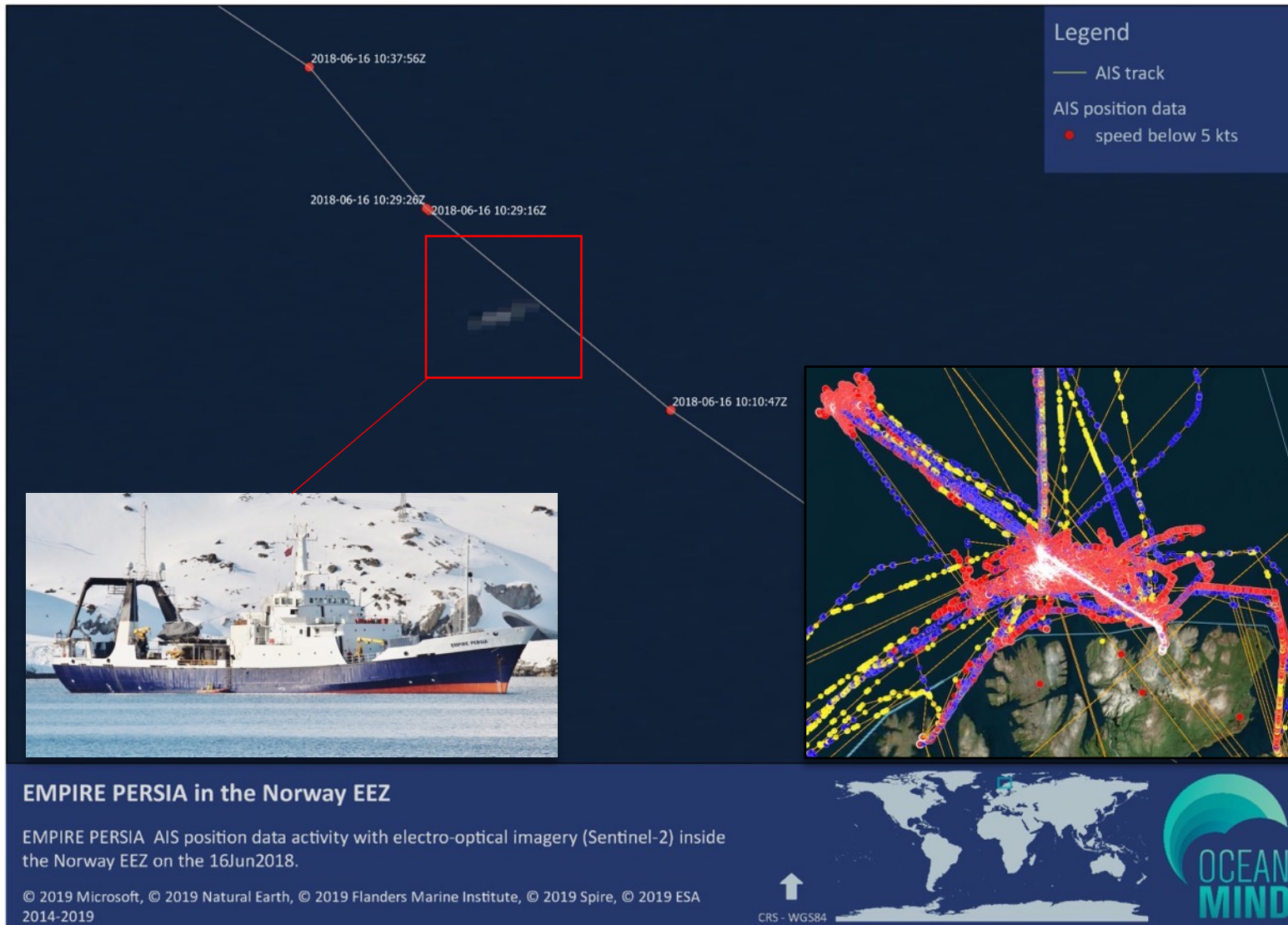
- Material Focused
 - Non-ferrous metals/Pre-nuclear steel
- Targeted removal (e.g. engine room components) or general recovery (whole wreck)
- Dedicated salvage platforms
 - Range from converted trawlers to the biggest crane barges
- Opportunistic – switch between legitimate and unauthorised work.
- AIS Fitted, but frequent evidence of tampering.
- Evidence of MMSI cloning/switching to obscure identity.

AIS: VESSEL TRACKING AND 'DARK PERIODS'



'Dark Periods' are interruptions in a vessel's AIS transmission. They may indicate a deliberate attempt to obscure a vessel's position.





Monitoring Compliance

- AIS position data enhanced with electro-optical imagery tracked movements of salvage vessel EMPIRE PERSIA in the Norwegian EEZ between 2017-2019.
- Identified survey and recovery activities on multiple sites.
- Demonstrates capability to funnel data to law enforcement for compliance check while vessels still in locality.



Men jailed for stripping First World War shipwreck



Diver Pleads Guilty to Fraud Involving Historic Cannons

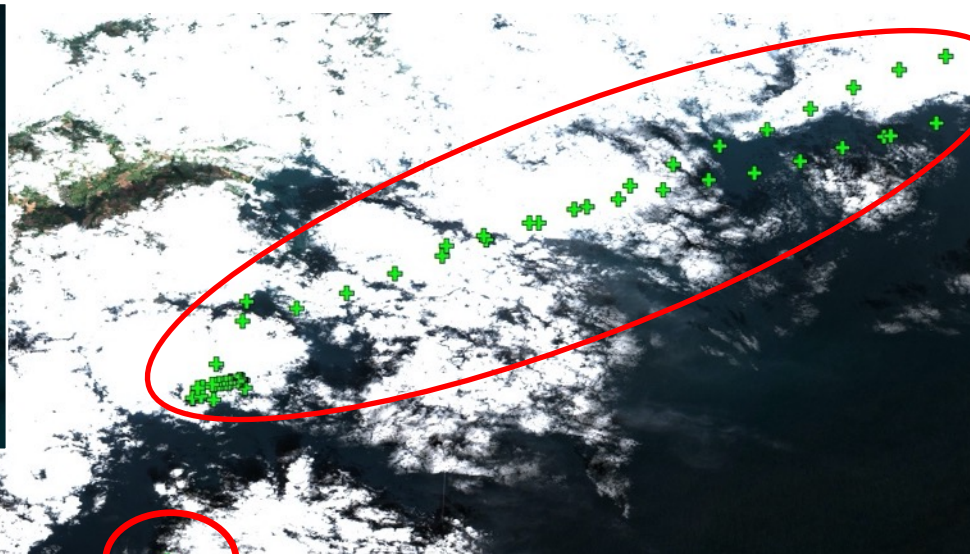


- **Small scale recoveries** usually involve divers operating off RIBs or small boats. The motive may be personal souvenir-hunting or more targeted recovery of artefacts for sale. While the vast majority of divers stay within the law, recent prosecutions in the UK highlighted the damage caused by a small minority. This looting is not easily detected or distinguishable from normal recreational diving, presenting a challenge for enforcement.
- Artefact Focused
- Motivation varies from personal souvenirs to commercial exploitation
- Typically use small vessels – RIBs, ‘hard-boats’, commercial charters.
- AIS not usually fitted. Challenging targets for Satellite Detection

REAL TIME SITE PROTECTION WITHOUT AIS: VICTORY 1744



Later public release of images confirmed diving activity on site

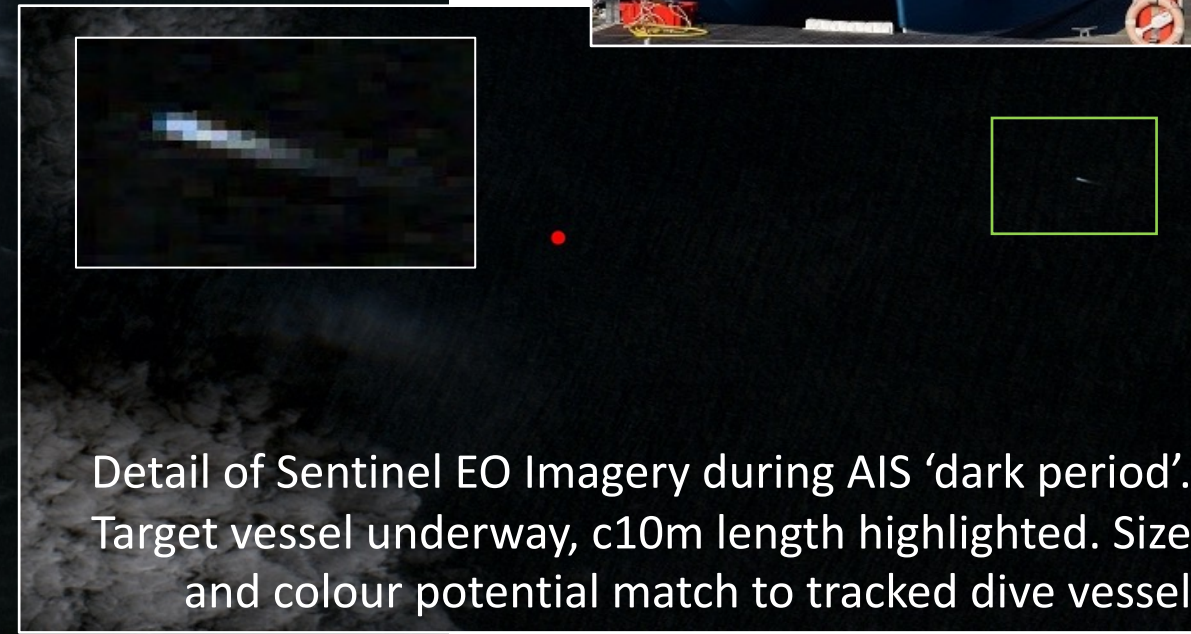
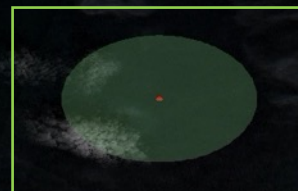


HMS Victory 1744 is an historic wreck site in the English Channel. Alerted by a dive vessel's AIS 'dark period', Observatory analysts were able to identify a potential attempt to dive covertly on the wreck

(L) AIS 'dark period': dive vessels transmissions stop 10nm North of Victory 1744 site and restart 8 hours later

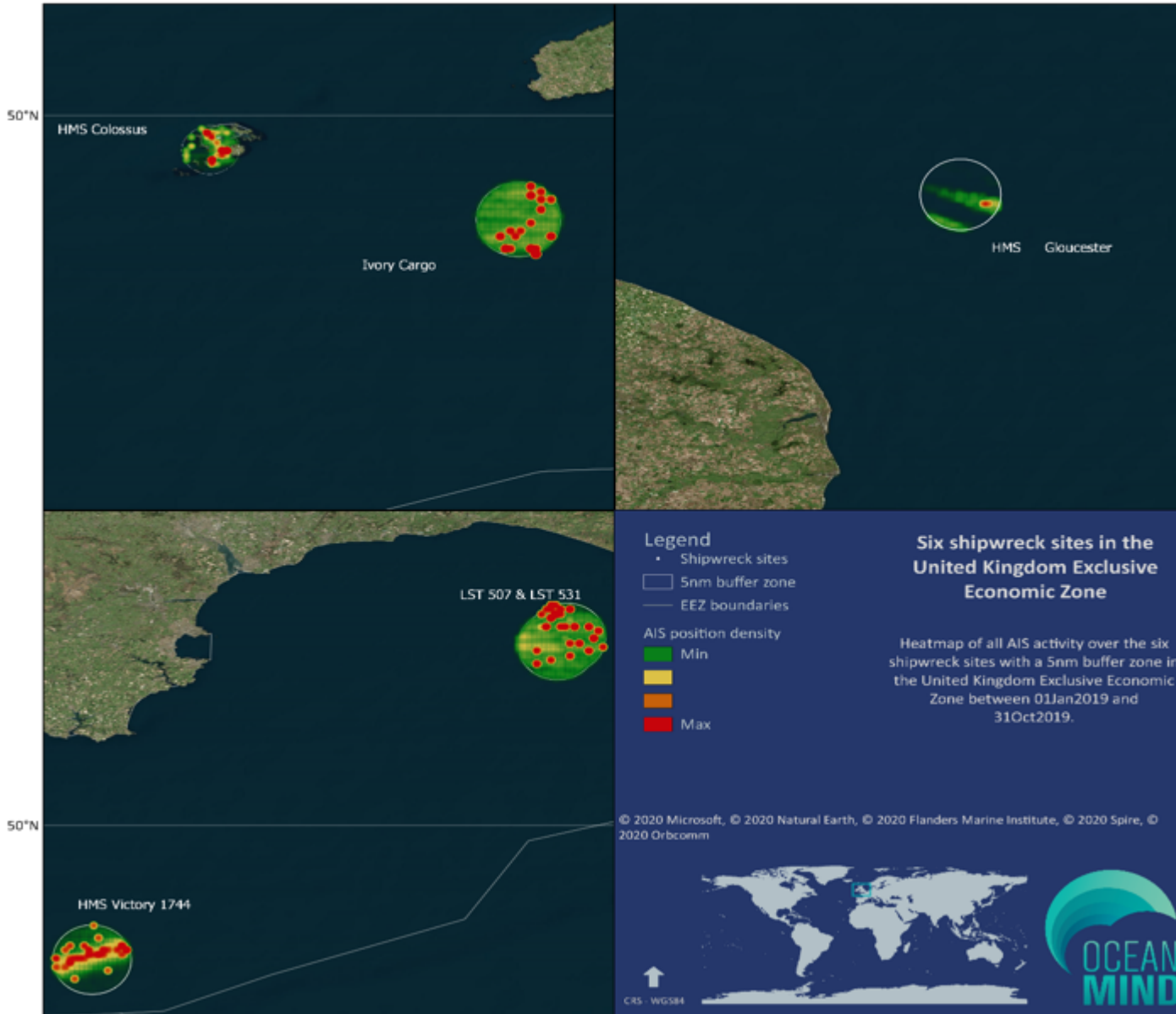


Partial AIS track overlaid on Sentinel EO Imagery. Victory 1744 wreck site and 2nm buffer zone highlighted

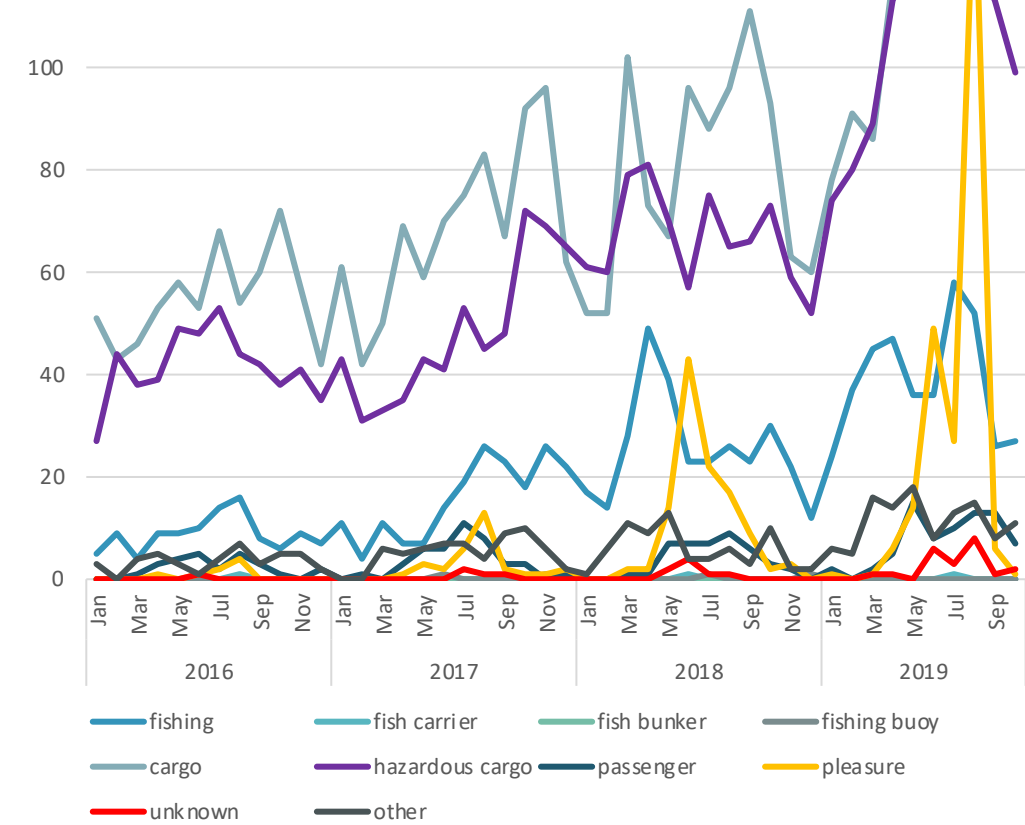


Detail of Sentinel EO Imagery during AIS 'dark period'. Target vessel underway, c10m length highlighted. Size and colour potential match to tracked dive vessel

SITE MANAGEMENT SUPPORT



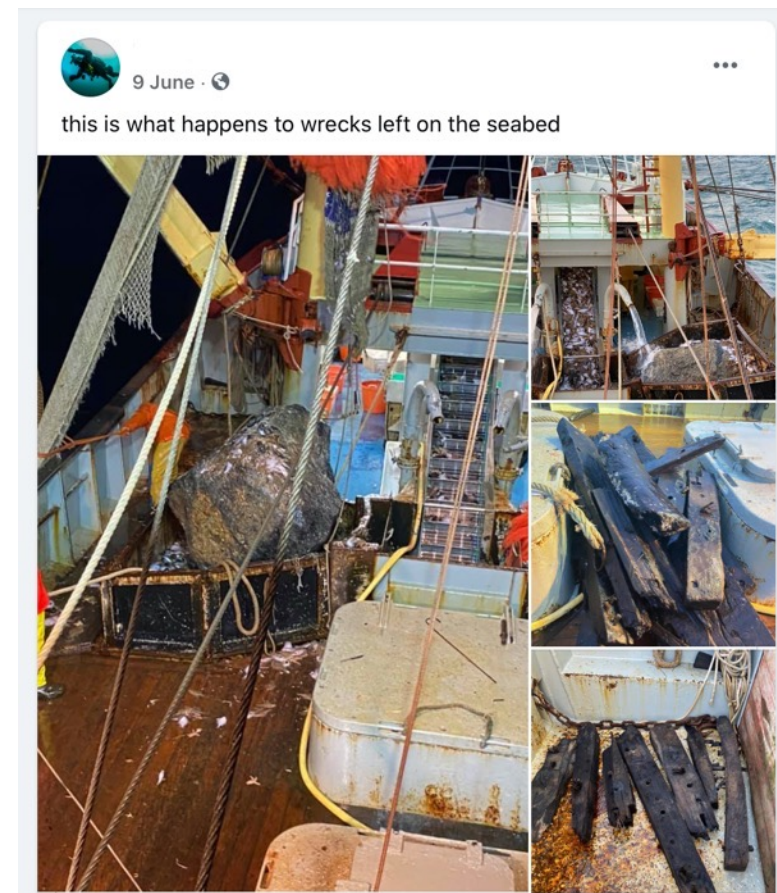
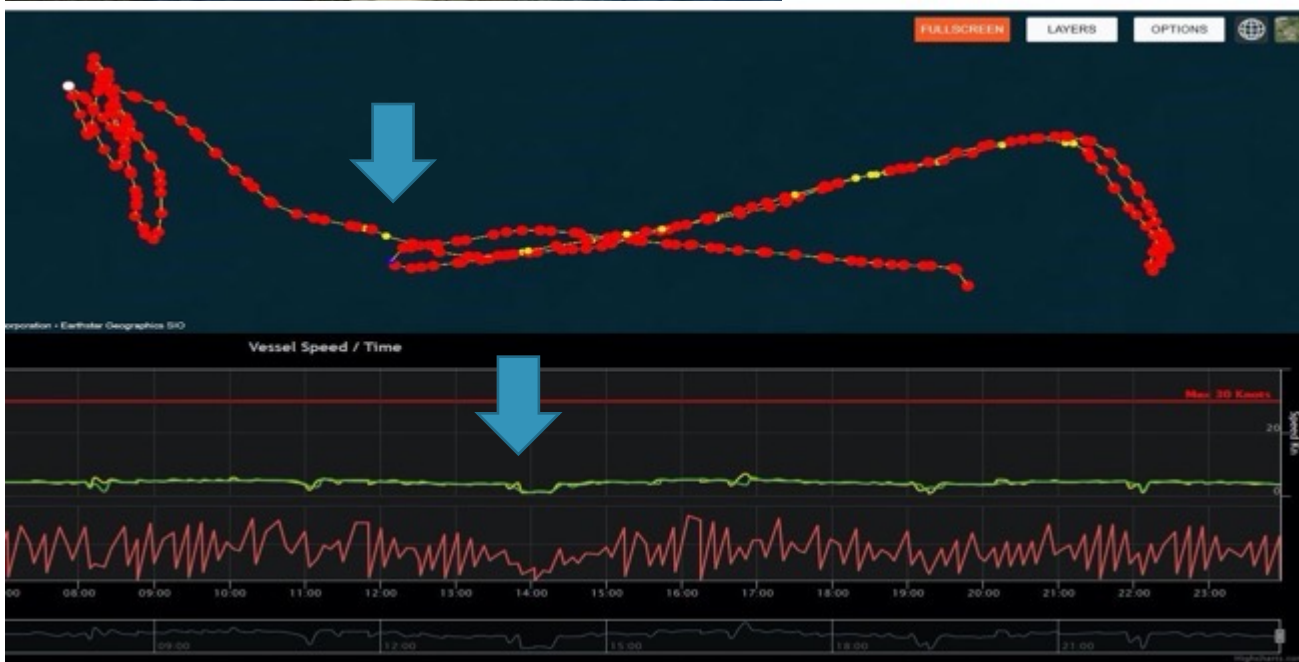
The Observatory supports site management through AIS monitoring of all shipping movements in an area of interest, providing insights into patterns of activity above and below the surface.





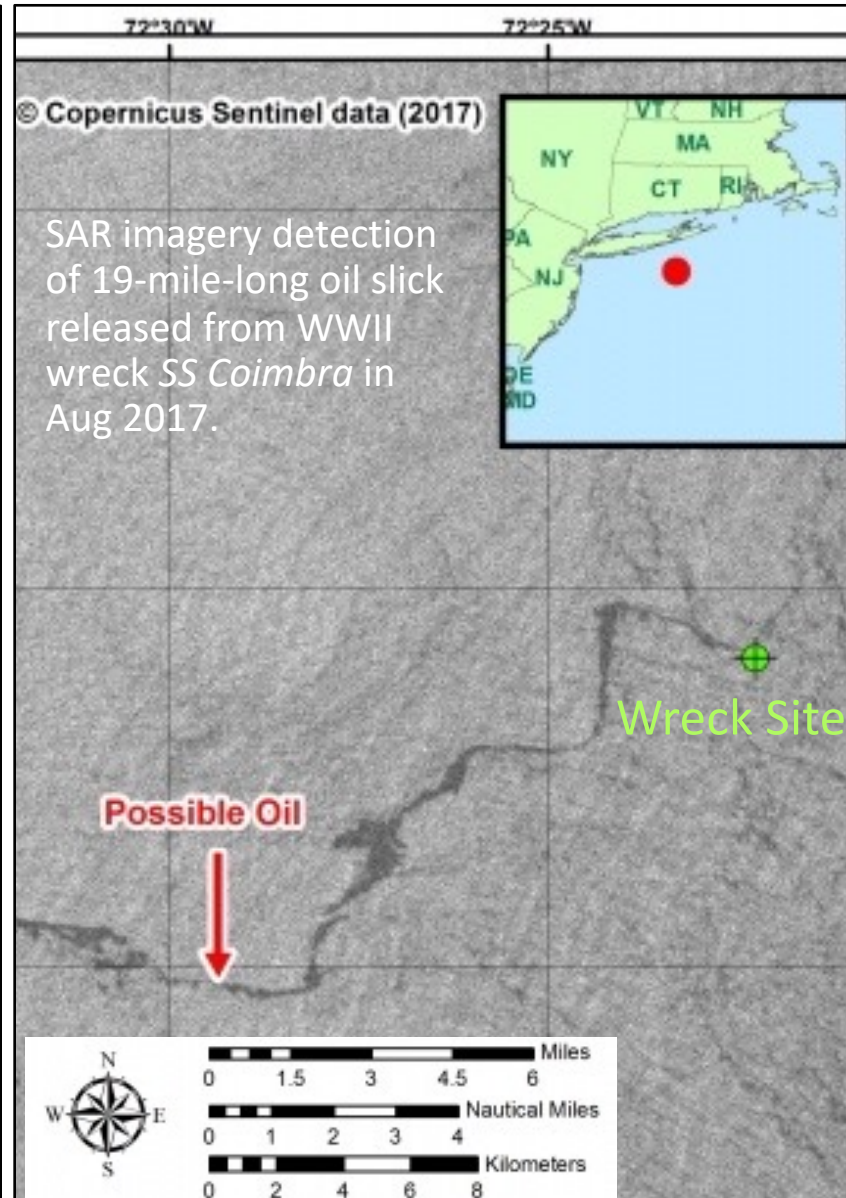
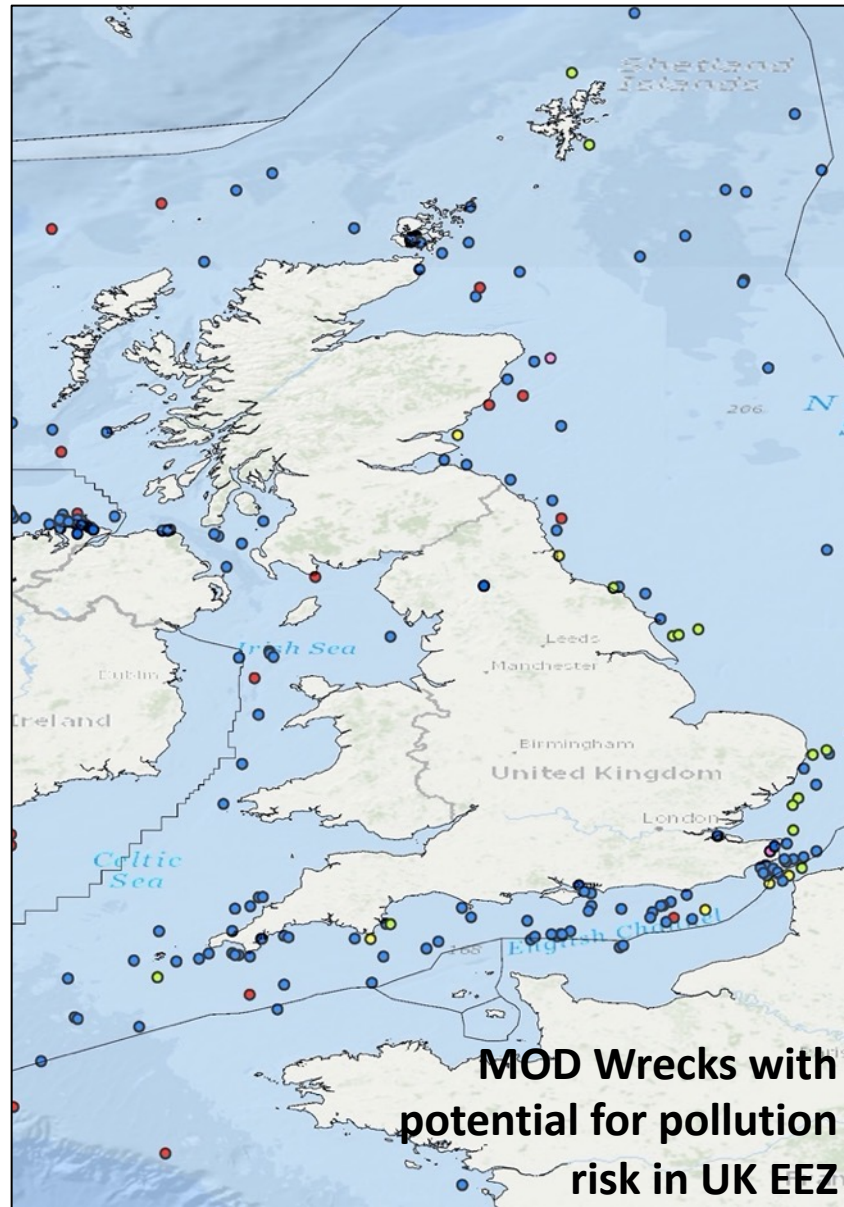
Fishing vessels operating close to wrecks pose a high risk of damage from their gear becoming entangled. Fishing gear lost in this way contributes significantly to marine pollution and can cause harm to marine life and other vessels at sea.

AIS track of suspected trawler strike on UK historic wreck



Social Media post documenting fishing damage to a UK wreck

POLLUTION & DANGEROUS WRECK MONITORING



- Thousands of wrecks carrying dangerous cargos including pollutants, chemical weapons and munitions remain a risk today.
- This risk increases with time as wrecks degrade and pollutants are released.
- The Observatory is able to monitor the most at risk sites, providing early warning of pollution events.



Please contact us for more information and how you can get involved:

www.thisismast.org/maritime-observatory.html

Report Suspicious Activity at Sea in Confidence:

Observatory@thisismast.org