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MONITORING ILLEGAL, UNREPORTED, AND UNREGULATED FISHING IN UK OVERSEAS TERRITORIES

Copernicus Sentinel data is being used to monitor illegal, unreported, and unregulated fishing in UK Overseas Territories. The data can help detect vessels which are trying to evade the authorities, thereby protecting marine resources and ecosystems.

THE CHALLENGE

The days of criminals evading the authorities while sailing amongst remote islands, far across the seas, may seem like a distant fantasy to most. This notion is only bolstered by Hollywood blockbusters which have sold us all romantic portraits such as the "Pirates of the Caribbean". However, the truth is that maritime crime has never stopped, in fact, according to the United Nations Office on Drugs and Crime, crimes on the high seas are becoming increasingly sophisticated, endangering lives, undermining regional safety, and hampering economic growth. With more than 90% of the world's goods being transported by sea, it is no wonder that maritime activity attracts crime. From illegal fishing to drug trafficking and even human trafficking, authorities in coastal states all around the world have their hands full when it comes to monitoring and protecting their surrounding waters. Impacts on the marine environment and biodiversity are also a major concern. Fish stocks are not only under threat from intensive legal fishing activities, they also must contend with illegal, unreported, and unregulated (IUU) fishing. IUU remains one of the greatest threats to marine ecosystems due to its covert ability to undermine efforts to conserve and manage fish stocks which, consequently, inhibits progress towards achieving long-term sustainable management of marine resources. A common tactic when it comes to flouting maritime laws and engaging in IUU activities involves illicit vessels switching off their automatic identification system (AIS), vessel monitoring system (VMS) or any other systems through which they can be identified. These are known as "dark vessels" and this practice helps criminals to evade detection and tracking from the watchful the eye of the authorities. To combat this ever-present issue, authorities concerned with the maintenance of maritime security need other types of surveillance methods to detect and track suspect vessels discovered in or near their waters. This is where Copernicus and the Sentinels can be of help.

More information on
www.earsc.org/sebs

HOW SATELLITES CAN HELP

OceanMind is a non-profit organisation who use satellite data, including Sentinel data, in conjunction with various sensors and artificial intelligence to analyse and understand fishing activity. By comparing this activity to applicable rules and regulations, OceanMind can help governments and local authorities to identify non-compliant activities at sea.

When vessels turn off their tracking systems or "go dark", satellite imagery can step in. Copernicus data can be used to detect suspect vessels and track their movements, with Sentinel-1's Synthetic Aperture Radar (SAR) being particularly useful in this application thanks to its ability to detect day and night, in all weather conditions, and through cloud cover. Radar data from Sentinel-1 can "illuminate" vast areas of ocean with radio waves and record the backscattered signals (i.e., echoes) to detect vessels. This is particularly effective with any vessels made of metal thanks to the strong backscatter signal response metal surfaces provide.

Sentinel-2 optical data can also complement Sentinel-1's radar data by helping to estimate vessel speed, size, and course. By combining these data sources, a picture can be built of the distribution of vessels across any given area of the earth's oceans, regardless of whether their tracking systems are on or not. So, despite the efforts of these vessels to hide from the authorities, there isn't much they can do to avoid the gaze of satellites!

OceanMind's use of Sentinel data in conjunction with other data sources and machine learning techniques ensures that vessel activities are automatically identified and corroborated, allowing their fishery analysts to focus specifically on anomalies that characterise possible IUU fishing activity, which can then be investigated further.

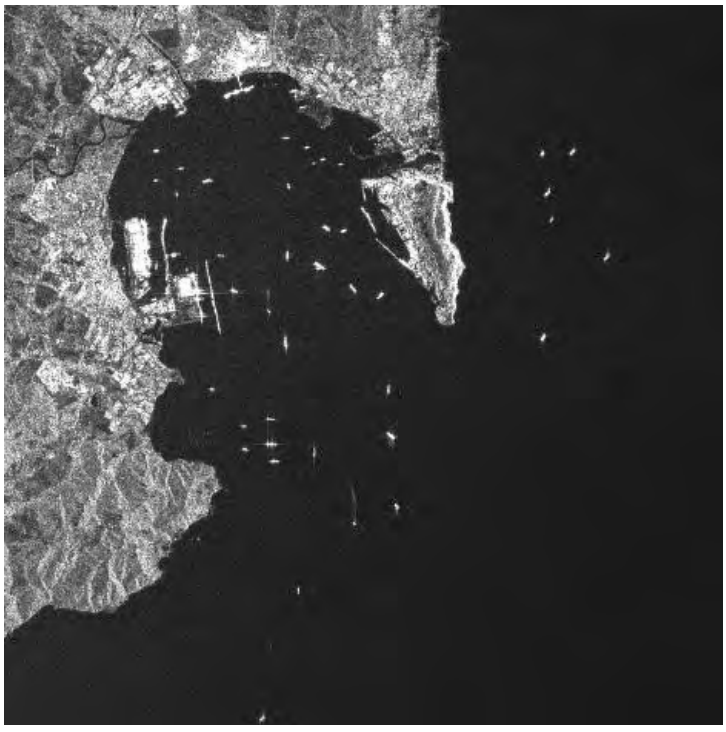

Figure 1: Sentinel-1 image of vessels surrounding Gibraltar – Source Copernicus

The satellite data:

Sentinel-1 is the Copernicus radar mission, providing an all-weather, day-and-night supply of imagery of Earth's surface.
The mission consists of two satellites embarking C-band synthetic aperture radars (SARs) in continuity of the ESA's ERS-2 and Envisat missions. The mission images the entire Earth every six days for the benefit of manifold applications such as monitoring of Arctic sea ice extent, surveillance of the marine environment, monitoring land-surface for motion risks, mapping for forest, water and soil management.

Copernicus Sentinels data are available under an open and free data policy.

Sentinel-1 data can be accessed at https://scihub.copernicus.eu

More info: https://sentinels.copernicus.eu

The Service Provider

OceanMind is a non-profit organisation that powers marine enforcement and compliance to protect the ocean's ability to provide for human wellbeing. Using satellites and artificial intelligence they help authorities enforce more effectively and industry actors to work more responsibly.

OceanMind has been involved in fishery compliance since 2014, including monitoring, control and surveillance, port state measures implementation, marine protected area enforcement, and third-party verification and supply chain traceability.

www.oceanmind.global

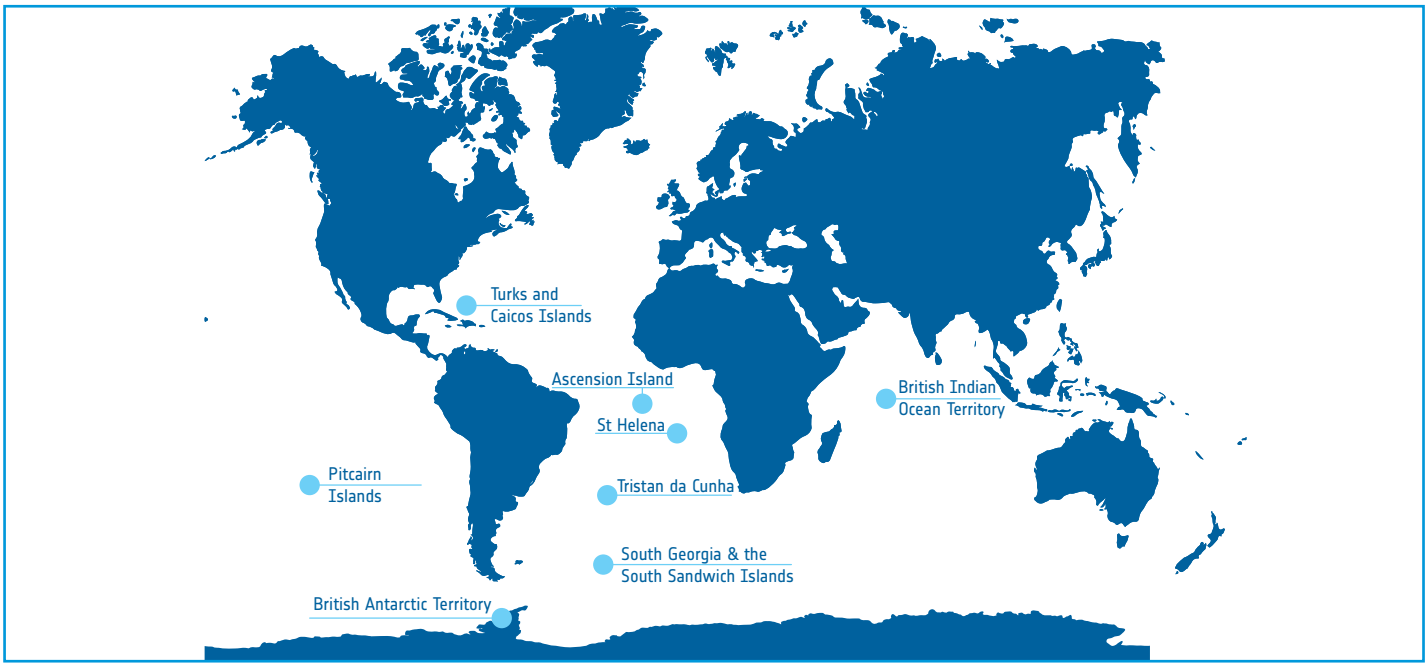

Figure 2: Geographic scope of the Blue Belt Programme – Source gov.uk

WHO IS CONCERNED?

The Marine Management Organisation (MMO) is a UK public body whose role is to protect and enhance the marine environment and support UK economic growth through the management of sustainable marine activities. In addition to its responsibilities closer to home, the organisation has a dedicated Global Marine Team who support marine protection through their management services all around the world. The team provides advice and assistance outside of the UK at the request of the Secretary of State through initiatives such as the Blue Belt Programme.

The Blue Belt Programme, launched in 2016, supports the UK Overseas Territories (OTs) with the protection and sustainable management of their marine environments. The OTs within the programme are Ascension Island, British Antarctic Territory, British Indian Ocean Territory, South Georgia & South Sandwich Islands, Tristan da Cunha, St. Helena, Pitcairn Islands and, the recently joined, Turks and Caicos Islands. The Blue Belt Programme aims to protect and enhance ocean health to halt biodiversity loss, enable sustainable growth and ensure climate change resilience. Under the programme MMO assists OTs to strengthen governance in their surrounding waters, support sustainable fisheries management, support fisheries compliance and enforcement and monitor climate change impacts.

The Primary Users

The Marine Management Organisation (MMO) was created in 2009 by the UK's Marine and Coastal Access Act. MMO is an executive non-departmental public body, sponsored by the Department for Environment, Food & Rural Affairs.

Driven by UK Government's aim for clean, healthy, safe, productive, and biologically diverse oceans and seas, MMO's purpose is to protect and enhance the marine environment and support UK economic growth by enabling sustainable marine activities and development.

Marine Management Organisation

www.gov.uk/government/organisations/marine-management-organisation

Launched in 2021, Blue Belt's maritime domain awareness sub-programme is a newer UK Government initiative aimed at specifically tackling the challenges of illegal fishing and unlawful marine activities that may impact the health and sustainability of the maritime environment around the UK OTs. The maritime domain awareness sub-programme will provide specialist training for on-island staff and give access to innovative surveillance and enforcement techniques, including the latest satellite surveillance data can be used to monitor maritime activity across entire Exclusive Economic Zones (EEZ). Currently, Bermuda is the only confirmed OT in this sub-programme.

MMO utilise the Sentinel-powered services of OceanMind to aid them in delivering the goals of the Blue Belt Programme. In particular, OceanMind aid MMO in monitoring for dark vessels and IUU activities in the surrounding waters of the various UK OTs. OceanMind and MMO can efficiently execute their IUU monitoring responsibilities across vast areas of ocean all around the world thanks to the global coverage and resolution of Sentinel data.

WHAT ARE THE BENEFITS?

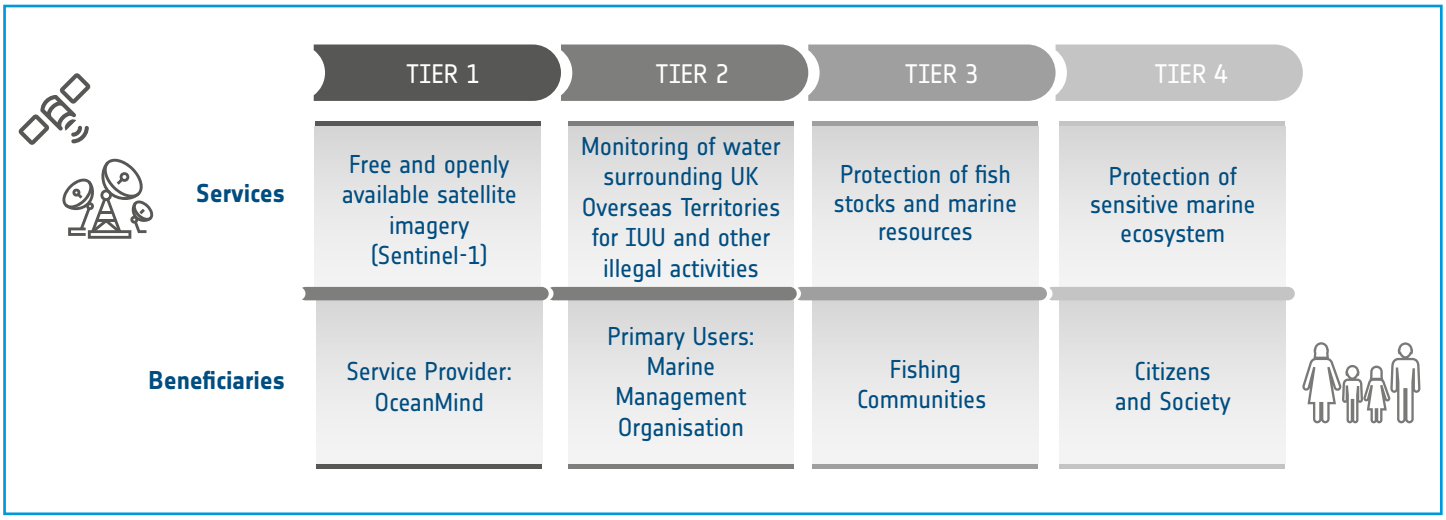

Figure 3: Value chain of the main stakeholders and beneficiaries

Entities such as OceanMind can build or enhance service models around the free and open Copernicus Sentinel data, allowing them to save on operating costs, meaning they can offer cost-effective cutting-edge services and diversify their service offerings.

For stakeholders tasked with monitoring IUU activities, the utilisation of Sentinel data allows for efficient, remote, and continuous coverage of huge areas of ocean. Prior to the use of satellite-enabled monitoring, it was much easier for IUU activities to go unnoticed, as other sources of data such as in-situ monitoring or the use of patrol vessels were some of the only ways in which dark vessels could be detected. Unfortunately, these methods could not continually scan such huge areas of ocean in the way satellite-powered methods do. Now, thanks to the all-encompassing nature of satellite data, waters can be protected in a much more effective manner. Organisations and territories can boast vastly improved operational efficiencies thanks to satellite-based remote sensing techniques, which in turn helps them to fulfil their role of protecting their waters.

Thanks to the efforts of OceanMind and MMO, the fishing communities who depend upon marine environments are safer and more sustainable. Legal fisheries benefit from the reduced likelihood of IUU activities depleting their resources which can lead to severe economic losses in local fishing communities and the destruction of sensitive ecosystems in surrounding waters. These local communities also benefit from the watchful eye of Sentinel data as it helps the Blue Belt Programme and UK OTs to secure their exclusive economic zones and deter other illegal activities such as the trade of illicit products or the illegal encroachment of unfriendly vessels in territorial waters.

Finally, citizens and society as a whole benefit from the Sentinel-powered monitoring of the waters surrounding UK OTs as it helps to reduce the overfishing and exploitation of marine resources. This has a huge effect in maintaining the biodiversity of marine ecosystems, fights against species extinction and climate change and ensures these resources will be sustained for future generations.

The key benefits are:

Economic

The deterrence of IUU activities helps legal fisheries avoid loss of income due to the overfishing of their waters (Tier 3).

Environmental

The use of Sentinel data helps to combat the overfishing of marine ecosystems. This aids in sustaining these biologically sensitive and diverse environments and contributes to the fight against climate change (Tiers 3 & 4).

Regulatory

The use of Sentinel data helps UK OTs monitor their waters (Tier 2).

Societal

Citizens and society benefit from the sustainable management of marine resources and the protection of territorial waters (Tier 4).

EXTENDED IMPACT

This case already greatly exemplifies the geographic extension of Sentinel data. Thanks to the global coverage of Copernicus, the waters of UK OTs in the Pacific Ocean, the Atlantic Ocean, the Indian Ocean, the Antarctic Ocean, and the Caribbean can continually and effectively be monitored. The findings of this case demonstrate the capability of Sentinel data in worldwide ocean monitoring applications.

Smarter ways of detecting IUU or other illegal activities at sea using Sentinel data are continually being developed thanks to cutting-edge technologies such as machine learning, artificial intelligence (AI), blockchain, big data analytics and and high performance computing (HPC). In addition to the services discussed in this case, Sentinel data can also complement validation and traceability services for seafood supply chains, aid in the monitoring and protection of undersea cultural heritage sites such as shipwrecks and contribute to the protection of human rights through the surveillance of human trafficking activities at sea.

The Copernicus Marine Environment Monitoring Service (CMEMS) also provides a plethora of complementary data and services which can bolster marine regulation, support the blue economy, and drive forward scientific understanding and innovation. Through this service, user can access catalogues of ocean monitoring products including hindcasts, nowcasts and forecasts, robust analyses of the state of the ocean and advanced ocean visualisation tools.

Figure 4: OceanMind Maritime Observatory
Source oceanmind.global

ABOUT THE PROJECT

The Sentinel Benefits Study (SeBS) is conducted by EARSC (European Association of Remote Sensing Companies) with partners The Greenland, IIASA (International Institute for Applied Systems Analysis) and Evenflow on behalf of the European Space Agency (ESA). It has the goal to study 20+ full cases by analysing the impact of the use of Sentinel data along a value-chain. This short case has been prepared where there has been an interesting use made of Sentinel data, but it has not (yet) been possible to conduct a full case. It tells the story of the use of Sentinel data without going deeply into the economic or environmental benefits.

"Copernicus Sentinel data helps us to detect suspect vessels in the waters surrounding UK Overseas Territories. The global coverage of this data is key to ensuring these waters stay as secure as possible"

Andrew Deary - Head of Enforcement and Compliance for the Blue Belt Programme at the Marine Management

We acknowledge that the understanding of the case was supported by discussions with Lulu Phillips from OceanMind and Andrew Deary from the Marine Management Organisation. We thank them for their valuable insights and availability.

Do you know an interesting case demonstrating the benefits derived from the use of Sentinels data?

Email info@earsc.org

More Information on Sentinels Benefits Studies:

www.earsc.org/sebs

The Sentinels Benefits Study is funded by the EU and ESA.
The views expressed in this study cannot be taken to reflect the official position of the EU or of ESA.