

Blue Belt Programme: Technology to target illegal fishing

Sarah Keynes

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Marine
Management
Organisation



Centre for Environment
Fisheries & Aquaculture
Science



Funded by
UK Government



**“TECHNOLOGY IS
THE ANSWER...
BUT WHAT WAS
THE QUESTION?”**

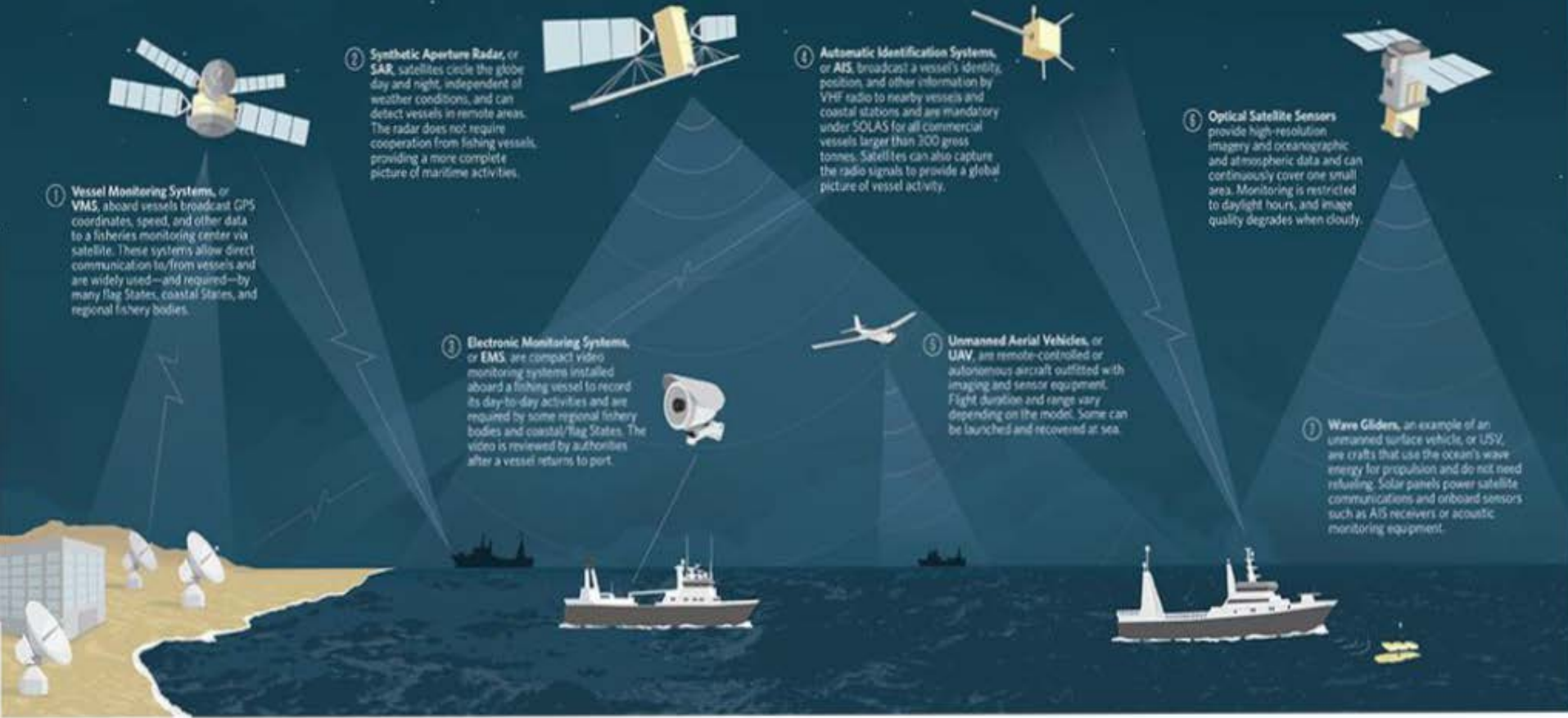
CEDRIC PRICE, ARCHITECT

Blue Belt Technology Review

Two distinct challenges, two distinct technology streams:

- Monitoring the marine environment – environmental
- **Monitoring of human activity – maritime security**

Technology for Fisheries Monitoring and Surveillance



1 Vessel Monitoring Systems, or VMS, aboard vessels broadcast GPS coordinates, speed, and other data to a fisheries monitoring center via satellite. These systems allow direct communication to/from vessels and are widely used—and required—by many flag States, coastal States, and regional fishery bodies.

2 Synthetic Aperture Radar, or SAR, satellites circle the globe day and night, independent of weather conditions, and can detect vessels in remote areas. The radar does not require cooperation from fishing vessels, providing a more complete picture of maritime activities.

3 Electronic Monitoring Systems, or EMS, are compact video monitoring systems installed aboard a fishing vessel to record its day-to-day activities and are required by some regional fishery bodies and coastal/flag States. The video is reviewed by authorities after a vessel returns to port.

4 Automatic Identification Systems, or AIS, broadcast a vessel's identity, position, and other information by VHF radio to nearby vessels and coastal stations and are mandatory under SOLAS for all commercial vessels larger than 300 gross tonnes. Satellites can also capture the radio signals to provide a global picture of vessel activity.

5 Unmanned Aerial Vehicles, or UAV, are remote-controlled or autonomous aircraft outfitted with imaging and sensor equipment. Flight duration and range vary depending on the model. Some can be launched and recovered at sea.

6 Optical Satellite Sensors provide high-resolution imagery and oceanographic and atmospheric data and can continuously cover one small area. Monitoring is restricted to daylight hours, and image quality degrades when cloudy.

7 Wave Gliders, an example of an unmanned surface vehicle, or USV, are crafts that use the ocean's wave energy for propulsion and do not need refueling. Solar panels power satellite communications and onboard sensors such as AIS receivers or acoustic monitoring equipment.

- 1 Vessel Monitoring Systems**
- + Signals are secure and difficult to fake
 - + Authorities can alert vessels not in compliance
 - Helps show vessel location but cannot verify vessel activity
 - Legal restrictions on data sharing

- 2 Synthetic Aperture Radar**
- + Covers large, remote areas
 - + Works in all weather conditions
 - Low resolution and inability to identify vessels

- 3 Electronic Monitoring Systems**
- + Can be used to monitor fishing activity and catch
 - + Compact and simple installation
 - Vulnerable to tampering, large time-delay for evaluation of data

- 4 Automatic Identification Systems**
- + Can detect vessel patterns consistent with fishing
 - + Satellite-based systems have unlimited range
 - Broadcasts can be switched off or altered to show inaccurate vessel information

- 5 Unmanned Aerial Vehicles**
- + Imagery available for immediate analysis
 - + Stealth and access to remote areas
 - Restricted by weather and flight duration

- 6 Optical Satellite Sensors**
- + Provides detailed situational picture
 - + Can cover remote fishing areas
 - Imagery is dependent on time of day, weather conditions

- 7 Wave Gliders**
- + High endurance with low maintenance cost
 - + Able to be deployed to remote areas
 - Limited payload, low speed

Blue Belt Technology Review

Market Readiness (Technology Readiness Level)

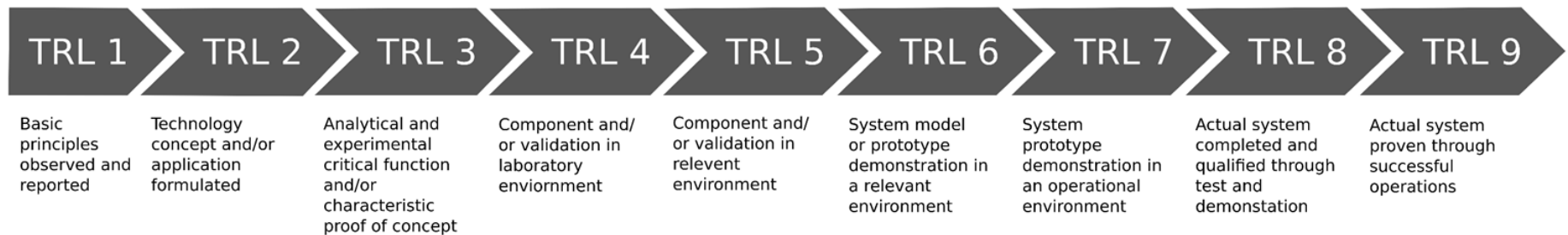


Image credit: www.cre-8.org

- **Short-term:** Trialling front-runner technologies; focus on High Technology Readiness Level (TRL) – reduced risk
- **Medium and long term:** What might be relevant? – Technology Roadmaps

Blue Belt Technology Roadmap Project

- Technology Roadmaps:
 - Appraised assessment – suite of technologies options for each OT in the short, medium and long term
 - Cross-cutting issues
 - Considering long-term implementation and integration
- Basis: Understanding requirements and opportunities

No discussion on the use of future technology should take place without being in the context of a set of well understood requirements

Blue Belt Technology Roadmap Project

Relevant technologies including:

- Satellite surveillance
- Unmanned aerial vehicles (UAVs)
- Passive acoustic monitoring
- Unmanned marine surface vessels
- Natural tags (such as genetic analysis)
- AIS monitoring/analysis
- Ground/buoy based RADAR
- Argo Floats

Blue Belt Technology Roadmap Project

Cross-cutting issues:

- Intelligence management
- Data acquisition and management
- Training
- Asset tasking



In the meantime...

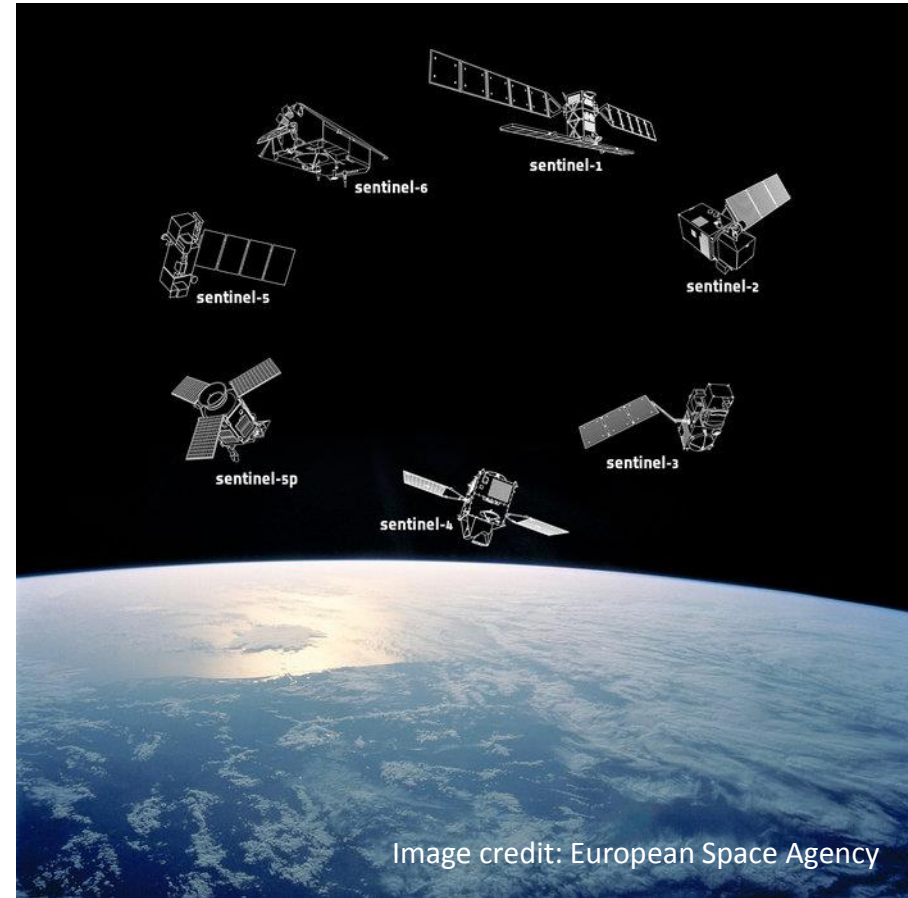
Operational capability trials – understand operational readiness of front-runner technologies:

- Satellite surveillance
- Unmanned aerial vehicles (UAVs)
- Passive acoustic monitoring



Sentinel Satellite Project

- Sentinel and other low-cost satellite data:
 - Sentinel-1
 - Sentinel-2
 - VIIRS
 - Others?
- Understand coverage
- Prototype tool for monitoring and surveillance



Drone Trial Partnership with ZSL



Marine
Management
Organisation

ZSL
LET'S WORK
FOR WILDLIFE

- Dual aims:
 - Compliance and enforcement
 - Biological surveys – large rays and megafauna
- Trialling drone: Affordability? Waterproofing? Can it operate in tropical maritime conditions? Durability? Battery life? What training and maintenance is needed? Supporting legislation and guidance?

