NOAA FISHERIES

Office of Law Enforcement

Equipment and operation of Vessel monitoring systems (VMS) and other Electronics

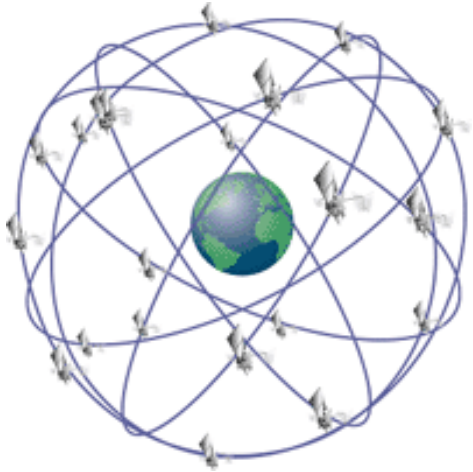
PSM Inspector Training

Lima, Peru

January 21-30, 2020

Global Positioning System - explained

- Network of 27 interconnected satellites that orbit the earth and can determine the exact location of anyone accessing their signals at a given time.
- Receiver is used to interpret signals from these GPS satellites, and can pinpoint the location of a vessel to within a few feet
- GPS information is embedded within:
  - Vessel Monitoring System (VMS)
  - Automatic Identification System (AIS)

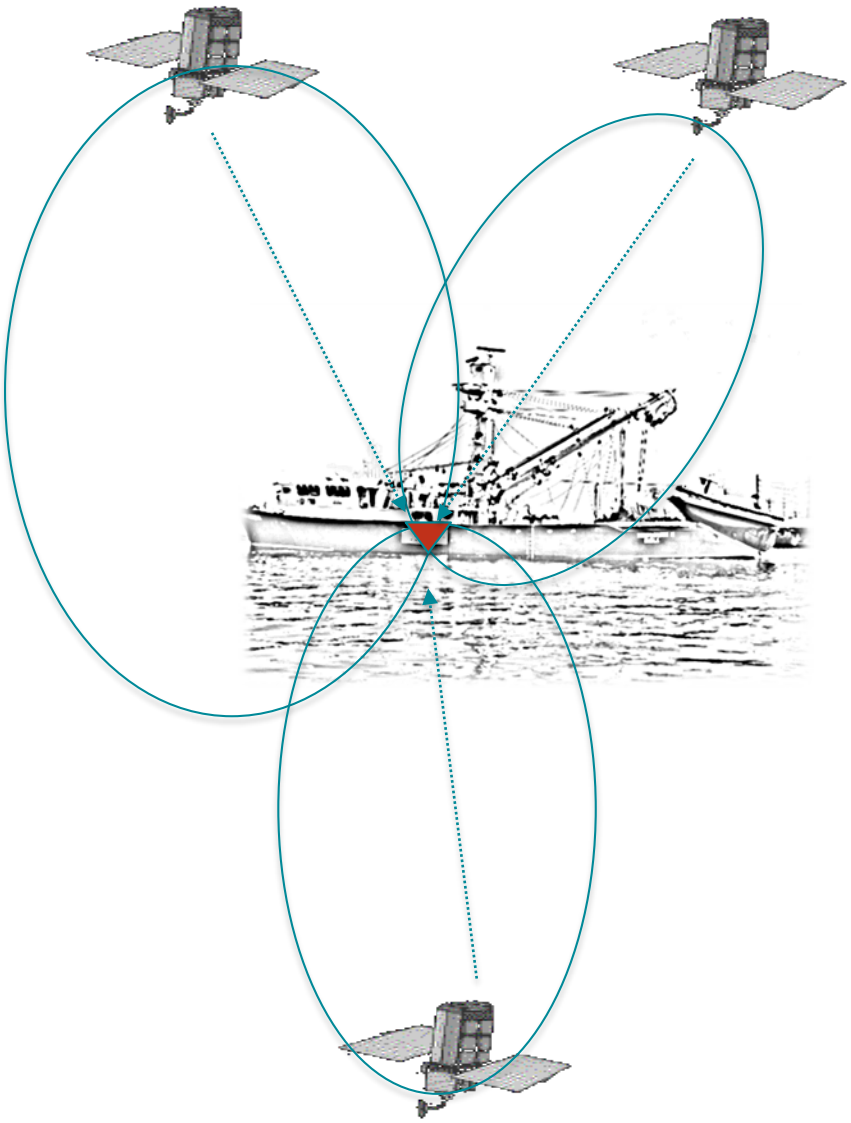


GPS explained

Trilateration

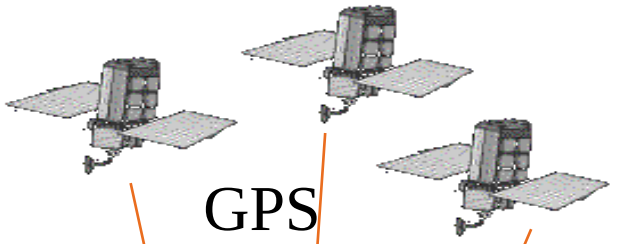
- Measures distance to 3 or more satellites

- Intersection of spheres is the receivers location



Vessel Monitoring System

(Data from the vessel to you)

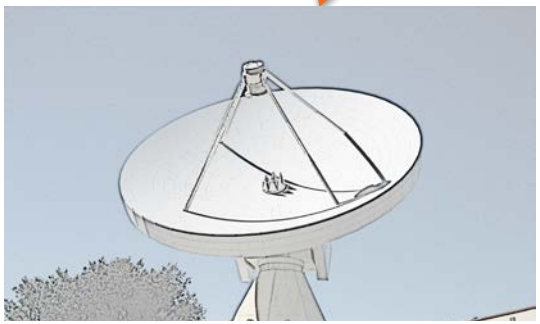


GPS Satellites

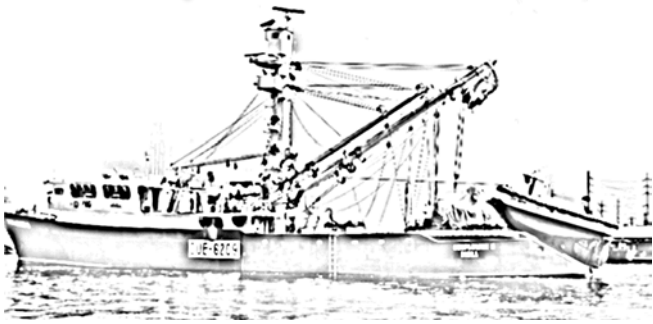
Satellites

Processing Center

Users



Receiving Station



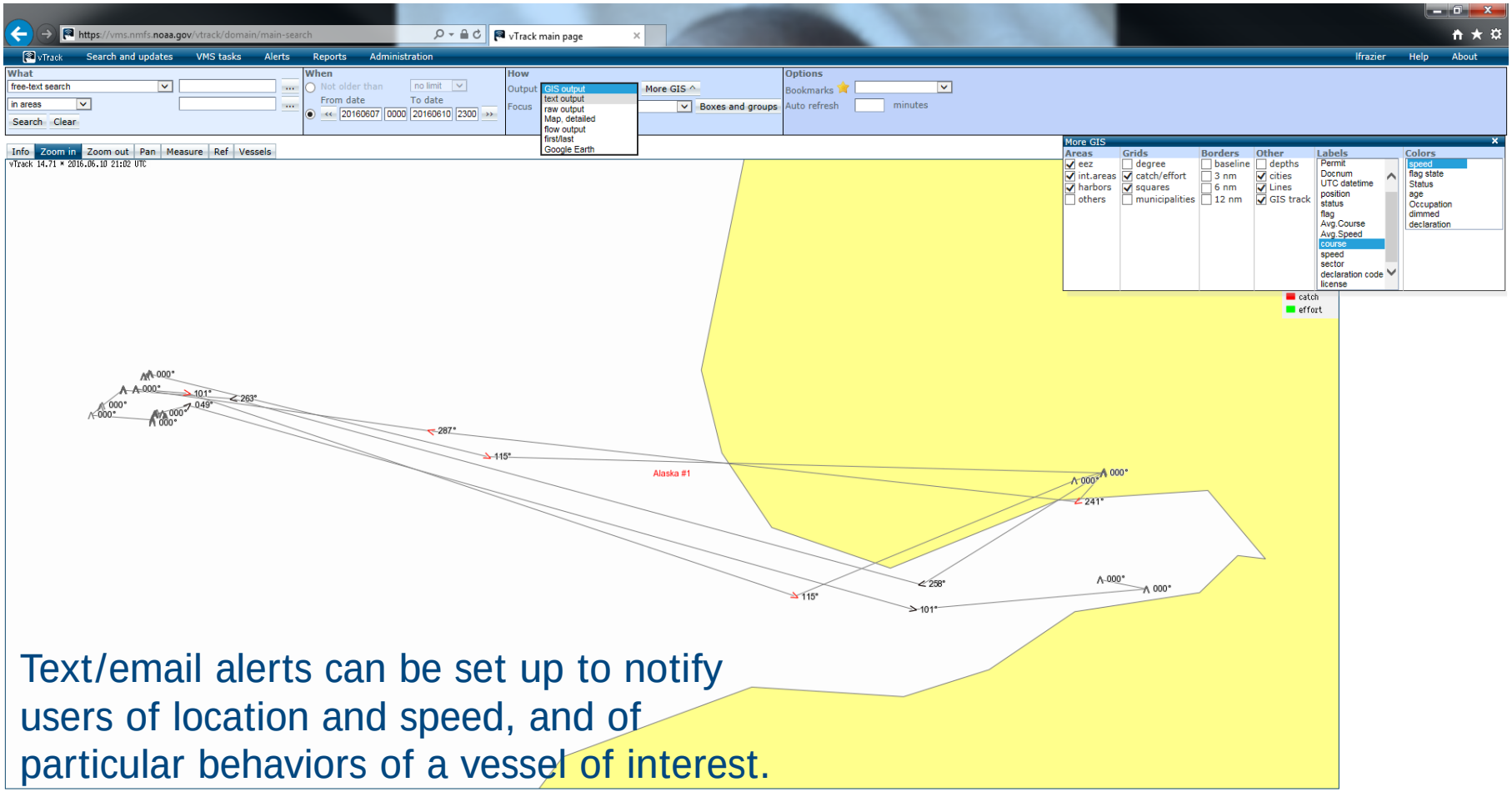
Fishing Vessel

Data Collected

Vessel ID	Xceiver status	Lat	Long	Date	Time	Decla-ration	Vessel name	DOC/ Permit #	Speed	Direction

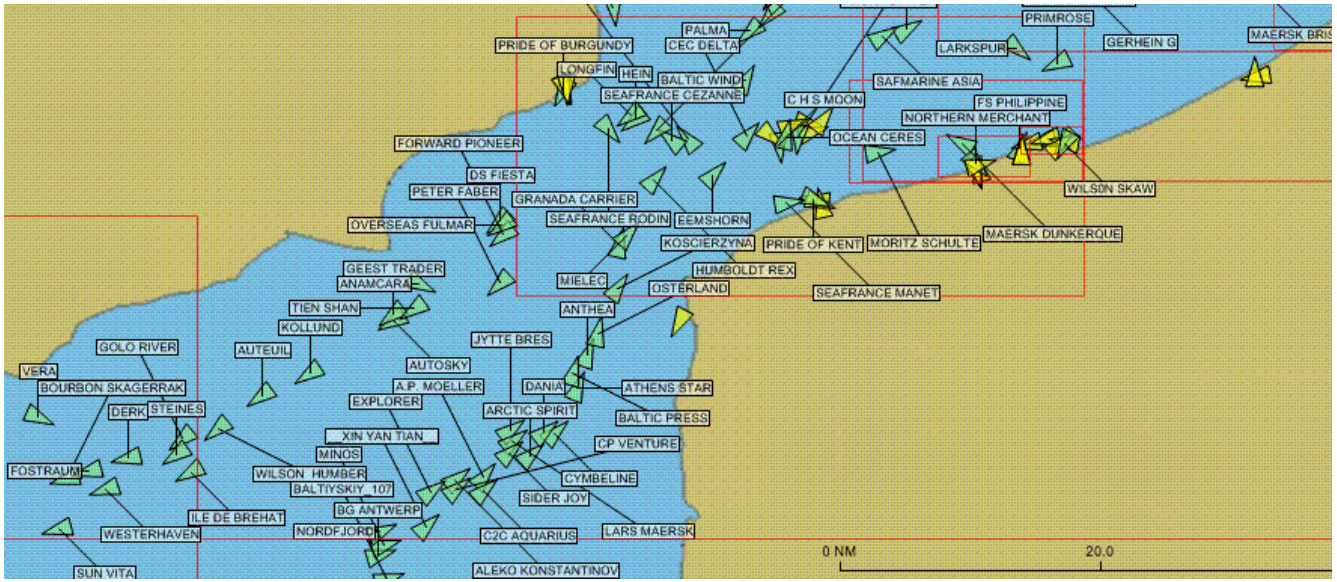
- VMS data includes
  - (GPS) position reports (Latitude, Longitude)
  - Date and time
  - Speed, course
  - Name and Registry information
  - License / Permit data
  - Gear Declarations

Software System for viewing



Text/email alerts can be set up to notify users of location and speed, and of particular behaviors of a vessel of interest.

Automatic Identification System (AIS)



- Endorsed by the International Maritime Organization
- Maritime safety
- Maritime Domain Awareness - provides governments with greater situational awareness of commercial vessels and their cargo

- Operates in the VHF maritime band
- Communicates ship to ship as well as ship to shore
- Transmits information on a real-time, wholly automated basis relating to:
  - ship identification,
  - geographic location,
  - vessel type, and
  - cargo information

Benefits of VMS

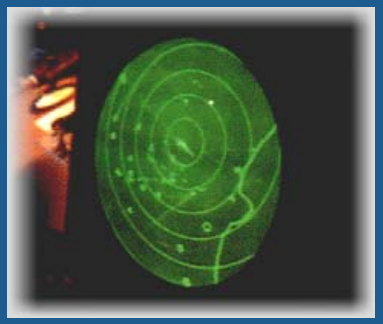
- Improved Surveillance
  - Provides Fleet Location Monitoring for monitored fleets
  - Efficient Directed Response to Suspicious Activity and Violations
  - Efficient coordination for intelligence and patrol resources

- Increased Safety
  - Accurate Position Data Transferred in Near Real-Time
  - Two-Way Communications Capable (newer units have e-mail capability)

- Enhanced Security
  - Rapid Vessel Identification for Search and Rescue Operations

VMS Program Goals
What does it do for Field Enforcement?

MONITORING
- Detect/Deter



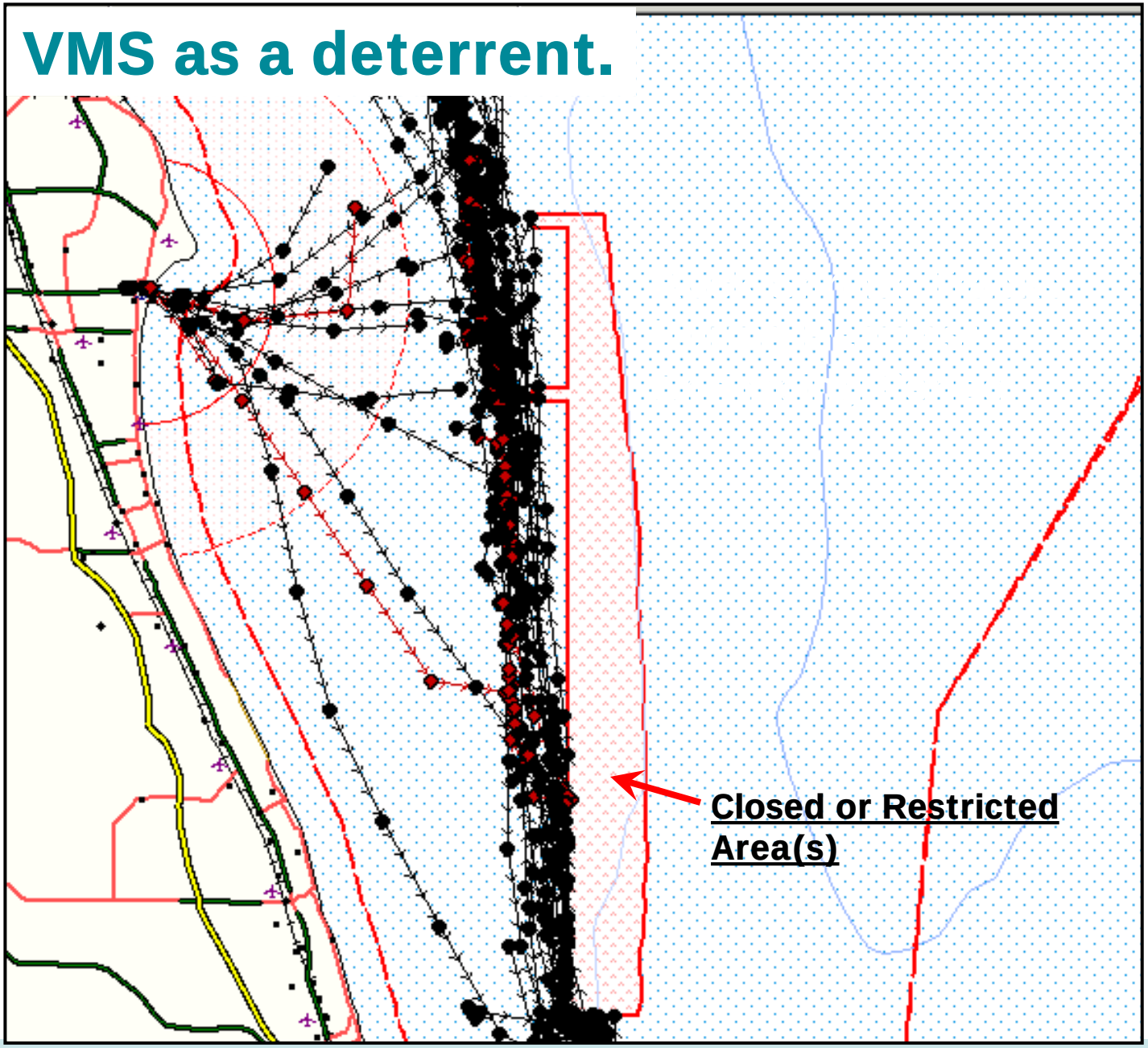
INTEL / PATROL
COORDINATION

INVESTIGATIONS
- Document

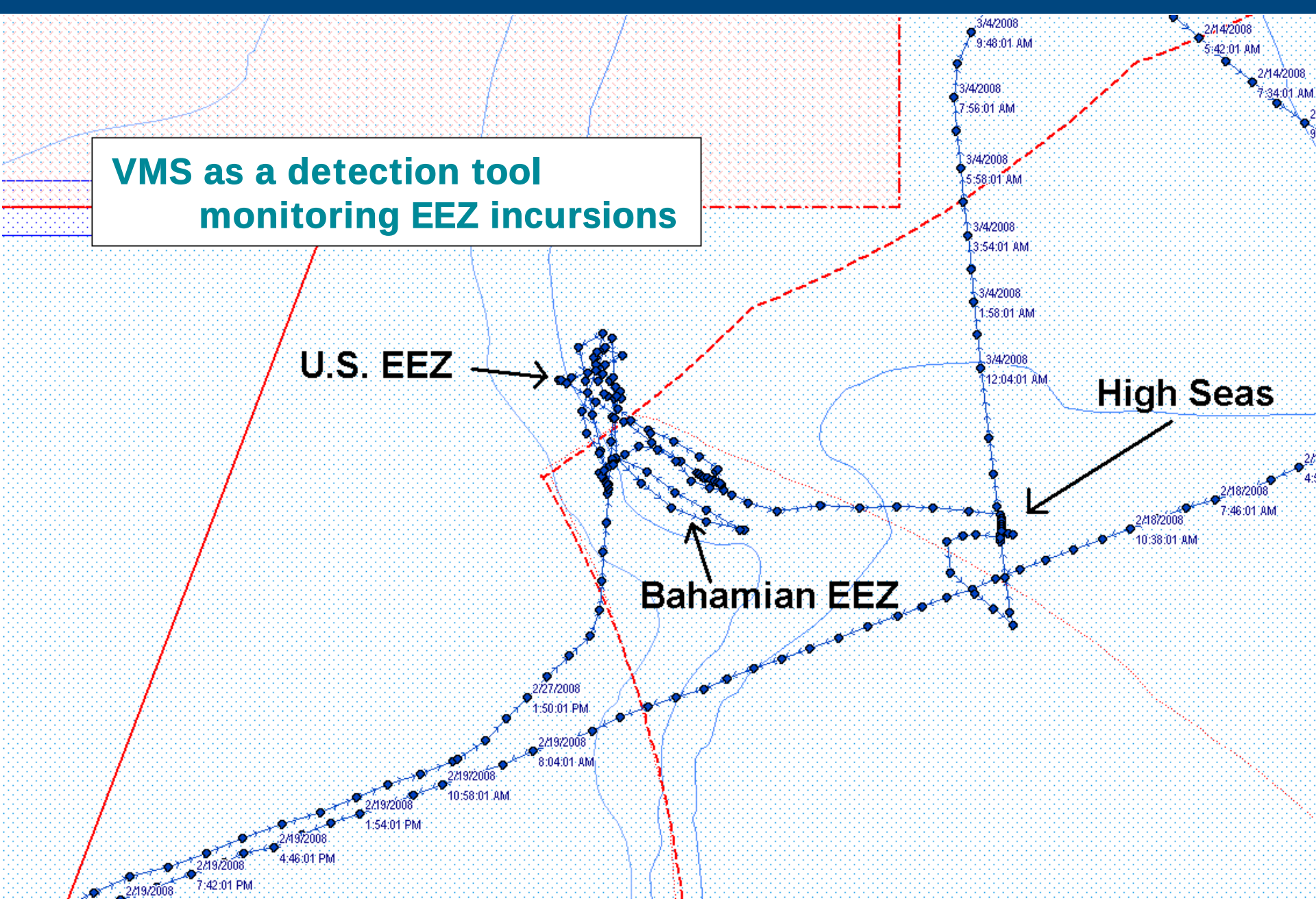
Monitoring

- Detect/deter violations
  - F/Vs in foreign EEZ
  - Managing sensitive areas such as marine protected areas
- Verifying/validating data from other sources
- Monitoring activity and arrivals in port to plan for inspections and investigations
- Supporting Homeland and National Security initiatives

VMS as a deterrent.



VMS as a detection tool monitoring EEZ incursions



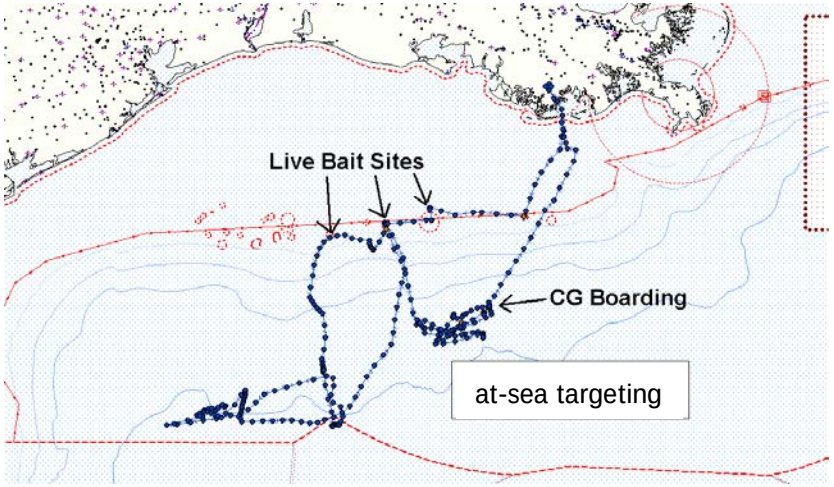
Intelligence Information

- VMS provides enforcement with valuable intel:
  - Start of fishing season/increased effort
  - Fishing fleet movement
  - Current position of vessels of interest
  - Landing ports
  - Possible increased interaction with ESA species (sea turtles, right/humpback whales)

Patrol Planning / Coordination

- VMS assists in patrol planning/coordination by identifying F/V concentrations

- Patrols compliment VMS by ensuring compliance with VMS requirements (non-reporting, verifying identity)

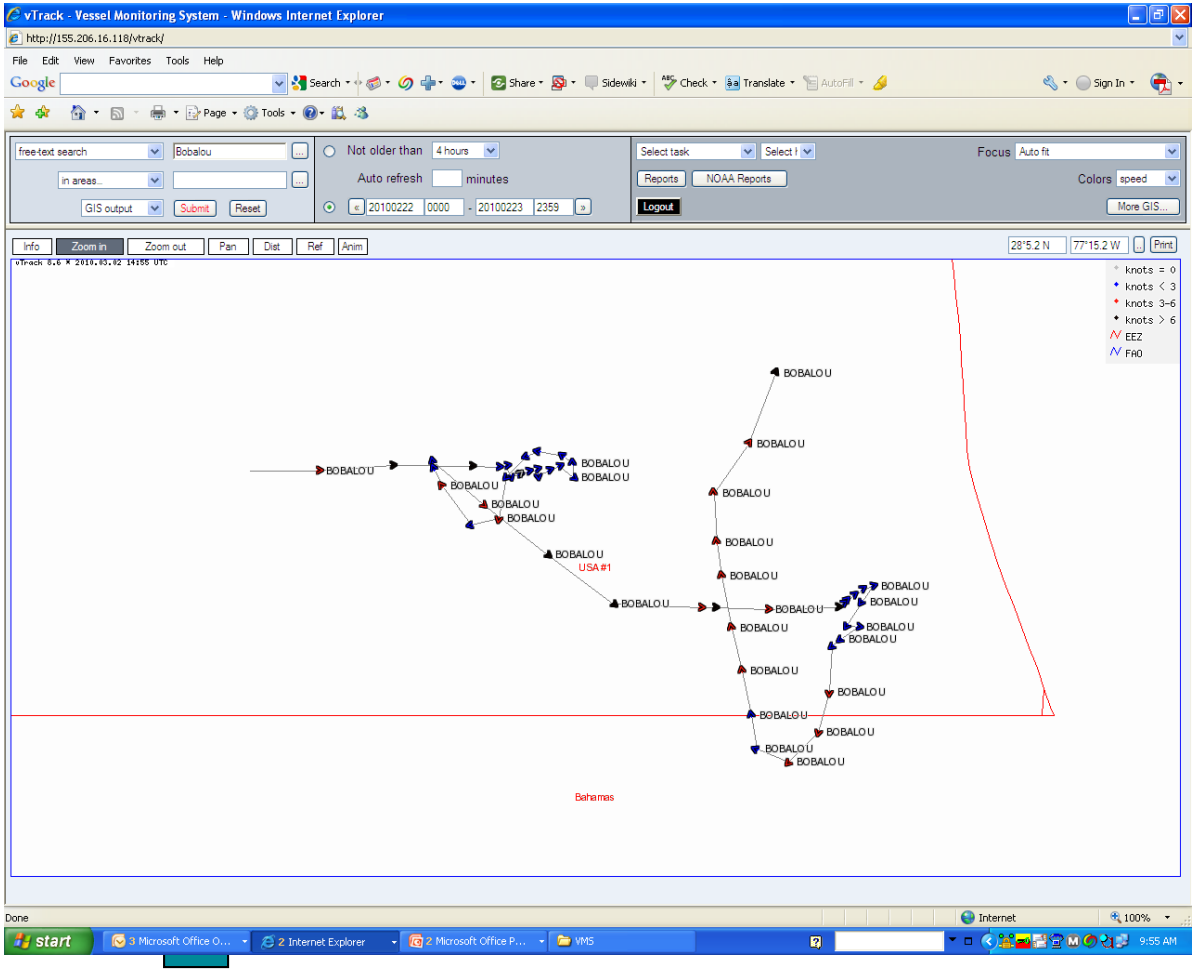


Investigations

- VMS assists agents with investigations
  - Provides position evidence and historical data
  - Vessels can be tracked for follow-up investigation, dockside boarding
  - Data can be compared to vessel GPS and logbook information through Track Analysis

VMS: Track Analysis

- Software displays vessel track data based on position reports, i.e. “connects the dots”
- Speed info important in certain fisheries
  - Trawling
  - Longlining



Track Analysis

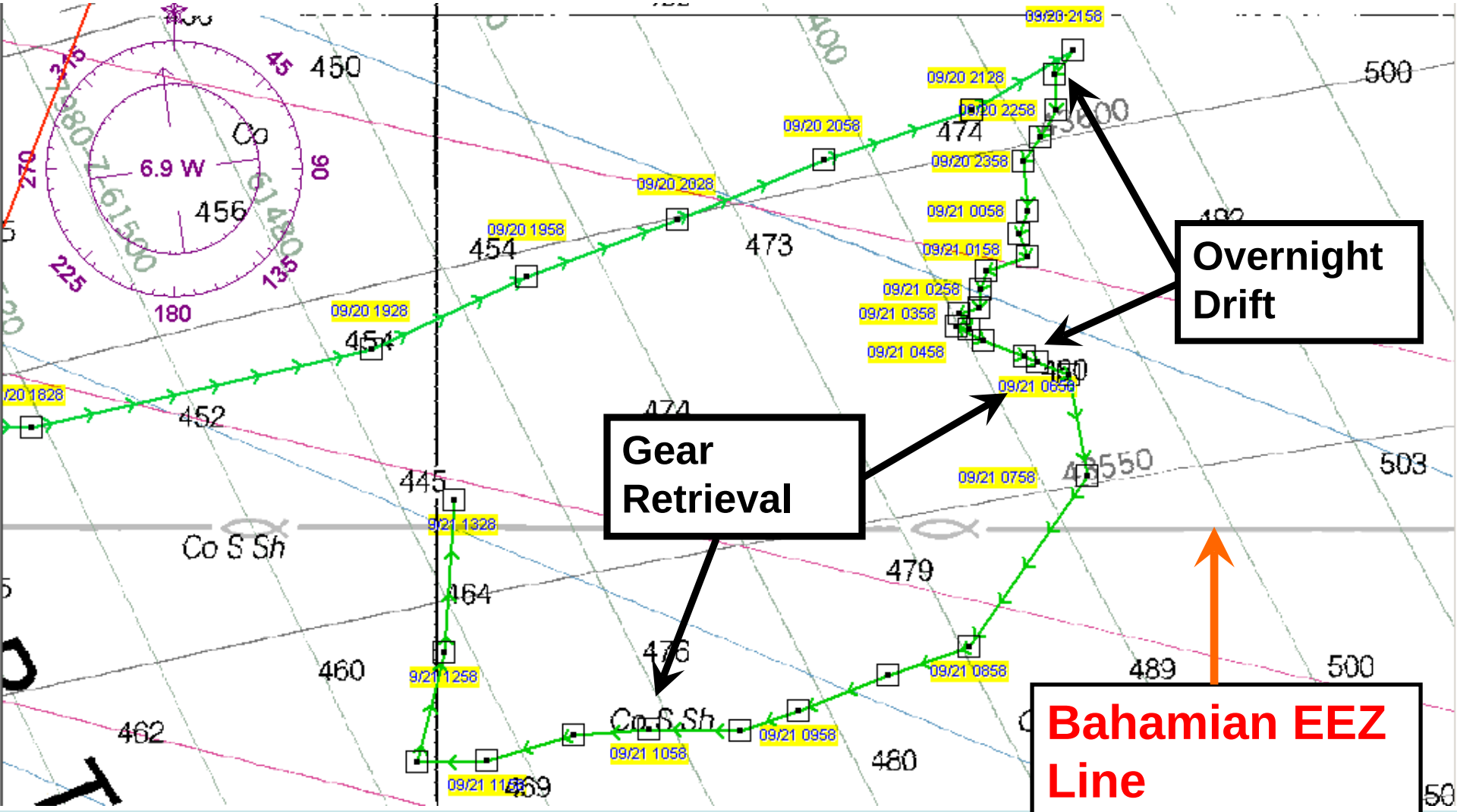
- Currently, no case precedence of using VMS to establish a “Fishing Signature”

- VMS data coupled with knowledge of fishing practices and GPS forensics can assist agents/officers with identifying fishing activity
  - Useful for vessel captain/owner interviews
  - In closed area cases where there is an enhanced penalty for fishing in the area
  - Provides GCEL a clear picture of activity

Case Examples (HMS Pelagic)

- HMS Pelagic longliner targeting swordfish
- VMS showed activity in Bahamian EEZ
- VMS tracks compared to Captain's logbook
- Once confronted with VMS info, Captain gave an admission

Set 1 Overnight Drift and Gear Retrieval from VMS Data



Recognizing Illegal Fishing

Analysis of course, speed and positions demonstrated that the vessel traveled over the same two areas:

- At a speed consistent with setting long line gear,
- At a speed consistent with retrieving long line gear after departing for a period of time consistent with fishing of long line gear.

Bottom characteristics were consistent with the preferred depth habitat for Pacific halibut and not sablefish.

Gear Deployment

6/20 1830-1900 hrs

S- 4 kts / C-316* T

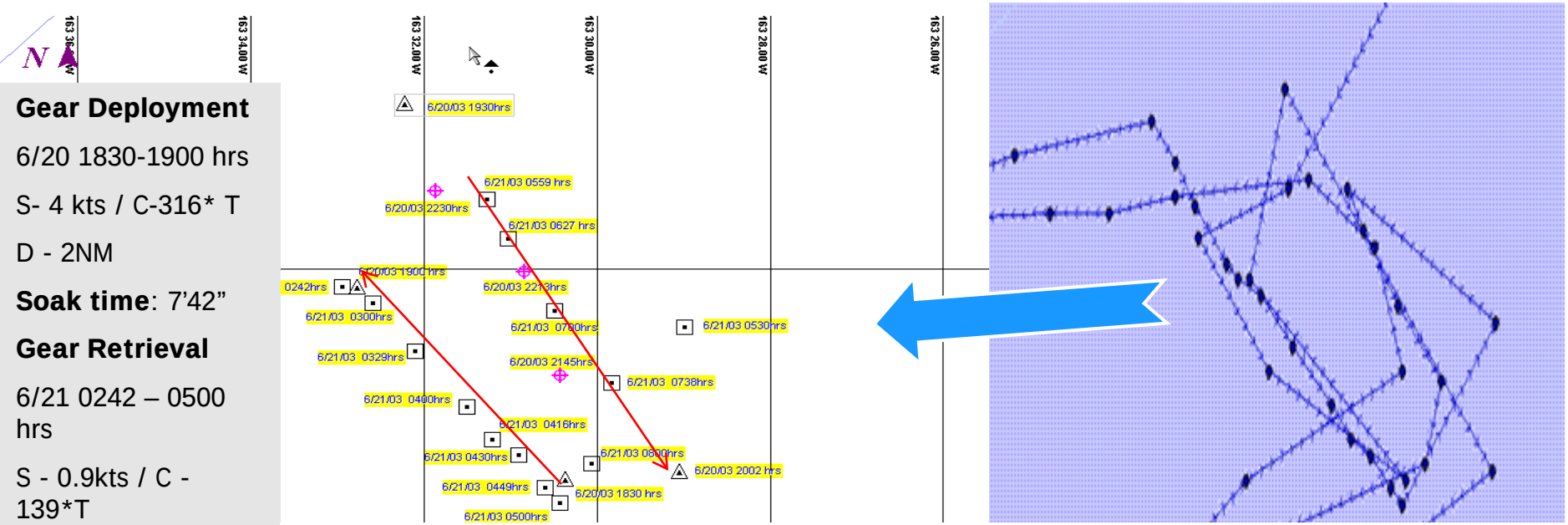
D - 2NM

Soak time: 7'42"

Gear Retrieval

6/21 0242 – 0500 hrs

S - 0.9kts / C - 139*T



Once confronted with evidence, the Captain did not admit guilt but negotiated a settlement in the case.

VMS under RFMO's and International Agreements

Checklist for Attempting to Determine if a Foreign Vessel Should Be Reporting, and if so, What Entity Should Have Visibility Of The Vessel Positions*

The following series of slides provides a number of items to check while boarding a FFV to determine VMS data flow and whether or not an officer/inspector will be able to view the vessel's track line

VMS requirements and limitations are based on RFMO and national requirements and may vary significantly.

* in the Pacific Region

Check The Vessel's Licenses, Authorizations, Vessel Register, and Registration of FV Listings

- IATTC Vessel Register: https://www.iattc.org//VesselRegister/VesselList.aspx?List=RegVessels&Lang=ENG
  - Similar to WCPFC, this is not a license list, but rather vessels authorized by their flag State to fish for HMS in the IATTC area
  - Unlike WCPFC, IATTC does not have a Commission VMS, but rather relies on flag States to monitor vessels
  - This also means that the only way to confirm a vessel is successfully reporting in VMS, is to check with the flag State
  - Coastal States may NOT be able to see the VMS track of these vessels entering their EEZ (unless the vessel is also registered with the WCPFC)

Check The Vessel's Licenses, Authorizations, Vessel Register, and Registration of FV Listings

- WCPFC Record of Fishing Vessels (RFV): http://www.wcpfc.int/record-fishing-vessel-database
  - This is not a "license list"; it is a list of vessels "authorized" by their flag State to fish for HMS (tuna) on the high seas in the WCPFC Convention Area
  - Vessels on this list should be reporting in VMS to WCPFC, but are generally only "visible" to WCPFC if/when on the high seas in the Convention Area.
  - Vessels on this list should also (in most cases) be reporting in VMS to their flag States (who likely have fuller visibility than WCPFC)
  - Vessels on this list should be reporting to coastal state(s) when within their EEZ (and/or on the high seas within 100 NM outside of the EEZ)

Check/Determine the Vessel's Targeted Species

- If HMS (tuna), it should likely be on one of the lists above (and if it is not on one or more of those lists above, need to check with the vessel's flag State authorities)
- If not HMS (tuna), there may not be a VMS requirement for the vessel (need to check with your own regional or national fisheries authorities if in doubt)

Check Log Books to Determine Where the Vessel Fished on this Trip

- If on the high seas in the IATTC Area, it should be on at least the IATTC RFV.
- If in an FFA member EEZ, it should be on at least the FFA RFV, & should be visible to FFA VMS staff

Check the VMS Junction Box (Aka “Black Box”) in the Wheel House to Confirm “Power On”

- A very wide variety of VMS units are installed on non-US vessels; some are not easily located/recognized/identified (see examples, in following slides)
- Some captains/vessel masters cannot identify their own VMS units (or reliably determine if they are fully operational)
- Sometimes easiest to start at the VMS antenna and follow the cable back to the wheel house “black box” (that is not always black, and is sometimes inside cabinets)
- Normally the vessel’s flag State authorities and/or FFA (if on the FFA VMS list) will be most reliable in confirming a vessel’s VMS-reporting status/history

Unit Inspection

Is the:

Unit on and functioning?

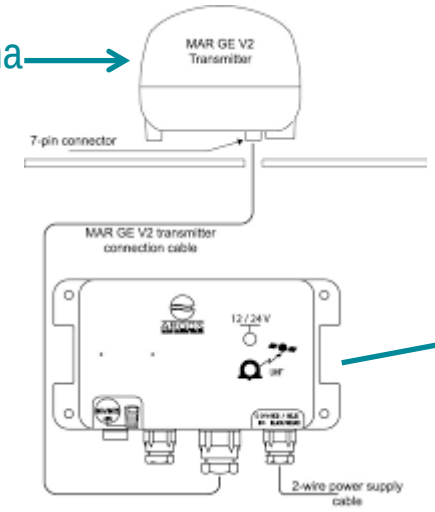
Serial Unit # the same as listed on RFMO Vessel Record?

Wires connected and undamaged between unit and antenna?

Is the Antenna blocked from transmitting?

CLS ARGOS MAR-GE & GE V2

Antenna



Normal display (in wheelhouse)

Power On light

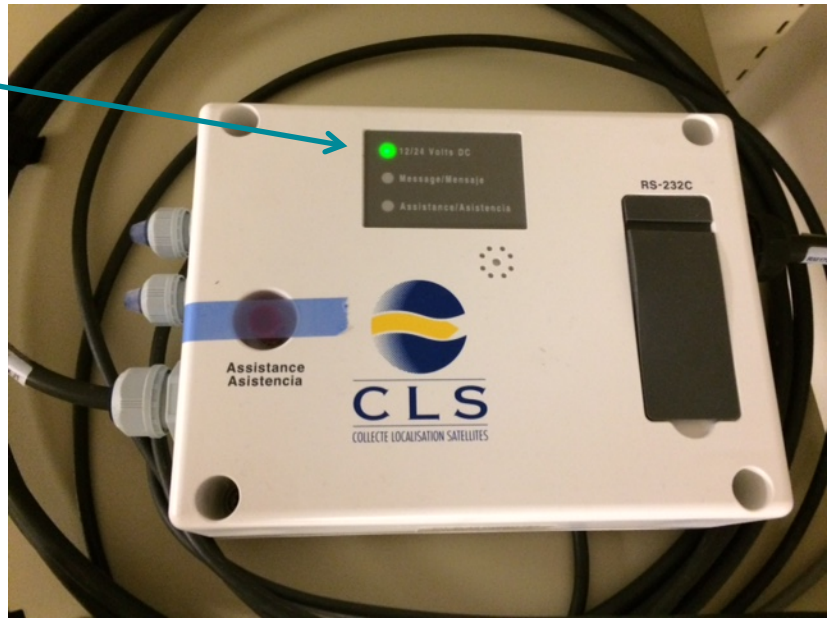
CLS LEO

Normal display (in wheelhouse)
(note: box is only about 2” wide x 4” high)

CLS Thorium TST100

Normal display (in wheelhouse)

Power On light



Furuno Felcom-series

Antenna

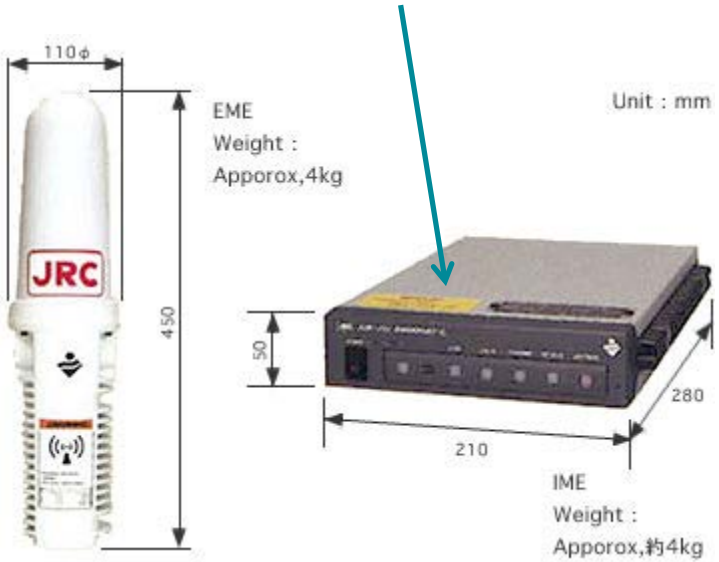
Distress buttons

Power On & status lights

normal display “black box” in wheelhouse

JRC 75C

Normal display (in wheelhouse)
Power On & status lights



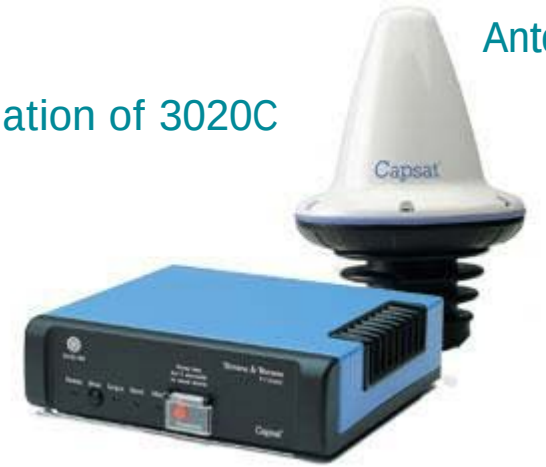
JRC 95VM


Power On & status lights
Antenna
JRC
Internal Mounted Equipment
External Mounted Equipment

Thrane & Thrane 3020C & 3022C & 3026D

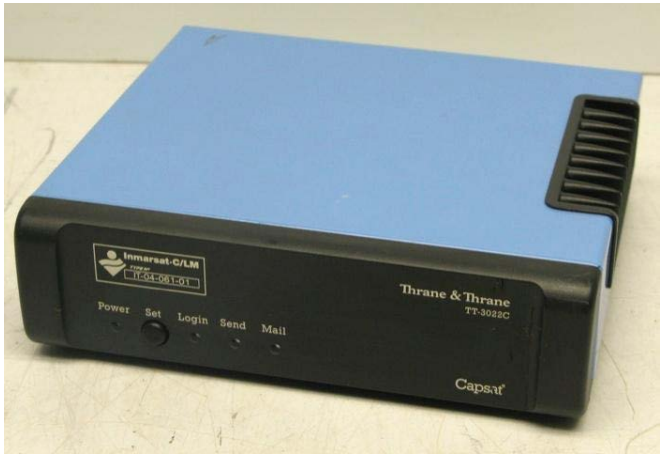
Antenna

Variation of 3020C



3020C “black box” (in wheelhouse)

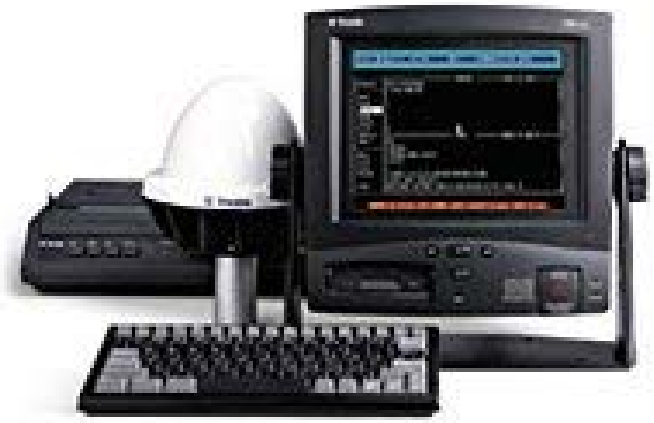
Power On & status lights



3022C “black box” (in wheelhouse)

3026D (mini) antenna & “black box”

Trimble TNL 8001 “black box”/terminal



TNL 8001 antenna, terminal, keyboard

TNL 8001 integrated terminal & junction box

Faria “Watchdog” wheel house components*

Optional Accessories

Faria VTERM™

- 7-inch WVGA TFT color display with an integrated touch-screen.
- Use the display for text messaging, forms reporting and e-mail.

2” User Interface

- Displays system status, when unit detects a GPS fix and an open communication channel.
- Can send emergency notifications

Note: this small round indicator’s readout, in some cases may be the only indication in the wheel house that the unit is operating

* Note: Faria’s “black box” has no lights/indicators & is often installed internally

Multiple Sources of Electronic Information

Other Electronic Devices

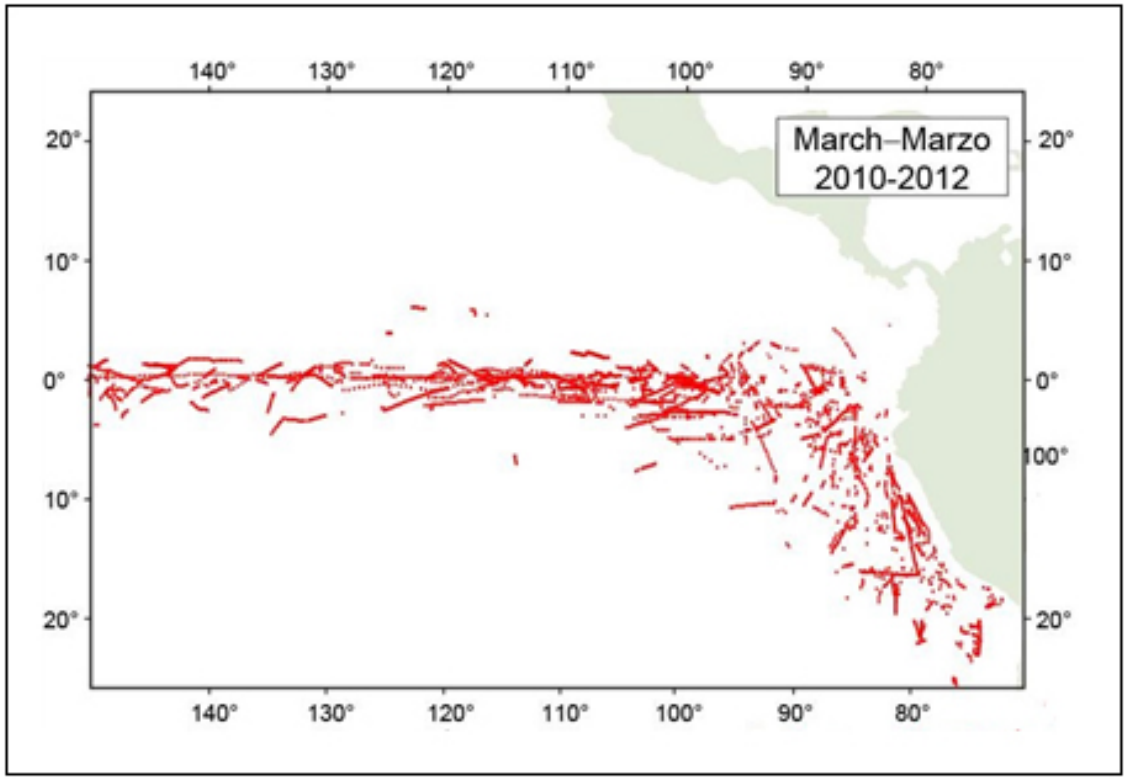
- Electronic devices can provide multiple sources of evidence and can be the most accurate data available in an investigation.
- The ability to identify and secure electronic evidence is essential not only in the present investigation, but also for identifying potential historical violations.
- In addition to Vessel Monitoring Systems (VMS), electronic evidence may be found on devices such as, chart plotters, global positioning systems (GPS), and laptops.

Other Electronic Devices

- Closed Systems (e.g., VMS)
- Open Systems
  - GPS Plotter
  - Radar
  - Sounder
  - Computers
  - Communications equipment
  - Electronic logbooks

Other Electronic Equipment

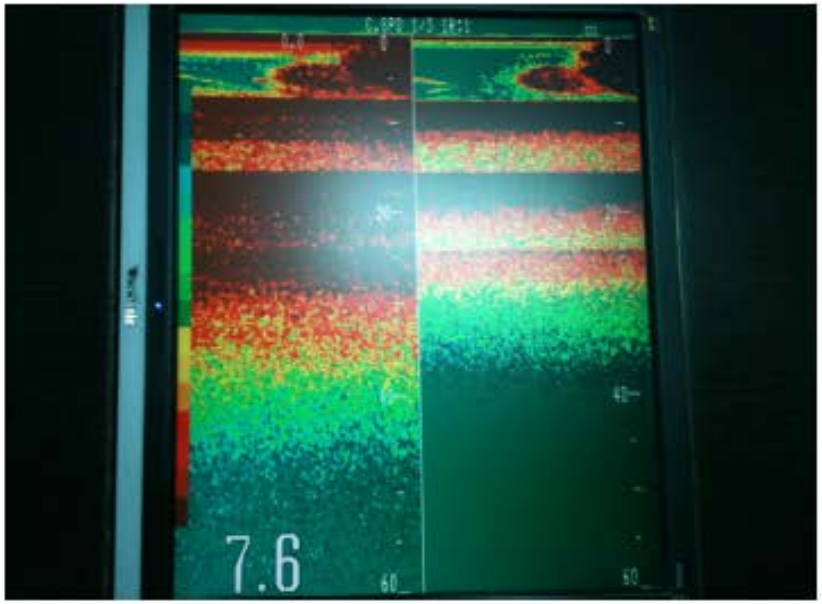
GPS / VMS Antenna



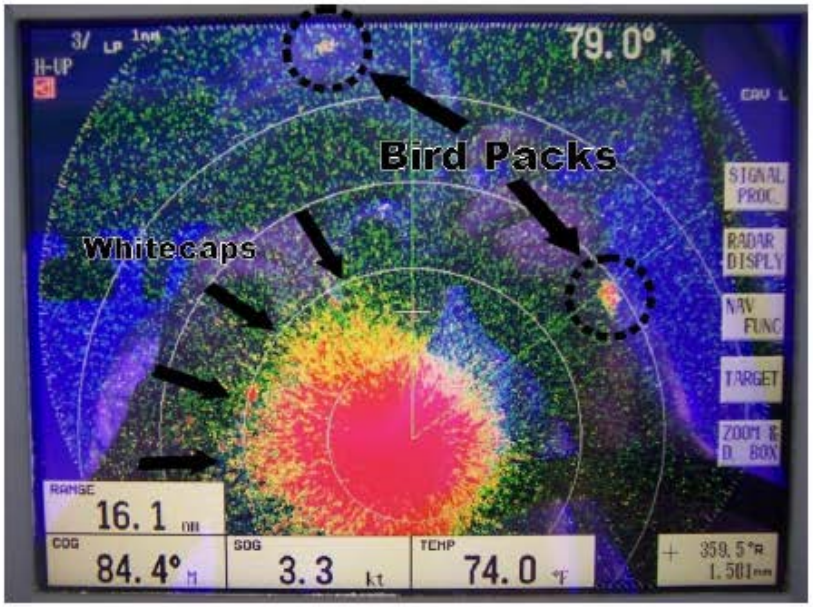
Fisheries Aggregating Device (FAD) Tracking

Other Electronic Equipment

Sounders



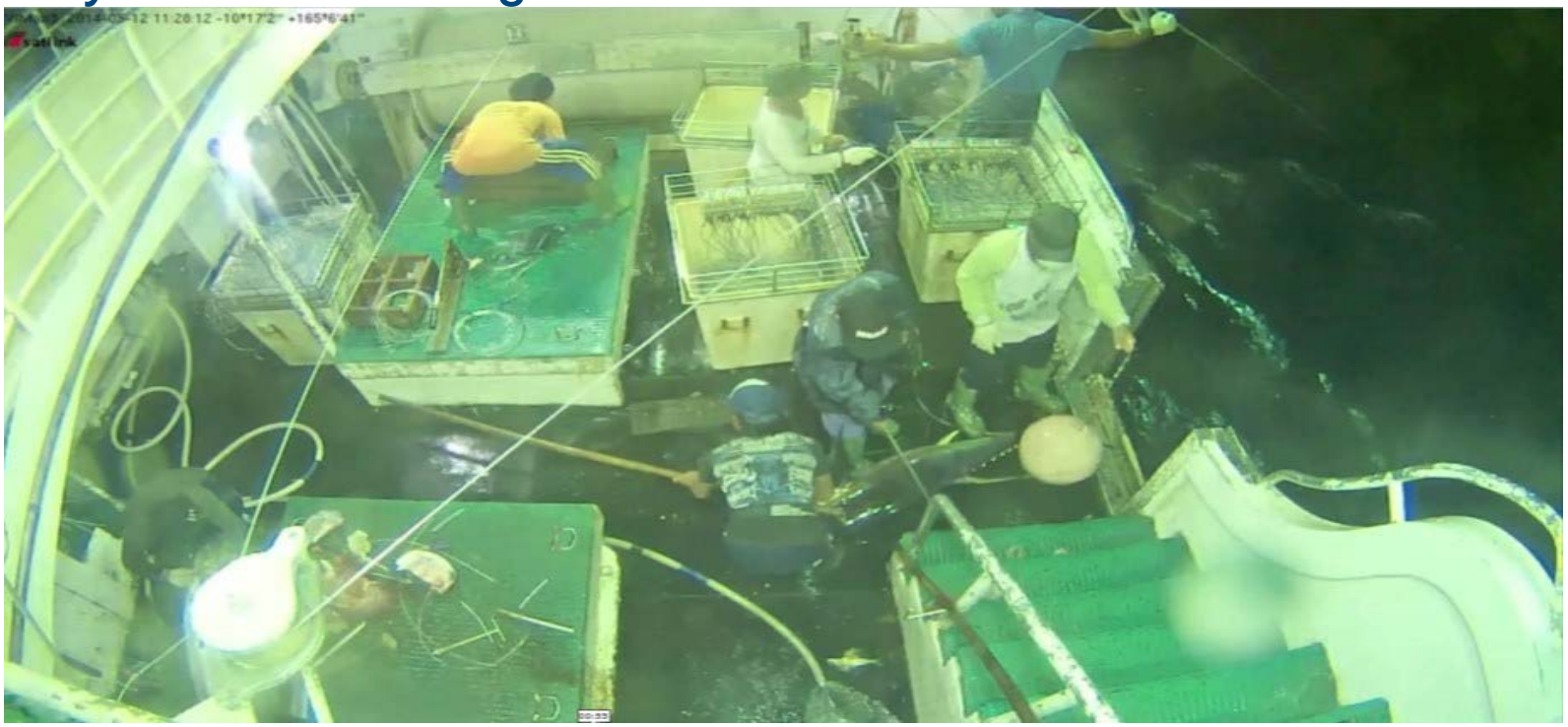
Bird Radar



Photos: Asia-Pacific Fishery Commission

Closed Circuit Television (CCTV) and Electronic Monitoring System (EMS)

- Required video monitoring devices
- Non-mandatory units
- May have recording device on vessel or in remote location



Screen shot from video footage recording fishing activities onboard fishing vessel Yi Man 3. Photo Credit: Satlink.

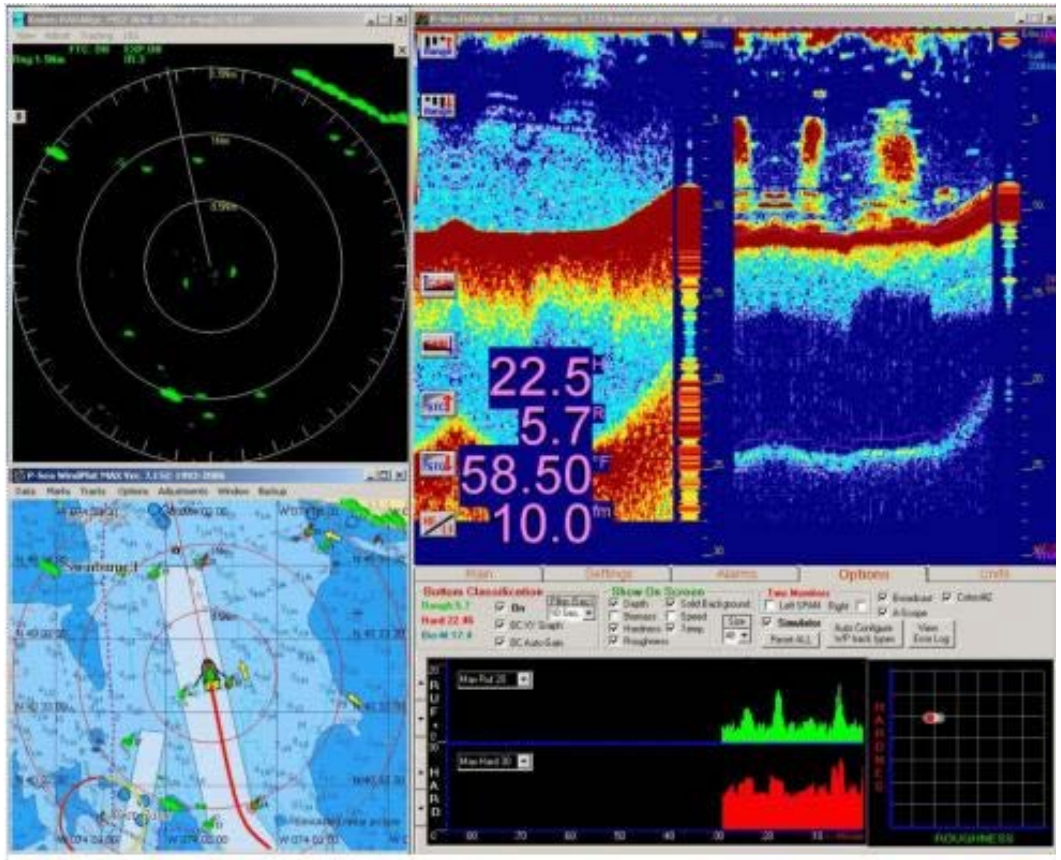
GPS Unit

- Global Positioning System
- Maintain independent storage of marks, tracks, routes
- Connected to PC/Laptops used in vessel navigation
- They overwrite the oldest data – TURN THEM OFF TO PRESERVE DATA
- Use discretion regarding continued safe operation of the vessel (utilize escort)
- Analysis may be able to reveal if any changes were made to the device and when those changes were made

Personal Computer/Laptop

- Uses software to display data received from GPS unit and overlay onto a chart
- Creates a 2nd set of available data
- Identifies what part of the GPS data is most valuable to the captain (ie, it's been saved)
- May identify if there has been obstruction or deletion of data (time/date stamps)
- Provides other data (VMS emails - SkyMate)

Chart Plotter



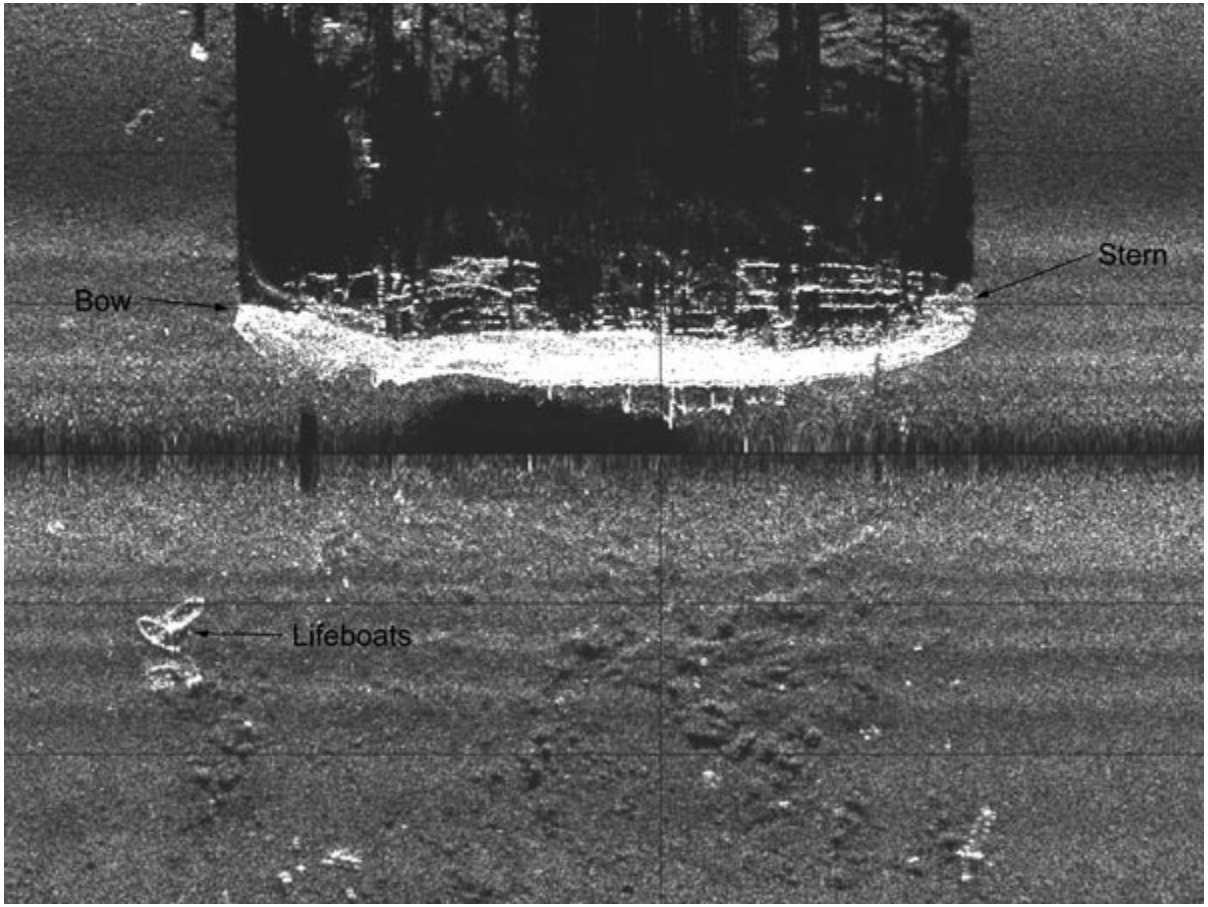
“P-Sea WindPlot is a commercial fishing software program that can display many types of raster and vector nautical charts called moving maps, including; C-Map and Navionics World-Wide vector Charts, MapTech, BSB'S CHS/NDI or NOS/NOAA and our own 2D and 3D bathymetrics. With ARPA Radar ovelay, AIS tracking, FishFinder and Bottom Characterícstic Options”

Sounder/Sonar

SOund NAvigation and Ranging

Used to find and identify objects in the water

Can be used for fish detections and determining seabed conditions



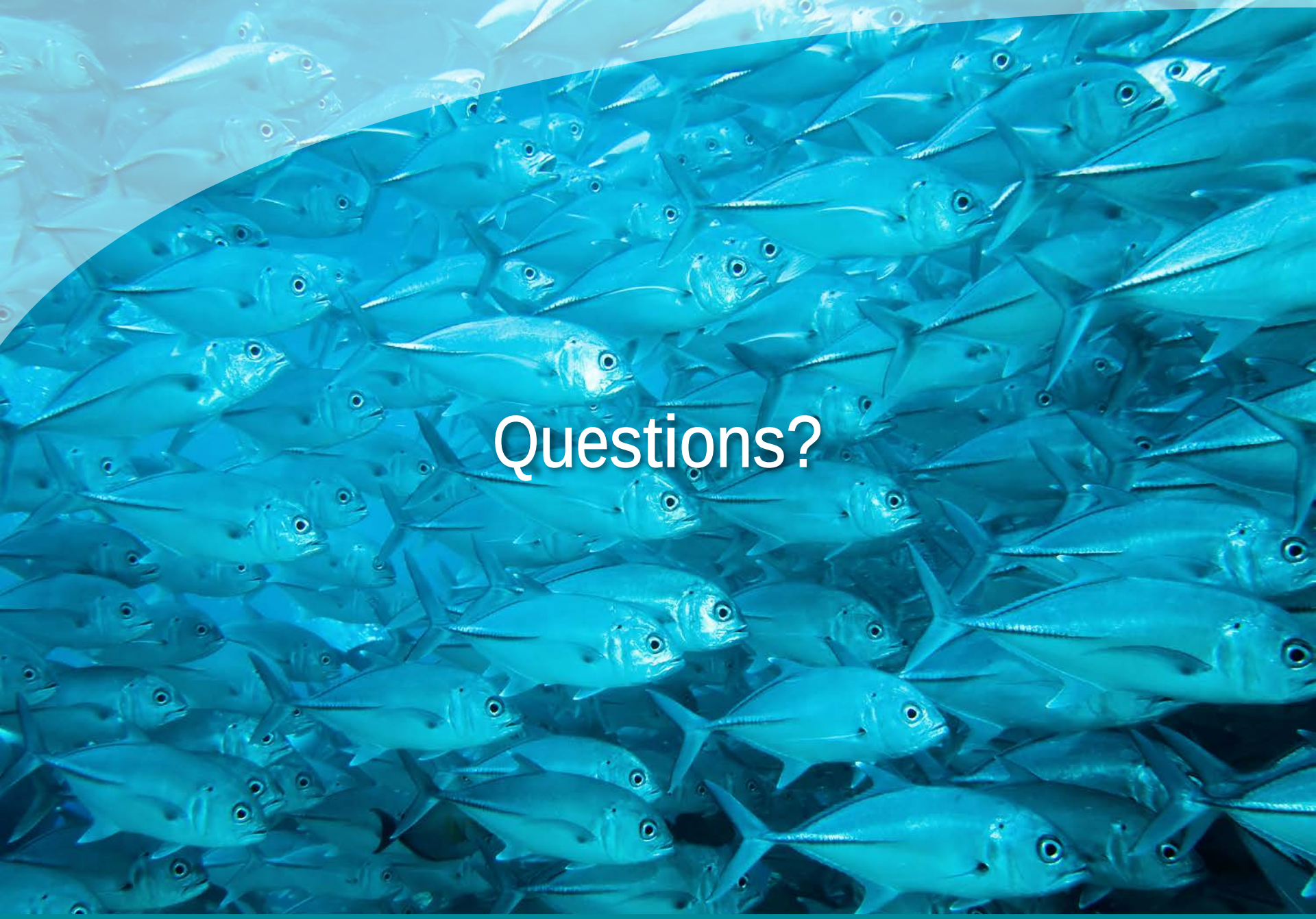
A side-scan sonar image of the passenger freighter Robert E. Lee, collected by the HUGIN 3000 AUV in 2001.

Why electronic information is important

- It can be the most accurate data available in the investigation
- It can provide more detailed vessel signature data (due to reporting frequency)
- GPS data consistently verifies the accuracy of VMS data – helps legally substantiate the data
- It can help uncover historical violations
- It a source to identify when people lie/obstruct
- Know there is always a potential it may exonerate a subject

Summary

- Value of VMS / AIS is based on:
  - understanding and familiarity of the system available to you,
  - RFMO and national restrictions on access
- Proven effective tool for MCS practices and compliance by the monitored fleets
- Think outside the box for investigative purposes


Questions?