

# Vessel Characteristics

# Learning Objectives

Upon successful completion of this lesson, the student will be able to:

- Describe typical ship type characteristics, speed, track patterns, and operating range for the following vessel types:
  - Fishing
  - Cargo and Tankers
  - Passenger and Cruise Ships
  - Tug, Tow, and Pilot
  - Research
  - Other Vessel Types

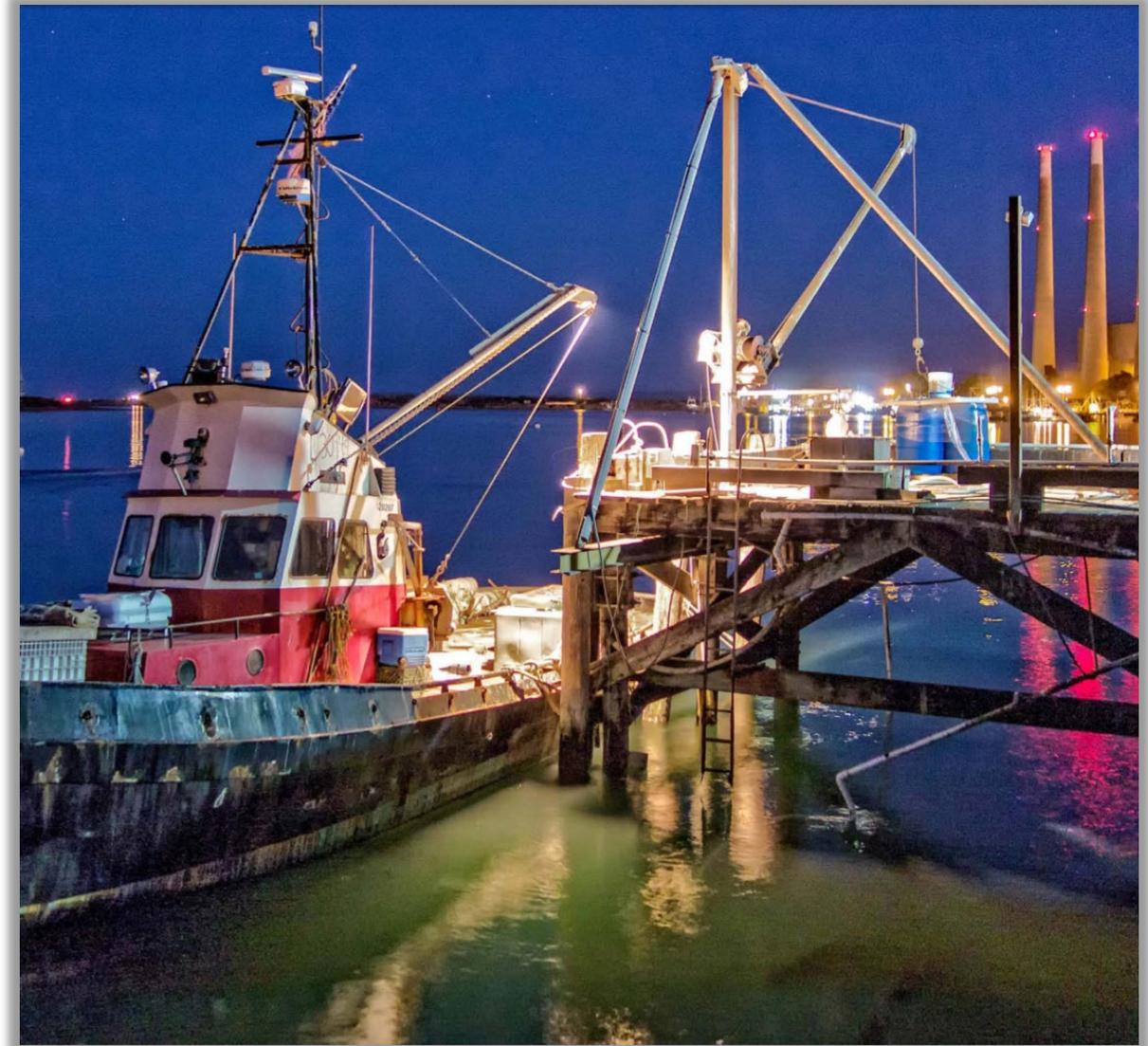
# Vessel Types

- Large vessels (> 300GT) consist of:
  - Cargo
    - (Bulk, Container, and Hazardous)
  - Tankers
    - (Chemical, Oil, and Other)
  - Military, Passenger, and Cruise ships
- These vessel types will all have their own International Maritime Organization (IMO) number



# Vessel Types (cont.)

- Medium-size vessels consist of:
  - Fishing
    - Trawlers, Longliners, and Motherships
    - Tuna Passenger ships
  - Patrol vessels



# Vessel Types (cont.)

- Small vessels
  - Wooden canoes
  - Fiberglass boats
  - Speed boats
  - Sailboats
  - Paddle boats
  - Dhows
- Others
  - Oil rigs
  - Buoys
  - Research

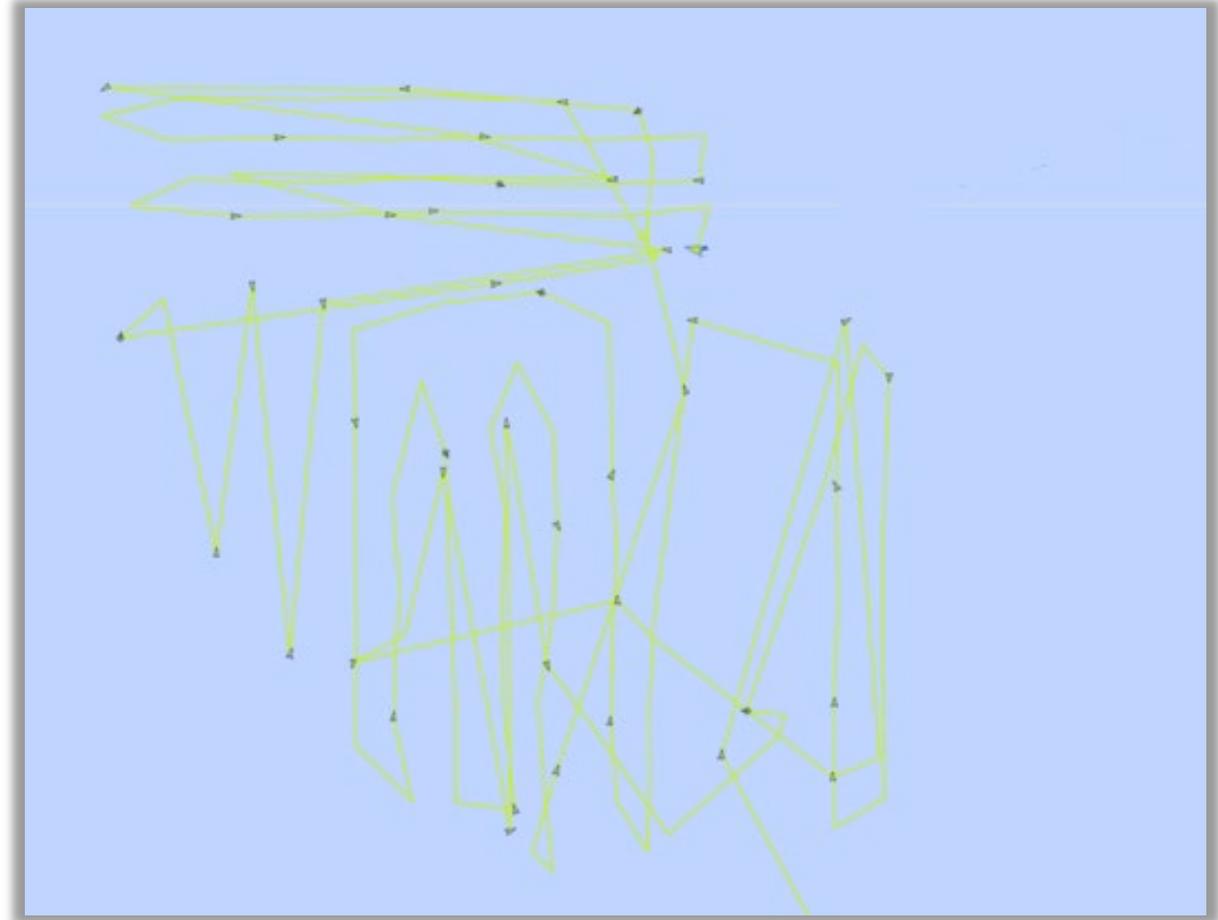


# Details of Vessel Characteristics

- Owner (country flag, and registry)
- Crew (nationality and criminal records)
- Cargo (hazardous, illegal, weapons, and drugs)
- History (high-risk vessels, detained previously, and previous inspections)
- Current activity (fishing, transport, etc.)
- Current and historical position (vessel tracks and ports visited)
- Dynamic information (speed and heading)

# Vessel Characteristic Considerations

- Different size ships behave differently
- Fishing vessels are always in search of fish, but they do it differently
- It may be hard to distinguish from one that is actually setting and hauling their fishing gear from other ship types





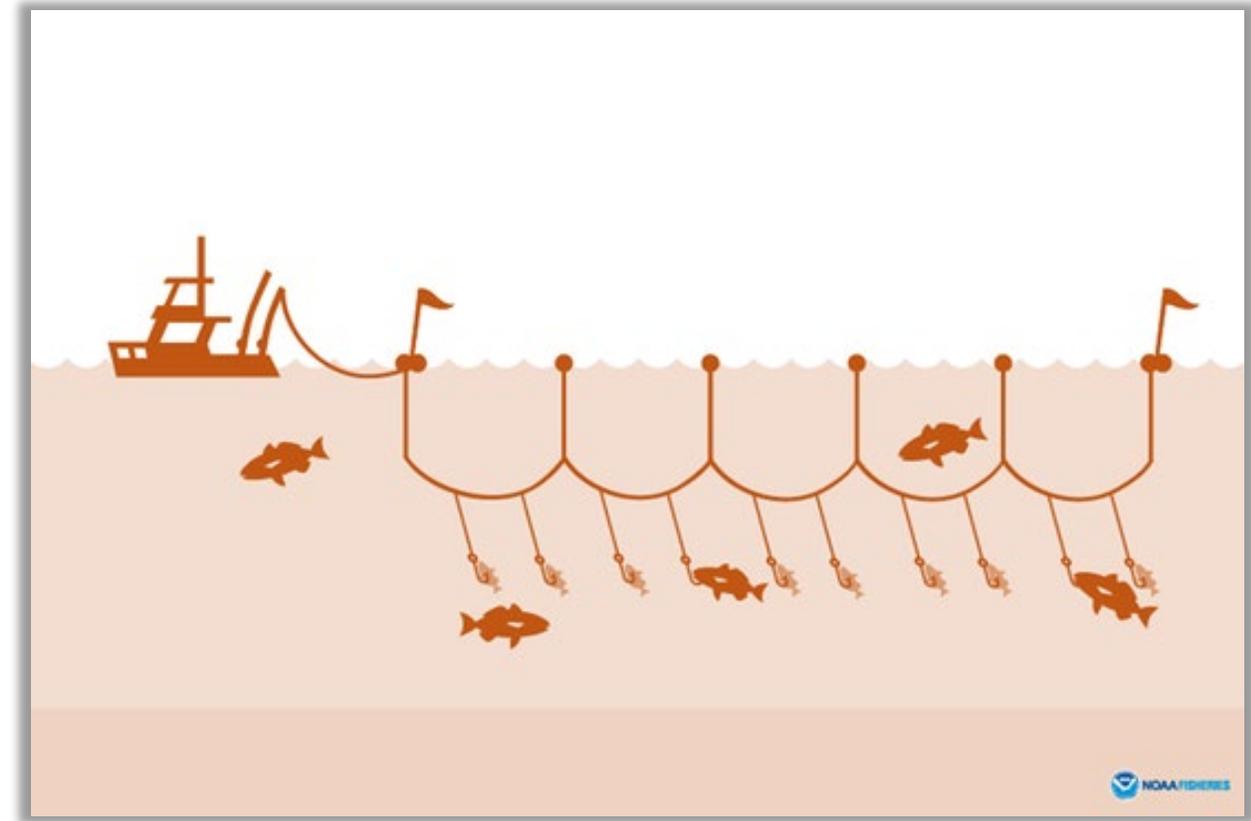
# Fishing Vessels

- Large commercial fishing vessels (>300 GT) are required to carry an AIS beacon
- About 70,000 vessels report they are fishing, but the signals do not identify the kind of fishing they are doing
- Self-reporting isn't entirely reliable
- Whether intentionally or accidentally, vessel operators sometimes enter the wrong codes



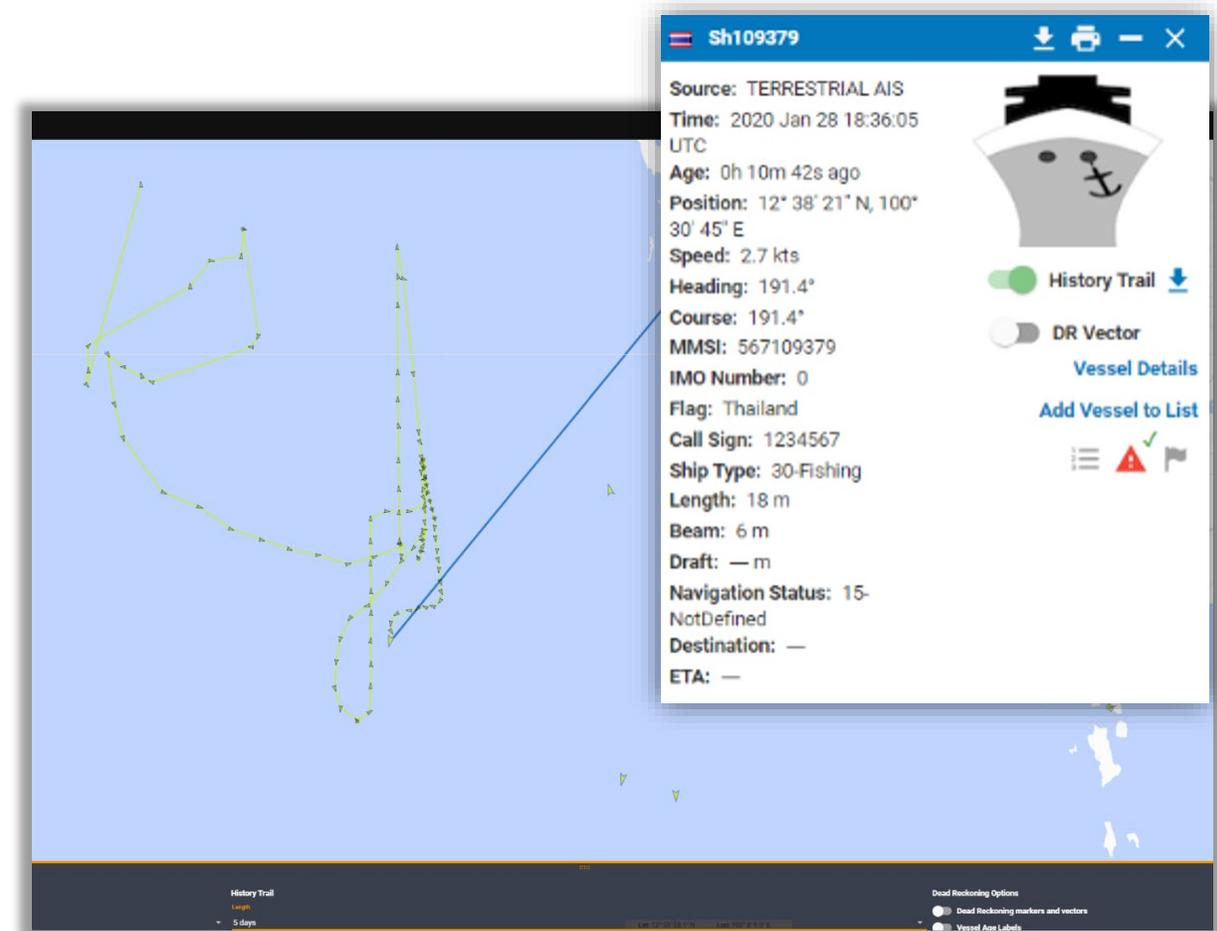
# Types of Fishing Vessels - Longliner

- Longliner fishing or longlining, is a commercial fishing technique
- Lines can be up to 10 kilometers with 70,000 hooks



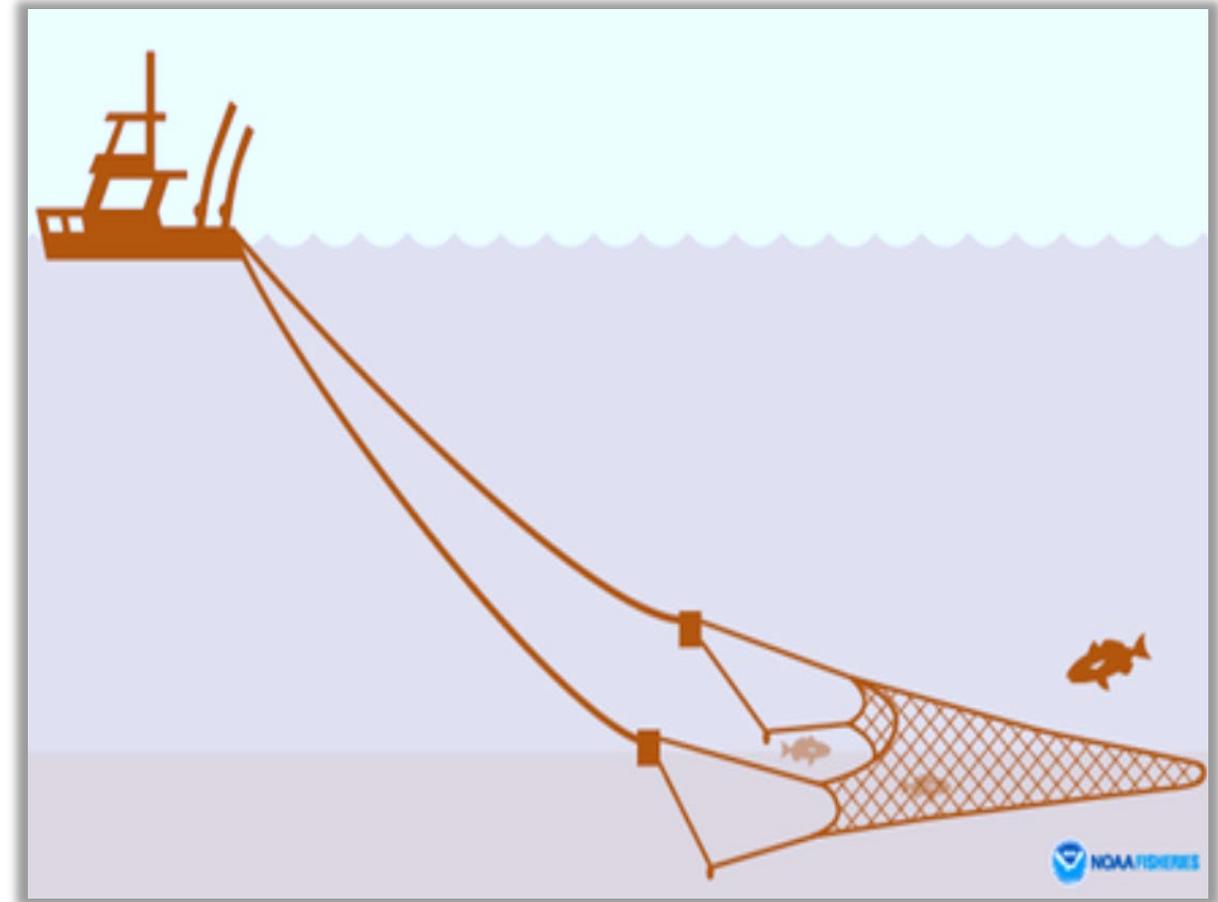
# Types of Fishing Vessels - Longliner Tracks

- Longliners traverse an area back and forth as they alternately set their hooks and return to pull them in
- Tracks are spikey, tracing the same line again and again as they set their hooks and return to retrieve their catch



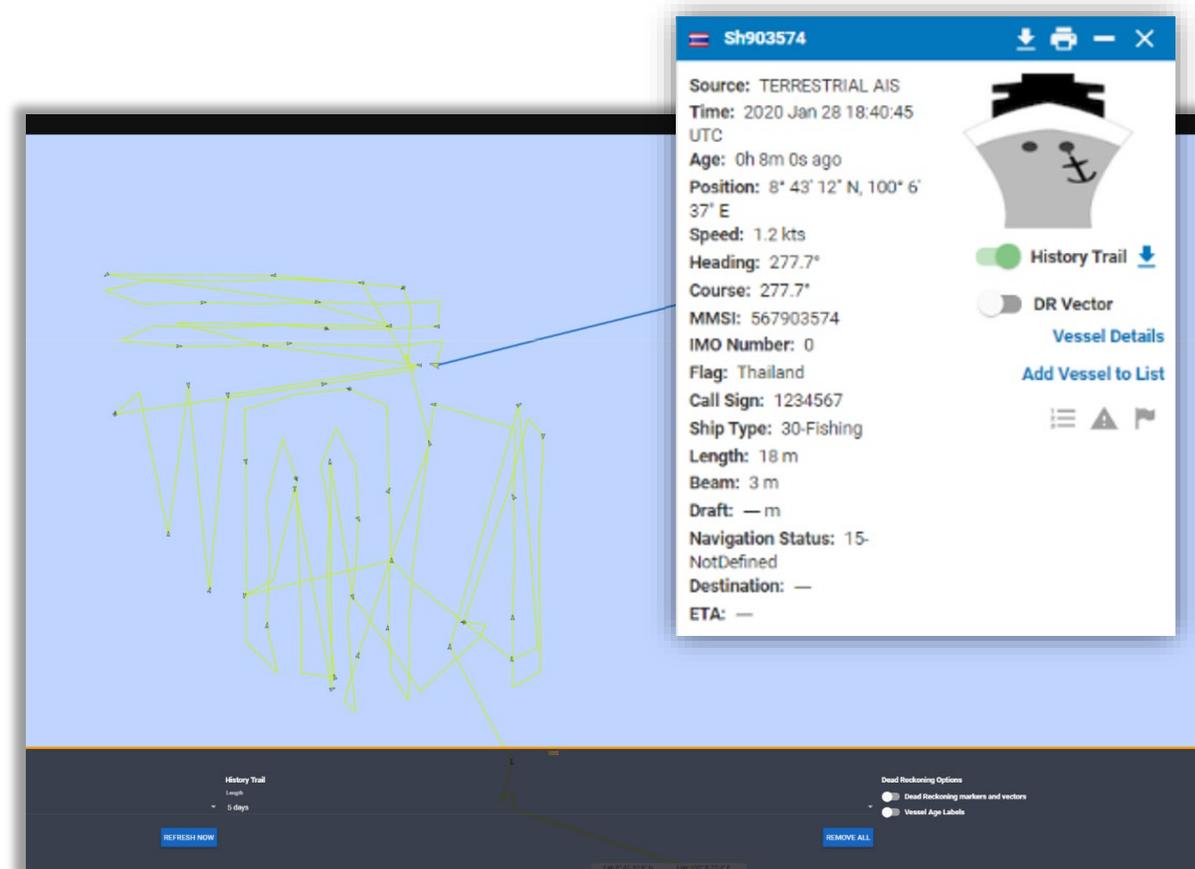
# Types of Fishing Vessels - Trawlers

- Trawls are fishing nets
- Pulled either along the bottom of the sea or in midwater at a specified depth



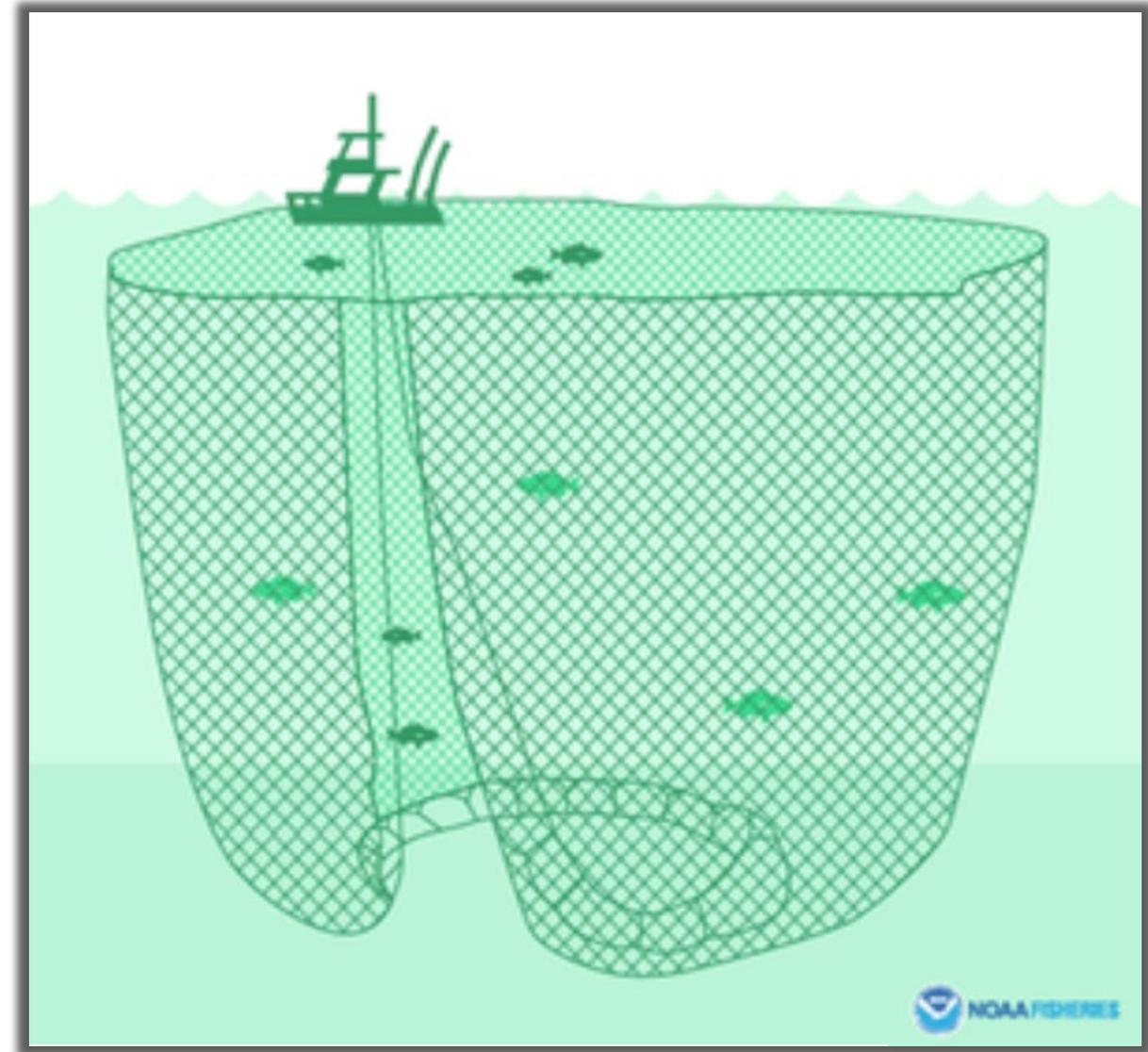
# Types of Fishing Vessels - Trawler Tracks

- Trawling is a method of fishing that involves actively dragging or pulling a trawl through the water behind one or more trawlers
- Trawlers move at a constant speed dragging their gear behind them
- Their back and forth movement displays a zig-zag pattern



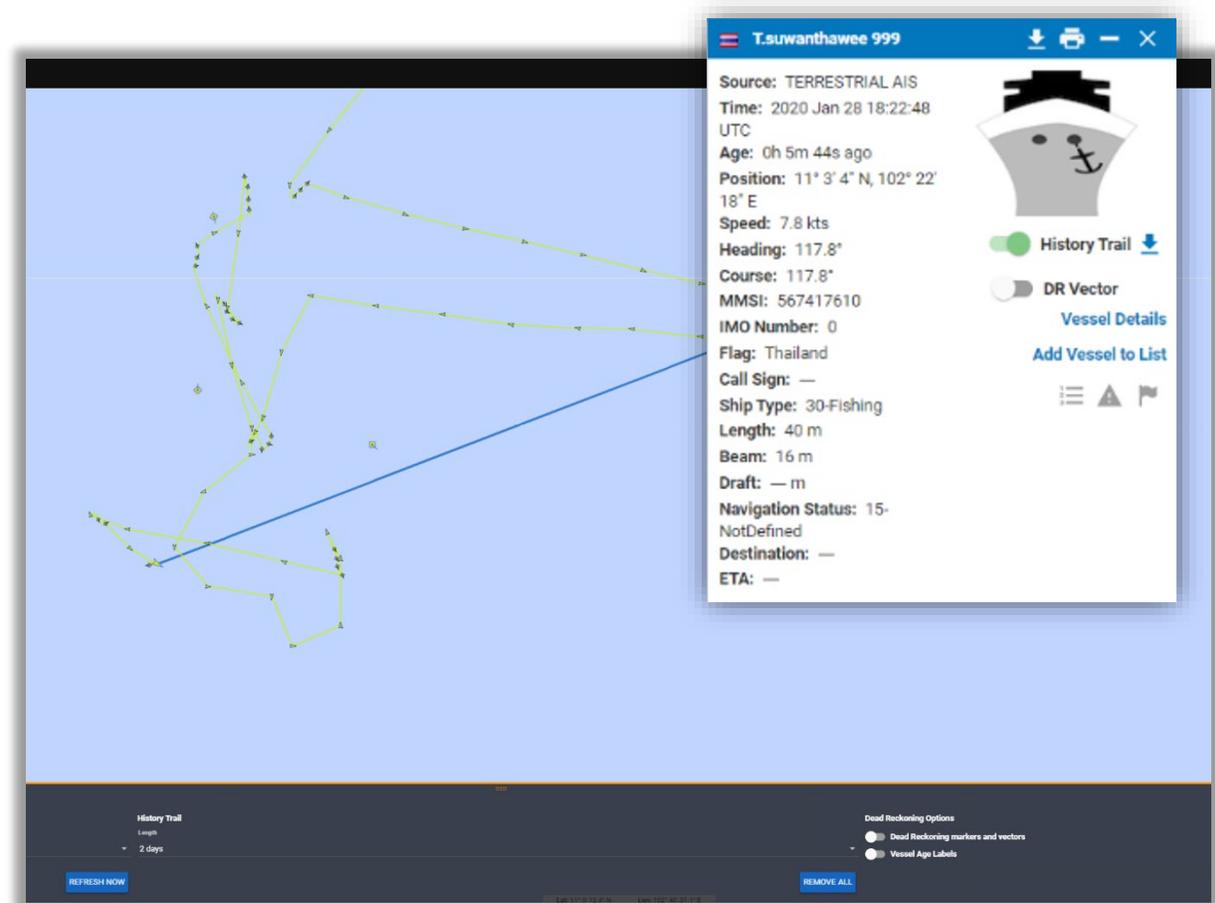
# Types of Fishing Vessels - Purse Seines

- A purse seine is a large wall of netting deployed around an entire area or school of fish

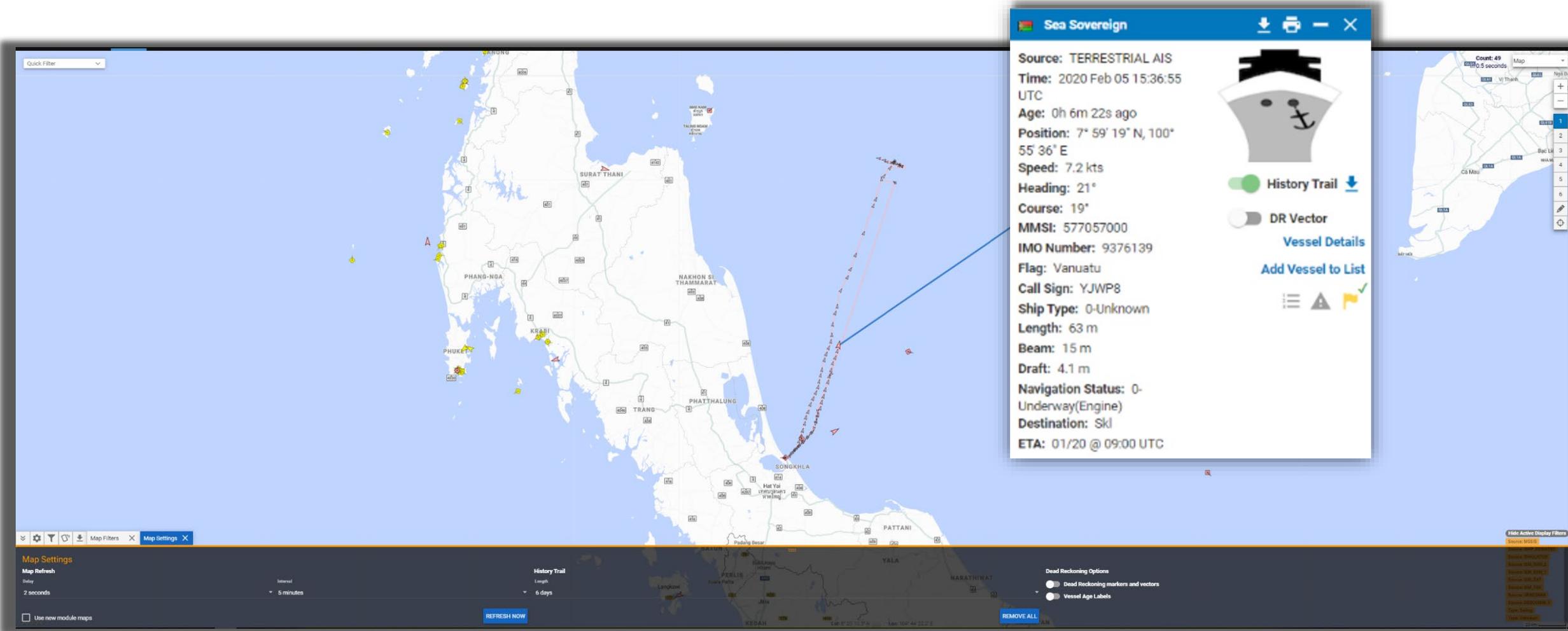


# Types of Fishing Vessels - Purse Seines Tracks

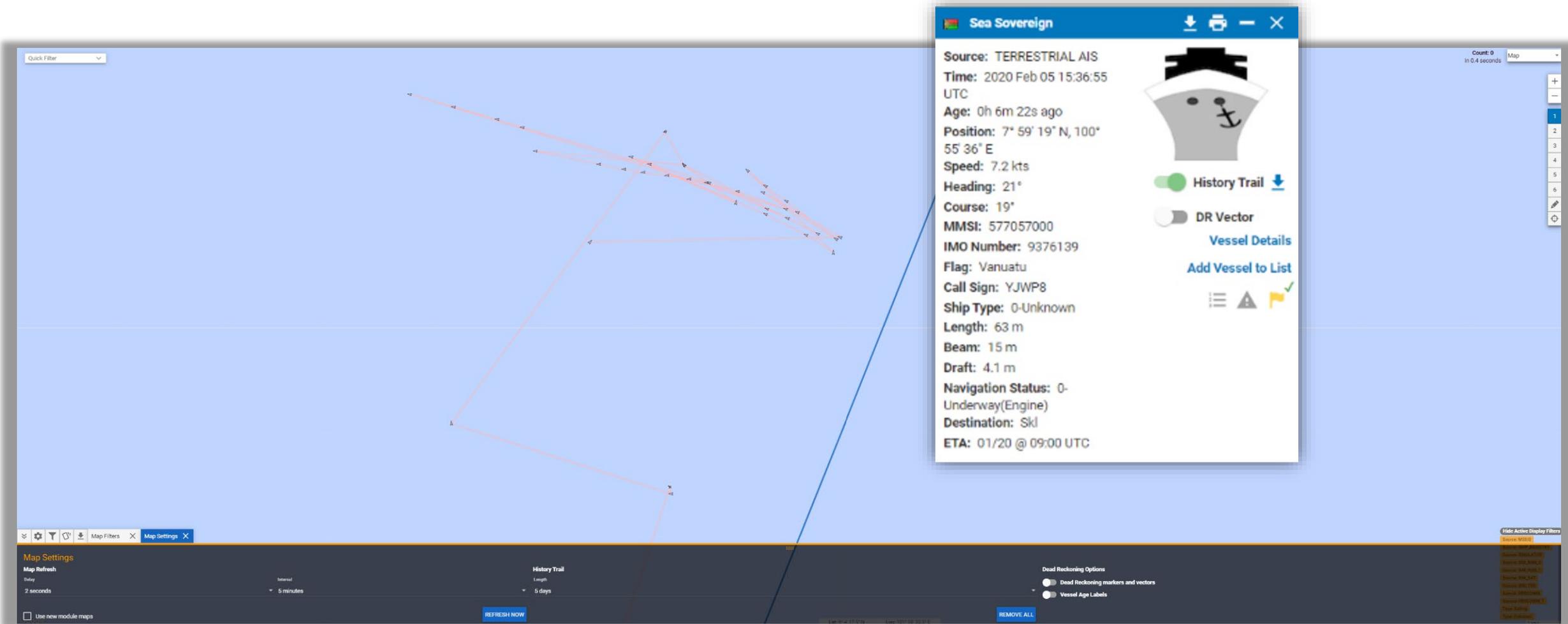
- Purse seine vessels stay more or less stationary except when closing nets
- Speed over ground is generally slow, ranging around 2.5 knots or less



# Unknown Vessel Type Engaged in Fishing?



# Zoomed in Track Reveals a Possible Longliner



# Fishing Vessel Summary

## Normal Operating Speeds

- 2.3-5.6 knots
- During transit to their fishing locations, vessels may go at speeds of 10-15 knots depending on the size of the vessel

## Track Patterns

- Longliner
- Trawling
- Purse Seines

## Normal Operating Range

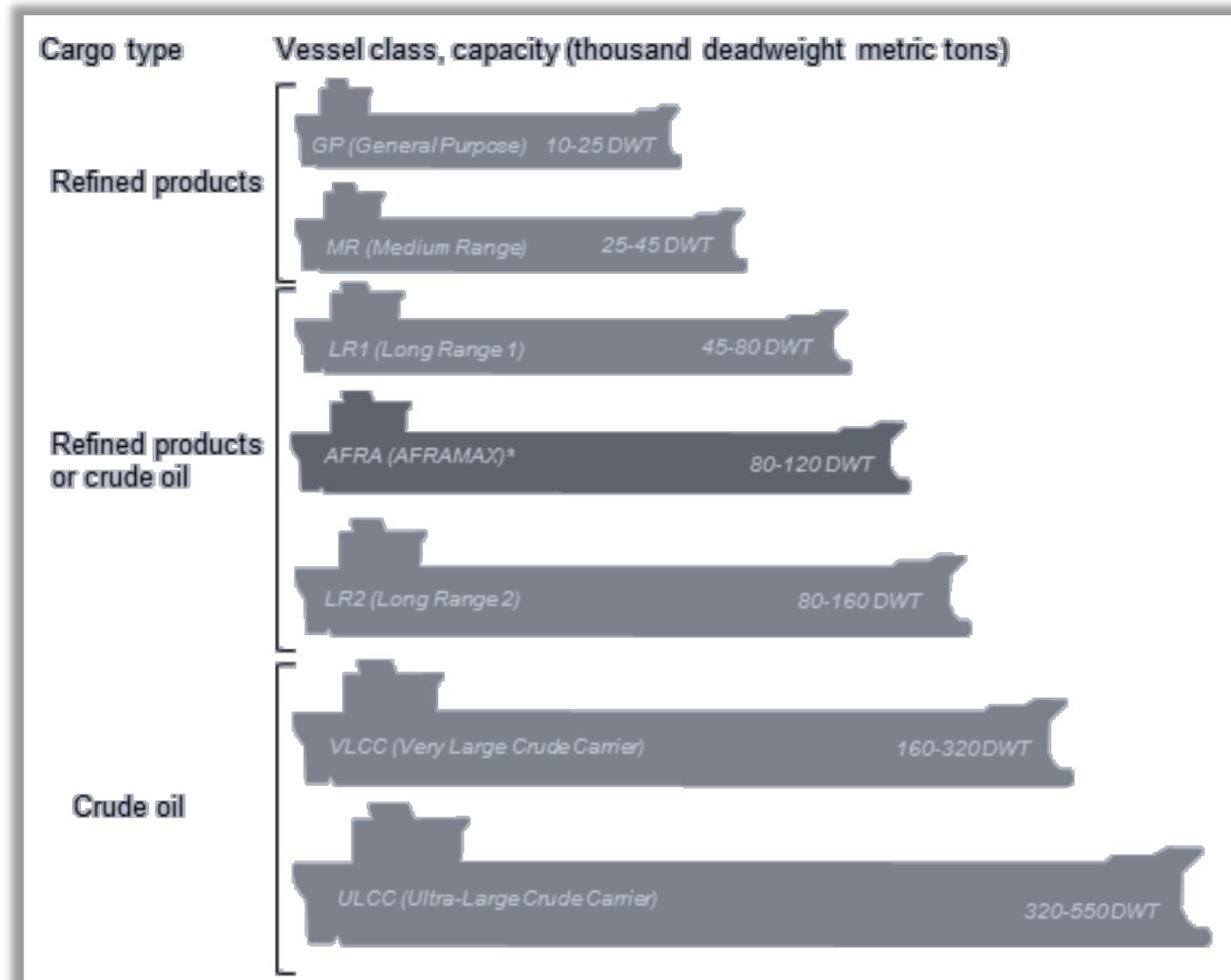
- Limited only by other countries' Exclusive Economic Zone (EEZs)

# Cargo Ships and Tankers

- Cargo ships and tankers are relatively easy to identify
  - Typically move from port to port in a fairly straight line and steady speed
- Non-characteristic movement
  - Erratic patterns

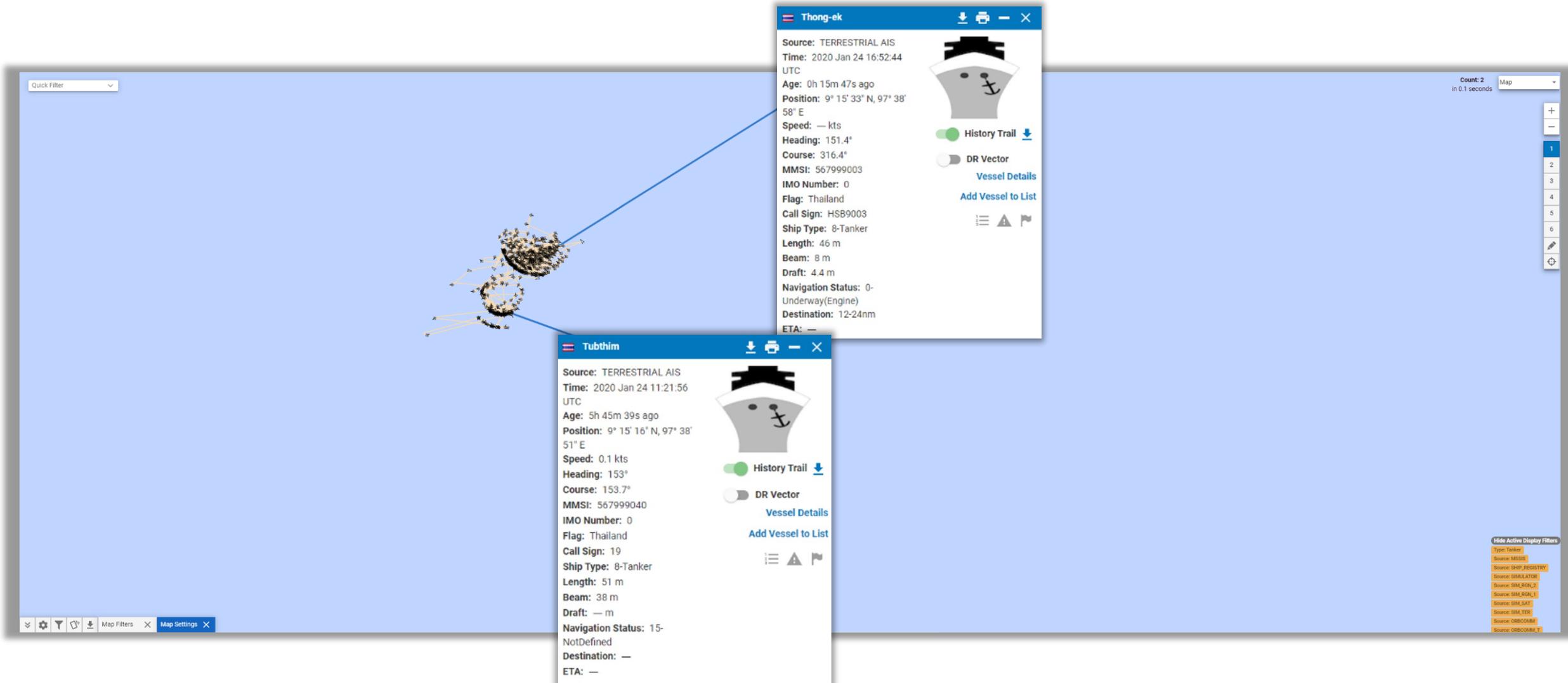


# Comparison of Tanker Size





# Tanker at Anchor



# Cargo Ships and Tankers Summary

## Normal Operating Speeds

- They prefer consuming the least amount of fuel by adopting lower speeds
- Normal ship speeds are:
  - 12-15 knots

## Track Pattern

- Mostly point to point
- Cargo Ships and Tankers will want to operate cost-effectively and, if possible, go from point to point in a straight line

## Normal Operating Range

- Can be worldwide, based upon their service area
  - Larger ships travel from continent to continent
  - Smaller vessels have set local routes

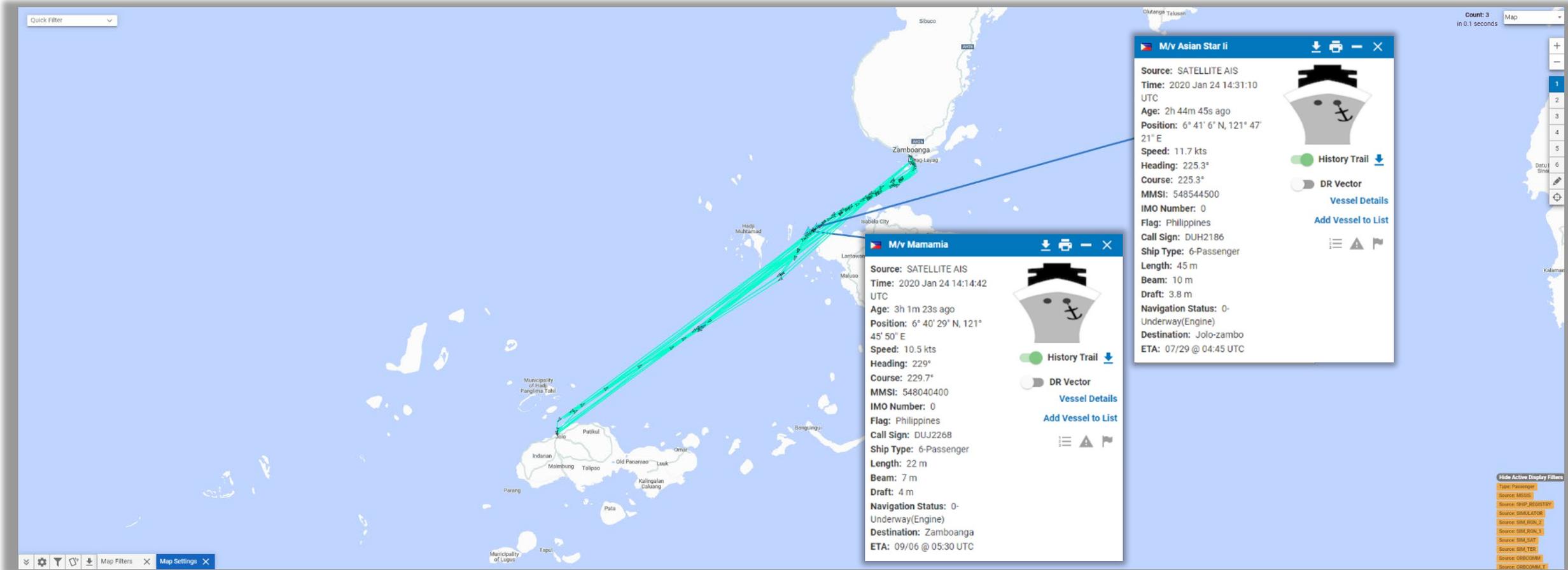
# Average Cargo / Tanker Transiting Speeds

Standard Type	Count	Avg Main hrs.	Avg Aux kW	Avg Cruising Speed	Default Vessel Category
Bulk Carrier	3,177	8,990	1,935	14.3	3
Bulk Carrier, Laker	80	7,069	2,216	13.7	3
Buoy Tender	4	4,266		12.6	2
Container	1,218	39,284	7,851	23.2	3
Crude Oil Tanker	731	15,070	2,888	15.1	3
Drilling	7	15,806	12,840	11.7	2
Fishing	123	1,262	272	2.3	1
FPSO	2	18,123		11.5	3
General Cargo	1,020	6,130	1,619	14.6	3
Icebreaker	2	21,844		12.0	2
Jackup	4	1,643	270	3.5	1
LNG Tanker	44	29,607	8,129	19.2	3
LPG Tanker	151	8,557	3,021	15.8	3
Misc.	35	2,805	631	10.0	1
Passenger	168	45,760	4,477	20.4	3
Pipelaying	14	11,355	5,037	12.6	2
Reefer	182	8,930	3,328	18.9	3
Research	55	5,395	1,905	11.2	2
RORO	72	9,479	4,006	16.7	3
Supply	255	3,201	662	10.1	1
Support	73	6,590	2,305	9.7	2
Tanker	1,423	8,474	2,730	14.5	3
Tug	396	3,440	348	7.7	2
Vehicle Carrier	441	13,829	3,729	19.8	3
Well Stimulation	3	7,697	340	8.2	3

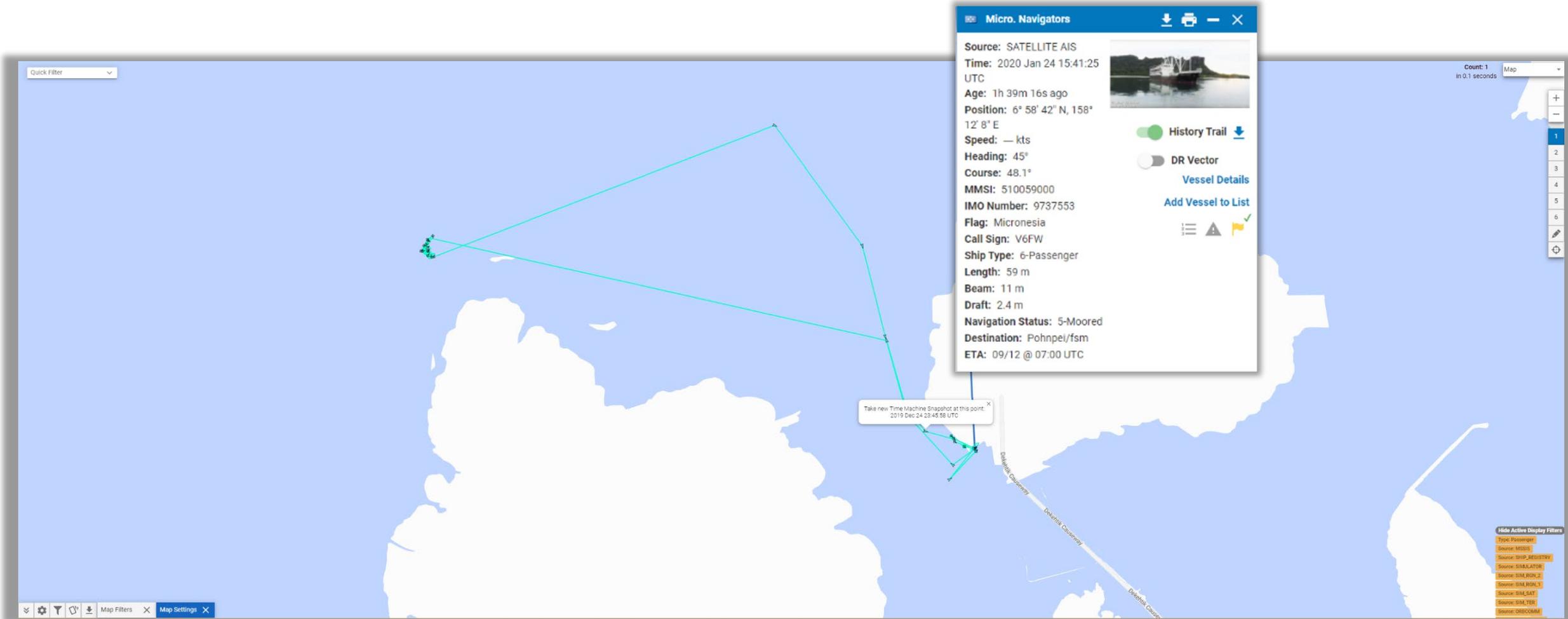
# Passenger and Cruise Ships



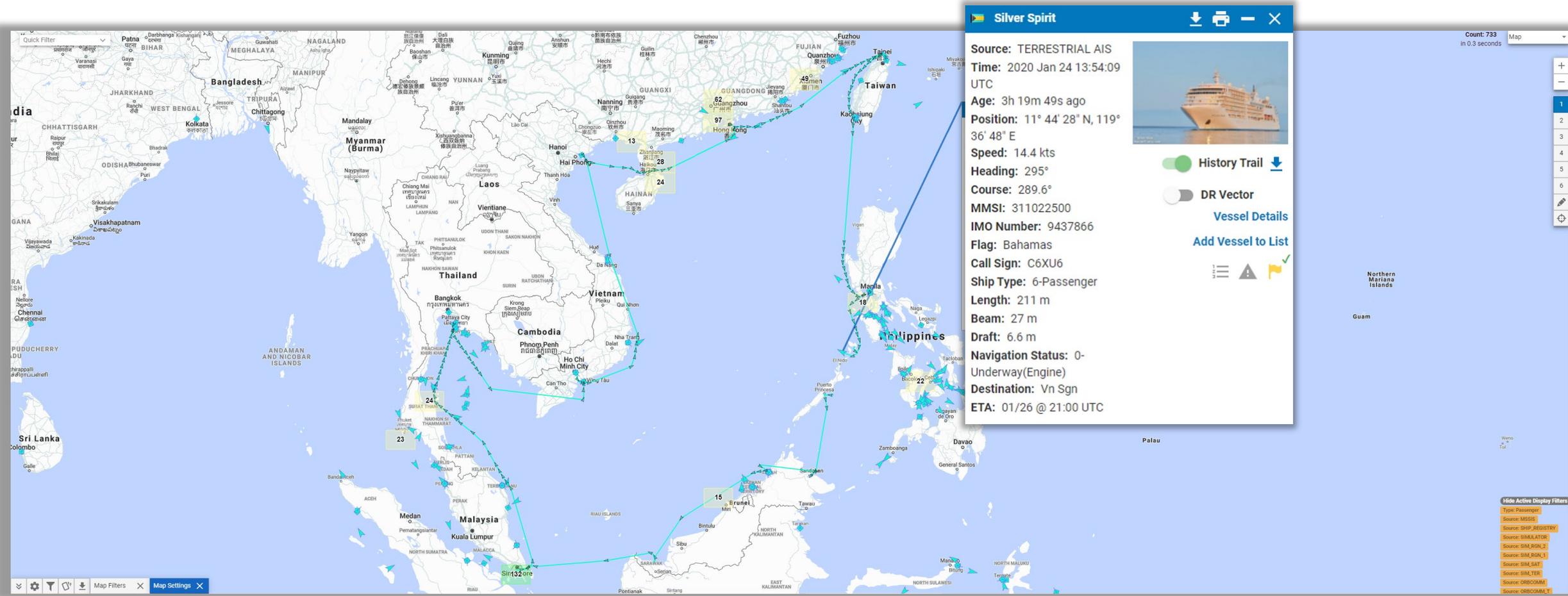
# Passenger - Point-to-Point



# Daily In-and-Out Pattern



# Passenger Ships and Cruise Liners



# Passenger and Cruise Ships Summary

## Normal Operating Speeds

- 15–20 knots

## Track Pattern(s)

- Passenger vessels will display a more consistent pattern like set schedule between distinct locations

## Normal Operating Range

- Mostly point to point but displaying their History Trail will help to confirm their stops have been at relevant locations

# Cargo or Passenger?

**Ocean Venture II**

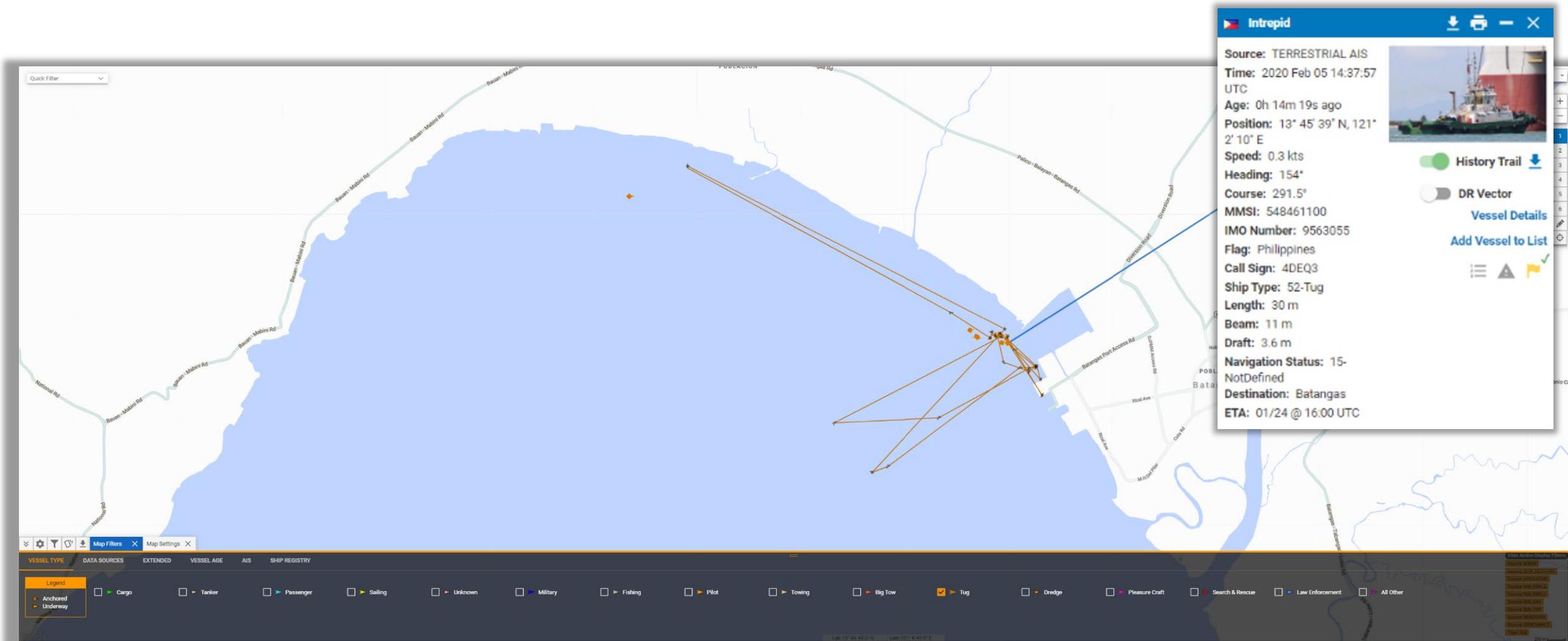
Source: SATELLITE AIS  
 Time: 2020 Jan 24 16:53:32 UTC  
 Age: 0h 25m 14s ago  
 Position: 6° 20' 8" S, 79° 27' 28" E  
 Speed: 13.2 kts  
 Heading: 229°  
 Course: 235.7°  
 MMSI: 577079000  
 IMO Number: 9688740  
 Flag: Vanuatu  
 Call Sign: YJRZ4  
 Ship Type: 6-Passenger  
 Length: 76 m  
 Beam: 11 m  
 Draft: — m  
 Navigation Status: 15-NotDefined  
 Destination: —  
 ETA: 00/00 @ 24:60 UTC

History Trail  
 DR Vector  
 Vessel Details  
 Add Vessel to List

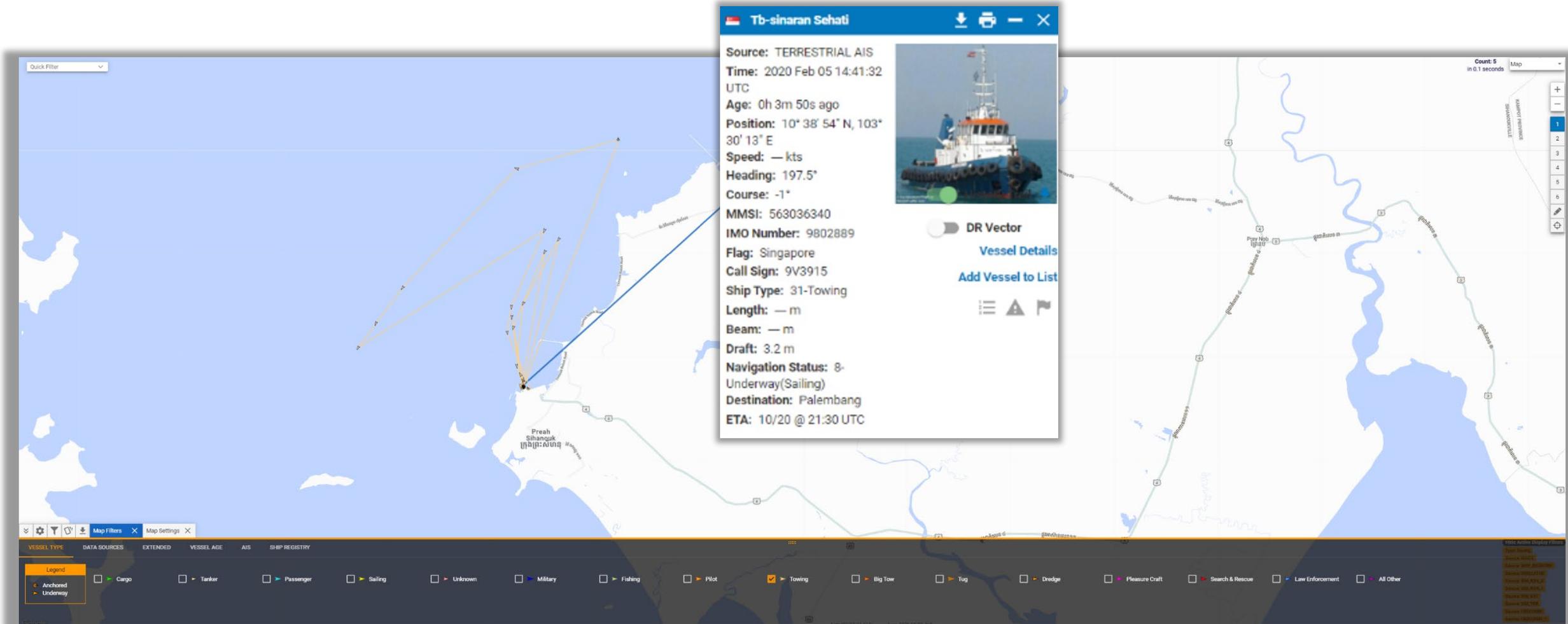
# Tug, Tow, and Pilot Vessels



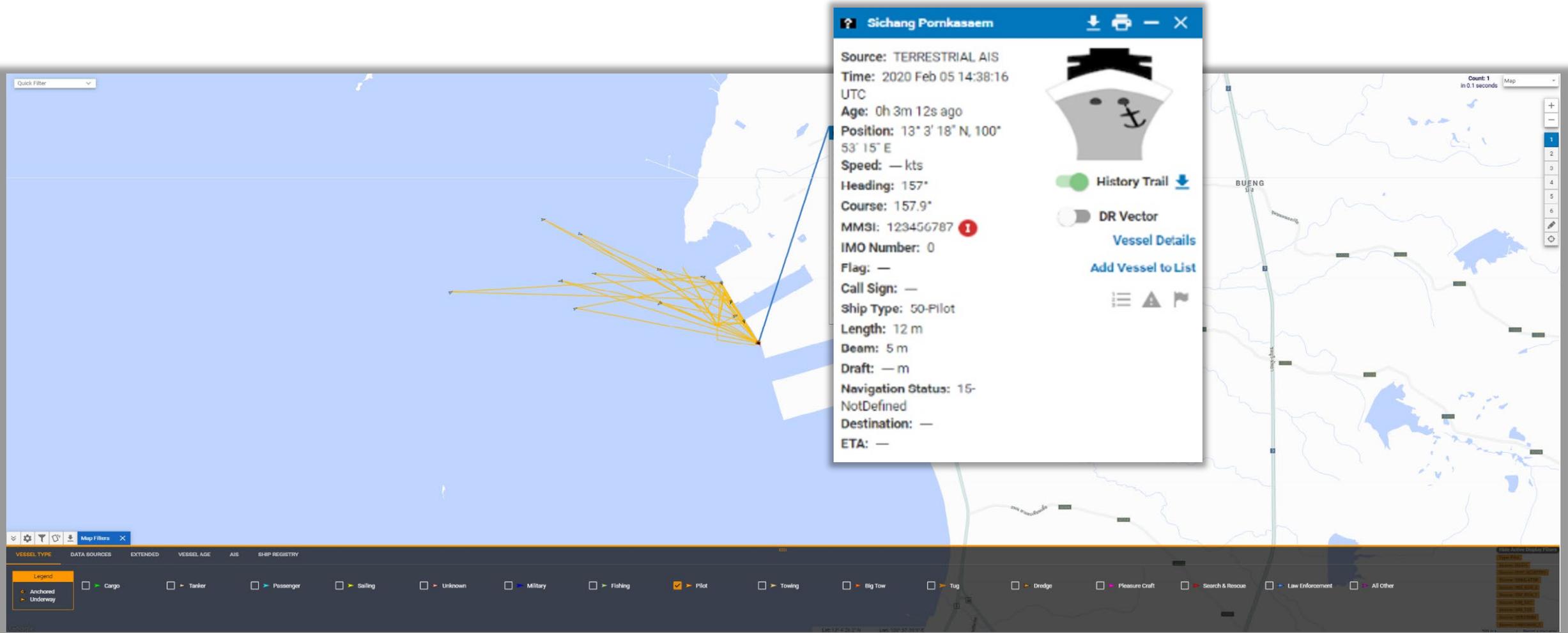
# Tugs



# Tow Vessels



# Pilot Vessels



# Tug, Tow, and Pilot Vessels Summary

## Normal Operating Speeds

- 7-10 knots while in transit to location but mostly 3-5 knots

## Track Pattern(s)

- Straight lines while in transit and when returning to ports

## Normal Operating Range

- Mostly close to port and areas just outside of port

# Research Vessels



# What Are Research Vessels?

- Research vessels are usually mission-oriented shipboard platforms that support and conduct scientific research



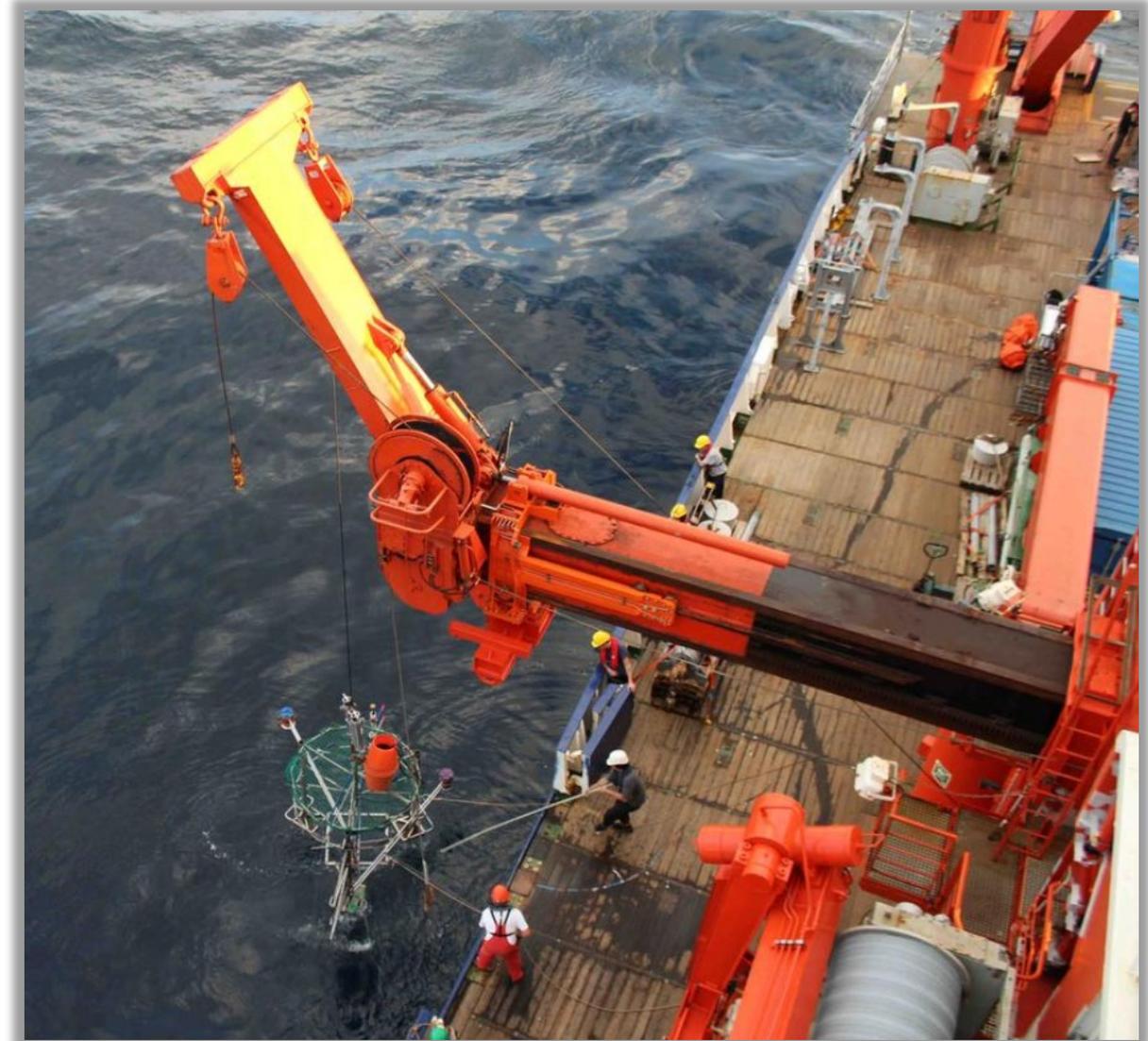
# Types of Research Vessels

- Mapping and Charting
- Resources
- Marine Chemistry and Biology
- Fishery
- Ocean Acoustics
- Climate
- Archaeology
- Hazards



# Research Vessel Types

- Fishery research vessels are capable of carrying out:
  - Trawling
  - Sampling
  - Conductivity, Temperature, Depth (CTD) Rosette operations
    - Seawater sampling
  - Towed body operations
  - Hydrographic operations
  - Hydroacoustic research work
  - Seismic operation
  - Other marine biology and testing



# Autonomous Underwater Vehicle (AUV)

- Anchor moorings keep an AUV in one place
- Buoys float and bob on or below the surface, to keep their line stationary and out of the way of ships
- Some surface buoys may also hold meteorological instruments such as rain, sun, and wind gauges



# Research Vessel Summary

## Normal Operating Speeds

- Unfortunately, there are too many variations on these types of ships. Whether they are following a school of fish or other countries' navy vessels, they can be slow to fast.

## Track Pattern(s)

- Once again, anything from circles to back and forth along with the same position or just a long ocean transit.

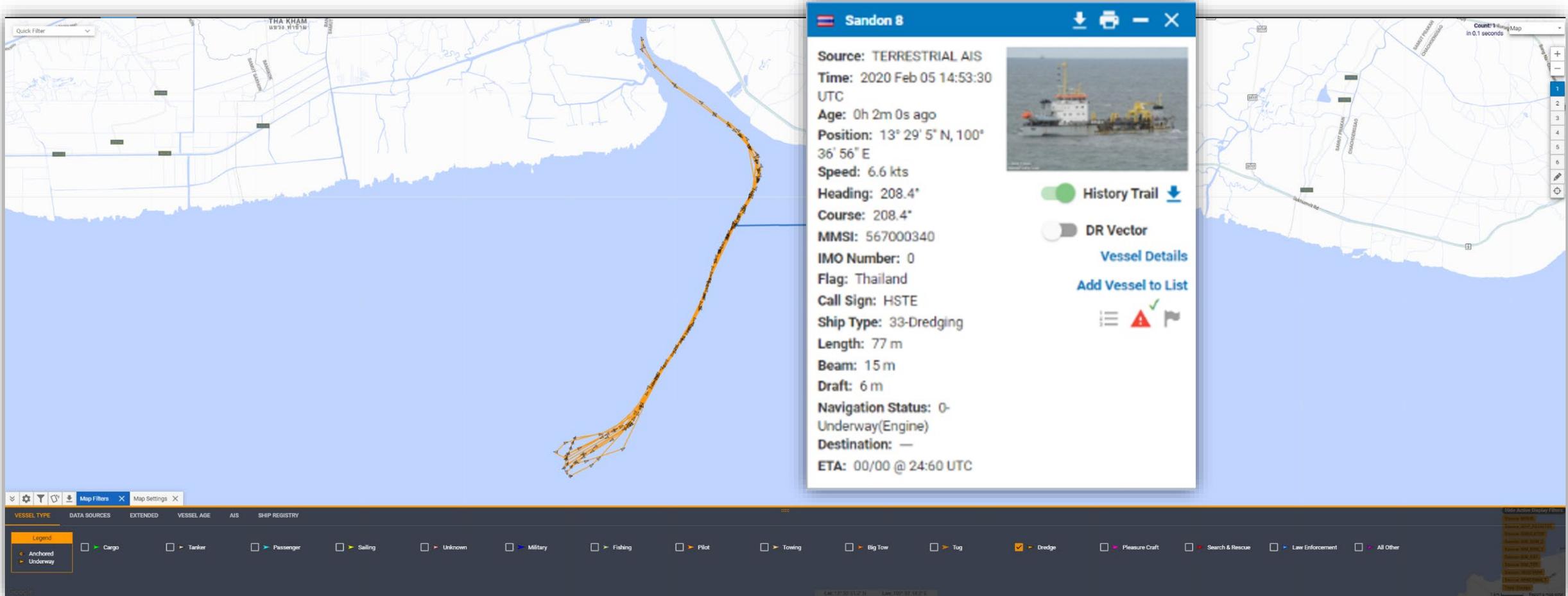
## Normal Operating Range

- Worldwide from pole to pole

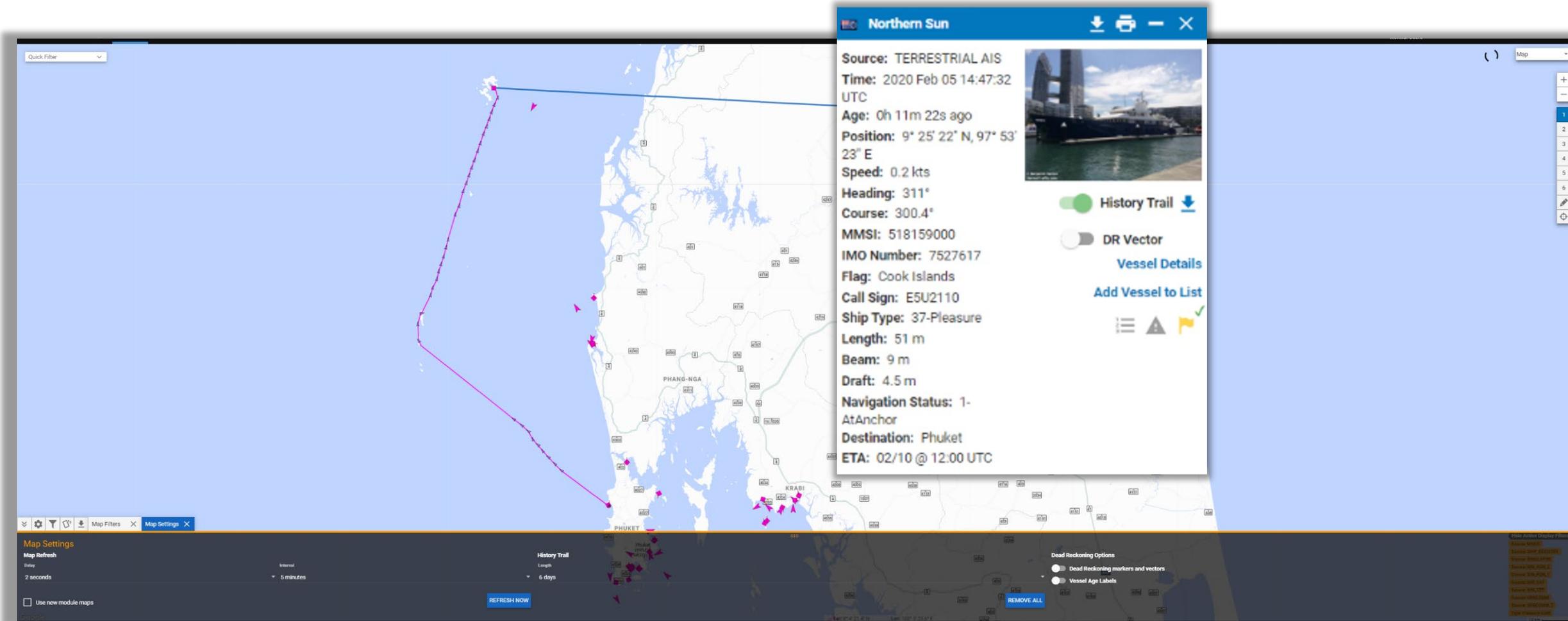
# Other Vessel Types



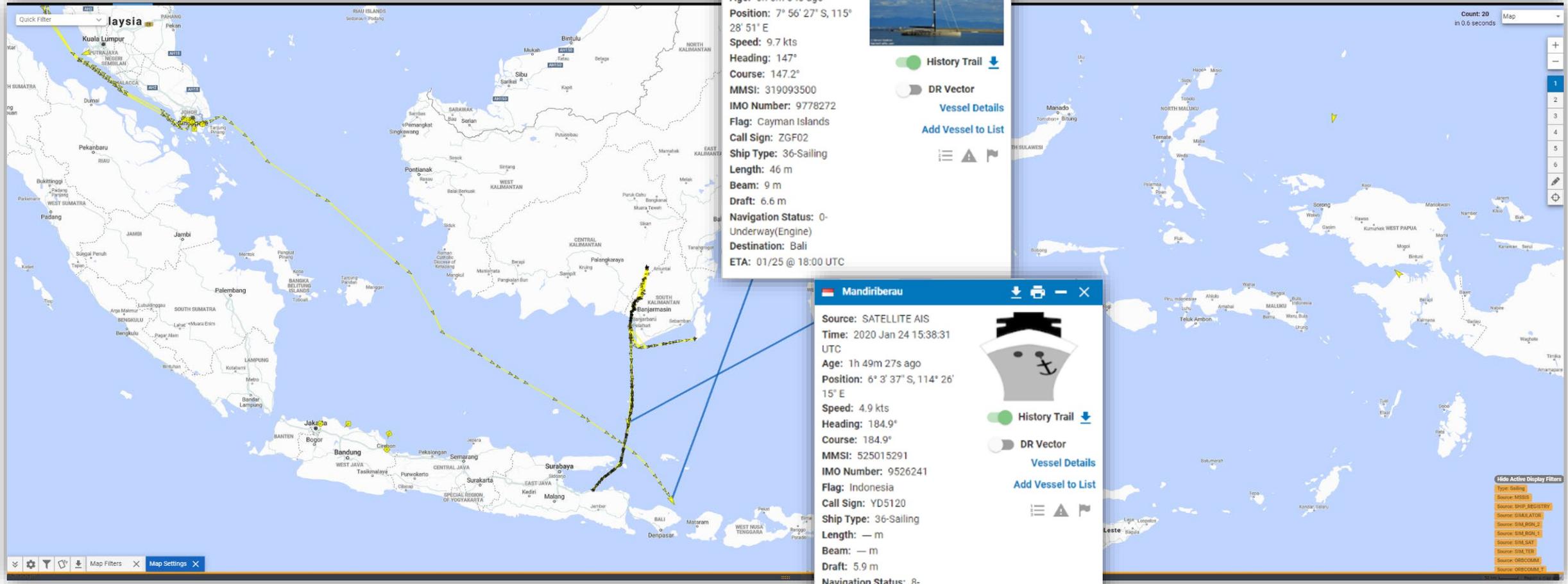
# Dredge



# Search and Rescue



# Sailing



# Other Vessel Summary

## Normal Operating Speeds

- Whether it is the Search and Rescue Boat getting on-site as quickly as possible or the Sailboat going from 2-15 knots simply based on the wind, each vessel will be a case by case investigation.

## Track Pattern(s)

- From the Sailboat going wherever the wind will blow it, to a Dredge slowly going back and forth over the same area, this is what analysis is all about.

## Normal Operating Range

- From local to worldwide

# 2 Samples of Average Vessel Speeds

IHS Register of Ships (IHS 2014)

Standard Type	Count	Avg Main hrs.	Avg Aux kW	Avg Cruising Speed	Default Vessel Category
Bulk Carrier	3,177	8,990	1,935	14.3	3
Bulk Carrier, Laker	80	7,069	2,216	13.7	3
Buoy Tender	4	4,266		12.6	2
Container	1,218	39,284	7,851	23.2	3
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Tanker	1,423	8,474	2,730	14.5	3
Tug	396	3,440	348	7.7	2
Vehicle Carrier	441	13,829	3,729	19.8	3
Well Stimulation	3	7,697	340	8.2	3

Army Corps of Engineers Waterborne Commerce Data (WCD)

Vessel Type	Vessel Count	Average Cruising Speed (knots)
Bulk Carrier	376.00	10.09
Bulk Carrier, Laker	27.00	13.74
Buoy Tender	197.00	6.90
Container	111.00	8.48
Crude Oil Tanker	44.00	6.97
Drilling	39.00	11.74
Fishing	13,652.00	5.67
Floating Production and Storage Offloading	10.00	4.90
General Cargo	7,179.00	8.09
Icebreaker	27.00	10.52
Jackup	173.00	4.25
LNG Tanker	3.00	9.33
LPG Tanker	183	10.83
Miscellaneous	2,014	6.83
Passenger	3,017	15.67
Pipelaying	280	6.39
Reefer	183	9.62
Research	951	9.79
RORO	1,997	11.28
Supply	3,409	12.98
Support	1,036	10.42
Tanker	2,880	8.28
Tug	15,660	8.54
Vehicle Carrier	20	14.42
Well Stimulation	30	8.63

# Vessel Characteristic Application

The screenshot displays a map of Pattaya City, Thailand, with several roads labeled: Pattaya Sai 2 Rd, Beach Rd, Pattayasaisong Rd, and S Pattaya Rd. The city name 'Pattaya City เมืองพัทยา' is visible. Two red triangular markers are placed on the map, one in the water and one on a road. Below the map is a control panel with the following sections:

- VESEL TYPE** (selected)
- DATA SOURCES**
- EXTENDED**
- VESSEL AGE**
- AIS**
- SHIP REGISTRY**

The **Legend** section is expanded, showing the following vessel types and their corresponding symbols:

<input type="checkbox"/> Cargo	<input type="checkbox"/> Tanker	<input type="checkbox"/> Passenger	<input type="checkbox"/> Sailing	<input checked="" type="checkbox"/> Unknown	<input type="checkbox"/> Military	<input checked="" type="checkbox"/> Fishing	<input type="checkbox"/> Pilot
<input type="checkbox"/> Towing	<input type="checkbox"/> Big Tow	<input type="checkbox"/> Tug	<input type="checkbox"/> Dredge	<input type="checkbox"/> Pleasure Craft	<input type="checkbox"/> Search & Rescue	<input type="checkbox"/> Law Enforcement	<input type="checkbox"/> All Other

At the bottom of the map, the Google logo and coordinates are visible: Lat: 12° 56' 20.5" N, Lon: 100° 54' 28.3" E.

# Identifying Vessels Listed as Unknown

- Missing AIS information, like Vessel Type Information, will be listed in Sea Vision as an Unknown

<input checked="" type="checkbox"/> ▶ Unknown	<input type="checkbox"/> ▶ Military
<input type="checkbox"/> ▶ Pleasure Craft	<input type="checkbox"/> ▶ Search & Rescue

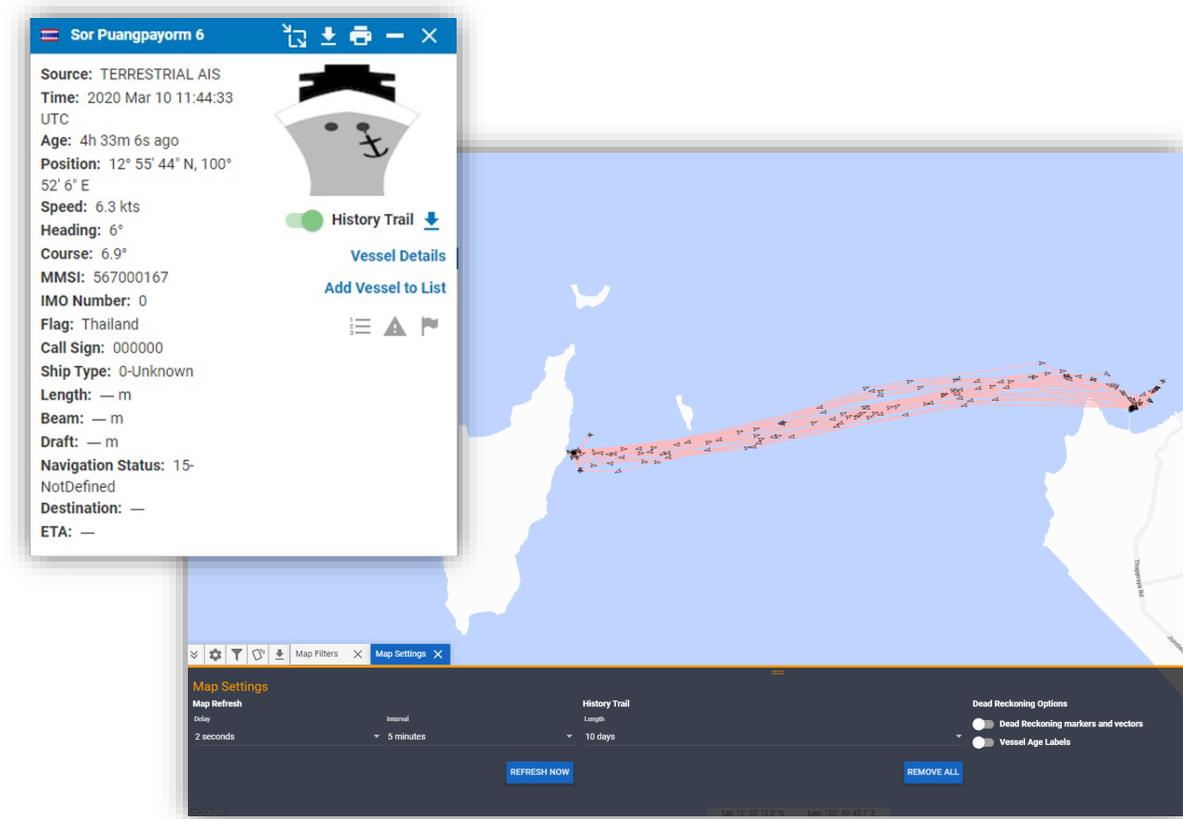
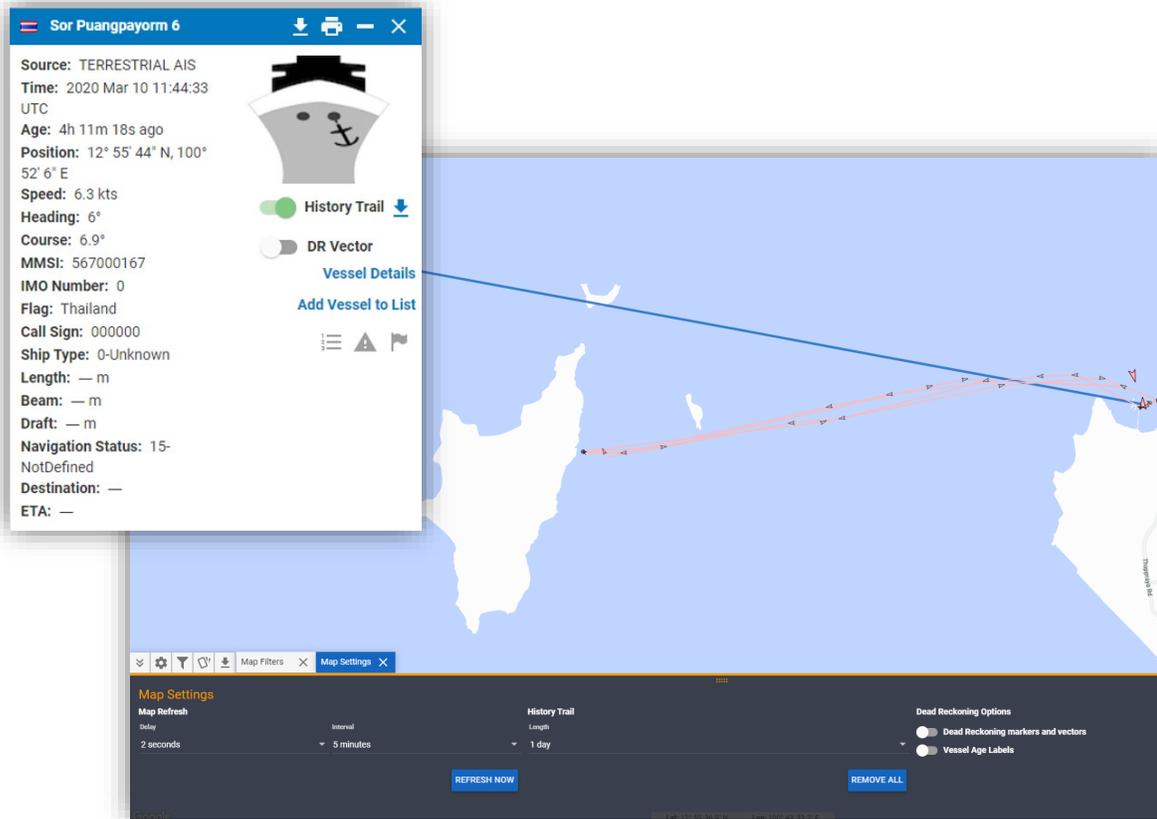
  

The screenshot shows a map interface for Pattaya City, Thailand. The map displays several vessel icons: a red triangle (Unknown), a blue triangle (Military), and a pink triangle (Pleasure Craft). A legend at the bottom of the interface lists various vessel types, with 'Unknown' checked. Other vessel types include Cargo, Tanker, Passenger, Sailing, Fishing, Pilot, Towing, Big Tow, Tug, Dredge, Pleasure Craft, Search & Rescue, Law Enforcement, and All Other. The map also shows roads like Beach Rd, Pattayasaisong Rd, and Pattaya Sai 2 Rd.

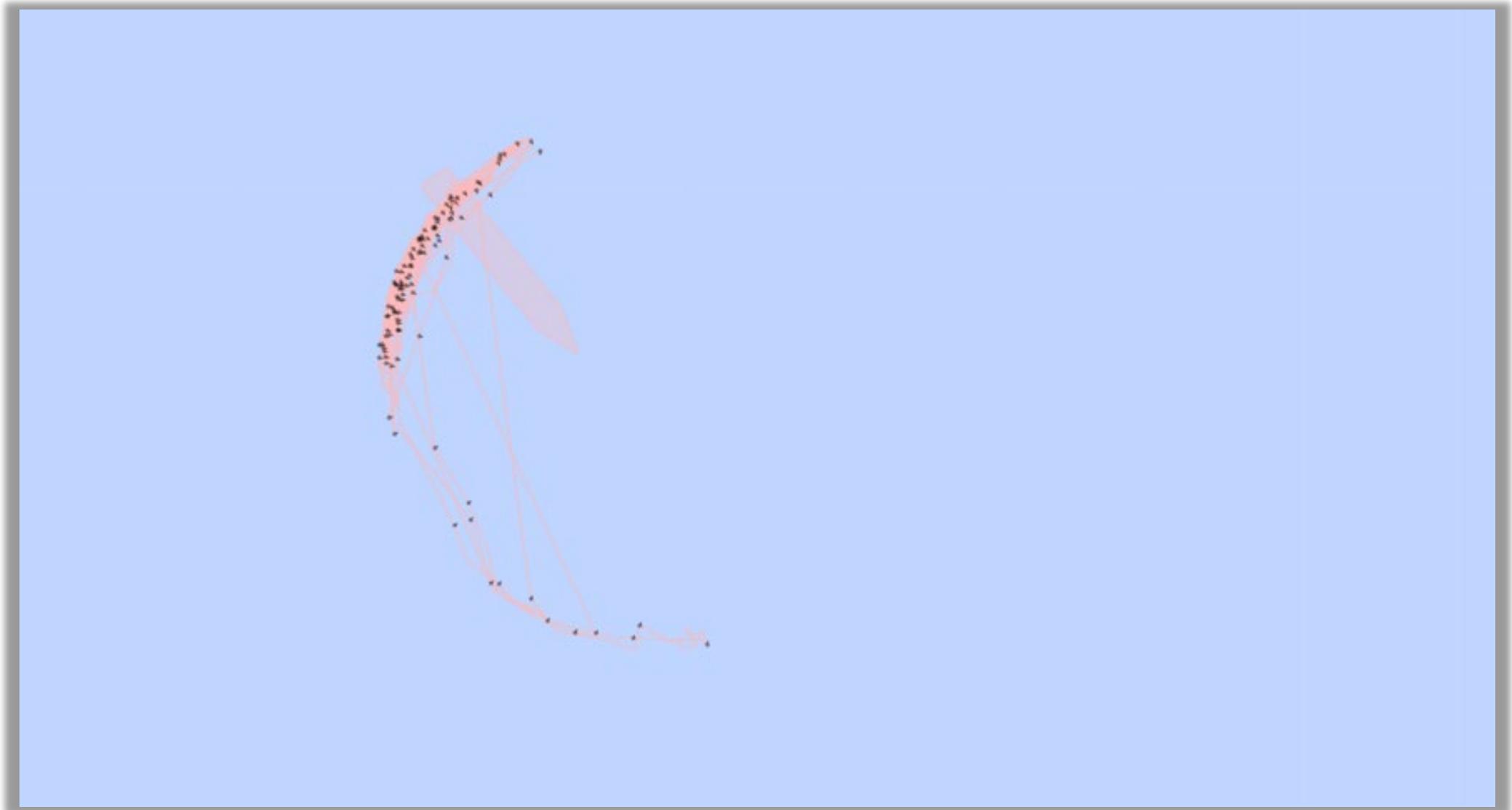
# Analyzing Unknown Vessels and Tracks

History Trail: 1 Day  
Trips: 2 Per Day  
Speed (Avg.): 8 Knots

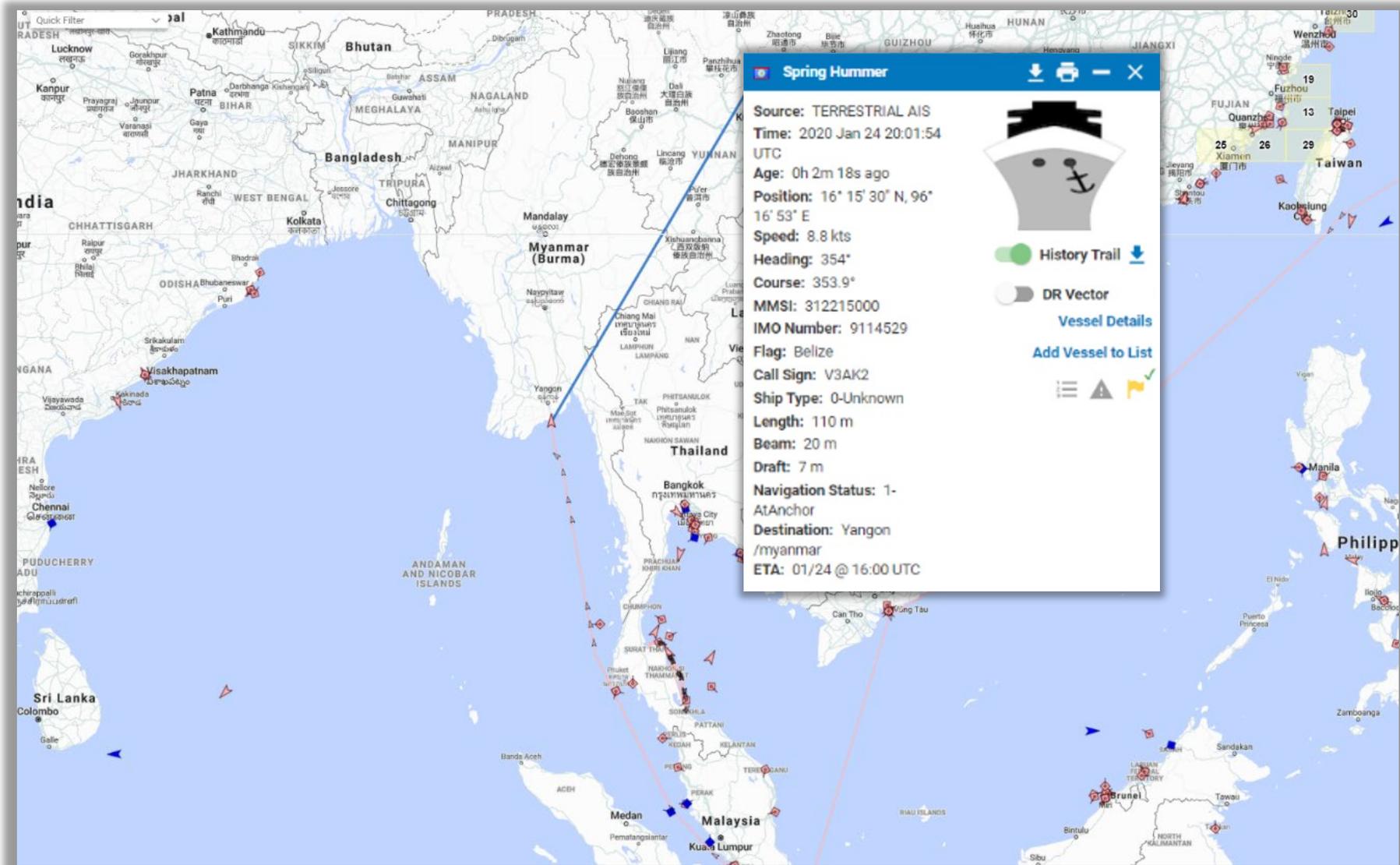
History Trail: 10 Days  
Trips: 2 Per Day  
Speed (Avg.): 8 Knots



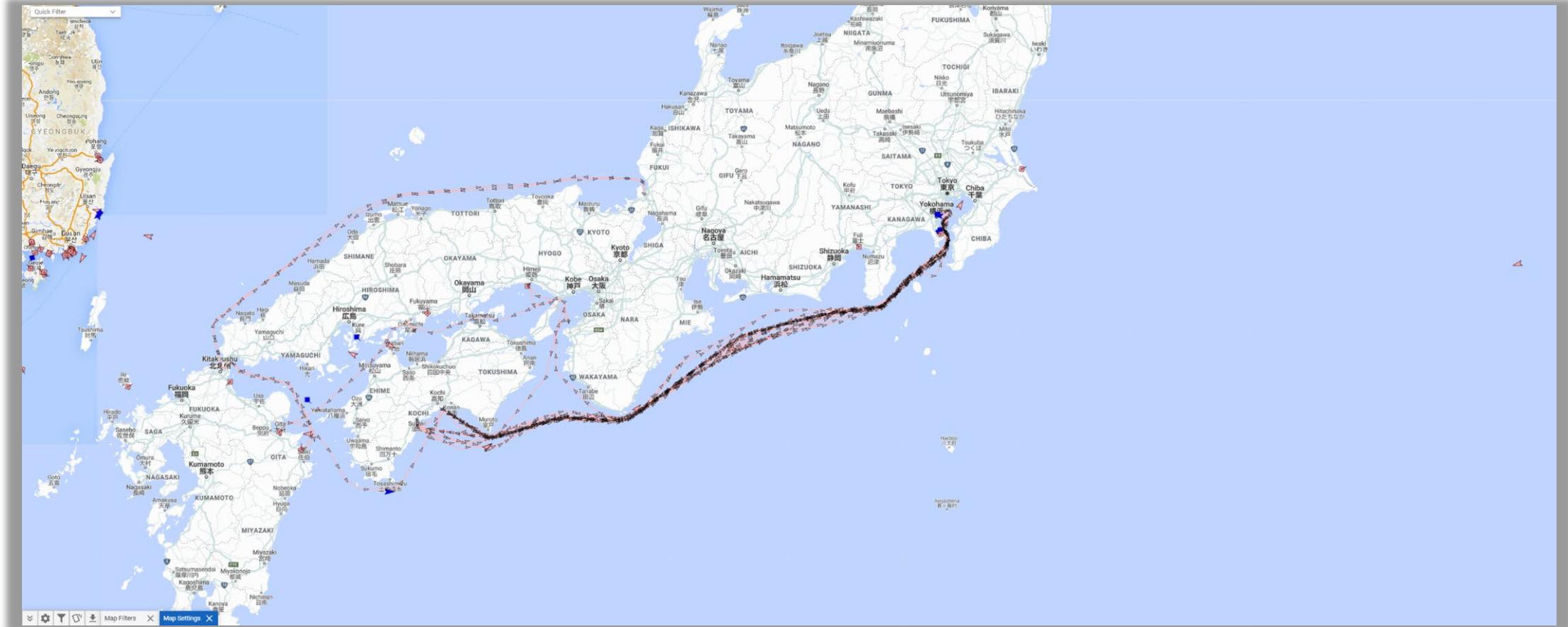
# Unknown Vessel



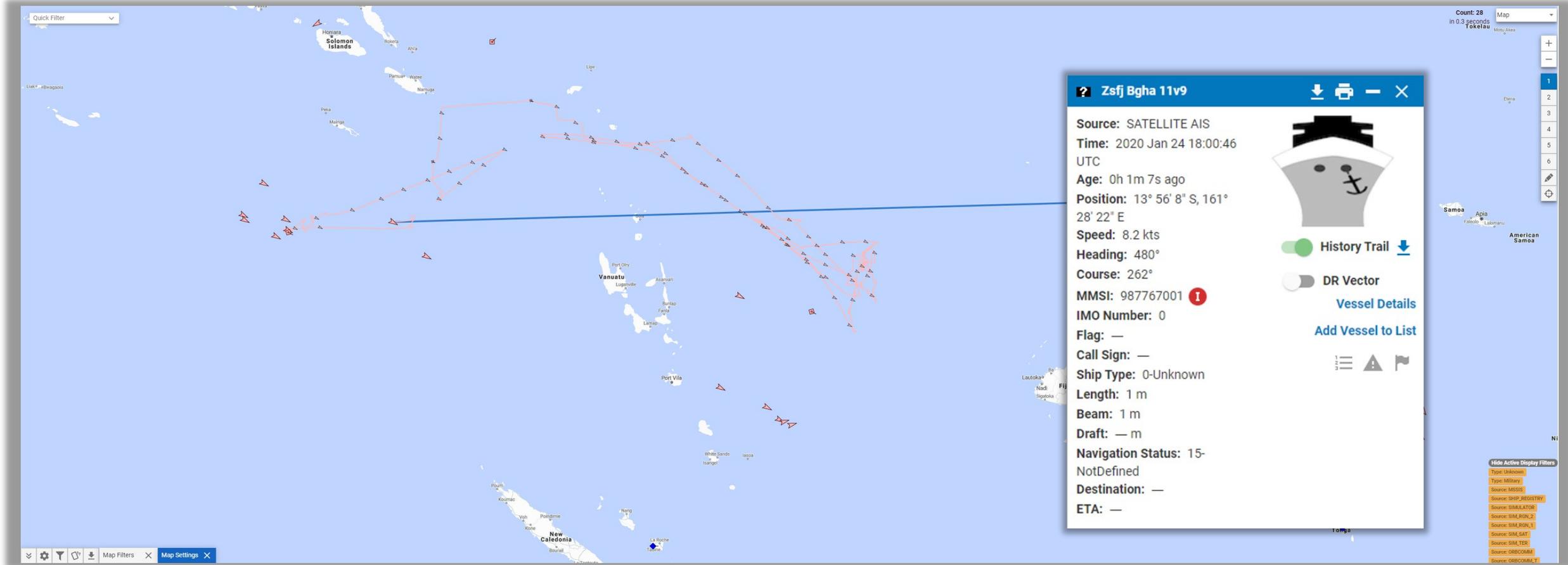
# Unknown Vessel



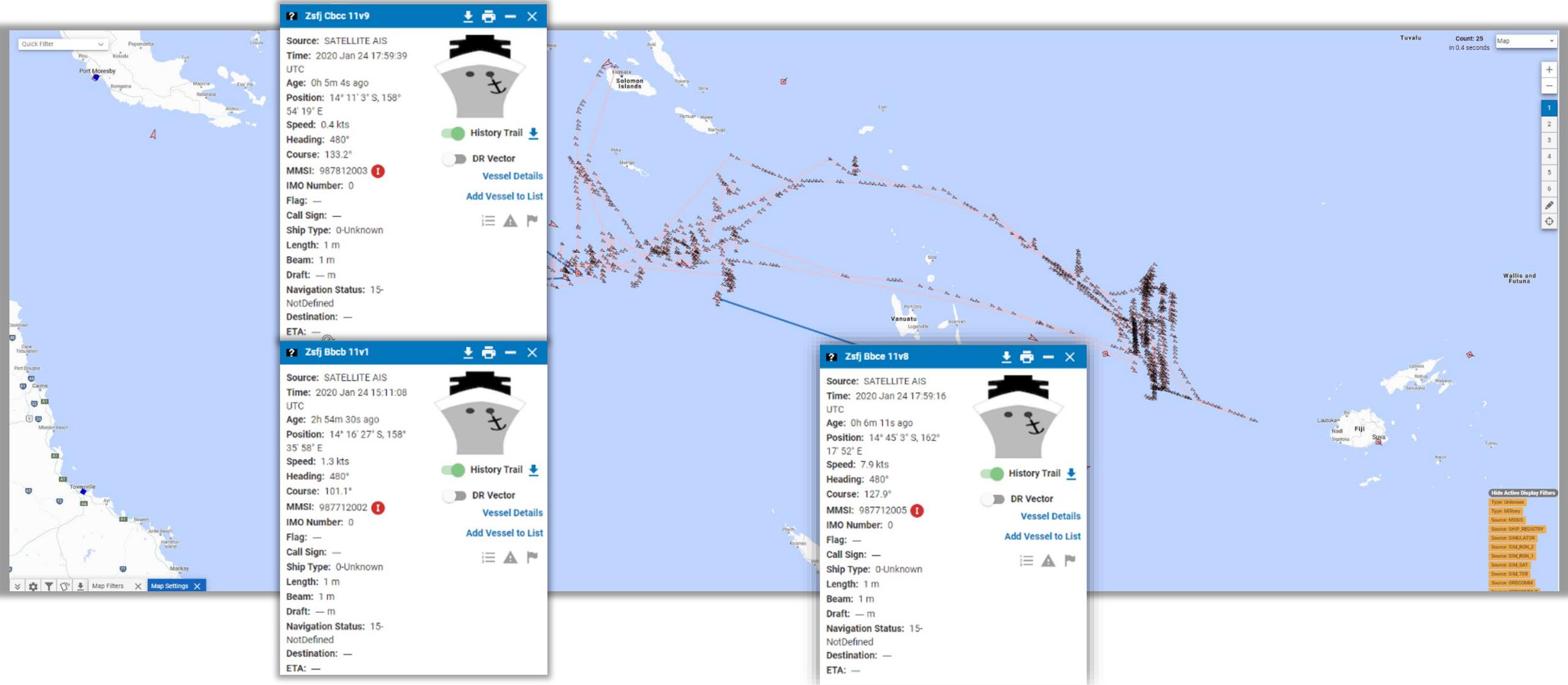
# Unknown Vessel



# Unknown Vessel Track



# Unknown Vessel Track



# Indication of FADs

The screenshot displays a maritime tracking application interface. On the left, a map shows the vessel's track with a blue line and a green arrow indicating direction. The vessel's current position is marked with a red square. The right side of the interface is divided into two panels. The top panel shows vessel details for MMSI 994068011 7v, including source (SATELLITE AIS), time (2020 May 06 14:49:59 UTC), age (5h 29m 4s ago), position (4° 26' 59" N, 68° 10' 1" E), speed (0.6 kts), heading (148°), course (148.1°), and other specifications. The bottom panel shows the 'Port History' tab, which displays a table with columns for COUNTRY, MAIN PORT, INITIAL POSITION, FINAL POSITION, and CALCULATED TIME IN PORT. The table is currently empty, and a large 'No Port History Data' message is displayed with a 'RETRY' button below it.

**994068011 7v**

Source: SATELLITE AIS  
 Time: 2020 May 06 14:49:59 UTC  
 Age: 5h 29m 4s ago  
 Position: 4° 26' 59" N, 68° 10' 1" E  
 Speed: 0.6 kts  
 Heading: 148°  
 Course: 148.1°  
 MMSI: 994068011 ⓘ  
 IMO Number: 0  
 Flag: —  
 Call Sign: —  
 Ship Type: 0-Unknown  
 Length: — m  
 Beam: — m  
 Draft: 1 m  
 Navigation Status: 15-NotDefined  
 Destination: —  
 ETA: 00/00 @ 00:00 UTC

History Trail  
 DR Vector

Vessel Details  
 Add Vessel to List

Summary Details EEZ History **Port History** Rules

COUNTRY	MAIN PORT	INITIAL POSITION	FINAL POSITION	CALCULATED TIME IN PORT
No Port History Data				

RETRY

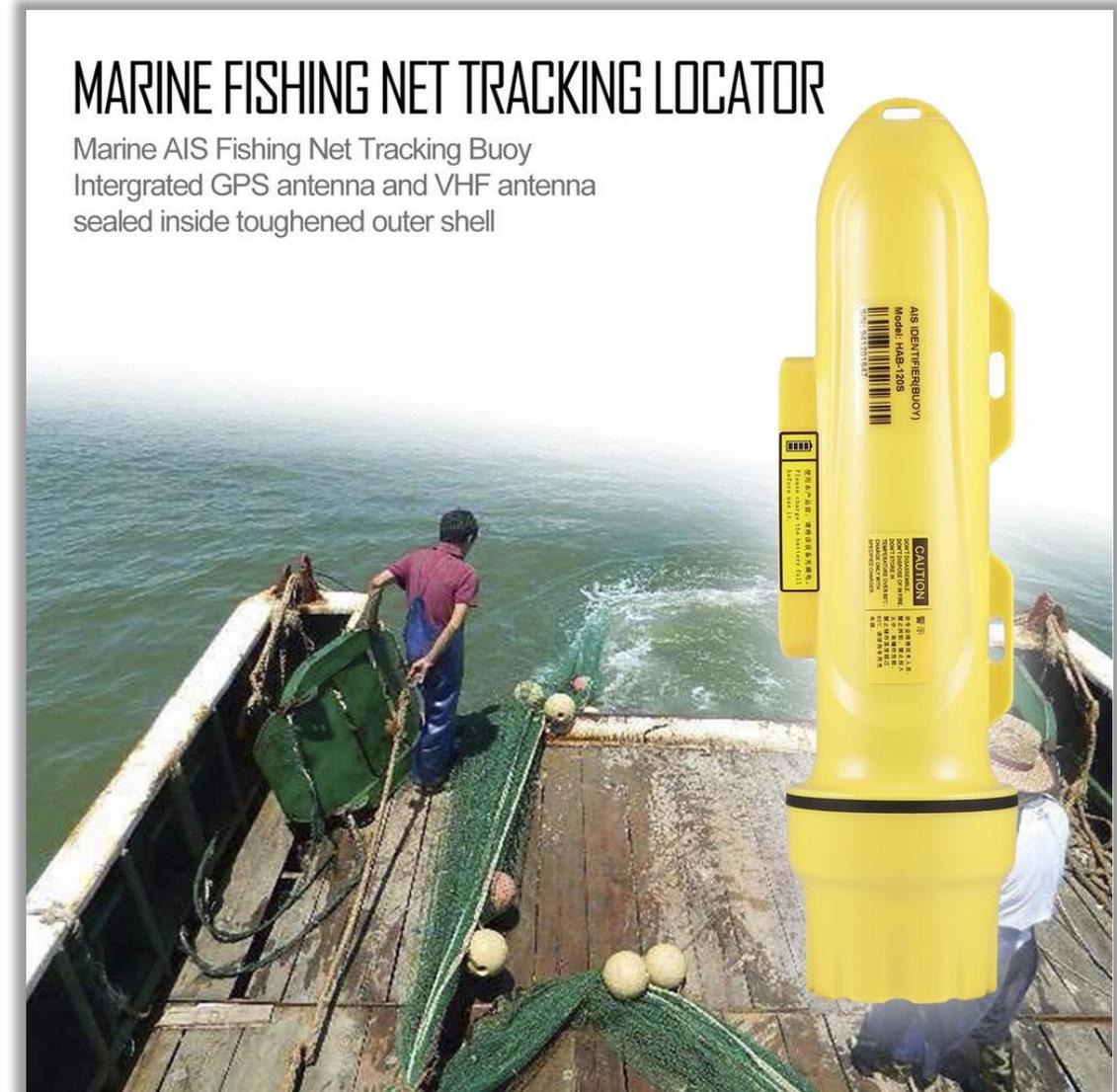
Lat: 0° 42' 4.3" N Lon: 70° 41' 8.2" E

# Considerations for Unknown Vessel Tracks

- There are no outright prohibitions to use AIS as a marine marker
  - Nets, pots, traps, moorings, offshore platforms, rigs, or as race markers
- However, it is not permissible to use equipment that is intended for use on vessels as a marine marker
- AIS equipment:
  - Class A or B devices, lifesaving equipment
  - Search And Rescue Transponders (AIS-SART)
  - Man Overboard Beacon (AIS-MOB)
  - Emergency Position Indicating Radio Beacon (AIS-EPIRB)

# Considerations for Unknown Vessel Tracks

- Fishing net tracking locators are sold on the internet for about \$100.00
- Waterproof to 10 meters
- Pre-programmed with an MMSI



# Summary

In this lesson, we covered:

- Typical ship type characteristics, speed, track patterns, and operating range for the following vessel types:
  - Fishing
  - Cargo and Tankers
  - Passenger and Cruise Ships
  - Tug, Tow, and Pilot
  - Research
  - Other Vessel Types