FFI Forsvarets forskningsinstitutt

# Vessel tracking using Automatic Identification System data in the Arctic

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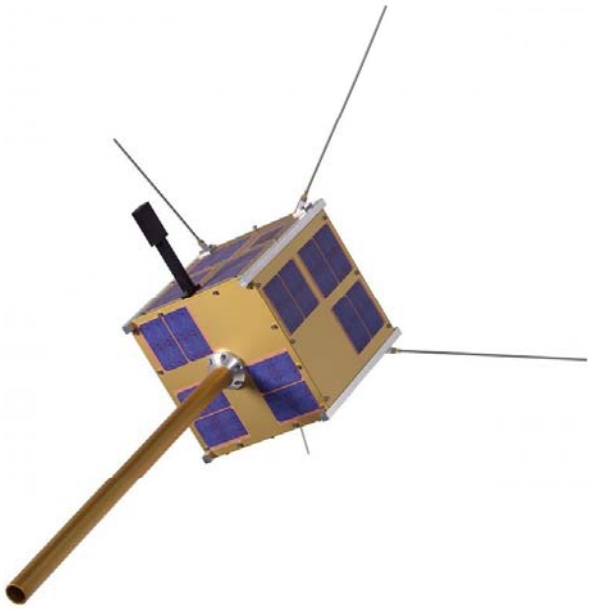
ShipArc2015

Malmø, 26 August 2015

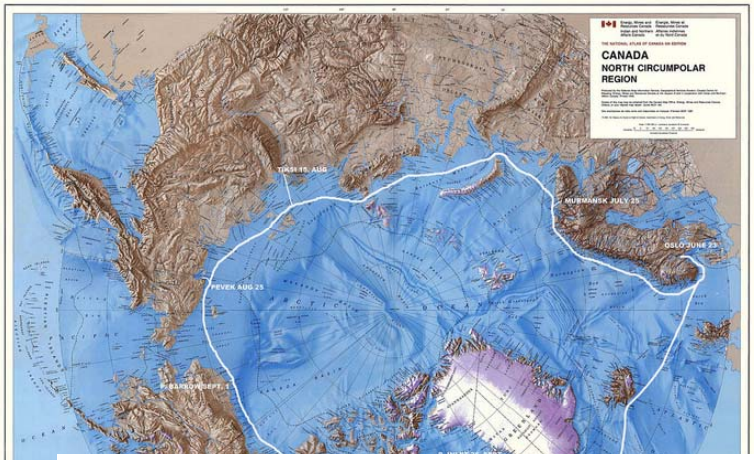
# Content

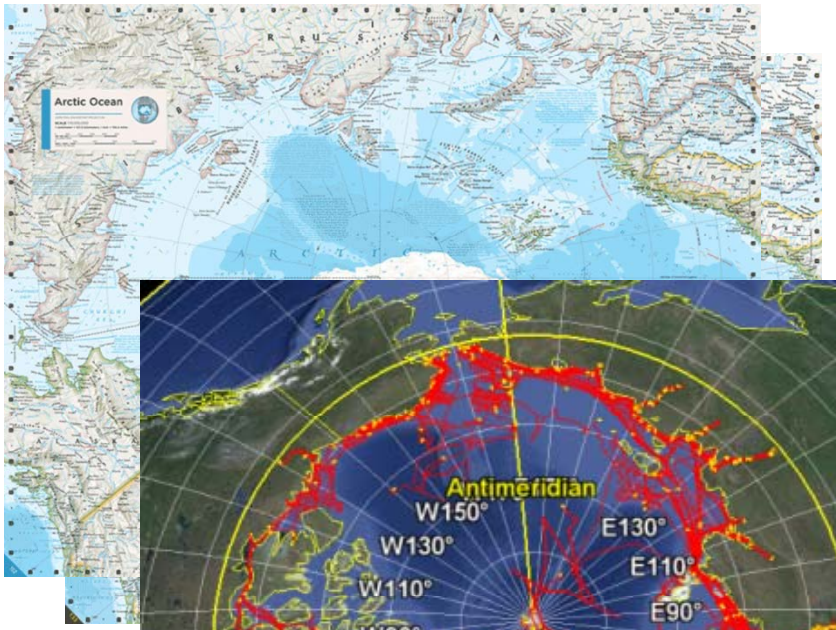
- Use of SAT-AIS data from AISSat-1 and AISSat-2 for trend analysis as well as situational awareness

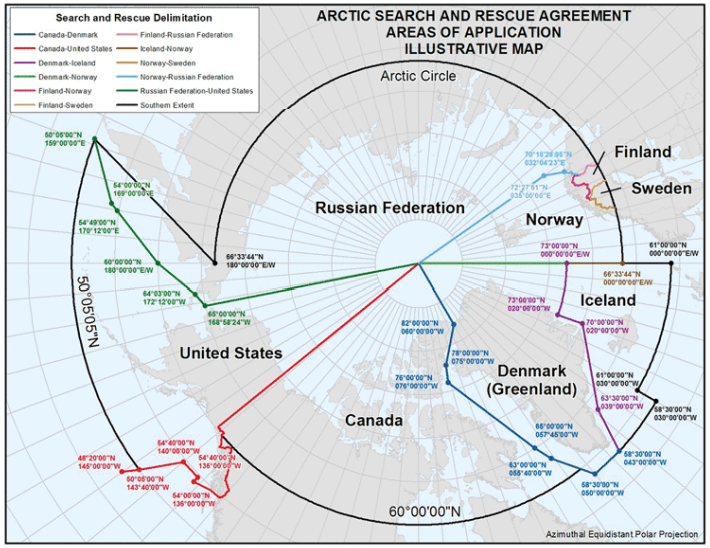
- Number of ships per month north of 67°
  - In the entire area north of 67° (Arctic)
  - In sectors of 45° longitude
  - By flag state
  - By ship type
- Number of ships through the Northeast Passage
- Ship densities and tracks
- Quality of SAT-AIS service

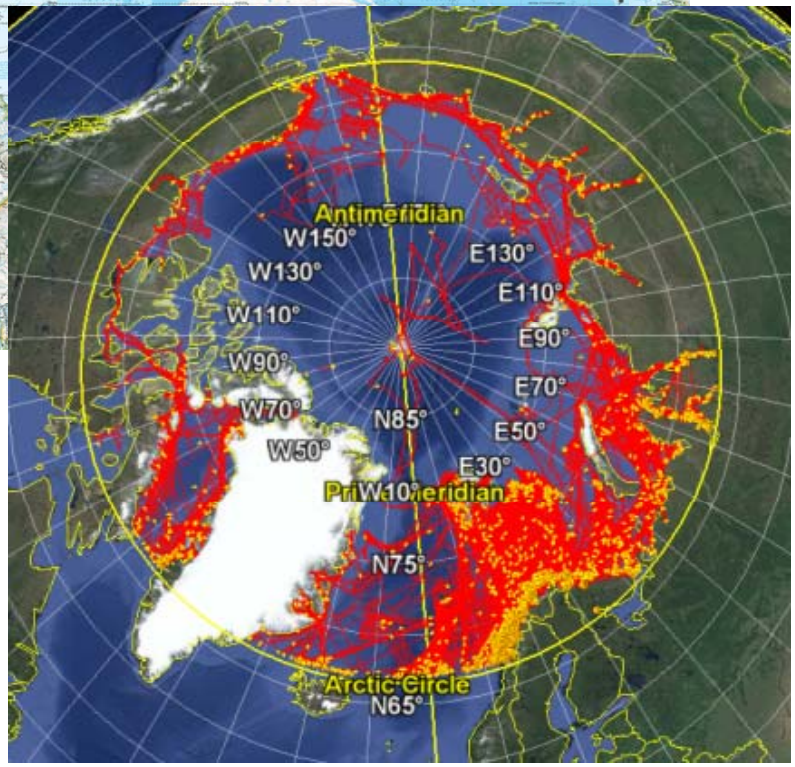


# Views on the Arctic, sea ice, and ship traffic



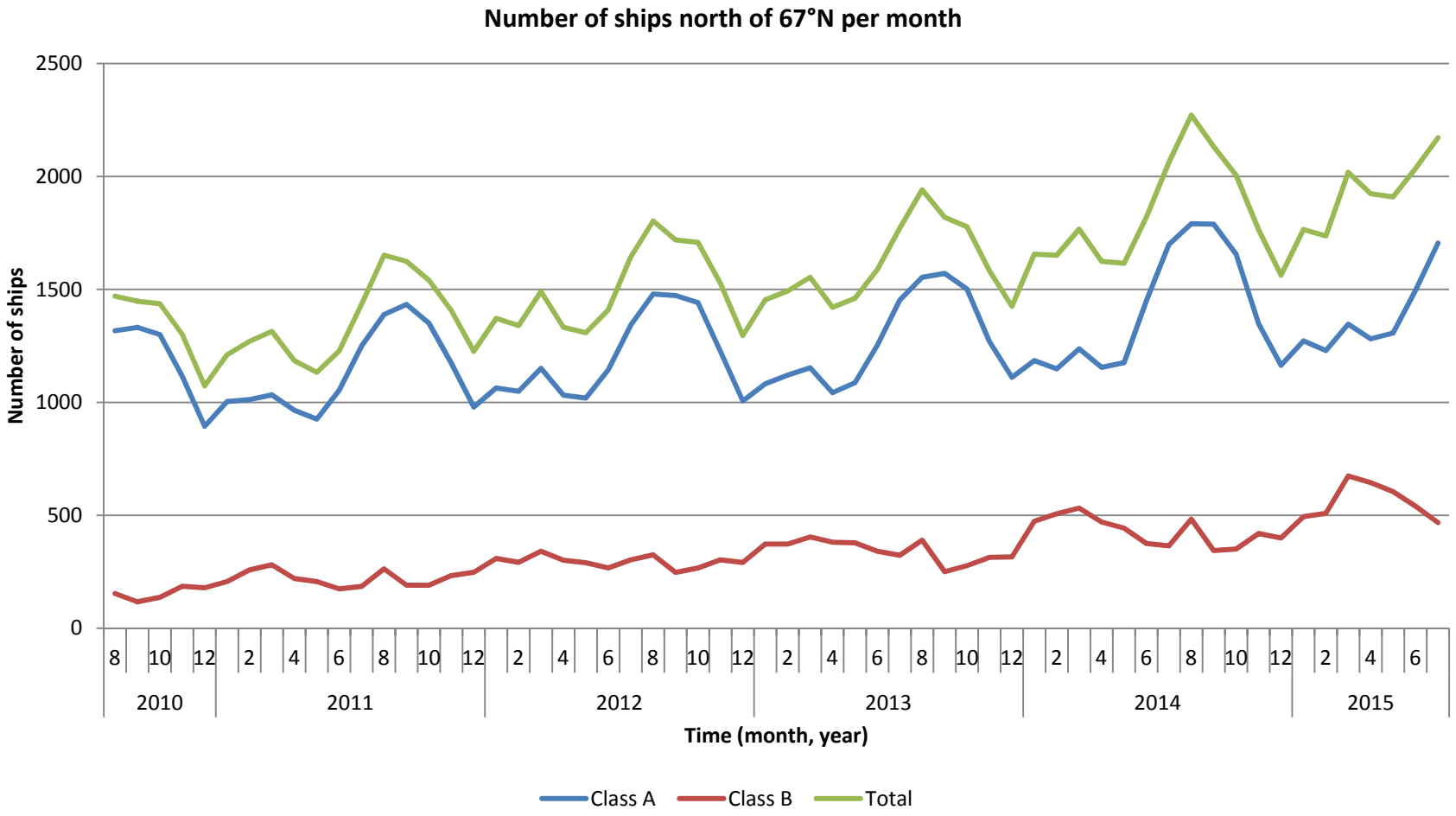



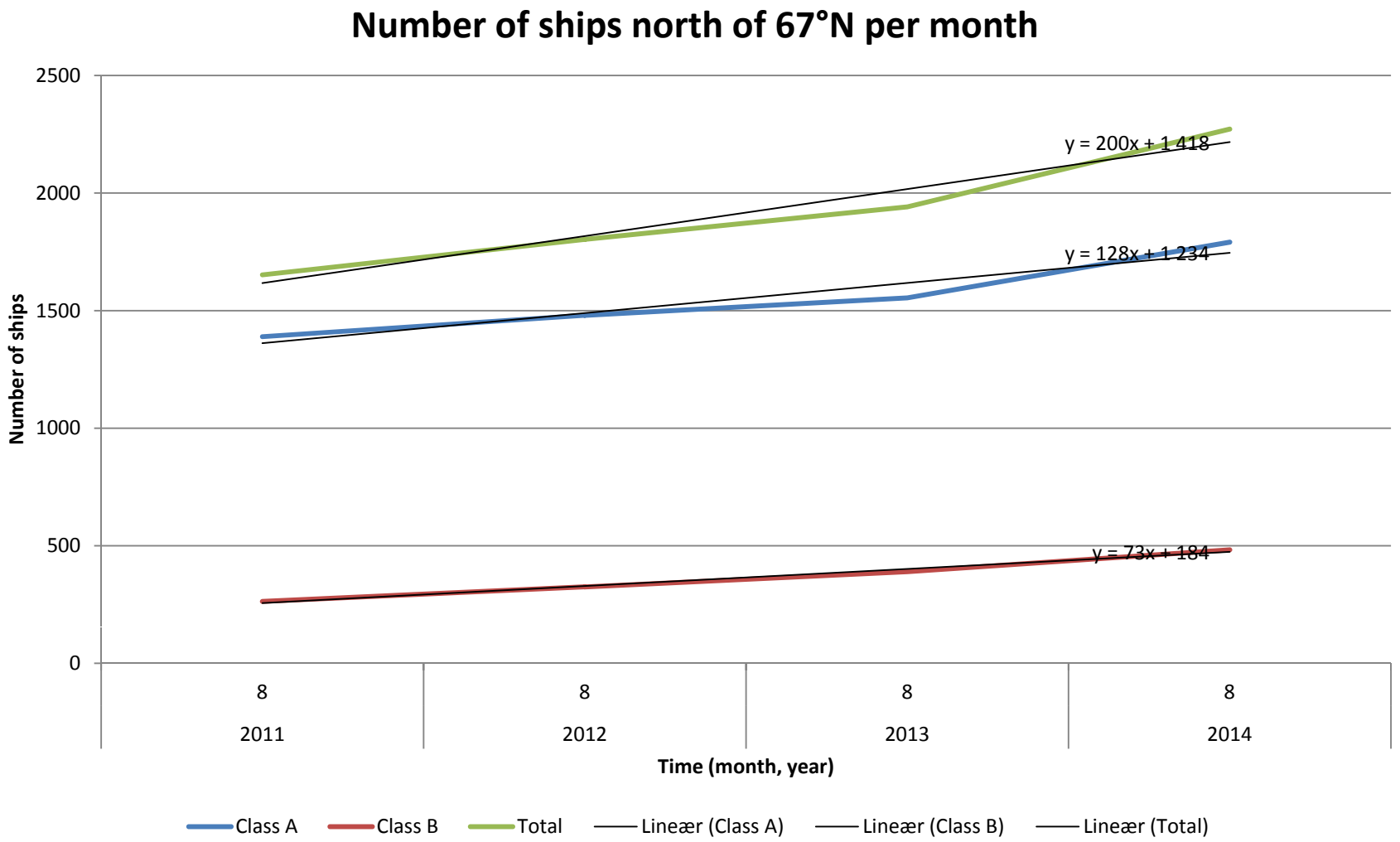



Maps courtesy Devold/Ousland, National Geographic, Arctic Portal, and Google Earth

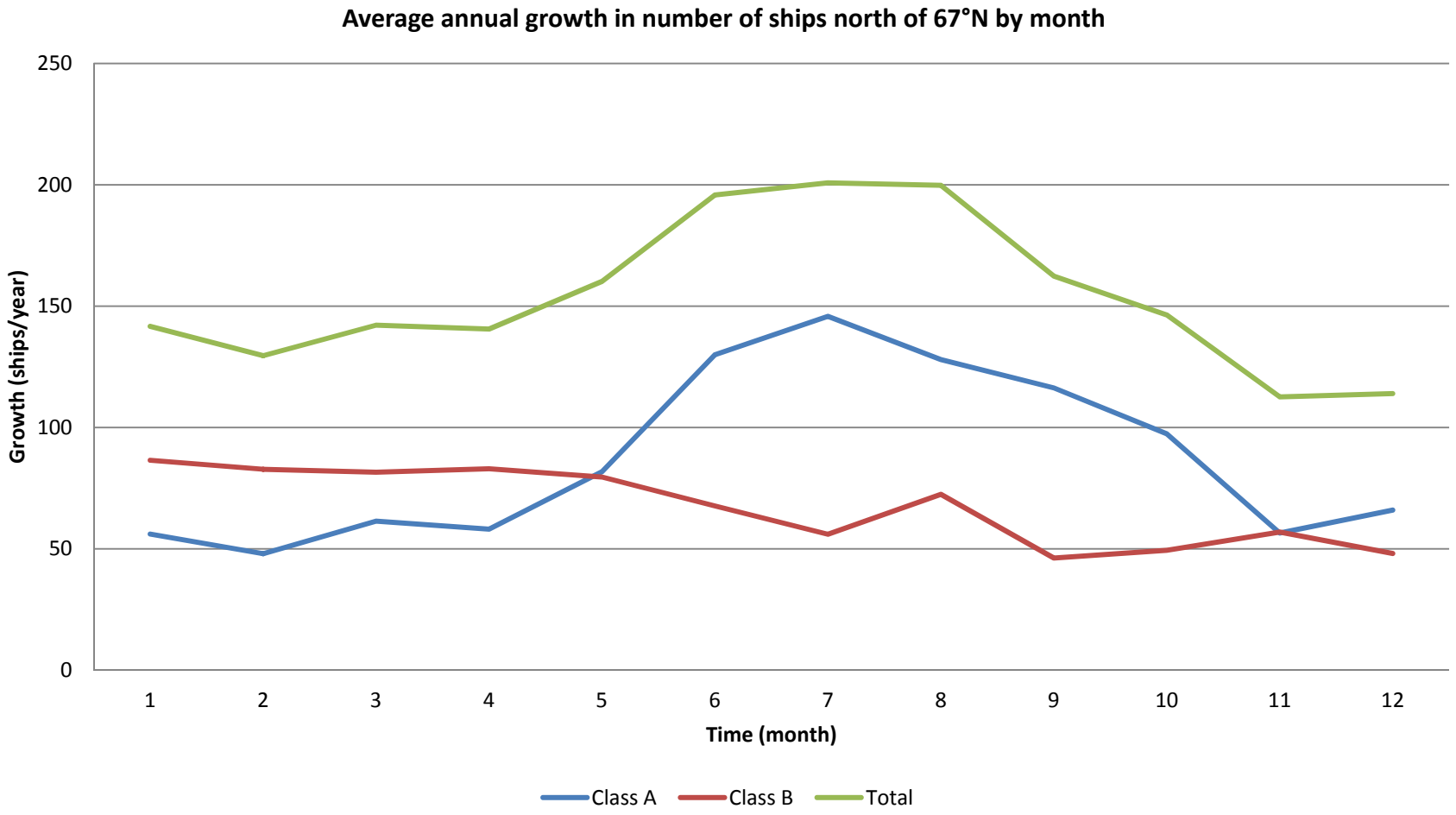
# Number of ships per month
# - 5 years; class A, B, and total number of ships



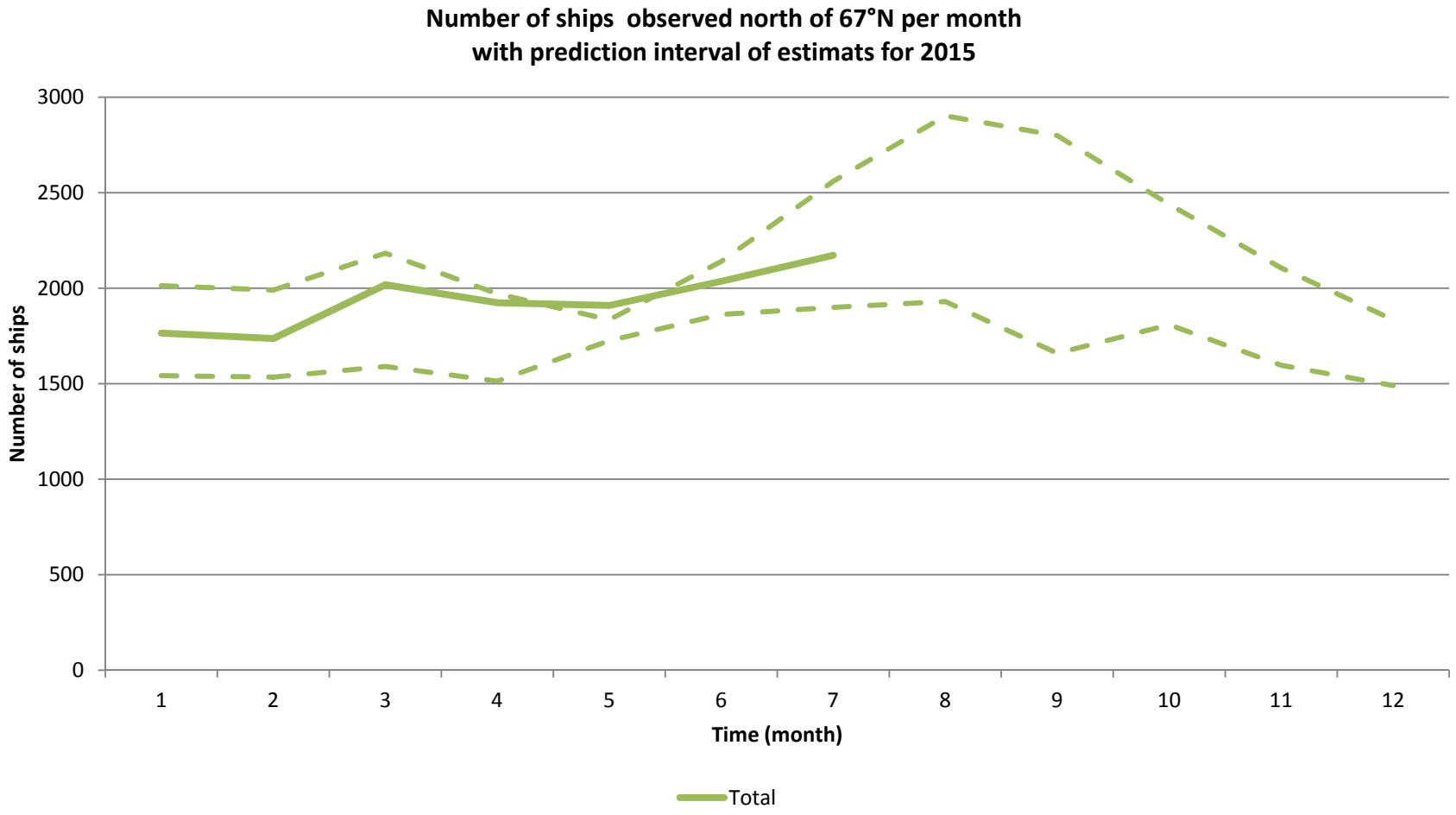
# Number of ships per month
# - 4 years; monthly trend lines (August example)



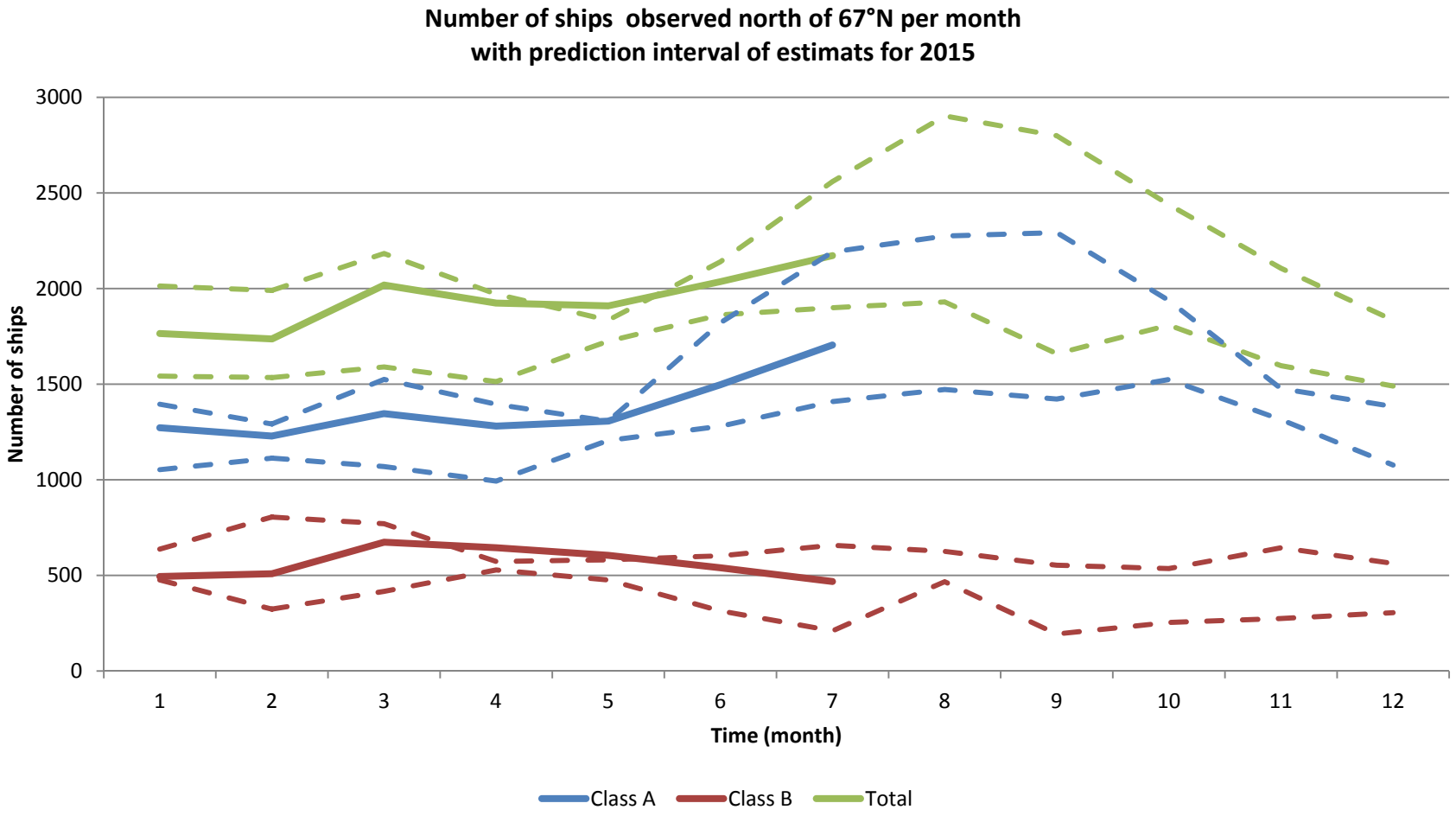
# Number of ships per month
# - Average annual growth (from trend lines)



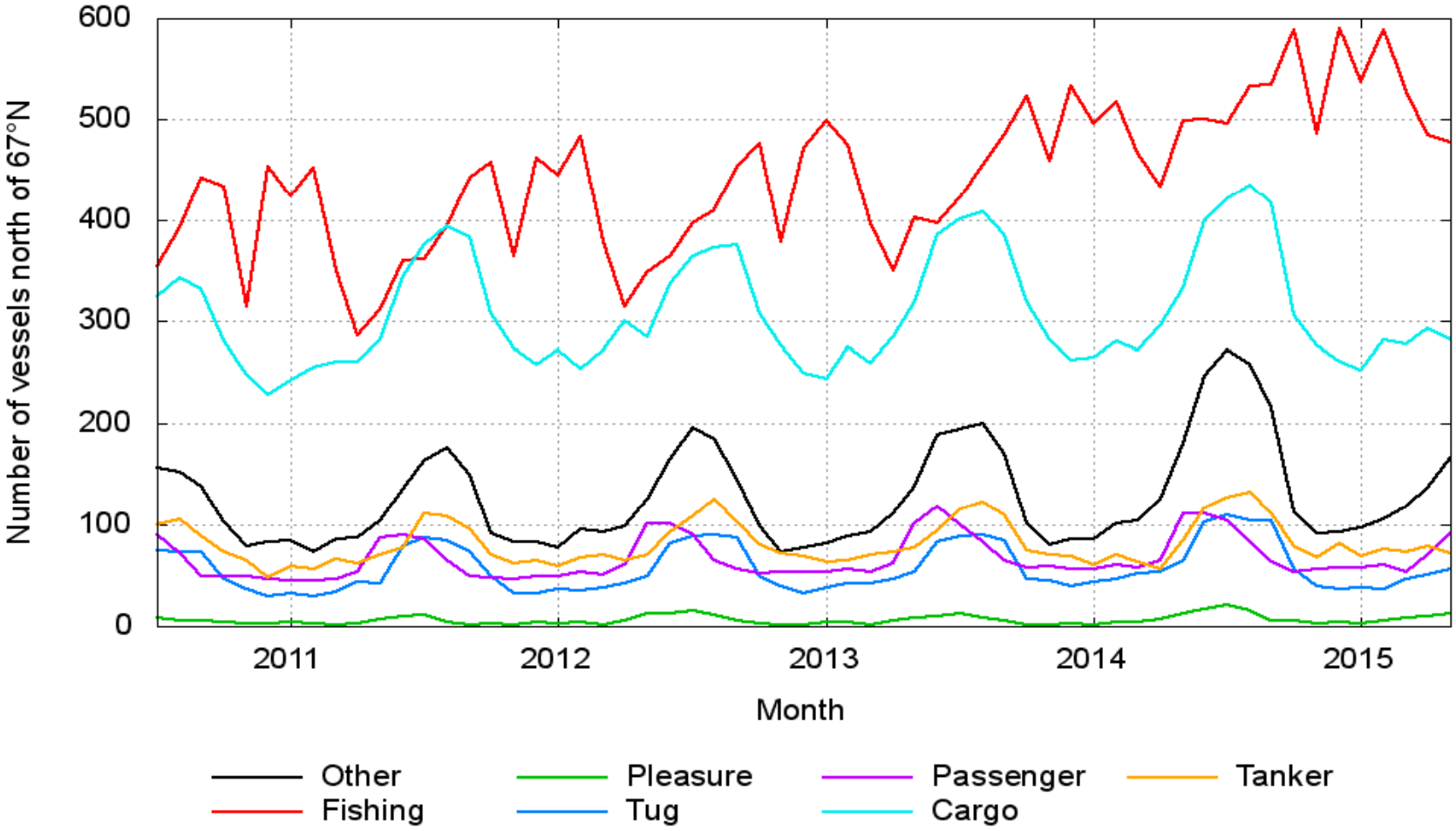
# Number of ships per month
# - 2015; Observations and prediction intervals



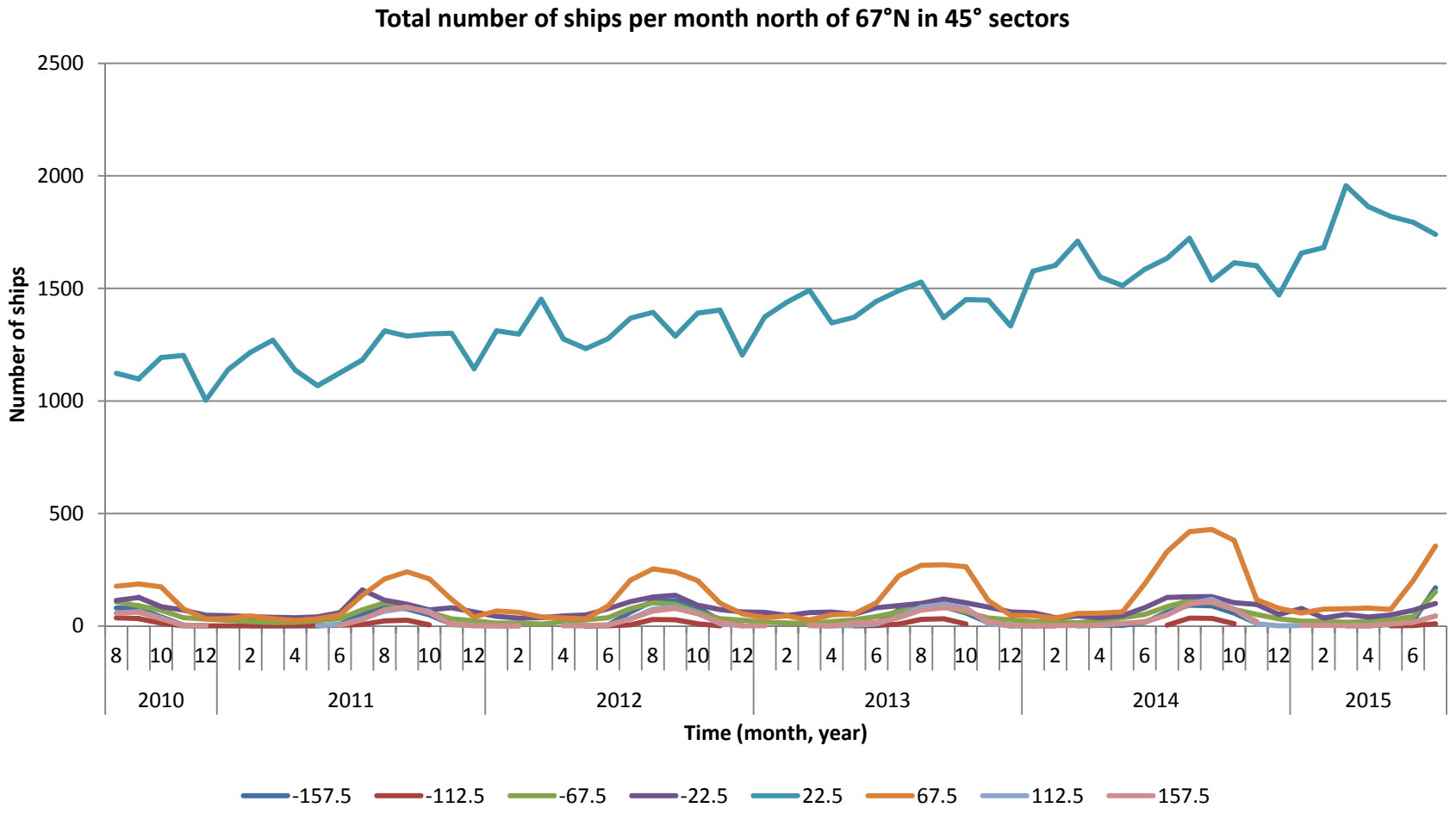
# Number of ships per month
# - 2015; Observations and prediction intervals



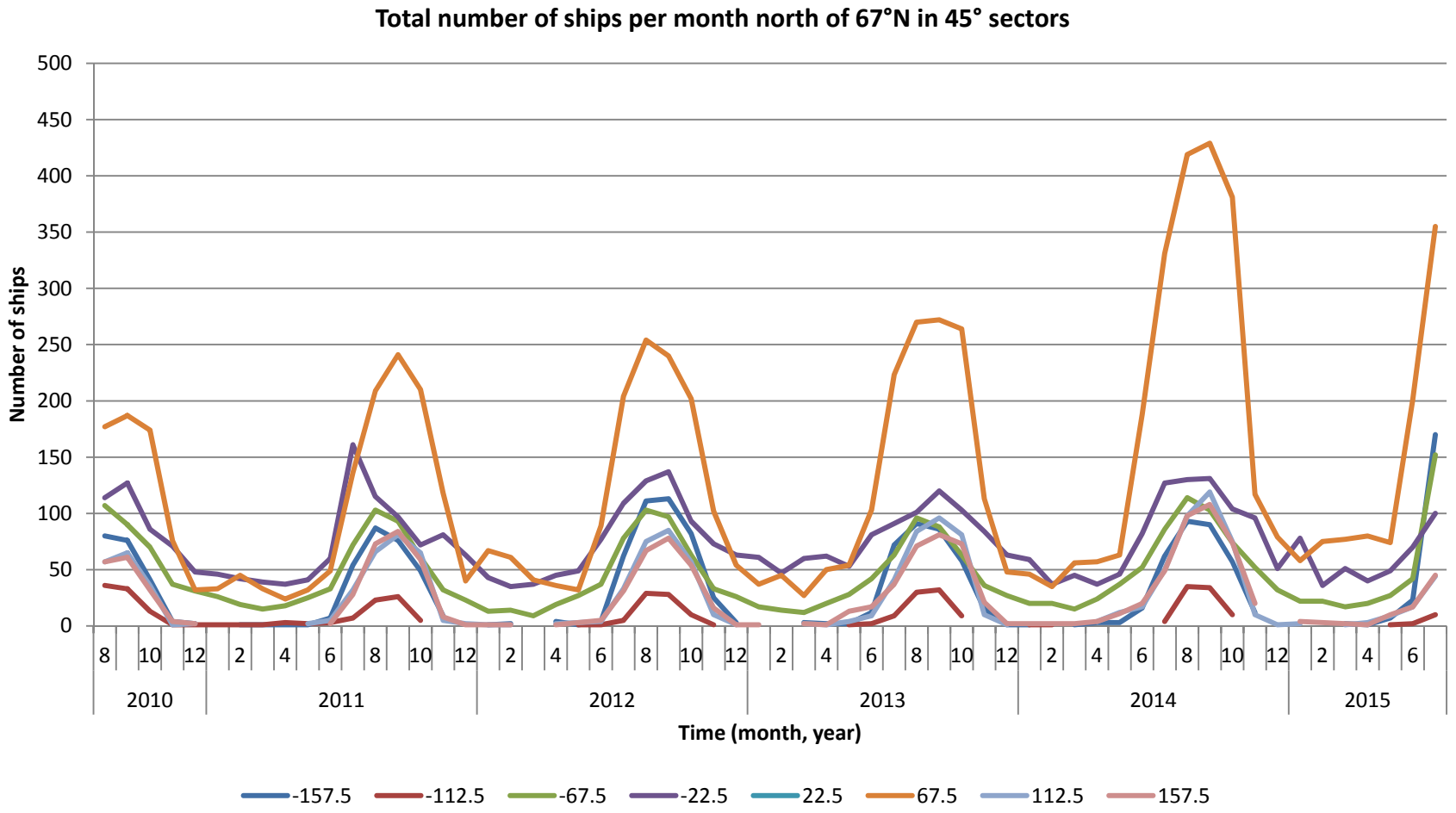
# Number of ships per month
# - 5 years; by ship type



# Geographic distribution in 45°-lon sectors - 5 years; total number of ships



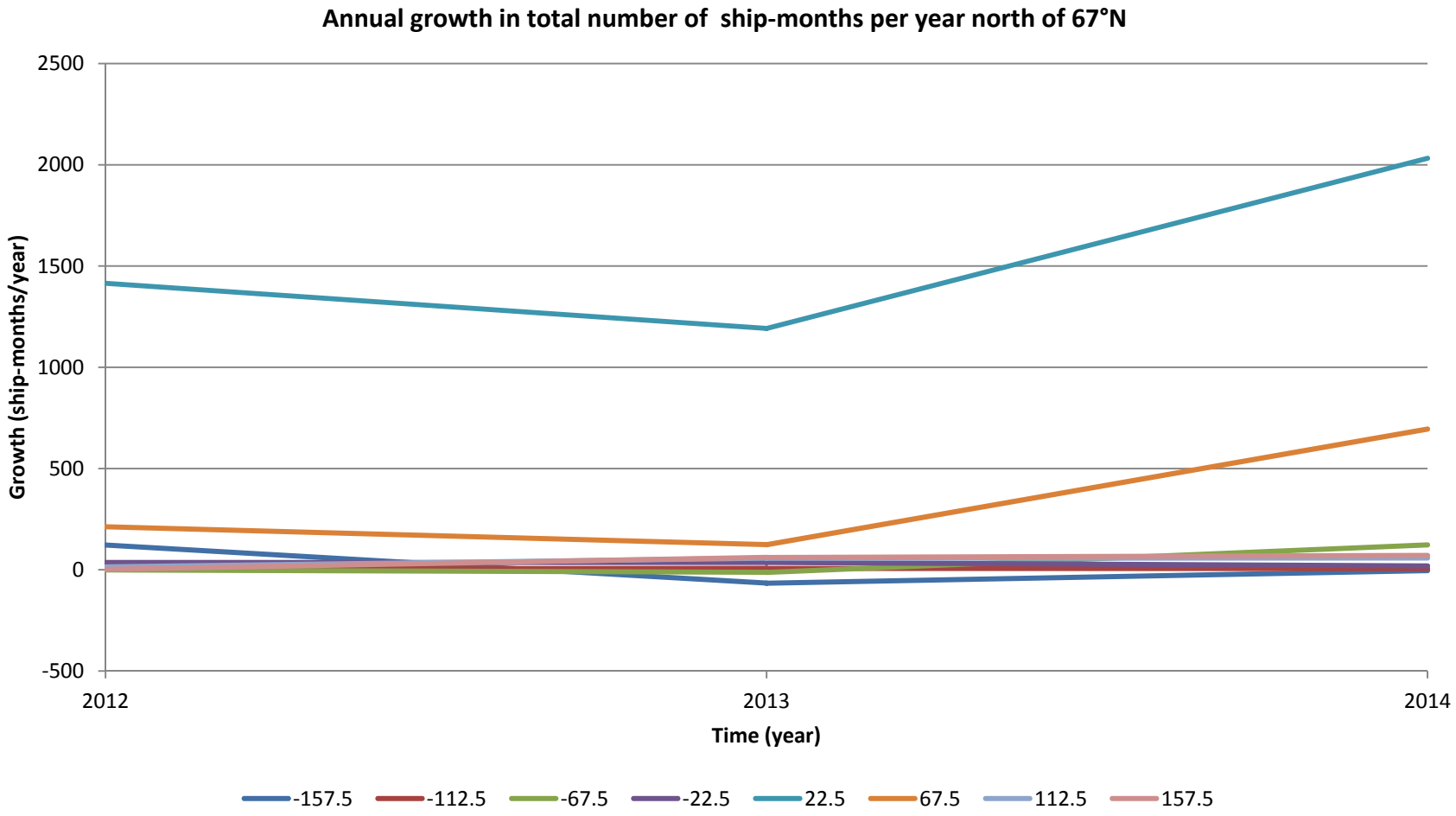
# Geographic distribution in 45°-lon sectors - 5 years; total number of ships (zoom)



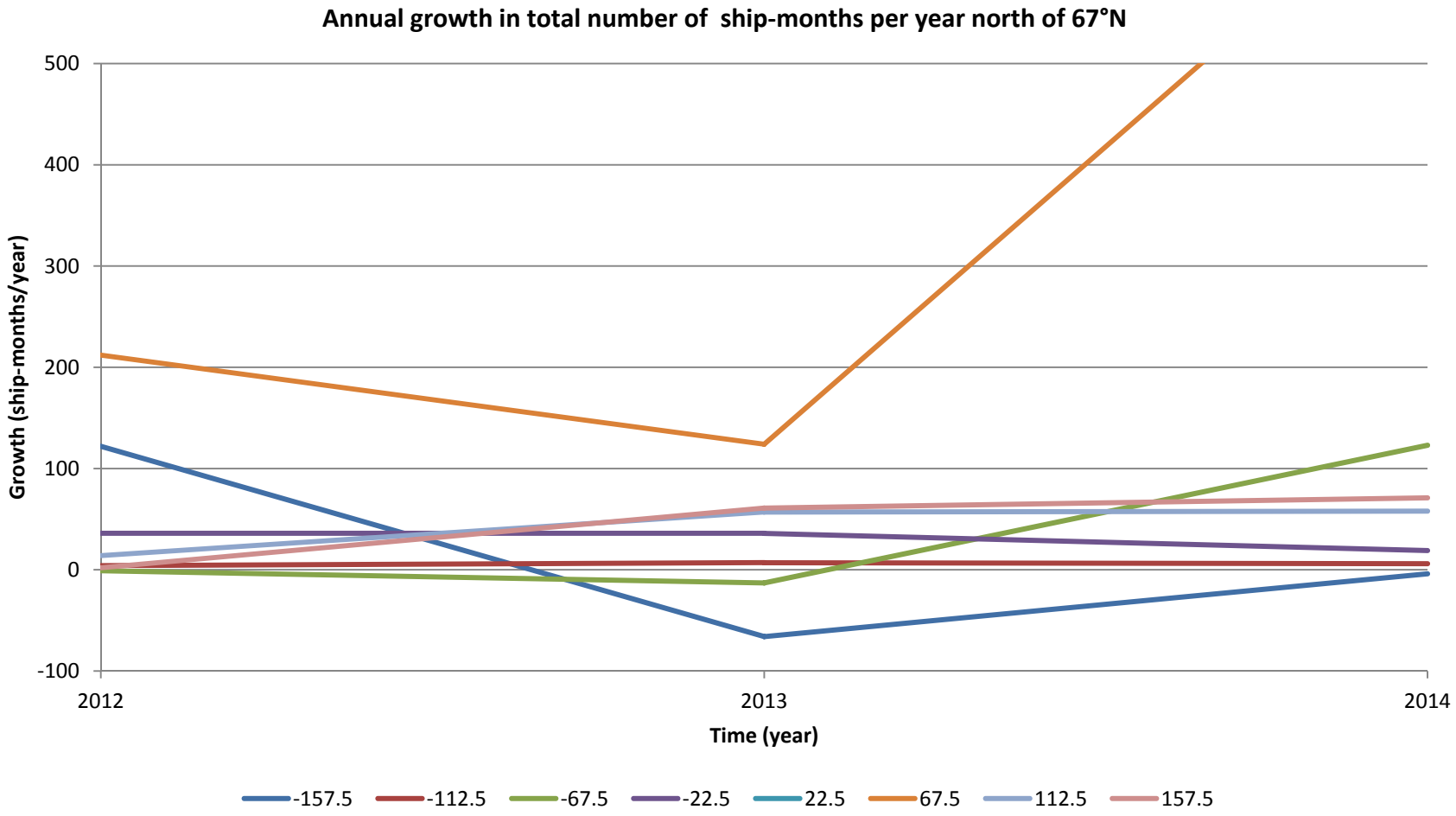
# Geographic distribution in 45°-lon sectors - growth in total numbers from 2013 to 2014

| | -157.5 | -112.5 | -67.5 | -22.5 | 22.5 | 67.5 | 112.5 | 157.5 | Total |
|---|---|---|---|---|---|---|---|---|---|
| Jan | 1 | 1 | 3 | -2 | 204 | 9 | 0 | 1 | 217 |
| Feb | 0 | 1 | 6 | -10 | 163 | -10 | 1 | 2 | 153 |
| Mar | -2 | 0 | 3 | -15 | 218 | 29 | -2 | 0 | 231 |
| Apr | 1 | 1 | 4 | -25 | 204 | 7 | 3 | 3 | 198 |
| May | 1 | -1 | 9 | -7 | 141 | 9 | 8 | -2 | 158 |
| Jun | 4 | -2 | 10 | 1 | 142 | 85 | 8 | 3 | 251 |
| Jul | -10 | -5 | 23 | 36 | 144 | 108 | 9 | 12 | 317 |
| Aug | 2 | 5 | 18 | 29 | 195 | 149 | 14 | 27 | 439 |
| Sep | 4 | 2 | 15 | 11 | 166 | 157 | 23 | 27 | 405 |
| Oct | -1 | 1 | 11 | 1 | 164 | 117 | -6 | 1 | 288 |
| Nov | -3 | 0 | 16 | 12 | 153 | 4 | 0 | -1 | 181 |
| Dec | -1 | 3 | 5 | -12 | 138 | 31 | 0 | -2 | 162 |
| Total | -4 | 6 | 123 | 19 | 2032 | 695 | 58 | 71 | 3000 |

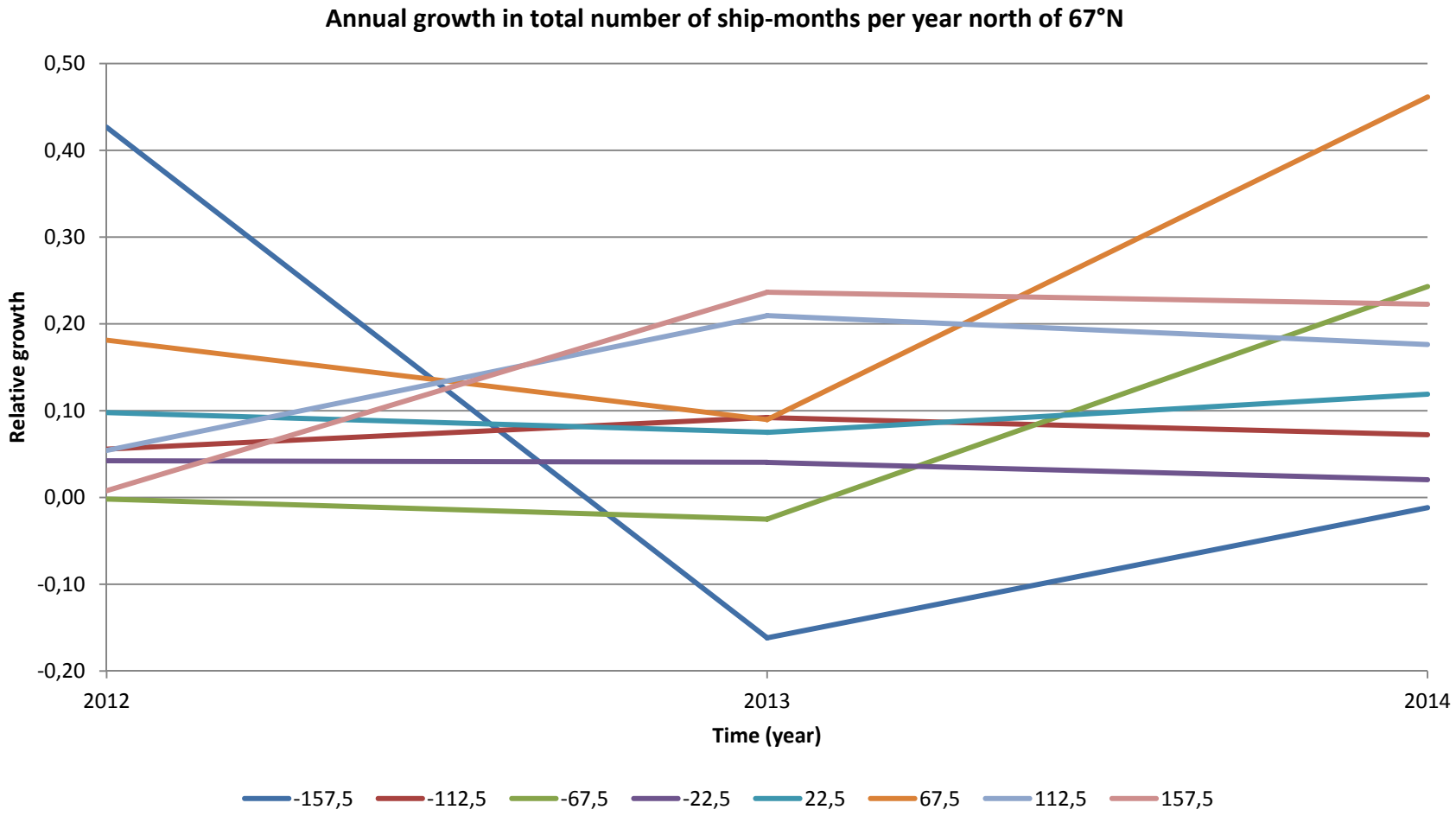
# Geographic distribution in 45°-lon sectors - growth in total between 2011 and 2014



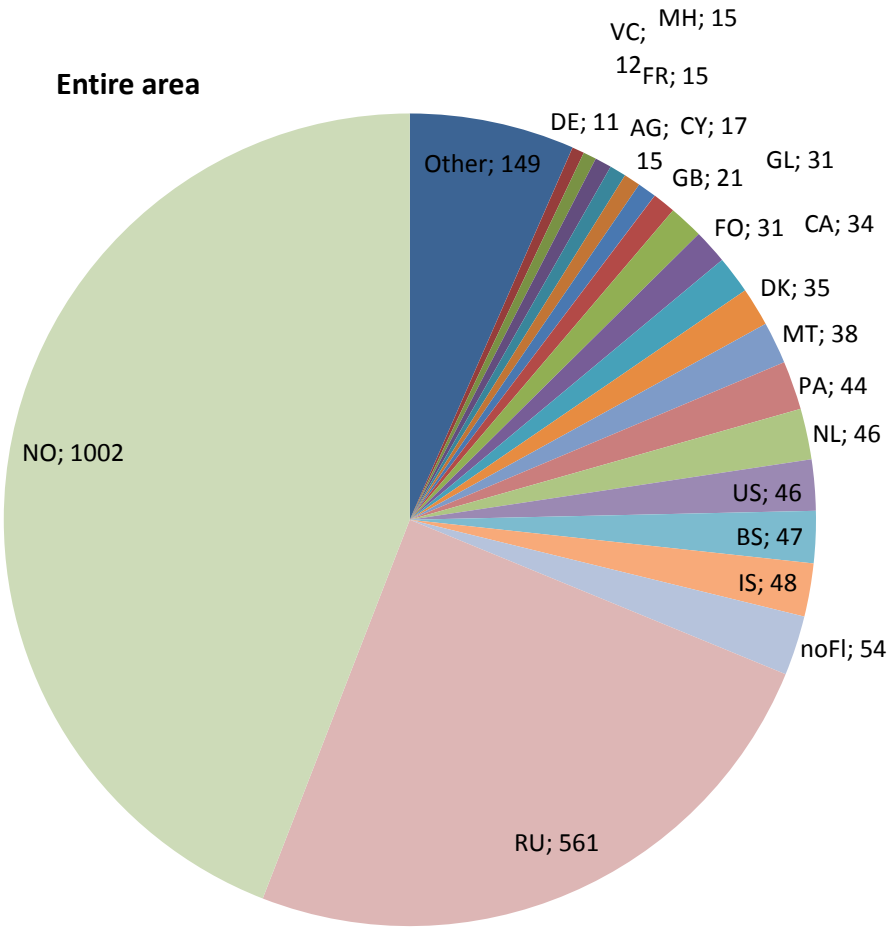
# Geographic distribution in 45°-lon sectors - growth in total between 2011 and 2014 (zoom)



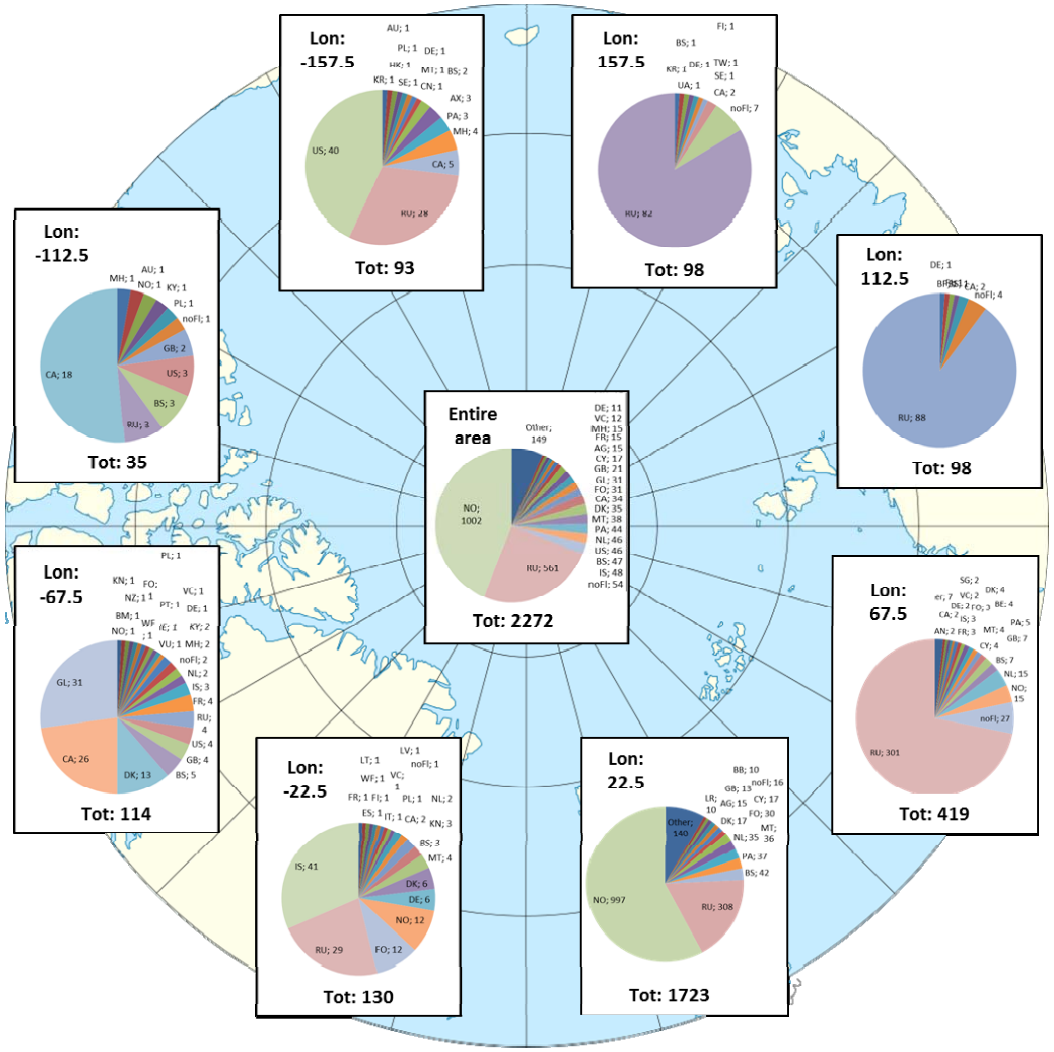
# Geographic distribution in 45°-lon sectors - relative growth in total between 2011 and 2014



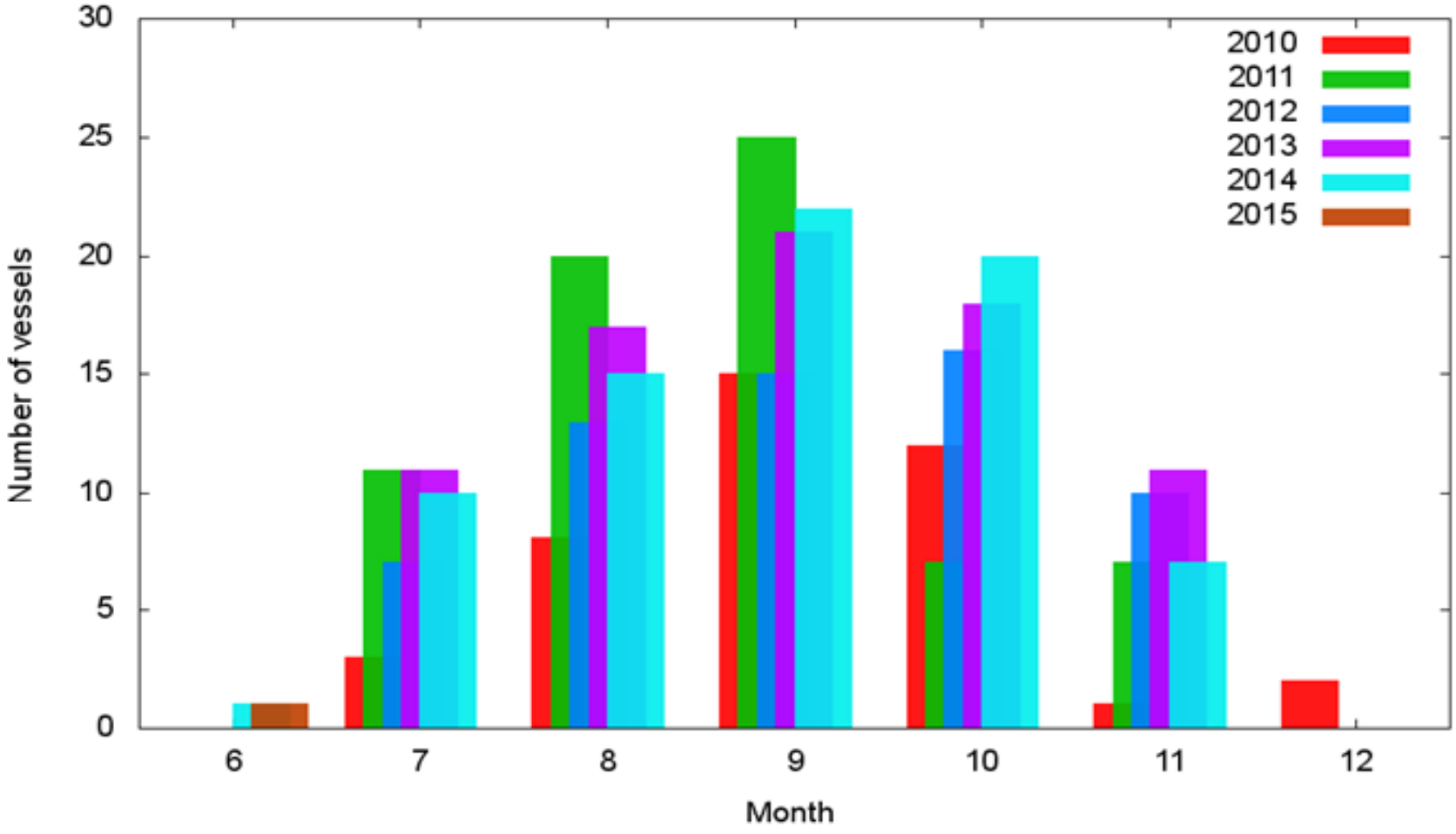
# Number of ships counted by flag state
# - August 2014 in the entire Arctic north of 67°N



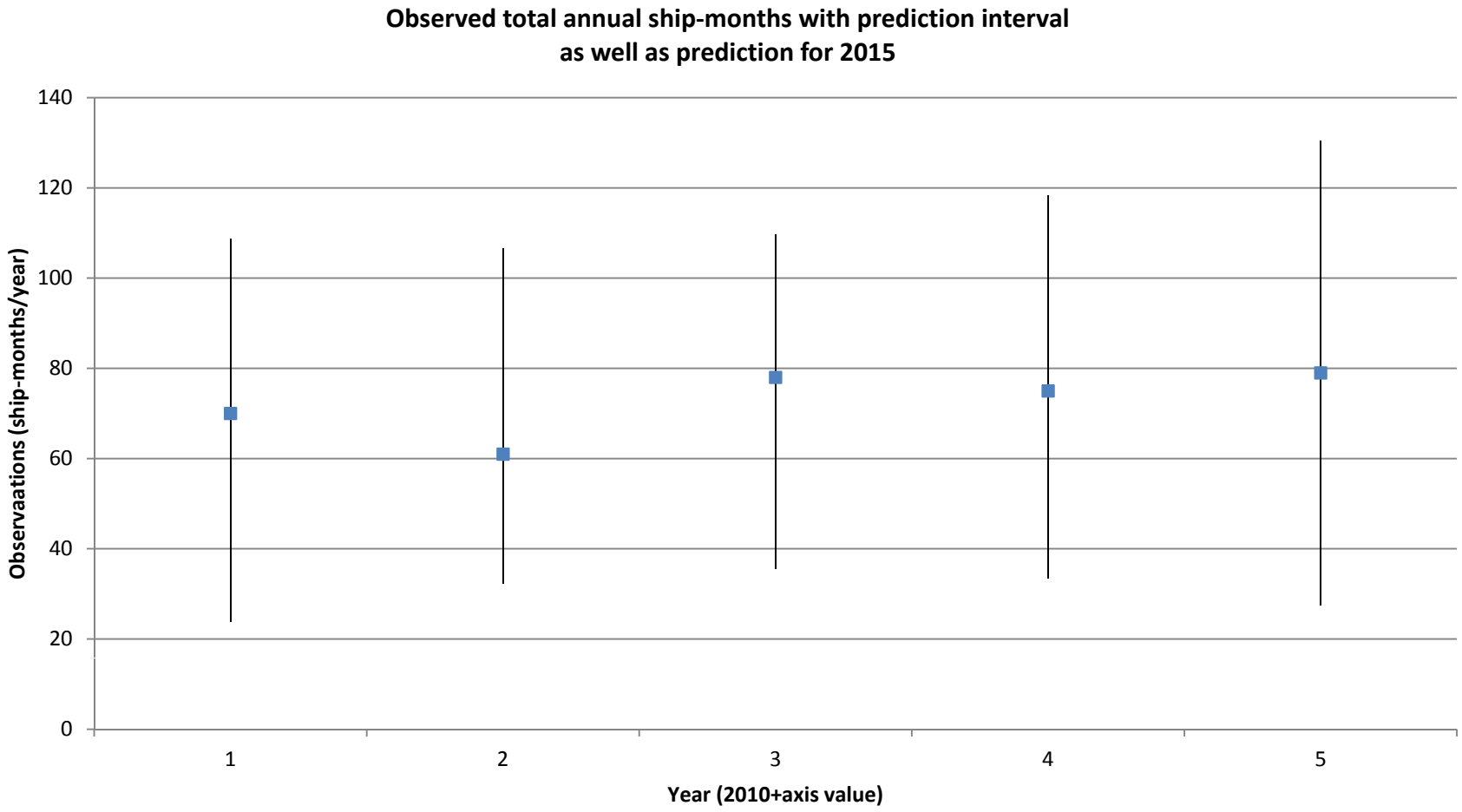
# Number of ships counted by flag state
# - August 2014 in sectors of 45° longitude



# Ships crossing the Northeast Passage - 5 years; Count of ships per month

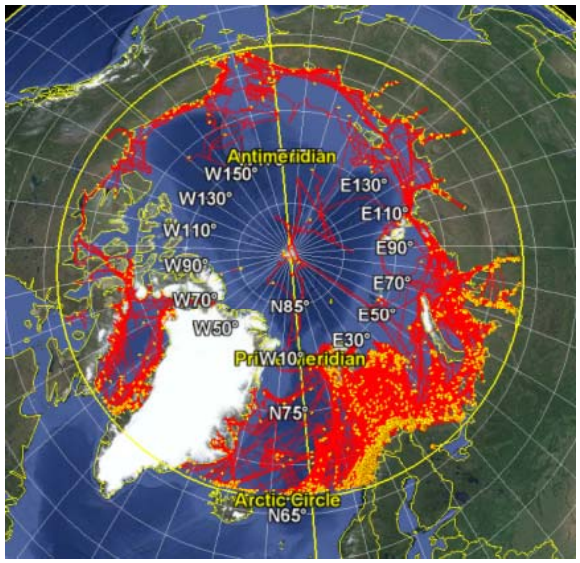


# Ships crossing the Northeast Passage - 5 years; Total ship-months with uncertainty

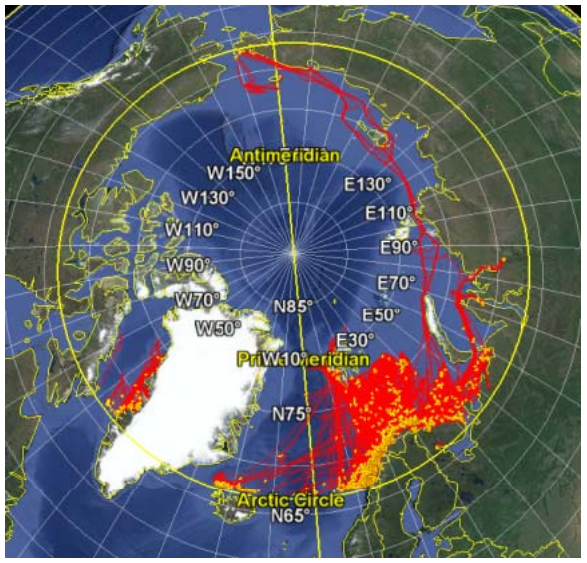


# Seasonal variations in ship tracks

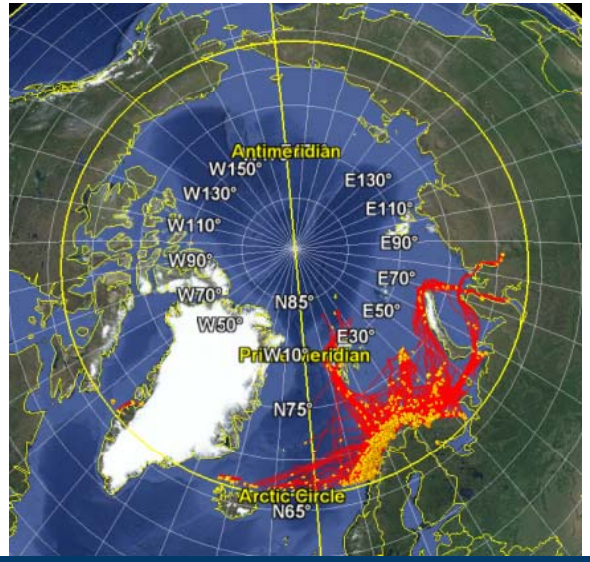
August 2014



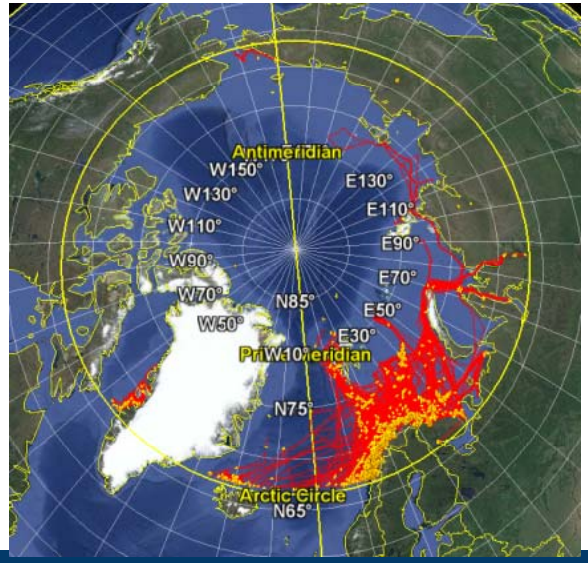

November 2014




February 2015



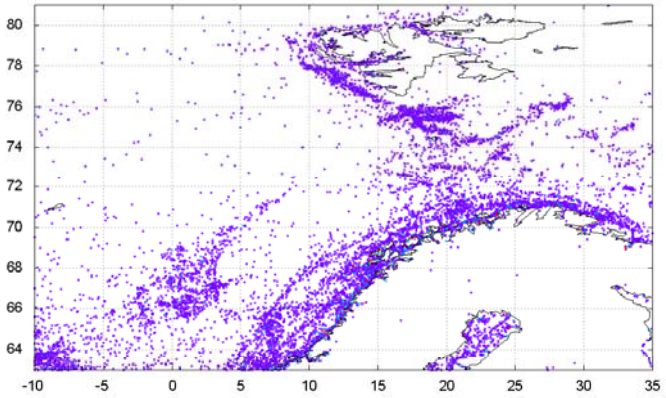

May 2015



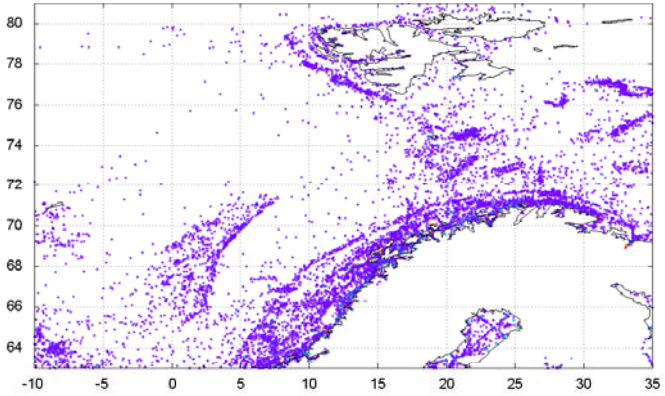



Background map courtesy of Google Earth

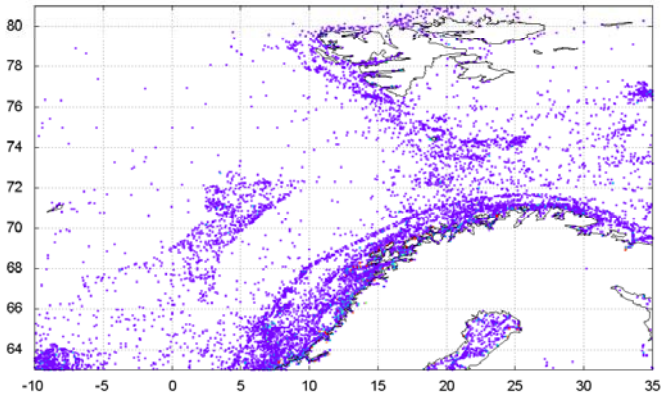
# Annual ship densities in July 2011 - 2014



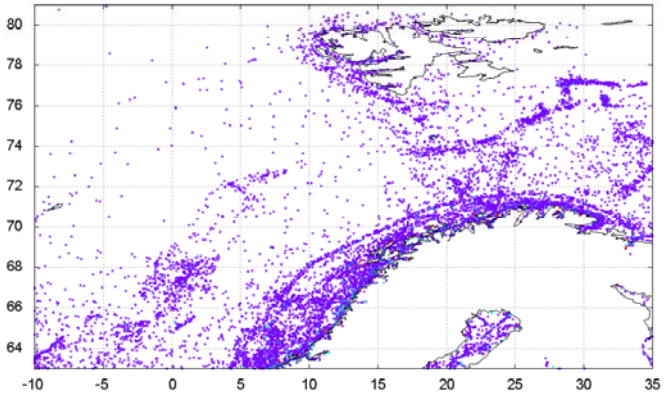

July 2011




July 2012




July 2013

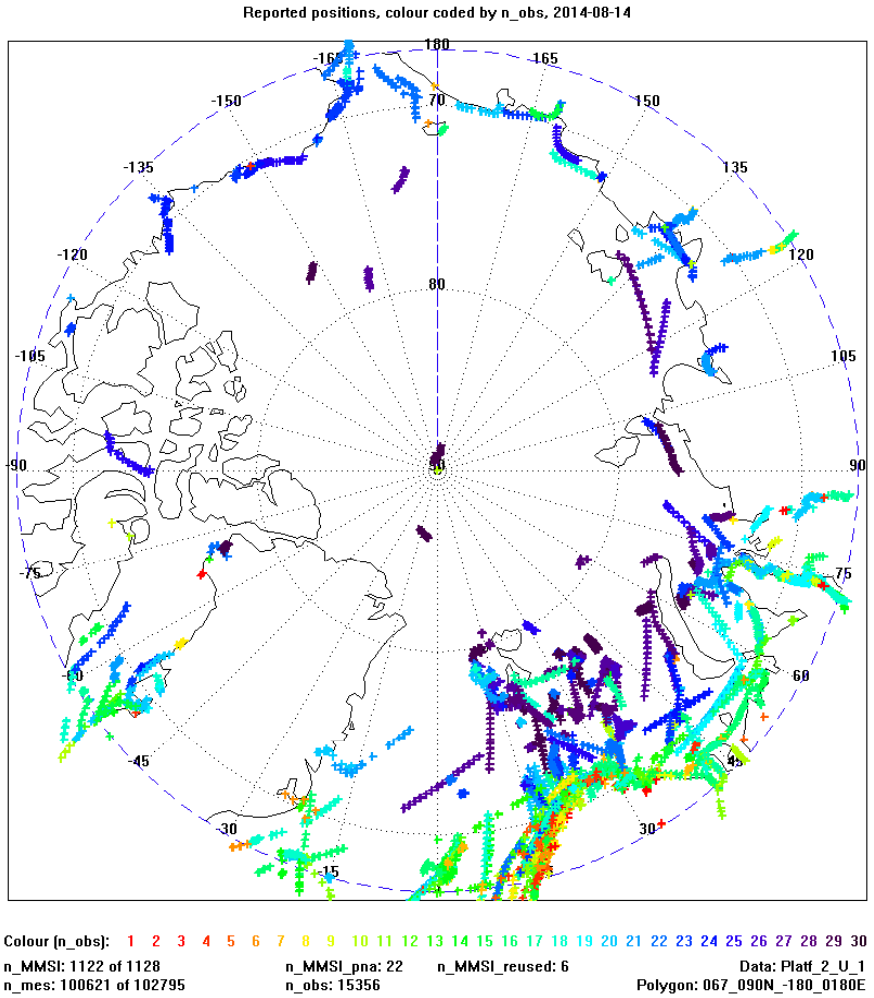



July 2014

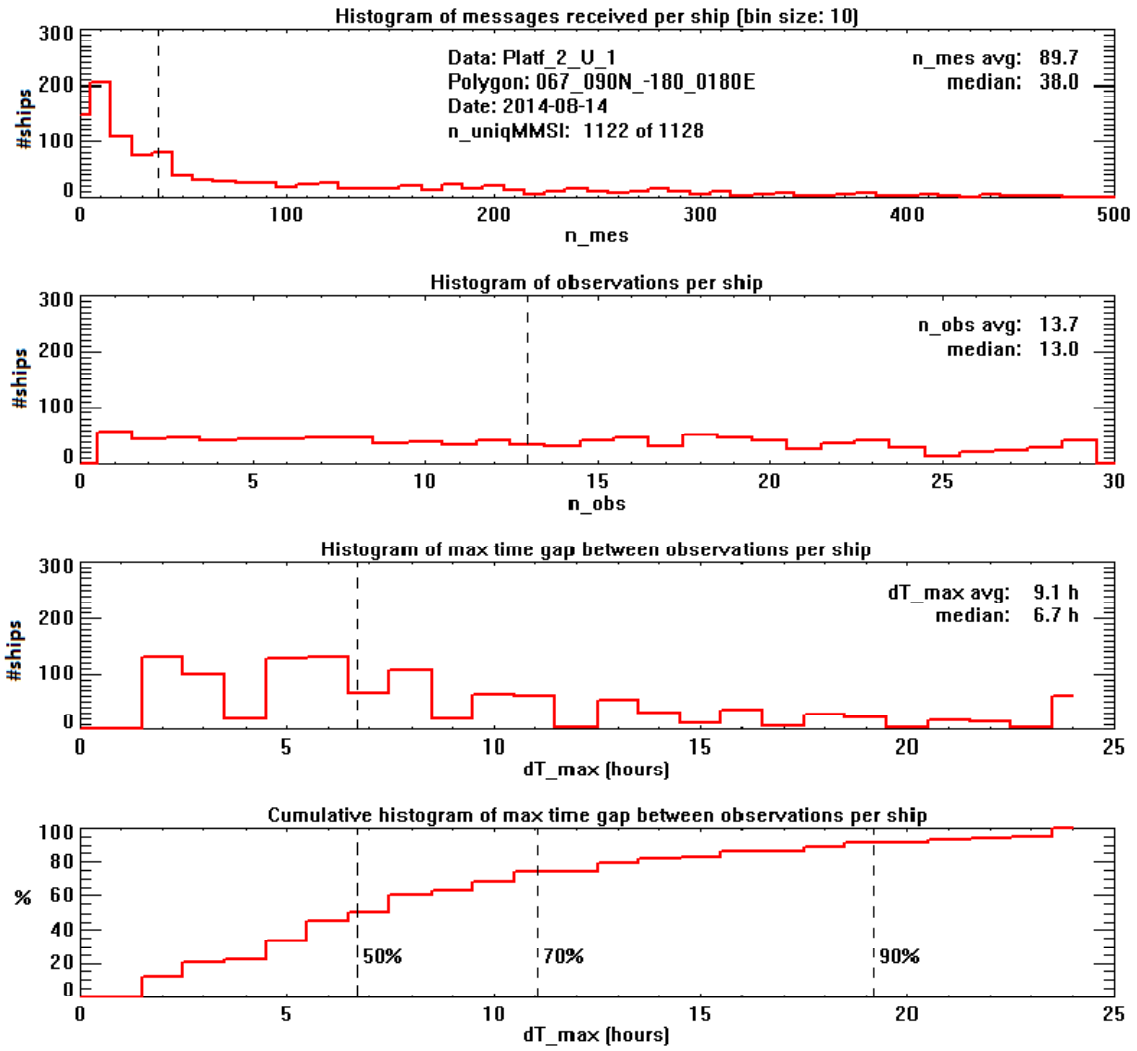
# Ship tracks on 14 August 2014

Ship photos courtesy of MarineTraffic. Background map courtesy of Google Earth

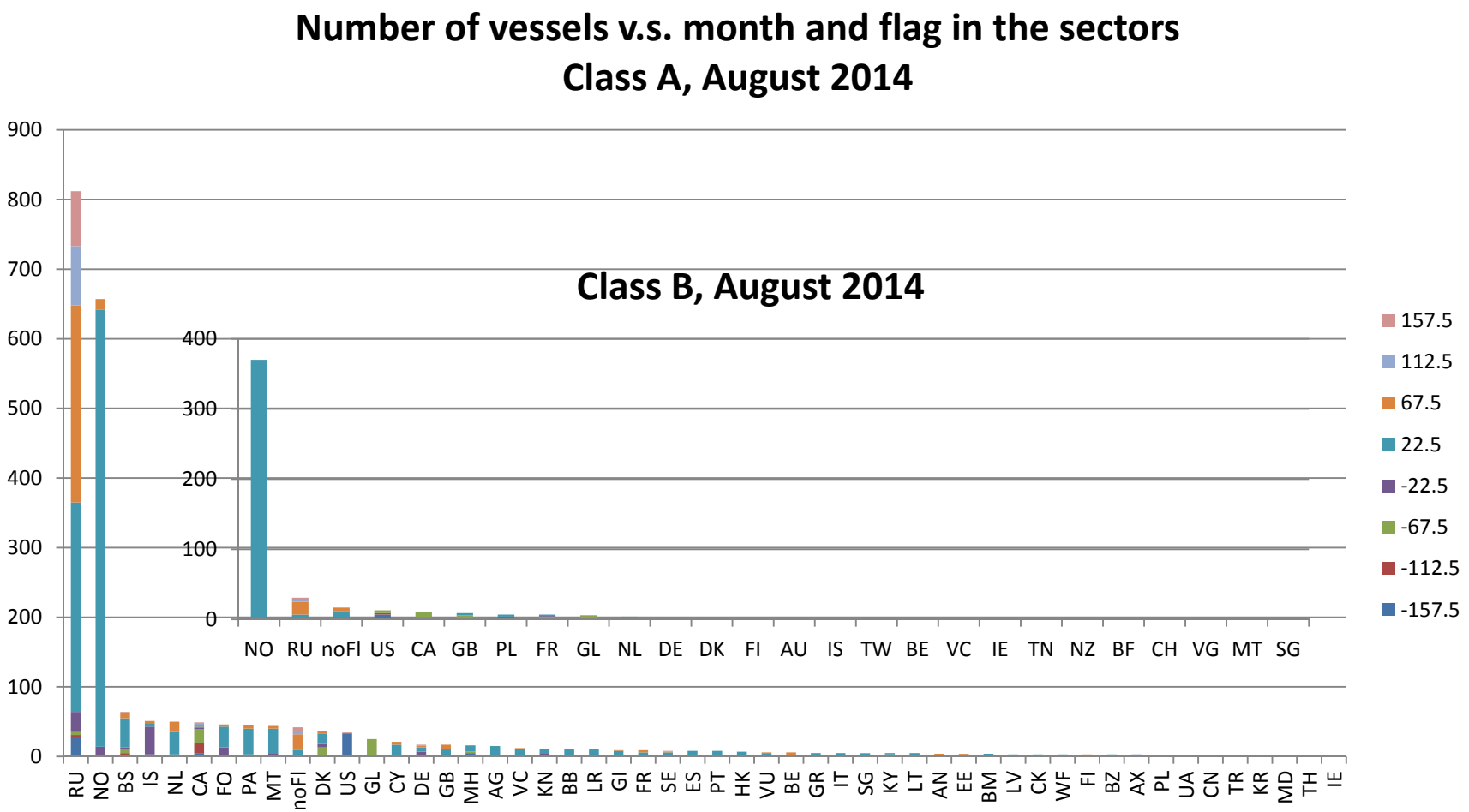
# Ship positions coloured by the number of observations for each ship



# Quality of service parameters distributions



# Summary

- The number of reporting ships per month has varied from 1073 (December 2010) to 2272 ships (August 2014).
- The growth in number of reporting ships varies with month; from 113 at the minimum in November to 201 ships/year at the maximum in July.
- The growth is partly due to changes in regulations, i.e. EC 1224/2009 (the Control Regulation) by 31 May 2014 all fishing vessels above 15m.
- The highest number of ships are in the 0-45°E sector, 1723 of 2272 ships in August 2014.The annual growth has been around 10%.
- The highest relative growth is in the following three eastern sectors, having an average growth between 15% and 24% per year.
- Monthly ship-type counts give 600 fishing vessels, 430 cargo ships, 120 tankers, 100 passenger ships, 100 tugs and 280 other ships (in 2014).
- Up to 1200 vessels are observed per day, of which 1100 are using AIS Class A and 100 Class B.
- The median number of position updates per ship per day are typically 13 and the largest daily time gaps are smaller than 6.7 hours.

# Number of ships counted by flag state - August 2014 by sector