Analysing Vessel-Strike Risk to NARWs:

Benefits and challenges of working with AIS

Session:
Data and Modelling for Shipping Risk

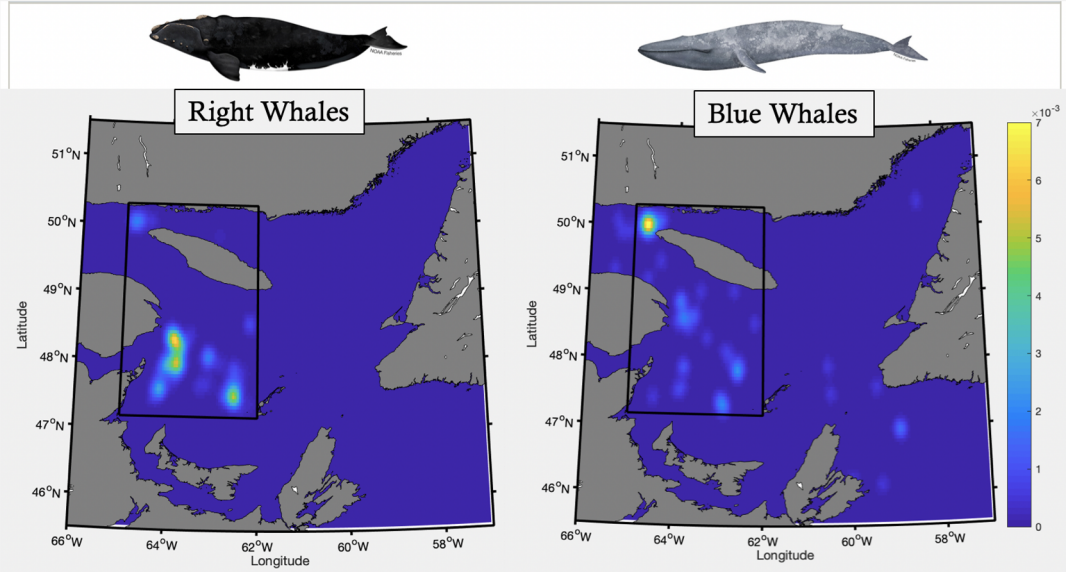
Outline

I. Problem we're investigating

II. Practical application

III. Gaps and challenges of AIS

Vessel strike risk to endangered whales in the Gulf of St. Lawrence (GSL)



- ❏ North Atlantic right whale (<409)
- ❏ Northwest Atlantic blue whale (<250)

- ❖ Endangered
- ❖ Primary cause of death: strikes, entanglement
- ❖ Blue whales SINK

What questions could be addressed through information about vessel traffic?

1. Probability of vessel strike
2. Probability of death if a whale is struck
3. Effectiveness of past management (was risk reduced?)
4. Vessel density/speeds in the area of carcasses
5. Compliance with speed restrictions
6. Are changes in vessel traffic patterns due to ice-out or speed restrictions?
7. Fleet turnover rates: are safety bulletins/outreach effective?

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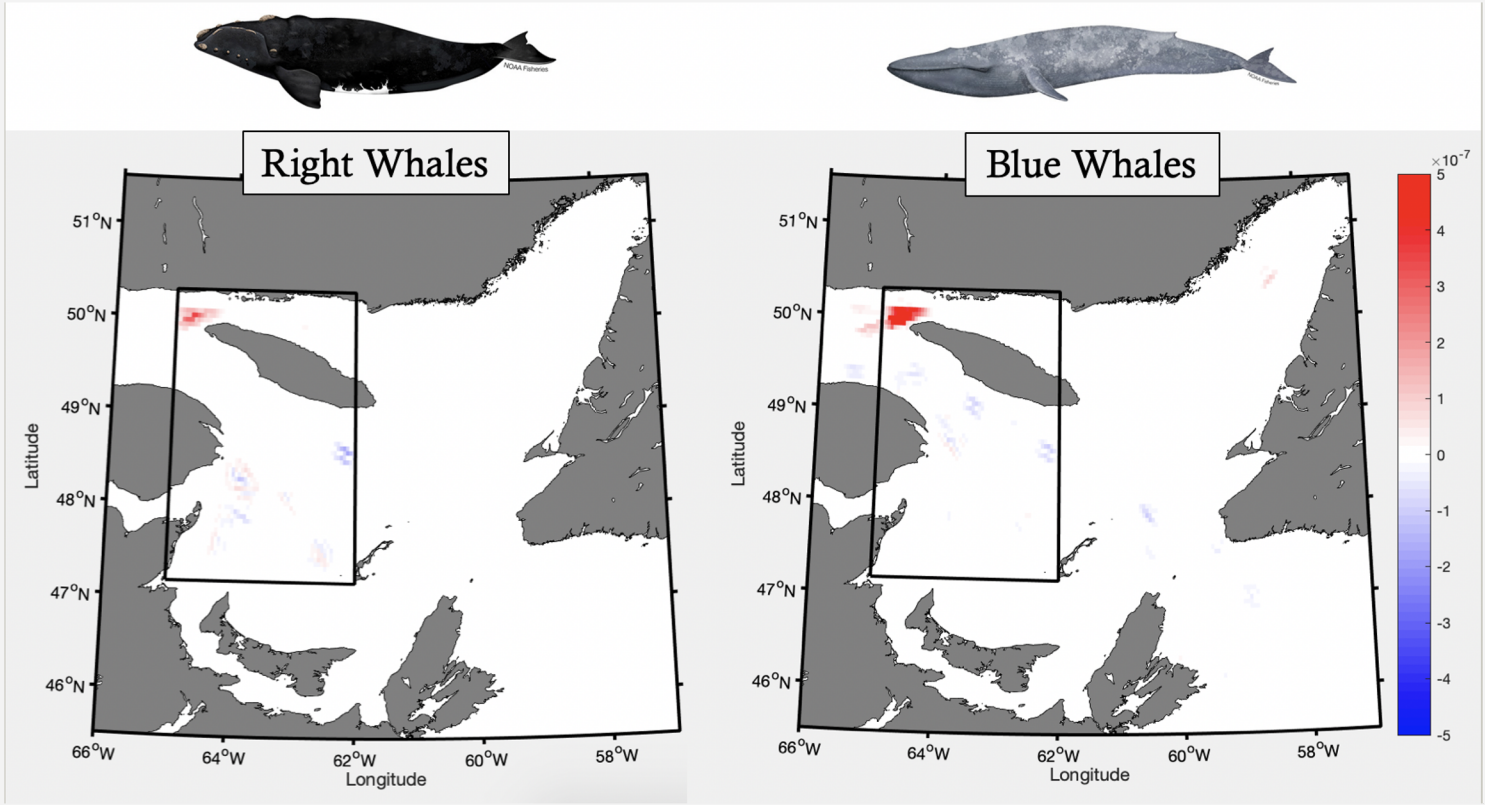
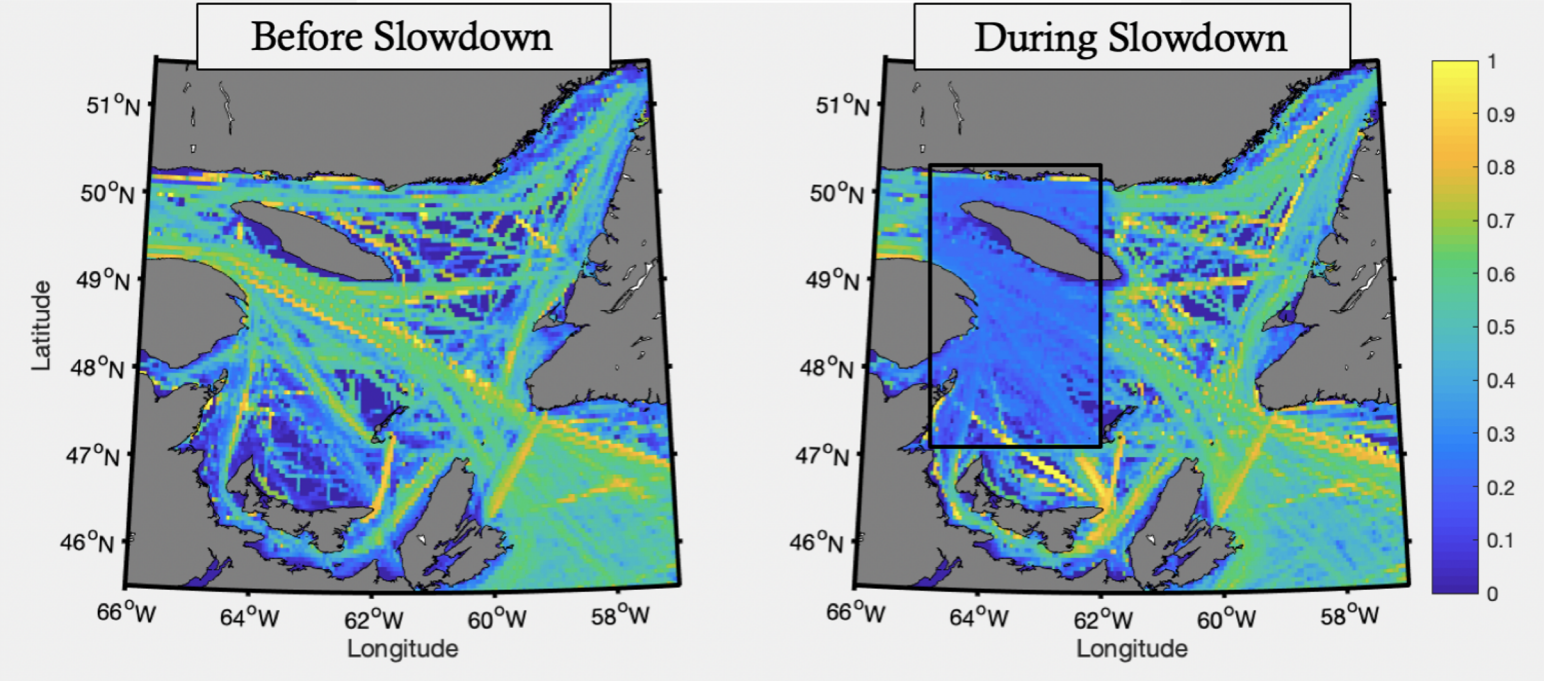
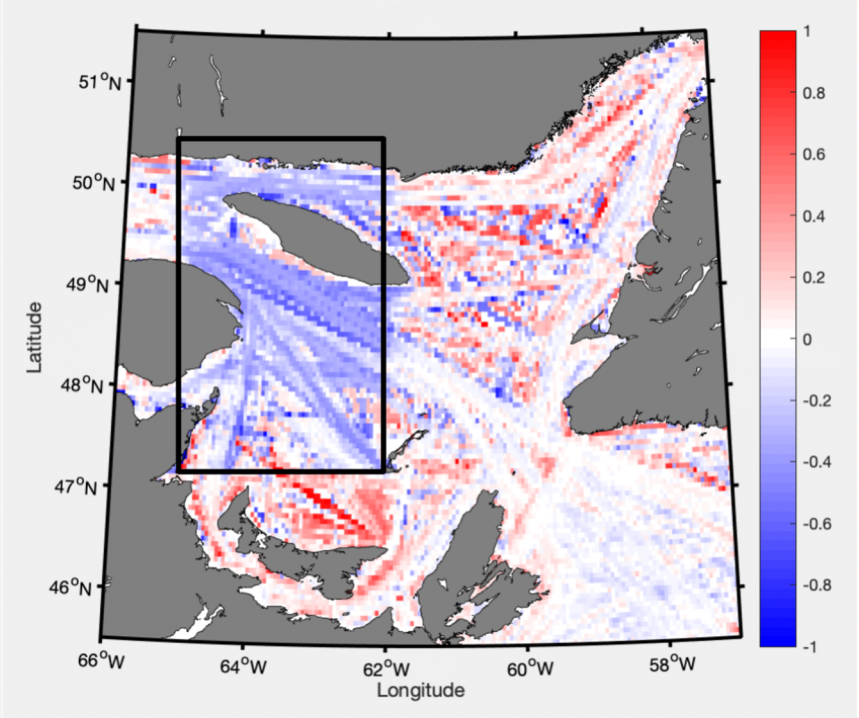
Preliminary observations: p(Encounter) residual



Preliminary observations: p(Lethality)

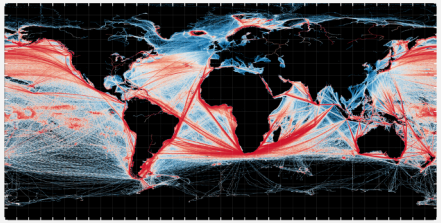


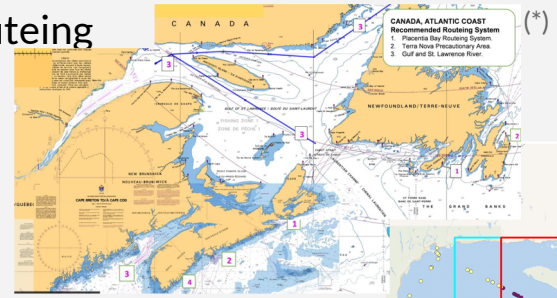
Preliminary observations: p(Lethality) residual



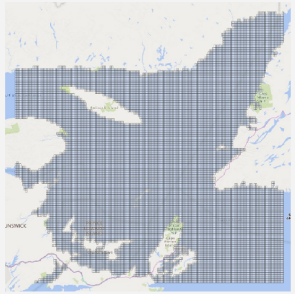
Data integrated into this effort

- Satellite AIS data
- Traffic separation area / recommended routeing
- Boundaries of speed reduction area
- Shoreline boundary
- Study area boundaries





(*)



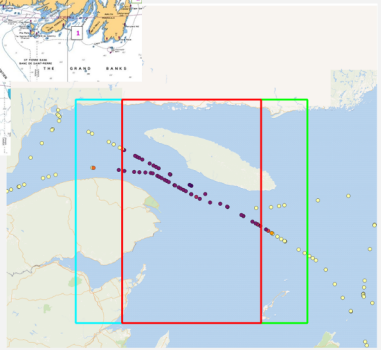
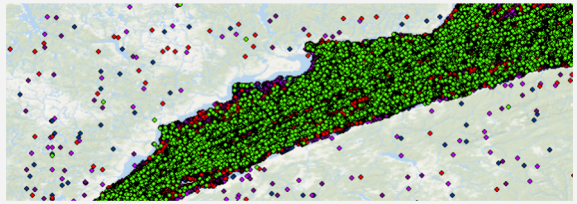
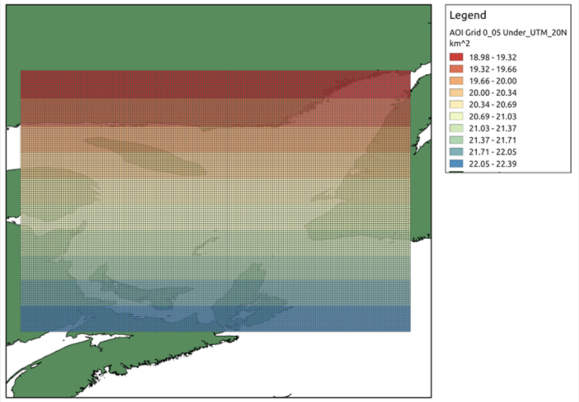


Image credit: (*) Canadian Hydrographic Service, Transport Canada

Data cleaning and planning

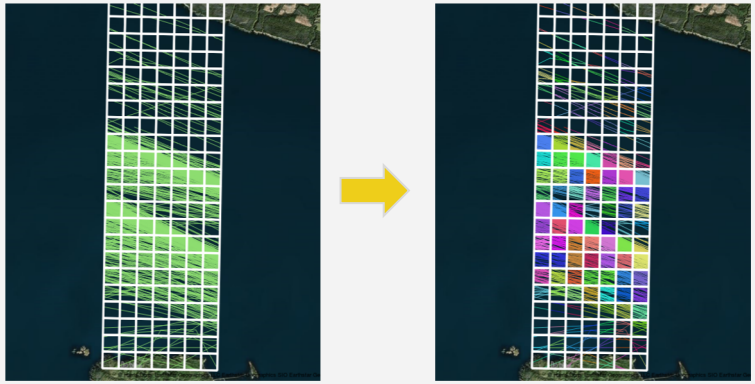
a. Invalid unique identifier (MMSI)
    i. Erroneous (MID not valid)
    ii. Duplicate (Transmit error)
b. Filter speeds
    i. Low (<0.5kts) speeds
    ii. Unrealistically high (>35kts)
c. Pare spurious positions
d. Limit to Class A AIS
e. Set output grid resolution
    i. Size needed (0.5deg)
    ii. Consider impact of cell size vs area

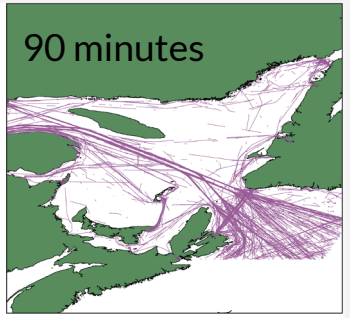


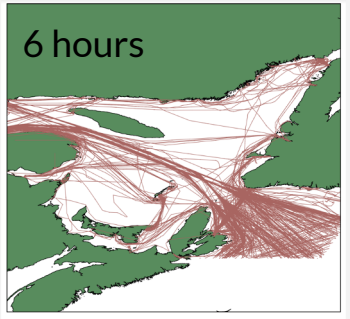


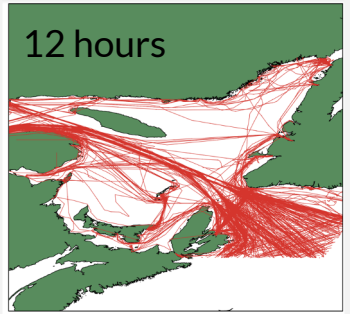
Modelling

a. Establish desired output metrics:
    i. Ships / time interval
    ii. Statistics on vessel, transit parameters (e.g. speed, size)
b. Resolution, range of acceptable speeds, latitude issues
c. Interpolate between reported positions & speeds
d. Construct grid representation









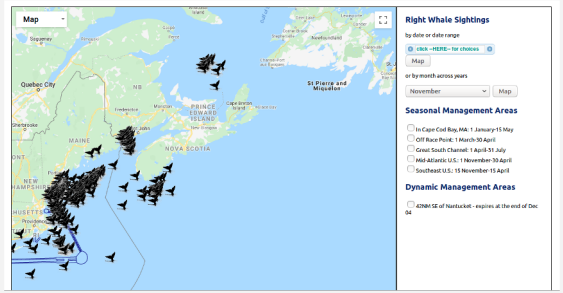
Limitations Identified

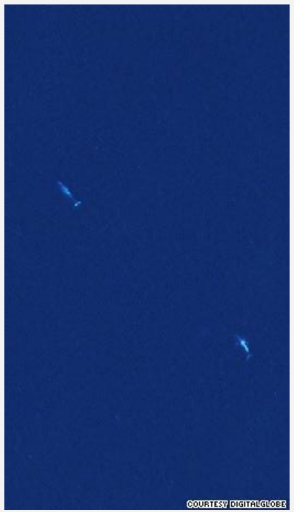
1. AIS
    a. Application difficulties:
        i. Not all vessels operate Class-A AIS (e.g. fishing, pleasure)
        ii. Not all data (vessel details, in particular) are input consistently across the fleet
    b. Use for compliance:
        i. Suitability / propriety of applying data stream to this role
    c. Cost / coverage can be prohibitive:
        i. More coverage -> more cost
        ii. Offshore areas of interest necessitate a technological solution (read: satellite)
2. Whale observation
    a. More observations pending
    b. Incorporation of effort correction

Additional data resources for future work

a. For vessels:
    i. Class-B AIS
    ii. VMS
b. For whales:
    i. Mandatory sighting reports
c. For both:
    i. Satellite imagery
    ii. Acoustic (PAM+detection) systems

...other prospective resources, suggestions?





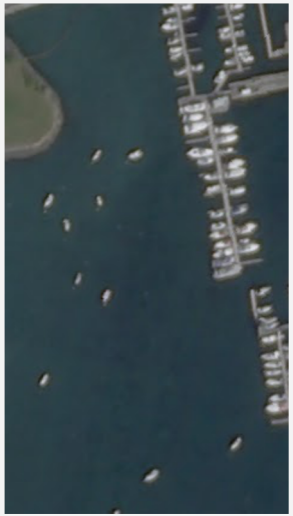


Image credit: CW from top: NOAA, Planet Inc., Digitalglobe

Acknowledgements and Citations

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