

Assessing Speed Reductions: Efficacy, Data Gaps, and Opportunities

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Vessel strikes remain a significant contributor to morbidity and mortality of North Atlantic right whales. Various voluntary and mandatory regulations including vessel re-routing or speed reductions have been implemented specifically to reduce lethal-vessel strikes to right whales. After implementation, monitoring and evaluation are critical steps in assessing effectiveness. We have used two approaches to assess effectiveness of vessel-strike mitigation measures: (1) Automatic Identification System (AIS) data, which provide vessel movement in time and space, in combination with whale movement. Based on observed observed mariner compliance to the Roseway Basin ATBA, per-capita lethal vessel-strike probability to right whales has been reduced by 69%, extending vessel-strike occurrence from every 2 years to every 42 years. (2) Spatial and temporal trends in large whale mortalities attributed to vessel strikes following post-mortem investigations can be used to assess mitigation measures. For example, there are significantly fewer vessel-strikes to right whales following the Ship Speed Rule implemented in 2008, and the distribution of vessel-strike mortalities to all large whales has changed. However, high mortality occurs outside of managed time and space, and reductions in mortality cannot be linked to the Speed Rule alone. Compliance assessment is critical to properly assess the efficacy of regulations, and AIS and mortality approaches should be combined to understand the mechanism and outcome of a policy.

My recommendations for additional effective vessel-strike measures in Canada are to (1) make any regulation easy to follow and well-enforced, and use mariner behaviour (AIS) data to assess compliance and risk reduction, and (2) determine cause of death and continue to monitor vessel behaviour and whale mortality for extended periods of time to derive sufficient datasets to assess efficacy with mortality data.

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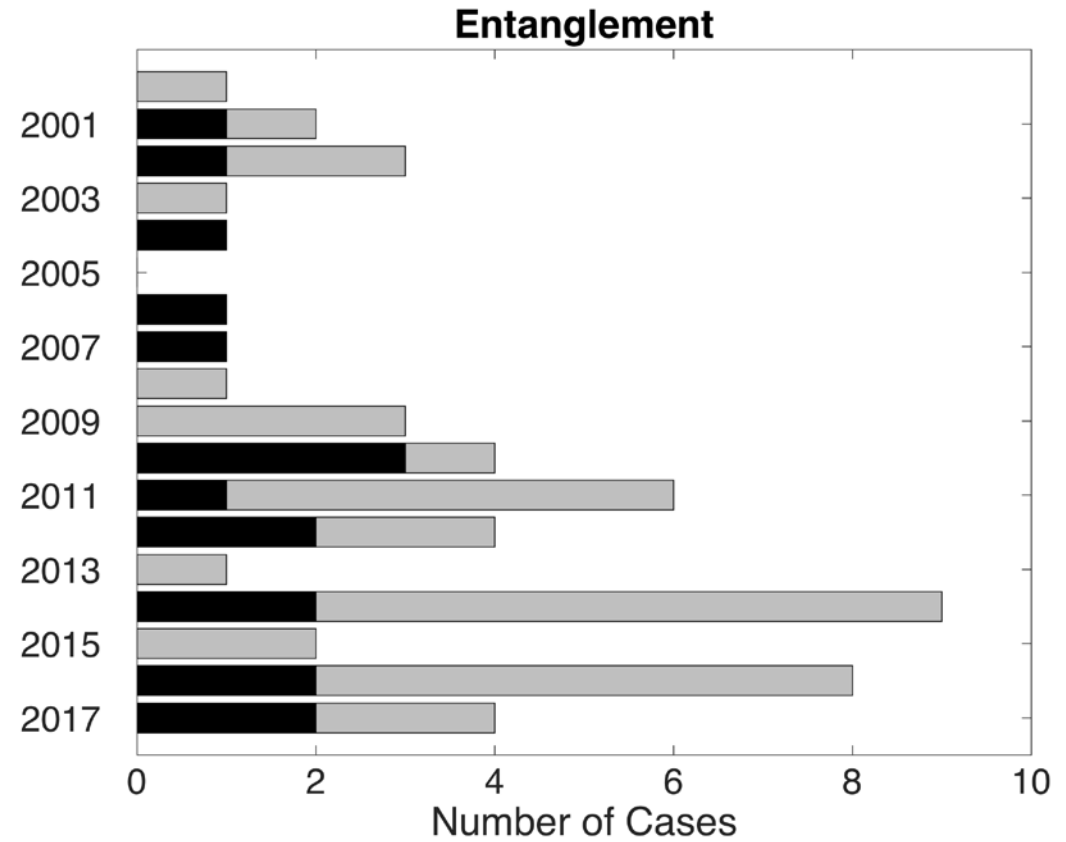
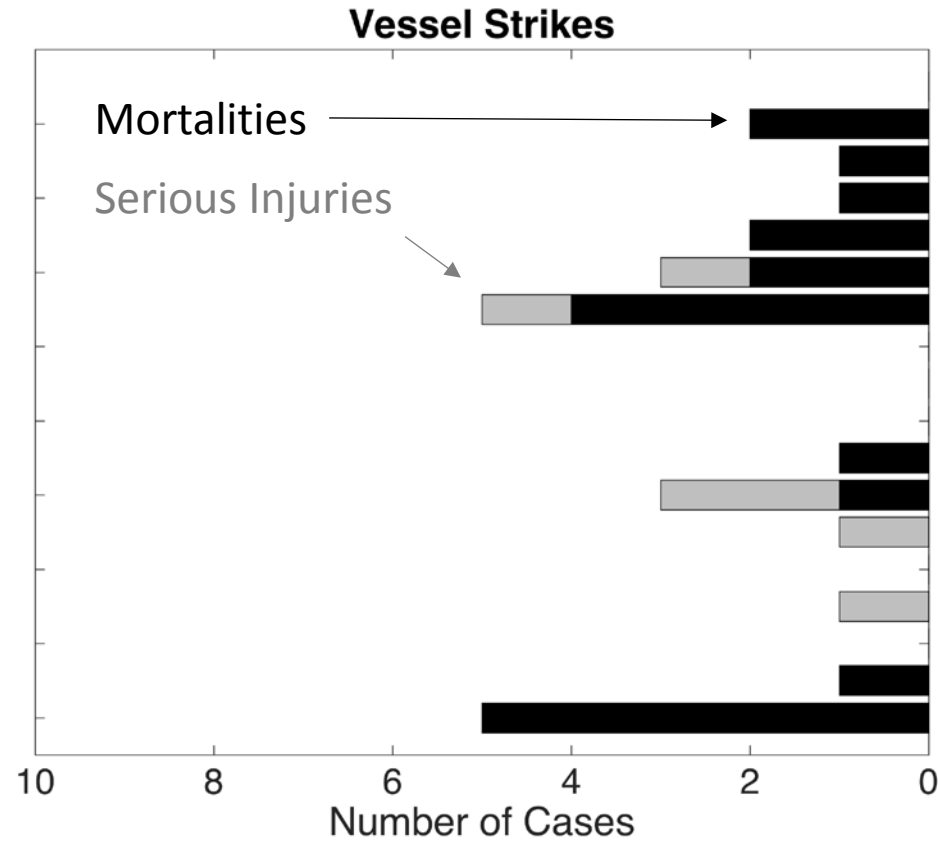


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Vessel strikes remain a serious risk to NARW population



Completing the policy cycle:

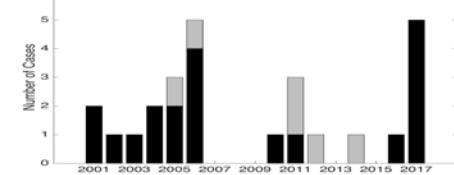


Indicators vs Goal:

Did the policy achieve the goal?

Evaluation

Issue Identification



Goal: Reduce mortality and injury as a result of vessel strikes

Brown et al. 2009 – RW Recovery Plan
NOAA 2008, 2013 – Federal Register

Indicators:

Navigator behaviour
Probabilities
Mortality data

Implementation and Monitoring

Analysis and Selection

Go around e.g. TSS, ATBA
Slow down

Bay of Fundy
Roseway Basin

Everywhere, all year
Seasonally e.g. SMA
Adaptively e.g. DMA

Long-term Eastern Seaboard
U.S. Ship Strike Rule

Assessing voluntary ATBA in Roseway Basin

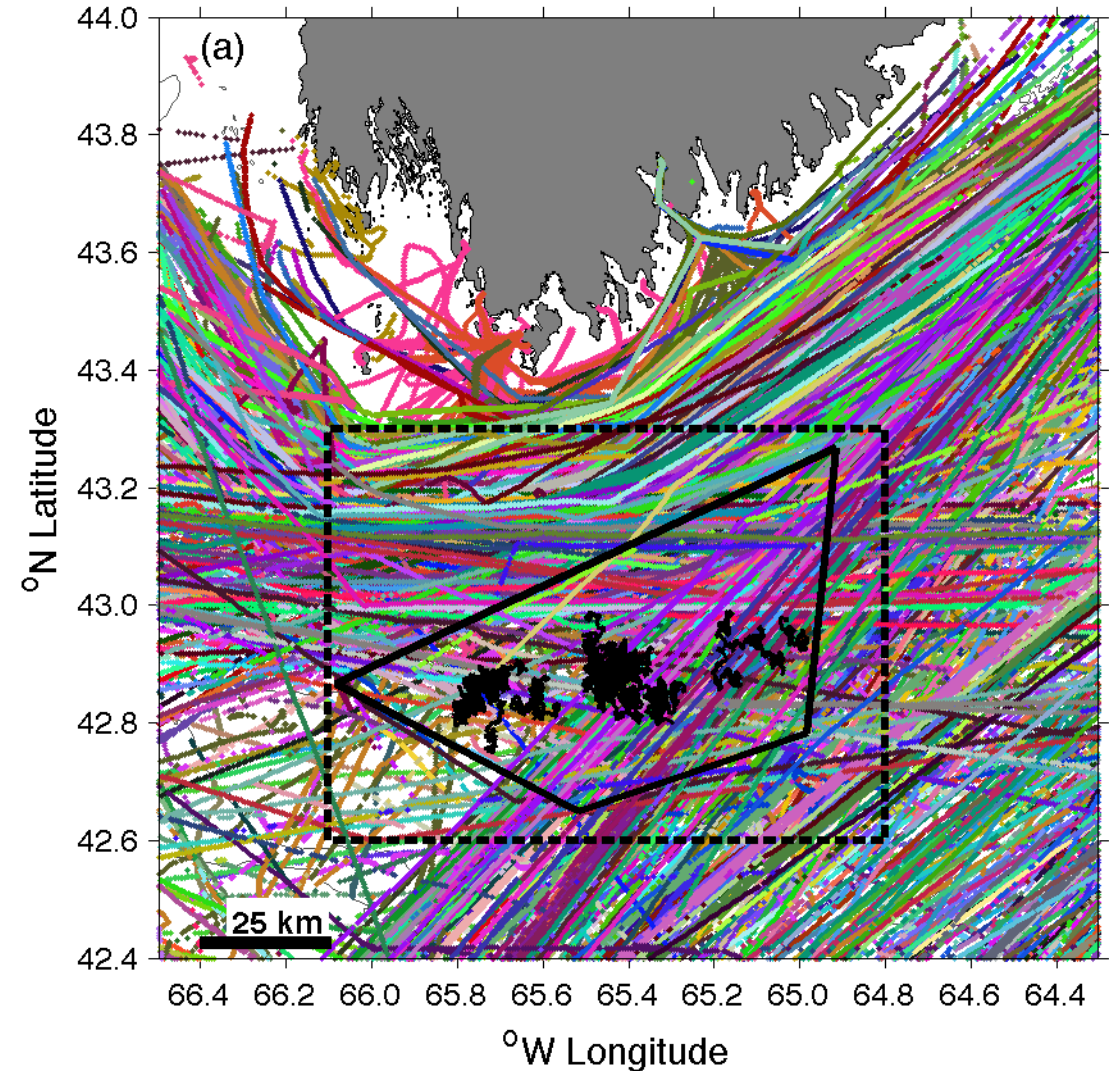
AIS data: Real vessels in space and time

Whale observations: historical average

Simulated movement

Encounter probabilities

Probabilities of lethal vessel strikes



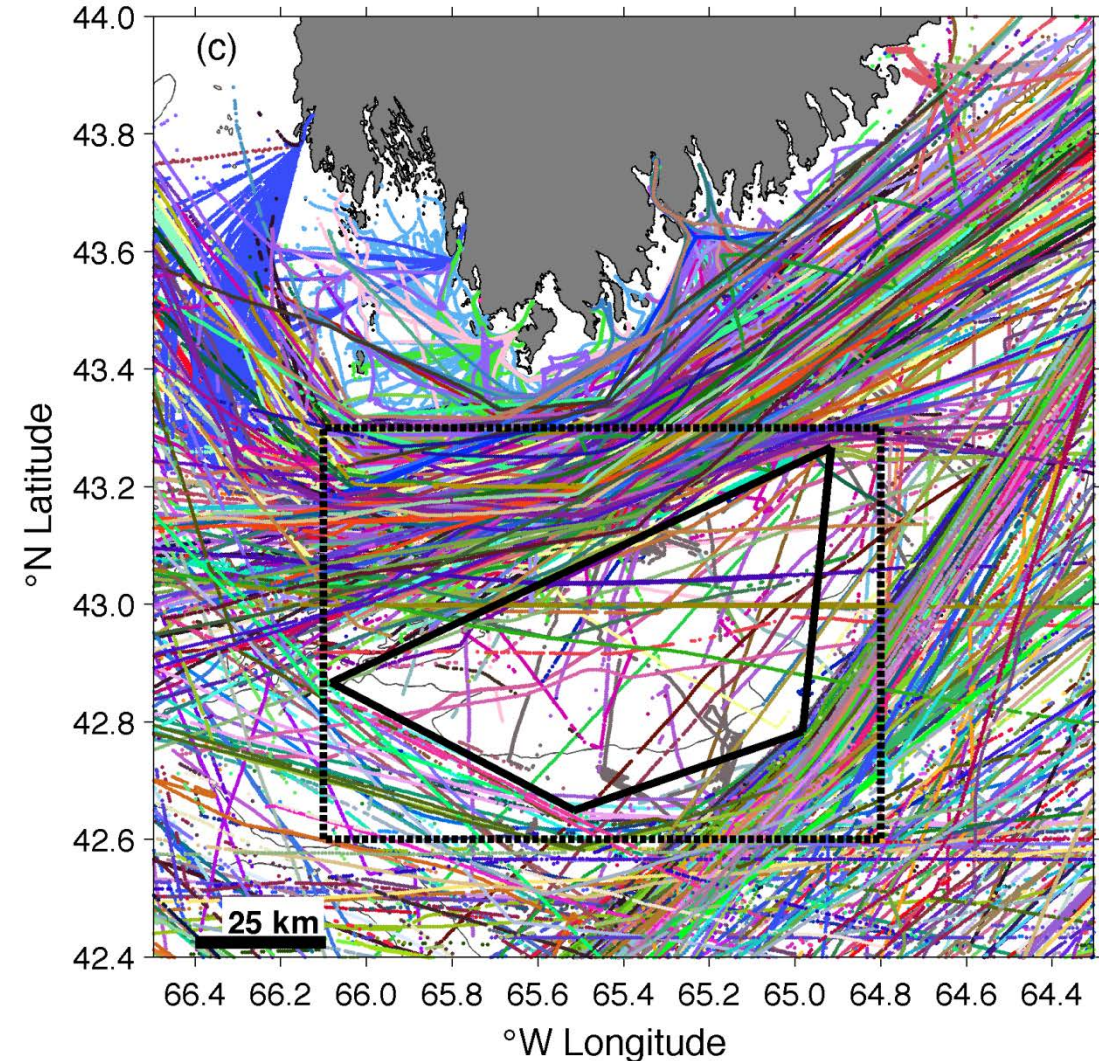
Before (2007)

ATBA reduces per capita lethal vessel-strike probability by **69%**

Extends vessel strike occurrence from every **2 years** to **42 years**

- **Direct effect** of voluntary initiative
- Considers **compliance** and **observed behaviour**

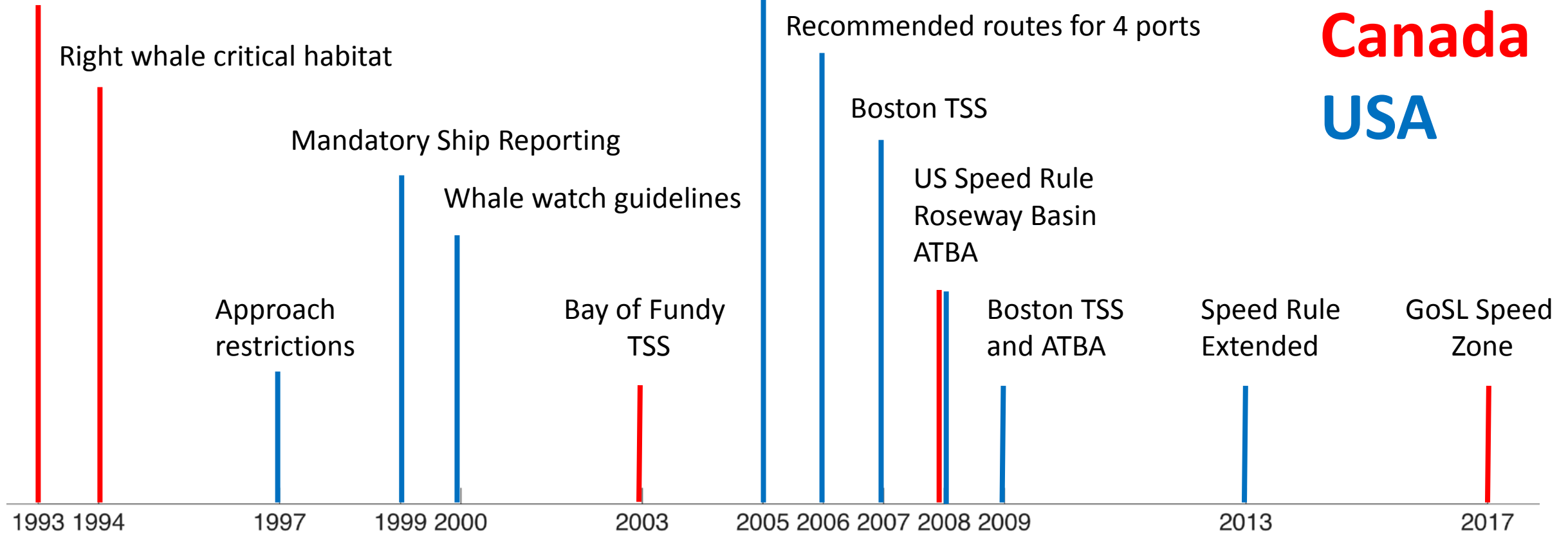
After (2009)



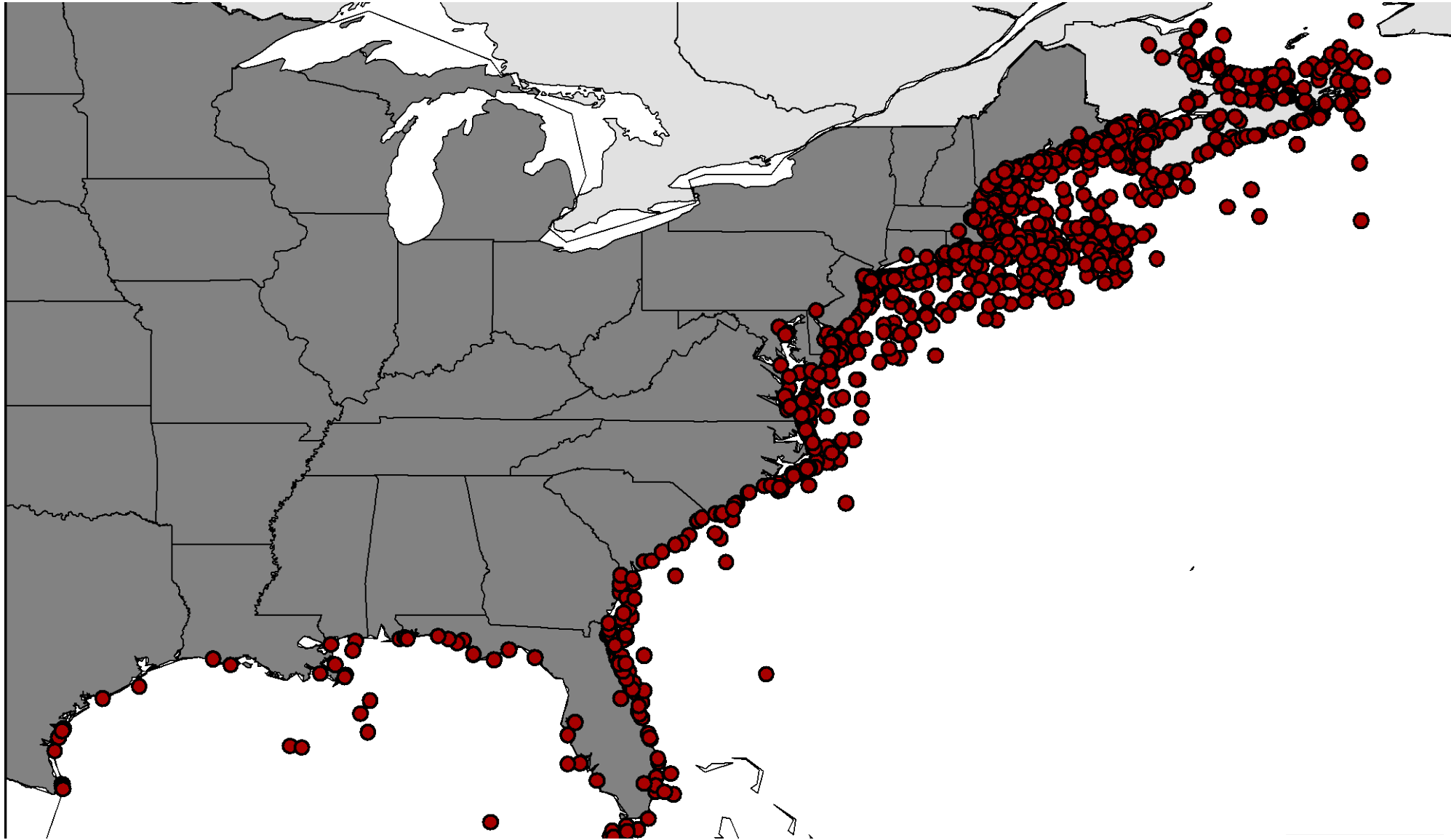
Vessel-strike mitigation actions

Right whale conservation areas
Mariner awareness program

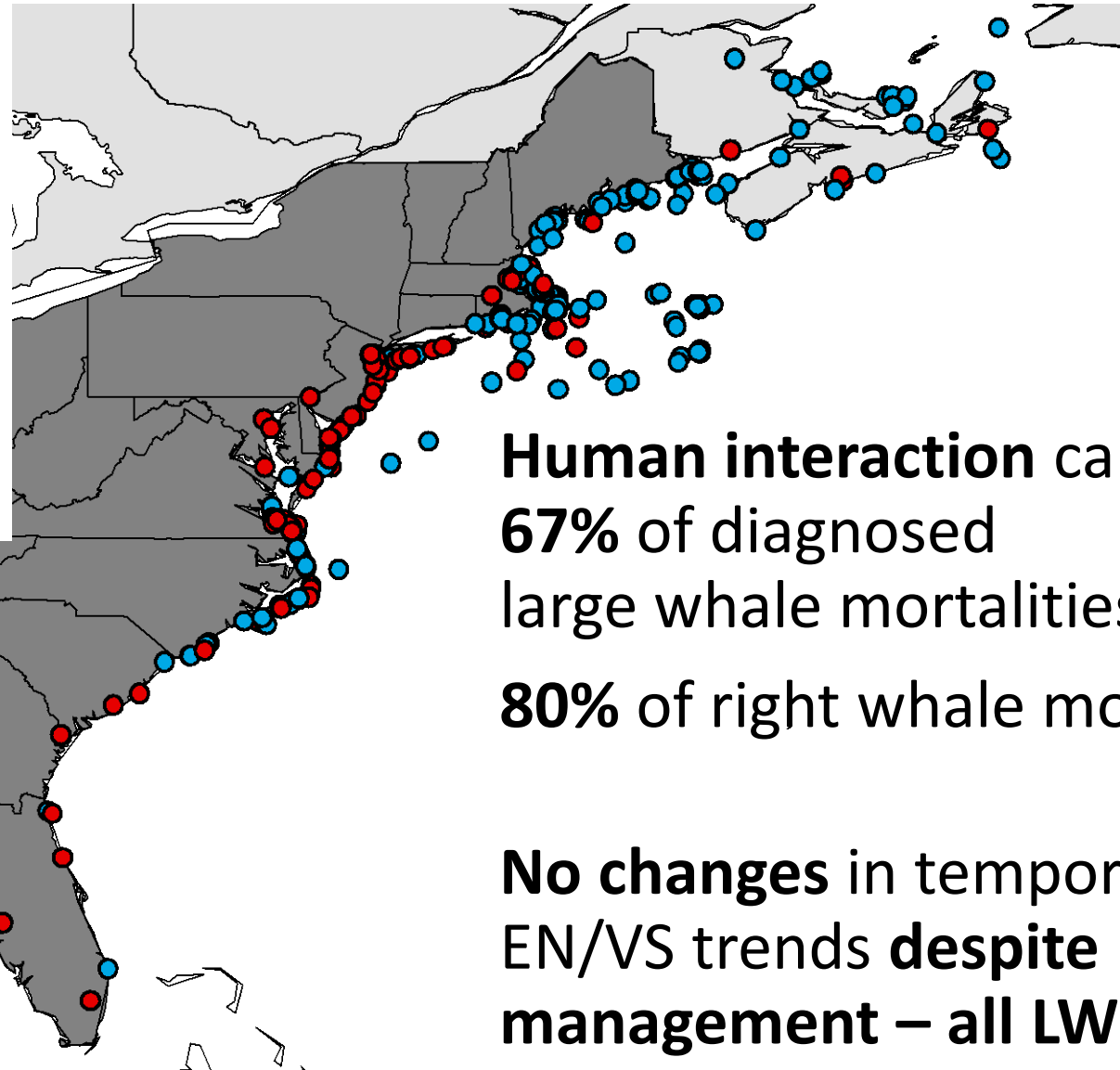
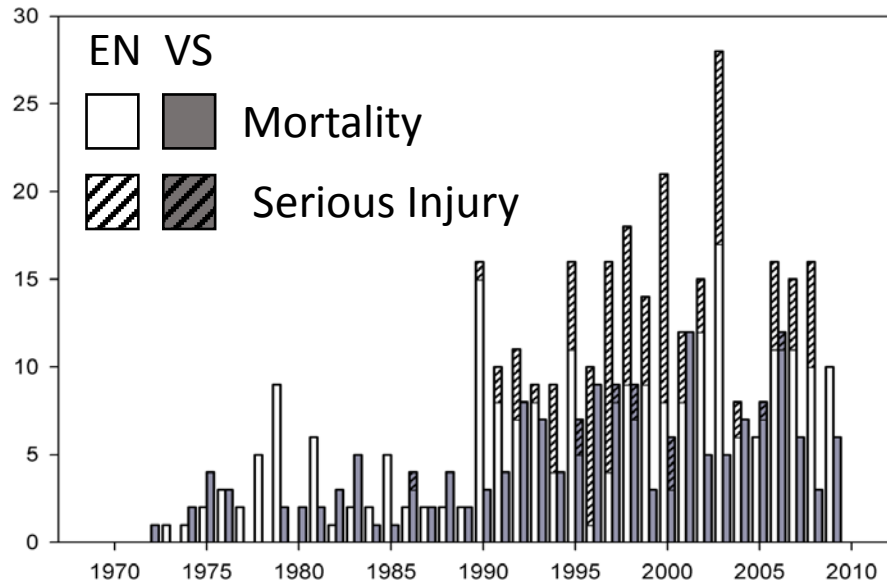
Ship strike reduction strategy



Testing effectiveness with mortality data



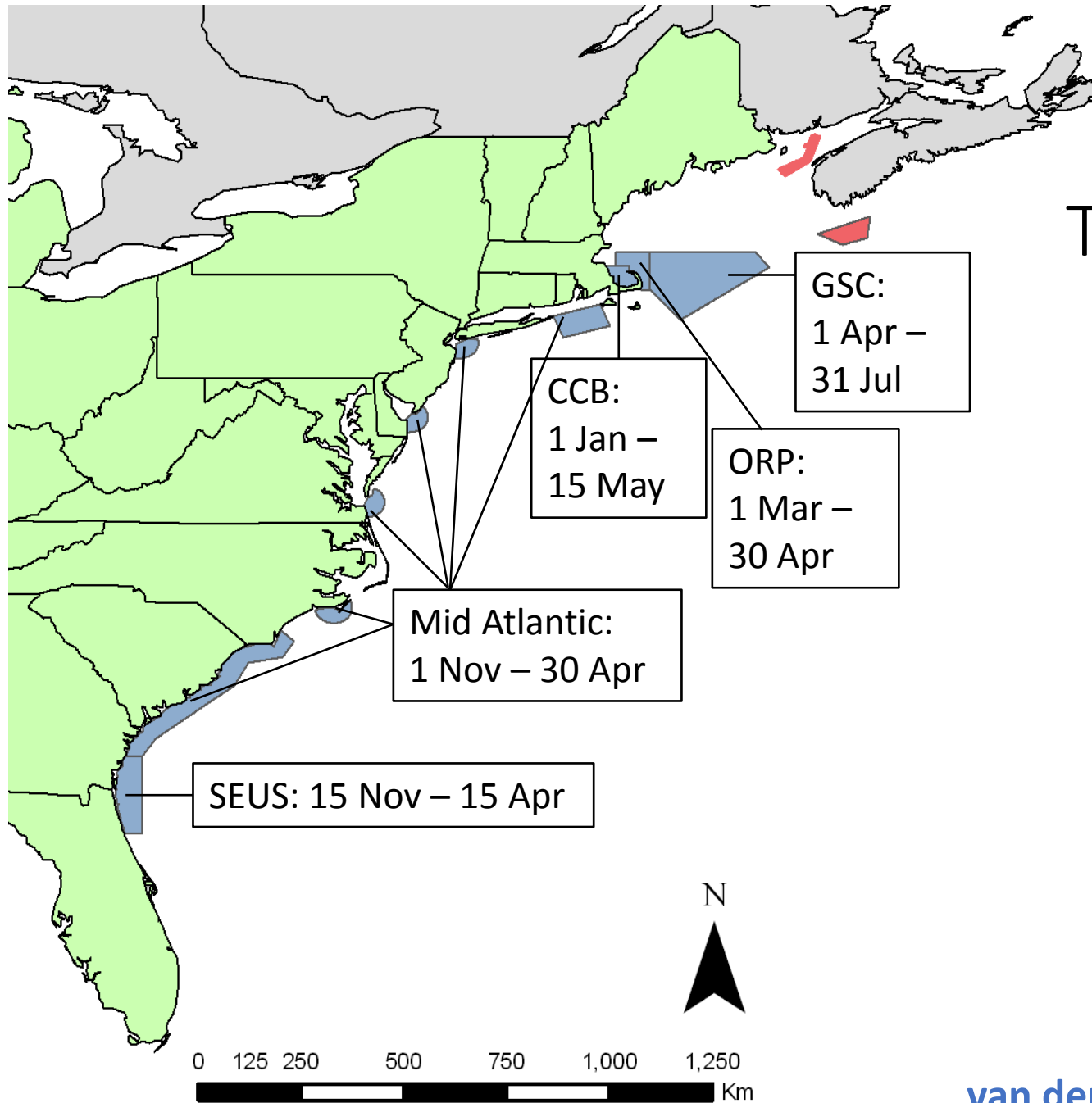
Testing effectiveness with mortality data



Human interaction causes 67% of diagnosed large whale mortalities

80% of right whale mortalities

No changes in temporal EN/VS trends despite management – all LW



The “Ship Strike” Rule

Effective 9 Dec 2008

All vessels \geq 65ft

< 10 knots

**Seasonal
Management Areas**

Testing effectiveness of the Ship Strike rule with mortality data

Effect in **space**?

- Change in **distribution** of vessel-strike mortalities since **8 Dec 2008**

Effect in **time**?

- Significantly **fewer** right whale vessel-strike mortalities since **2007**

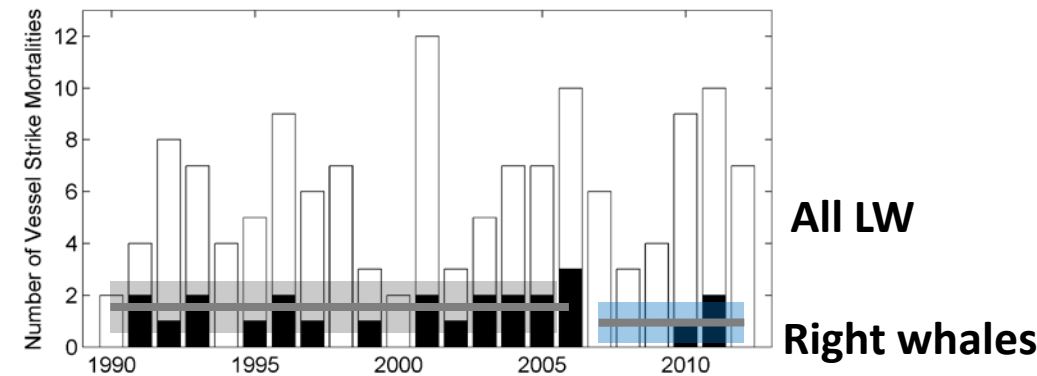
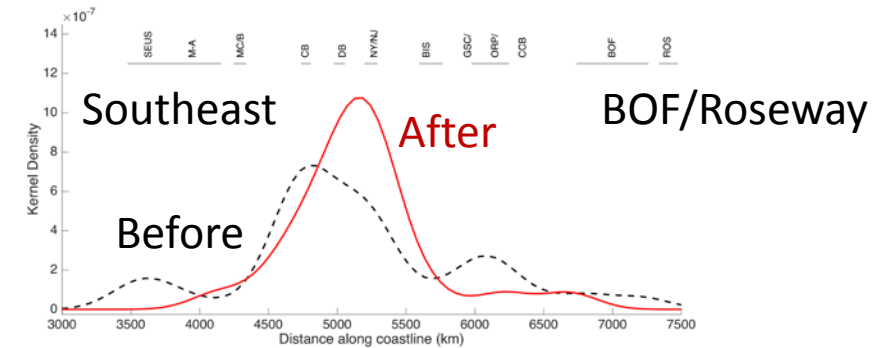
Effect in **space and time**?

- **If effective, expect fewer vessel-strike mortalities in managed **space** during managed **times**.**

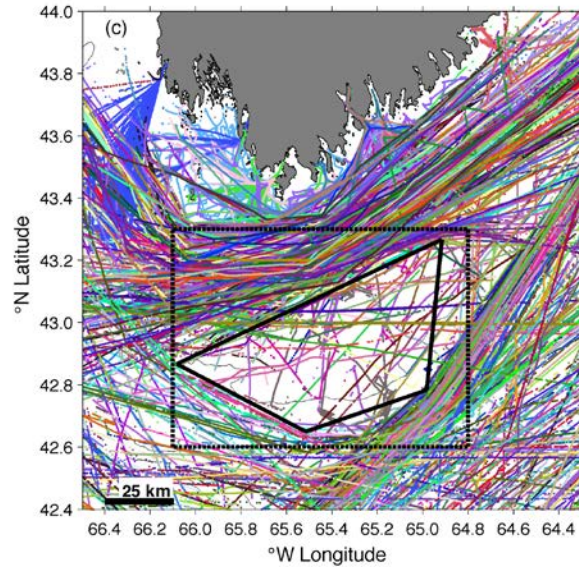
- No: changes cannot be attributed to the Ship Strike Rule **alone**

Temporal gap: high mortality to RW, other LW outside active **time**

Spatial extent: high mortality around **small** SMAs



Modeling, mortality and monitoring



AIS approach:
Observed mariner behaviour

Mechanism



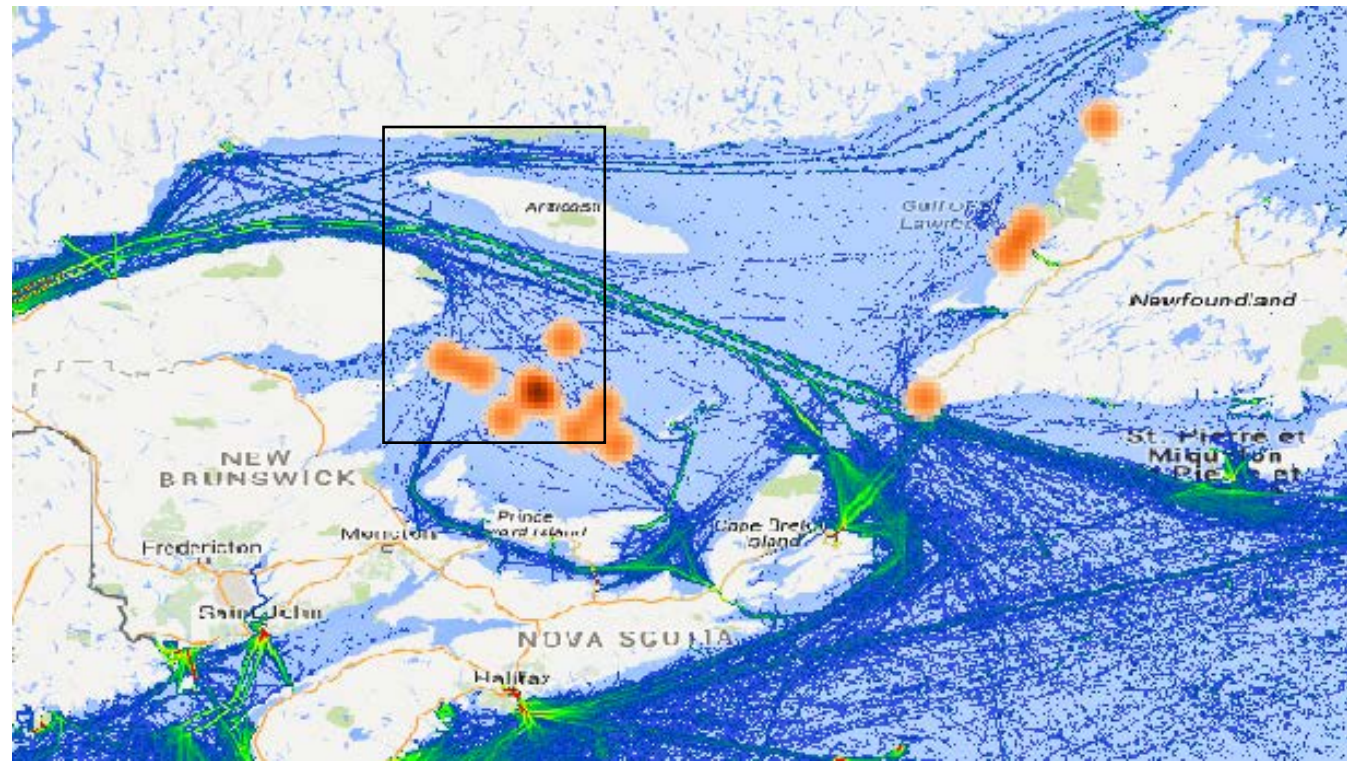
Mortality approach:
Straight to goal

Outcome



Opportunity

To **design, monitor and evaluate** a policy based on experience in Canada and the USA.

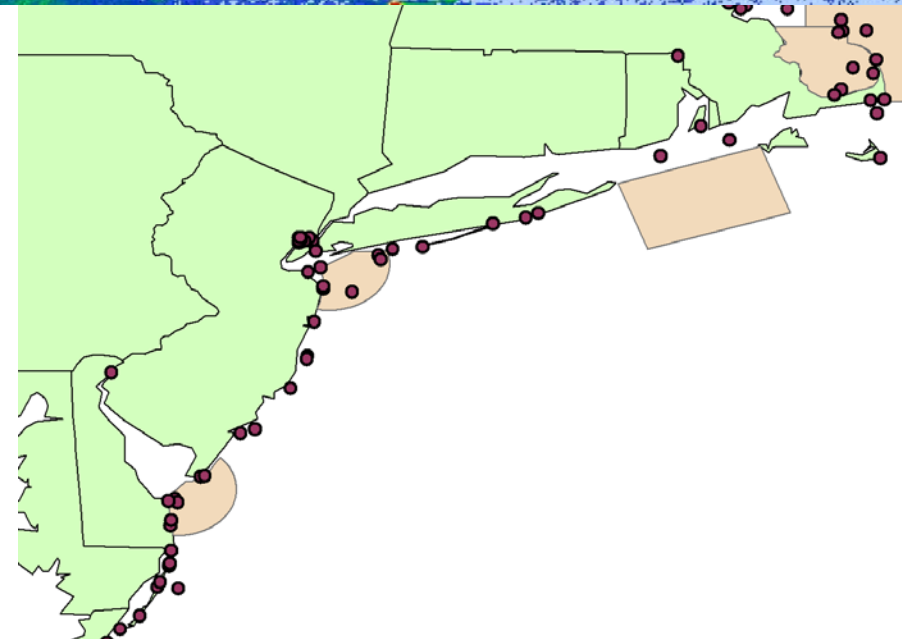


Recommendations

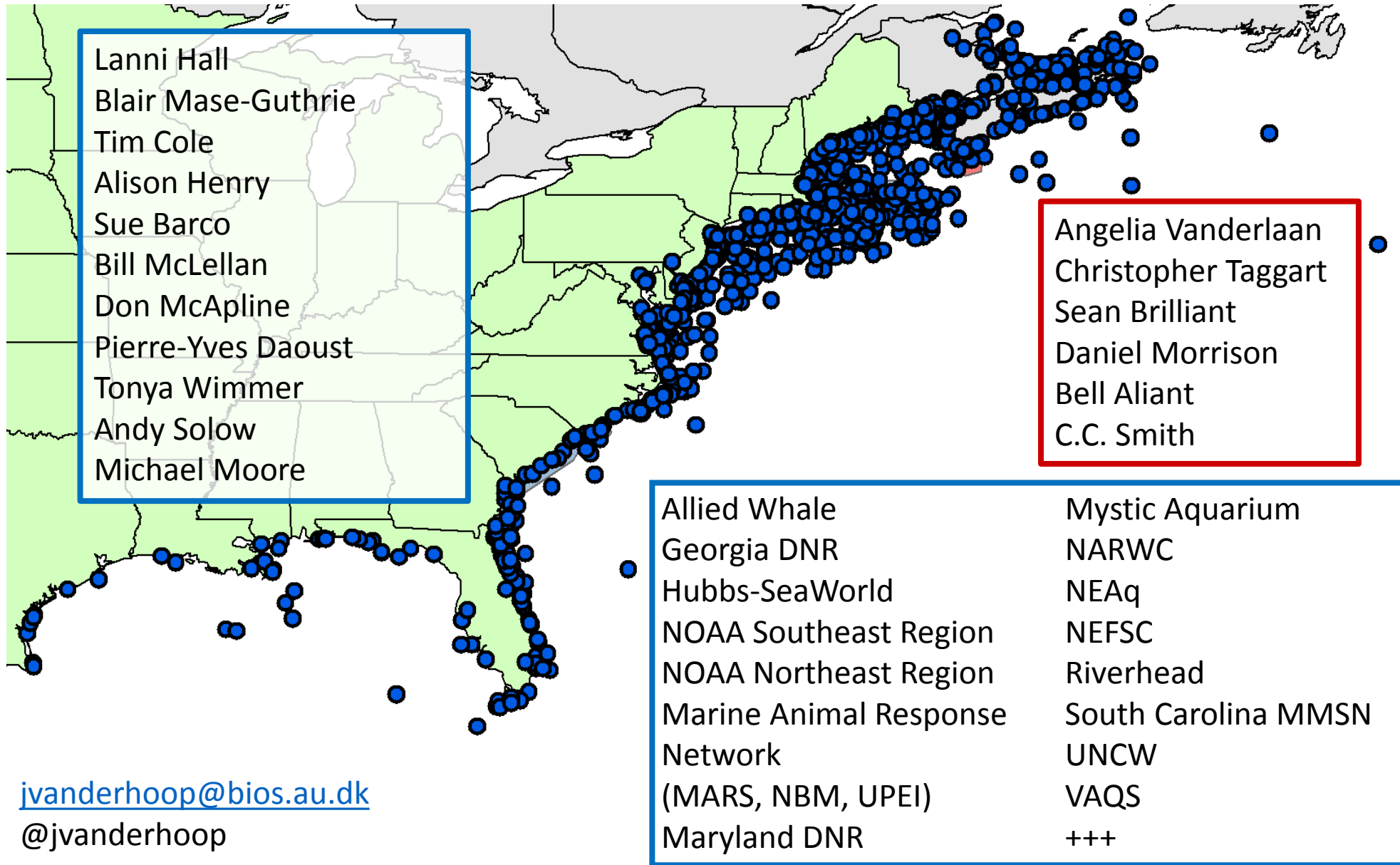
Make the rule hard to break, **easy to follow**
→ Compliance is based on human behaviour.

Monitor for a long time: where ships go, where whales go, how whales die.

→ It takes time to assess effectiveness



Thank you



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