Unexpected Consequences of Shifting Distributions and Conflicts with Human Activities: Implications for Right Whale Recovery

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From 2010 to now, right whale seasonal distributions have shifted. Large reductions in the summer Fundy and Roseway aggregations, and the springtime Great South Channel aggregations occurred. In the spring, Cape Cod Bay right whale numbers increased significantly. New right whale aggregation areas have been observed south of Nantucket in winter and spring and in the Gulf of St Lawrence in the summer. If food is limited in normal seasonal habitats, these distributional shifts indicate right whales are looking for food elsewhere. Searching increases energetic demands, and if food is patchy, female weight gain can be slowed, delaying reproduction. Annual calf production over the last 5 years (2012-2016) is 45% lower than the previous 5 years (2007-2011). Only 3 calves were born in 2017, the lowest number in 16 years. In addition, as right whales search further afield for prey, entanglement probability increases. Right whale sightings, entanglements, and mortalities in the Gulf of St Lawrence in 2015 and 2016 indicate this northerly shift has led to increasing conflicts with human activities there. An estimated 4.3 right whales were killed annually by human activities from 2009 to 2013, mostly from fishing gear. Until 2009, 44% of diagnosed right whale mortalities were vessel strikes and 35% were entanglements; after 2010, 15% were vessel strikes and 85% were entanglements. Further, the latest NMFS report indicates human-caused serious injury and mortalities are increasing. As of 2015, 83% of all North Atlantic right whales have been entangled at least once. New data indicates that non-lethal entanglements can cause reproductive failure and declining health long after the entanglement. The combined factors of reduced reproduction and increased mortality from human causes are double jeopardy for right whales, turning a slow recovery into a decline. However, there are actions, which if taken immediately, can reverse these trends. Fishing gear modifications, specifically of rope, to both prevent and reduce the severity of entanglements now exist. In some places closures may be necessary. Joint Canadian and US discussions (including fishermen, scientists, shipping companies, and managers) are urgently needed to develop a coordinated strategy for reducing mortality in this species.

Overview of Status and Trends in the North Atlantic Right Whale Population

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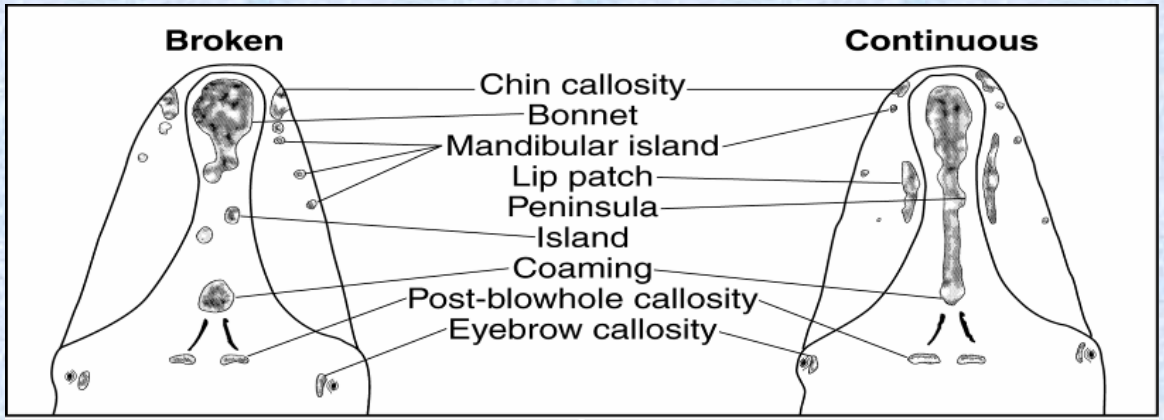
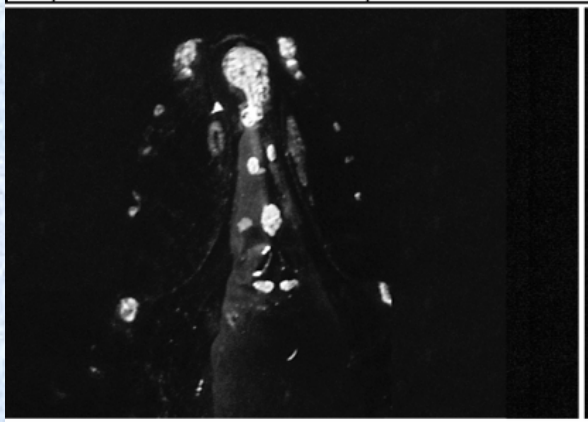
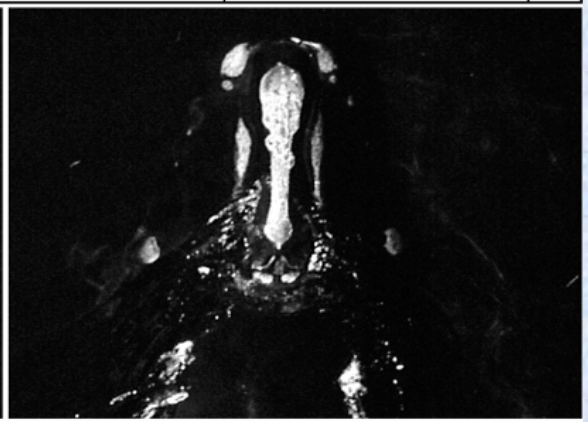
The Right Whale Catalog: Source Data for Most Analyses on this Species







- Photographic Catalog contains over 900,000 slides, prints, and digital images collected during the 73,360 sightings of 723 individual right whales photographed since 1935.

-Each year, 2,000 to 5,000 sightings consisting of 20-30,000 images are added to the identification database from hundreds of contributors

North Atlantic Right Whales

Population Size 2016: n = 451 (Pace)

Available data: **38 years of life history data**

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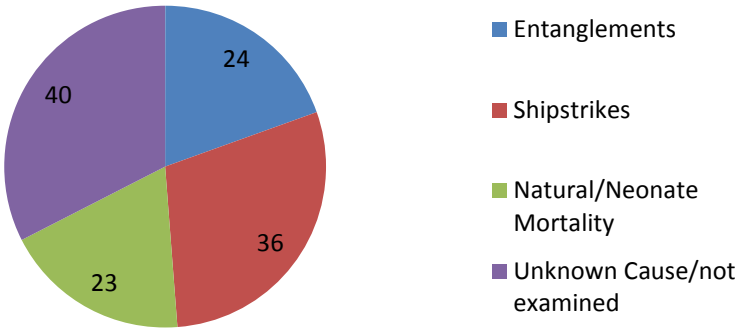
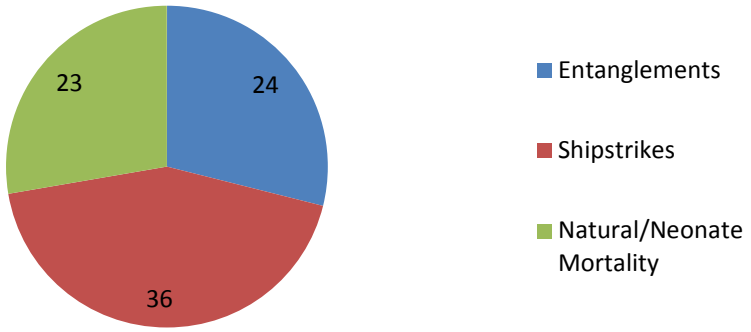
- Distribution and movements of know individual whales.
- Calving counts
- Dead whale identifications and counts
- Necropsy data on ca 50% of dead whales
- Estimated (presumed) dead whales after 6 years missing from all sightings data
- Entanglements and ship strikes
- Scarring data on all right whales
- Right whale genetics and hormone data
- Visual Health assessments since 1980
- Some tagging data
- Some blubber thickness data
- Morphometric data

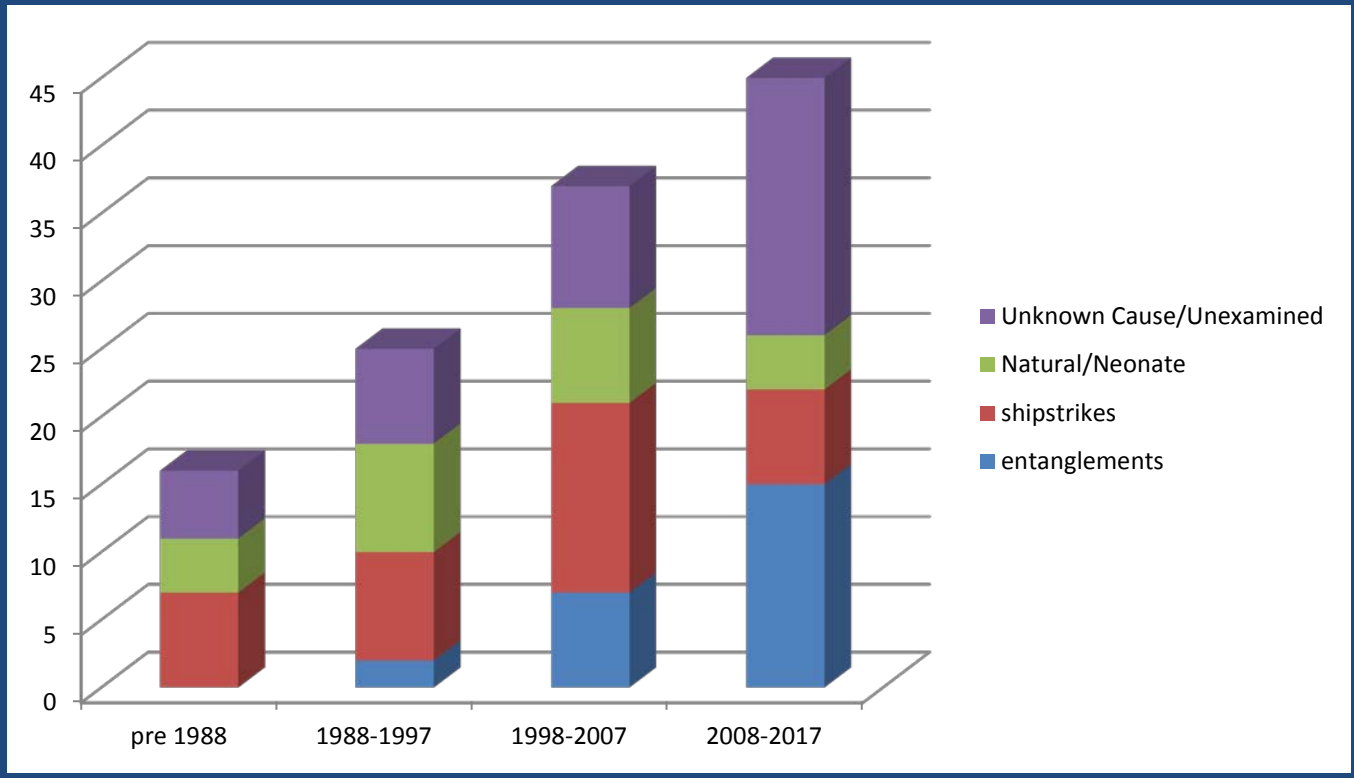
Trends in Mortality

Right Whale Mortality 1970-2017 (n=123)

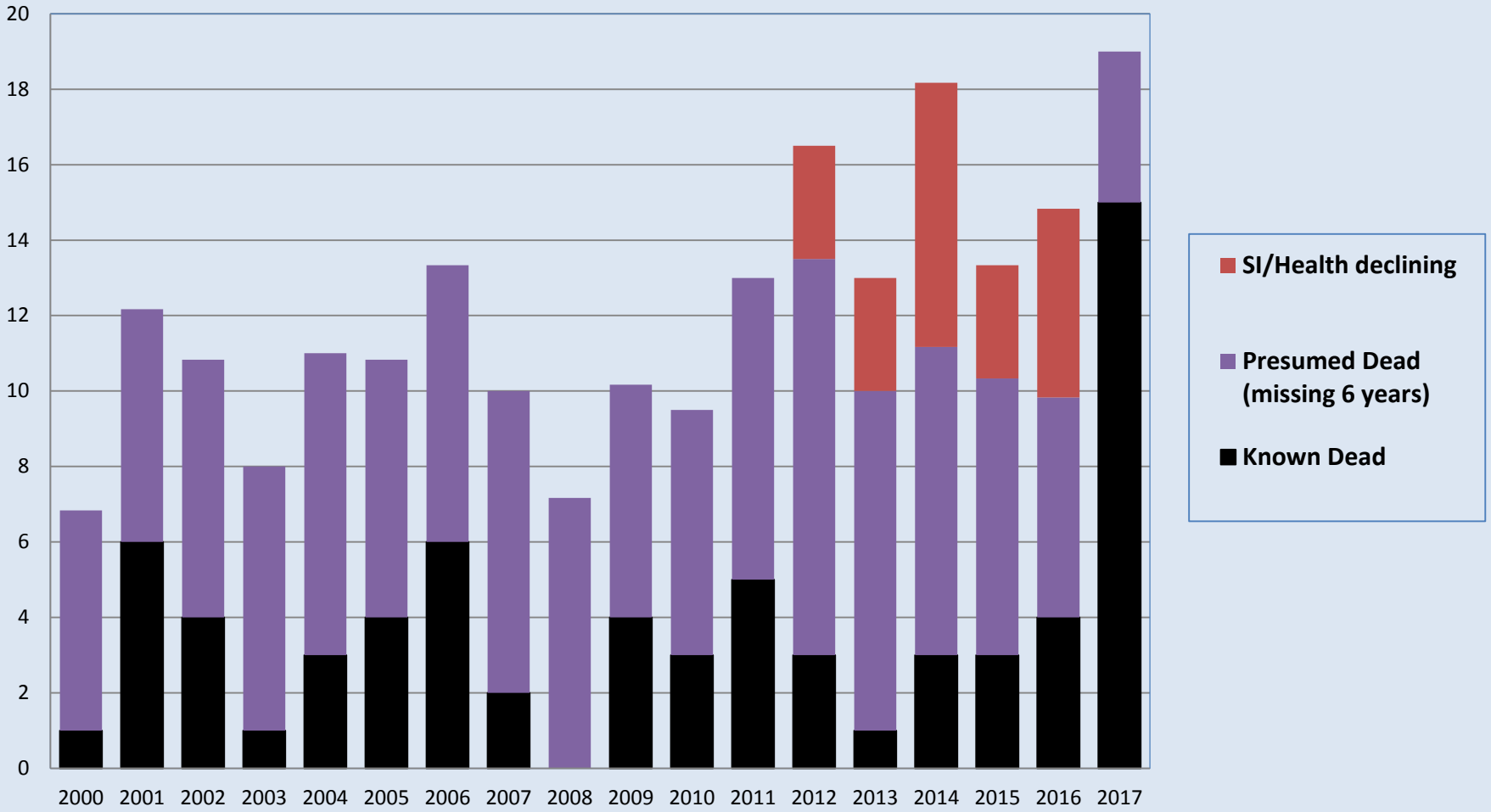


Right Whale Mortality by Cause (excluding unknown/unexamined)



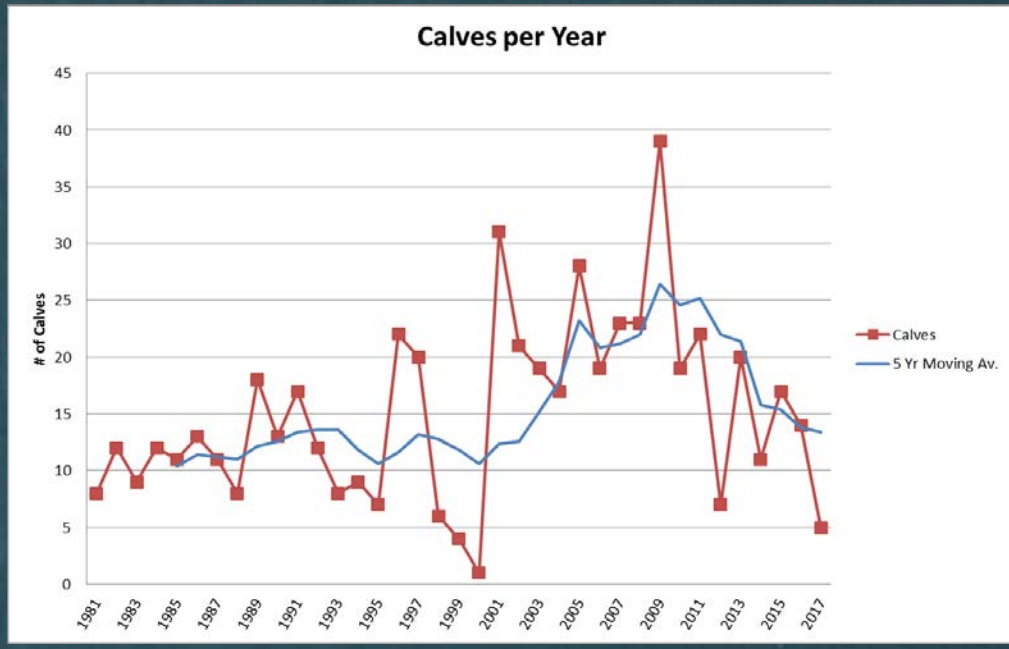


Right whale mortality estimates, including observed dead (black), 6 yr. average probable dead(purple), and whales with health assessments or injuries indicating death is likely (orange)

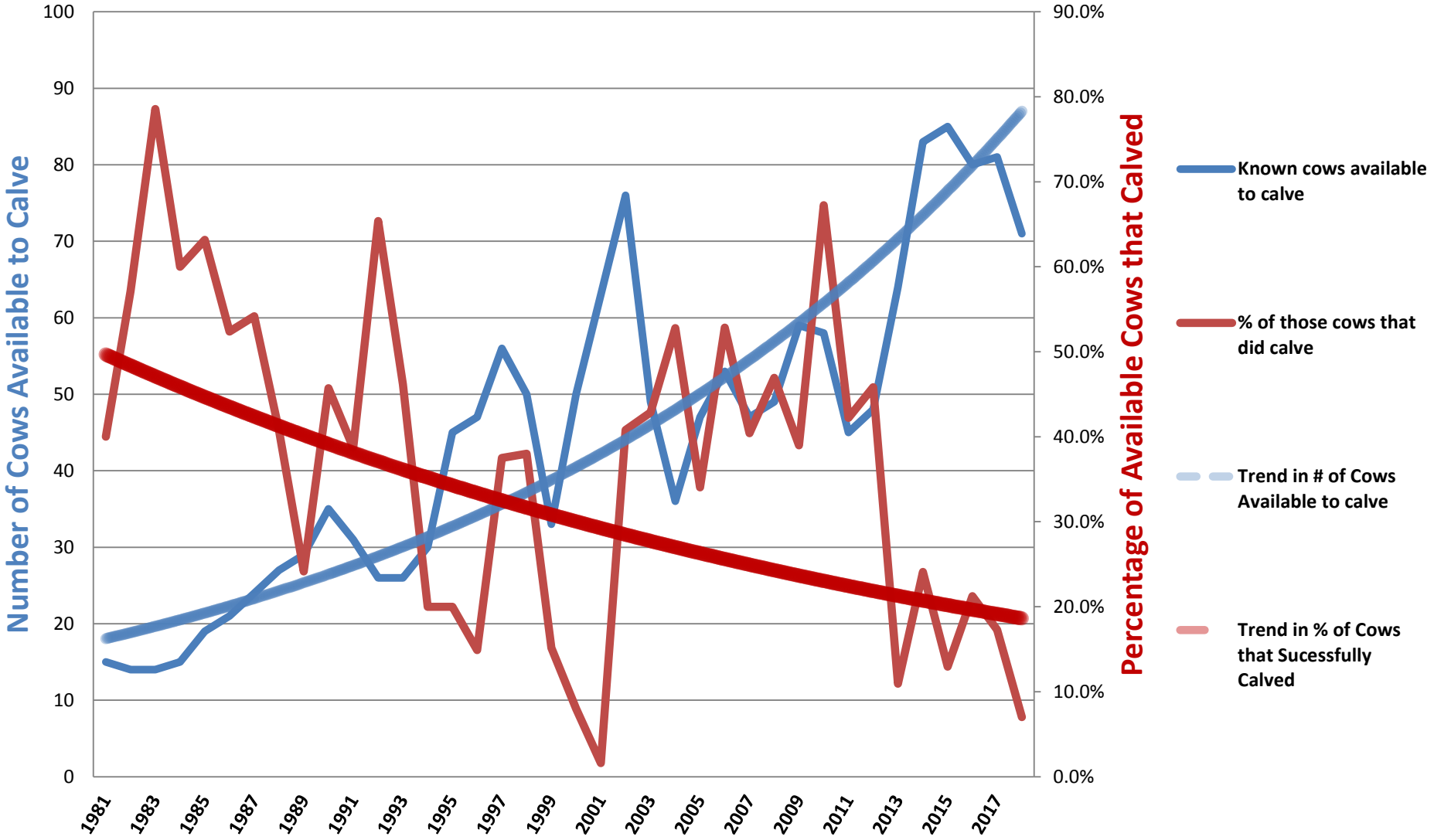


2015-2017 SI Determinations are Preliminary and may change

Trends in Reproduction



Number of Right Whale Cows Available to Calve (blue line) vs % of Cows that Successfully Calved (red line)



Distribution shifts began around 2011

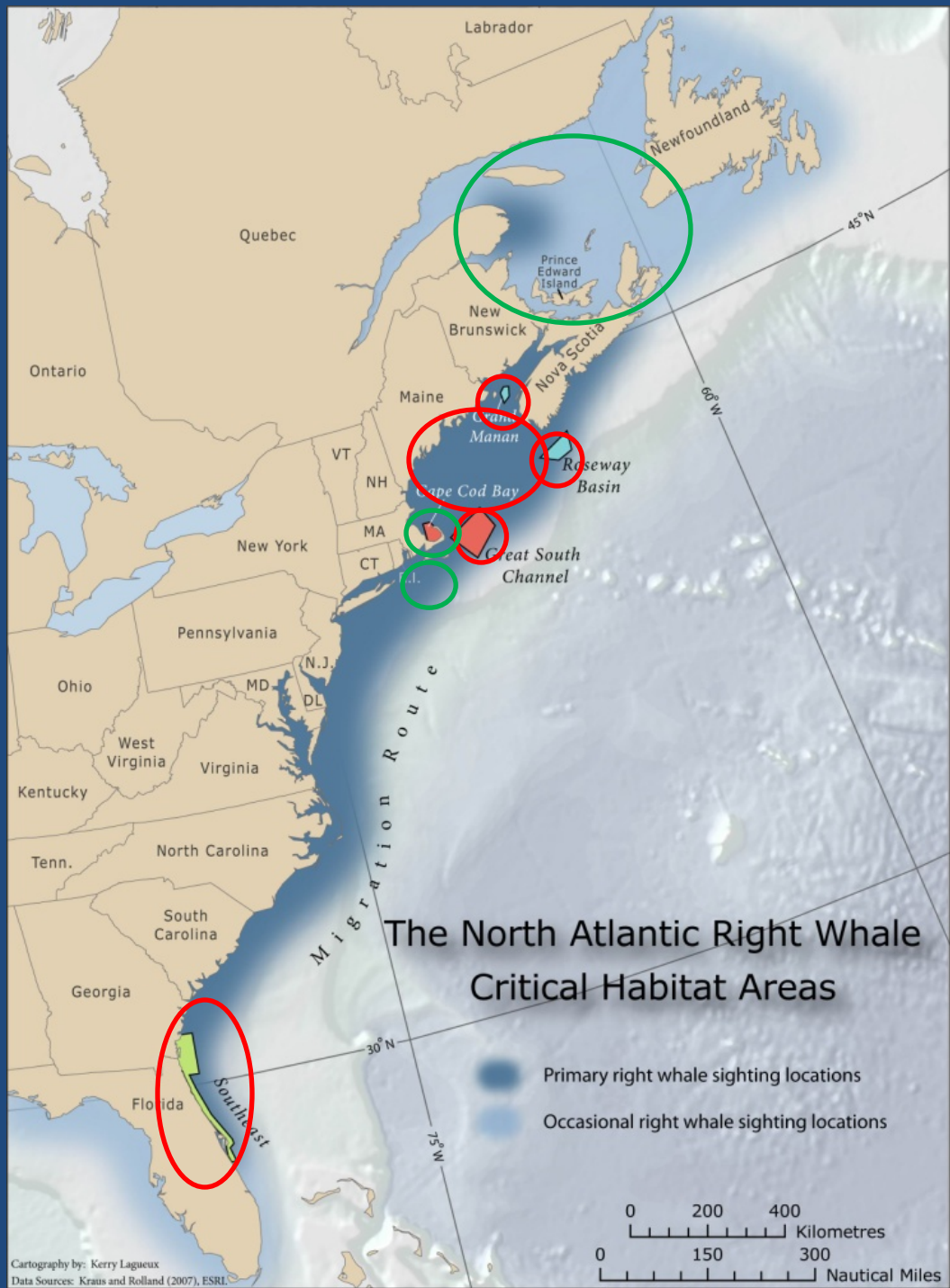
Four critical habitats –
Bay of Fundy, Roseway Basin, Great South Channel, Southeastern US – declines in sightings numbers from previous decade

Cape Cod Bay – major increase in number of sightings

South of Nantucket/Martha's Vineyard – surveys for wind farms – newly identified aggregation area

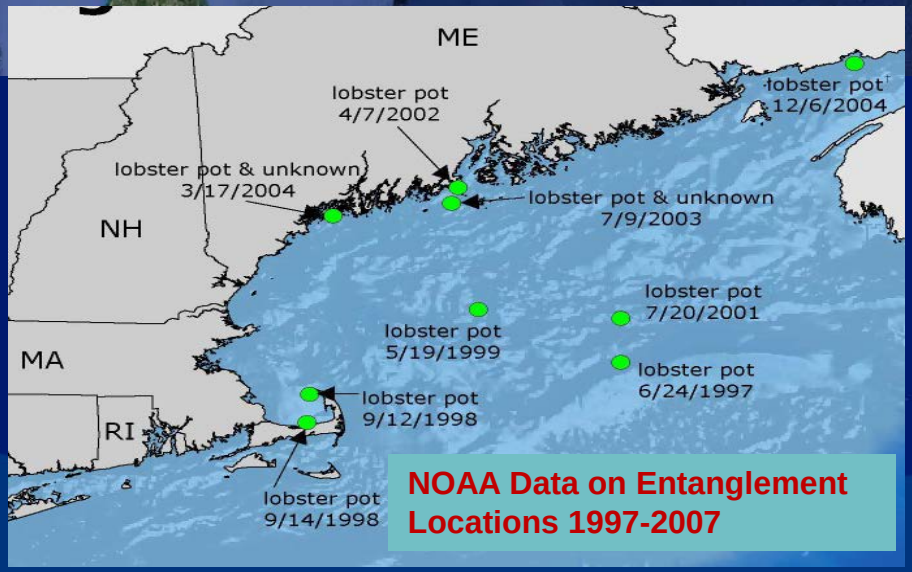
Gulf of St Lawrence – increase in sightings

- 2015: 3 dead and 2 entangled RWs
- 2016: 2 entanglements (one dead)
- 2017: 12 dead (2 entanglements, 4 ship s in springtrikes)



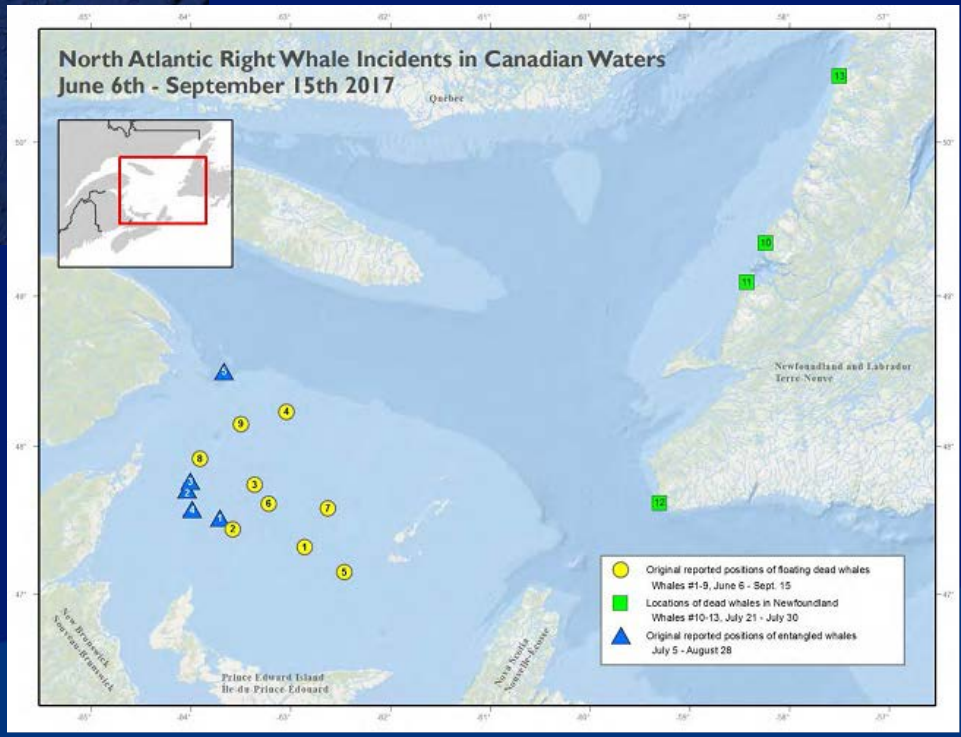
Entanglements in Fishing Gear Occur Anywhere there is Rope in the Water Column

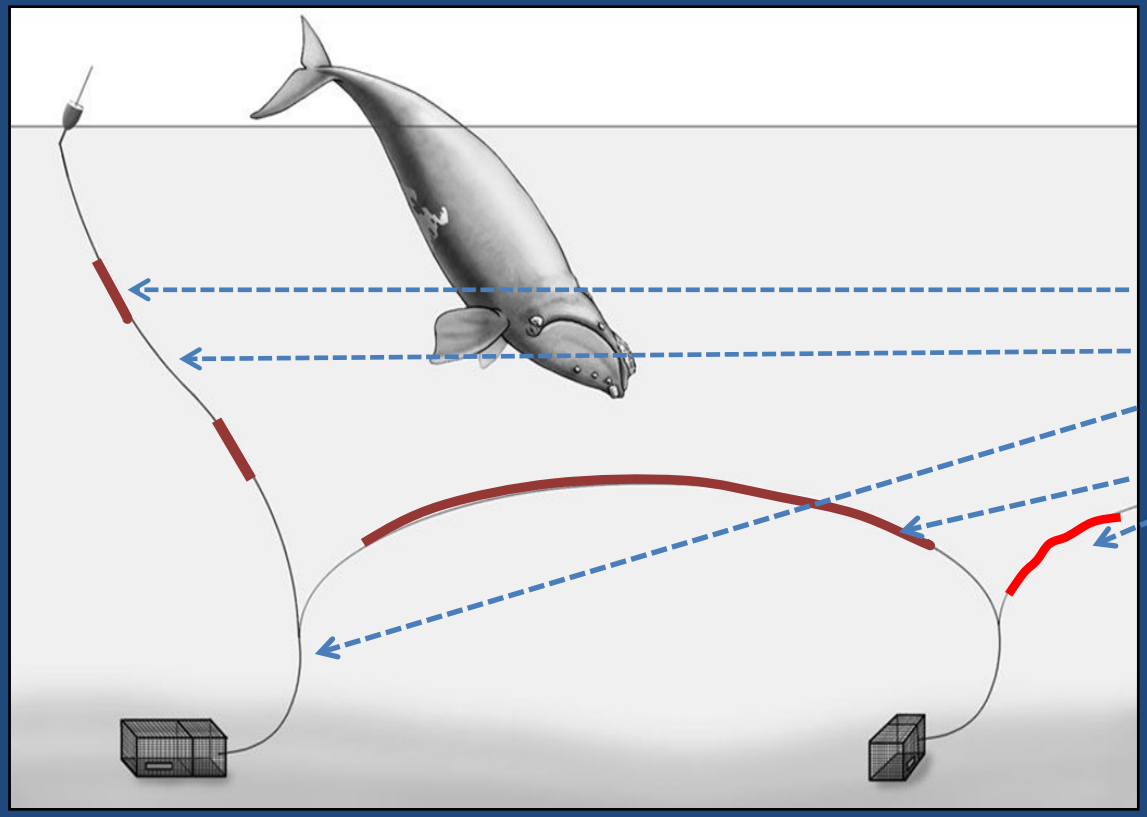
Original entanglement location (green) and later sightings (red) of whales carrying gear



NOAA Data on Entanglement Locations 1997-2007

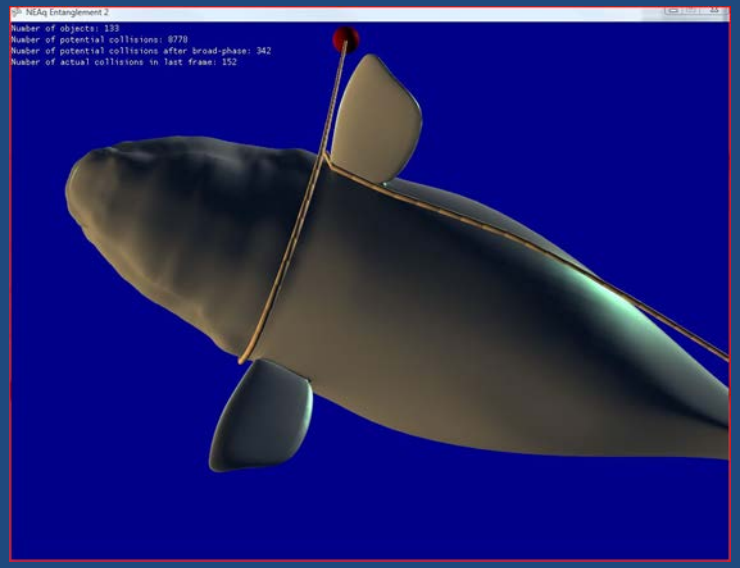
Daoust, P.-Y., Couture, E.L., Wimmer, T., and Bourque, L. 2017. Incident Report: North Atlantic Right Whale Mortality Event in the Gulf of St. Lawrence, 2017.





Entanglement Risk Reduction Options

Closures in high risk areas
Weak sleeves
Weak Rope
Extended 1st trap groundline
Sinking Groundlines
Change rope color to red/orange
Ropeless fishing
- Acoustic releases
- AUV traps
- Rapid surface retrieval

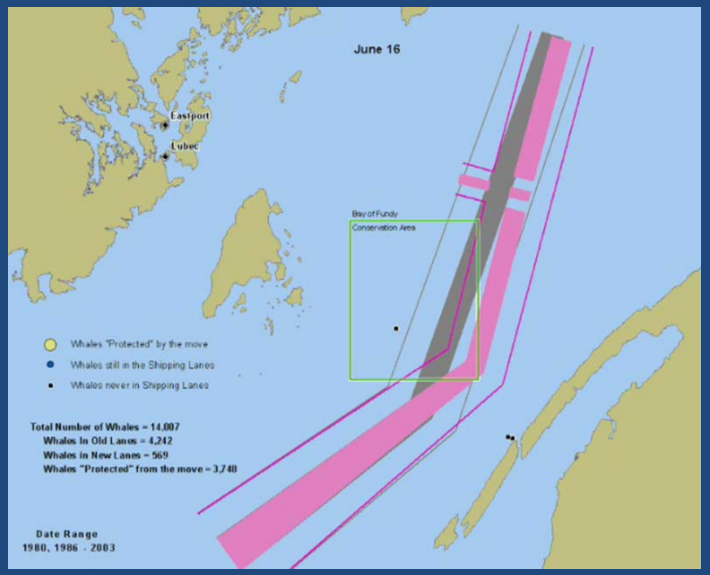


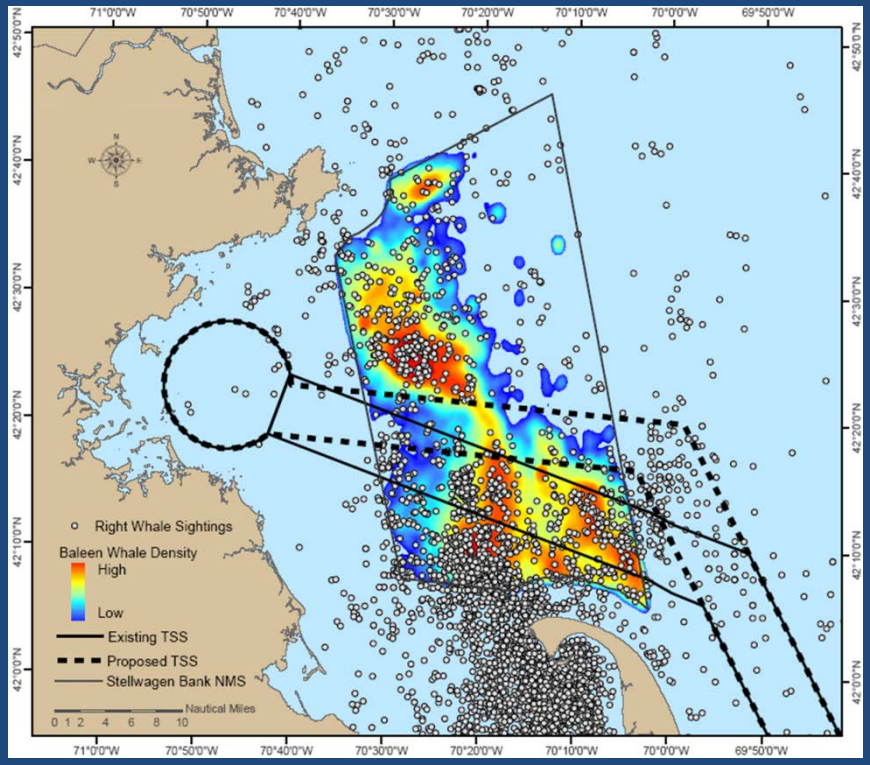
How to Test What Works?

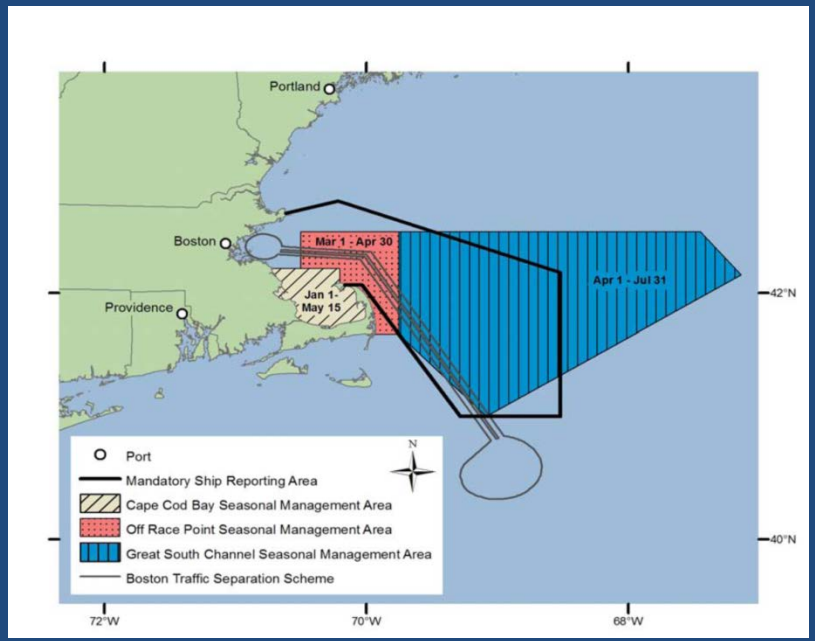
- Gear Marking to identify entanglement source
- Disentanglement team support
- Forensic approaches to every entanglement
- Identify right whale/fishery conflict areas
- Support for fishermen in experimental whale-safe fisheries
- Rapid necropsy responses w/support
- L. Howles Simulator
- Scar monitoring to assess effectiveness

Shipping Risk Reduction Options

- Moving Shipping Lanes
- Seasonal ATBA's
- Slow speeds
- Notices to Mariners
- Whale Alert (app)







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