



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

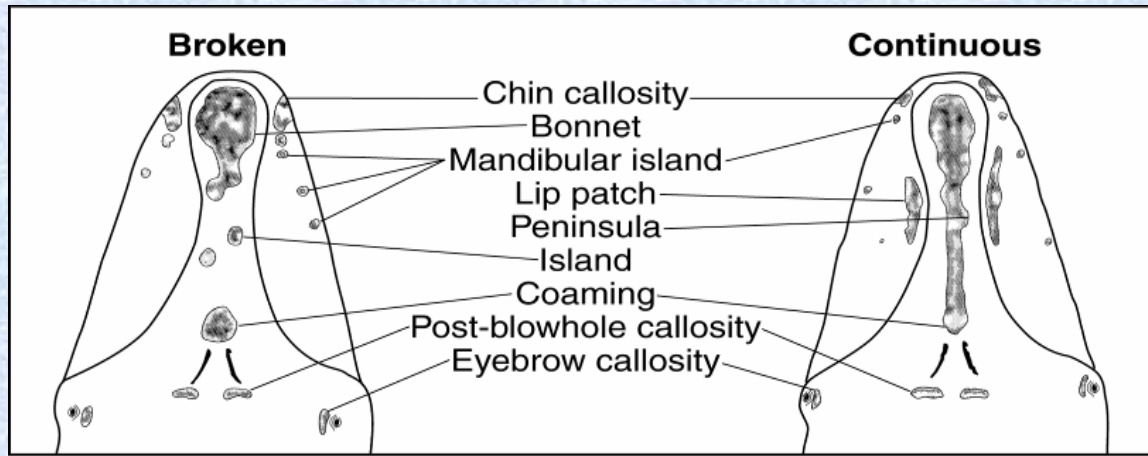


Scott Kraus

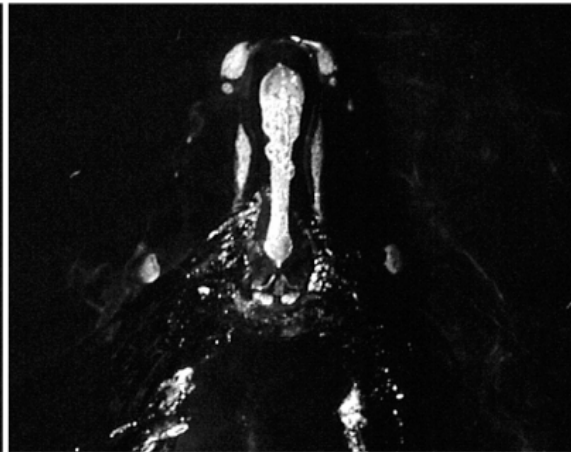
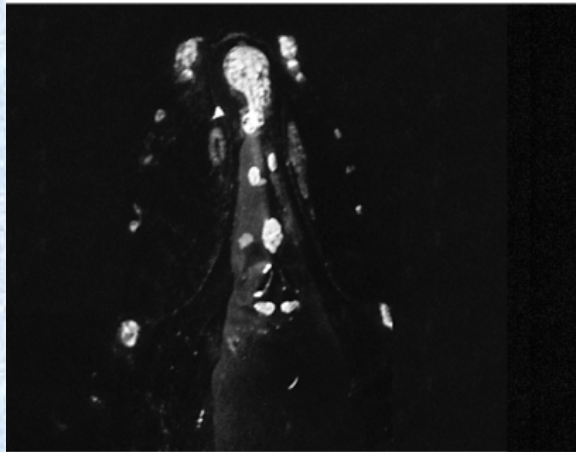
- Why we know so much about right whales
- Status and trends
- Reproduction
- Mortality
- Mitigation options



The Right Whale Catalog: Source Data for 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

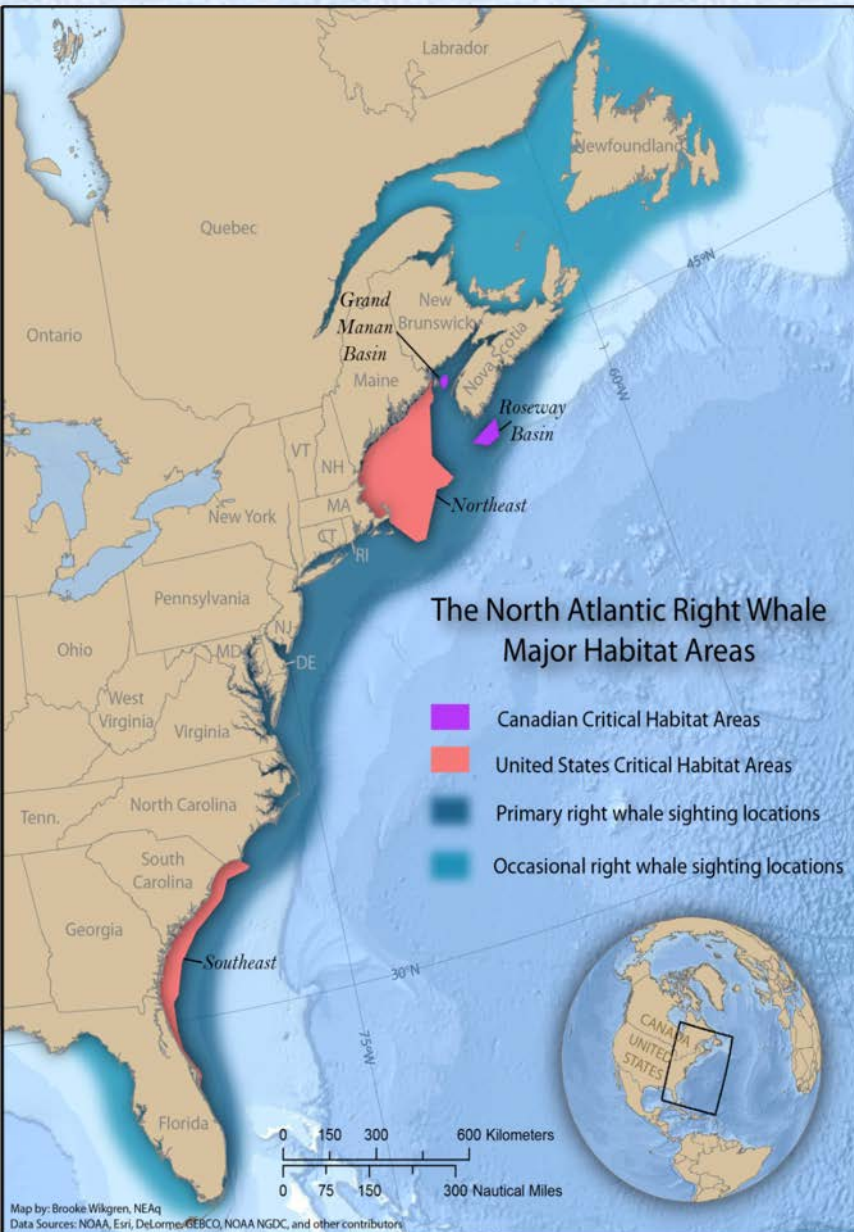


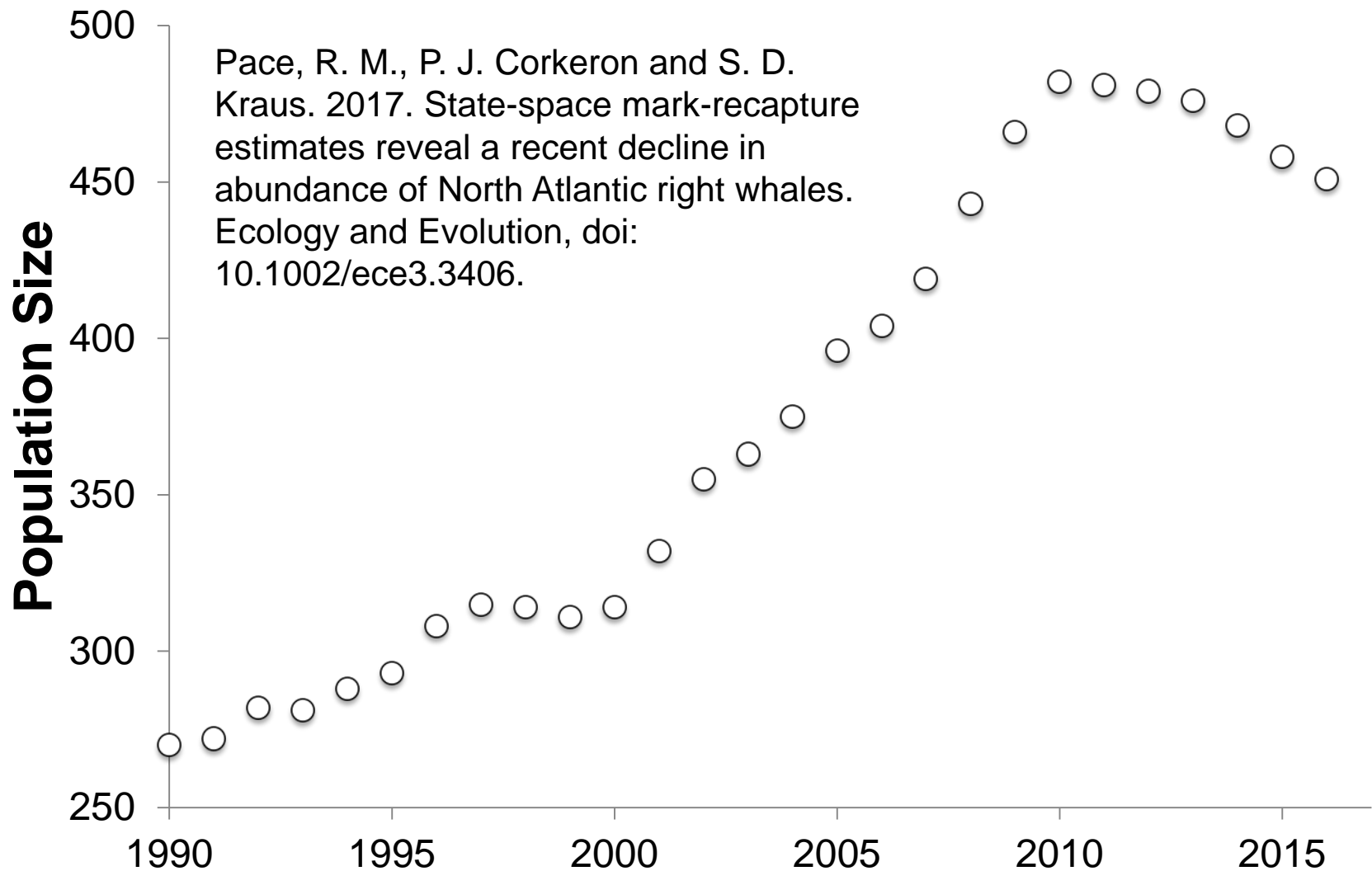
North Atlantic Right Whales

Population Size 2016: $n = 451$ (Pace)

Available data: 38 years of life history data

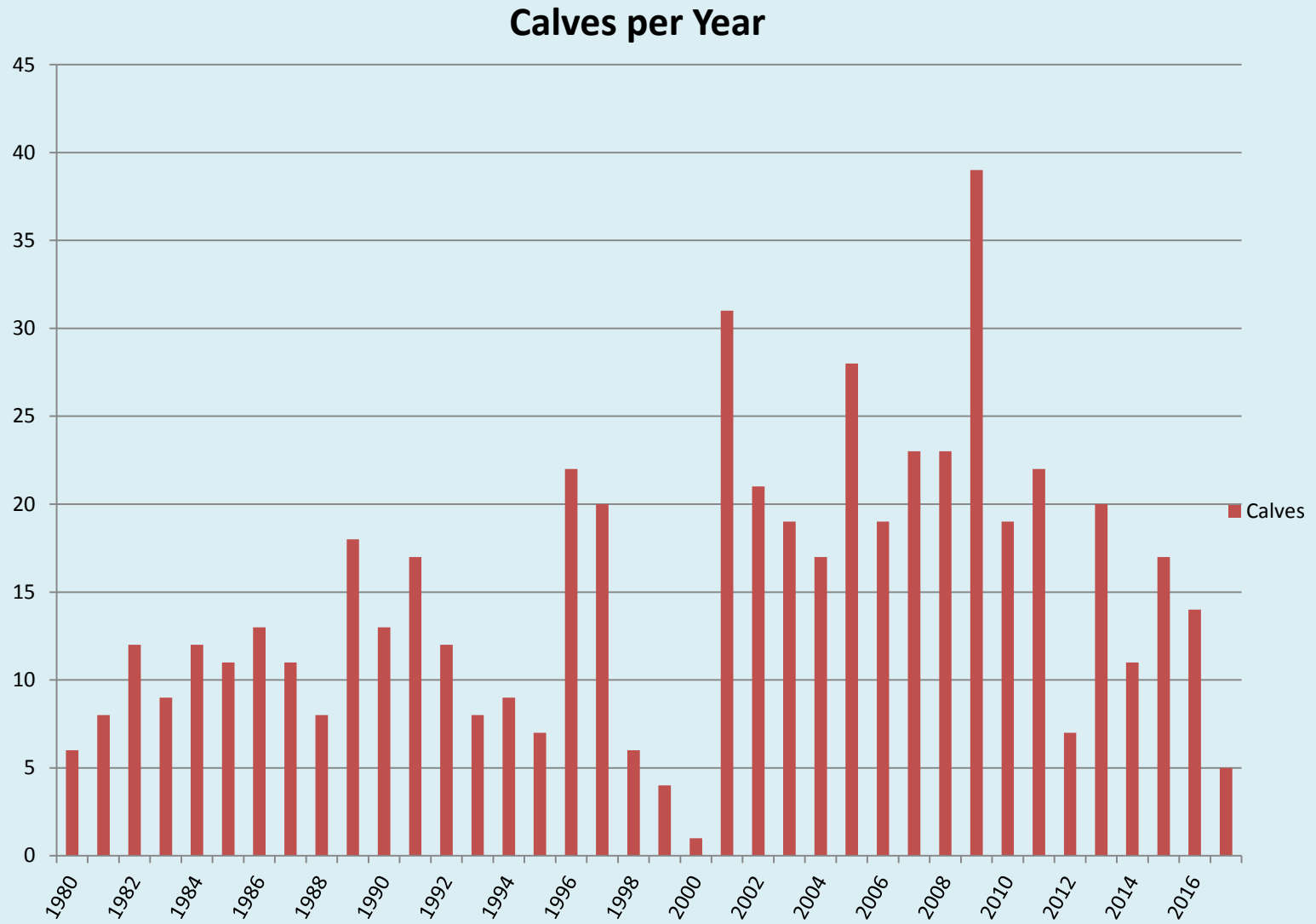
- Photographic Catalog contains over 900,000 slides, prints, and digital images collected during the 73,360 sightings of 723 individual right whales photographed since 1935.
- 2,000 to 5,000 sightings (20-30,000 images) are added annually
- Distribution and movements
- Annual calf counts since 1986
- Dead whale identifications and counts
- Necropsy data on ca 50% of dead whales
- Estimated (presumed) dead whales after 6 years missing from sightings data
- Entanglements and ship strikes
- Scarring data on all right whales since 1980
- Right whale genetics and hormone data
- Visual Health assessments since 1980
- Some tagging data
- Some blubber thickness data
- Morphometric data
- over 100 peer reviewed scientific publications





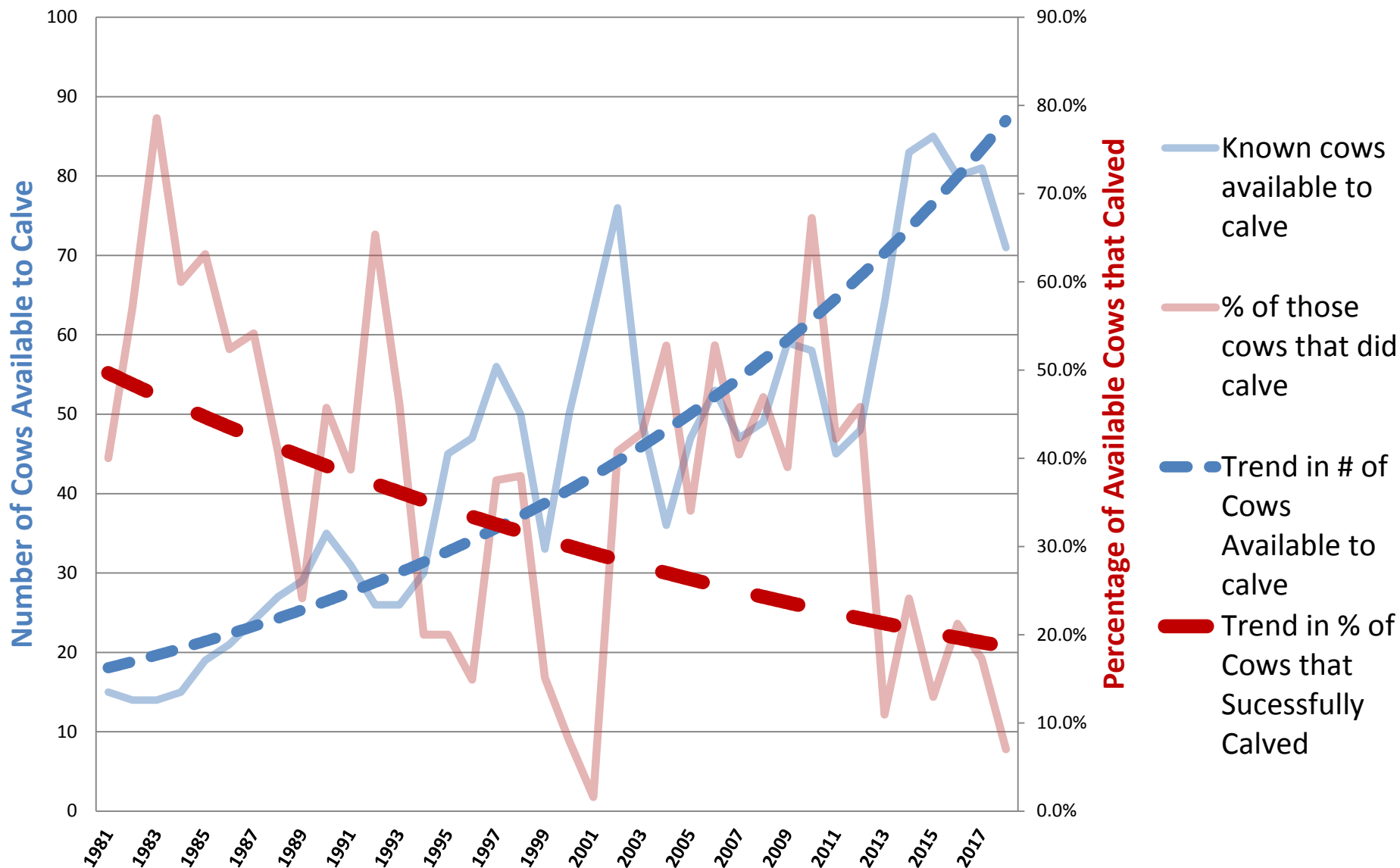
Decline since 2010 (7 years of decline)
Species is not “weak”: 2.8% increase 1990-2010

Trends in Reproduction





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



Potential Causes for Calving Decline (1) Prey Changes

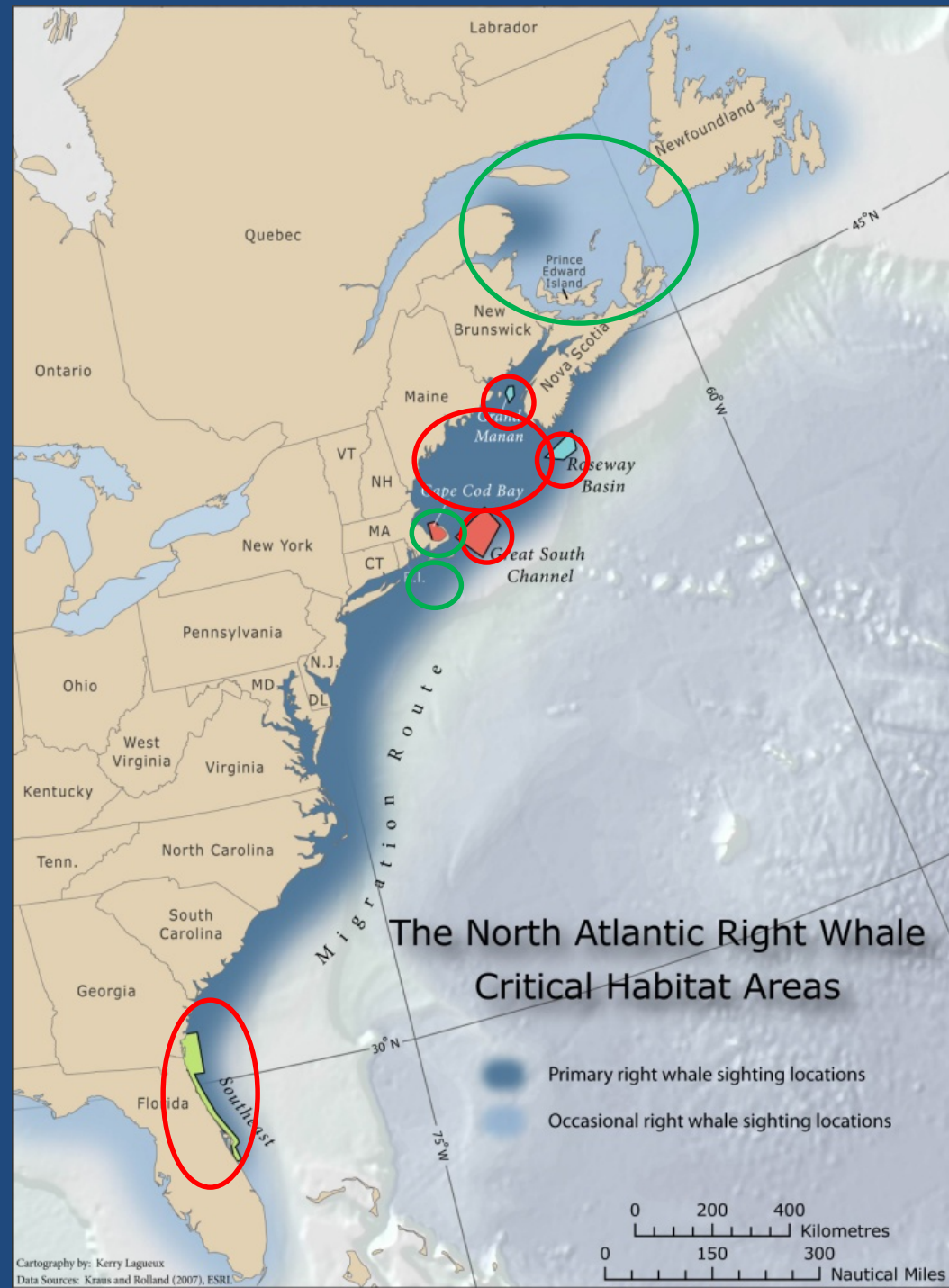
Distribution shifts began around 2010

Bay of Fundy, Roseway Basin, Great South Channel, Southeastern US – declines in sightings numbers from previous decades

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 since 2010 (but limited survey effort prior to that time)



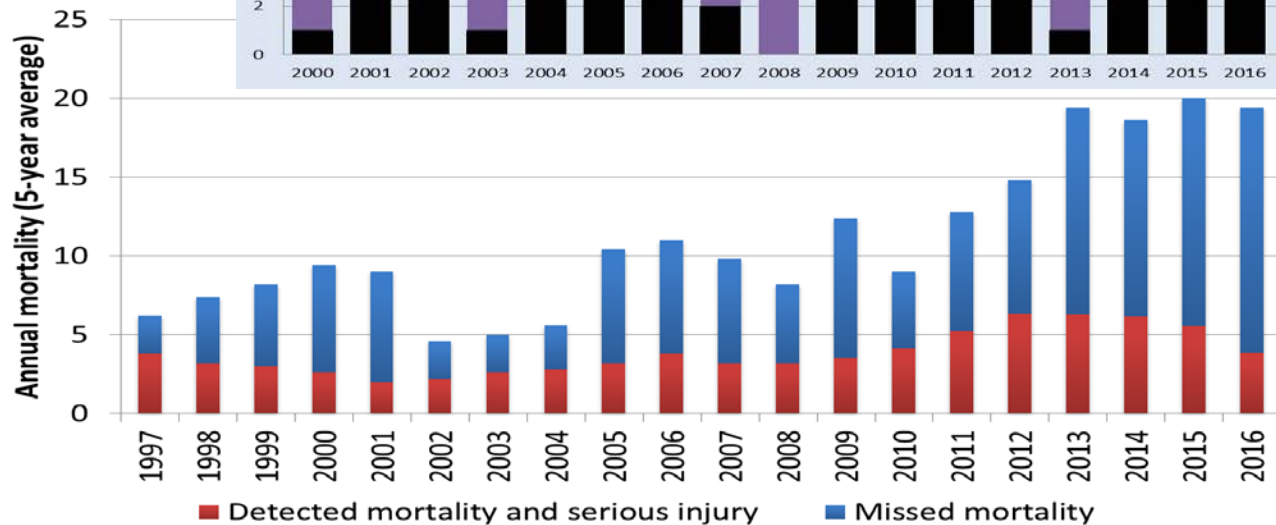
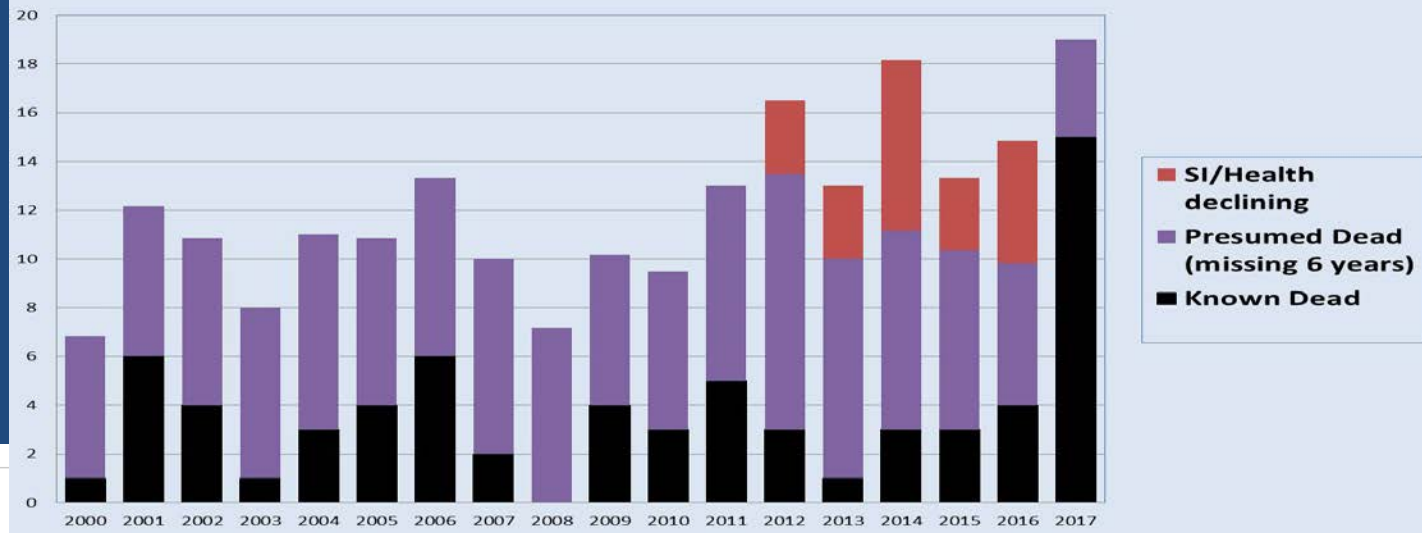
Potential Causes for Calving Decline (2) The non-lethal effects of entanglement



If entanglement does not kill, it affects health of the whale, and it delays reproduction for females

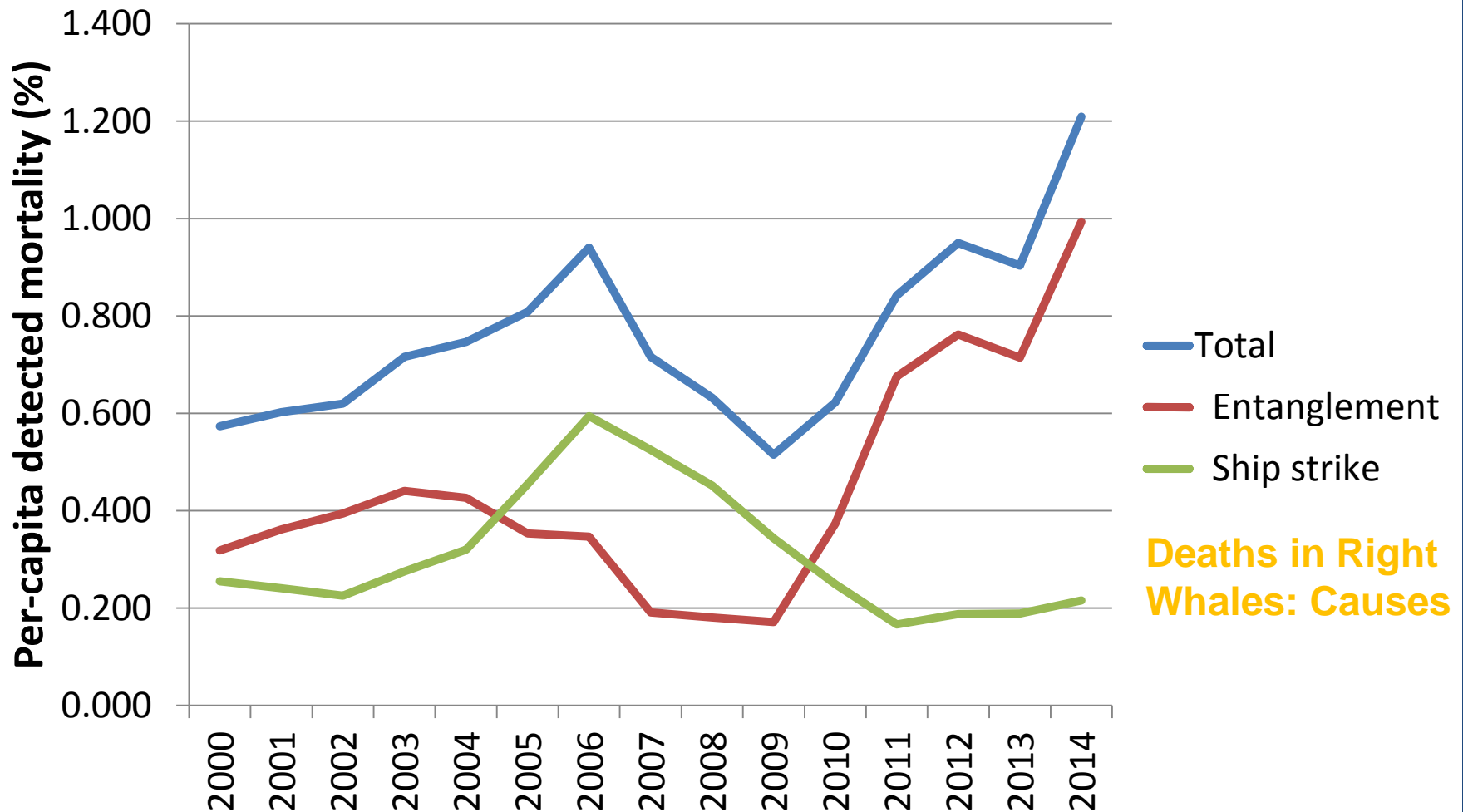
Deaths in Right Whales: Known and Estimated

Catalog Data
for missing
whales



Take Home Message:
Only 1/3 of deaths are detected. We are underestimating deaths from human activities by a large number. (why?)

Modelled results for known deaths and estimations of missing deaths.
From: Pace, R. M., P. J. Corkeron and S. D. Kraus. 2017. State-space mark-recapture estimates reveal a recent decline in abundance of North Atlantic right whales. *Ecology and Evolution*, doi: 10.1002/ece3.3406.

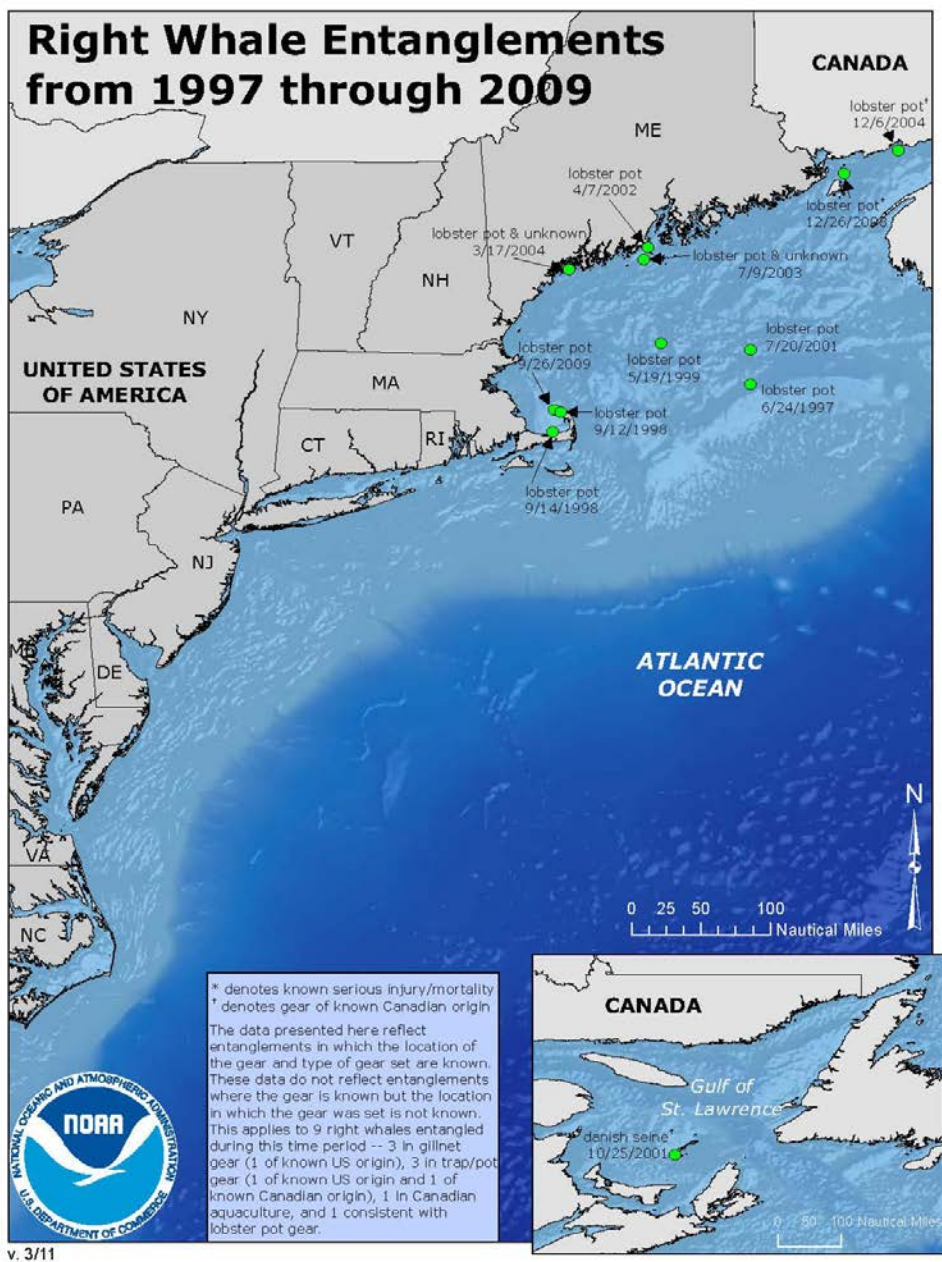


Total *documented* mortality is over 1% per year
If we account for *undocumented* mortality, over 3%?



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

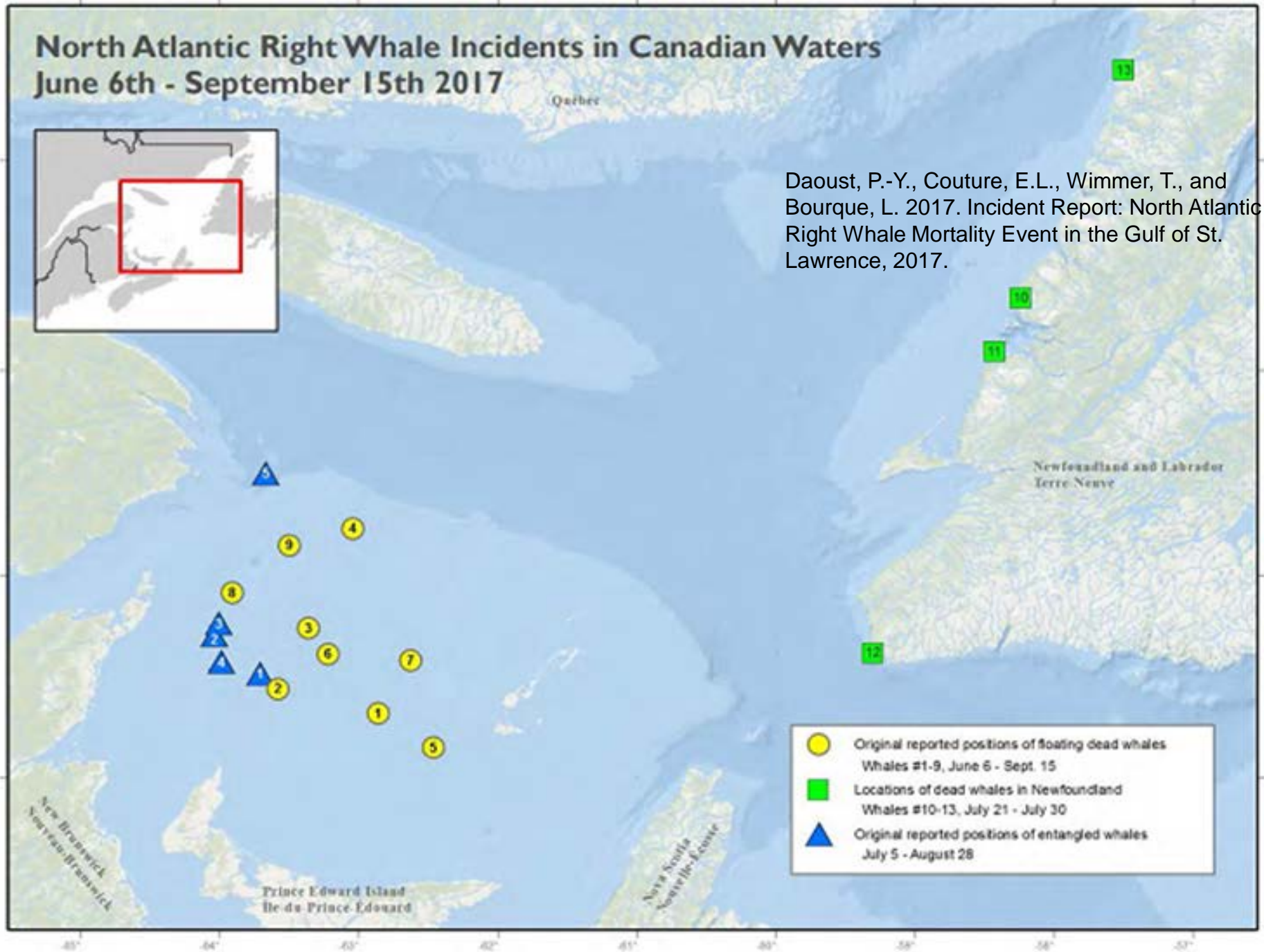
Entanglements in Fishing Gear Occur Anywhere there is Rope in the Water Column



North Atlantic Right Whale Incidents in Canadian Waters June 6th - September 15th 2017



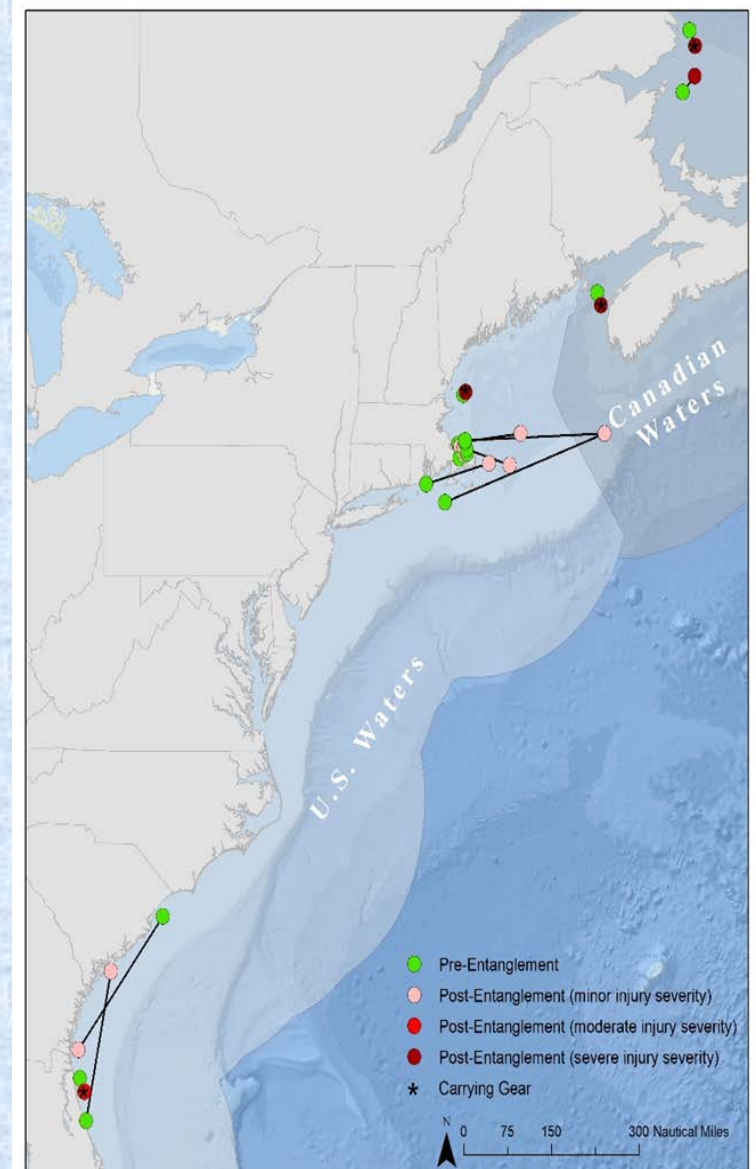
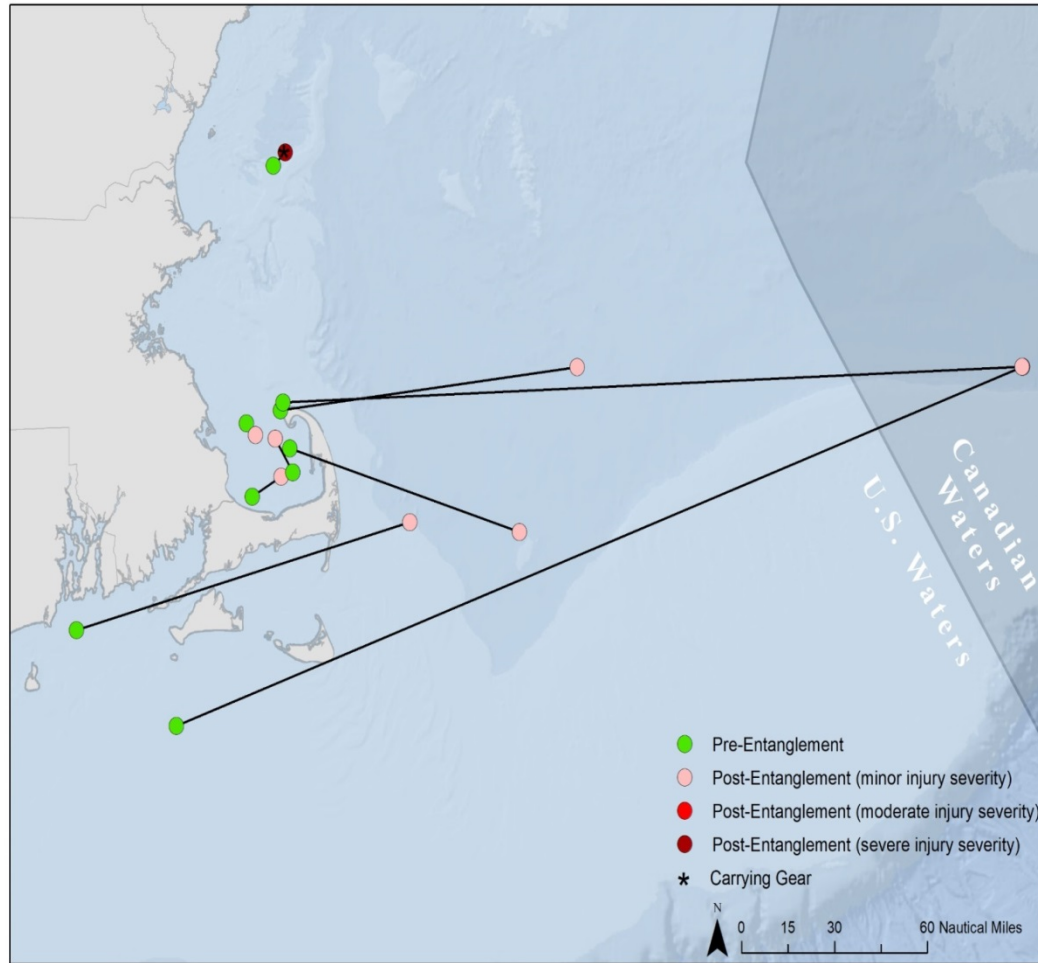
Daoust, P.-Y., Couture, E.L., Wimmer, T., and Bourque, L. 2017. Incident Report: North Atlantic Right Whale Mortality Event in the Gulf of St. Lawrence, 2017.



- Yellow circle: Original reported positions of floating dead whales
Wales #1-9, June 6 - Sept. 15
- Green square: Locations of dead whales in Newfoundland
Wales #10-13, July 21 - July 30
- Blue triangle: Original reported positions of entangled whales
July 5 - August 28

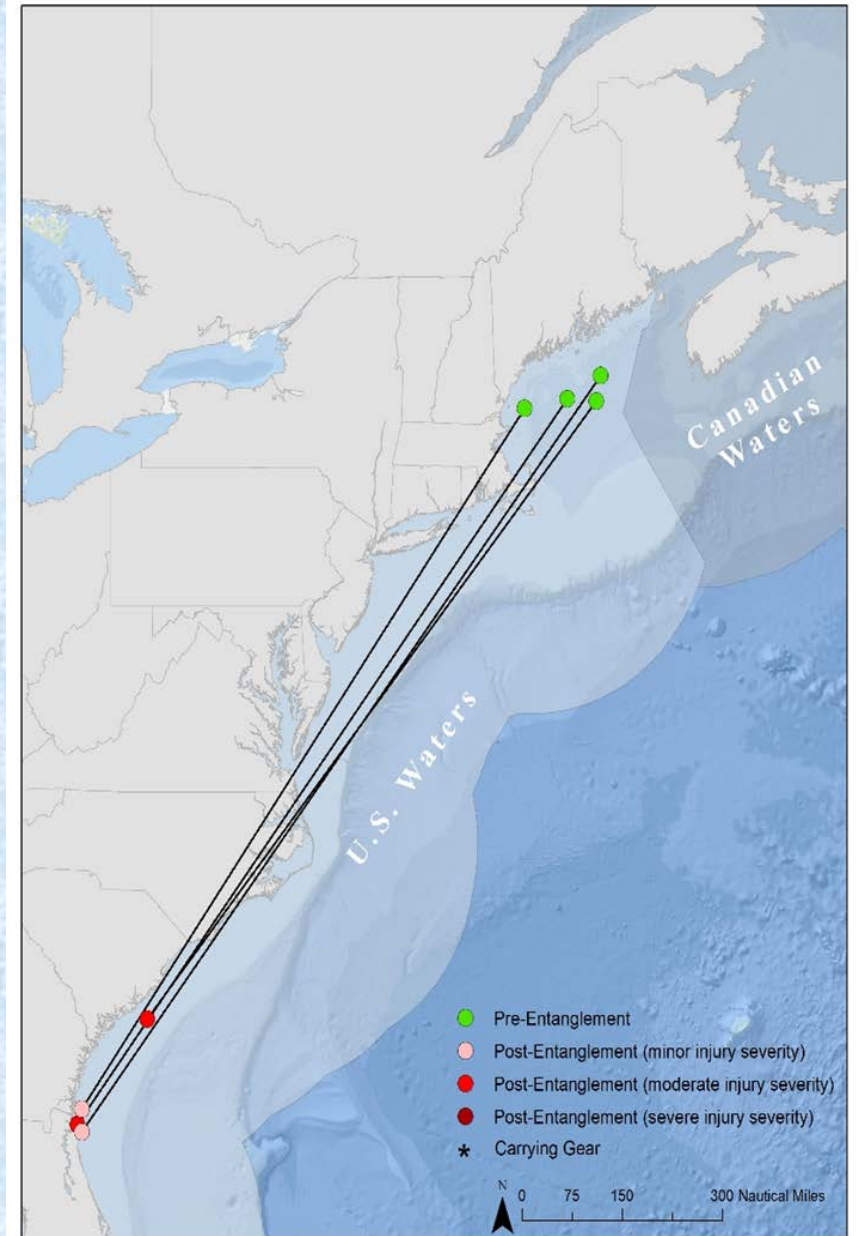
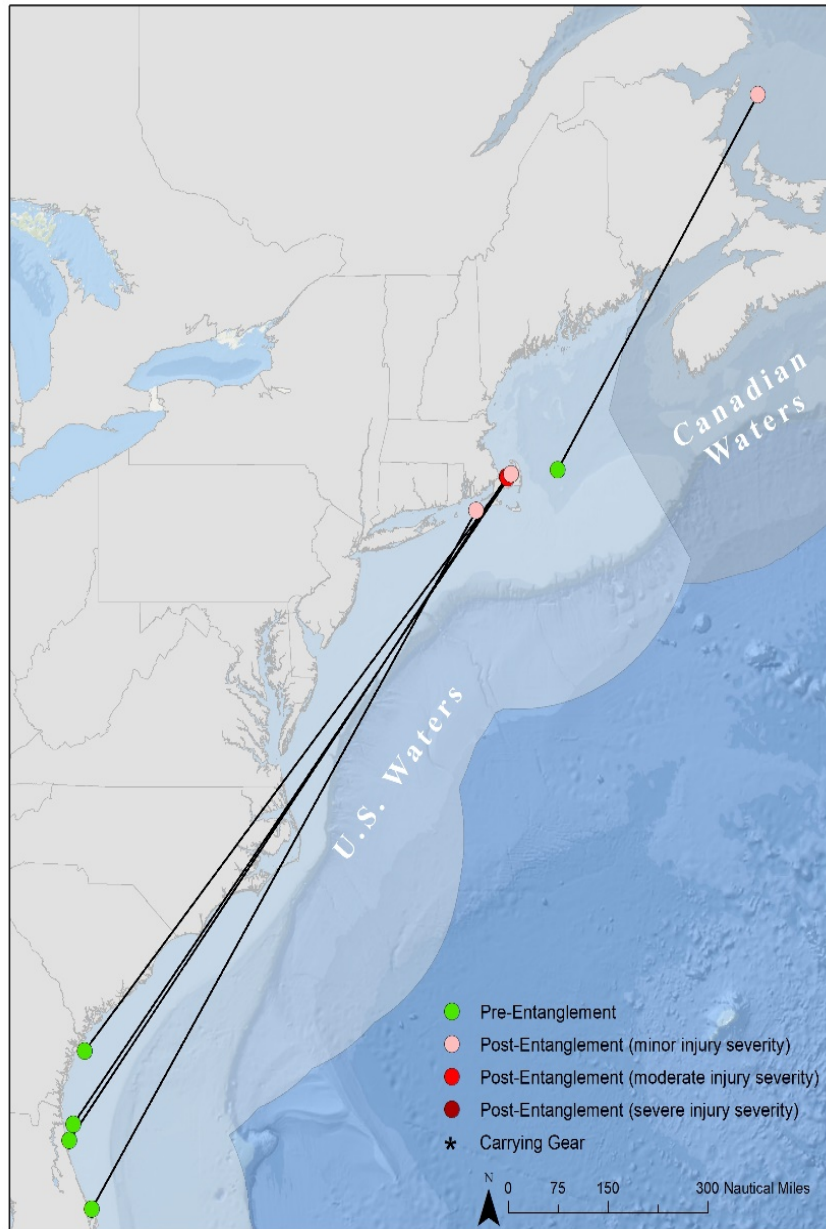
Right Whale Entanglement Location Likelihood Map

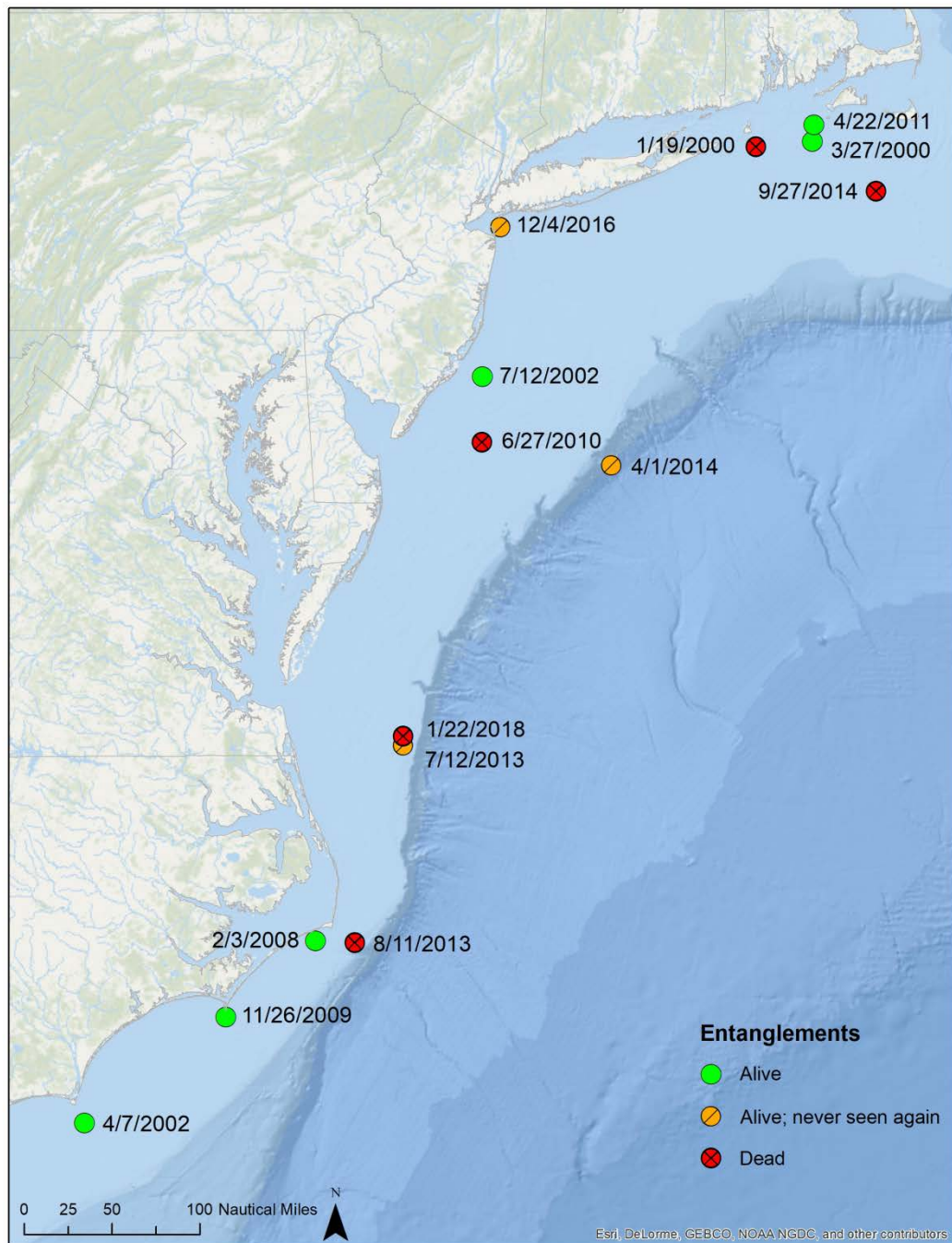
Sightings with less than 60 days between before and after an entanglement event

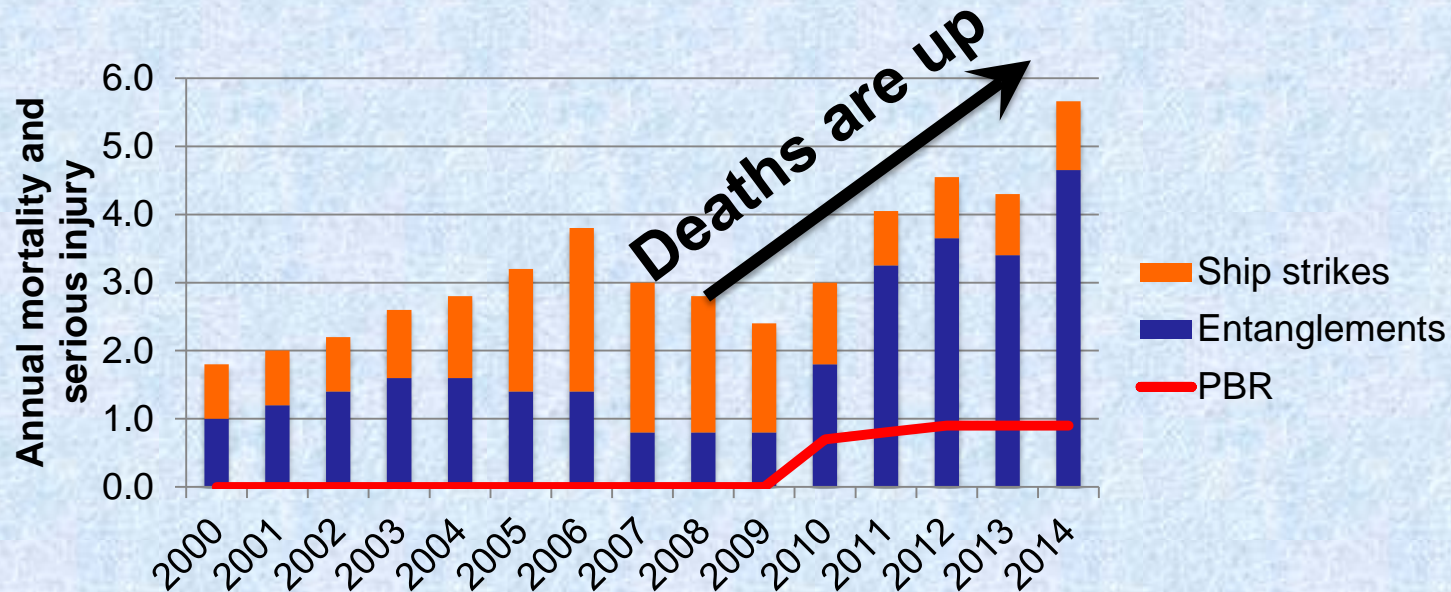
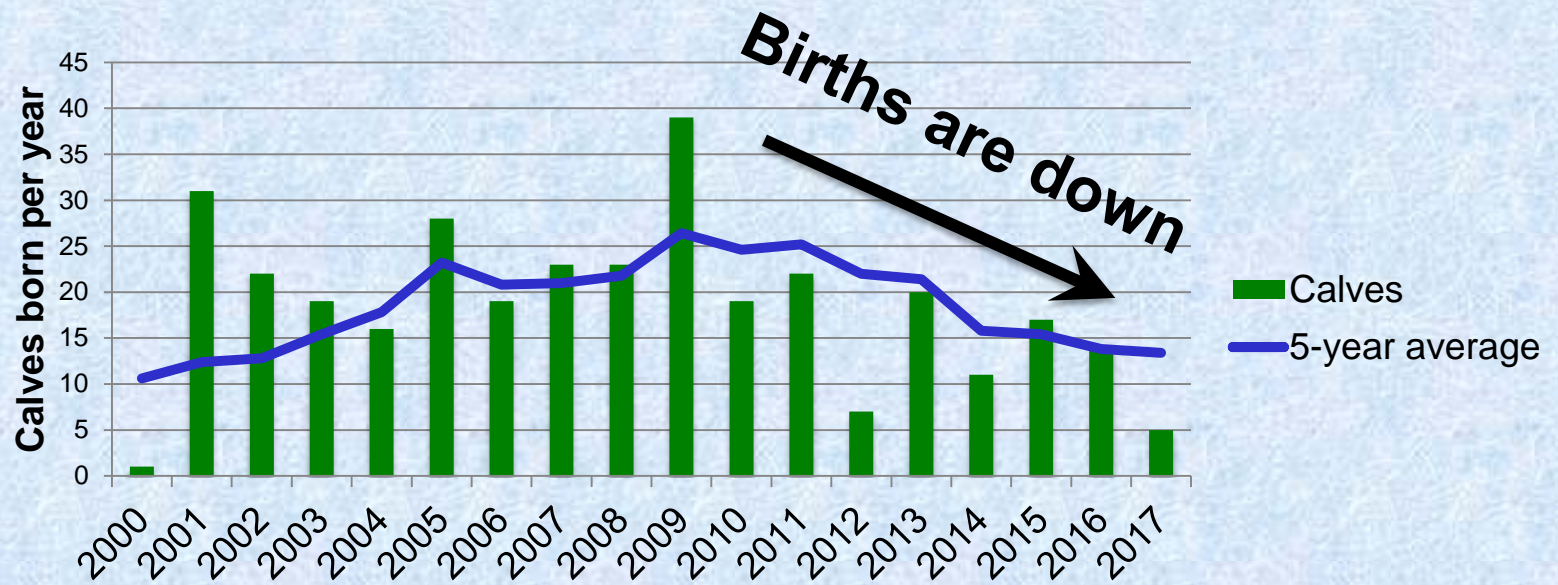


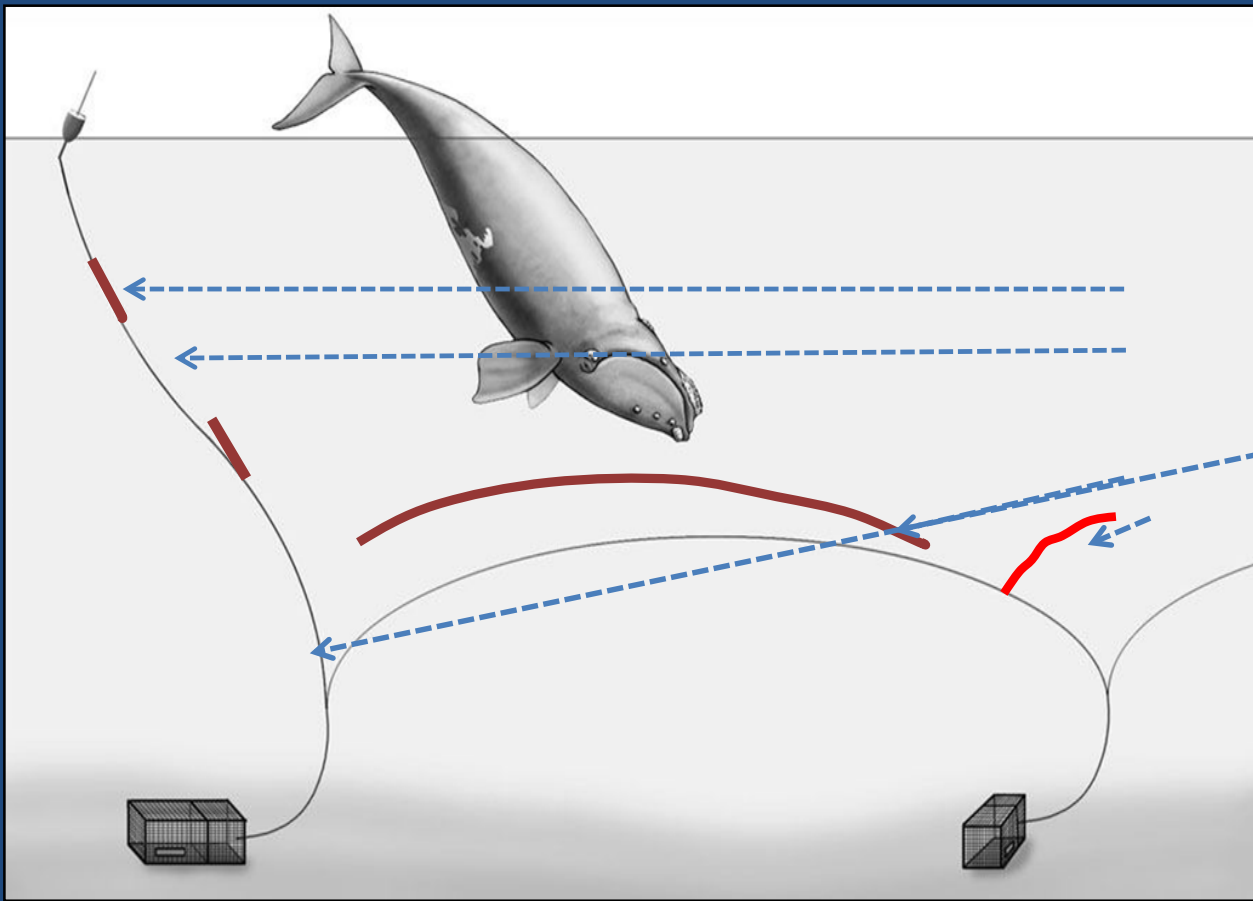
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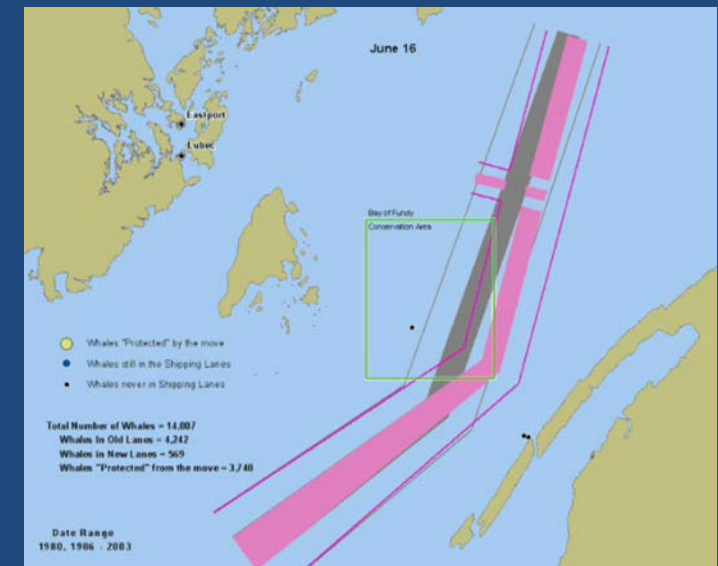
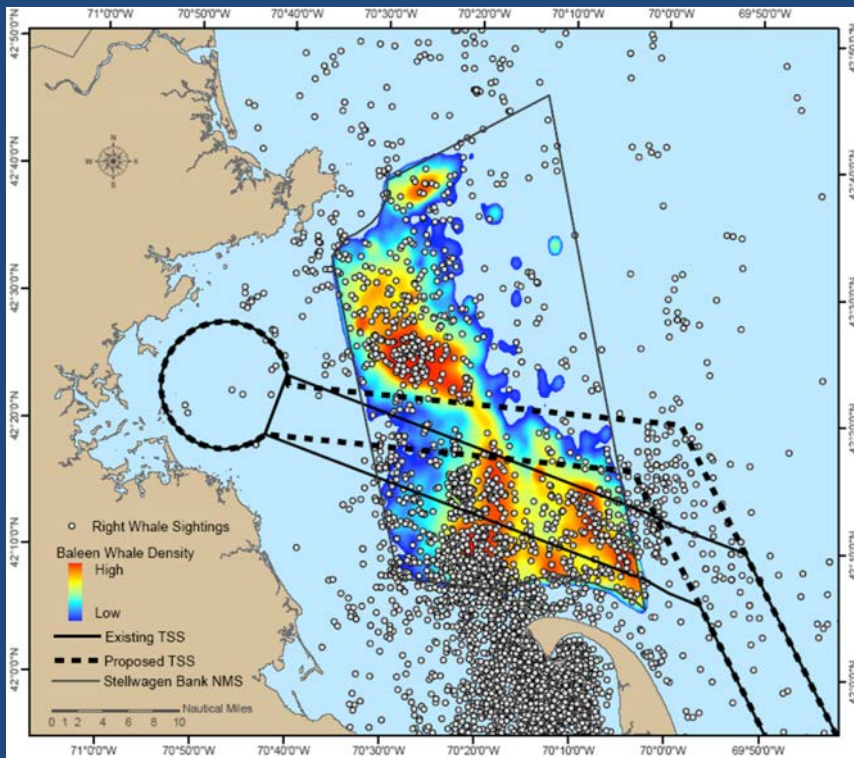






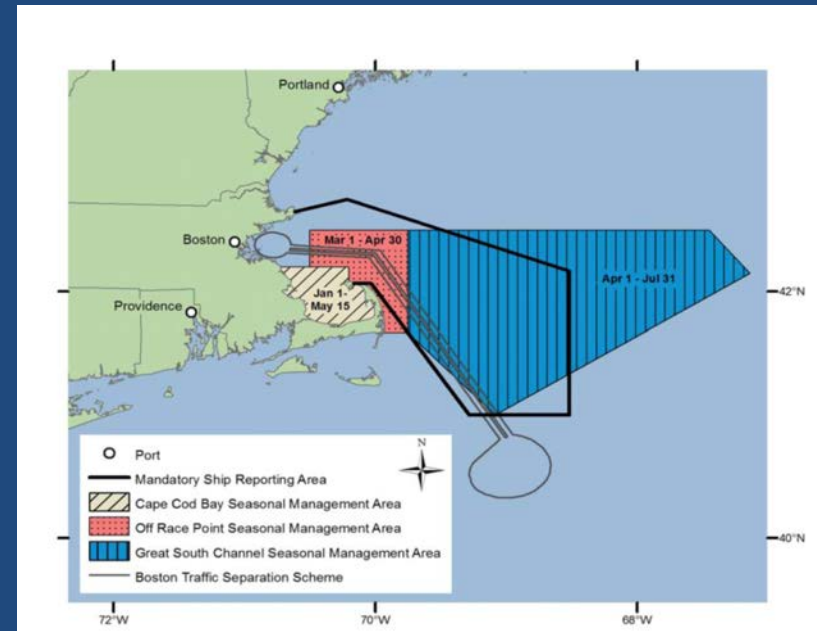
Entanglement Mitigation

- Closures
- Sinking ground lines
- Weak rope
- Rope-less fishing



Ship Strike Mitigation

- Move shipping lanes
- Seasonal areas to be avoided
- Slow ships down



458 right whales alive in 2015, including 105 adult breeding females

$105 \div 458 = 23\%$ of population are breeding females

481 right whales alive in 2011 + 77 calves born between 2011 and 2015 = 558 whales

$558 - 458 = 100$ deaths over 5 year period (2011-2015)

$100 \text{ deaths} \div 5 \text{ years} = 20 \text{ deaths per year}$

$20 \text{ deaths per year} \times 23\% = 4.6$ breeding females died per year

$105 \text{ breeding females} \div 4.6 \text{ breeding females dead per year} = 23 \text{ years}$

If nothing changes, we will wipe out the 105 breeding females that were alive in 2015 in **23 years**

Two takeaways:

- 1. We have years, not decades, to fix this problem**
- 2. The longer we wait, the harder the problem will be to fix**